THE ENERGY AND RESOURCES INSTITUTE

Creating Innovative Solutions for a Sustainable Future

ANNUAL REPORT

2024/25



Vision

Creating Innovative Solutions for a Sustainable Future

Mission

Tackle issues of concern to Indian society, and the world at large, and develop innovative and cost effective solutions

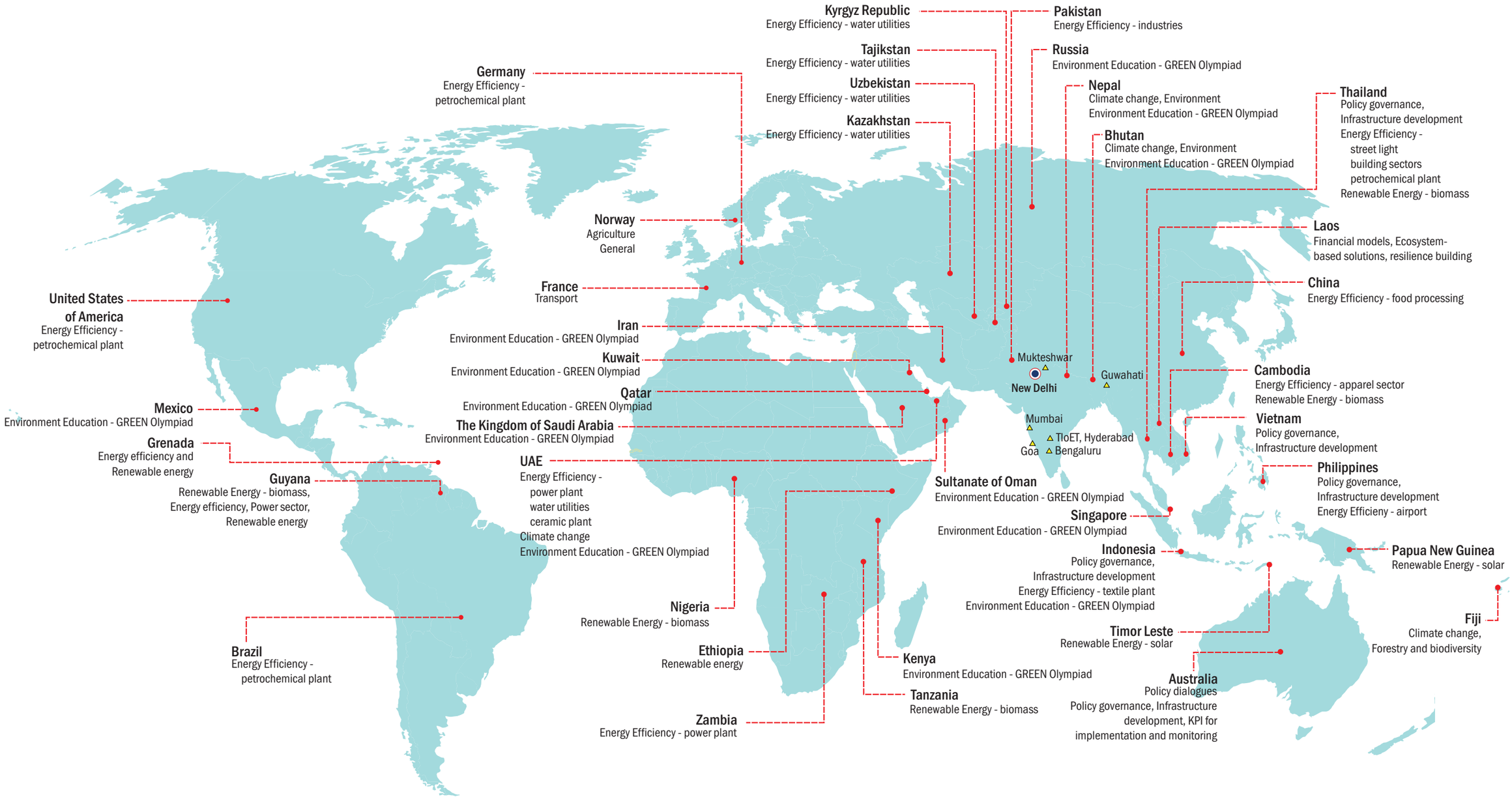
Enhance networking for sustainable interventions

Realize potential for national and international leadership as a knowledge-based agent of change in the fields of energy, environment, other natural resources, and sustainable development

Inspire and reach out to diverse stakeholders for realizing a shared vision of global sustainable development, which could be translated into action

Our growing commitment to a sustainable future

Research and outreach activities in over 40 countries



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FROM THE **DIRECTOR GENERAL'S DESK**

The bygone year, 2024–25, brought the climate crisis into sharper focus—heatwaves of unparalleled intensity, devastating floods, and large-scale displacements pushed global temperatures perilously close to, and at times dangerously above, the 1.5°C threshold. These extreme events revealed the widening inequalities of climate impact and the urgency of action. Against this backdrop, the Sustainable Development Goals (SDGs) are not just ambitions—they are imperatives. However, globally, with only 16% of the SDG targets on track, time is running out to realize the 2030 Agenda.

At TERI, this has only strengthened our resolve. In FY 2024–25, our efforts continued to be closely aligned with both India's and the world's commitment to the SDGs, especially Goals 7 (Affordable and Clean Energy), 11 (Sustainable Cities and Communities), 12 (Responsible Consumption and Production), and 13 (Climate Action).

I take pride in TERI's sustained role as a bridge—linking people and policy, science and society, and innovation and impact. Our World Sustainable Development Summit (WSDS) 2025 embodied this ethos of partnership, bringing together a multitude of voices and perspectives committed to sustainable progress. Under the umbrella theme, 'Partnerships for Accelerating Sustainable Development and Climate Solutions,' the Summit hosted the world's leaders, heads of state, industry pioneers, scholars, civil society representatives, and young, enterprising gamechangers. Their participation and active engagement reflected their solidarity and collective responsibility.

As Pope Francis so beautifully put it, "The time for seeking global solutions is running out. We can find suitable solutions only if we act together and in agreement." These are words that particularly resonate with our own belief at TERI. In a world that is increasingly polarized, the call for collective and inclusive action has never been so urgent. And it is here that I envision TERI's special role—as a unifying force driven by purpose and a catalyst for practical, scalable solutions.

Last year, our Climate Change and Air Quality Programme made significant strides in addressing some of the most critical environmental and

sustainability challenges. At the Centre for Climate Change Research (CCCR), we steered over 25 projects in climate risk assessment, adaptation planning, mitigation strategy, and climate finance. Whether it was working on Emergency Action Plans for critical dams, designing inflow forecasting tools in Bhutan, or developing a Climate Action Plan (CAP) for Delhi under the C-40 network, our efforts informed decisions in 11 countries and multiple key sectors including energy, water, health, and shipping.

Our strength lies in the integration of high-resolution climate models with empirical observations and stakeholder engagement. This enabled us to deliver geoscale-specific solutions to enable low-carbon transitions by geography and by scale.

There have been significant contributions from our Environment and Health Assessment (EHA) and Centre for Air Quality Research (CAQR) teams. From hyperlocal air pollution planning in Patna, airshed management in Uttar Pradesh, and compensation studies in Thadagam Valley, our evidence-led strategy focused on addressing pollution at its source. We provided policy advice on national air quality standards, facilitated the establishment of Clean Air Zones in Andhra Pradesh, and supported capacity-building for State Pollution Control Boards (SPCBs). TERI's recognition as an 'Institute of Repute' by the Central Pollution Control Board (CPCB) stands as a testament to our credibility and impact.

TERI's Energy Programme deepened India's clean energy transition through innovations in storage, policy, and access. Our focus was on energy access, integration of renewables, battery storage, green mobility, and industrial decarbonization—issues at the heart of the achievement of SDG 7 and SDG 13. As a certified lead energy auditing agency under the Perform, Achieve and Trade (PAT) scheme, TERI conducted energy audits across large industries and MSMEs, contributing to enhanced energy efficiency and emissions reduction. Internationally, we extended our efforts in Guyana and Nepal, installing over 7,300 Solar Home Energy systems in the remotest corners of Guyana.

A noteworthy milestone was TERI's collaboration with the Ministry of Steel in creating India's hard-to-abate industry decarbonization strategy. Our efforts became the foundation for long-term industry sustainability. We also accelerated the adoption of solar through projects like Kerala's renewable energy (RE) road map and Pacific Islands' solar ferries.

Furthermore, TERI led the successful commissioning of India's first regulatory-approved 20 MW/40 MWh utility-scale Battery Energy Storage System (BESS), and implemented a residential BESS project in Delhi under the Indo-US initiative. Our low-voltage network digital twin platform provided a cutting-edge extension to our digital energy efforts.

The establishment of the TERI Institute of Energy Transition (TIoET) in Hyderabad and a Centre of Excellence with the Bureau of Energy Efficiency (BEE) marked a milestone in our journey—advancing our mission to catalyse next-generation learning and research. These initiatives further reinstate TERI's leadership in shaping energy policy and empowering communities.

Over the past year, I have witnessed remarkable progress in TERI's work towards advancing sustainable maritime practices and circular bioeconomy pathways. Our Green Shipping Programme has strengthened India's transition to a low-carbon maritime sector. As the host of the National Centre of Excellence in Green Ports and Shipping (NCoEGPS), TERI is supporting the Ministry of Ports, Shipping and Waterways through strategic policy advisory, innovative research, and technological interventions. The Centre has initiated seven projects that range from biofuels adoption to decarbonization road maps for ports and shipping. The launch of the NCoEGPS portal, with features like a virtual assistant and interactive

knowledge dashboard, is another step towards sectoral transformation.

Simultaneously, our Resource Efficiency and Governance Division has played a critical role in aligning SDG 12 and Mission LiFE (Lifestyle for Environment) with practical, evidence-based outcomes. We contributed to national policy dialogues and undertook pivotal projects including the International Climate Initiative (IKI) India Interface Function, sustainability evaluation for defence simulator training, and promotion of sustainable packaging.

At the same time, our Advanced Biofuels and Biochemicals teams have built on TERI's legacy of innovation. In the thermochemical domain, we now have advanced pathways for sustainable aviation fuels, pyrolytic bio-oils, and green methanol. These efforts not only offer scalable solutions but also contribute to reducing emissions from agriculture and transport. In microbial biofuels, our state-of-the-art pilot facilities at TERI Gram, including the TATA Chemicals Ltd., TERI Centre of Excellence (CoE) on Biochemicals, are demonstrating zero-waste bioprocesses that harness microbial interventions for fuel and biochemical production.

Our Industrial Biotechnology Research is a cornerstone of innovation. With 14 funded projects supported by leading government bodies and corporate partners, we have deepened our impact across sectors. Our pioneering microbial technologies such as Oilzapper, Microbial Enhanced Oil Recovery (MEOR), and CO_2-to-methane conversion have not only enhanced oil recovery and waste valorization but also contributed meaningfully to climate action and environmental remediation. Through our sustained efforts, we are showing that innovation in biotechnology can power both industrial growth and ecological responsibility.

Our Sustainable Agriculture Programme continued to deliver high-impact, science-driven solutions to promote climate-resilient and resource-efficient farming. Our innovations in bio-nanofertilizer and mycorrhizal biofertilizers are transforming nutrient management practices. Strategic partnerships with Chambal Fertilizers, Shell India, and HRPL, have enabled large-scale field deployments, now spanning over 1.6 million acres across India and the Middle East.

The Centre for Bio Nano Fertilizers (CBNF) in Mandideep, Madhya Pradesh—with a current production capacity of 40 lakh litres per annum, expandable to 2 crore litres—is a testament to TERI's ability to scale impactful innovations. Through such timely interventions, we are advancing India's transition to regenerative agriculture, thereby moving away from low productivity, soil erosion, and excessive chemical use.

The Waste, Water, and Natural Resources (WWNR) Programme continued to be a trendsetter in innovative and inclusive sustainability. Over 100 projects were successfully implemented, positively impacting thousands of lives through carbon finance, eco-restoration, and integrated water and waste management. Through our agroforestry carbon models, over ₹9 crore were disbursed to 3,200 farmers, while our ARR and REDD+ projects benefited more than 35,000 farmers, generating a total income of ₹115 crore.

Our green restoration work in Belagavi and Muri revived degraded ecosystems, demonstrating nature-based solutions (NbS) in action. TERI's proprietary technologies—Enhanced Acidification and Methanation (TEAM) and Advanced Oxidation Technology (TADOX®)—were deployed at new locations, converting waste to biogas in Ayodhya and enabling textile wastewater recycling in Kanpur. In Central Asia, our interventions across 394 MSMEs led to measurable reductions in energy and water consumption, as well as greenhouse gas (GHG) emissions, thereby setting a benchmark for sustainable production practices.

In parallel, we expanded our Water Programme through initiatives such as Jal Mitra, clean water access programmes for remote border posts, and green water solutions for industry and airports. These concerted efforts aim to directly support SDG 6 (Clean Water and Sanitation) and SDG 12 (Responsible Consumption and Production), taking science-driven, people-centric solutions to where they are needed most.

In the realm of infrastructure, our Sustainable Infrastructure Programme (SIP) demonstrated

how cities and buildings can be drivers of change. Through 36 workshops and 63 projects, our Sustainable Buildings Division (SBD) facilitated mainstreaming of Energy Conservation Building Code (ECBC) (amended to Energy Conservation and Sustainable Building Code [ECSBC]) and Energy Conservation in Building Sector Code (ECSBC) in Madhya Pradesh, Ladakh, Chandigarh, and Odisha. We developed a knowledge portal on green building materials, facilitated freight decarbonization efforts with the Indian Railways and CONCOR (Container Corporation of India), and enabled urban resilience planning in Shimla, Panaji, and Coimbatore.

Under the Green Rating for Integrated Habitat Assessment (GRIHA), 608 new green building projects were registered, and over 1,000 professionals trained. With more than one billion sq. ft now rated, GRIHA continues to drive the transformation of cities and industries towards greener, smarter built environments.

In a year marked by both urgency and opportunity, our Social Transformation and Strategic Alliance Programme spread the message of sustainability beyond institutions—into homes, communities, and classrooms. Through the Environment Education and Awareness (EEA) division, over one lakh students participated in the GREEN Olympiad; while the Youth Climate Conclave amplified the voices of young champions. The Energy Wise Energy Rise (EWER) programme struck a chord with more than 27,000 students in Delhi government schools, inspiring awareness and action on energy efficiency.

The Knowledge Resource Centre (KRC) served over one lakh users with digital information services and trained 210 youth in solar energy applications. Aligned with the Mission LiFE framework, we reached more than 1.1 lakh stakeholders–helping embed sustainable behaviour as a people-led movement.

TERI's CSR initiatives have impacted over 50,000 households across India through the deployment of decentralized clean energy solutions. In 2024–25 alone, 25 projects supported MSMEs, self-help groups (SHGs), and rural communities with solar-powered systems, collectively reducing over one lakh tonnes of CO_2 emissions annually. These interventions helped bridge energy access gaps, improved livelihoods, enabled skilling and entrepreneurship, and reduced pollution. Women-led SHGs emerged as last-mile energy service providers, while green job creation gained momentum through school electrification and youth training programmes.

TERI's Regional Centres are the epicentres of our on-ground action–translating strategy into impact. From Bengaluru and Mumbai to Mukteshwar, Assam, and Goa, each centre reflects our commitment to context-specific, locally driven solutions. They bring TERI's vision to life where it matters most, making sustainability personal, practical, and participatory.

At our Centre in Mukteshwar, Uttarakhand, we are empowering mountain communities through sustainable development tailored to the Himalayan context. By promoting the cultivation of medicinal plants, strengthening climate-resilient agriculture, and encouraging ecotourism, we are enhancing livelihoods while preserving the region's rich biodiversity.

In the Eastern Himalayas, we have also established the Centre for Himalayan Studies—a collaborative initiative with Gauhati University, International Centre for Integrated Mountain Development (ICIMOD), and the Balipara Foundation. Envisioned as a strategic platform for interdisciplinary research, policy dialogue, and community-led conservation, the Centre aims to focus on ecosystem-based adaptation, biodiversity protection, and climate-resilient livelihoods. It places an emphasis on harnessing indigenous knowledge to inform sustainable practices. By fostering academic partnerships and grassroots action, the Centre will attempt to build long-term resilience across the ecologically sensitive Northeastern states and position Northeast India as a leader in climate adaptation and nature-positive development in the region.

In Mumbai, our Centre spearheaded a range of impactful initiatives–from the Department of Science & Technology (DST)-funded Citronella cultivation project in Mokhada, and the plantation

of 6,000 saplings among tribal farmers, to path-breaking studies on microplastics. With efforts such as reforestation in the Western Ghats, real-time air and water monitoring in partnership with the Maharashtra Pollution Control Board, and circular economy promotion, the Centre has emerged as a regional leader in sustainability.

In Goa, our Regional Centre supported 800 tribal beneficiaries through the DST-SEED's STI-Hub project and climate-resilient aquaculture under the Asian Development Bank (ADB) initiative. Marine protection was enhanced through SDG 14 mapping and targeted watershed interventions. Strategic MoUs with the Goa Government are enabling the reclamation of the Khazan lands and promotion of ecotourism.

Through technical research, industrial collaboration, and cross-sectoral innovation, the Southern Regional Centre in Bengaluru has been at the forefront of decarbonization and waste minimization, thereby driving cleaner processes and greener growth.

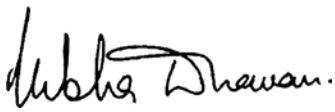
In Assam, our North-Eastern Regional Centre (NERC) left an indelible mark through a series of high-impact initiatives. From the bioremediation of Jamuna Pond to the development of a Zero-Waste Campus at Raj Bhavan, we delivered measurable outcomes–treating nearly 115 metric tonnes of waste and decreasing faecal coliform levels by 83%. Our National Accreditation Board for Testing and Calibration Laboratories (NABL)-accredited Food Testing Lab expanded its outreach, while our collaborations with Assam Agricultural University (AAU) and Assam Science Technology and Environment Council (ASTEC) continue to facilitate region-based innovation in livelihoods and biodiversity.

The TERI Council for Business Sustainability (CBS) remained a bridge between industry and science. In FY 2024–25, CBS mobilized 94 Indian CEOs to endorse the *Industry Charter for Near Zero Emissions by 2050*. At COP29 in Baku, it showcased India's industry-led solutions and Global South leadership in solar transitions. Strategic collaborations with the steel and cement sectors, the launch of digital platforms for decarbonization practices, and global sessions with partners such as Invest India, have positioned CBS as a driving force in climate leadership.

Through the Centre for Sustainable Development Research and Leadership (CSDRL), TERI enabled systemic shifts such as green budgeting and green public procurement in Assam, Bihar, and Puducherry – aligning financial decisions with sustainability goals. Such initiatives mark a key milestone in accelerating the SDGs at scale. Internationally, TERI reaffirmed its leadership through the 24th edition of the World Sustainable Development Summit (WSDS), which convened 1,527 stakeholders from 42 countries this year. The Summit focused on energy transition partnerships, nature-based solutions, and climate finance with a strong emphasis on partnerships across the Global South.

Looking back, we carry within us both pride and humility–pride in our team's unwavering devotion to excellence, and humility in the face of insurmountable challenges and boundless opportunities ahead. TERI is not a research ivory tower; it is a dynamic laboratory of hope, innovation, and action. In the year ahead, we will intensify our efforts, seal gaps, and drive the change our world so urgently demands.

With courage, collective resolve, and solidarity, we will turn the promise of the 2030 Agenda into a common, shared reality—for people, for the planet, and for generations to come.



Vibha Dhawan
Director-General, TERI

WHO'S WHO AT TERI

TERI'S GOVERNING COUNCIL



Mr Nitin Desai
Chairman



Mr R Mukundan



Mr Mahendra Singhi



Mr M S Unnikrishnan



Dr Vibha Dhawan



Ms Ireena Vittal
(till 11/03/2025)



Mr Siddharth Sharma

THE MANAGEMENT TEAM



Dr Vibha Dhawan
Director General, TERI



Dr Banwari Lal
Industrial Biotechnology



Mr Girish Sethi
Energy



Mr Sanjay Seth
Sustainable Infrastructure



Dr Jitendra Vir Sharma
Waste, Water, and
Natural Resources



Dr Dipankar Saharia
Social Transformation & Strategic
Alliance and Administrative Services &
Regional Centres



Mr R R Rashmi
Green Shipping



Ms Suruchi Bhadwal
Climate Change
and Air Quality

TERI'S DISTINGUISHED FELLOWS



Dr Prodipto Ghosh
Distinguished Fellow, Earth Science and Climate Change



Mr K Ramanathan
Distinguished Fellow, Electricity and Fuels Division



Mr Shri Prakash
Distinguished Fellow, Transport and Urban Governance



Mr Ajai Malhotra
Distinguished Fellow and Senior Advisor (Climate Change), Director General's Office



Mr R R Rashmi
Distinguished Fellow and Programme Director, Green Shipping



Mr Ajay Shankar
Distinguished Fellow, Director General's Office



Mr S Vijay Kumar
Distinguished Fellow and Lead, Food and Land Use Coalition, India



Mr Dipak Dasgupta
Distinguished Fellow, Earth Science and Climate Change



Dr Arvind Kapur
Distinguished Fellow, Sustainable Agriculture (upto November 2024)



Mr Sanjay Mitra
Distinguished Fellow, Transport and Urban Governance



Dr Syamal Kumar Sarkar
Distinguished Fellow, Water Resources



Mr Manjeev Singh Puri
Distinguished Fellow, Earth Science and Climate Change



Mr I V Rao
Distinguished Fellow, Transport & Urban Governance



Dr Asha Ram Sihag
Distinguished Fellow, Resource Efficiency & Governance



Mr Jiwesh Nandan
Distinguished Fellow, Industrial Energy Efficiency



Mr Mahendra Singhi
Honorary Distinguished Fellow, Director General's Office



Mr Venkittu Sundaram
Distinguished Fellow, Director General's Office (upto 31/12/2024)



Dr T P Singh
Distinguished Fellow, Director General's Office (from 16/05/2024)



Mr Shailesh Ganeshrao Tembhurnikar
Distinguished Fellow, Land Resources (from 01/01/2025)

RESEARCH PROGRAMMES

- Energy
- Green Shipping
- Climate Change and Air Quality
- Waste, Water, and Natural Resources
- Sustainable Infrastructure
- Industrial Biotechnology
- Sustainable Agriculture
- Social Transformation and Strategic Alliance



Energy Programme

The Energy Programme promotes energy efficient and renewable energy-based technological solutions to enable India and other developing economies realize sustainable and resilient future through low-carbon pathways.

Themes and Commitments

Thematic Focus

The Energy Programme dedicates itself towards the energy transition space, addressing key issues such as energy efficiency, cleaner technology options, renewable energy as well as conducting modelling and assessment exercises. We develop and promote clean energy solutions across India and globally by conducting in-depth analysis, field testing, demonstrations and offering customized, need-based solutions to meet the challenges.

Initiatives across the following thematic domains help achieve the key motto of 'promoting energy efficient and low-carbon solutions':

- Industrial energy efficiency
- Electricity and renewables
- Energy assessment and modelling

Industrial Energy Efficiency

- Conducting energy audits and identifying options for energy conservation measures for implementation by the industries to reduce their energy consumption levels
- Developing evidence-based roadmaps for decarbonization of Indian industry, notably, hard-to-abate sectors such as iron and steel, cement, amongst others
- Undertaking technology assessment studies for different industry sectors with regard to energy and environment
- Supporting energy-intensive micro, small, and medium enterprises (MSME) sub-sectors through energy sector studies, technology development, demonstration and creating enabling environment for large-scale adoption of cleaner options

Electricity and Renewables

- Facilitating energy transition by promoting low-carbon pathways through:
  - » Integrated demand–supply studies at national and state levels
  - » Storage solutions including pumped storage hydro, concentrated solar thermal with storage, battery energy storage (including behind the meter storage), hydrogen, etc.
  - » Smart distribution with storage
  - » Electric mobility
  - » Pilot implementation
- Promoting demand-side management (DSM) and smart grids
- Promoting solar PV, solar thermal, applications through research, development, new and innovative solar (NISA) testing, third party inspection, and deployment
- Pre-feasibility assessment, including technical and financial evaluation, for rooftop solar installations in the industrial sector
- Research and development in the field of smart grid, DSM & EE, etc.
- Conducting policy and regulatory analyses
- Promoting inclusive and equitable transition through research and action in the coal mining regions

Energy Assessment and Modelling

- End-use demand estimation and forecasting for major energy-consuming sectors such as industry, transport, agriculture, residential, and commercial
- Estimate alternative pathways for decarbonization at the national level using energy model to realize the following mandates:
  - » Estimation of optimal energy-mix across alternative decarbonization scenarios
  - » Estimation of total and sectoral emissions (CO_2 equivalent)
  - » Estimation of investment requirement to facilitate decarbonization
- Socio-economic and political assessment of decarbonization
- Studying cross-country energy trade and its implications

Larger Goals and the Context

The varied activities under the Energy programme touch upon SDGs 7,8,9,11,13, and17. It envisions overall socio-economic development of India being driven by clean energy along a low-carbon pathway. The Programme focusses on supporting the transformation of the nation's energy landscape by ensuring adequate, reliable, affordable and easily accessible supplies of clean and renewable energy, as well as by developing and promoting energy-efficient technological solutions/measures for end-users in diverse sectors of the economy.

Approach and Innovation

The Energy Programme promotes low-carbon solutions and clean energy pathways through its in-depth field research and demonstrations, simulations, and modelling. Industry-centric need and opportunity mapping, data gathering and analysis and co-designing sustainable solutions define our journey. We also facilitate multi-stakeholder dialogue around Just Energy Transition and disseminate proven ideas for large-scale adoption and mainstreaming of efficient and cleaner technologies.

Our Accomplishments

In 2024–25, numerous projects, pertaining to the relevant topics such as low-carbon pathways, energy efficiency, promotion of renewable technologies and studies, Just Transition, battery energy storage, e-mobility, RE integration, and capacity building were carried out at both national and international levels. Key projects are as follows:

- TERI holds prominence in carrying out energy audits for industry and commercial buildings in India. As a lead energy auditing firm, the Institute also supports the effective implementation of the Perform, Achieve, and Trade (PAT) scheme of the Bureau of Energy Efficiency (BEE) via mandatory energy audits and verification audits. During 2024–25, energy audits were conducted in large industries as well as MSMEs across various sectors such as iron and steel, cement, power plants, pharmaceuticals, airports etc.

1. Comprehensive energy audits were conducted in Amneal Pharmaceuticals, ACC, Ambuja cements, GMR Airports, FS India Solar, Deendayal & Paradeep Ports, Haldia Energy, etc.
2. On the international front, energy efficiency services were rendered to Guyana and Nepal. Various renewable energy projects are supported as part of the MOU implementation between the Government of the Republic of Guyana and TERI. The Solar Home Energy (SHE) systems are established as a complementary solution to grid electrification and have proven to be the most viable off-grid electrification to date. Building on last year's efforts, an additional 7,300 home systems have been distributed to remote and riverine communities across 10 regions in Guyana.
3. A prudence check of Capital Expenditure (CAPEX) for electricity transmission and distribution companies was conducted as part of the tariff revision process initiated by the Karnataka Electricity Regulatory Commission (KERC).
4. Considering India's commitment to becoming a net zero economy, a core area of TERI's research focuses on decarbonization of hard-to-abate industry sectors like steel and cement. TERI served as the knowledge partner for seven of the 14 task forces constituted by the Ministry of Steel to develop the strategy for decarbonizing the sector. Further, TERI contributed significantly to the development of the strategy report launched by the Ministry, 'Greening the Steel Sector in India: Roadmap and Action Plan,' which outlines actionable pathways for the sustainable transformation of India's steel industry. Technology roadmaps examining different facets of decarbonization such as energy and resource efficiency, material circularity, renewable energy, green hydrogen, carbon capture and storage were prepared.



➢ **Report on Green Steel released by the Honourable Minister of Heavy Industries and Steel, Government of India on September 10, 2024**

The research studies on decarbonization were supported by the organizations of relevance including the World Bank, SED Fund, SSEF, GCCA India, Pellet and Manufacturers Association of India among others.

5. TERI is undertaking several studies related to technical assistance and capacity building support to various sectors like iron and steel, engineering and food processing. This includes study of age profile and relining status of blast furnace in integrated steel plants (ISPs), study on industrial heat use and carbon emission

reduction, promoting green technologies and practices among selected MSME clusters in West Bengal and technical assistance and capacity building support to SME fans manufacturers in selected clusters. Knowledge products were prepared and disseminated on emission monitoring methodology and global climate regulations. The activities under SAMEEEKSHA platform were strengthened. These projects are supported by various organizations including British High Commission, UNIDO, SSEF, CLASP, etc.

6. TERI executed the Battery Energy Storage System (BESS) project via its appointed vendors, M/s BHEL, following extensive feasibility and technical analyses. The BESS project was installed and commissioned at Ispatika Society in Dwarka, Delhi under the Indo-US Project funded by the Department of Science & Technology (DST), Government of India in January 2025. The BESS will provide power to critical loads (lighting, water/fire pumps, lifts, etc.) during grid outages as a primary application thereby reducing diesel consumption and can be utilized for energy arbitrage as a secondary application in the event of the society adopting time of day tariff.
7. India's first commercial regulatory approved utility scale 20 MW/40 MWh BESS project under BRPL license for which the bid process management was done by TERI was commissioned in New Delhi.
8. The implementation of a digital twin platform for monitoring of low voltage distribution network with TERI as a consortium partner along with M/s Panitek of Switzerland and M/s Venios of Germany was completed. The project included implementation of use cases like online distribution transformer (DT) health monitoring, Automated Demand Response (ADR), optimized BESS dispatch for peak shaving at DT level, and power quality & harmonics analysis for distributed energy resources integration.
9. A study, supported by the World Bank and the Government of Kerala, to develop a Renewable Energy (RE) roadmap for the state was completed. The objective was to accelerate the integration of clean energy across Kerala's power system to support its targets of 100% non-fossil electricity by 2040 and net carbon neutrality by 2050.
10. A study titled 'Macro Assessment of Solar Potential' was undertaken to reassess the potential of solar energy in the country. The approach and methodology for the potential reassessment was presented in a stakeholders meeting on October 24, 2024 for validation and feedback.
11. Assessment of Deployment of Solar Ferry in Pacific Islands: The study aimed at exploring the potential of solar energy in addressing marine transportation challenges while promoting sustainable development and reducing environmental impacts in island communities, was completed. The study involved a comprehensive assessment of factors such as energy demand, regulatory frameworks, technological feasibility, economic viability, and environmental impacts. The ultimate objective is to provide actionable insights to facilitate decision-making and enable the successful integration of sustainable transportation solutions in Pacific Island nations, such as Fiji, thereby driving economic development, enhancing environmental conservation, and building long-term resilience.
12. Under the project titled 'People-centric transition in Coal mining region,' TERI has initiated a livelihoods value chain analysis in Betul, Madhya Pradesh that shall eventually guide the needs-based technical training, business establishment, and business sustainability workshops.

Inspirational Evidences

- The Mainstreaming Low-emission Energy Technologies to Build Guyana's Green Economy (MLEET), which promotes the use of renewable energy sources across water treatment plants, was developed by TERI and implemented with funding support from the European Union and the United Nations Development Programme (UNDP).

- TERI has played a key role as knowledge partner to support NITI Aayog's Net Zero study, cutting across various working groups set up for the purpose. In particular, TERI led the work for Working group 1 (Macro-economic implication of transition) which incorporated implications on GDP, employment, and other macro-economic indicators.
- Agrivoltaics discussion as part of the Responsible Renewable Energy Summit: As part of the responsible energy summit, TERI organized a panel discussion and knowledge dissemination session, focusing on the Agrivoltaics plant in Maharashtra. The session featured a discussion on agrivoltaics as a potential people-centric business model and its potential to be deployed on a utility-scale level.

Impact We Created

- The India Industrial Decarbonisation Roadmap to 2070, developed by TERI, in collaboration with Rocky Mountain Institute (RMI), USA and The Industrial Decarbonisation Research and Innovation Centre (IDRIC), at the University of Sussex, UK, was presented to key stakeholders at a workshop held on October 7, 2024, in New Delhi. The roadmap outlined the technological solutions, business models, financing needs and modalities, policy and regulatory frameworks, and research, development, and demonstration (RD&D) strategies required for six key industrial sectors, namely, iron and steel, cement, pulp and paper, aluminium, fertilizers, and chemicals.
- Port Mourant (Guyana), a high-energy-consuming water treatment plant with an annual consumption of 0.45 million kWh, installed a 300-kWp grid-tied solar PV system in December 2024. This project was financed through a grant from the European Union and other bilateral institutions. The solar PV system is projected to reduce greenhouse gas emissions by around 7,111 metric tonnes of CO_2 equivalent over the plant's 25-year lifespan. TERI provided design and project management services for this initiative.
- Under the pilot initiative – SheUdyami – TERI trained and successfully established 50+ women from the coal-mining affected region of Giridih, Jharkhand as business entrepreneurs across four areas such as home decor items, incense stick production, etc.

Knowledge Building and Dissemination

1. A policy brief, 'Pathways for the Indian Steel Sector: Realizing low carbon industrial clusters in eastern India through a place-based approach' was brought into the public domain. The paper, which is based on research studies conducted at steel clusters surrounding the Chota Nagpur plateau, looks at geographic settings or places to make green industrial transformation without exacerbating socio-economic disparities.
2. TERI prepared detailed situation analysis reports for three secondary steel clusters—Raipur cluster in Chhattisgarh, Durgapur cluster in West Bengal, and Sundergarh cluster in Odisha.
3. Four SAMEEEKSHA newsletters were published.
4. An article 'Greener Industries, Stronger Economies—Japan-India Collaboration on Technology Transfer for a Sustainable Future,' detailing how India and Japan are engaging towards the goal by knowledge-sharing and technology transfer, was published in *TerraGreen*, March 2025.
5. A seminar, 'Exploring Collaboration Opportunities toward Decarbonized and Sustainable Society in India' was organized in New Delhi on March 4, 2025 in partnership with Federation of Indian Chambers of Commerce and Industry (FICCI); Japanese Chamber of Commerce and Industry of India (JCCII); Kansai Research Centre, Institute for Global Environmental Strategies (IGES); and Overseas Environmental Cooperation Center, Japan (OECC).
6. An 'India-Japan Workshop on Hydrogen' was organized in Mumbai on January 20–21, 2025 in collaboration with Indian Institute of Technology, Bombay (IITB), Institute of Energy

Economics Japan (IEEJ) and the Ministry of Economy, Trade, and Industry (METI), Japan.

7. A session on 'The role of energy mix planning and power grids to achieving net zero' during G-STIC Conference Delhi was organized by TERI. The details of the event are available at https://gsticdelhi.org/programme
8. A stakeholder consultation was organized on 'Sustainable Per Capita Energy Consumption in India: Role of LiFE Initiative' to discuss and deliberate various policy interventions and their implications on energy consumption.
9. A stakeholder consultation on 'Finance for Climate Action – Exploration of Gaps in Analytical Frameworks' was conducted to deliberate on and explore the gaps in analytical frameworks for climate finance especially in context of India.
10. A two-day workshop was organized on 'Enhancing modelling capacity and stakeholder engagement for climate policy strategies in India' to discuss about modelling results and its interlinkages with policies for a smooth and effective transition.
11. Under the Responsible Energy Initiative (REI) project, TERI hosted a webinar on 'Promoting Inclusive Renewable Energy (RE) Deployment,' focusing on people-centric solutions like AgriPV. Experts from diverse fields—AgriPV developers, government stakeholders, and bilateral organizations—shared actionable insights and inspiring stories on the scalability of these innovative models.



12. At WSDS 2025, a thematic track organized by TERI under the Development Partnership with the Private Sector (PPP) project by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and Ornate Solar, focused on overcoming cost barriers, enhancing standardization, and fostering stronger collaborations to drive large-scale adoption of BIPV. The session also featured a BIPV model-demonstration by Ornate Solar and Sunage SA.



13. The 'Building Integrated Photovoltaics (BIPV) Whitepaper' by TERI focuses on scaling up BIPV in India, leveraging international expertise and stakeholder engagement. It explores BIPV's potential for energy transition, urban resilience, and policy/market readiness, highlighting its role in decentralizing power generation and transforming building surfaces into energy sources.
14. A report titled 'Understanding the Implications of Coal Transition: The scenario in Chhattisgarh, Jharkhand and Odisha' was released during WSDS 2025 which analyses the socio-economic vulnerabilities resulting from coal mine closures through the five capitals approach.
15. During WSDS 2025, a report titled 'Comprehensive Assessment of Job Impacts and Skill Gaps while Transitioning from ICE to Electric Trucks' was released which is one of India's first such detailed study on the truck lifecycle, stakeholders at each stage and skillsets of each stakeholder. The report lists out the impact of job loss and skill gap present at each of the three stages of the truck life cycle and recommends reskilling measures to ensure the shift towards electric trucks is just and inclusive.

Partnerships and Networks

Multiple projects in energy space were carried out with generous support from varied donors such as UNIDO, BHC, SED Fund, etc. Consultancy projects were executed for many domestic corporate players as well as international players such as the Government of Guyana, The World Bank, etc., in the field of energy efficiency in countries such as Guyana, Uzbekistan, Tajikistan, etc.

TERI also received support from Shakti Foundation to conduct studies on various themes including India's net zero roadmap, steel sector, and MSMEs.

TERI received support from the BEE to conduct a study on sustainable level of per capita energy and electricity consumption in India in context of India's aspiration for Viksit Bharat and exploring the role of LiFE mission in energy conservation.

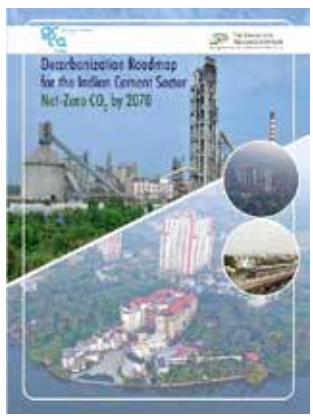
TERI is driving key initiatives under the Indo-German StoREin (Storage for Renewable Integration in India) project, supporting the integration of renewable energy through energy storage solutions at the distribution grid level. The project is being implemented on behalf of the Federal Ministry for Economic Affairs and Climate Action (BMWK), under the umbrella of the International Climate Initiative (IKI) and in close cooperation with the Ministry of New and Renewable Energy (MNRE), Government of India. TERI brings its expertise in energy storage research, technical assistance in implementations, training & capacity building and policy/regulatory recommendations to drive India's clean energy transition alongside partners Fraunhofer IEE, IIT Bombay, and WRI India.

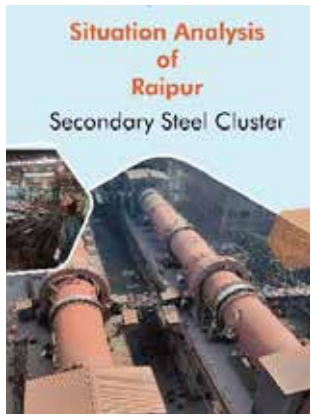
A series of deliberations with Landesa and their leadership team resulted in a 3-year engagement with a focus on 'Mainstreaming equity and justice





➢ **Energy audit at Amneal Pharmaceuticals**







➢ **India–Japan Workshop on Hydrogen**



➢ **Site Acceptance Test (SAT) and training at BESS Pilot site at Ispatika Society, New Delhi**

in procuring land for utility-scale renewable energy projects' aiming at delivering a tangible and scalable framework for socially responsible land acquisition in utility-scale RE projects.

TERI Institute of Energy Transition

The Institute has set up TERI Institute of Energy Transition (TIoET) at its 40 acres campus at Hyderabad Central University with the aim to catalyze transformative reseach and innovation under the overarching themes of energy, environment, and sustainability. In collaboraton with the Bureau of Energy Efficiency (BEE), Ministry of Power, TERI set up the first Centre of Excellence on Energy Transition (CoEET) under the ambit of the TIoET. A Memorandum of Understanding (MoU) was signed between the BEE, Ministry of Power and TERI on January 24, 2025 for jointly setting up the CoEET in the presence of Shri Manohar Lal, Hon'ble Union Minister of Power and Housing & Urban Affairs, and Shri A Revanth Reddy, Hon'ble Chief Minister of Telangana, along with senior dignitaries and officials from the Ministry of Power, BEE, the Government of Telangana, and TERI. The Centre of Excellence is envisioned as a world-class knowledge hub designed to promote research, innovation, and capacity-building in energy transition technologies and policies. By fostering partnerships with national and international organizations, the Centre aims to enhance India's capabilities in addressing energy transition challenges and developing solutions that align with global sustainability goals.



➢ **MoU signing between BEE and TERI to establish the Centre of Excellence on Energy Transition in Hyderabad**

Details on Knowledge Building; Partnerships and Networks can be viewed via the following URLs:

1 https://teriin.org/files/Knowledge-Contributions.pdf

2 https://teriin.org/files/Partnerships-and-Networks.



Green Shipping Programme

The Green Shipping programme demonstrates TERI's research capabilities in supporting sustainable utilization of resource across key sectors including ports, shipping, and waterways. The programme hosts the National Centre of Excellence in Green Ports and Shipping (NCoEGPS), which was set up to support the Ministry of Ports, Shipping and Waterways (MoPSW) and keys stakeholders in fostering carbon neutrality and circular economy in India's maritime sector in line with changing global and national regulatory landscape. The programme actively engages in industry advisory services on various Environmental, Social and Governance (ESG) dimensions. It undertakes cutting-edge scientific and policy research in promoting commercially viable and sustainable solutions derived from biobased routes, anchored on the principles of circularity, towards greening India's maritime sector and beyond.

RESOURCE EFFICIENCY AND GOVERNANCE DIVISION

Thematic Focus

The Resource Efficiency and Governance (REG) Division leads TERI's work around sustainable consumption and production (SDG12) supporting public policy actors and businesses, to drive sustainable use of natural resources along product and service life cycles. Using evidence-

based decision tools and state-of-the-art life cycle assessment frameworks, the Division provides comprehensive understanding of resource efficient solutions in key sectors that support India's achievement of Mission LiFE (LiFEStyle For Environment) and SDG12.

Many of these key findings are leveraged by leading Indian and global brands for their sustainability reporting initiatives while supporting ESG compliance. The Division actively engages with relevant ministries, businesses, think tanks, consumers, and other stakeholders advocating strategic approach to critical mineral resource security and use of secondary material use for achieving successful policy change.

Expertise and Thrust Areas

The Division's expertise include Life Cycle Assessment, Agriculture Policy, Blue Economy, Natural Resources Management, Critical Minerals and End of Life Management, and Ecosystem Evaluation.



Life Cycle Assessment (LCA)



Material Flow Analysis (MFA)



Agriculture Policy and Food Systems



Blue Economy



Natural Resource Management



Circular Economy around Critical Minerals



Ecosystem Evaluation

Our Accomplishments

1. **Support Implementation of IKI India Interface function for all IKI Projects in India under Indo-German Support project for Climate Action in India:** TERI, as a partner, facilitates the implementation of the Interface Function. TERI is also actively involved in organizing the IKI-GIZ community calls and thematic workshops.

The IKI India Community Calls, held regularly throughout the year, facilitates knowledge exchange and collaboration among stakeholders. The 2nd Community Call on October 21, 2024, focused on enhancing the IKI India newsletter and website. The 3rd call on January 27, 2025 delved into project progress, stakeholder engagement, and sustainable exit strategies for maximizing long-term impact. The 4th call on April 21, 2025 focused on exploring opportunities for collective impact within IKI-funded projects.

The IKI India thematic workshops address specific climate action themes. The thematic workshop on mitigation, held on December 6, 2024 concentrated



➢ **IKI India Community Calls**





➢ **IKI India Thematic Workshops on adaptation and mitigation**

on India's path to reducing greenhouse gas emissions, identifying opportunities for scaling mitigation efforts. The adaptation workshop, held on March 6, 2025 brought together government officials, policymakers, and experts to discuss India's National Adaptation Plan framework, sectoral adaptation approaches, and financing mechanisms.

2. **Environmental and Sustainability Benefits of Simulator Training by the Indian Army:** This project involves conducting a Life Cycle Assessment and Techno-Economic Analysis of ammunitions used by the armed forces to understand the environmental and economic burden of ammunition use in live training and thereby gauge the benefits arising from the induction of simulators for army training.

In association, a 'Consultative Workshop on Strengthening Sustainability Initiatives of the Indian Armed Forces,' was held on December 3, 2024 at NITI Aayog, New Delhi, which brought together experts and leaders to discuss sustainable practices within the defense sector. Key discussions included the integration of renewable energy solutions, the use of simulators for green training, and the importance of circular economy practices for waste management.



➢ **The Consultative Workshop on Strengthening Sustainability Initiatives of the Indian Armed Forces**

3. **Promotion of Sustainable Beverage Packaging: Phase II:** Under this project, life cycle assessment was considered to determine the sustainability positioning of various beverage packaging materials. For the dissemination of the study outcome and for awareness creation, various clean-up drives and associated events were organized as detailed below.
    - *Restoring Goa's Beaches with Beach Clean-up Initiatives:* At Miramar Beach, 80 participants collected approximately 400 kg of waste. A larger group of 120 volunteers gathered around 320 kg of waste along the stretch from MS Junction to MES College, Zuarinagar. Bogmalo Beach saw 110 participants removing roughly 80 kg of debris, while the clean-up from Caranzalem Beach to Aviao Beach involved 50 volunteers collecting an impressive 500 kg of waste.

TERI hosted "Safeguarding Our Future – A Path to Sustainable Solutions" at MES College, Goa: This event, organized by TERI at MES College, Goa, aimed to discuss strategies for environmental preservation and sustainable development, engaging stakeholders in actionable dialogues.









➢ **Clean-up drives across Goa**

- *Chief Minister of Goa Unveiled TERI's 'Act Now, Sustain Tomorrow' Video*: The video emphasizes the urgent need to protect the five elements: earth, water, fire, air, and space from pollution and overconsumption. Highlighting India's critical plastic waste statistics and their impact on health and climate, the narrative advocates for sustainable alternatives like aluminium cans and fostering a circular economy.
- *Cleanup Drive at Kalighat, Kolkata:* On February 22, 2025, TERI organized a clean-up drive at Kalighat, focusing on the restoration of the Adi Ganga, a historically significant river in Kolkata. The initiative aimed to raise environmental awareness and mobilize community participation in sustainability efforts, emphasizing the importance of preserving cultural and ecological heritage.



➢ **Safeguarding Our Future: A Path to Sustainable Solutions event at MES College, Goa**

4. **Catalyzing Delivery of Ten Critical Transitions: FOLU Phase III:** Under this project, TERI supports Food and Land Use Coalition (FOLU) in driving policy and practice changes to tackle critical challenges related to climate change,



➢ **Chief Minister of Goa Unveils TERI's 'Act Now, Sustain Tomorrow' Video**



➢ **Clean-up drive at Kalighat, Kolkata**

biodiversity, and health that India will face in the coming decades.

FOLU India officially launched the report titled 'Empowering Decisions in Food, Agriculture, and Land Use: A Collaborative, Resilient, and Democratized Ecosystem' on March 10, 2025. The report focuses on strengthening geospatial policy and data-sharing frameworks to support sustainable food systems and nutrition security in India. It highlights pressing issues such as data fragmentation and offers actionable solutions through policy reforms, technological interventions, and enhanced collaboration to improve decision-making and system resilience. It was attended by all FOLU India partners including TERI.

TERI partnered at the 'Food Systems Summit 2024: Marketplace for Ideas,' held from October 15–17, 2024, leading the 'Improving Nutritional Outcomes' pavilion. The Summit brought together perspectives from over 200 practitioners, academicians, and private sector representatives on various aspects of food systems transformation. The need for a life-course perspective on nutrition that can enhance individuals' nutritional outcomes and even influence the health status of future generations was highlighted.

5. **Knowledge Support on Critical Minerals to the Ministry of Mines:** Under this project, TERI is extending support to the Ministry of Mines



➢ **FOLU India's report launch**



➢ **Dr Manish Anand, Senior Fellow, at the 'Food Systems Summit 2024: Marketplace for Ideas'**



➢ **Ms Mrunali Tembhurne, speaking at the workshop on 'Critical Minerals Recycling'**

on matters related to critical minerals. As part of this collaboration, events have been jointly organized by the Ministry and TERI. Additionally, researchers have actively contributed to events conducted by other institutions and stakeholders in the field.

Paper Presentations, Panel Discussions, and Other Events

1. Ms Mrunali Tembhurne, Associate Fellow, participated as a panelist at the workshop on 'Critical Minerals Recycling' jointly organized by the International Energy Agency (IEA), and the Ministry of Mines, GOI.
2. Ms Aparna Sajeev, Research Associate, presented a paper titled 'Infrastructure, Opportunity, and Willingness: Triple Pillars for Fostering Socio-Economic Resilience through Capability Expansion among the Coal Mining Communities in India' at the India Just Transition Summit 2024



➢ **Ms Aparna Sajeev presenting a paper at India Just Transition Summit**

organized by World Resources Institute and Just Transition Research Center, IIT Kanpur.

3. Budget Seminar on Critical Minerals Mission: On August 14, 2024, the Ministry of Mines hosted a Budget Seminar in New Delhi to advance the National Critical Minerals Mission, aligning with the Union Budget 2024–25. Dr Veena Kumari Dermal, Joint Secretary, Ministry of Mines, presented strategies focusing on domestic exploration, overseas asset acquisition, robust recycling processes, and responsible frameworks for industries utilizing these minerals. The seminar convened industry leaders, start-ups, government officials, scientists, academia, and policy experts to discuss comprehensive strategies, including incentivizing exploration, managing trade and stock, and promoting research, development, and skilling initiatives. TERI, along with Shakti and CEEW, has been supporting the Ministry on Critical Minerals.

Mr Souvik Bhattacharjya, Senior Fellow and Associate Director, moderated the session titled, 'Acquiring Critical Mineral Assets Abroad: Trade and Stock Management.'



➢ **TERI's presence at the Budget Seminar on National Critical Minerals Mission**

4. Ms Aparna Sajeev and Ms Mandavi Singh presented a paper titled 'Harnessing Bio CNG for Vehicle Fuel in India: Environmental Impact and Policy Considerations' at the Activity Committee Meet on 'CBG: For Cumulative Biofuel Growth in the Country' organized by the Centre for High Technology (CHT), Ministry of Petroleum & Natural Gas (MoPNG), and HPCL.



➢ **Mandavi Singh and Aparna Sajeev presenting a paper at the ACM organized by CHT and HPCL**

Training and Skill Development Initiatives

A hands-on offline training session on conducting Lifecycle Assessment on SimaPro software was organized along with SIPL Sustainability Consultants.



➢ **LCA and SimaPro training organized by TERI with SIPL**

Aggregate Numbers

The Division through its engagements across more than 12 projects has delivered various customizable analytical tools that can be used by organizations and brands in assessing environmental impacts and footprints across product and service life cycles.

In recent months, the Division has completed several innovative research on ecological footprints of products and processes in selected sectors including benchmarking, thereby, providing meaningful insights to consumers, brands and government for strategic and policy decisions.

The Centre has been working very closely with major ministries including the Ministry of Mines for developing and implementing 'National Critical Mineral Mission', NITI Aayog on critical evaluation of circular economy policies in major economic sectors, and the Ministry of Power for setting up the national energy data management unit.

Approach and Innovation

The REG Division at TERI spearheads initiatives on sustainable consumption and production in alignment with SDG12. The Division supports policymakers and businesses in promoting the efficient use of natural resources throughout product and service life cycles. By employing advanced life cycle assessment methodologies and evidence-based decision-making tools, it offers deep insights into resource-efficient solutions across key sectors—contributing to India's progress on Mission LiFE and SDG12 goals.

These insights are widely utilized by prominent Indian and international brands to enhance their sustainability reporting and ensure ESG compliance. The Division also maintains active engagement with government ministries, businesses, think tanks, consumers, and other stakeholders, advocating for a strategic approach to critical mineral resource security and the increased use of secondary materials to drive effective policy transformation.

Inspirational Evidences

FOLU India officially launched its report titled, 'Empowering Decisions in Food, Agriculture, and Land Use: A Collaborative, Resilient, and Democratized Ecosystem.' The report emphasizes the need to strengthen geospatial policy and data-sharing frameworks to advance sustainable food systems and ensure nutrition security in India. Addressing critical challenges such as data fragmentation, the report proposes practical solutions through policy reforms, technological innovations, and improved stakeholder collaboration to enhance decision-making and build system resilience.

TERI supported the Ministry of Mines in drafting the National Critical Mineral Mission by providing strategic insights on resource efficiency, sustainability, and circular economy principles. Leveraging its expertise, TERI contributed to policy recommendations aimed at securing critical mineral supply chains and promoting responsible mining and material use in India.

Partnerships and Networks

TERI has been a key knowledge partner to the Ministry of Mines in the development and implementation of the National Critical Mineral Mission, offering strategic guidance on ensuring resource security and promoting sustainable practices in mineral extraction and use. Additionally,





TERI serves as a knowledge and technical partner to NITI Aayog in advancing the circular economy agenda across five critical economic sectors. Through research, policy recommendations, and capacity-building initiatives, TERI supports the integration of circular economy principles to enhance resource efficiency, reduce environmental impact, and contribute to India's long-term economic and environmental sustainability goals.

NATIONAL CENTRE OF EXCELLENCE ON GREEN PORTS AND SHIPPING (NCOEGPS)

The programme hosts the National Centre of Excellence in Green Ports and Shipping (NCoEGPS), that was set up in 2022 to support the Ministry of Ports, Shipping and Waterways (MoPSW) and key stakeholders in fostering carbon neutrality and circular economy in India's maritime sector, in line with the evolving national and global regulatory landscape.

Thematic Focus

The programme contributes directly to SDG7 (Affordable and Clean Energy), SDG9 (Industry, Innovation, and Infrastructure), SDG13 (Climate Action), and SDG14 (Life Below Water). It strengthens India's alignment with the Maritime India Vision 2030 and Harit Sagar Guidelines through:

Expertise and Thrust Areas of NCoEGPS

The Programme's work is anchored in five core domains:

- Policy, Regulatory and Research
- Human Resource Development
- Network-Key Partners and Strategic collaborators
- Explore- Area of work, outcomes, projects, and resources
- Engage- Past events, upcoming events, dissemination

Accomplishments and Initiatives

National Centre of Excellence in Green Ports and Shipping

Established in November 2022, the National Centre of Excellence in Green Ports and Shipping (NCoEGPS) is a Co-Action Centre between the MoPSW and TERI. The Centre brings together a consortium of partners including major ports, public shipyards, classification societies, and knowledge institutions. The NCoEGPS is going to serve as a



'single-point contact' for the MoPSW in matters relating to green ports, green shipping, and green vessels and will be pivotal in evolving solutions in terms of policy, research, and technology that will enable the greening of the sector.

The work under the NCoEGPS will also include development of infrastructure supporting research and capacity-building activities by the Ministry.

Key achievements during the reporting period include:

- Seven ongoing projects under Phase-1 are at different stages of completion and various reports are under review by the associated entities:
  1. Adoption of Biofuels in the Maritime Transport Sector
  2. Green Ports - Low Energy Consumption of Ports
  3. Just-in-Time (JIT) Arrival of Ships
  4. Adoption of Green Fuels for Maritime Applications
  5. Market-Based Mechanisms for Decarbonization in the Shipping Sector
  6. Road Map for Decarbonization - Assessment of Carbon Foot Printing of Selected Ports
  7. Developing a Renewable Energy Generation/ Sourcing Road Map for Ports
- Launch of NCoEGPS Portal

The NCoEGPS Portal was officially launched on February 27, 2025 by the Hon'ble Union Cabinet Minister Shri Sarbananda Sonowal. The portal includes a dedicated virtual assistant ('Varuni'), an interactive data dashboard, and a knowledge repository of over 1,000 green maritime resources.

- NAVIC Cell #3

Under the directive of the MoPSW, 20+ Viksit Bharat Sankalp (ViBhaS) and Neel Arth Vision Implementation Cells (NAVIC) were constituted for monitoring and implementation of various objectives enlisted in Maritime India Vision 2030 and Maritime Amrit Kaal Vision 2047.

NAVIC Cell #3, where the NCoEGPS is a key technical partner, focuses on integrating sustainable practices across India's maritime domain. While ViBhaS cells are coordinated by senior MoPSW officials, NAVIC cells include implementation-level experts from major ports, DGS, IWAI, and affiliated agencies.

NCoEGPS, in collaboration with NAVIC Cell #3, is developing a comprehensive 'Green Initiatives and Pollution Control Measures' report which



consolidates current practices, gaps, and future pathways for various thematic areas identified for decarbonization in the Indian maritime sector.

Key Thematic Areas under NAVIC Cell #3 for ports, shipping and waterways:

- **Green Ports**: Initiatives to drive energy transition and low-carbon infrastructure including adoption of renewable energy, implementation of shore-to-ship power supply. Electrification of port equipment including vehicles, switching to energy efficient appliances and various pollution control measures for air, water, soil and noise pollution control.
- **Green Shipping**: Cleaner fuels, retrofits, and decarbonization pathways for vessels.
- **Green Inland Waterways**: Various thematic areas pertaining to energy transition and pollution control and cleaner fuels, retrofits and decarbonization pathways for vessels.
- **Capacity Building**: Training roadmaps and institutional strengthening
- **Green Financing**: Leveraging climate finance and sustainable investments
- The NCoEGPS is also actively partnering with key national and international stakeholders in the development of strategic policy frameworks, including the Draft National Green Shipping Policy, Market-Based Mechanisms for Decarbonization (with technical points for IMO MEPC discussions), and India's Future Fuel Strategy for the maritime sector.
- The NCoEGPS is working on draft Business Model for shore-ship supply for DPA, VOCPA, VPA and PPA based on the vessels data having reception facilities as received from the respective ports.
- Green Port Ranking Framework for India – Draft framework is ready

A nationally tailored framework is under development to benchmark Indian ports on environmental sustainability performance.
The Green Port Ranking Framework includes various categories and sub-indicators, developed through rigorous literature reviews, international benchmarking, and alignment with national initiatives such as Harit Sagar Guidelines (2023), Maritime India Vision 2030, and MAKV 2047.

Proposed Phase-2 projects: The NCoEGPS has identified three strategic projects for the upcoming phase:

1. Sustainability Roadmap for Inland Waterways Authority of India (IWAI)
2. Roadmap for Sustainable Ship Recycling in India
3. Deployment of Electric Trucks at Indian Ports



Aggregate Numbers

During 2024–25, the NCoEGPS completed assessment of 7 projects (listed above) involving major ports, DGS and CSL with field visits conducted by project investigators (PIs) to validate technical and operational recommendations on-site. These visits enabled high-resolution primary data collection and facilitated action plans tailored to port-specific constraints and opportunities. Various projects are at different stages of completion from studies completed to draft report review by the associated authorities.

The programme's goal is to mainstream net-zero and circularity practices in the Indian maritime ecosystem by 2030.

Approach and Innovation

The programme combines systems thinking with applied research and policy foresight. Its innovation lies in cross-sectoral transitions, digital port tools, green rankings, and scalable models for emission reductions, capacity building, and finance-readiness.

Inspirational Evidence

- NCoEGPS Portal launched with around 1000 curated resources
- Draft frameworks developed for policy, rankings, and infrastructure investment, etc.
- Technical studies shaping India's global inputs at IMO
- Active collaboration with various public and private partners

Impact

- Strengthened port readiness for green hydrogen, methanol, biofuels and ammonia
- Strategic alignment with MIV 2030, MAKV 2047, Harit Sagar Guidelines, etc.
- Greening models to be adopted by VOCPA, DPA and PPA ports
- Life cycle assessment and techno-economic analysis tools to be adopted in National Policy Pilots
- Draft frameworks to be adopted by India for ranking Indian ports based on sustainability and greening of port ecosystem
- Green skill development programme underway for green transition in Indian maritime sector

Knowledge Building and Dissemination

Conference Presentations

- 'Adoption of Green Fuels in the Indian Maritime Sector' at the 7th Coastal Multimodal Logistics Summit 2024
- 'Renewable Energy Roadmap for Ports' at Wind Energy 2024 Conference (Oct 23–25, 2024 Chennai)
- Two papers presented at the Green Shipping Conclave 2025 (February 20, 2025 Mumbai):
  - » 'Pursuit of E-Fuels (Methanol, Ammonia, and Hydrogen) Powered Engines for Decarbonizing the Indian Maritime Industry'
  - » 'Fuel Cells in Marine Applications – Prospects for India'
- **Power-to-X (PtX) for Green Shipping:** The NCoEGPS hosted interactive sessions on PtX technologies, covering:
  - » Demonstrated cutting-edge Power to X PtX fuel production technologies and their integration into maritime operations.
  - » Interactive sessions on zero-carbon fuel adoption, challenges, and benefits for shipping.
  - » Explored international climate agreements, emissions standards, and regulatory frameworks.
  - » Addressed climate impacts of shipping and alternative fuel pathways in a broader context.

Collaboration and Outreach

1. Indian Sugar Mills Association (ISMA):
   - » To conduct LCA analysis of sugar-based sustainable aviation and marine fuel.
   - » To collaborate in policy advocacy and stakeholder engagement to promote the Indian feedstock for SAF production by ICAO.

2. Indian Oil Corporation Ltd. and Centre for High Technology (MoPNG):

- Production of Advance green fuels
  - » Topic: Pilot Scale Process Development for Generation of Pyrolysis Oil from Multi-feed (Biomass, Tyre, Plastic) and its Co-processing in Refinery & Valorization of Biochar with LCA & Techno-economic Assessment
  - » Tri-party MOA signed between TERI, IOCL, CHT (MoPNG) on March 19, 2025

3. HYLA (USA) – For "Just in Time Arrival of Ships" Project:

- HYLA is a company registered in the US, that develops software solutions for the maritime sector – for both sea and land side operations at ports, vessels, and inland channels.

4. Methanol Institute & IIT Kanpur:
   - » The collaboration focuses on promoting methanol as an alternative fuel through advocacy and awareness campaigns to highlight its role in India's energy mix.
   - » Additionally, the partnership emphasizes knowledge sharing by co-organizing industry events such as conferences, workshops, and seminars to disseminate best practices.
   - » Joint research initiatives will target methanol production and utilization, aiming to generate impactful publications and foster synergy in advancing methanol adoptions.

ADVANCED BIOFUELS DIVISION

Advanced Biofuels Division, with its circular bioeconomy strategy, aims to address climate, energy, and food security issues through the production of clean biofuels & green biochemicals and bio-commodities.

To achieve the goal of sustainability, Advanced Biofuels research and development spectrum deals with development and demonstration of sustainable technologies for biofuel production and biomaterial production from renewable non-edible resources such as lignocellulosic woody biomass, agricultural residues, aquatic weeds, algae, and organic matter, through biochemical and thermochemical routes.



Based on these themes, the Advanced Biofuels Division is exploring interventions under two thematic areas: 1) Microbial Biofuels and Biochemicals (MBB); and 2) Pyrolytic Biofuels, Biochar & Green Chemicals (PBGC).

MICROBIAL BIOFUELS AND BIOCHEMICALS AREA

Thematic Focus

Microbial Biofuels and Biochemicals (MBB) department leads TERI's Biofuels & Biochemicals research & development vertical. MBB's cutting-edge microbial interventions aim at technology development and demonstration for production of gaseous and liquid biofuels and biochemicals from biobased resources, in a circular bioeconomy approach. The vision of MBB Area is to drive India's biotransition towards a sustainable bioeconomy by advancing microbial technologies for producing clean biofuels and high-value biochemicals from renewable feedstocks in a zero-waste approach. The 'Biofuels & Biochemicals' Research, Development, and Demonstration (RD&D) domain is led by the MBB department of TERI. MBB's goal is to propel India's biotransition towards a sustainable bioeconomy. Using a circular bioeconomy strategy, MBB's state-of-the-art microbial interventions seek to develop and demonstrate technologies to produce gaseous and liquid biofuels and biochemicals from bio-based resources, in a zero-waste approach.

Thrust Research Areas

Centre for Microbial Biofuels

- The MBB department at TERI is well equipped with state-of-the-art microbiology, molecular biology, analytical laboratory facilities and state-of-the-art pilot and large-scale bioreactor laboratory facilities at TERI Gram, Gwal Pahari and at TERI Mumbai Centre.
- These state-of-the-art infrastructure facilities along with domain expertise of MBB team, research explorations of this group are focused on development of pilot-scale processes for production of liquid and gaseous biofuels; biohydrogen, bioethanol, algae biomass-based and biodiesel, biobutanol, biogas, high rate biomethane, alcohol-based bio-jet fuel precursors from 1st, 2nd and 3rd generation feed (low cost feed, organic matter, lignocellulose biomass).

Approaches are focused on isolation and domestication of select biomolecule production microbe(s) bacteria, yeast, photosynthetic bacteria, microalgae with a goal to achieve high productivity of biomolecules close to the theoretical yield efficiency.

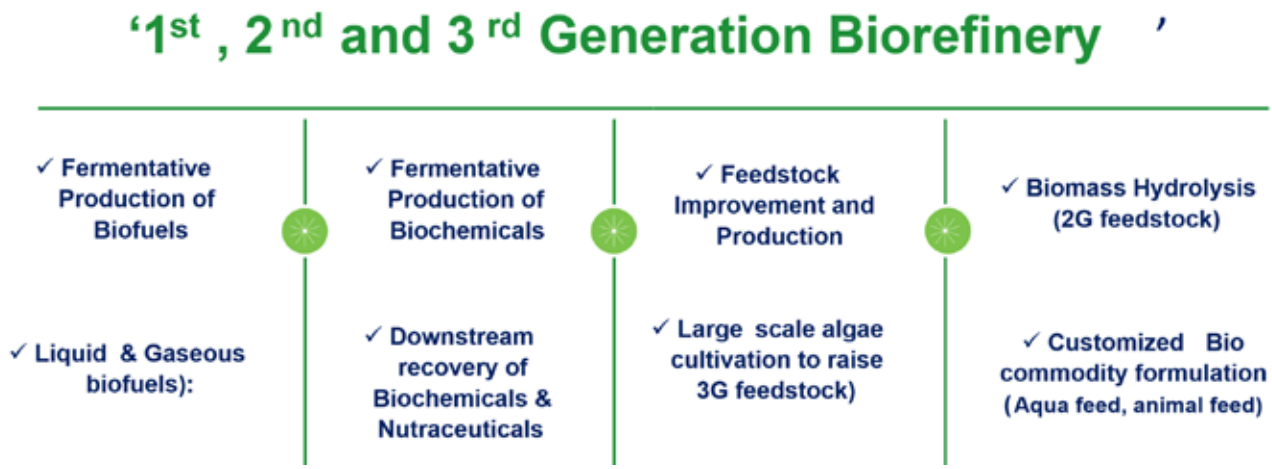
Centre for Biochemicals & Bio-commodities

- MBB's Centre for Biochemicals & Bio-commodities is well equipped with state-of-the-art pilot and large-scale bioprocessing laboratory facilities; 10-, 100- and 1000-litre bioreactors and pilot-scale distillation units.
- These state-of-the-art infrastructure facilities along with domain expertise of MBB team is actively exploring for technology development for production of bulk, specialty and industry platform biochemicals (2,3 butane diol, 1-3 propane diol, bioethanol, biobutanol, lactic acid, acetic acid, butyric acid, lipase, beta carotene, gamma linolenic acid) and bio-commodities (aqua feed, animal feed) from 1st, 2nd and 3rd generation feed (low-cost feed, organic matter, lignocellulose biomass).

State-of-the-Art Pilot-Scale Infrastructure Facilities at TERI Gram, Gwal Pahari

- The MBB Area at TERI is well equipped with state-of-the-art microbiology, molecular biology, and analytical laboratory facilities. These enable the MBB team to carry out product-specific isolation of microbes (bacteria, yeast, photosynthetic bacteria) and microalgae, as well as to develop various bioprocesses for establishment of proof of concept for biofuels, biochemicals, and bio-commodity production.
- State-of-the-art pilot-scale bioprocess laboratory facility at MBB is very well equipped with various bioreactors; 3.5 L multi vessel laboratory scale bioreactors, 10 L-, 100 L-, and 1000-L bioreactors. This facility enables for demonstration of bioprocesses in pilot scale.

Expertise





➢ **Pilot-scale (1000 L) in situ sterilized photobioreactor**

- State-of-the-art pilot-scale downstream processing laboratory facilities; pilot rotary evaporation system and pilot-scale fractional distillation system, facilitates for pilot-scale downstream processing for extraction of biomolecules.
- Pilot-scale biomass processing laboratory facilities: high temperature reactor & high-pressure reactor and centrifuge, facilitates for recovery of value-added biomolecules from waste biomass



➢ **Proto-scale flat raceway – pond algal cultivation system (1000 L)**

TERI Mumbai Centre for Algal Biotechnology

MBB's TERI Mumbai Algal Biotechnology Centre is well equipped with large 1,00,000 litre scale flat panel photobioreactor that spans 220 square metres at Mumbai coast, in Airoli, Navi Mumbai. This system utilizes saline water for large-scale cultivation of indigenously isolated saline algae (isolated from sea water) to generate large-scale biomass. This laboratory is also well equipped with pilot-scale downstream processing equipment for lipid extraction supporting applications in biodiesel production.

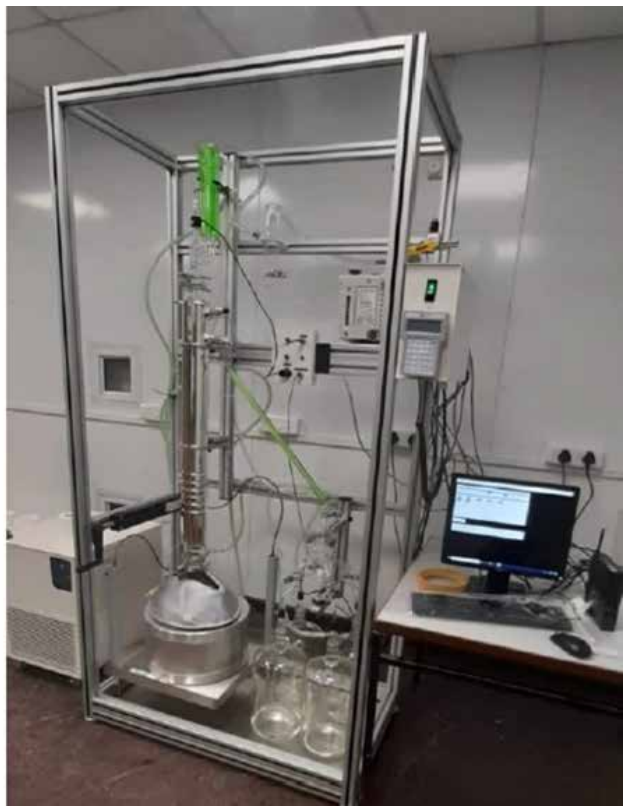


➢ **1,00,000-litre state-of-the-art large-scale outdoor flat panel photobioreactor facility at TERI Mumbai Centre for Algal Biotechnology, Airoli, Navi Mumbai**



➢ **Pilot-scale cultivation of azolla in organic-based wastewater**





➢ **Pilot-scale downstream bioprocessing laboratory facility**

Establishment of 'TATA CHEMICALS Ltd.-TERI' Centre of Excellence (CoE) on Biochemicals

State-of-the-Art Bioprocess Laboratory Facilities (Bioprocess Demonstration at Technology Readiness Level 7)

MBB's 'Tata Chemicals Ltd.- TERI Centre of Excellence on Biochemicals' established at TERI Gram, Gwal Pahari, houses specific state-of-the-art large-scale bioprocessing infrastructure facilities for demonstration of technologies for large production of microbial-based biochemicals and their downstream recovery in a zero-waste approach.



➢ **Multi-vessel parallel laboratory scale bioreactor facility**



➢ **100-L high temperature and high-pressure reactor facility**



➢ State-of-the-art large-scale bioprocess laboratory facility (10 L, 100 L and 1000 L bioreactors)

Establishment of DBT-TERI Centre of Excellence on 'Integrated production of Advanced biofuels and Bio-commodities

Sustainable Solutions Promoted

Under two centres for 'microbial biofuels and microbial biochemicals', the MBB is advancing clean fuel production by leveraging microbial platforms to produce a wide range of biofuels. Our work on first-generation (1G), second-generation (2G), and third-generation (3G) bioethanol focuses on efficient conversion of edible, lignocellulosic and algal biomass such as water hyacinth, corn cob, wheat straw, de-oiled algal, and whole algae biomass through pretreatment, enzymatic hydrolysis, and fermentation using bacteria and yeast strain with enhanced tolerance to inhibitors and stress conditions. In the area of biohydrogen, we have successfully demonstrated the conversion of aquatic weeds such as *Azolla* and water hyacinth, as well as microalgae biomass, using *Enterobacter* strains at scales ranging from 30 to 150 litres.

- **Large-scale algae cultivation and lipid extraction from wet microalgae biomass:**



➢ Demonstration of 3rd generation biorefinery for coproduction for advanced biofuels and biochemicals and bio-commodities

Developed process for large-scale marine algae cultivation for biomass generation to use as feed for bio-commodity and lipid production. Pilot-scale process developed for lipid extraction from wet microalgae to reduce the process cost. (patent filled, TRL-5).

- **Aquatic fern and microalgae feedstock production improvement:**

Developed process for large-scale microalgae and azolla cultivation for achieving high biomass production and to use 3rd generation biomass for value added biochemical and bio- commodity production; aqua feed, animal feed, bio-pigments such as beta carotene and phycocyanin and phycoerythrin, nutraceuticals such as Gamma Linolenic acid (GLA), pro- and prebiotics.

- **Agri-residue and algae biomass processing:**

Developed technologies for pilot-scale biomass processing and hydrolysis for recovery of lignin, silica, and fermentable sugars (TRL-5).

- **High rate biomethane production:**

Developed process high rate biomethane production process in proto scale through employment of specific microbial consortium and nutrient solution, to reduce process time and enhance methane yield efficiency (TRL-4-5).

- **Pilot-scale biohydrogen production:**

Developed technologies for pilot-scale biohydrogen production through dark fermentation route (TRL-6) and photo-fermentation route (TRL-5) for green hydrogen production from sugarcane molasses, commercial sugar, and lignocellulose biomass sugars. (Host: facultative and strict anaerobic bacteria).

- **Pilot-scale biochemical production:**

Developed technologies for pilot-scale production of biochemicals from low-cost feed and their downstream recovery; butane diol, lactic acid (TRL-5-6).

- **1st, 2nd and 3rd next generation bioethanol production and downstream recovery:**

Developed technologies for bioethanol production from low-cost feed including de-oiled algae biomass, commercial feed, molasses and lignocellulose biomass, by using specific indigenous yeast as host (TRL 3-4). Bioethanol recovered and being explored for production for sustainable aviation fuel (SAF) through alcohol to jet pathway.

- **Agri-jet biofuel production: sustainable aviation fuel production through alcohol to jet pathway:**

Bioethanol produced from lignocellulose biomass (rice straw and wheat straw) is explored for conversion to SAF. Proof of Concept validated at TRL 3. Hydrous bioethanol converted to hydrocarbon mixture (pentane and hexane).

- **Fermentative production of enzymes, fermentative biochemicals:**

Develop technologies for production of lipase, 1,3 propane diol, butanol, short chain organic acids (TRL-3), low-cost feed, like crude glycerol, commercial sugar, biomass-based feed.

- **Establish standard for adoption of biofuels in maritime transportation:**

The MBB team is actively engaged in exploring the adoption of biofuels in maritime transportation and has taken proactive initiatives to harmonize ISO standards with Indian standards for implementing biodiesel blending in marine fuels. The harmonization of biodiesel standards was established based on pilot-scale case studies, wherein two major shipping companies—Ambuja Shipping Services Ltd. and Great Eastern Shipping Ltd.—operated ships on biodiesel-blended marine fuel for over a year under the directives of the Directorate General of Shipping (DGS), Government of India. Harmonization of biodiesel standard for maritime transportation will pave the way for biodiesel blending implementation in maritime transportation in India.

Key Major Projects Executed

- Establishment of Tata Chemicals Ltd (TCL) - TERI Centre of Excellence; 2,3 butane diol (precursor of bio-jet fuel) products from sugarcane industry distillery spent, commercial sugar, and lignocellulose biomass; pilot scale
- Establishment of 'DBT-TERI Centre of Excellence on integrated production of advanced Biofuels

and Bio-commodities' using marine algae biomass as platform feed

- Indo-Dutch collaboration for preparation of Bio-transition Report
- TERI-University of York joint Agri-Jet biofuel project for production of 2nd-generation bioethanol from wheat biomass and its exploration for bio-jet fuel production
- Adoption of biofuels for maritime transportation/ harmonization of biodiesel standard for implementation in blending with marine fuels in India
- 6th Research and Development (RD20) international conference, G20 research leaders meet, on clean energy technologies
- Pilot-scale biohydrogen production from renewable sources
- Pilot-scale biohydrogen production from second-generation biomass
- Pilot-scale butane diol production from low-cost feed commercial sugar
- Sorghum biomass-based biorefinery for production of bioethanol, biochemicals and amino acids and value-added bio-commodities
- Indo-Australia joint project on clean energy technologies for 2nd-generation bioethanol production from lignocellulose biomass and process development for mixotrophic algae cultivation using spent ethanol fermentation broth

Our Accomplishments

6th RD20 International Conference in Clean Energy Technologies/ G20 research Leader's meet

RD20 (Research and Development 20) is a global framework that was constituted in 2019 to foster international collaboration in clean energy technologies among G20 countries. Leading G20 research institutions come together under the RD20 framework to facilitate the sharing of renewable energy R&D efforts, experiences, and best practices among nations and regions. It also provides a forum for investigating collaborative research opportunities and forming new alliances between and among governments, academia, and businesses. TERI, in collaboration with the Ministry of New and Renewable Energy (MNRE), Government of India, co-hosted the 6th RD20 International Conference in India from December 2–6, 2024. The MBB Area played a key role in organizing this G20 international research leaders' meet. This historic global conference brought together 64 research leaders from leading G20 research institutions, from G20 countries including subject matter experts from Indian government, academia, and industry. The forum enabled experts to exchange ideas and best R&D practices related to clean energy technologies as well as to identify R&D priorities in the subject domain.





➢ **G20 research leaders meet during 6th RD20 international conference in clean energy technologies held in India, hosted by TERI and the MNRE**





➢ **Leader's session, 6th RD20 International Conference in clean energy technologies**



➢ **Workshop convened on Sustainable Biorefinery during 6th RD20 International Conference**



➢ **G20 research leader's visit to the National Institute of Solar Energy, MNRE, Government of India**

The conference featured three technical sessions, a leaders' session, three closed-door workshops, and a technical site tour to MNRE, the National Institute of Solar Energy (NISE), and TERI Gram biofuel laboratory facilities.

The event underscored India's growing leadership in climate aligned innovation and provided a platform for TERI to showcase its scientific capabilities and collaborative mindset at this global framework.



➢ **Collaboration between Mission innovation (clean energy ministerial) and RD20**

India–Netherlands Bilateral Innovation Mission Workshop on Biorefineries, Bioenergy and Biochemicals

The MBB Area played a pivotal role in hosting the India–Netherlands Innovation Mission Workshop on October 15, 2024, a high-level bilateral event focusing on biorefineries, bioenergy, and biochemicals. With participation from industry leaders, policymakers, and R&D institutions, the workshop emerged as a milestone in Indo-Dutch cooperation on clean energy. Dr Vibha Dhawan, Director General, TERI, delivered a compelling opening address, emphasizing TERI's leadership in microbial solutions and sustainable energy transition.

Dr Sanjukta Subudhi deliberated on TERI leads on Biofuels and biochemicals and brief collaboration opportunities between India and the Netherlands on the subject. Dr Kees Kwant (Mission Innovation, Netherlands) and Dr Balendra Singh (DBT, India),





➢ India–Netherlands Innovation Mission workshop on 'Biorefineries, Bioenergy and Biochemicals,' held at TERI Gram on October 15, 2024

enriched the workshop with insights on policy, pilot-scale technologies, and key mission innovation initiatives of India and the Netherlands highlighting on SAF, marine fuels, and biochemicals.

Indo-German Bilateral Workshop (funded by IGSTC), Organized by National Centre for Cell Science, Pune: Path to Sustainable Future: Innovations in Biomanufacturing

Deliberated as invited speaker at IGSTC funded Indo-German bilateral workshop.



Indo-Dutch bilateral Tech Summit 2025 (co-organized by TERI, Netherlands Innovation Network and MNRE)

The MBB team contributed extensively to shaping the Indo-Dutch Tech Summit panel discussion table on the bioeconomy, helping design the panel themes and bringing together cross-sectoral stakeholders. It was held at IIT-Delhi on February 6, 2025. The summit, anchored by TERI and the Netherlands Innovation Network (NIN), featured a vibrant panel discussion on “Bioeconomy & Waste to Wealth Technologies.” Dr Anu Raghunathan (CSIR-NCL) introduced the panel with an overview on BioE3/BioRIDE Policy & CSIR-NCL.
Dr Vibha Dhawan represented TERI, with industry participants from NCCS-Pune, Praj Industries, SHV Energy, Godavari Biorefineries, and RVO Netherlands.



➢ Indo-Dutch Tech Summit 2025 on Bioeconomy & Waste to Wealth Technologies held at IIT Delhi

The event addressed policy landscapes, investment gaps, R&D linkages, and the need for harmonized certification under the Global Biofuel Alliance. TERI's work on TRL-6 biohydrogen, microbial fermentation pathways, and bioreactor design was acknowledged as leading examples of Indian innovation with global application. The summit set the groundwork for Indo-Dutch joint funding under Horizon Europe and highlighted bio-based trade opportunities in renewable carbon.

Way Forward

The MBB Area is scaling towards TRL 7+ with a clear path to industrial co-development, technology licensing, and bio-based entrepreneurship. We welcome industry, start-ups, and research partners to jointly shape a bio-based, low-carbon future.

- Large-scale biomass hydrolysis for recovery of fermentable sugars, lignin and silica
- Enhancing feedstock production (micro-algae)
- Scaling up fermentative production of bio-alcohols for application in SAF and maritime transportation
- Scaling up of fermentation industry platform biochemicals and nutraceuticals (Beta Carotene, GLA)
- Large-scale demonstration of biohydrogen production (TRL 7-8)
- Large-scale production of high rate biomethane production (through microbial interventions) (TRL-7-8)
- Large-scale production of fermentative industry platform, specialty, and bulk biochemicals
- Large-scale production of algae-based in commodities like aqua feed and animal feed

Pyrolytic Biofuels, Biochar and Green Chemicals Area

Thematic Focus

The Pyrolytic Biofuels, Biochar, and Green Chemicals (PBGC) area focuses on advancing research, technology development, policy, and consultancy in sustainable low-carbon biofuels, green fuels, bioenergy, and bioplastics. Its core research emphasizes thermochemical and catalytic conversion of agro-industrial biomass, waste residues, scrap plastics & tyre, and used cooking oil (UCO) into advanced biofuels such as sustainable aviation fuels (SAF), refinery-grade pyrolytic bio-crude & biodiesel. Additionally, the area emphasizes producing valuable by-products such as biochar and high-porosity activated carbons including renewable biomass-based carbon nanomaterials contributing to a circular economy while addressing the challenges of sustainable energy transition. The PBGC area aligns closely with three Sustainable Development Goals (SDGs): SDG7 (Affordable and Clean Energy), by promoting the development of sustainable low-carbon biofuels and green energy solutions; SDG9 (Industry, Innovation, and Infrastructure), through advancing cutting-edge technologies for thermochemical and catalytic conversion processes; SDG 12 (Responsible Consumption and Production) by promoting resource efficiency, waste reduction, and sustainable material use, SDG13 (Climate Action) by promoting climate-resilient waste and energy systems, and SDG14 (Life Below Water), by addressing plastic waste management and reducing marine pollution through innovative recycling and



conversion methods. This integrated approach contributes to building a sustainable, resilient, and environmentally responsible future.

Expertise and Thrust Areas

- **Advanced Pyrolysis Technologies**: Innovating in pyrolysis for efficient energy recovery and by-product utilization.
- **Sustainable Aviation Fuel (SAF)**: Developing renewable jet fuels to support decarbonization of the aviation sector.
- **Bio-based Chemicals and Plastics**: Creating eco-friendly alternatives to petroleum-based products.
- **Circular Economy Solutions**: Enhancing plastic and waste recycling into fuels and high-value chemicals.
- **Carbon Management**: Utilizing biochar for soil enhancement, carbon sequestration, and industrial uses.


Thermochemical and Catalytic Conversion


Green fuels Development


Biochar and Carbon Materials


Process Design and Optimization


Waste Valorization


Sustainable Solutions Through Biomass


Bio-based Chemicals and Plastics


Policy and Advisory

- **Industrial Applications**: Supporting the refinery sector with renewable feedstock solutions like refinery-grade bio-crude.
- **Collaboration and Capacity Building**: Engaging with industries and policymakers to foster technology transfer and implementation.

Our Accomplishments

TERI maintains a cutting edge advanced Thermochemical Conversion Laboratory that conducts research in pyrolysis technology for production of advance biofuel/sustainable aviation

fuel (SAF), green methanol/dimethyl ether (DME), biodiesel, biochar and activated carbon including carbon nanomaterials pyrolysis oil to refinery grade oil. This Area also works on bioplastic research and green chemicals.

To its credit, TERI has a few patented technologies in this field and is currently engaged with development of some others. These include:

Pyrolysis Research (Patented Technology Developed (TRL: 5)

TERI Pyrolysis Technology: Gas Fired Augur

- Heating dual mode: internal gas fired and external electrical
- Augur moving bed 10–20 kg /h, T up to 800^{0}C, continuous operation
- Intermediate and fast
- Downstream catalytic bio-oil upgradation unit (both liquid and gas phase) integrated
- Using TERI's patented pyrolysis technology, different biomass feedstocks/agro-industrial residues such as tea wastes, coffee wastes, mustard residues, paddy straw, cashew nutshell, cotton stalk, sugarcane bagasse, scrap bamboo, plastics, industrial spent biomass (L'OREAL) have been converted to pyrolytic biofuel and biochar.
- PBGC area has performed intense research aimed at downstream catalytic upgradation of pyrolytic oil produced in pilot pyrolyser to further superior quality bio-oil for refinery integration.
- Indigenous catalysts have been developed for downstream catalytic upgradation of pyrolytic bio-oil to refinery grade bio-oil, aviation fuel components, specialty chemicals and aromatics.

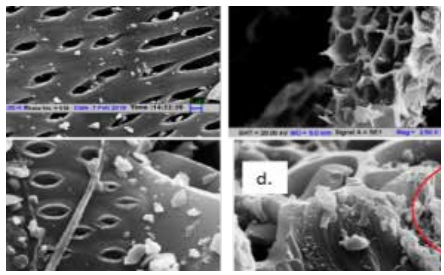
Biochar, Activated Carbon and Green pellets

TERI has been continuing technology development in making high grade carbon products from pyrolytic biochar and its applications.

- High micro-porosity (BET surface area 500–2400 m^2/g) activated carbon (green carbon) is successfully made from agro-residues and de-oiled marine algal biomass-based pyrolytic biochar through indigenously developed downstream activation process. The activation is accomplished using environmentally benign physical and chemical processes. These carbon



➢ TERI's pyrolytic char derived green pellets



➢ TERI's biochar derived activated carbon



➢ **TERI pilot pyrolyser (patented)**



➢ **Bio-oil catalytic upgradation unit**

micro and nano porosities are found highly suitable for CO_2 adsorption.

- TERI has also conducted promising research on biochar, demonstrating improvements in soil fertility through pot experiments under controlled in-house conditions.
- Under sponsored research project, the PBGC Area has developed indigenous process for making green pellets using pyrolytic biomass-based biochar. The Comparative Analysis of Emission of Air Pollutants from Biochar Pellets against conventional Biomass Briquettes shows 61–93% reduction of Particulate matters ($PM_{2.5}$ and PM_{10}) and VOC, respectively.

TERI's Technology has entered a stage where bio-oil and biochar could be recognized as the building block for thermal bio-refinery for co-production of fuels and chemicals.

SAF from Biomass Agro Residues and Marine algal Lipid (TRL 3)

- TERI has initiated work in converting both biomass pyrolysis oil and marine algal lipid to SAF. The pyrolytic bio-crude has been downstream upgraded through catalytic intervention to bio-jet fuel range products including diesel fraction from a variety of agro residues as well as from de-oiled marine algal biomass.
- Upscaling of these processes and demonstration at minimum sustainable scale will lead to jet fuel range products from 2nd generation low-cost feedstocks and 3G marine algal feedstock available in abundance in India.

Knowledge Building and Dissemination

The PBGC Area is one of the most dynamic teams in TERI working across diverse disciplines. The Area currently has the following keys projects to its credit:

1. Pilot Scale Process Development for Generation of Pyrolysis Oil from Multifeed (Biomass, Tyre, Plastic) and its Co-Processing in Refinery and Valorization of Biochar with LCA and Techno-Economic Assessment

This Project supported by the Centre for Higher Technology (CHT), Indian Oil Corporation Limited (IOCL), marks a pivotal step towards advancing sustainable energy solutions and waste management practices in India. Mainly focuses on the pilot-scale development and optimization of pyrolysis technology for the conversion of various Indian biomass feedstocks, waste tyres, and selected plastic wastes into valuable products such as bio-oil (pyrolysis oil) and biochar, with an integrated approach towards product upgradation, co-processing in refineries. It includes co-pyrolysis studies, catalytic upgradation of bio-oil, and conversion of biochar to activated carbon. The project also explores refinery co-processing, chemical recovery, and use of biochar. A detailed techno-economic analysis and life cycle assessment will evaluate economic viability and environmental impact.

2. Adoption of Green Fuels in Indian Maritime sector

PBGC Area is undertaking one of the major projects for "Advanced Green fuels for Maritime Application (Mono Fuel, Dual Fuel/Hybrid, Co-Blending)". The overall objective of this project is to develop green fuel adoption road map for maritime sector in India. The key component of this project includes assessment of feasibility of establishing supply chain logistics for alternative green fuels, assessment of different engines, fuel cell and hybrid ship design options for alternative green fuel transition in ships, assessment of technical feasibility of establishing alternative green fuel storage, bunkering and transport facilities at selected ports in India and developing relevant policies and standards, etc., for accelerating green fuel transition in India. The primary objective of this study is to establish a comprehensive green fuel roadmap, focusing on hydrogen-derived fuels such as hydrogen, methanol, and ammonia, with the aim of achieving a GFI-based compliance with IMO decarbonization targets.

3. Advancing Green Shipping: TERI- PtX Green Shipping Training Workshop

TERI's National Centre of Excellence in Green Ports and Shipping (NCoEGPS), in collaboration with the International PtX Hub, MNRE, the German Federal

Ministry for Economic Affairs, and the Embassy of Denmark, successfully conducted a series of PtX Green Shipping training workshops across India. The first session was held on September 17–18, 2024 in Gandhinagar during the MNRE RE-INVEST Conference, followed by the second on September 24–25, 2024 at TERI, Gwal Pahari, and the third on May 7–8, 2025 in Mumbai. These workshops focused on green fuels such as hydrogen, ammonia, and methanol, exploring their integration into maritime operations, along with policy, economic, and environmental considerations. The trainings brought together stakeholders from government, industry, academia, and finance, reinforcing TERI's leadership in advancing India's maritime decarbonization agenda.



➢ **PtX–Green Shipping Training Workshop I on sustainable maritime fuels and technologies**

- **PtX–Green Shipping Training Workshop I:** Key attendees at the workshop included Shri Abhay Bakre (Mission Director – National Green Hydrogen Mission, MNRE); trainers such as Dr Piyali Das, Mr Souvik Bhattacharjya, and Mr Yogin Soodesh C who emphasized zero-carbon fuel strategies and highlighted TERI's leadership in sustainable maritime transition. The attendees also included participants from Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping (MMMCZCS) and Methanol Institute. Topics covered included policy frameworks, port-based fuel production, and Green Shipping Corridors.
- **PtX–Green Shipping Training Workshop II:** It was held at TERI Gram, Gurgaon, and advanced dialogue on alternative fuels and renewable energy in maritime decarbonization. Dr Vibha Dhawan, Director General, TERI, opened the session, emphasizing the urgency of action in the shipping sector. Dr Piyali Das shed light on alternative fuel adoption and India's renewable energy landscape, while Mærsk Mc-Kinney Møller Center, Copenhagen shared insights on decarbonization strategies for the maritime sector and Green Corridors.



➢ **Mr R R Rashmi addressing participants during PtX–Green Shipping Training Workshop II**



➢ **PtX–Green Shipping Training Workshop II on sustainable maritime fuels and technologies held at TERI Gram**

- **PtX–Green Shipping Training Workshop III:** Held in Mumbai, the 3rd TERI-PtX Green Shipping Training showcased India's emerging leadership in renewable energy and green maritime fuels. Shri Shyam Jagannathan, DG Shipping, stressed the need to work backwards from IMO 2050 targets, Dr Piyali Das led a session on 'Alternative Fuel Mix Options for India and Port Readiness Level – in Light of MEPC 83', outlining strategies for aligning fuel adoption with port infrastructure development. Other key persons highlighted India's green shipping potential,



➢ **3rd TERI-PtX Green Shipping Training highlighting India's leadership in renewable energy and green maritime fuels**

export opportunities for hydrogen/ammonia, and key policies like Sagar Mala & Harit Sagar.

4. Knowledge partner for the session titled 'Building a Green Hydrogen Ecosystem: Seamless Integration for Shipping & Aviation' on ICGH-2024

As part of the International Conference on Green Hydrogen (ICGH-2024), organized by the Ministry of New and Renewable Energy (MNRE) from September 11–13, 2024 at Bharat Mandapam, New Delhi, TERI was engaged as a knowledge partner and moderator for the session titled 'Building a Green Hydrogen Ecosystem: Seamless Integration for Shipping & Aviation'. The session featured insights from Cochin Shipyard Limited, CSIR-Indian Institute of Petroleum-Dehradun, EU-SEA CCCA CORSIA Project, TATA Projects, and Maersk, focusing on the potential of green hydrogen to decarbonize shipping and aviation.



➢ **Delegates at the session on 'Building a Green Hydrogen Ecosystem' for the maritime and aviation sectors**

5. Coastal Multimodal Logistics Summit 2024

TERI, under the NCoEGPS initiative, participated in the 10th edition of the Coastal Multimodal Logistics Summit held on August 9, 2024 at Ernakulam, Kochi. Representing TERI, the team presented key insights on fuel mix options for decarbonizing India's maritime sector in line with the IMO Greenhouse Gas Fuel Intensity (GFI) targets. The summit included focused business sessions and a plenary discussion covering the integration of coastal shipping with port projects, addressing first and last-mile connectivity, and adoption of global best practices to drive efficiency and sustainability.

6. Workshop on Green Hydrogen Standards and Policy Dialogue

Dr Piyali Das from TERI participated as an invitee in the "Workshop on Green Hydrogen" organized by the Bureau of Indian Standards (BIS) in collaboration with the British Standards Institution and the British High Commission on January 28–29, 2025 in New Delhi. The workshop aimed at fostering knowledge exchange and identifying priority areas for standardization in the green hydrogen sector.

7. Workshop on the National Green Hydrogen Mission: Advancing India's Clean Energy Future

As part of the Workshop on the National Green Hydrogen Mission – Opportunities for MSMEs, held at Atal Akshaya Urja Bhawan, New Delhi, a panel discussion on 'Decentralized Hydrogen Production through Biomass Pathways' was chaired by Dr Sangita M Kasture, MNRE, with MSME



➢ **Delegates engaged in discussion during the session 'Building a Green Hydrogen Ecosystem: Seamless Integration for Shipping & Aviation'**



➢ **Delegates at the 'Workshop on Green Hydrogen' organized by BIS in collaboration with the British Standards Institution and the British High Commission**

Business Forum as knowledge partner. Dr Piyali Das emphasized the critical need for robust pilot-scale demonstrations to bridge the gap between the need for lab research and field deployment. She highlighted how scalable biomass-based hydrogen solutions can accelerate decentralized energy access and also emphasized the importance of integrated approach of thermochemical and biotechnological technologies. The session also addressed technology readiness, safety, and policy support needed for wider adoption.



➢ **Engaging deliberations at the workshop on India's National Green Hydrogen Mission**

8. Strategic Engagement at Methanol Forum 2025: Clean Fuel Solutions for India's Energy Future

As part of ongoing efforts to promote alternative clean fuels, Dr Piyali Das chaired a key session at the Methanol Forum 2025, organized by the Methanol Institute in collaboration with the IDD Trade Council. Brainstorming sessions on advantages of methanol over conventional fossil fuels, particularly its potential as a cost-effective carrier for hydrogen due to ease of storage, transport, and enhanced safety. Mr Alexander Döll, COO of the Methanol Institute, commended India's leadership in low-



➢ **Strategic engagement at Methanol Forum 2025 on clean fuel solutions for India's energy future**

carbon innovation and emphasized methanol's critical role in securing energy independence and supporting industrial growth. Discussions during the session focused on the need for robust public-private collaboration to develop the necessary infrastructure and supply chains for widespread methanol adoption.

9. Green Shipping Conclave (GSC) 2025

TERI actively contributed to the 'Green Shipping Conclave (GSC) 2025', held on February 20, 2025 at The Westin Mumbai Powai Lake, jointly organized by the Directorate General of Shipping (DGS), Ministry of Ports, Shipping & Waterways (MoPSW), and the Institute of Marine Engineers (IMEI). Dr Piyali Das represented TERI as an expert in the session 'Driving Maritime Sustainability Through Green Fuels', highlighting the institute's work on the **Greenhouse Gas Fuel Index (GFI)** and its role in evaluating low-carbon marine fuels through lifecycle-based emissions assessment. The conclave served as a platform for sharing TERI's thought leadership in shaping India's sustainable maritime future.

10. Indo-German Business Roundtable on Green Shipping

The Indo-German Chamber of Commerce (IGCC), in partnership with the Indo-German Energy Forum (IGEF-SO), hosted a business roundtable on Green Shipping on February 21, 2024 in Mumbai. Cmde. Debesh Lahiri and Dr Piyali Das, TERI highlighted the importance of the Greenhouse Gas Fuel Index in evaluating low-carbon marine fuels based on lifecycle emissions. The event brought together key stakeholders from government, industry, and research to discuss collaborative pathways for decarbonizing maritime transport. The discussions focused on advancing green shipping corridors, integrating future fuels like green hydrogen, methanol, and ammonia, and aligning with global regulations.



➢ **TERI's Dr Piyali Das and Cmde. Debesh Lahiri highlight the Greenhouse Gas Fuel Index at the Indo-German Green Shipping roundtable**

11. Memorandum of Agreement (MOA) Signed Between Centre for High Technology (CHT), TERI, & Indian Oil Corporation, R&D (IOCL) on Waste (Biomass Residues, Tyre & Plastic) Conversion to Pyrolysis Oil and Renewable Carbon



➢ **TERI at Green Shipping Conclave 2025, highlighting the Greenhouse Gas Fuel Index and pathways for low-carbon marine fuels**



➢ **MoA signed between TERI, Centre for High Technology (CHT), and IOCL R&D for a upscaling TERI's pyrolysis technology**

On March 19, 2025, TERI signed a Memorandum of Agreement (MoA) with the Centre for High Technology (CHT), MoPNG, and IOCL R&D for a collaborative project titled, 'Pilot Scale Process Development for Generation of Pyrolysis Oil from Multi-feed (Biomass, Tyre, Plastic) and its Co-Processing in Refinery and Valorization of Biochar with LCA and Techno-Economic Assessment.' The project aims to upscale TERI's patented pyrolysis technology, enabling refinery co-processing and industrial valorization of biochar.

Approach and Innovation

The PBGC Area is working towards developing strategic collaborative research partnerships with institutes and industries of national and international importance, particularly in the technology upscaling of green fuel production, bioplastics/biodegradable polymers, and biochar-based products. TERI's PBGC Area has strong expertise in green fuels (including biofuels), biochar, and bioplastics, which can be leveraged to establish dedicated Centres in collaboration with industry partners.

Impact We Created

- Developed a green fuel adoption road map for maritime sector in India focusing on 'Bio/E Ammonia, Methanol, Hydrogen & LNG fuels for Maritime Application (Mono Fuel, Dual Fuel/ Hybrid, Co-Blending)'
- Pyrolytic bio-oil and biochar based products for reducing GHG emission (by 60–95%) associated with stubble burning
- Agro-residue biomass to sustainable aviation fuel production pathway established, which could be employed for wider biomass feedstocks like municipal solid waste (MSW) and algal biomass
- Conventional petroleum feedstock replaced by renewable feedstock (glycerol) for making green acrylic acid production through allyl alcohol pathway
- Policy advocacy in ethers (MTBE and ETBE) as replacement alcohols in road transport.

Partnerships and Networks

- Long-term partnership with CHT and MoPNG on Clean Fuel Technologies; MoPSW on Policies and Green Fuel Adoption in Shipping; BIS Committee membership for developing H_2, methanol & ammonia standards for maritime applications; IOCL on collaborative research on Pyrolysis Technology; Tata Chemicals on special pyrolysis biomass based products; and DBT.



Climate Change and Air Quality Programme

The Climate Change and Air Quality Programme has been actively researching global and local environmental and sustainability issues for over three decades. Employing an interdisciplinary approach, it conducts groundbreaking studies related to climate change and air quality in both national and international platforms. By utilizing a combination of research methods, including instrumentation, model-based assessments, and stakeholder consultations, the programme aims to bridge the gap between scientific knowledge, policy formulation, and practical implementation. Its primary focus lies in providing evidence-based recommendations for climate change mitigation, adaptation strategies, and enhancements to air quality and public health.

CENTRE FOR CLIMATE CHANGE RESEARCH (CCCR)

Themes and Commitments

Established in 1989, the Centre for Climate Change Research (CCCR) conducts evidence-based research on global, national, and regional climate change to inform policy and action. Our work supports climate adaptation, risk resilience, and greenhouse gas (GHG) mitigation while promoting sustainable cooling and energy-efficient technologies to reduce carbon footprints. We engage in transdisciplinary research across engineering, economics, social

sciences, and policy, offering customized tools and solutions backed by robust science. CCCR collaborates with government bodies, development partners, academia, and the private sector to co-develop climate action strategies. Backed by a state-of-the-art research infrastructure and guided by experienced professionals, CCCR continues to play a key role in advancing India's climate agenda.

Thematic Focus

Impacts, Vulnerability, and Adaptation Research

We conduct action-oriented research on climate impacts and vulnerabilities across sectors. Our work supports national, state, and local adaptation strategies—including contributions to National and Sub National Plans on Climate Change. We also design Monitoring, Evaluation, and Learning (MEL) frameworks to improve the effectiveness of climate interventions through robust feedback mechanisms and stakeholder engagement.

Climate Risk and Disaster Management

We provide cutting-edge climate risk assessments and disaster resilience solutions. Using high-resolution climate data and advanced modelling tools, we develop risk mitigation strategies, early warning systems, and impact assessments for sea-level rise, floods, cyclones, and other hazards. Our tools support regional and municipal planning for risk-informed development.

Climate Mitigation, Technology, and Policy

Our research supports national and international climate targets by advancing climate policy, mitigation strategies, and technology adoption. We develop GHG inventory and MRV tools, design low-carbon pathways, and advise on carbon markets. We also lead research on refrigerant transitions and energy-efficient cooling technologies, promoting scalable, ESG-aligned solutions for a Net Zero future.

Climate Finance and Markets

We assess domestic and international climate finance mechanisms, evaluating funding tools, policy frameworks, and governance reforms to mobilize investment. Our work supports fair transitions, industrial decarbonization, and India's climate finance strategies. We also analyse global carbon markets and their implications for national climate policy and investment planning.

Our Accomplishments

Aggregate Numbers

During the year, CCCR led over 25 major projects across climate risk assessment, adaptation planning, mitigation strategies, and climate finance. Noteworthy projects include Emergency Action Plans for Ranjeet Sagar and Shahpurkandi dams, inflow forecasting for Chhukha dam in Bhutan, and Climate Action Plan for Delhi under C-40. We covered diverse geographies including 11 South and South-East Asian nations, major Indian states, and key sectors such as energy, water, shipping, ports, steel, and health.

These initiatives contributed to energy efficiency improvements, hydropower optimization, enhanced disaster preparedness, and policy advancements. For instance, hydropower forecasting in Bhutan supports economic planning and energy security, while the port-level GHG inventories help reduce maritime emissions.

The overarching objective is to enable evidence-driven climate action. Key risks included data uncertainty, cross-sectoral coordination, and evolving policy mandates, all addressed through adaptive approaches and stakeholder engagement.

Approach and Innovation

CCCR integrates science, policy, and technology in a transdisciplinary framework. Its innovations include climate modelling, sectoral GHG tools, and climate-health frameworks. A unique strength lies in combining ground data, high-resolution models, and institutional partnerships to co-create scalable, localized solutions.

Inspirational Evidences

- **Emergency Action Plans:** Developed dam break analysis and EAPs for Ranjeet Sagar and Shahpurkandi dams (Dams of National Importance) to safeguard downstream populations and infrastructure.
- **Forecasting Systems:** Designed inflow and generation forecasting for Chhukha dam (Bhutan), improving Bhutan's energy trade readiness and planning.
- **City-Level Planning:** Prepared Delhi's climate action plan under the C-40 initiative to address urban emissions and resilience.
- **Cooling Technologies:** Published guides and training materials with Ozone Cell to promote energy-efficient cooling solutions and technician awareness.
- **Steel Sector Engagement:** Contributed to the Ministry of Steel's report as Finance Task Force knowledge partner.
- **Port Emission Baselines:** Developed India's first GHG inventories for Kochi, Kandla, and Paradeep ports to aid maritime decarbonization.
- **South Asia Focus:** Led FCDO-supported studies on climate-health linkages in 11 Southeast Asian countries.
- **Capacity Building:** CCCR conducted two high-impact workshops: One on Solar Radiation Modification (SRM) Governance, bringing together top scientists, policymakers, and legal experts to discuss the ethical, technical, and policy implications of geoengineering solutions. Another on Physical Climate Risk Assessment for the Financial Sector, which sensitized RBI-regulated institutions to climate risk exposure and introduced asset-level profiling approaches essential for future financial disclosures and sustainability reporting.
- **Global Engagement:** Represented India at COP29 through side events and discussions promoting Global South leadership in climate action.
- **State Climate Action Plans:** Supported Uttarakhand, Puducherry, Chandigarh, and J&K in crafting sub-national climate strategies.
- **River Water Quality Management**: Conducted a comprehensive measurement of discharge from 210 drains out-falling into the River Yamuna, including all sub-drains of Najafgarh and Supplementary Drains, to estimate greywater generation for improved wastewater management and enhancement of Yamuna River water quality.



➢ **TERI@COP29**



➢ **Workshop on Solar Geoengineering Scenario Development**

Impact We Created

- Enabled risk-informed dam operations and early warning systems.
- Supported low-carbon planning at city, state, and sectoral levels.
- Built capacity across 11+ countries for climate-health integration.
- Strengthened climate transparency through MRV tools and GHG inventories.
- Raised awareness and capacity of financial institutions on climate risk.
- Advanced India's engagement in global climate negotiations and frameworks.

Knowledge Building and Dissemination

In 2024–25, CCCR significantly advanced its role as a national climate knowledge hub by generating and disseminating evidence-based research and tools tailored for policymakers, practitioners, and communities. CCCR developed and published a series of technical guidebooks in partnership with the Ozone Cell, MoEFCC, focusing on sustainable cooling technologies and good servicing practices



➢ **SDG Financing event - TERI, UNDESA and Desai Associates**

for RAC (Refrigeration and Air Conditioning) technicians. These publications were supported by quarterly *NewsTrack* bulletins, circulated nationally to enhance awareness and build capacity among frontline service providers.

As part of its South Asia climate-health programme supported by FCDO, CCCR developed 11 country-level comprehensive reports for (India, Bangladesh, Nepal, Vietnam, Philippines, Thailand, Indonesia, Malaysia, Cambodia, Fiji, and Tuvalu) highlighting the intersection of climate risks and public health impacts. These reports provide scientific evidence and policy pathways for governments across the

region to integrate climate adaptation into national health strategies.

Additionally, CCCR conducted hands-on training workshops and expert sessions on high-impact topics such as solar radiation modification (SRM) governance, physical climate risk assessment for financial institutions, and MRV (Measurement, Reporting, and Verification) protocols. Notably, CCCR presented these methodologies to a large cohort of RBI-regulated financial institutions, contributing to mainstreaming climate risk profiling in India's finance sector.

CCCR also served as a knowledge partner to the Ministry of Steel, contributing a dedicated chapter on climate finance and green transitions in the national Steel Report. The Centre continues to disseminate knowledge through its research bulletins, conference engagements, and international partnerships—including through the Australian Awards Fellowship Programme with Griffith University, with whom a long-term MoU has been signed.

Through these efforts, CCCR has strengthened climate literacy, built institutional capacities, and catalysed informed climate action across sectors and scales.



➢ Stormwater drainage measurement in Delhi



➢ Hydropower inflow forecasting system development for Chukha dam, Bhutan project

Partnerships and Networks

CCCR continues to build and nurture a wide array of partnerships with government agencies, academic institutions, multilateral organizations, and the private sector to advance collaborative climate action. These partnerships span short-, medium-, and long-term engagements, enabling us to leverage cross-sectoral expertise, co-develop tailored solutions, and scale impactful innovations across geographies.

In the short term, we collaborate on project-specific initiatives such as urban climate action plans, GHG inventories, or disaster management tools. Our medium-term partnerships often focus on knowledge generation, technology assessments, and capacity-building efforts. Long-term engagements are rooted in strategic planning, system-level transformation, and national or state-level policy support.

Our network includes strategic partners who offer not only financial or technical support but also serve as knowledge co-creators and implementation allies.

(At programme level including)

Government Partners

- **National & State Governments**: Govt. of Punjab, Maharashtra, Haryana, Uttar Pradesh, Jammu & Kashmir, Uttarakhand, and Puducherry





➢ **Drainage discharge measurement in Delhi**

- **Institutions & Departments**: NDMA, MoES, MoEFCC, NIDM, CSIR-NEERI, CPCB, DPCC, State Pollution Control Boards, PSCST, EMPRI
- **Public Sector and Agencies**: DGPC (Bhutan), Mahanadi Coalfields, RITES, Municipal Corporations, WAPCOS

Other Partners

- Accenture, BCG, KPMG, Sky Mate, ITC
- **Multilateral & Bilateral**: World Bank, USAID, UNEP, European Commission
- **Foundations & Think Tanks**: IGSD, McArthur Foundation, CAF, EDF, Bloomberg Philanthropies, SDC, IKI Foundation, Pure Earth, DSG
- **Academic & Research Institutions**: Griffith University, University of Aberdeen, University of Bern, EPFL, IIASA, PSI, NCAR, DIW, WUR, ITB, University of Capetown (UCT), Vasudha Foundation,FIPI, IIT Delhi, IIT Roorkee
- **Implementation & Technical Agencies**: GIZ, RICARDO, VITO Belgium, SED

Through these alliances, CCCR has amplified its impact, enriched its research agenda, and co-developed climate solutions grounded in local context and global best practices.

CENTRE FOR CLIMATE MODELLING (CCM)

Themes and Commitments

During the year 2024–25, the Centre for Climate Modelling (CCM) area focused on addressing climate information at regional scales through the following key themes:

1. **Climate Change Impacts on Energy Sector:** Investigating the effects of historical and future climate variability on wind resources, including changes in wind characteristics at relevant heights under different climate scenarios.
2. **Climate Change Trends, Projections, and Extremes Analysis:** Analysing past climate patterns and extreme events, developing downscaled future climate projections, calculating climate extreme indices, and assessing sea-level rise and tropical cyclone information.
3. **Sustainable Consumption and Production (Focus on Beverage Packaging):** Exploring and promoting sustainable practices within the


India needs to be ready for hotter and longer summers

By Suruchi Bhadwal, K Venkatramana

May 30, 2024 11:45 PM IST

India needs to be sensitive to rising temperatures and heatwave conditions. The country is now locked into this due to the climate crisis.

➢ An article authored by the Centre for Climate Modelling team published in the media

Completed Projects

S. No.	Name of Area	Project Title	PI Full Name	Project Sponsor
1	Centre for Climate Modelling	Assessment of Climate Change Impacts on Wind Resources at Thimmapuram in Andhra Pradesh	K Venkatramana	Hero Future Energies
2	Centre for Climate Modelling	Sub-Project for Sustainable Beverage Packaging Options in India	K Venkatramana	Ball Beverage Packaging India Pvt. Ltd
3	Centre for Climate Modelling	Sub-project for Risk Assessment and Accounting for the ecosystem services for the identified high-altitude wetlands in Uttarakhand and Ladakh	K Venkatramana	WWF-India
4	Centre for Climate Modelling	Sub-project for Developing Climate Change Resilience Plan and Upgrading City	K Venkatramana	Tandon Urban Solutions Pvt Ltd.
5	Centre for Climate Modelling	Sub-project for Ecoregion specific Climate Impact Assessment and Sustainable Agricultural Practices	K Venkatramana	The Norwegian Ministry of Foreign Affairs



➢ **Mr K Venkatramana was invited as a Resource Person to deliver a lecture and conduct hands-on training at the One-Week National Skill Development Workshop on "Data Science in Environmental Sustainability: Integrating Python and AI/ML," organized by the Department of Environmental Science, University of Kalyani, West Bengal, from December 2–7, 2024**

beverage industry, including addressing marine litter and highlighting the environmental benefits of alternative packaging options through awareness campaigns.

4. **Climate Change Adaptation in Aquaculture:** Assessing historical and future climate trends and their potential impacts on smallholder fish farming across various Indian states and developing strategies for adaptation.
5. Regional down scale of climate models using dynamical and statistical methods
6. Studies on ocean and atmospheric dynamics
7. Climate modelling and monsoon research

Approach and Innovation

- Created TERI Climate Tool (TCT) with the goal of making it easier to integrate the results of climate modelling.
- Adoption of AI/ML-based approach to assess climate risk for different sectors.

Knowledge Building and Dissemination

- Dr Ashwini Pai Panandiker moderated a thematic session on *"Role of Community Participation in Climate-Sensitive Urban Planning"* during the State-Level Policy Dialogue on Mainstreaming Climate-Sensitive Urban Planning in Goa, held on April 25, 2025.
- Mr K Venkatramana delivered a presentation titled "An Overview of Climate Change: Assessment, Projections & Impact" at the National Training Programme on Audit of Climate Change and Financing Measures, conducted from July 8–12, 2024, in Jaipur.
- Mr K Venkatramana delivered a presentation titled "Climate Change: Assessment and Projections over the Third Pole" at the workshop "Tibet in Global Climate Conversation," organized by the Tibet Policy Institute of the Central Tibetan Administration, held in Delhi from August 20–22, 2024.



➢ **Mr K Venkatramana and Ms Suruchi Bhadwal delivered a presentation titled "Impact of Climate Change on Coastal Infrastructure and Resilience Strategy for the Indian Armed Forces" at the Consultative Workshop on Strengthening Sustainability Initiatives of the Indian Armed Forces, held on 3rd December 2024 at NITI Aayog, New Delhi**

- Mr K Venkatramana gave a talk on "Assessment of Future Climate Projections for Tirupati District Using the Latest IPCC AR6 Models." At the National Symposium on Seventy-Five Years of Accomplishment of Mausam, held on January 13, 2025, at Prithvi Bhawan, New Delhi.
- Mr K Venkatramana was invited as a Resource Person to deliver a lecture and conduct hands-on training at the One-Week National Skill Development Workshop on "Data Science in Environmental Sustainability: Integrating Python and AI/ML," organized by the Department of Environmental Science, University of Kalyani, West Bengal, from December 2–7, 2024.

Partnerships and Networks

International

NORCE Research Center-Norway, BCCR-Norway, MPI-Germany, University of Reading, British Antarctic Survey-UK, Potsdam Institute for Climate Impact Research (PIK)-Germany, Advanced Research and Invention Agency (ARIA), Department of Earth and Planetary Sciences, The University of Texas.

National

Ministry of Earth Sciences, Indian Institute of Tropical Meteorology (IITM)-Pune, Indian Meteorological Department (IMD), Indian National Centre for Ocean Information Services (INCOIS), NRSC-ISRO, Andhra Pradesh State Development Planning Society, KL University, NIT-Warangal, SV University, Andhra University, Indian National Centre for Ocean Information Services (INCOS), Cochin University of Science and Technology (CUSAT), National Institute of Technology Rourkela, Jawaharlal Nehru University, New Delhi, Indian Institute of Science Education and Research (IISER), Mohali, National Centre for Medium Range Weather Forecasting (NCMRWF), NOIDA.

CENTRE FOR AIR QUALITY RESEARCH (CAQR) AND ENVIRONMENT AND HEALTH ASSESSMENT (EHA)

Themes and Commitments

During the year 2024–25, the Centre for Air Quality Research (CAQR) remained steadfast in its commitment to address critical environmental and air quality challenges through the following key focus areas:

1. Air Quality and Emissions Monitoring

- Strengthened ambient air quality and source emissions monitoring networks across urban and industrial areas.
- Ensured data integrity through the implementation of rigorous QA/QC protocols and advanced analytical techniques.

2. Emission Inventorization and Air Quality Modelling

- Developed and refined spatially resolved emission inventories for key pollutants across multiple regions.
- Applied dispersion and chemical transport models to simulate air quality scenarios and assess policy impacts.

3. Linking Air Pollution with Climate Change

- Evaluated the interlinkages between air pollutants and short-lived climate forcers, highlighting mitigation co-benefits.



➢ Cleaner cooking: Gas tandoors in restaurants

- Contributed to integrated strategies that align local air quality improvements with broader climate action goals.

4. Air Quality Management Planning at Urban and Regional Scales

- Supported the development and implementation of Clean Air Action Plans by providing scientific inputs and stakeholder facilitation.
- Incorporated source apportionment findings and real-time data into actionable strategies at the city and regional levels.

5. Indoor Air Quality Assessment in Urban and Rural Settings

- Conducted extensive indoor air quality monitoring in households, schools, and workplaces, with a focus on exposure risks.
- Promoted interventions including cleaner fuels, improved ventilation, and low-cost filtration technologies.

6. Pilot Demonstrations for Air Pollution Mitigation

- Designed and executed on-ground pilot projects to showcase scalable solutions across different sectors.
- Engaged local stakeholders to ensure knowledge transfer and replication potential.

7. Sustainable Management of Crop Residue

- Implemented both in-situ and ex-situ interventions for managing post-harvest crop residue in collaboration with farmers and local authorities.
- Demonstrated viable alternatives to open burning and explored value-added reuse pathways.

8. Training and Capacity Building

- Conducted capacity-building workshops and training programmes for government agencies, academia, and communities on air quality and climate issues.
- Developed resource materials and toolkits to support informed decision-making and enhance environmental awareness.

9. Climate Change and Health Challenges

- Conducting state-level assessment of climate change-related health impacts in India under future climate scenarios.

10. Air Pollution and Health Effects

- Estimating and understanding the health impacts of air pollution in Kolkata and Howrah cities.

Thematic Focus

During 2024–25, the area advanced its thematic goal of improving environmental quality by delivering integrated solutions for air pollution and climate resilience. Through comprehensive air quality and emissions monitoring, emission



➢ Air Quality Exhibition in Jaipur – Showcasing TERI's initiatives



➢ Regional Workshop on Urban Air Quality – Jaipur

inventory development, air quality modelling, and health impact assessments, the team provided actionable insights for policy and planning. Urban and rural indoor air quality assessments and pilot mitigation demonstrations directly supported local interventions. Development of city and regional air quality management plans, sustainable crop residue management strategies, and stakeholder-engaged training programmes further aligned with clean air targets. These efforts addressed sectoral challenges and enhanced cross-cutting capacities across health, agriculture, and climate domains, helping the division meet its strategic objectives. Our work contributes directly to SDG 3 (Good Health), SDG 11 (Sustainable Cities), SDG 13 (Climate Action), and SDG 7 (Clean Energy) by reducing pollution exposure and enabling evidence-based environmental governance. By promoting sustainable practices, clean technologies, and behavioural change, we help cities and regions transition towards low-emission pathways. These efforts align with national commitments under the NCAP targets and sustainable development.

Our Accomplishments

- **State-level policy recommendations:** Conducted source apportionment studies and guided state-level regulatory authorities in developing local action plans to control air pollution and mitigate its impacts.
- **Strengthening airshed management in Uttar Pradesh:** A project, supported by the Clean Air Fund and Bloomberg Philanthropies, aims to enhance airshed management. TERI established the Strategic and Policy Advisory Unit within the Department of Environment, Government of Uttar Pradesh, providing strategic guidance and technical assistance for effective utilization of funds and results delivery under the Uttar Pradesh Clean Air Action Plan (UP-CAMP).
- **SLCP concentration estimation and impact assessment:** Building on past knowledge, estimated the present concentration of short-lived climate pollutants (SLCPs) across India, aiding the government in prioritizing policies for maximum co-benefits. Additionally, TERI is developing a coupled model approach to quantify the impact of air pollutants on climate, a unique capability in the country.
- **Hyperlocal air quality management in Patna:** Developed a first-of-its-kind Local Air Quality Management Plan (LAMP) for Patna, integrating hyperlocal monitoring, emission inventory, and source apportionment to identify area-specific interventions. Supported local authorities in prioritizing actions around heritage sites and high-risk zones, paving the way for replicable, evidence-based air quality management at the ward level.
- **Environmental compensation assessment for brick kilns in Thadagam Valley:** Conducted a scientific assessment of environmental damage caused by unauthorized



➢ Biomass assessment in Thadagam Valley, Coimbatore

brick kilns in the ecologically-sensitive Thadagam Valley of Coimbatore district. Estimated compensation based on pollution load, land degradation, and regulatory non-compliance, aiding state authorities in enforcement actions and policy formulation. The study provided a benchmark framework for quantifying environmental loss and ensuring accountability in fragile ecosystems.

- **Piloting clean air zones in Andhra Pradesh:** Prepared detailed plans for establishing Clean Air Zones in three cities of Andhra Pradesh, integrating culturally relevant and technically sound solutions. Assessed and prioritized interventions across mobility, urban design, heritage conservation, emissions control, and waste management based on their potential for air quality improvement, supporting city authorities in actionable and sustainable urban planning.
- **Assess state level health impacts of climate change in India:** Working on estimating future climate change impacts on climate sensitive diseases in India at state level. Informing the government decisions on future health budget, by assessing the effects of these health impacts on health budget in the country.

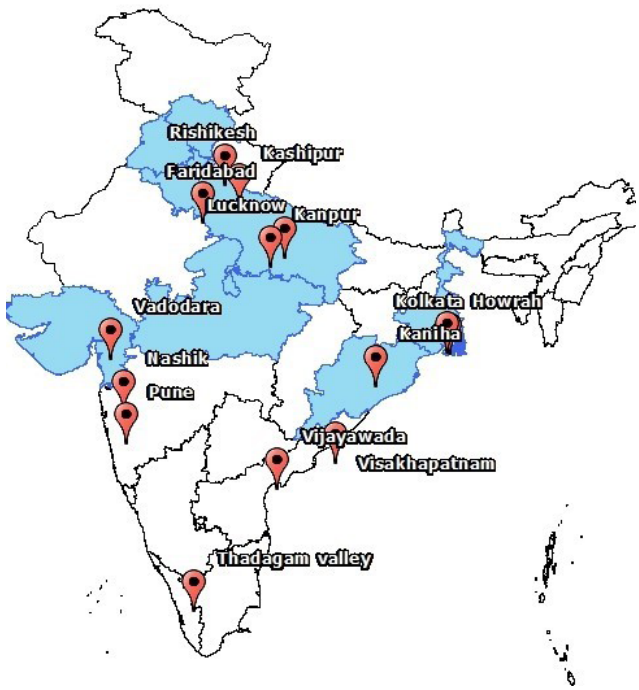
During 2024–25, the Centre for Air Quality Research undertook 16 key projects spanning a diverse range of themes, including air pollution source apportionment, emission inventory development, environmental compensation assessment, net-zero pathways, clean air zone planning, and indoor air quality evaluation. These projects were implemented across more than 10 states, including West Bengal, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Uttarakhand, Gujarat, and Haryana, reflecting a strong pan-India geographic footprint.

The projects catered to a wide target population, from urban residents in polluted industrial and heritage zones to rural households using traditional cookstoves, as well as state pollution control boards, city municipalities, and corporate stakeholders. The work supported policy formulation, local-level planning, and compliance enforcement, directly contributing to improved environmental governance and public health outcomes.

The ultimate objective remains to support India's transition towards cleaner air and sustainable development, while contributing to national and global goals, including NCAP, SDGs, and Net Zero commitments. Key risks faced include data gaps, multi-stakeholder coordination challenges, and limited implementation capacity at the ground level, which were addressed through robust



➢ Ambient air quality monitoring in progress



➢ Geographical spread of TERI's Air Quality Initiatives

Aggregate Numbers

S.No.	Name of Area	Project Title	PI Full Name	Project Sponsor
Centre for Air Quality Research				
1	Centre for Air Quality Research	Improving urban air quality by facilitating the piloting of clean air zones	Ms Shivani Sharma	International Sustainable Energy Foundation
2	Centre for Air Quality Research	Assessing Energy Transition Pathways: An Integrated Modelling Approach and Analyzing the Co-Benefits of Energy Transition Pathways	Dr Anju Goel	International Sustainable Energy Foundation
3	Centre for Air Quality Research	Assessment of Environmental Compensation for the brick kilns that were functioning in the Thadagam region of Coimbatore district for causing ecological damage/environmental pollution in that area	Mr R Suresh	Tamil Nadu Pollution Control Board
4	Centre for Air Quality Research	Analysis of Annual Spatiotemporal Variation of Atmospheric Black Carbon Concentration in Kolkata and Howrah Municipal Corporation Area	Dr Arindam Datta	West Bengal Pollution Control Board
5	Centre for Air Quality Research	Source Apportionment Study of Kaniha OCP	Mr R Suresh	Mahanadi Coalfields Limited
6	Centre for Air Quality Research	Air Pollution Source Apportionment study for Kolkata and Howrah	Dr Arindam Datta	West Bengal Pollution Control Board
7	Centre for Air Quality Research	Carrying Out Indoor and Ambient Air Quality of Accenture	Mr Prabhat Sharma	Accenture Solutions Pvt. Ltd.
8	Centre for Air Quality Research	Achieving Net Zero with Development and Other Co-Benefits	Mr Nimish Singh	Vasudha Foundation USA
9	Centre for Air Quality Research	Emission inventory and SA study for Kashipur and Rishikesh	Mr R Suresh	Uttarakhand Pollution Control Board
10	Centre for Air Quality Research	Emission inventory and SA study for Vadodara	Mr R Suresh	Vadodara Municipal Corporation
11	Centre for Air Quality Research	Pilot Study on Preliminary Assessment of Potential Carbon Benefits by Shifting to Improved Cook Stoves in Rural Households of West Bengal	Dr Arindam Datta	West Bengal Pollution Control Board
12	Centre for Air Quality Research	Support to Government of Uttar Pradesh for establishment of Strategic and Policy Advisory Unit for Uttar Pradesh Clean Air Management Programme (UP CAMP)	Dr Anju Goel	Clean Air Fund (CAF)
13	Centre for Air Quality Research	To develop a Net Zero Emissions Pathways Report (NZEP Report)	Mr Nimish Singh	Institute for Governance & Sustainable Development (IGSD)

S.No.	Name of Area	Project Title	PI Full Name	Project Sponsor
14	Centre for Air Quality Research	Emission inventory and SA study for Faridabad	Mr R Suresh	Municipal Corporation of Faridabad
15	Centre for Air Quality Research	Developing strategies for control of air pollution in India and its cities	Dr Anju Goel	Bloomberg Philanthropies
16	Centre for Air Quality Research	Clean Air Project in India (CAP India) -Phase I	Dr Anju Goel	SDC
17	Environment and Health Assessment	Assessing the Disease Burden Considering Climate Change in the Future Time Periods - A State Level Health Assessment for India	Dr Richa Sharma	Clean Air Fund (CAF)

scientific methodologies, capacity-building efforts, and close engagement with regulatory agencies and communities.

Approach and Innovation

By adopting a science-policy-action framework, the CAQR area delivers context-specific solutions using hyperlocal data, advanced modelling, evidence from health impact assessments and stakeholder engagement. Recognized as an Institute of Repute by the MoEFCC, we lead in source apportionment and carrying capacity studies. Our use of TERI-developed indigenous emission factors further strengthens emissions estimation, enabling scalable, evidence-based interventions for cleaner air.

Inspirational Evidences

- TERI has been instrumental in developing research-informed evidence for policy making, aiding government bodies in the formulation of state of environment reports and environmental policies, specifically in the field of air quality management.
- TERI has also been focused on providing state-level policy recommendations through several source apportionment studies, which guided state-level regulatory authorities to develop local action plans to control air pollution and its impacts.
- The capacity-building and training programmes for personnel involved in air pollution management enhanced awareness and policy-making capacity in the relevant departments.
- Pilot demonstration of technologies to mitigate air pollution, like the introduction of gas-based tandoors in Lucknow.
- TERI has set up a policy and advisory unit in Uttar Pradesh to support the state government in formulating regional sector-specific strategies to improve air quality.
- Developed India's first hyperlocal air quality management plan, integrating real-time data, emission inventory, and stakeholder inputs—now serving as a replicable model for other cities.



➢ **Drone-based survey in Thadagam Valley, Coimbatore**

Impact We Created

- **National State of Environment Report (NSoER):** Played a pivotal role in preparing the NSoER, ensuring comprehensive analysis and accurate reporting of environmental conditions and trends.
- **Host institute for environmental studies:** Served as a national host for conducting crucial studies on source apportionment, emission



➢ **Soil sampling activity in Thadagam Valley, Coimbatore**

inventory, and carrying capacity, providing essential data and recommendations.

- **Steering committee member:** For revision of ambient air quality standards formulated by the CPCB, for development of Framework for New Emission Inventory and Source Apportionment in Delhi-NCR by CAQM, and a Member of the Swachh Vayu Sampark formulated by the Commission of Air Quality Management.
- **Institute of repute:** Designated by the Central Pollution Control Board (CPCB) as an 'institute of repute' to offer technical inputs and guidance for inventory emissions, source apportionment, and carrying capacity reports for cities with populations over a million and non-attainment cities.
- **Air quality management:** Delivered policy-relevant scientific research to inform policymakers, contributing to the enhancement of air quality standards and making high-level policy submissions to the government.
- **Training and capacity building:** Implemented training programmes to improve the skills and knowledge of officials from state pollution boards and the Central Pollution Control Board, effectively bridging gaps and building expertise in pollution management.
- **Local action plans for air pollution control:** Guided state regulatory authorities through source apportionment studies, helping prioritize actions to achieve NCAP's interim target of a 20–30% reduction in air pollutant concentrations by 2024 for non-attainment cities.
- **SLCP concentration mapping:** Leveraging past project knowledge, TERI is mapping current SLCP concentrations and aiding the government in policy prioritization. We are also developing a

Event list 2024–25

S. No.	Programme title	Venue	City	Mode	Area
1	Stakeholder consultation on Conversion of coal-based tandoors to gas-based tandoors in hotels and restaurants as a proactive measure for air quality management	Directorate of Environment, Forest and Climate Change	Lucknow	Physical	CAQR
2	Regional Workshop on Best Practices for Managing Urban Air Quality	Jaipur Exhibition and Convention Centre	Jaipur	Physical	CAQR
3	Round-table discussion under the Clean Air Project in India (CAP India)	ARAI	Pune	Physical	CAQR
4	Regional Workshop (CAP India)	Hotel Taj	Lucknow	Physical	CAQR

coupled model approach to quantify the impact of air pollutants on climate, making TERI one of the few organizations in the country with this capability.

Knowledge Building and Dissemination

TERI actively builds and disseminates knowledge through scientific research, training programmes, stakeholder consultations, and policy dialogues. By translating complex data into actionable insights, we empower regulators, communities, and urban planners. Our evidence-based tools, capacity-building efforts, and publications drive informed decision-making and foster sustainable air quality management practices nationwide.

Partnerships and Networks

Government

Municipal corporations, State Pollution Control Boards, Central Pollution Control Board (CPCB), Delhi Pollution Control Committee (DPCC), MoEFCC, Department of Environment, CSIR NEERI, Punjab Council for Science and Technology (PSCST), Environmental Management and Policy Research Institute (EMPRI), Mahanadi Coal Fields, PWC, Automotive Research Association of India (ARAI), CAQM.

Non-Governmental and Academic

IIT Delhi, IIT Kanpur, Accenture, Calcutta University, Sky Gate, IIT Roorkee, KPMG, BCG, ITC, Pi Green Innovations Pvt Limited, C-STEP, CEEW.

International

The World Bank, USAID, IGSD, SED, Royal Norwegian Embassy, IKI Foundation, McArthur Foundation, Swiss Agency for Development and Cooperation (SDC), Bloomberg Philanthropies, UNEP, VITO Belgium, GIZ, RICARDO, Clean Air Fund (CAF), Vasudha Foundation, University of Aberdeen, EPFL, IIASA, PSI, University of Bern, Pure Earth, European Commission, NACOM, ENRAC, Global Heat Reduction Initiative (GHR) of SCS Global Services, Jennifer Norfolk, Kiff Gallagher, GRIFFITH University.



Waste, Water, and Natural Resources Programme

Themes and Commitments

The Waste, Water, and Natural Resources (WWNR) Programme's mission is to spearhead transformative solutions for sustainable resource management. We are setting a new standard for environmental stewardship by generation of carbon credits through nature-based solutions, unlocking nature's potential by valuing ecosystem services, and rehabilitating degraded lands. Using Sustainable Development Goals (SDGs) as way-posts, we develop innovative strategies for biodiversity conservation to strive for a harmonious coexistence between progress and nature. As both pioneers and providers of cutting-edge technologies, we are at the forefront of revolutionizing water and waste management, circular economy practices, wastewater reuse, and resource efficiency.

Thematic Focus

The thrust areas of the WWNR programme are as follows:

- Carbon Finance Projects Development for Forestry and Allied Sectors
- Biodiversity Assessment and Valuation of Ecosystem Services
- Forest Management and Governance
- Rehabilitation of Mined Areas and Land Restoration
- Water Conservation and Sustainability
- Integrated Watershed Management
- Safe, Efficient and Sustainable Use of Water Resources

- Circular Economy in Waste Sector and Treated Water Reuse
- Implementation of Resource Efficient Cleaner Production
- Bio-waste Resource Mapping and Biogas Plant Installation

The WWNR Programme consists of three broad divisions.

Land Resources Division

The Land Resources Division focuses on promoting sustainable forest and biodiversity management, providing solutions for generating finance through carbon finance mechanisms for forests and agroforestry plantations and supporting the livelihood of famers and forest dependent communities. Land Resources Division operates through seven areas: CBES, CFMG, CSLM, CGTA, CFBC (Guwahati), SSM (Bengaluru), and CSRM (Mumbai).



Circular Economy and Waste Management Division

The Circular Economy and Waste Management (CEWM) Division of TERI addresses systemic sustainability challenges through integrated policy research, technology innovation, capacity building, and field interventions across waste management. The Division operates through four areas—Centre for Waste Management (CWM), Bio-Waste Technologies (BWT), Resource Efficient Technologies (RET), and the NMCG–TERI Centre of Excellence on Water Reuse (NTCoE). It promotes circular economy models, low-carbon development, cleaner production in MSMEs, and reuse-based wastewater management. Major areas of work include demonstration of emerging technologies such as TADOX® for wastewater reuse, TEAM technology for converting waste into energy, feedstock mapping for bio-CNG across India and promoting sustainable consumption and production for SMEs in different sectors.



➢ **TADOX® Technology Demonstration Project bagged the Silver Award in the International Water Association (IWA) Project Innovation Awards 2024**

Water Resources Division

The Water Resources Division (WRD) focusses on key areas such as integrated water resources management, sectoral water use efficiency, urban & rural water supply & sanitation, water conservation, wastewater management, pollution abatement, water positivity, policy analysis, etc., through multi-stakeholder partnership, collaboration and



engagement, to contribute towards a water-secure future. The WRD functions through two areas: WRPM and CHE.

The WWNR programme contributes to the achievement of nearly all 17 Sustainable Development Goals, particularly SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 6 (Clean Water and Sanitation), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 15 (Life on Land)—by promoting sustainable water and land management, circular economy solutions, sustainable forestry, and nature-based livelihoods.

The programme plays a pivotal role in advancing Mission LiFE (Lifestyle for Environment) by encouraging pro-planet behaviours, decentralized solutions, and local stewardship of natural resources, building a future that is both climate-smart and inclusive.

The programme is contributing to India's Nationally Determined Contribution (NDC) target of creating an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent by 2030 through expanded forest and tree cover.



CENTRE FOR FOREST MANAGEMENT AND GOVERNANCE (CFMG)

Focuses on research and implementation in the areas of forest management, governance, and policy. The Area is involved in monitoring, evaluation, training, and capacity building in natural resource management and implementing ARR (Afforestation, Reforestation and Revegetation) based carbon finance projects.

CENTRE FOR SUSTAINABLE LAND MANAGEMENT (CSLM)

Focuses on addressing critical environmental challenges through integrated approaches in mine rehabilitation and eco-restoration and carbon forestry. It emphasizes enhancing ecosystem resilience and productivity by promoting climate-resilient land use practices. The Centre organizes training and capacity building on climate change, forestry, and policy.



➢ Oil Distillation Unit under construction

CENTRE FOR BIODIVERSITY AND ECOSYSTEM SERVICES (CBES)

Focuses on assessment, monitoring, and evaluation of management of forest ecosystem and biodiversity conservation, valuation and payment of ecosystem services. We develop effective strategies for environmental restoration and community development through REDD+ and ARR-based carbon finance projects.

CENTRE FOR GEOSPATIAL TECHNOLOGY APPLICATION (CGTA)

Focuses on developing and applying remote sensing (RS), GIS, and machine learning-based tools for carbon stock assessment, climate risk analysis, forestry, biodiversity, watershed, and ecosystem monitoring. The Centre supports evidence-based environmental policy and project development.





CENTRE FOR FOREST AND BIODIVERSITY CONSERVATION (CFBC), BASED IN GUWAHATI

Focuses on advancing ecological restoration and biodiversity conservation across the Northeastern region of India. The team is actively engaged in designing and implementing science-based, context-specific solutions to restore degraded landscapes, enhance ecosystem services, and promote sustainable livelihoods.

CENTRE FOR SUSTAINABLE RESOURCE MANAGEMENT (CSRM) BASED IN MUMBAI

Focuses on environmental management and reporting, food security and livelihoods, as well as plastic waste management. The Centre aims to broaden its initiatives to include ESG (Environmental, Social, and Governance), sustainability management, biodiversity assessment, and carbon assessment and sequestration.

CENTRE FOR WASTE MANAGEMENT (CWM)

This Area focuses on developing technologies (e.g., biomethanation) and creating solutions to minimize waste generation and convert waste into energy or valuable products. It promotes low-carbon development and circular economy adoption by advancing resource-efficient processes and maximizing resource recovery and recycling in urban and industrial ecosystems to create waste-free societies.

SUSTAINABLE SERVICES MANAGEMENT (SSM) BASED IN BANGALURU

Focuses on watershed development, natural resources management, rural energy and sustainable practices. Presently engaged in monitoring, evaluation, learning and documentation of watershed development programmes, development of management plans for mining areas and forests and renewable energy system integration in rural areas.

RESOURCE EFFICIENT TECHNOLOGIES (RET)

This Area provides resource efficiency, circular economy and sustainable consumption and production (SCP) consulting and implementation support for small and medium enterprises (SMEs) in different sectors. The Area is also involved in value added utilization of wastes (e.g., bagasse ash) for environmental applications.

BIO-WASTE TECHNOLOGIES (BWT)

The Area focuses on biowaste resource mapping, prefeasibility and feasibility assessments, technology research, dissemination, techno-economic analysis (TEA), and capacity building across the entire biogas and compressed biogas value chain.





NMCG-TERI CENTRE OF EXCELLENCE ON WATER REUSE (NTCOE)

Jointly established by National Mission for Clean Ganga (NMCG), Ministry of Jal Shakti (MoJS), GoI and TERI that has an objective to create platform for supporting targeted research and innovation to develop clean, green, cost and resource effective wastewater treatment technologies for reuse of treated water.





THE CENTRE FOR HIMALAYAN ECOLOGY (CHE)

The Centre for Himalayan Ecology was set up to intensify TERI's research initiatives for sustainability of Himalayan ecosystem. The Centre facilitates focus on issues affecting the mountain communities, from the research and development perspectives, for planning and implementation of climate change adaptation and mitigation strategies for Himalayan states.



WATER RESOURCES POLICY AND MANAGEMENT (WRPM)

WRPM comprises of a multidisciplinary team that facilitates an integrated approach, enabling it to provide comprehensive and sustainable solutions to scientific queries for efficient management of water resources both for the present as well as for the future.





Our Accomplishments

- The WWNR programme successfully implemented 100+ projects in the fiscal year 2024–25 across themes like carbon finance, ecosystem services, land degradation, biodiversity, watershed resilience, circular economy, water and waste management.
- Hosted many high-level events during the fiscal year, including UNCCD COP 16 side event on Ecological Restoration of a Red Mud Dump Site through Vegetation; A Round Table Discussion on Aligning Carbon Credit Standards with India's Agroforestry and Forestry Landscapes; three WSDS 2025 thematic tracks on Investing in Nature: Financing Forest Landscape Restoration in India; Watershed Management for Agricultural Resilience: Challenges, Solutions; and Context-Specific Carbon Finance Standards Aligning with India's Agroforestry Potential.
- Delivered capacity-building lectures for multiple State Forest Departments and IFS Officer Training programmes on topics such as carbon financing, ecosystem service valuation and climate change and forestry; conducted over 9 awareness & hands-on training programmes for farmers, SHGs and local stakeholders across tribal, rural and peri-urban landscapes.
- In the fiscal year 2024–25, we have provided livelihood support to over 3,200 farmers that consist of around Rs 9 crore through our agroforestry-based carbon finance projects.
- We organized the 7th G-STIC Conference in India: Harmonizing Technology, Policy, and Business Pathways for a Sustainable Future and Coexistence at IHC, New Delhi from October 22–23, 2024. The conference brought together global leaders, policymakers, researchers, and innovators to address the world's most pressing sustainable development challenges. Hosted by The Energy and Resources Institute (TERI) and co-organized by VITO, this landmark event—hosted in Asia for the first time—underscored the need to align technology, policy, and business pathways to advance the United Nations' Sustainable Development Goals (SDGs).
- We in collaboration with UNDP India and endorsed by the Ministry of Jal Shakti, successfully organized the 4th edition of the Water Sustainability Awards (WSA) 2024–25 on March 21, 2025, at the India Habitat Centre, New Delhi. Aligned with the World Water Day 2025 theme, 'Glacier Preservation', the event underscored the urgent need to safeguard our freshwater reserves amidst accelerating climate change.







- We in association with the State Level Nodal Agency (SLNA), Watershed Development Component under Pradhan Mantri Krishi Sinchayee Yojana 2.0 (WDC – PMKSY 2.0), Government of Uttar Pradesh, organized a training programme on Climate Resilient Integrated Watershed Management.
- We organized training and outreach programmes under the project Jal Mitra. Through the three-day training programmes, the project trained over 250 youth—more than 30% of whom were women—in critical skills such as plumbing, rainwater harvesting, groundwater recharge, and water quality monitoring. A major innovation was the development of the Jal Mitra App, an IT-based platform that connects consumers, technicians, and vendors to streamline maintenance and reporting of water supply issues.
- The Water Sustainability Conference 2025, organized by the Bureau of Water Use Efficiency (BWUE) under the National Water Mission (NWM), Ministry of Jal Shakti, in association with The Energy and Resources Institute (TERI), was held on March 12, 2025, at the NDMC Convention Centre, New Delhi. Inaugurated by the Union Minister of Jal Shakti, Shri C R Patil, the conference focused on enhancing Industrial Water Use Efficiency.
- In 2024–25, we made significant strides in promoting circular economy principles by scaling up and mainstreaming resource-efficient and waste management solutions, including the deployment of TERI's patented technologies.
- TERI's patented TEAM technology, supported by G-STIC and VITO, was successfully commissioned in Ayodhya, processing 1 tonne per day of organic waste and generating 60–80 m^3/day of biogas. Another notable achievement includes the successful demonstration of a co-digestion model in Udaipur, which efficiently processed a combination of STP sludge and municipal solid waste to recover both energy and compost.
- The TADOX® wastewater treatment system earned global recognition, securing the Silver Award in the 'Breakthrough in R&D' category at the International Water Association (IWA) Awards and receiving accolades at the GRIHA Awards 2024. A policy brief based on its successful application in a textile CETP in Kanpur has contributed to national discourse on wastewater reuse.
- The Division also undertook comprehensive waste audits, feedstock mapping, and GHG emissions modelling in over 20 states.
- Internationally, RET-led RECP efforts across 394 MSMEs in Central Asia resulted in significant resource and cost savings.
- We continued pioneering work on microplastics, frothing, and treated water reuse, including pilot studies and GHG assessments, influencing urban and river basin wastewater management strategies.
- We are collaborating with the Ministry of Mines to conduct a comprehensive study to augment Extended Producer Responsibility (EPR) frameworks for critical minerals supply chains.



➢ Aravalli workshop



➢ Inception report presentation at Watershed Development Department, Govt.of Karnataka under CEPMIZ Project

We support the Department of Environment, GNCTD in identifying and promoting the most suitable alternatives to single-use plastics (SUPs) for adoption in the NCT of Delhi, contributing to the development of actionable plans, policies, and informed decision-making.

- We are assisting ABT Associates in providing technical, analytical, and capacity-building support to promote methane mitigation activities and project development to reduce methane emissions from India's agriculture and MSW sector.
- Our work has led to savings of energy, water and materials along with minimized waste in SMEs from various sectors. The work has also contributed to greater awareness among various stakeholders and increased technical capacities of local project team members. A regional alliance, the Lakshadweep Zero Waste Alliance (LOWA) has been created; it is a first initiative of its kind in the region and aims to contribute towards a zero-waste future through collaboration and knowledge exchange. The research is leading to the development of low-cost products from waste contributing to circular economy.
- We are working on Techno-economic analysis (TEA) of Compressed Biogas (CBG) under the SATAT and GOBARDhan scheme.

Aggregate Numbers

- The Land Resources Division is currently implementing about 64 projects in the fields of ARR and REDD+ carbon finance within the AFOLU sector, biodiversity assessment, and ecosystem service valuation. These projects promote biodiversity conservation and empower local communities to sustainably utilize natural resources. Key initiatives include ARR projects for agroforestry plantations in Gujarat, Uttar Pradesh, Punjab, Haryana, and Uttarakhand; REDD+ projects in Tiger Reserves such as Dudhwa, Periyar, Pench (Maharashtra), Pench (Madhya Pradesh), Sundarbans, Manas, Kaziranga, Kanha; Projects in Community Conserved Areas of Nagaland and Assam.
- The Land Resources Division also developed 40+ project proposals in the fiscal year 2024–25 to clients such as NITI Aayog, UNDP, World Bank, GIZ, NTPC, Capgemini, and State Forest Departments. Secured 15+ new projects, reflecting diversified funding from CSR, government, bilateral, and multilateral sources.
- In 2024–25 Water Resources Division has worked on 9 projects across India, belonging to the following genres: Research Projects (7), Training & Capacity Building projects (2).



➢ MoU Signing with Watershed Development Department, Govt.of Karnataka for CEPMIZ Project

- The Circular Economy and Waste Management Division has been executing about 39 projects related to solid and liquid waste management solutions; plastic waste, bioenergy and circular economy implementation. Major initiatives include emissions modelling using SWEET, TADOX® integration in Kanpur's textile cluster CETP, landfill leachate management with MCG and HSPCB, and policy support for EPR in critical mineral supply chains with the Ministry of Mines. We partnered with ICICI Securities for a successful co-digestion model in Udaipur and supported the Delhi Government on identifying SUP alternatives. Projects ranged from techno-economic assessments of bio-CNG units to international RECP efforts across MSMEs and tourism clusters. Feedstock assessments across Uttar Pradesh, Haryana, Tamil Nadu, and Punjab are driving developer investments in 20 CBG plants.
- The nature of our projects blends R&D, field demonstration, stakeholder engagement, and policy advisory, anchored in circularity and low-carbon development. This holistic approach ensures cross-sectoral impact, replicability, and measurable benefits across the waste, water, and energy interface.

Approach and Innovation

- The WWNR programme adopts a multidimensional, innovative-driven, and inclusive approach to address sustainability challenges across land, water, forests, biodiversity, and waste systems. Our strategy blends research, technology deployment, policy support, and capacity-building to enable systemic transformation.
- Our initiatives focus on improving the sustainable management of biodiversity and ecosystem services through forestry and agroforestry-based carbon finance projects under ARR and REDD+. The ARR and REDD+ projects in India are local projects being implemented on PPP model, generally in collaboration with Forest Department, EDCs, local communities and farmers. The project address issues such as income generation, biodiversity conservation, and alternate sustainable livelihoods.
- We lead large-scale landscape restoration (LR) projects and post-mining site rehabilitation, integrating native biodiversity, carbon mitigation, and sustainable value chains. Innovative financing mechanisms—including CSR, PPP, and blended models—support long-term restoration success. Our non-zero baseline approach enhances inclusivity in carbon credit projects.
- We adopt an integrated, multi-stakeholder, and innovation-driven approach to enable circular economy transitions in waste and water systems. At the core of our strategy lies the deployment of context-appropriate technologies, policy-informed research, and capacity-building models that are adaptable, inclusive, and scalable.
- Our technology-led solutions demonstrated innovations include the award-winning TADOX® wastewater treatment technology, digital



➢ Solar based cold room installed under EKOenergy project in Sadali village, Chikkaballapura District, Karnataka



➢ Punjab CM distri cheques

platforms for waste data collection, emissions modelling (e.g., SWEET), development of circularity toolkits (e.g., for plastics and textiles), solar-based cold storage for marginal farmers, and advanced geospatial tools such as linear spectral unmixing for carbon stock estimation and AI/ML models for drought mapping and biodiversity analysis. TADOX® technology emerged as a breakthrough innovation in wastewater reuse, reducing treatment time and footprint while enhancing quality compliance.

- We support policy development, e.g., climate-resilient waste management and biodiversity strategies for corporates—and conduct extensive stakeholder training and institutional strengthening. Partnerships with global and national agencies strengthen science-policy linkages.



➢ Trade Show (Carbon Projects)

Inspirational Evidences

- Empowering Communities through Carbon Finance in Punjab: Implemented a Carbon Finance Project to support local livelihoods while enhancing environmental sustainability in Punjab.
- Ecological Restoration of Red Mud Dumps in Muri, Jharkhand: Transformed a red mud disposal site into green cover through targeted ecological interventions, restoring land and improving biodiversity.
- Biomethanation for Waste-to-Energy in Udaipur: Installed a biomethanation plant in partnership with Udaipur Municipal Corporation at Madari Fire Station. Using modified TEAM technology, the plant processes organic waste and STP sludge, generating electricity and bio-slurry for sustainable urban waste management.
- Integrated Waste Management Model in Ayodhya: Established a biogas plant utilizing TEAM technology to process wet waste, generating biogas to power a Material Recovery Facility (MRF), creating a sustainable waste-to-energy system.
- TADOX® Technology Piloted for Wastewater Treatment in Kanpur: Successfully piloted TERI's TADOX® technology at a Common Effluent Treatment Plant (CETP) in a textile cluster under Namami Gange National Mission. The project was recognized with the IWA Project Innovation Award 2024 for its contribution to water sustainability.
- Water Audits for High-Consumption Industries: Conducted comprehensive water audits across water-intensive sectors including thermal power plants, textiles, pulp & paper, and steel industries. Identified key interventions to enhance water-use efficiency, set potential benchmarks, and provided policy recommendations for improved resource management.

Impact We Created

- Carbon Finance Projects are benefiting over 35,000 farmers across five states in India by generating an additional income of approximately INR 115 crore. In fiscal year 2024–



➢ Training for Mushroom and Azolla

25 about INR 8 crore of carbon finance revenue was distributed to more than 3,000 farmers in Punjab, promoting climate-resilient livelihoods.

- Eco-restoration initiatives restored mining-impacted sites in Belagavi and Muri, enhancing biodiversity, soil health, and water quality.
- Capacity-building sessions trained over 800 stakeholders in carbon finance, geospatial monitoring, and sustainable land management.
- AI/ML-driven models were used for forest vulnerability assessments, supporting data-informed climate adaptation planning in forestry.
- The Jal Mitra app created a scalable and replicable model for sustainable rural water governance, adopted by key ministries and state departments.
- TERI conducted water audits for airports under Adani Airport Holdings, recommending location-specific roadmaps for water conservation and reuse.
- In remote BSF posts along the Gujarat border, TERI installed atmospheric water generators, providing sustainable, off-grid access to clean drinking water.
- A biomethanation plant in Ayodhya processes 1 TPD organic waste, reducing 550 tCO_2e annually while producing clean biogas and compost.
- Feedstock assessments across 20 districts enabled strategic planning for 20 new compressed biogas (CBG) plants, boosting clean energy in rural areas.
- Circular economy interventions in 394 MSMEs across Central Asia resulted in annual savings of 1.9 million kWh energy and 7,000 m^3 water. These interventions also led to over 500 tCO_2e of GHG emissions reduction and significant material and waste savings.
- A TADOX®-based textile wastewater reuse system in Kanpur treats 20,000 litres daily, serving as a replicable model for industrial reuse aligned with SDG 6.
- GIS-based planning, emissions modelling tools, and circularity toolkits helped mainstream zero-waste and net-zero approaches across sectors.

Knowledge Building and Dissemination

- The WWNR Programme at TERI has consistently advanced knowledge sharing and capacity development through strategic publications,



➢ Biogas plant in Ayodhya



➢ Engaging stakeholders during biomass assessment



➢ **Group discussion with farmers during biomass assessment**

reports, training, workshops, conferences, and technology showcases.

- The programme has authored several impactful publications, including feature articles in LEISA India, *TerraGreen*, and TERI's annual publications. Authored National and States, state of Environment Reports.
- Training modules and field exercises were developed on climate change, carbon finance, nursery management, and forest landscape restoration. Over 200 farmers and numerous students, interns, and professionals were trained through exposure visits and hands-on sessions.
- The Programme organized major knowledge events such as the 7th G-STIC Conference, Water Sustainability Awards 2025, and multiple thematic tracks during TERI's flagship event WSDS 2025. The team participated in key global events including UNFCCC COP29 and UNCCD COP16. These forums enabled high-level dialogue on climate resilience, water efficiency, nature-based solutions, and circular economy practices.
- The TADOX® wastewater treatment technology was demonstrated live at India Water Week 2024 at Bharat Mandapam, treating complex effluents in real time. Jal Mitra mobile app and control centre were launched to streamline maintenance of rural water systems by connecting technicians, vendors, and consumers.
- The Centre of Excellence on Water Reuse (NTCoE), under NMCG-TERI, hosted multiple sessions on water reuse and circular economy, including during Ganga Utsav 2024 and the 12th Regional 3R Forum in Jaipur. A flagship international conference on Advancing Circular Economy and Water Reuse was held that coincided with TERI's 50th anniversary, in collaboration with FICCI and NMCG.
- Technical trainings on anaerobic digestion and biogas were conducted in partnership with MNRE, ABT Associates, and USEPA.
- The Programme developed e-learning modules, policy briefs, and technical manuals on ecosystem valuation, treated water reuse, and circular economy. These tools support informed decision-making and are widely disseminated among government, academia, and industry stakeholders.

Partnerships and Networks

- The WWNR Programme at TERI has cultivated robust partnerships with government agencies, corporates, international organizations, and research institutions.
- At the national level, TERI collaborates with key government departments such as DST, various State Forest Departments across Maharashtra, Uttar Pradesh, Uttarakhand, Gujarat, and Karnataka, the Watershed Development Department, Karnataka Mining Environment and Restoration Corporation (KMERC). Internationally, TERI partners with GIZ, IUCN, EKOenergy (Finland), and The Ocean Cleanup (Netherlands) on projects related to ecosystem restoration, plastic waste monitoring, and sustainability.
- Corporate partnerships with organizations like Capgemini, ReNew, HINDALCO, Indian Oil Corporation, ONGC, and Mastercard's Priceless Planet Coalition support CSR-driven initiatives on clean energy, landscape restoration, and community-based development.
- The programme also engages with Verra, Plan Vivo, and Gold Standard, and contributes to global platforms like the UN Decade on Ecosystem Restoration. Academic collaborations with institutions such as TNAU, FRI, IIFM, and TERI School of Advanced Studies enhance joint research and capacity building.



Sustainable Infrastructure Programme

The rapid pace of urbanization has significantly increased the demand for sustainable infrastructure. In response, the Sustainable Infrastructure Programme focuses on minimizing urban carbon footprints by applying sustainability principles to the built environment.

Themes and Commitments

Thematic Focus

The Sustainable Infrastructure Programme (SIP) at TERI promotes sustainability in urban development by addressing the challenges of rapid urbanization and integrating sustainable practices in:

- Buildings
- Urban Planning
- Mobility
- Governance

The SIP has regional centres in Bengaluru and Mumbai to strengthen outreach, implementation and communication with the clientele for seamless project execution. The centres significantly contribute to the development of a strong network of stakeholders and collaborations, including but not limited to government agencies, corporates, and bilateral organizations.

The SIP aims at creating innovative solutions for low-carbon resilient cities and infrastructure. It comprises three divisions.

Sustainable Buildings Division (SBD)

The Division advocates policy reforms and conducts advanced research to drive innovation in the building sector. It delivers integrated, scalable and cost-effective solutions to mainstream sustainability, offering services in environmental consultancy, sustainable project management and capacity building. With a holistic whole lifecycle-based approach—spanning design to demolition—it aims to enhance resource efficiency and building performance. Supported by the Mahindra-TERI Centre of Excellence's modelling capabilities, it supports the development of low-carbon, net-zero and climate-resilient buildings, aligned with national missions and global climate goals.

Transport and Urban Governance Division (TUGD)

Accelerating urbanization and rising resource consumption in India present opportunities to integrate resource efficiency and low-carbon pathways into urban sectors. Cities, while hubs for innovation, face complex challenges. Focusing on transport systems and governance can help address these issues, fostering sustainable development, economic growth, and inclusivity. The Transport and Urban Governance Division (TUGD) assists policymakers in urban management and transport, offering technical support for smart city planning, mobility policies, air quality management and innovative approaches like urban living labs. Our multidisciplinary team conducts research on electric vehicles, fuel efficiency norms, transport demand modelling, deployment of clean technology, GHG inventorization and climate change impacts on urban growth and resilience.

GRIHA Council

As a transformative catalyst, GRIHA Council advances sustainable and resilient habitats by promoting and administering the GRIHA rating tool—India's own green building rating system. It holistically evaluates a building's environmental performance, setting the definitive standard for 'green buildings.'

Larger Goals and the Context

Aligning with global commitments, the SIP addresses SDG 3, SDG 6, SDG 7, SDG 9, SDG 11, SDG 12, SDG 13, SDG 15, and SDG 17.

Our Accomplishments

Sustainable Buildings Division

- In 2024–25, the Sustainable Buildings Division (SBD) maintained a portfolio of 63 projects, comprising 39 ongoing projects and 24 newly submitted proposals.
- **Capacity Building & Outreach**:
  - » Conducted 36 workshops and training programmes nationwide.
  - » Supported rollout of the National Manuals for Energy-Efficient Retrofit of Existing Buildings across India's climatic zones.
  - » Engaged 1,400+ participants, including architects, engineers, planners, students and government officials.
  - » Hosted 4 high-impact sessions at national and international platforms to catalyze dialogue and enhance visibility on implementation of India Cooling Action Plan.
- **Support to Ministry and State Governments**:
  - » Enabled dissemination and state-level adoption of ECBC and ECSBC in Madhya Pradesh, Ladakh, Chandigarh, and Odisha.
  - » **NITI Aayog Net Zero Vision**: TERI represented the Inter-ministerial Working Group on Buildings Sector contributing to the formulation of sectoral pathways and advancing strategies to support India's Net Zero targets through its role in the buildings-focused working group under national strategic planning.
  - » Executed 15 government-sponsored initiatives, reinforcing its role as a key technical partner in national sustainability missions.

Transport & Urban Governance Division

- In 2024–2025, the Transport & Urban Governance Division (TUGD) completed 5 projects and worked on 16 ongoing projects across India.

- TUGD is actively developing a diverse portfolio of project proposals focused on sustainable urban transport, clean mobility, infrastructure resilience, and energy transitions.
- **NITI Aayog Vision 2070 Inter-ministerial Working Group**: The TUGD team is contributing to the long-term transport modelling work as part of India's Vision 2070 strategic planning.
- **Ministry of Heavy Industries (MHI) -EV Task Force on Skilling**: The team is engaged in developing the skilling component to support a just and inclusive transition towards electric trucking in India.
- **Commission for Air Quality Management (CAQM):** The team is actively involved in technical inputs and advisory support related to transport sector strategies for improving air quality in Delhi National Capital Region (NCR).

GRIHA Council

- 608 projects have been registered with GRIHA Council under diverse GRIHA variants.
- 196 projects have been rated under GRIHA in the last financial year.
- Over 35 capacity-building programmes were conducted on diverse aspects of green buildings and sustainable habitats for varied stakeholder groups, wherein more than 1000 participants were trained in capacity-building programmes.
- 6 Green Building Tours of GRIHA rated/ registered projects were conducted pan-India and were attended by more than 200 participants.
- 127 new green building products were enlisted in the GRIHA Product Catalogue.

Approach and Innovation

Sustainable Buildings Division

The Sustainable Buildings Division advances sustainability in the built environment through data-driven research, stakeholder engagement, and policy advocacy. Supported by the NABL-accredited Mahindra-TERI Centre of Excellence (MT-CoE), it offers scalable, cost-effective solutions using climate-responsive design, simulation tools, testing capabilities and lifecycle thinking—optimizing energy, water and materials to enable net-zero, low-carbon and climate-resilient development across India.

Transport and Urban Governance Division

The Division adopts a holistic approach to decarbonization, innovation, sustainability, resilience, and stakeholder engagement. It promotes sustainable urban mobility through transport planning, EV adoption, non-motorized and public transport, low-carbon logistics, metro construction and emissions accounting. It also supports regional transport via rail, ports, shipping, and e-buses. Urban climate resilience is advanced through risk assessments, resilience strategies, and capacity building.

GRIHA Council

- Launch of GRIHA Rating for Ports and GRIHA Infrastructure Rating for Highways to provide a standardized framework and enhance the sustainability performance of ports and highways, respectively.
- Launch of Sustainable Guidelines for Design Implementation, Construction Management and Operation & Maintenance translated into regional languages—Punjabi, Assamese and Odiya for enhanced outreach.
- Developed a central dashboard for state-wise GRIHA-rated projects for enhanced stakeholder engagement.
- To augment the development of green buildings and sustainable habitats at the regional level, hosted six GRIHA Regional Conclaves in Lucknow, Hyderabad, Jaipur, Chandigarh, Guwahati, and Bhubaneswar, with around 1,500 stakeholders—including government officials, architects, engineers, builders, developers, urban planners, product manufacturers, industry experts, end-users, and academicians—participating in the discussions.



➢ **Glimpses of GRIHA Regional Conclaves hosted in Lucknow, Hyderabad, Jaipur, Chandigarh, Guwahati and Bhubaneswar**

Six GRIHA Green Building Tours were conducted for building industry professionals in 2024–2025: Light House Project (LHP), Lucknow; Civil Aviation Research Organization (CARO), Hyderabad; KMT Logistics Headquarters, Jaipur; Gujarat Bhawan, New Delhi; Net Zero Carbon Homes, Chandigarh; Vastukar Design Studio, Bhubaneswar.







➢ **Green Building Tours of GRIHA-rated and registered projects were conducted in various cities for green building professionals**

Inspirational Evidence

Sustainable Buildings Division

- **Inception of India Solar Shading Alliance in collaboration with Industry partners: July 10, 2024**

The India Solar Shading Alliance was officially established as a national platform to promote dynamic shading solutions. The Sustainable Buildings Division played a catalytic role in its inception, uniting key stakeholders across industry, academia, and policy. The Alliance aims to serve as the competence authority on solar shading, driving the adoption of energy-efficient, thermally comfortable and visually optimized building solutions nationwide.

- **National Building Retrofit Guidelines Unveiled to Accelerate India's Energy Efficiency at the National level workshop in partnership with the Bureau of Energy Efficiency (BEE): February 28, 2025**

TERI led a national initiative to identify energy-saving retrofit strategies suited to India's diverse climates, advancing benchmarking, technology



adoption and capacity building aligned with net-zero goals. A key outcome was the National Manuals for Energy-Efficient Retrofit, supporting ECBC and ENS implementation. TERI conducted 36 workshops, reaching over 1,400 stakeholders and distributed manuals and pamphlets nationwide to promote awareness and scalable action—moving India's built environment closer to energy efficiency.





- **Advancing Implementation of ICAP: TERI's Side Event at MOP36, Bangkok: October 29, 2024**

TERI hosted a high-impact side event at United Nations Economic and Social Commission for Asia and the Pacific **(UNESCAP), Bangkok**, titled 'Empowering Sustainable Cooling Solutions – Advancing the India Cooling Action Plan (ICAP).' Inaugurated by Mr Sanjay Seth, Senior Director, TERI, the session featured keynotes from Ms Rajasree Ray and Mr Aditya Narayan Singh of the MoEFCC. The event enabled discussions on energy-efficient cooling, green buildings, servicing sector skills, supply chain resilience, and consumer awareness—underscoring TERI's role in advancing ICAP, regional cooperation, and scalable climate-resilient cooling models.



- **National Roundtable Dialogue on 'Facilitating the Adoption of Super-efficient Cooling Technologies in India' Under ICAP: October 17, 2024**

TERI convened a high-level National Stakeholder Roundtable at India Habitat Centre, New Delhi, to accelerate the adoption of super-efficient cooling technologies under the India Cooling Action Plan (ICAP). Inaugurated by Mr Sanjay Seth, the event brought together key voices from CEPT University, Rocky Mountain Institute (RMI), government bodies, industry leaders, and academic institutions. Discussions focused on enabling policies, lifecycle efficiency metrics, refrigerant labelling, and integration with green buildings—driving consensus on a unified, climate-resilient roadmap for cooling innovation in India.

- **WSDS 2025 Thematic Track: Integrating Passive and Active Solutions for Energy Efficiency and Thermal Comfort**

At WSDS 2025, Sustainable Buildings Division hosted a high-level thematic session on advancing energy efficiency and thermal comfort through integrated passive and active interventions. The dialogue brought together policymakers, researchers, and industry leaders to explore innovations such as adaptive facades, material advances, and sky modelling. Key outcomes included the launch of the Chennai Skyscanner report and an MoU with Autoclaved Aerated Concrete Producers Association (AACPA) to scale sustainable materials. The session emphasized regulatory support, cost-effective solutions, and cross-sectoral collaboration to drive climate-resilient building practices.



- **Mahindra–TERI Centre of Excellence Showcases Technical Leadership at 16th GRIHA Summit**

At the 16th GRIHA Summit, the Mahindra–TERI Centre of Excellence showcased its NABL-accredited, state-of-the-art testing infrastructure and research capabilities in sustainable building materials and systems. Under the TERI–GRIHA MoU, the Centre hosted an exhibit highlighting advanced performance evaluation tools, material testing protocols, and collaborative initiatives. The display engaged architects, developers, and industry professionals, establishing the Centre as a trusted partner in delivering data-driven, high-performance building solutions aligned with India's green building objectives.



Transport and Urban Governance Division

- **TUGD at the International Solar Festival: Exhibition and Plenary Session**

TUGD organized an electric tractor and farm equipment exhibition and a plenary session at the first International Solar Festival, hosted by the International Solar Alliance on September 5–6, 2024 at Bharat Mandapam, New Delhi. Centred on 'Sustainable Agricultural Practices,' the exhibition showcased India's progress in solar-based e-mobility for agriculture. TERI's plenary session, 'From the Ground Up: Impact Stories on Communities' featured an all-women panel sharing inspiring e-mobility success stories from the Global South.



➢ TUGD, TERI at International Solar Festival

- **State-level Policy Dialogue on Mainstreaming Climate-sensitive Urban Planning Organized in Chennai**

TUGD, TERI, in collaboration with the Government of Tamil Nadu and GIZ India, organized a State-level Policy Dialogue on February 25, 2025 in Chennai under the Urban-Act project to promote climate-sensitive urban planning. The event brought together key stakeholders to discuss strategies for low-carbon, resilient urban development. To know more about the project, visit https://www.teriin.org/project/integrated-urban-climate-action-low-carbon-resilient-cities-urban-act.



➢ TUGD at the State-level Policy Dialogue

- **Report Release: 'Baseline Study for Non-Urban Road Transport' in India by TUGD, TERI**

TUGD, TERI released a report on 'Baseline Study for Non-Urban Road Transport' in India at The India Habitat Centre, on June 12, 2024. The report dives into the world of heavy-duty vehicles (HDV) market, baseline emissions and energy efficiency in trucking sector. It also includes an implementation strategy aimed at enhancing energy efficiency, drawing inspiration from Perform, Achieve and Trade (PAT) scheme and international clean freight programmes. The report is available at https://www.teriin.org/project/baseline-study-non-urban-road-transport



➢ Report Release

- **TUGD, TERI Hosted Multiple Sessions at the World Urban Forum (WUF)**

TUGD, TERI hosted a session on 'Improving Quality of Life in Cities through Sustainable and EV-Ready Transport Investments' at World Urban Forum 12, Egypt, in collaboration with European Bank for Reconstruction and Development (EBRD) and Transport for Cairo. The session discussed about the possible decarbonizing transport alternatives in cities and the ecosystem requirements for same.



➢ TUGD hosted a session on Improving Quality of Life in Cities through Sustainable and EV-Ready Transport Investments at WUF 12 Egypt

TUGD hosted an Urban Library event on 'Towards Climate Responsive Urban Planning' at the World Urban Forum 12 in Egypt, in collaboration with GIZ India and the Egyptian Syndicate of Engineers. The event featured the release of TERI's whitepaper on integrating climate sensitivity into urban planning and highlighted strategies, frameworks, and best practices for embedding climate resilience in city development.

TERI hosted a session and launched a policy brief on Facilitating Zero-Emission Deliveries for Postal Services at World Urban Forum 12 Egypt.



➢ TERI hosted an Urban Library event on Towards Climate Responsive Urban Planning at WUF 12 Egypt

To know more about the TERI engagement at WUF, kindly visit: https://www.teriin.org/event/teri-wuf-12-cairo-egypt



➢ TERI hosted a session and launched a policy brief on Facilitating Zero-Emission Deliveries for Postal Services at WUF 12 Egypt

- **CONCOR and TERI Established a Centre of Excellence on Logistics**

TUGD, TERI signed an MoU with Container Corporation of India Ltd. (CONCOR) at WSDS 2025 to establish the CONCOR–TERI Centre of Excellence for Green and Sustainable Logistics. The Centre will focus on decarbonizing freight transport through modal shift to rail, adoption of zero-emission vehicles, development of a green warehousing rating system and sustainable logistics tools.

- **Launch of PACT-Digi-PULSE Project**

TUGD, TERI participated in the launch event of a new partnership under UK PACT (Partnering for



➢ MoU signing for CONCOR–TERI Centre of Excellence for Green and Sustainable Logistics

Accelerated Climate Transitions) and Government of Tamil Nadu on March 26, 2025. The project—PACT-Digi-PULSE—focuses on Thoothukudi, Tamil Nadu and will be implemented by Indian Institute of Technology (IIT) Madras, The Institute for Transportation and Development Policy (ITDP) - India, Cenex, and TERI.





➢ UK-PACT project launch event

- **TUGD, TERI Organizes Jan Mela at Visakhapatnam**

TUGD, TERI's Vizag Prajamukhi Urban Living Lab (VPULL), in collaboration with the Greater

Visakhapatnam Municipal Corporation (GVMC), organized a Jan Mela and Awareness and Cleanliness Drive at Gnanapuram, Visakhapatnam on February 14, 2025 under the T-CAP initiative. The event aimed to strengthen solid waste management practices and build climate resilience by engaging over 200 community members through infographic wall art, peer-learning sessions on rainwater harvesting, and community plantation activities.

To know more about the project: TCAP Project



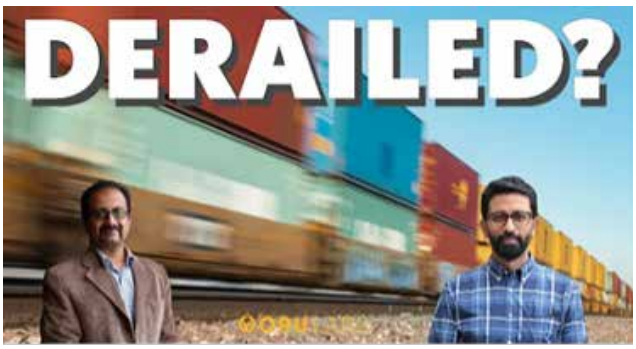
➢ Jan Mela in Visakhapatnam under the T-CAP Project

- **Podcast Feature: Indian Railways' Future with Mr Sharif Qamar**

Mr Sharif Qamar, Fellow and Associate Director at TUGD, TERI, appeared on OoruLabs podcast to discuss the transformative potential of Indian Railways. The conversation covered freight vs. passenger profitability, last-mile connectivity, private sector roles, infrastructure reforms, and the impact of strategic restructuring on enhancing railway efficiency.

- **Co-Hosting Session: 'Freight Emissions Accounting for India' with SFC India and IIM Bangalore**

TERI co-hosted a session on 'Freight Emissions Accounting for India' along with SFC India and IIM Bangalore. As part of the workshop on 'Accelerating Low Emission Logistics in India,' the session emphasized on the methodologies, implementation strategies and datasets requirements for emissions accounting in the freight sector.



➢ Details available at: OoruLabs Podcast



➢ TERI at "Indian Pavilion; Innovating Financing and Ownership Models for ZET Adoption" in Amsterdam

- **TUGD at COP29: Promoting Clean Energy and Transport Decarbonization**

At COP29 in Baku, Azerbaijan, TUGD signed an MoU with the King Abdullah Petroleum Studies and Research Center (KAPSARC) to collaborate on a joint study titled 'The Role of Clean Energy Policies: Trends in India's Transport Sector'. TUGD contributed to the thematic workshop 'From Global Climate Targets to Local Implementation: Energy and Transport Infrastructure at a Critical Juncture' during the session 'Mobilizing Urban Infrastructure for Net Zero Emissions'. TUGD also participated in the side event 'Decarbonization of the Transport





➢ TUGD at COP29

Sector and the Role of Alternate Fuels', jointly organized by KAPSARC and the Institute of Energy Economics, Japan (IEEJ).

- **TUGD participated in Smart Freight Week 2025 in Amsterdam**

TUGD participated in Smart Freight Week 2025 in Amsterdam, contributing to key discussions on India's zero-emission truck (ZET) transition, including challenges around technology readiness, charging infrastructure, and inclusive deployment. The institute also showcased its work on capacity building for charge-point operators under the MBRDI Sustainability Garage Initiative. A key highlight was the launch of India-specific GLEC Values—developed by Smart Freight Centre



➢ TUGD at Smart Freight Week 2025

India, TERI, and partners to standardize emissions accounting in the country's logistics sector.

- **TUGD Leads Stakeholder Consultation for EV Taskforce on Skilling**

As part of the EV Taskforce on Skilling constituted by the Ministry of Heavy Industries, TUGD led a stakeholder consultation focused on skilling needs in the e-trucking and broader EV ecosystem in India. It brought together policymakers, training institutes, OEMs, and industry partners to share insights and recommendations for strengthening workforce readiness in the sector.



➢ TUGD at EV Taskforce on Skilling in E-Trucking and EV Ecosystem

- **TUGD Hosted Roundtable on Sustainable Urban Freight at UMI 2024**

At the 17th Urban Mobility India (UMI) Conference held in Gandhinagar from 25–27 October 2024, TUGD organized a roundtable on Streamlining Urban Freight to discuss innovative and sustainable approaches to urban logistics.



➢ TUGD at the 17th Urban Mobility India (UMI)

- **TUGD at Tata Motors' Quarterly Technical Seminar in Pune**

TUGD participated in Tata Motors' Quarterly Technical Seminar held in Pune on 11 February 2025, marking the International Day for Girls and Women in Science. Dr. Vibha Dhawan, Director General, TERI, delivered the keynote address on innovation and sustainable product design in the automotive sector. The TERI team also visited Tata Motors' manufacturing facility and interacted with the All-Woman Assembly Line behind the production of the flagship Safari model.



➢ TUGD at Quarterly Seminar in Pune

- **Expert Insights on Transport Decarbonization in Raahgiri Foundation Podcast**

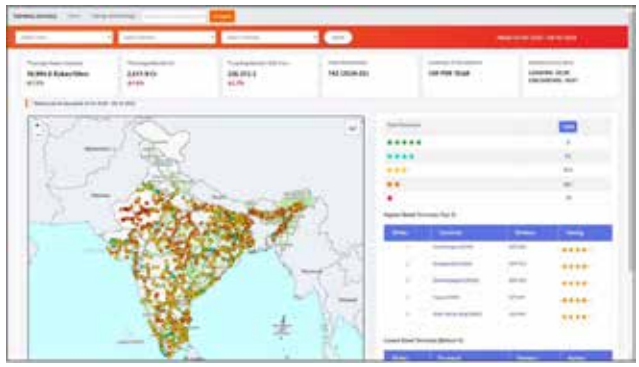
TUGD participated in a podcast hosted by the Raahgiri Foundation titled "Tackling Air Pollution: Insights from Top Experts." Mr. Sharif Qamar, Associate Director at TERI, emphasized the need to decarbonize the transport sector through cleaner fuels like biodiesel and ethanol blends, greater use of rail and metro systems, and the growing role of electric vehicles. He also advocated for prioritizing walking and cycling for short-distance travel by investing in dedicated infrastructure such as cycling corridors and walkable streets.



➢ TUGD in podcast with Raahgiri Foundation

- **Indian Railways and TERI Launch Goods Shed Rating Dashboard**

Indian Railways, in collaboration with CRIS and TERI, on September 6, 2024, launched the Goods Shed Rating Dashboard, an innovative tool to assess and enhance the performance of goods sheds across the railway network. The dashboard provides star ratings based on key efficiency and capacity indicators, supporting data-driven decisions for improvement, investment prioritization, and operatonal optimization.



➢ Goods Shed Rating Dashboard

- **TUGD at Regional Conference on Low-Carbon Transport in Asia**

TUGD participated in the regional conference "Low-Carbon Prosperity in Progress: Transforming Transport in Asia" held in Bangkok from June 25–28, 2024, organized by GIZ under the NDC Transport Initiative for Asia. As part of the India Component Implementation Partners Meet, TUGD shared insights on a multi-dimensional approach to decarbonizing India's road freight sector. TUGD also contributed to the panel on Pathway to Zero Emission Trucking (ZET), focusing on contextualizing ZET strategies to align with net-zero goals.



➢ TERI at regional conference Bangkok

GRIHA Council

- **The flagship event '16th GRIHA Summit'**

Theme: Accelerating Climate Action in the Built Environment

The event held on December 4–5, 2024 was graced by eminent personalities including Smt. Meenakashi Lekhi, Former Minister of State for External Affairs and Culture; Shri Abhay Bakre, Mission Director, National Green Hydrogen Mission, MNRE; Ms Martine Aamdal Bottheim, Minister Counsellor, Royal Norwegian Embassy; Mr Deepesh Gehlot, Joint Commissioner, Kendriya Vidyalaya Sangathan; Mr Sumit Bidani, CEO, Knauf India; Mr Aditya Bhutani, Director and COO, AIS GlassXperts, Asahi India Glass Ltd.; among others. The programme featured four plenary sessions and six thematic tracks covering climate action topics such as policy, building materials, energy transition, community-led initiatives, and green incentives. Details available at: https://www.grihaindia.org/grihasummit/









➢ Glimpses of 16th GRIHA Summit

- **'SANCHAY: An Exploration Through Centuries and Beyond' Exhibition:** Reflecting the evolution of architectural styles and technologies across three distinct centuries: the 19th, 20th, and 21st centuries, and beyond, the exhibition provided







➢ Exhibition 'SANCHAY' organized during the 16th GRIHA Summit

a platform to visitors to gain insights on future innovations and models focused on accelerating climate action and resilience.

- Prelude events of 16th GRIHA Summit

GRIHA Council organized a community-driven Plogging Event at the Central Market, Lajpat Nagar on November 12, 2024 to promote and raise awareness on environmental sustainability. The event was organized in collaboration with the Municipal Corporation of Delhi, Shopkeepers' Welfare Association and Lajpat Nagar Central Market Shopkeepers' Association. Over 200 participants, including local shopkeepers, community members, sanitation workers and students joined the event.







➢ **Plogging Event conducted with local communities and school children under GRIHA Council's flagship initiative Paryavaran Rakshak Programme**

- A Green Carnival was organized for school students, on Children's Day, November 14, 2024. Students showcased their understanding of sustainability through various competitions, including:
- Drama carnival on the theme **'Building Tomorrow – Green and Smart'**
- Musical parody themed **'Climate War'**
- Reel competition on **'The Burning Earth'**
- Model making exhibition titled **'The Past and the Future'**

Over 50 entries were received from schools nationwide. Approximately 150 students from









➢ Green Carnival organized for school children under GRIHA Council's Paryavaran Rakshak Programme

states such as Telangana, Jammu & Kashmir, Uttarakhand, Uttar Pradesh, Telangana and Haryana participated in the event.

- **Hosted GRIHA Stakeholder Meet**: A first-of-its-kind GRIHA Council initiative to connect stakeholders and offer a platform for showcasing green building technologies, products, and services, fostering collaboration among industry professionals and service providers.





➢ **GRIHA Stakeholder Meet conducted to engage with diverse stakeholders in the construction and building sector**

- **Hosted GRIHA Consultant Meet:** The 6th GRIHA Consultants' Meet was conducted on October 4, 2024 in New Delhi, for green building consultants to convene and discuss the various aspects of the green building rating and the associated processes, challenges, and potential solutions.
- **Stakeholder Consultation Workshop with ASTEC Assam**: A workshop on green buildings and GRIHA rating was organized in collaboration with the Assam Science Technology & Environment Council (ASTEC) at the Assam Secretariat. The session focused on addressing the hazards and impacts of unplanned urban development. Representatives from the Public Works Department, Administrative Staff College of Assam, Guwahati Municipal Corporation, Assam State Information Commission, Assam Power Distribution Company Limited (APDCL), and other departments participated in the workshop.







➢ **6th GRIHA Consultant Meet conducted for green building consultants**

- **Workshop on Adoption of Cool Roofs in Uttar Pradesh:** GRIHA Council and NRDC India hosted a 'Workshop on Adoption of Cool Roofs in Uttar Pradesh' on January 17, 2025, in Lucknow, Uttar Pradesh. The workshop brought together diverse stakeholders from the construction and building sector to identify challenges and potential drivers for the wider adoption of cool roofs as a sustainable, energy-efficient technology.





➢ **Stakeholders Consultation Workshop with ASTEC Assam, Guwahati**



➢ **GRIHA Council and NRDC India hosted 'Workshop on Cool Roof Adoption in Uttar Pradesh' in Lucknow with building and construction industry professionals**

Impact We Created

Sustainable Buildings Division

- Developed and disseminated a series of technical manuals on energy-efficient retrofitting for distinct Indian climates, complemented by user-friendly awareness pamphlets, reaching diverse stakeholders and improving accessibility and comprehension of sustainable retrofit strategies.
  - » Conducted 36 capacity-building workshops across India, engaging over 1,440 professionals and hosted a high-impact national workshop to equip stakeholders—including engineers, architects and policymakers—with actionable knowledge on implementing energy-efficient retrofits.
- Launched an open-access digital portal, supported by DSIR, housing a curated repository of advanced energy-efficient materials, construction technologies and real-world case studies—now serving as a go-to knowledge hub for practitioners, educators, and decision-makers.
- Institutionalized green building implementation by establishing and continuing ECBC and ECSBS cells within multiple state development boards, providing policy-level support, localized implementation frameworks, and capacity for state-wide code adoption.
- Conducted 4+ comprehensive water audits, facilitating the implementation of water-efficient measures that effectively reduced water demand and optimized water footprint management in large-scale dairy plants, hotels, and processing facilities.
- Delivered technical consultancy for four large-scale GRIHA-rated projects, enabling the practical application of green building principles and supporting the delivery of high-performance, sustainable infrastructure.
- Strengthened the GRIHA Council's outreach and technical capabilities by:
  - » Supporting 90+ school ratings under the JNV initiative
  - » Facilitating 25+ JAN GRIHA evaluations
  - » Developing the GRIHA for Interiors framework
  - » Publishing a case study compendium on best practices in the construction industry
  - » Conducting 5+ water audits, contributing to Water Positive certification.

  These collective efforts accelerated the mainstreaming of sustainable building practices nationwide.

- Tested over 50 material samples from 15 leading manufacturers at the Mahindra-TERI Centre of Excellence, generating performance data on thermophysical properties to inform evidence-based material selection and promote sustainable construction across India's building industry.

Transport and Urban Governance

- TUGD, TERI and CONCOR have established the CONCOR–TERI Centre of Excellence to decarbonize freight transport via rail modal shift, ZEVs, green warehousing, and sustainable logistics tools.
- TUGD is implementing Phase-II of the Clean Freight Programme to improve fleet-level energy efficiency in the road freight sector, reduce fuel consumption per TKM and enable large shippers to participate in the Carbon Credit Trading Scheme (CCTS).
- TUGD is promoting solar e-mobility to reduce diesel use, improve rural transport efficiency and support sustainable agriculture with zero-emission solutions.
- TUGD, is facilitating the formulation of upcoming fuel efficiency norms for Heavy Duty Vehicles (HDVs) (GVW>12 tonnes)
- As the National Center of Excellence in Green Ports and Shipping, TUGD, is advancing sustainable practices like Just-in-Time ship arrivals, and is currently preparing DPRs for Deendayal, Paradip, and VOC ports to reduce delays through infrastructure assessment and digital coordination.
- TUGD is developing a transition roadmap for sustainable and efficient transport at GIDC Naroda, focusing on electrification of freight, multimodal integration, and infrastructure upgrades to reduce congestion, emissions and promote inclusive economic growth.
- TUGD is evaluating the impact of e-cycles on the livelihoods of Self-Help Group (SHG) women, assessing improvements in mobility, quality of life, and household well-being, while also quantifying CO_2 emission reductions through sustainable transport adoption.
- TUGD is aligning road transport strategies with India's Nationally Determined Contributions (NDCs) and Long-Term Low Emissions Development Strategy (LT-LEDS) goals by identifying ways to cut emission intensity towards net-zero by 2070.
- TUGD is assessing metro civil works emissions to identify low-carbon materials and methods for reducing lifecycle carbon footprints in metro construction.
- TUGD is advancing zero-emission vehicle (ZEV) deployment in Uttar Pradesh by supporting targets, policy, roadmaps, and knowledge exchange to scale urban adoption.
- TUGD supported Indian Railways to roll out Terminal Rating System for informed decision-making regarding railway goods sheds.
- TUGD supported India Post in developing a comprehensive roadmap for electrification and initiating pilot projects in six cities, paving the way for a greener postal network.
- TUGD has engaged cities such as Visakhapatnam and Panaji, through Urban Living Labs to promote participatory and inclusive urban development.
- TUGD is mainstreaming climate-sensitive urban planning in cities such as Shimla, Panaji, and Coimbatore to integrate resilience and sustainability into city development.
- TUGD, TERI is supporting the regeneration of multi-modal transit hubs along Hyderabad's Musi River corridor through riverfront development, strategic land management approaches like TOD and land pooling, and a review of policies and regulations considering local economic and heritage contexts.



➢ Report release at the WSDS

GRIHA Council

- With over 5000+ projects registered, covering 1 billion sq. ft., GRIHA-rated projects have installed 599 MWp of renewable energy, saved 2,97,000 GWh of energy, prevented 8,400 Gigatonnes of CO_2 emissions annually, and contributed to water savings of 104 Gigalitres/year. Additionally, 27,000 new trees have been planted and 28,000 preserved.
- A total of 379 Navodaya Vidyalaya Schools were evaluated by GRIHA Council wherein 18,69,208 kL of water reduction was achieved; 65,129 tonnes of waste diverted from landfills; 27,142 tonnes of organic waste treated; 15,659kWp of total capacity of renewable energy installed; 28,414 kL rainwater recharged; 19,780 tonnes of CO_2 reduced, and 7,18,706 trees planted. The sustainable initiatives undertaken by JNV schools have been compiled into a publication—*Mindful Impressions –Targeting 2070 Workforce.*

Knowledge Building and Dissemination

The Sustainable Infrastructure Programme published 75 knowledge and information dissemination publications under the following categories:

1. **Green booklets:** GC: 2
2. **Manuals:** GC: 6; SB: 4
3. **Pamphlets/leaflets:** SB: 4
4. **Magazines:** GC: 1
5. **Research papers:** TUGD: 5; GC: 1
6. **Articles and Op-ed:** TUGD: 17; SB: 8; GC: 6
7. **Policy Briefs:** TUGD: 7
8. **Newsletters:** TUGD: 4; GC: 4; SB:4
9. **Interviews:** GC: 2

TUGD Organized 2 Thematic Tracks during WSDS 2025

- **Thematic Track 1:** TUGD conducted a thematic session on 'Accelerating India's Pathways to Sustainable Transport and Emission Reductions through Transport-specific Nationally Determined Contributions (NDCs)' at the World Sustainable Development Summit 2025 (WSDS). The discussion focussed on the importance of having transport-specific NDCs in India and highlighted actionable strategies involving road, rail, and urban mobility to enhance low-carbon mobility solutions by suitable policy framework, energy transition, technological interventions, and adequate finance mechanisms.

The session concluded with the release of a report titled 'Comprehensive Assessment of Job Impacts and Skill Gaps of Transitioning from ICE to Electric Trucks.' It analyzes the job impacts and emerging skill gaps across Delhi/NCR, Chennai, Pune, and Bengaluru, highlighting challenges for unorganized service operators, MSMEs, and ICE component manufacturers as the sector shifts to expertise in areas like IoT, cloud computing, analytics, and AI.

Thematic Track 2: TUGD also conducted another thematic session titled 'Beyond Blueprints: Reimagining Climate-resilient Cities through Living Labs and Digital Democracy,' as part of the WSDS 2025. The discussion emphasized upon the need and urgency of data-driven, technology and participatory frameworks that enable adaptive, citizen-led climate action for building urban resilience. The panel explored innovative approaches to fostering inclusive and resilient urban development through Living Labs, digital platforms, and participatory governance models.



➢ Panel discussion at the WSDS

Details on Knowledge Building; Partnerships and Networks can be viewed via the following URLs:

1 https://teriin.org/files/Knowledge-Contributions.pdf

2 https://teriin.org/files/Partnerships-and-Networks.pdf



Industrial Biotechnology Programme

The Industrial Biotechnology (IB) Programme focuses on developing environmentally sustainable technologies through research and innovation. Its primary goal is to protect the environment while delivering long-term, scalable solutions tailored to the needs of India's rapidly developing economy.

The programme emphasizes:

- Bio-based product development
- Waste minimization and valourizations
- Bioremediation of industrial pollutants
- Microbial technologies for energy recovery

Through partnerships with industry and research institutions, the IB Programme promotes the transition to a green economy by integrating biotechnology into core industrial processes.



➢ **Fermentation Technology Research Centre (FTRC) at TERI Gram, Gurugram, for large-scale production of Oilzapper and development of new products/ processes**

Themes and Commitments

Over the past three decades, the IB Programme has played a pivotal role in advancing sustainable technologies through continuous research and innovation. This effort has significantly contributed to the development of bio-based products, the bioremediation of oil-contaminated land, oil spills sites, and oily sludge, and the generation of sustainable energy.

A robust research initiative led to the development and commercialization of several indigenous technologies, including:

- **Oilzapper**: A globally recognized microbial consortium used for the bioremediation of oil spill sites and the treatment of oily sludge unavoidably generated by oil refineries.
- **PDB (Paraffin Degrading Bacteria)**: Prevents paraffin deposition in oil well tubing, enhancing operational efficiency.
- **MEOR (Microbial Enhanced Oil Recovery)**: An innovative method for recovering oil from mature wells using microbial solutions.

To commercialize and scale these technologies, ONGC TERI Biotech Ltd (OTBL) was established as a joint venture in 2006. More information can be found at: www.otbl.co.in

The Fermentation Technology Research Centre (FTRC), located at TERI Gram, Gurugram, is a state-of-the-art bioreactor facility that plays a pivotal role in the IB Programme. The FTRC is equipped with bioreactors ranging from 1 litre to 15,000 litres in capacity, enabling both large-scale manufacturing and the development of bio-based technologies and products. This cutting-edge facility supports the commercialization of innovations and facilitates the scalable production of bio-based solutions.

Products developed at the FTRC include carboxymethyl hydroxypropyl guar (CMHPG) and XC polymer (xanthangum), used in the hydrofracturing of oil reservoir rocks and drilling of oil wells, respectively. These products have potential industrial uses beyond oil and gas, such as in food items. In 2024–25, around 392.7 tonnes of Oilzapper and 18 tonnes of microbial culture were produced at the FTRC and supplied to the user industry.

Bioremediation Technology (BR)

The current work in the bioremediation domain involves the large-scale application of microbial products, with a primary focus on the remediation of oil spill sites in oilfields, as well as areas contaminated by pesticides and other persistent organic pollutants (POPs). In addition to field interventions, comprehensive environmental quality assessments are conducted, covering soil, water, and vegetation health.

The thematic focus areas of this work include:

- Development of bio-based products
- Bioremediation of oil-contaminated land, oil spills, and oily sludge
- Advancement of sustainable energy solutions

Over the past 30 years, the IB Programme has made significant contributions to sustainable development through continuous research, innovation, and field deployment of microbial technologies.

Microbial Biotechnology (MB)

The Microbial Biotechnology area focuses on leveraging bacterial systems to develop long-term, economically viable solutions for industrial and environmental challenges.

A notable success in this field is the enhanced methane production from coalbed methane (CBM) wells through microbial intervention. In addition, a range of microbial technologies have been developed to remediate environments contaminated with pesticides and persistent organic pollutants (POPs), including polychlorinated biphenyls (PCBs).

The area also explores value addition from industrial waste via biological processes.

Key achievements include:

- Bioconversion of carbon dioxide to methane (upgradation of biogas)
- Production of precipitated calcium carbonate (PCC) from industrial waste containing calcium oxide
- Fermentation-based production of succinic acid using CO_2 gas as a feedstock.

These innovations highlight the potential of microbial biotechnology to support both sustainability and circular economy initiatives across sectors.

Larger Goals and the Context

EIB research projects support six Sustainable Development Goals (SDGs): SDGs 7, 9, 12, 13, 15, and 17.

These projects align with the EIB's commitment to fostering sustainable development and addressing global challenges through research and innovation.

The Programme's focus is on collaborating with the public and private sectors to identify sustainable solutions for issues related to the environment and industry.



Our Accomplishments

- For FY 2024–2025, 14 projects were funded by various government departments and corporate sectors. Government funders included the Department of Biotechnology (DBT), Department of Science and Technology (DST), Department of Scientific and Industrial Research (DSIR), Defence Research and Development Organization (DRDO).
- Public sector undertakings included Oil and Natural Gas Corporation (ONGC) Ltd, Institute of Reservoir Studies, ONGC, Oil India Ltd (OIL), and Chennai Petroleum Corporation Ltd (CPCL).
- Notable private entities included Essar Oil & Gas Exploration & Production Ltd (EOGEPL), Vedanta Ltd (Cairn Oil and Gas), Reliance Industries Ltd, and Indian Synthetic Rubber Private Limited.



➢ **Bioremediation of Oily Sludge at CPCL Manali Refinery, Chennai by utilizing Oilzapper technology for effective treatment and restoration of oil-contaminated soil**

Approach and Innovation

- **Bioremediation Services in Assam and Arunachal Pradesh**: Hiring of services for *in-situ* and ex-situ Bioremediation of oily sludge/oil-contaminated soil and water at various sites for Oil India Ltd. (OIL), Duliajan, Assam. The project scope involved the bioremediation of 30,000 m^3 of soil contaminated with crude oil using *in-situ* processes, and 15,000 m^3 of oil-soaked soil/oily sludge through ex-situ bioremediation at oil fields operated by Oil India Ltd. TERI successfully completed the in-situ bioremediation of 42,653 m^3 of contaminated soil. The target is to achieve less than 5,000 mg/kg total petroleum hydrocarbon (TPH) or oil concentration in 4–6 months.
- **Environmental Quality Assessment at CPCL (Chennai)**: Assessment of environmental quality at oil spill contaminated sites at CPCL following Cyclone Michaung (December 2023). TERI conducted assessments and collected samples from water, sediment, vegetation, and fish.

- **Bioremediation of Oily Sludge at CPCL (Tamil Nadu)**: TERI was contracted to bioremediate approximately 500 metric tonnes of oily sludge produced by CPCL using Oilzapper technology. This process that started in June 2024, aims to reduce TPH in oily sludge to below 5000 mg/kg sludge.
- **Biodegradation of Polymer Lumps**: Feasibility and demonstration of biodegradation of polymer lumps (PAM/HPAM) used in oil production. This project seeks a sustainable solution for *in-situ* polymer degradation via microbial action. Development of a specific HPAM-degrading microbial strain for polymer used in Barmer oil fields (Cairn Oil and Gas) has been achieved in the lab scale success, now field demonstration is planned.



➢ **Collecting and analyzing water samples from the bottom of the Buckingham Canal to evaluate contamination of Total Petroleum Hydrocarbon (TPH)**

- **Microbial Corrosion Study and SRB Monitoring**: Study of corrosion caused by sulphate reducing bacteria (SRB) in pipeline networks at Mangala-Bhagyam-Aishwarya oil fields of Cairn Oil and Gas. The aim of this study is identification of SRB and other microbes contributing to microbial induced corrosion (MIC), aiming to control MIC through microbial intervention.
- **Bioconversion of CO_2 to Methane**: This initiative focuses on the development and demonstration of microbial technologies that enable the bioconversion of carbon dioxide (CO_2) to methane (CH_4) using hydrogenotrophic methanogens. These specialized microbes utilize CO_2 and hydrogen as substrates to produce methane in coal seams, offering a sustainable approach to enhance coalbed methane (CBM) recovery.
- This developed process presents a promising solution for carbon utilization, transforming a greenhouse gas into a valuable energy source while contributing to clean energy generation and climate change mitigation.
- **Biological Methane Generation from CBM Wells**: A collaborative effort between TERI and the ONGC Energy Centre Trust has led to the feasibility assessment and successful demonstration of in-situ biological methane generation/enhancement from coalbed methane (CBM) wells, particularly in the ONGC Bokaro Asset.
- The developed process involves the stimulation of indigenous microbial communities through the injection of specific nutrient formulations, resulting in a notable increase in biogenic methane production at the laboratory scale.
- This technology was re-validated in 10 marginal and 3 non-producing CBM wells, where it achieved an increase in methane output in marginal CBM wells, leading to significant economic returns and offering a sustainable solution for tapping into underperforming CBM reserves.
- **CO_2 Utilization and PCC Production**: Lab demonstration for CO_2 utilization and production

of precipitated calcium carbonate (PCC) using bypass dust and carbon dioxide. The process uses cement industry waste and CO_2 to produce pure PCC. Approximately 1.2 kg of bypass waste and 440 grams of CO_2 are used to produce 1 kg of PCC.

- **Controlled Release P-fertilizer (CRPF)**: Development and evaluation of a CRPF with plant growth-promoting rhizobacteria (PGPR) on soybean productivity and soil health. Aims to improve the efficiency of phosphatic fertilizers using a nanofiller-based natural product.
- **Degradation of Polychlorinated Biphenyls (PCBs)**: Research on the degradation of PCBs by microorganisms. Findings suggest synergistic effects of co-culturing different microbial strains enhance PCB degradation, highlighting the potential of consortia-based approaches for degradation of persistent pollutant PCB.
- **Abatement of Microplastics**: Project addressing the abatement of microplastics (MPs) and associated pollution using biodegradation and nanomaterials. MPs are defined as plastic particles less than 5 mm, recognized as 'emergent water pollutants'. Funded by DBT, the project studies MPs' occurrence, fate, and removal technologies in wastewater. MPs were quantified in Okhla, New Delhi wastewater plants. Collaboration with IIT-Delhi explores biodegradation and nanomaterial-based bioremediation.



➢ **Implementing improved microbial techniques to enhance oil recovery in stripper wells at ONGC, Ahmedabad Asset**

- **Resident Microbial Enhanced Production Pilot – Gujarat Onshore Fields**: The Resident Microbial Enhanced Production Pilot is an innovative initiative conducted in the Gujarat onshore oil fields, focusing on harnessing the potential of indigenous microbial communities to enhance oil recovery through a sustainable and environmentally conscious approach. This approach supports sustainable resource utilization by minimizing chemical usage and reducing the environmental footprint associated with conventional enhanced oil recovery (EOR) methods. Moreover, it offers a cost-effective solution for improving recovery efficiency from aging or low-performing wells.
- **Production of Xanthan Gum**: Research initiated in 2014 to indigenously produce xanthan gum (XC Polymer), a viscosifier polymer used in oil well drilling. TERI achieved scale up production and field trials, demonstrating the superior quality of XC Polymer in drilling three oil wells and achieving Technology Readiness Level (TRL level 8). A patent has been filed for the process.

Inspirational Evidences

Converting carbon dioxide to methane – a breakthrough in carbon utilization: In a pioneering step towards sustainable energy and carbon management, TERI, in collaboration with the ONGC Energy Centre, successfully developed and demonstrated a microbial process for the bioconversion of carbon dioxide (CO_2) to methane (CH_4) using hydrogenotrophic methanogens.

Challenge: Large volumes of CO_2 produced from CBM processes contribute significantly to climate change. Simultaneously, the challenge of tapping residual methane from low-yielding coal seams demanded innovative solutions for energy recovery.

Innovation: Researchers identified and cultivated hydrogenotrophic methanogens—a group of microorganisms capable of using CO_2 and hydrogen to produce methane biologically. This led to the development of a field-deployable process designed for in-situ application in coal seams.

Demonstration: The technology was first validated at the laboratory scale, showing stable and efficient



➢ **Optimized methane extraction in coal-bed methane wells by applying methane-producing microbes**

conversion of CO_2 into methane. Building on this success, field trials were conducted in coalbed methane (CBM) wells, particularly in the Jharia region, where the microbial stimulation process was applied in-situ.

Impact

- Demonstrated feasibility of carbon utilization in energy generation
- Delivered significant returns
- Provided a low-carbon, cost-effective enhancement for CBM extraction

This success story highlights how microbial biotechnology can be leveraged to address both energy security and climate change mitigation. The process not only converts a greenhouse gas into methane but also revitalizes underperforming CBM wells—paving the way for sustainable and circular energy systems in India.

Impact We Created

The IB Programme has made significant strides in sustainable development and environmental remediation over the past three decades. Through innovative technologies such as Oilzapper, MEOR (Microbial Enhanced Oil Recovery), PDB (Paraffin Degrading Bacteria), and Coalbed Methane (CBM) bioconversion, the programme has created a profound positive impact in several critical areas:

- Sustainability: Each innovation contributes to more sustainable industrial practices, reducing the environmental footprint of oil and gas extraction.
- Economic Growth: By improving oil recovery rates and utilizing waste (such as CO_2 and oil sludge), these technologies drive cost savings and profitability for oil companies.
- Climate Change Mitigation: Technologies like CO_2-to-methane conversion and bioremediation of contaminated sites contribute significantly to climate action goals, reducing emissions and promoting cleaner energy.
- Global Recognition: The programme has positioned India at the forefront of biotechnological innovations in the oil and gas sector, earning international recognition for its contributions to environmental and industrial sustainability.

Overall, the Industrial Biotechnology Programme has successfully integrated cutting-edge microbial technologies into real-world applications, demonstrating that sustainability and economic growth can go hand in hand, paving the way for a cleaner, more efficient future.



➢ **Field trial of bioremediation of total petroleum hydrocarbon contaminated land at Nkeleoken, Eleme LGA, Nigeria oil field by using Oilzapper technology**

Details on Knowledge Building; Partnerships and Networks can be viewed via the following URLs:

1 https://teriin.org/files/Knowledge-Contributions.pdf

2 https://teriin.org/files/Partnerships-and-Networks.pdf



Sustainable Agriculture Programme

Sustainable Agriculture Programme is committed towards advancing innovation for resilient farming with focus on pioneering advances in soil health, bio-based agricultural inputs, food security and sustainable farming practices for profitable farming and livelihoods while conserving natural resources.

Themes and Commitments

At TERI's Sustainable Agriculture Programme, we are dedicated to drive agricultural innovation that boosts productivity, optimizes resource efficiency, and reinforces sustainability. Our solutions are designed to make farming more profitable by improving plant and soil health, conserving natural resources, and revitalizing ecosystems. With a strong emphasis on sustainable agriculture, environmental stewardship, and enhanced crop yields, we are committed to reduce the carbon footprint of farming. Our research focuses on critical areas, such as plant and soil health, climate resilience, and transformative farming practices ensuring a greener, more productive future for agriculture.

Thematic Focus

Agricultural Biotechnology

Agricultural Biotechnology (ABT) area focuses on application of biotechnology for improving agriculture practices including, biotic and abiotic stress tolerance in crop, agri-input management,



exploration of natural compounds from medicinal plants and microbial resources, and development of feed for livestock and poultry. Primary activities in the area include the following:

- Understanding soil microbiome, engineering and developing microbial products for soils to enhance crop yield, crop nutrition and minimize carbon footprint for farming.
- Developing practical Solutions for Climate Resilient Agriculture.
- Harnessing microbes (algae, fungi, etc.) to improve food and feed production, as well as developing nutraceuticals and functional supplements for human and animal health.
- Producing natural pigments using bacteria, algae, fungi, and lichens to replace synthetic dyes, reducing pollution in water, soil, and air.
- Transforming farm waste into high-value products for agricultural and industrial applications, promoting a circular economy.

Centre for Nano Research

Centre for Nano Research (CNR) focuses on carrying out cutting-edge research to develop nanobiotechnology-based smart materials for agriculture, environment, and energy. Complementation of nanoscience with biology opens a foray of opportunities for making nanomaterials efficacious as well as safe for humans and environment. TERI has pioneered in the development and industry-scale production of nanomaterials using a biogenic method. This is an inspiring journey from 'lab to land' based on in-house expertise and infrastructure only. Primary activities in the area include the following:

- Development of biogenic nanofertilizers and nano carrier/core-shell based slow-release fertilizers with high nutrient use efficiency (NUE) (>90 %)
- Novel nano-bio inputs for reduction in greenhouse gas (GHG) emission and enhancement of soil health (e.g., organic carbon, soil microbiome)
- Slow-release fertilizer composites with enhanced efficiency
- Bioplastics and bioactive molecules for biomedical applications
- Nanopesticides/fungicides and biocontrol agents for agriculture
- In-silico models and toxicity analysis of nanomaterials
- Development of nanomaterial for application in fuel, paint and bioremediation industries

Centre for Mycorrhizal Research

- Centre for Mycorrhizal Research (CMR) area focuses on mycorrhizal research to develop solutions for increasing plant productivity in agriculture and unproductive regions also by improving nutrient absorption in plants and soil health.
- Centre for Mycorrhizal Culture Collection (CMCC) – Mycorrhizal Bioresources Centre for research activities across India.
- Mass-production technology of mycorrhizal biofertilizers in vitro to ensure high-quality, genetically pure, and healthy propagules.
- Advanced mycorrhizal biofertilizers development utilizing mycorrhiza microbiome that complements mycorrhiza performance for synergistic effects and improved field performance.
- Wastelands restoration using mycorrhizal fungi to transform environmentally hazardous waste sites into green cover and ecologically stable areas.

Micropropagation Technology Park

Micropropagation Technology Park (MTP) has emerged as a pioneering initiative leveraging tissue culture techniques for the mass propagation of economically important crops including fruit crops, ornamental foliage, cash crops, and forest species.

- Facilitate large-scale, disease-free, and genetically uniform plant production and plays a crucial role in enhancing crop productivity.
- Provide technical support to establish a new commercial plant tissue culture lab.
- Beyond its scientific impact, MTP initiative is also closely tied to livelihood creation, by fostering proactive market linkages and business development opportunities.

Larger Goals and the Context

Our sustainable agriculture initiatives are driving transformative changes in farming systems worldwide, and our initiatives also align with the major United Nations Sustainable Development Goals (UNSDGs). By leveraging our extensive microbial germplasm bank, we are developing innovative biofertilizers and nano-agri inputs to enhance soil health, boost biodiversity, and promote regenerative agriculture. Our research extends to harnessing microbial systems for sustainable alternatives—from natural pigments and nutraceuticals to renewable energy sources—while actively evaluating carbon sequestration potential and conducting life cycle assessments to minimize environmental impact. Through these efforts, we directly contribute to UNSDGs 2 (Zero Hunger), 13 (Climate Action), 15 (Life on Land), and 17 (Partnerships for the Goals), driving systemic change towards a more resilient and equitable agricultural future.

Accomplishments

Our active projects focus on research and development, product development, implementation consulting, technology transfer, talent development, and research networking. We



receive funding support from government, industry, corporate social responsibility, and bilateral projects.

- **Contribution to lowering GHG emissions:** Creating nano-fertilizers and mycorrhizal biofertilizers focused on limited use of chemical fertilizers. Shell India (industry partnership) is providing support for the research and field trials.



➢ **Real-time data collection for CO_2 and N_2O emission from rice field by using LICOR instrument and sensors in research station at Gurugram**

- **Gene expression studies:** Unravelling the network of interactions by gene expression analysis involved in carbon and nitrogen

metabolism during tripartite associations (the mycorrhiza, mycorrhiza associated bacteria, and host) to estimate their capabilities to increase SOC and reduce GHG emissions. Shell India (industry partnership) is providing support for the research and field trials.

- **Biogenic sustainable agri-solutions:** Developing innovative biogenic solutions, such as nanobiotechnology-based alternative fertilizers, bio-fertilizers, bio-stimulants, and biological control agents and biopesticides which would have no negative impact on environment and human health and provide improved benefit to cost ratio to farmers. Chambal Fertilizers and Chemical Limited (Industry partnership) is providing support for the research and field trials in these projects.
- **Zero-discharge and biogenic production technology for nanofertilizers (from lab to the industrial scale):** Synthesis of nanofertilizers using biogenic means. Three nanofertilizers, viz., Nano Urea, Nano DAP, and Nano Phosphorus based on this pioneering technology are already available in the market through our commercial partners.
- **Commercial scale production of nanofertilizers at CBNF:** TERI in collaboration with Hindustan Rasayan Private Limited (HRPL) has established a new facility, Centre for Bio Nano Fertilizers (CBNF), for production of bio-nanofertilizers that can produce 40 lakh litres of nanofertilizers per annum. The facility is one-of-its-kind where nanofertilizers would be produced using biological processes and a disruptive biofermentation technology. The present capacity is easily scalable by addition of more fermenters to 2 crore litres per annum.
- **Mycorrhizal biofertilizers production technology:** Mycorrhizal biofertilizers products have provided a remarkable approach to enhancing agricultural yields while reducing chemical inputs. Mycorrhiza-based sustainable green technologies as well as leveraging the potential of mycorrhizal–microbiome for advanced formulations have been vital components of the project. Mycorrhizal technology product outreach has covered 16 states of India applied to cereals, pulses, oilseeds, horticulture, and cash crops. The outreach partners have marketed more than 6500 tonnes of Mycorrhiza biofertilizer products in FY 2024–25.
- **Micropropagation technology interventions:** Developed commercial micropropagation protocol for more than 70 plant species. Farmers received 45 million disease-free, micro-propagated horticultural plants. Micro-propagated ornamental plants for large-scale urban landscaping were also developed and provided.
- **Reclamation of industrial wastelands:** Subsequent to successful demonstration of 6.25 hectares of green cover, new project to cover 16 hectares area at Jarofix Dump Site was





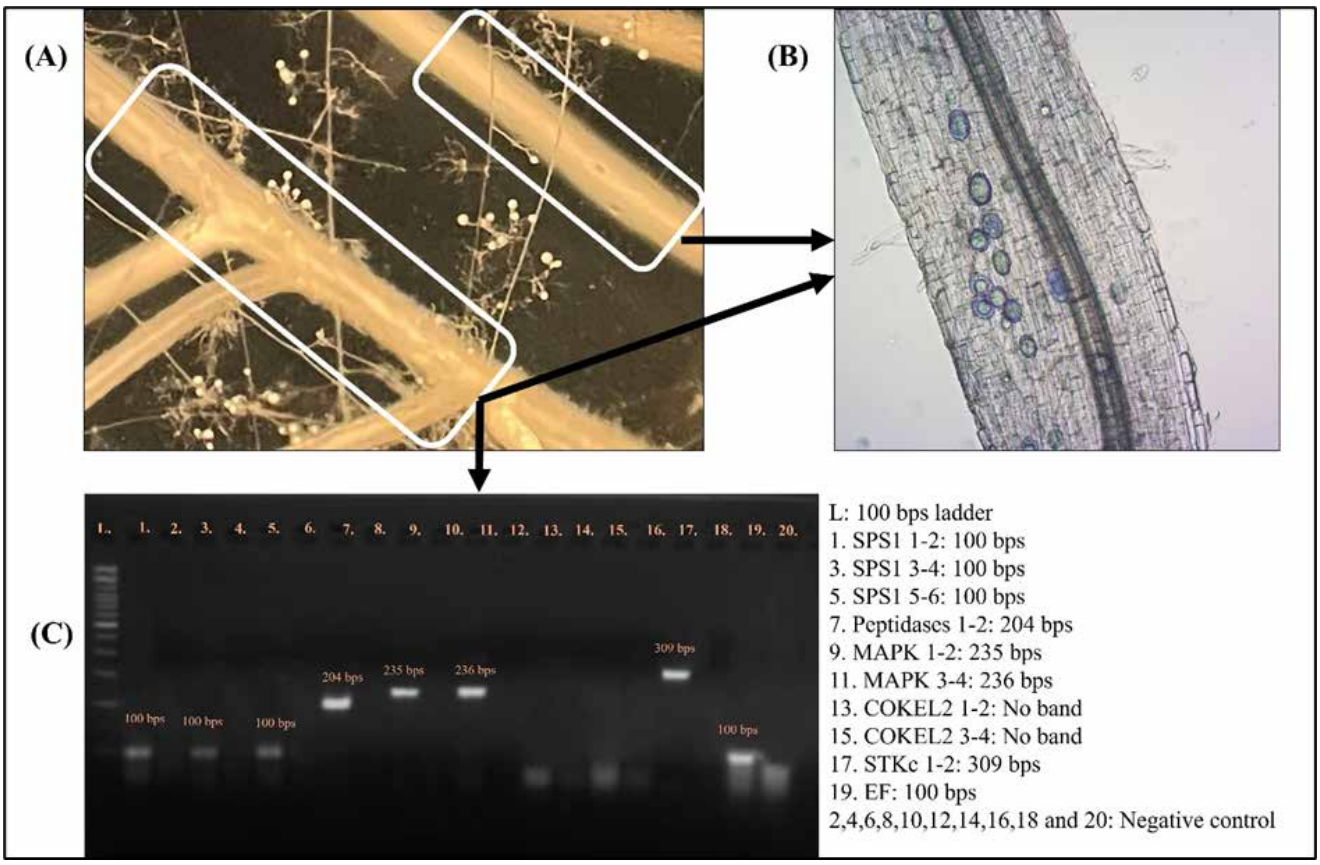
➢ **Chanderiya Lead-Zinc Smelter (CLZS) project site in Chittorgarh, Rajasthan**

awarded to CMR, TERI out of which development of 4 hectares is completed at Chanderiya Lead-Zinc Smelter (CLZS), Hindustan Zinc Limited, Chittorgarh, Rajasthan using mycorrhizal biofertilizers and phytoremediation techniques. The project aims to transform environmentally hazardous waste sites into green cover and ecologically stable areas, contributing to sustainable land management and environmental protection.

Approach and Innovation

- **Microbial bioformulations for controlled irrigation conditions**: Microbial biofertilizer bioformulations developed have been tested in farmers' fields in controlled irrigation conditions. From our robust pipeline, one of our promising bioformulations leads to significantly higher grain protein (~25%) and improved yield (~3–7%) even in controlled irrigation (57%). No lodging was observed in the treated crops indicating the capability of the plants to withstand climatic variations.
- **Biopriming of seeds with bacteria for improved vigour and germination**: Seed biopriming includes biological seed germination enhancement using various microorganisms and microbe-mediated signalling molecules, with seed coating. We have optimized the production and extraction of bacterial polysaccharides that can act as biopriming agents. Currently, we are optimizing the process for seed priming in tomato.
- **Enhancing food security using RNA-engineered bacteria:** We are working to uncover the small RNA-mRNA network of *Pseudomonas putida* under abiotic stress conditions, decode how regulatory RNAs participate in and control the interactions between the bacteria and the host plant, and engineer beneficial bacterial strains. We anticipate that the findings from this work will be exploited for the development of novel modified bacterial strains which can be taken up by the farmers to increase plant growth, crop yield and endure environmental stresses. The use of such tailored strains will help design more meaningful bioformulations for targeted beneficial effects, and pave a way for developing climate resilient and responsive crops.
- **Bioactives from medicinal plants:** Over 100 endophytic fungi were isolated to axenic cultures from 20 different medicinal plants collected from biodiversity-rich regions of the North-Eastern Himalayas in collaboration with TERI Guhawati. TERI has successfully developed a process of extraction, fractionation and isolation of pharmaceutically important bioactives such as Boswellic acids from the resin of medicinal plant *Boswellia serrata* (Indian frankincense) for nutraceutical and pharmaceutical application. A green extraction method using supercritical fluid extraction was established to isolate bioactive oil from *Cannabis sativa* (hemp), targeting applications in cosmetics and nutraceuticals.
- **Algal phycocyanin:** Developing Smartphone camera-based phycocyanin detection using FRET-based fluorescence enhancement.
- **Algal biofertilizer and biostimulant:** Algae-based biofertilizer and biostimulant used to improve soil organic carbon and enhance photosynthetic efficiency. We have conducted the initial bio-efficacy test at TERI's trialling station for TERI's biologicals along with diatoms-based industrial product and found interesting results on corn crop in Kharif season.
- **Vegan omega-3 fatty acids:** The bioprocess to cultivate both autotrophic and heterotrophic microalgae strains for high-value omega-3 fatty acid production are developed. Our technology efficiently yields eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)—essential nutrients known to combat cardiovascular diseases, cognitive disorders, and other lifestyle-related health conditions.
- **Bio-hydrogel:** TERRAGEL bio-hydrogel, derived from rice straw, exhibits remarkable water retention capacity—absorbing up to 1000 times its weight—with versatile applications as a soil conditioner, seed priming agent, smart agrochemical carrier, and in medical/hygiene products like wound dressings and biodegradable diapers, demonstrating our commitment to circular economy principles.

- **New and advanced mycorrhizal biofertilizer formulations:** Developments include novel products such as mycorrhizal formulations tailored to specific crops and regions and soil microbiome components that are compatible with the farming practices for sustainable agriculture.
- **Nano-biosensor:** Development of nano-biosensor that could potentially be used as a dual purpose tool for removal of heavy metals from water and at the same time detect water-borne common pathogens.
- **Effector proteins of arbuscular mycorrhizal fungi:** Effector proteins expressed by arbuscular mycorrhizal (AM) fungi and associated bacteria play an important role in establishment of mycorrhizal colonization of plant in different environmental conditions. Effector proteins-based formulation of mycorrhizal biofertilizers can pave way for easy and stable colonization in difficult terrains. In a project supported by the Department of Science and Technology, four important effector proteins were identified in *Funneliformis mosseae* isolate BR221. I. Protein–protein docking analysis revealed interactions between these potential effectors and plant proteins known to be differentially expressed during mycorrhizal association. Reference-based transcriptome sequencing of *Funneliformis mosseae* BR221 provided enhanced understanding on the molecular machinery involved in the establishment of interaction between host and AM fungi.
- **Nano sulphur:** The productivity of oilseeds (rapeseed and mustard) needs to increase from 20.50 to 25.60 q/ha by the end of 2030 in order to attain self-sufficiency in edible oil. Nano sulphur with particle size less than 100 nm shows improved uptake in plant in comparison to the conventional sulphur fertilizers. To evaluate bio-efficacy of nano-sulphur, trials were conducted on two Indian varieties of *Brassica juncea*



➢ **Expression analysis of predicted effectors in mycorrhizal roots**

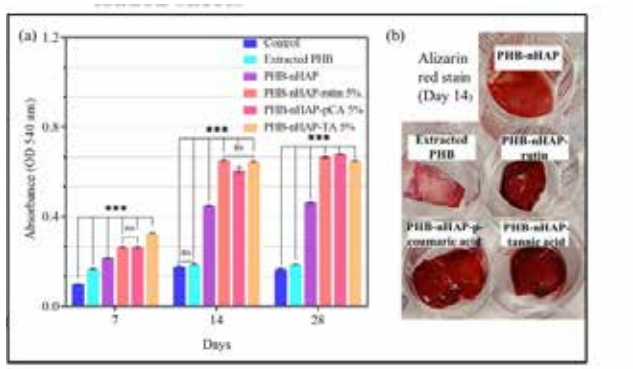
(mustard) in the Rabi season (2023–2024) at Gurugram, Haryana (28.4356674, 7.1325066) in randomized block design layout (plot size: 17 m × 11 m). Treatments comprising of application of two foliar sprays of nano sulphur (at 35 and 50 days after sowing) along with 75% or 50% RDF (for sulphur) were compared with recommended dose of fertilizers (RDF). The outcome from the field study demonstrated that nano sulphur can substitute up to 50% of traditional sulphur, while providing significant benefits in terms of increasing plant height (>10%), branches/plant (>20%), chlorophyll content of the leaf (SPAD value) (>10), biological yield (>30%). Considering the Minimum Support Price (MSP) of mustard in Haryana, farmers can generate additional revenue of INR 12,000 (approximately) per acre. The said cost benefit would help the small farmers to compensate for the cost of alternative fertilizers like nano-sulphur and any cost associated with foliar application.



➢ **Field trial of nano sulphur in mustard at TERI-GRAM, Gurugram, Haryana, showed yield increment by 32%**

Bioplastic-nano composite for tissue engineering scaffolds

- Biogenic polyhydroxybutyrate-nanohydroxyapatite (PHB-nHAP) nanocomposite scaffolds were prepared from recycling crop residues. Sustained release of polyphenols from the nanocomposite scaffold was achieved. The biomimetic and biogenic potential of the polyphenol-loaded scaffolds was investigated. The prior-art done till date successfully qualifies for enhancing the use of cost-effective, high-performance PHB-based sustainable composites.



(a) Quantification (Day 7, 14, 28) and (b) representative images (Day 14) of the *in vitro* mineralization assay of Kusa4b10 stem cells during osteogenic differentiation by Alizarin red staining

Inspirational Evidences

- **Nano products:** Poor soil nutrient content as well as nutrient use efficiency of traditional fertilizers are the major issues affecting agriculture yield globally. Introduction of nanotechnology enabled nanofertilizers, initiated by India, is helping farmers increase yield and reduce use of different conventional fertilizers by 25–50%. Field efficacy tests carried out by government agencies as well as farmer field demonstrations, reported improvement in quality and quantity of yield, that gives high benefit to cost (B:C) ratio to farmers, while also reducing GHG emission.
- **Field trial of TERI's biofungicide bioformulation at ICAR**: At an advanced stage of testing, TERI's bio-fungicidal formulations demonstrated improved germination, nodulation,



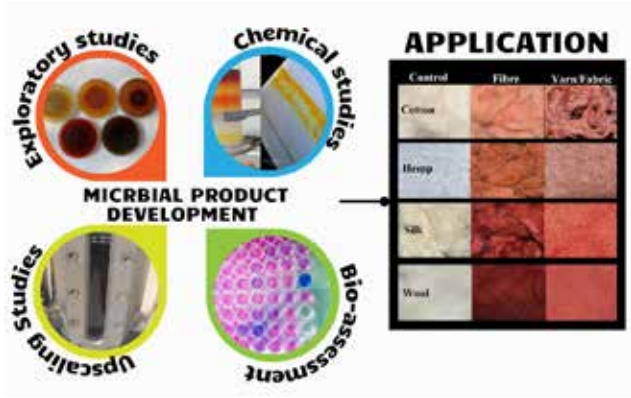


Pigeon pea crop Treated with TERI's newly developed Registered BioFungicide.

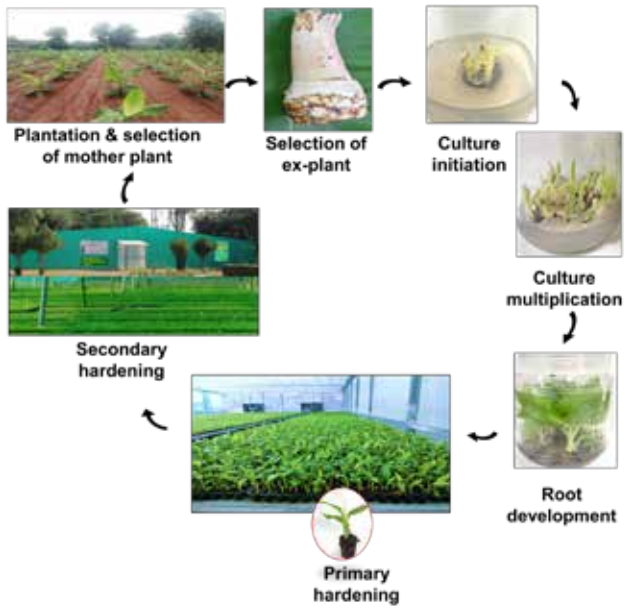
Untreated Pigeon pea crop from trials at ICAR-IIPR.

plant health, and suppression of Wilt disease in pigeon pea crops during field trials conducted at the ICAR–Indian Institute of Pulses Research, Kanpur.

- **Microbial products:** Microbial products have been developed for use across textile, cosmetic, and biopesticide industries.
  - » Our in-house R&D and scale-up facilities enabled the formulation of proprietary pigment recipes with enhanced yield and multifunctionality.
  - » In parallel, microbial bio-control agents have been harnessed to develop eco-friendly bio-insecticidal formulations, offering sustainable alternatives to conventional agrochemicals.
- **Poultry feed:** Developed an algae-based poultry feed that significantly improves in egg productivity, shell thickness, and omega-3 content in the eggs.
- **Waste to wealth:** Our sustainable biomass innovations harness agricultural waste to create high-value, eco-friendly solutions. We've developed a biomass-derived phenyl with potent disinfectant, cleaning, and insecticidal properties, proving effective against stored grain pests like *Tribolium castaneum* and nematodes such as *Caenorhabditis elegans*.



- **Micropropagation Technology Park (MTP):** Aimed to mass propagate disease free and clonally tested planting material of high yielding varieties of commercially grown horticulture crops for farmer's livelihood enhancement.



➢ **Steps of in vitro micropropagation techniques used for mass and rapid multiplication of superior planting material**

- **Waste land reclamation:** The project benefits humanity economically, physically, and environmentally. For industries, the reclamation efforts led to regulatory compliance, savings from avoided penalties, and reduced social agitation. The use of this technology in a natural and sustainable manner helped control eye problems and suffocation caused by fugitive dust emissions in nearby industrial areas. The



➢ Original project site: Jarofix dump



➢ Developed green cover at project site

project also created employment opportunities, generating approximately 5,000 man-days of work per year. Additionally, it successfully developed a green belt over 6.5 hectares of Jarofix dump wasteland. In total, the project generated a minimum of 25,000 man-days of employment by engaging local manpower, thereby supporting around 50 families.

Impact We Created

- **Nanofertilizers:** TERI in partnership with Hindustan Rasayan Private limited (HRPL), Zuari Farmhub Limited and Chambal Fertilizers & Chemical Limited has produced 10 lakh bottles of nano-urea, nano-DAP and nano-phosphorous that would cover 5 lakh acres of land. These nanofertilizers have wide-spectrum use in crop production including row-crops, horticultural crops, and various high-value/energy crops.
- **Mycorrhizal biofertilizers:** Mycorrhiza-based sustainable products as well as leveraging the potential of mycorrhizal–microbiome for advanced mycorrhizal formulations have benefitted 1.6 million acres of agricultural land in India in 2024–25 and the use of mycorrhiza biofertilizer products have increased agricultural productivity in the Middle East.



➢ **Rhodes grass cultivation in the Middle East using Mycorrhizal biofertilizers**



➢ Nanofertlizers synthesized using biogenic approach

- **Micropropagation Technology Park (MTP):** Supplied micro-propagated high yielding, good quality and disease-free planting material mainly Grand Naine (G-9) banana, potato, strawberry and various high value ornamental foliage to thousands of farmers and big growers/nurseries annually. This technology has had a good socio-economic impact by generating a total of INR 9 thousand million revenue made by farmers till date. MTP has generated approx. 1.30 lakh man-days employment for skilled manpower.



➢ **Potato mini-tuber production technology of mother tissue culture plants at MTP**

Knowledge Building and Dissemination

Agriculture and Food Sustainability (G-STIC)

A Parallel Session was organized on "Agriculture and Food Sustainability" as part of the conference organized by the "Global Sustainable Technology & Innovation Community (G-STIC)". Renowned experts from India enlightened on critical intersection of technology and sustainable practices in creating resilient food systems that can meet present and future demands while safeguarding ecological integrity.



Agriculture Sustainability through Advanced Technologies and Innovations for Achieving Food Security and Healing Our Planet – WSDS

As part of the World Sustainable Development Summit, the Sustainable Agriculture Division organized a thematic track on "Agriculture Sustainability through Advanced Technologies and Innovations for Achieving Food Security and Healing Our Planet," on March 5, 2025. This thematic track highlighted the importance of soil health and the need for innovative inputs to ensure food security of the world; especially South Asian countries. The need for policy modifications was also felt by national and international experts/ panel members so that existing and new research can be encouraged for on-field implementation at a larger scale. The role of the governments and the industries are equally important in this adventure.

Partnerships and Networks

CFCL-TERI Centre of Excellence

Chambal Fertilisers and Chemicals Limited (CFCL) and The Energy and Resources Institute (TERI) signed an Agreement to establish the "CFCL-TERI Centre of Excellence for Advanced and Sustainable Agriculture Solutions." This 5-year project will focus on advancing biogenic innovations to develop efficacious and eco-safe products for crop nutrition and crop protection in order to achieve sustainability in agriculture. The joint initiative of CFCL and TERI aims to address various challenges in agriculture sector, such as stagnating agricultural productivity, soil health degradation, poor nutrient use efficiency, reduced response (resistance) to chemicals and negative impact of excessive synthetic inputs on environment and human health, by developing innovative biogenic solutions.





➢ TERI–CFCL signing of MoU and facility inauguration

UK – Nano

Biogenic nanofertilizers (nano urea, nano DAP, and nano phosphorous) developed by TERI are being tested for field efficacy in different parts of the world including the UK, Dubai, and Guyana in collaboration with international industrial partners.

UPCAMP

As a part of the Uttar Pradesh Clean Air Management Project (UPCAMP), a detailed project report focused on the Indo-Gangetic Plain has been approved by the Government of Uttar Pradesh for: (i) on-farm demonstration for improved Agronomic Nitrogen-Use Efficiency (AgNUE) and increased adoption of precision Integrated Nutrient Management (INM) practices amongst farmers; (ii) developing methodology for quantifying and monitoring AgNUE through targeted interventions on precision nutrient management practices (PNMPs); (iii) measurement of emissions from the fields to contribute to centralized digital data for analytics and spatial trend analysis on AgNUE, thus relating to overall emission and subsequent particulate matter (PM) reduction; and (iv) knowledge management and promote experiential learning/awareness campaigns for farmers and stakeholders.

TERI–Guyana MoU

The Micropropagation Technology Park (MTP) has signed an MoU with the National Agricultural Research and Extension institute (NAREI), Ministry of Agriculture Guyana to establish a commercial plant tissue lab for one million plant production capacity.

TERI-Hindustan Zinc Limited Partnership

Collaboration for development of Green Belt on 16 ha area at Jarofix Dump Site 2 at Chanderiya Lead-Zinc Smelter (CLZS), Chittorgarh-Rajasthan. The project aims to transform environmentally hazardous waste sites into biologically productive and ecologically stable areas, contributing to sustainable land management and environmental protection.

TERI – Deakin University collaboration

As part of the TERI-Deakin programme, three postdoc projects have been approved for translational research in: (i) seed biopriming with plant-associated bacteria and hydrogels for improved crop performance; (ii) enhanced bioactivity of naturally occurring biopharmaceuticals by incorporation in a novel and low-cost bone tissue engineering scaffold; and (iii) isolation, purification, and characterization of the pigments.

TERI – Poultry Federation of India MoU

An MoU was signed between TERI and Poultry Federation of India for commercialization of a specialized feed for making omega-3 enriched eggs.

Training to Officials of the National Centre for Organic and Natural Farming (NCONF)

Hands-on training to scientific staff from the National Centre for Organic and Natural Farming (NCONF) for TERI's Spore Isolation and Enumeration Standard Operating Procedure for Mycorrhizal Biofertilizer Products.



➢ Training workshop for the National Centre for Organic and Natural Farming, India

All Nano-manufacturing Industry Meet

Multiple representatives from all nano-manufacturing companies, including IFFCO, TERI, Zuari Farm-Hub Limited, Coromandel, Ray Nano, participated in the brain-storming sessions organized by TERI in the months of March and April, 2025. The group together discussed and defined the modified guidelines for correct evaluation of nanofertilizers.



Awards and Recognition

- Dr Ashita Anand was awarded PhD degree as part of the TERI-Deakin programme based on her thesis on slow-release fertilizers.
- Ms Prerna Seth was bestowed upon Best Poster Award at the 8th International Conference on Functional Nanomaterials and Nanodevices (NANOMAT 2024), held from August 25–28, 2024, in Vienna, Austria on her poster entitled "*Green Synthesis and Safety Evaluation of Nanohydroxyapatite Ured*".

Details on Knowledge Building; Partnerships and Networks can be viewed via the following URLs:

1 https://teriin.org/files/Knowledge-Contributions.pdf

2 https://teriin.org/files/Partnerships-and-Networks.pdf



Social Transformation and Strategic Alliance Programme

The Social Transformation and Strategic Alliance Programme works towards inclusive and sustainable changes through networks, partnerships and integrated solutions. Pooling in diverse skill-sets and multiple locational approaches, activities of the Programme contribute towards action research fuelled with strategic approaches. The Programme rests on the strengths of education, communication, knowledge and technology tools to enable beneficiaries to move towards social transformation.

Environment Education and Awareness

Environment Education and Awareness Division has pioneered several sustainability education initiatives for schools and colleges through workshops, IEC materials, films and more importantly provided the youth a platform to evolve as harbingers of change. Developing quality content and implementing projects driven by experiential learning have been major hallmarks of the Division's activities. Work at EEA focuses on transformative impact through ideas for integrated solutions, fuelled by strategic approaches based on new-age paedagogy. Working on the principle of 'Catching them Young,' the Division works towards creating an environmentally conscious society by empowering students and youth with knowledge and skills, leading to best eco-friendly practices.

Young people, as the leaders of tomorrow, are crucial in driving the necessary transformations in

societal attitudes and practices towards sustainable development. EEA caters to youth from around 32 countries and have a presence in all states and UTs of India through its projects, with support of line ministries and departments for sustained impact.

Themes and Commitments

Thematic Focus

The Environment Education and Awareness (EEA) Division is dedicated to advancing Education for Sustainable Development (ESD) by engaging future citizens and academicians in capacity-building initiatives and cutting-edge research. Its activities aim to create an interdisciplinary learning environment that fosters an understanding of innovative sustainable practices and develop competencies of young people to integrate sustainability into their thoughts and actions. Working with Gen Z to reverse the planetary environmental crisis, the division's activities are focused on enhancing knowledge, attitudes and behaviour patterns of children and youth towards sustainability. Implemented through two operational areas—Education for Youth Empowerment (EYE) and Strategic Communication for Sustainability (SCS)—the Division's efforts are spread across TERI's centres in Bengaluru, Delhi, Guwahati, Goa, and Mukteshwar.

Thematic Goals:

- Environment Education
- Strategic Communication
- Behavioural Change
- Community Impact

Larger Goals and the Context

Projects and activities are directly aligned with SDG 4.7, aiming to ensure quality education that promotes global citizenship, sustainable development, and respect for cultural diversity, focusing on fostering critical thinking, responsible behaviour, and innovative solutions among learners, thereby empowering them to actively contribute to a sustainable and inclusive future. The Division's work is aligned with Mission LiFE, Poshan Abhiyan, National Education Policy (2020) and National Curriculum Framework (2023). Interdisciplinary learning is the focus of projects driven through Higher Education Institutions (HEIs), and these promote activities under Jal Sanchay Jan Bhagidari, Unnat Bharat Abhiyan, and Eco-friendly and sustainable campus development (SATAT) schemes of the Government of India. Projects of the Division are endorsed by the Ministry of Environment, Forest and Climate Change, Ministry of Education, Ministry of Culture, Ministry of Earth Sciences, Ministry of Science & Technology, etc. Along with direct alignment with SDG4.7 (Quality Education), the work is also linked with SDG6 (Clean Water and Sanitation), SDG7 (Affordable and Clean Energy), SDG 12 (Responsible Consumption and Production), SDG13 (Climate Action), SDG14 (Life below Water), SDG15 (Life on Land), and SDG17 (Partnerships for the Goals).



Our Accomplishments

- Formulated and disseminated the Youth Pledge under the annual Youth Climate Conclave (YCC) in a participatory manner with inputs from youth representatives from across the country. It also engaged over 1,000 students in creative expressions on climate change issues.
- Registered over 1 lakh school students for the GREEN Olympiad and approximately 7,276 youth for the GREEN Olympiad for Youth (GO4Youth) initiative.
- Kick started programme on "Knowledge to Action" to empower young climate innovators in government schools in Bengaluru.
- Strengthened pro-environmental behaviour in vulnerable communities through initiatives like The Green School project, Ocean Matters, Energy Wise Energy Rise and EN-Powered Schools.



➢ **Dessimination of Books under Energy Wise Energy Rise project in Schools**

- TERI initiated a Nutri Garden programme at Carmel Convent School to promote sustainable living and nutritional awareness among students. The initiative combined insightful knowledge sessions with engaging hands-on activities, allowing students to learn about the importance of healthy food and environmental stewardship. Through planting vegetables, students experienced the joy of nurturing a garden while developing practical skills.
- Initiated in 1999, GREEN Olympiad is one of the leading flagship programmes of TERI. It is designed in an innovative manner so as to test knowledge levels of students about environment and sustainable development issues. The Green Olympiad for Youth (GO4Youth), organized by TERI and endorsed by UGC, MoEFCC, and MoE, is an annual MCQ-based examination targeting students aged 18–30 years in Indian HEIs.
- The Green School Project, a joint initiative between the Tata Steel Foundation and TERI, was designed and formally launched in April 2017 to prepare students across Tata Steel's operational areas by developing their critical, interdisciplinary, and holistic thinking related to environmental conservation.
- The OTBL Campus Impact Challenge, launched by TERI and ONGC TERI Biotech Limited, empowers youth in Assam's colleges to identify sustainability challenges on their campuses and develop collective solutions, emphasizing the importance of the Sustainable Development Goals.
- Youth Climate Conclave (YCC) a launchpad for climate warriors participated from across the country for the 5th Edition of Youth Climate Conclave (2024–25) which was held on March 2–4, 2024 to discuss and deliberate on the most pressing issues related to climate action.
- The capacity building programme targeting school children on Climate Change, Health, and Hygiene with support from UNOPS across 11 districts in Uttar Pradesh has transcended conventional educational paradigms to emerge as a transformative force driving towards sustainable change.
- "Knowledge to action: Empowering Youth Climate Innovators", a collaboration between TERI and HCLFoundation, which aims to empower students from selected government schools in



➢ **Group photo during Ideation Workshop at TERI SRC, Bangalore**



➢ **Insightful session on WASH (Water, Sanitation, and Hygiene) conducted by a TERI expert**

Bengaluru by equipping them with knowledge and skills to address the issue of climate change.

- The Energy Wise Energy Rise (EWER) initiative, in collaboration with BSES Rajdhani Power Limited, aims to educate school students on energy issues, having reached students in grades 6–8 across 400 government schools in South and West Delhi by integrating energy literacy into the curriculum and promoting student engagement as energy ambassadors.
- EN-Powered Schools- TERI implemented 'EN-powered Schools' in partnership with BSES Yamuna Power Ltd. to make students and teachers understand the grim situation and establish coexistence between demand and supply curve of energy sector, through combination of conservation, efficiency measures while also introducing renewable energy and other developments in the energy sector. The programme was implemented in 100 Municipal Corporation of Delhi (MCD) schools engaging 20,000 students.
- Ocean Matters: Safeguarding Our Oceans- Ocean Matters was implemented in partnership with US Consulate General Chennai. The project adopted a two-pronged approach to evidence based awareness of teachers and students for strengthening the Ocean health. Scientific evidence were gathered using the GLOBE protocol and the Microplastic Monitoring Protocol wherein data related to climate change and marine plastic helped in facilitating the campaigns, awareness and action to bring about positive changes for improving ocean health.

Approach and Innovation

- Create an interdisciplinary learning environment that incorporates systems thinking to enhance futuristic planning and design thinking methodologies for youth.
- An out-of-the-box thinking and innovative, cutting-edge sustainable practices that students can adopt within their campuses and communities.
- Create value-based learning and citizen science programmes for creating environmentally responsible citizenry and self-reliance in communities.



➢ **Inauguration of Photo Exhibition as part of Youth Climate Conclave**

- Distinct paedagogy through knowledge transfer by promoting peer-to-peer learning.

Inspirational Evidences

Success stories and sustainable solutions promoted:

- GREEN Olympiad 2024–25, registered over 2251 schools from over 600 districts in all 28 States and 7 UTs.
- The best entries from the Youth Climate Conclave photography competition were exhibited, inaugurated by dignitaries including Mr Tarun Kumar Pithode, Director, Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India; HE Ewa Suwara, Chargée d'affaires, Deputy Head of Delegation of the European Union to India; Mr R R Rashmi, Distinguished Fellow & Programme Director, Resource Efficiency & Governance, TERI, highlighted the creative expressions of youth on climate resilience and environmental challenges.
- Eighty teachers from Bruhat Bengaluru Mahanagara Palike (BBMP) Government schools participated in the teacher training workshop. A total of 677 students from 44 BBMP government schools across major areas of Bengaluru participated in the students' training workshop on "Creating Climate change agents through capacity building."
- The Green School project has made a significant impact, reaching approximately 35,000 students, 1,100 teachers, and 5,000 community members across more than 100 schools in West Bengal, Uttar Pradesh, Maharashtra, Punjab, Odisha, and Jharkhand.



➢ **OTBL Campus Impact Challenge winners' felicitation**

- EN-Powered Schools Project engaged 20,000 students from 100 schools under the jurisdiction of Municipal Corporation of Delhi. The project organized 200 workshops to education students on energy conservation, energy efficiency and role of youth. The project also built capacity of approximately 700 teachers.
- Ocean Matters: Safeguarding Our Oceans- The project impacted 1000 students and 200 teachers from 100 schools in Kochi, Chennai and Puducherry. The project helped in inculcating scientific temperament amongst teachers and students to solve most pressing issues around oceanic health.
- Drafting and presentation of a collective 'Youth Pledge' by 95 Indian youth from 12 states, engaged 1000 Indian youth in YCC and linked activities and involved 30 global experts to share their understanding about Climate Change with youth under Youth Climate Conclave.
- The OTBL Campus Impact Project successfully implemented six exemplary sustainability ideas across Assam benefiting around 3,000 students and 1,700 community members through education focused on the SDGs.
- Students adopted Bio-enzyme and plantation activities in schools under Knowledge to action: Empowering Youth Climate Innovators Project.
- 129 National Students, 29 International Students and 35 Schools got awarded under 'The GREEN Olympiad Examination 2024' for their excellent performance.
- The Green School project has significantly enhanced the knowledge and capacity of both students and teachers regarding pro-environmental behaviour, inspiring them to undertake small initiatives at the individual and school levels to protect and conserve the environment. By implementing various actionable, community-based projects, the initiative has further encouraged pro-environmental behaviour among community members and schoolchildren alike.
- EWER has empowered over 27,450 students across 100 government schools in South and



➢ School Workshop Held under Energy Wise Energy Rise project

West Delhi, with the support of the Directorate of Education, Government of Delhi and BRPL.

Knowledge Building and Dissemination

- A Project Teaser was developed that not only showcased tangible results but also educated and raised awareness and served as a long-term documentation of the project's impact. https://www.youtube.com/watch?v=NCbsfGELgwE
- Publication: YCC Case Story- https://wsds.teriin.org/2025/ycc_v5/vote/assets/pdf/YCC_Case_Story_5th_edition.pdf
- A DIY (Do It Yourself) module, a comprehensive book on climate change, and a teachers' training module have been developed as part of Knowledge to Action: Empowering Youth Climate Innovators supported by HCLFoundation. These resources have been translated and designed in both Kannada and English, ensuring accessibility and supporting learners from diverse backgrounds, fostering an inclusive learning environment.
- Resource materials, including learning modules on Waste, Water, Energy, & Biodiversity, were created in local languages—Punjabi, Marathi, and Bengali—to meet the demands of local audiences under The Green School Project.
- An article 'Empowering Youth for Sustainability: The Role of Higher Education Institutions in Climate Action' was published in *TerraGreen*



➢ Young changemakers cultivating a vibrant kitchen garden



➢ Schools and NCC members uniting for an impactful awareness rally

WSDS special edition in March 2025 under OTBL Campus Impact Challenge project by Mr Ravi Sankar Das, Ms Monmi Barua, and Ms Taru Mehta from EEA TERI.

- Under Energy Wise Energy Rise (EWER), a key feature of the programme is a custom-designed, age-appropriate workbook in Hindi titled "पर्यावरण से हम" (Paryavaran Se Hum). Designed to be both informative and engaging, the workbook introduces core environmental and energy concepts through colourful illustrations, relatable characters, and do-it-yourself experiments.
- EN-Powered Schools: Implemented in the first year, this project developed 'Vidyut Jaise Sashakt Bane Hum', a children's workbook on understanding the energy sector. The book was widely disseminated to 20,000 students of 100 MCD schools.
- An article 'Promoting Agriculture linked SDGs with Youth' was published in *TerraGreen* by Dr Neetika W Chhabra and Dr Livleen K Kahlon
- An article on 'Snowballing Sustainability through Schools Skilling Students to Grow Food' was published in *Science Reporter* by Dr Neetika W Chhabra and Dr Livleen K Kahlon from EEA, TERI.
- A joint publication was released on 'Comphrehensive Assessment of Job Impacts and Skill Gaps while Transitioning from ICE to Electric Trucks' by TUG, ERD and EEA divisions of TERI. Dr Neetika W Chhabra contributed in the publication fron EEA.

Partnerships and Networks

- Ministry of Environment, Forest and Climate Change, Government of India
- Ministry of Education, Government of India
- Ministry of Culture, Government of India
- University Grants Commission
- United Nations Institute for Training and Research, Geneva
- United Nations Environment Programme, New Delhi
- United Nations Educational, Scientific and Cultural Organisation, New Delhi
- US Consulate General Chennai
- European Union Delegation to India
- Central Board of Secondary Education
- Kendriya Vidyalaya Sangathan
- Navodaya Vidyalaya Samiti
- Municipal Corporation of Delhi
- Bruhat Bengaluru Mahanagara Palike
- Tata Steel Foundation
- HCLFoundation
- State Council of Educational Research and Training, Goa
- Council on Energy, Environment and Water
- Deutsche Gesellschaft für Internationale Zusammenarbeit, India
- Assam Science Technology & Environment Council
- Department of Education, Govt. of Assam
- ONGC TERI Biotech Limited
- United Nations Office for Project Services
- BSES Rajdhani Power Limited
- BSES Yamuna Power Limited

KNOWLEDGE RESOURCE CENTRE

Themes and Commitments

Knowledge Resource Centre's (KRC) vision is to develop technology-enabled knowledge solutions and emerge as a skill development hub to support the transition to sustainability. At the forefront of knowledge creation and dissemination, KRC empowers India's sustainable future by building robust knowledge management systems, delivering high-value services, and leading impactful skill development programmes.

Library and Knowledge Management

KRC plays a pivotal role in empowering TERI researchers and a diverse spectrum of

stakeholders—from government bodies and corporates to multilateral institutions and academia—by delivering innovative knowledge-driven products and services through advanced ICT tools. Leveraging both physical and digital resources, KRC offers research support, while its professionals actively contribute to collaborative, multi-stakeholder research initiatives, data analytics, and capacity-building programmes. Their expertise extends to developing national and international knowledge networks, curating web content and databases, and publishing peer-reviewed literature and innovative knowledge products. Central to KRC's operations is a state-of-the-art Knowledge Management System that captures, organizes, and disseminates TERI's rich repository of research and insights.

Specialized Information Centres

KRC has established several specialized information centres to disseminate knowledge on key sustainability areas, including transport, renewable energy and climate change, and sustainable development. These centres create knowledge products, maintain websites and repositories and provide online knowledge services to support and engage stakeholders.

Knowledge Sharing and Collaboration

During 2024–25, KRC executed several knowledge-based activities aimed at enhancing institutional capacity, supporting evidence-based decision-making and promoting knowledge sharing across key stakeholders.

The National Centre of Excellence in Green Ports and Shipping (NCoEGPS) Portal <https://green-port-shipping.org/> was launched by the Union Cabinet Minister Shri Sarbananda Sonowal in February 2025 at the "Powering the Blue Economy – Viksit Bharat with Budget 2025" event in Mumbai. This landmark initiative, a collaboration between the Ministry of Ports, Shipping, and Waterways (MoPSW) and TERI marks a significant leap towards fostering sustainability within India's maritime sector.

The NCoEGPS Portal serves as a comprehensive repository of resources, including best practices, digital tools, and cutting-edge research, designed to empower stakeholders across the spectrum. The portal enables seamless knowledge sharing and collaboration among a diverse range of stakeholders—from port and shipping industry officials and government agencies to academia and civil society.



➢ **Launch of NCoEGPS portal, February 26, 2025**

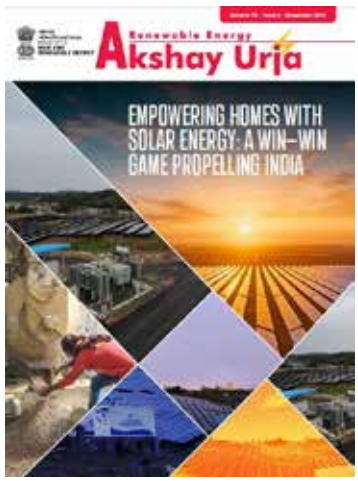
KRC hosts the EIACP (Environmental Information, Awareness, Capacity Building and Livelihood) Resource Partner on Renewable Energy and Climate Change <http://terienvis.nic.in> supported by the MoEFCC, Government of India, which works relentlessly towards knowledge creation and dissemination for education, awareness and inputs to policy-making. The Centre has produced reports, infographics, datasets, case studies, and 4 issues of *eNREE News*.

With support from the Department of Science and Technology (DST), KRC has undertaken the National Survey on Resources devoted to Science & Technology during 2024–25, collating data from central and private sector R&D organizations nationwide to map the R&D landscape. KRC has developed the Digital Repository of S&T Publications <http://digitalrepository-nstmis-dst.org>, with support from the DST. This repository includes the 2025 edition of the Directory of R&D Institutions, available in both print and online formats.

Publications

KRC brought out TERI's annual flagship publication *TERI Energy and Environment Data Diary and Yearbook (TEDDY)*, which seeks to support policy research and decision-making by providing facts and data that can further be used to develop actionable solutions warranted by rigorous analysis. It presents the state-of-the-art information on energy supply, energy demand, and environment.

TERI facilitates the publication of *Akshay Urja* magazine, published by the Ministry of New and Renewable Energy (MNRE) with support from GIZ. The magazine focuses on various aspects of renewable energy including rural and urban applications of RE in India, detailed case studies/success stories of PV applications, commentaries on key schemes and initiatives, feature articles on new innovations, technologies, implementation, and education.



➢ **November 2024 issue of *Akshay Urja***

Training and Skill Development

KRC maintains an E-learning Platform <https://teriin.org/e-learning> that aims to facilitate capacity building in TERI's research areas across professionals and communities with the aim to promote education and learning to reduce impact on environment and climate. KRC is also actively engaged in skill development, awareness and training activities on sustainability issues. Several such programmes were organized during the year.

As part of the Skill Development in EV Space and the Exploratory Study on CPO Skill Requirements in India, a Focus Group Discussion on 'EV Infrastructure and the Need for Skilling' was convened on March 28, 2025, to delve into the urgent skill gaps and infrastructure challenges shaping the fast-evolving electric vehicle sector.

TERI EIACP RP conducted 32 awareness programmes under Mission LiFE at different parts of India reaching over 16,046 stakeholders. During the reporting period, under the Green Skill Development Programme (GSDP), the Centre imparted 7 residential technical trainings engaging rural youths from different Indian states on solar energy applications and waste management sectors to develop skills and livelihood generation in Dhanbad (Jharkhand), Lucknow (Uttar Pradesh), Sohra (Meghalaya), Kumarghat (Tripura), Ahmednagar (Maharashtra), Pasighat (Arunachal Pradesh), and Tiruchirappalli (Tamil Nadu).

TERI, with support from NABARD, conducted specialized skill development training programme on Skill Development Training for Unemployed Youth of Lucknow Region, Uttar Pradesh on solar energy and its technologies with reference to agriculture for the rural youth of Lucknow, Uttar Pradesh. TERI has provided classroom-based training programmes that included site visits and imparting practical understanding of the functioning and maintenance of solar power plants,





➢ (from L to R): Mission LiFE Awareness Programme, February 14, 2025, Ahmednagar, Maharashtra; Green Skill Development Programme, February 6, 2025, Tiruchirappalli, Tamil Nadu; Mission LiFE Awareness Programme, October 16, 2024, Khwaja Moinuddin Chishti Language University, Lucknow, Uttar Pradesh



➢ June 15, 2024 Kamlabad, Uttar Pradesh



➢ May 20, 2024, Guwahati, Assam



➢ October 5, 2024, Kumarghat, Tripura

solar pump, solar dryers, solar cold storage, solar lighting-cooking, and other solar systems.

Impact We Created

- Over one lakh diverse stakeholders have leveraged our online knowledge platforms and contents to drive research, decision-making, and foster meaningful collaborations.
- Empowered 210 trainees with green skills through a comprehensive, hands-on programme specializing in solar energy technologies, preparing them for the sustainable energy workforce.
- Under Mission LiFE awareness drive, we have reached over 1,11,150 stakeholders from different parts of India.
- Engaged 573 farmers through awareness programmes and trained 27 farmers in the cultivation of medicinal and aromatic plants and solar technologies applications.

Knowledge Building and Dissemination

KRC has consistently led the way in knowledge creation by acquiring, organizing, and disseminating valuable resources, while also offering value-added services in the areas of energy and environmental topics.

Partnerships and Networks

- Most of the funding and support has been received from the government sector comprising the MoEFCC, MNRE, MoPSW, DST, and the Ministry of Earth Sciences, Government of India.
- The collaboration with bilateral organizations, such as Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, has led to the successful publication of the *Akshay Urja* magazine.

- Partnerships with multiple academic institutions, development agencies, and NGOs have facilitated the successful implementation of skill development programmes focused on the SDGs and climate action across various states in India.
- The collaboration with Mercedes-Benz Research & Development India in the skill development of EV charge point operators aims to strengthen the EV ecosystem in the country.

SOCIAL TRANSFORMATION AND CSR

Themes and Commitments

Thematic Focus

In Social Transformation and CSR space, TERI addresses a wide spectrum of techno-social dimensions such as:

- Solar PV technology design and customization for household energy access and livelihoods
- Develop innovative and scalable business models for the large-scale dissemination of clean energy
- Promote skilling and entrepreneurship
- Conduct action research for learning and policy integration
- Deploy decentralized energy solutions for improving operational efficiencies in health, education, micro and small-enterprise sector, etc.

Besides, the division also focuses on interweaving elements of gender and social inclusion at every stage of design and implementation, which has been the cornerstone of its endeavours. With an emphasis on clean and rational use of energy, the division continues to strive for a climate-resilient and Atmanirbhar rural India, aligning with the broader objectives of TERI.

Larger Goals and the Context

ST & CSR initiatives, encompassing clean energy solutions and capacity building to enhance energy access, livelihoods, green jobs and overall sustainable development, while balancing greenhouse gas emissions, are helping to support



India in achieving its Net Zero targets by 2070. In doing so, they address the following 10 out of 17 SDGs.

Sustainable Solutions Promoted

Developing green skills of rural India is a key intangible sustainable solution actively advocated by TERI. In parallel, TERI promotes several tangible sustainable solutions, including:

- Clean energy solutions in MSMEs
- Solar-based solutions—irrigation pumps, home lighting system, LED streetlights and DC fans, portable solar-powered cold storage units, boats, sewing machine motors, toy motors, brass-making motors and water pumps for drinking water supply, etc.
- Hybrid solar charging units for power looms
- Solar-powered biomass cookstoves
- Large-scale village adoption programmes for integrated community development









Our Accomplishments

Number and Nature of Projects

To date, over 200 projects have been successfully implemented across India, with the dissemination of clean energy-based sustainable solutions still ongoing to drive social transformation. In the reporting year, 25 projects were executed, covering research, modelling, policy advocacy, demonstration & replication, consultancy, and CSR activities. These projects have positively impacted diverse communities, including farmers, micro and small entrepreneurs, fisher folk, school students, women-led self-help groups (SHGs), and coastal and tribal populations.

Role in Reducing Carbon Footprint

Special focus is placed on CO_2 emissions mitigation in all projects undertaken by ST & CSR division.

- A cumulative capacity of 1071 kW of hybrid solar charging units (HSCU) for power looms has been installed in Varanasi, Malegaon, and Burhanpur, helping reduce approximately 1282 metric tonnes of CO_2 emissions annually.
- A cumulative capacity of 300 kW of clean energy systems installed in MSMEs across Uttar Pradesh, other than power looms, abates around 245 metric tonnes of CO_2 per year.
- 200 units of hybrid solar systems (with a cumulative capacity of 64 kW) have been disseminated to support the tailoring business in the mining belt of Jharkhand.
- More than 50,000 clean cookstoves are promoted in rural areas, reducing approximately 1,00,000 metric tonnes of CO_2 annually.



Approach and Innovation

Sustainable and customer-centric ST & CSR initiatives have fostered the development of clean energy technologies, shared through open-source platforms. Implementation methodologies are continuously adapted to evolving contexts, enhancing process efficiency and reinforcing best practices through policy advocacy and capacity building.

Persistent efforts have led to the creation of sustainable, market-driven value chains that align commercial and social objectives with stakeholder needs. This has resulted in the development of customized technology solutions, responsive service mechanisms, localized and inclusive entrepreneurial business models, and increased awareness and livelihood opportunities at the grassroots level.



Inspirational Evidences

Demonstrations

Holistic village and school development programmes, supported by CSR funding under the theme of Natural Resource Management (NRM) have been primarily implemented in Haryana, Jharkhand, and other regions across India. These initiatives have driven positive social transformation, increased adoption of clean energy practices, and behavioural shifts in rural communities. The impacts of these efforts have been documented through the following audio-visual materials.

Films & Videos		
S. No.	**Film / Video**	**YouTube link**
1.	Weaving In The Sunshine: A film on hybrid solar charging unit for power loom	https://youtu.be/2oQEHmjIMdU
2.	Solar Flow In Mandakini: A film on battery powered boat	https://youtu.be/bJ2N50_S5jA
3.	Anjora: The Light	https://www.youtube.com/watch?v=WNTk-Qx6Nmc
4.	Solar Chandna: A documentary on Solar Micro Grids	https://www.youtube.com/watch?v=_N63ERilrEE
5.	New bloom on the loom (Short film on solar loom)	https://www.youtube.com/watch?v=aw30zHEujkg
6.	Solar flow in Mandakini: A film on battery powered boat	https://www.youtube.com/watch?v=bJ2N50_S5jA
7.	A Journey towards Sustainability: Empowering Lives, Preserving Nature	https://youtu.be/pLpwAWnVaFk?si=8MqY9qKeUzpFd5Pq

Success Stories

The Division has taken the lead in providing reliable energy infrastructure for remote schools, ensuring quality education for children. Through this initiative, renewable energy has been seamlessly



integrated with quality learning and local economic development. Over 400 students have been trained in solar energy-related skills by leveraging the Green Skill Development Programme of the Ministry of Environment, Forest and Climate Change (MoEFCC). Of these, approximately 50% have secured placements in various industries, while some have launched careers as green entrepreneurs.

As part of a major project in collaboration with the World Bank Group, TERI-JEEViKA-JWiRES successfully established 35 women-led Uttam Urja Shops, facilitating the dissemination of more than 7000 clean cookstoves across Bihar between 2022 and 2025. A pivotal step towards pan-India penetration is TERI's flagship clean energy access initiative – Lighting a Billion Lives (http://labl.teriin.org/).





The division continues to innovate clean energy solutions and dissemination models for enterprise clusters, including toy making, rope twisting, pottery, sewing, and other crafts across different regions of India.

Impact We Created

- Due to persistent issues related to energy access, unreliable electricity supply, and inadequate operation and maintenance, the village has been experiencing power outages that result in a loss of 3–4 working hours. These disruptions also lead to noise pollution, CO_2 emissions from diesel generators, and interruptions in household chores and livelihood activities.
- Interventions aimed at addressing these issues benefitted the rural population by ensuring a stable power supply, lowering electricity costs, preventing disruptions to livelihood activities, saving time and reducing CO_2 emissions, noise pollution, and indoor air pollution. Creating jobs and entrepreneurship by enhancing





knowledge and skills on solar energy among rural unemployed youths through the Green Skill Development Programme, Govt. of India.

- Developing women self-help group (SHG) networks as last mile clean energy service providers in the backward districts of Bihar under clean cooking and lighting initiatives.
- The initiative to provide reliable energy to remote schools accelerated the growth of green jobs while expanding career and entrepreneurship opportunities.

Knowledge Building and Dissemination

By synthesizing insights from diverse projects on sustainable energy promotion, social inclusion and gender equality, the Division has effectively shared innovative solutions, ground level perspectives, and policy recommendations. This has enabled active participation in knowledge exchange events at village, state, national and international levels.



Contribution in Knowledge Building

Publications derived from action research and innovative practices have successfully engaged researchers, practitioners, policymakers and other stakeholders, fostering knowledge dissemination and collaboration.

- 180 publications including 100+ articles
- 1 patent and 4 other patents have been filed

Partnerships and Networks

The Division actively collaborates with national and state government programmes to integrate energy access into key sectors such as livelihoods, health, education and women's empowerment. By working alongside government schemes, rural development initiatives, and various programmes, the Division has successfully reached some of the most remote areas providing energy poor communities with access to clean technologies for both basic and productive use.

To create a generation of socially conscious youth committed to a sustainable future, the Division engages students and young professionals in the rural energy access framework, fostering progress towards the Sustainable Development Goals (SDGs).

Awards and Recognition

- Mahatma Award for best CSR project in Environment category for Coal India Project
- Best CSR project in Rural Development category for Coal India Project
- Indo–French Award for CONCOR CSR Project
- MCA Award for PFC CSR Project
- Best CSR Initiative by IIT and DPE
- Award for best Swachhata Project
- Woodpecker Award for CONCOR CSR Project
- National Best overall Excellence in CSR under the Organizational Award by ET Ascent
- Dedication Excellence Award in Sustainability Program Development-South Asia by Acquisition International

COMMUNICATIONS AND PUBLICATIONS

Communications and Stakeholder Engagement (CSE) Area

The Communications and Stakeholder Engagement (CSE) Area designs and executes outreach initiatives to enhance the visibility of TERI's diverse knowledge and effectively engage key stakeholders including policymakers, media, and the public. CSE contributes to TERI's outreach through a well-outlined communication strategy.

TERI strives to bring about transformative change through its cutting-edge research practices and stakeholder engagement and uptake. To maximize the impact of research, it is imperative that the Institute goes beyond the selective realm of science and theory to reach the general public. CSE plays a critical role in achieving this goal.

Work We Do

Mainstream Media Engagement

Media—print, broadcast, and digital—continues to be the most popular and effective mode of outreach for TERI's knowledge outputs. Engagement with the media ranges from get-to-know meetings with leading publications, facilitating in-depth opinion pieces, experts' inputs and interviews. Project milestones, such as publication of reports and findings, policy briefs, workshops, and conferences are amplified through prominent outreach tools of press releases, press conferences, and special stories or features.

Social Media

Social media is an indispensable tool in reaching out to a larger audience base, thereby building brand awareness and fostering growth. TERI is active across all popular social media platforms – Twitter, Facebook, LinkedIn, Instagram, and YouTube. The Institute has a growing and dynamic following on all these platforms, and the content shared showcases a varied range, including announcements, project milestones, multimedia productions, and more. CSE leverages the potential of social media platforms to take TERI's innovative research to a cross-section of followers. Project- and platform-specific social media strategies are also curated by the team.

Project-based Films and Audio

CSE produces audio-visual content, such as micro and short films, to augment the reach of TERI's vast body of work in the sustainability domain.

Additionally, CSE brings out 'TAKE-3', a monthly short video, where in-house experts answer three questions on relevant subjects.





➢ Films and videos

Kumaon Vani

The community radio station serves as a vital connection for the agricultural communities in and around Nainital, reaching nearly 3,50,000 people within a 20-kilometre radius. During 2024–25, the station curated and broadcast several impactful, community-oriented programmes. These included *Zameen Hamari Dharohar*—a series focused on

Uttarakhand's land laws, aimed at protecting local rights and ecology—along with content on health and nutrition, sustainable agriculture, and cultural heritage. These programmes not only raised awareness but also encouraged active community participation and dialogue. They served as a platform for local voices, allowing grassroots concerns to reach a broader audience.

Kumaon Vani also broadcast information on environment, education, disaster, and social welfare schemes. The programmes are available here: http://bit.ly/KumaonVaniYouTube

Social Media Performance of TERI FY 2024–25

Platform	01-Apr-24	31-Mar-25	Increase by
LinkedIn	88,852	111,588	22,736
YouTube	84,246	85,308	1,062
Instagram	3,755	4.490	735
Twitter	25,109	25,459	350
Facebook	37,586	37,810	224

Media Analytics FY 2024–25

Activity	Total
Interviews	435
News Stories	1,562
Op-eds	274
Press Releases	320

Films/Videos and TAKE 3

Several film and videos were produced in FY 2024–25.

Several webinars and events were also livestreamed on the YouTube channel. Which are available here: https://www.youtube.com/teri

Films and Videos

Film / Video	YouTube link
Industrial Biotechnology Programme | TERI	https://youtu.be/ZbBmHVBu4Qk
Ripples of Change: A film on safeguarding the marine environment	https://youtu.be/_G-fn5qGde8
Sustainable Agriculture Programme | TERI	https://youtu.be/Zsh16B5VGXw
Energy Programme | TERI	https://youtu.be/qqQq4oamcMY
Simplifying Sustainability: TERI's Radio Campaign with 92.7 BIG FM	https://youtu.be/IXffJKk-IAk
Sustainable Infrastructure Programme | TERI	https://youtu.be/e8OCYmu9CNM
Energy Wise Energy Rise (EWER) Phase III: A TERI-BRPL flagship CSR programme	https://youtu.be/gBOW5ixD-Qc
Capacity Building Programme Targeting School Children on Climate Change, Health, and Hygiene	https://youtu.be/3esQ-rDdzMQ
Powering MSMEs, Empowering Lives: Sattata Jeevika Vardhanam	https://youtu.be/DtkxmicRa50
As She Changes: Seeding People-Centric Transitions in India's Coal Belt	https://youtu.be/7CpU9-mHs14
Youth Climate Conclave (YCC): A platform for the Youth and by the Youth	https://youtu.be/fCxzU_fQqfU
NMCG-TERI Centre of Excellence on Water Reuse (NTCOE)	https://youtu.be/xzgubsocusk





➢ Kumaon Vani community radio station

Film / Video	YouTube link
ONGC TERI Biotech Limited (OTBL) Campus Impact Challenge Project	https://youtu.be/NCbsfGELgwE
WSDS 2025: World Sustainable Development Summit || 5–7 March 2025	https://youtu.be/ICGxx1cA44o

TAKE 3

Take 3 is a short video featuring in-house experts who answer three questions on current developments related to environment and sustainable development.

Title	YouTube link
TAKE 3: Planet vs Plastics	https://youtu.be/U7c_Hbay4zo
TAKE 3: Sustainable Buildings	https://youtu.be/xAmSBin38xE
TAKE 3: Circular Bioeconomy	https://youtu.be/G3y3lH3Zevw
TAKE 3: Climate Finance	https://youtu.be/0mIbMZqAAAk
TAKE 3: North East Traditional Indigenous Knowledge	https://youtu.be/L4_yJ-ca6-Y
TAKE 3: Green Budgeting	https://youtu.be/d0kmsyBTzIw
TAKE 3: Education for Sustainable Development	https://youtu.be/x4q2qo-TZkQ
TAKE 3: Global Warming, Climate Change & Buildings	https://youtu.be/qfDkvn28gtg
TAKE 3: Towards 500 GW: Opportunities and Challenges	https://youtu.be/WIz0oEVvkyk
TAKE 3: Assessing Northern India's Winter Air Pollution Crisis	https://youtu.be/J-rb4JFn_EM



Title	YouTube link
TAKE 3: Nano Fertilizers: Smarter Farming Solutions	https://youtu.be/QJcuz15tCNA
TAKE 3: International Clean Energy Day	https://youtu.be/wl3GVxFEA9Q
TAKE 3: World Sustainable Development Summit (WSDS) 2025	https://youtu.be/2sPe7YRDmcA

Simplifying Sustainability

'Simplifying Sustainability', a radio campaign by TERI (https://www.teriin.org/project/simplifying-sustainability-radio-campaign-927-big-fm), in association with 92.7 BIG FM, was designed to make sustainable practices easy to understand and implement in daily life. Aired from May 22 to June 19, 2024, the campaign aimed to break down complex environmental concepts into practical steps for reducing ecological footprints. TERI experts discussed various themes, such as air, energy, environment, climate change, sustainable habitat, and sustainable agriculture.

TERI Publications

TERI Publishing Solutions area, the publishing arm of TERI, is one of India's prominent publishers in the areas of environment, energy, and sustainable development. The Publications team publishes books, journals, and magazines on these topics at all levels. TERI Publications, in its endeavour to bring greater ecological awareness, has an extensive range of print publications; widely accessible e-books; and sophisticated, interactive e-learning products that cater to every type of reader and knowledge requirement on diverse areas of the environment. We work with academics across the globe to produce quality content and materials and contribute significantly towards enhancing learning outcomes of the students.

Our Accomplishments

Number and Nature of Projects

With nearly 400 titles published over the years, TERI Publications has played a key role in bridging the knowledge gap in the fields of environment

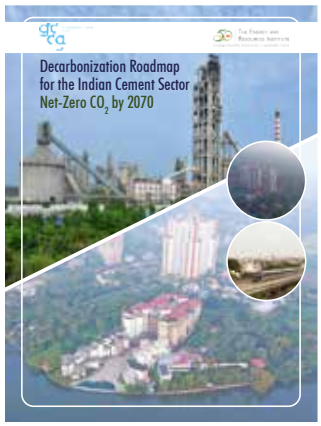
and sustainability. We also extend support to all programmes and divisions within TERI by catering to their diverse publication requirements across a wide spectrum of projects. TERI Publishing Solutions area develops tailored knowledge resources, designed in alignment with the needs and insights of specific target audiences. This includes implementing environment-focused initiatives that foster a stronger social connection with nature. Each title is selected and produced with a commitment to quality, which remains the core principle guiding TERI Publications. Our books and educational materials aim to leave a lasting impact and contribute meaningfully to positive change.

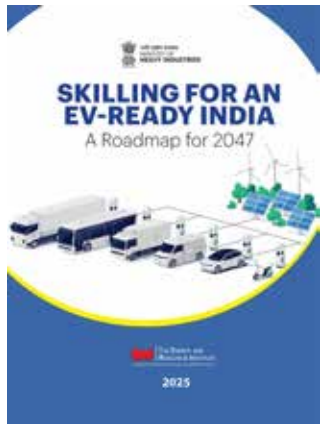
TerraGreen

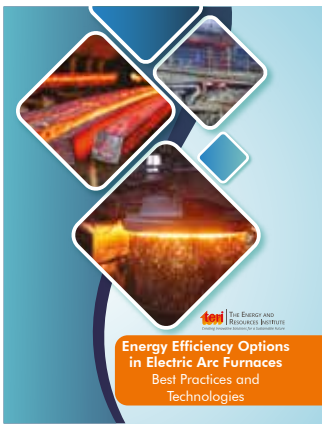
TERI's flagship digital magazine that deals with issues related to sustainable development, environment, and energy.



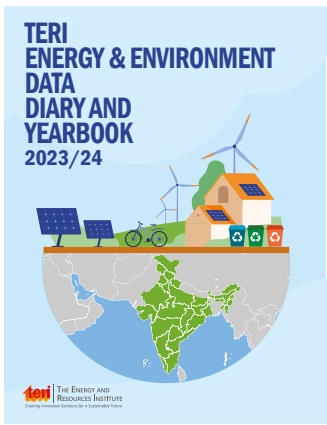


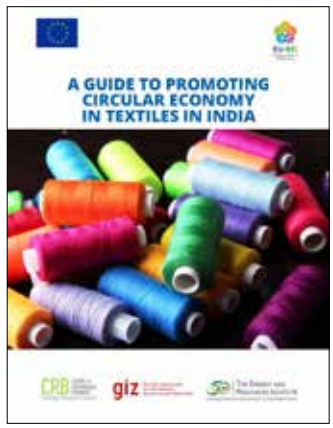


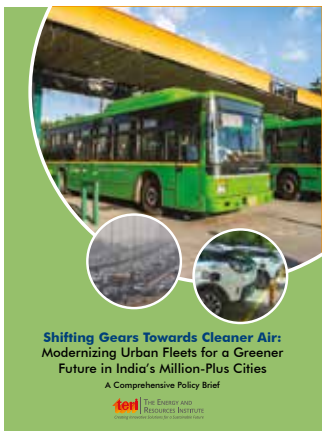


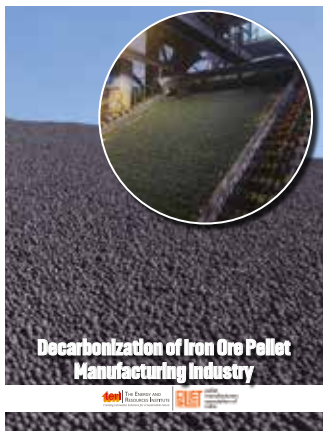


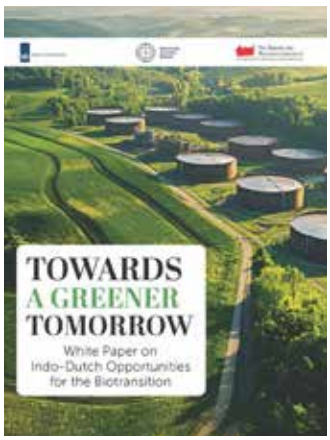














Energy Future

This printed and online magazine aims to educate and inform you about the wide world of energy: its history, its future, how the energy industry works, how it has affected the world and how is continues to affect you and me.

World Digital Libraries (WDL)

WDL is an international peer-reviewed biannual journal that seeks quality research papers that present original theoretical approaches.

Electronic Newsletter on Renewable Energy and Environment (eNREE)

Beneficial for policymakers, researchers, consultants, academicians, and students engaged in the area of renewable energy and environment.

Journal of Resources, Energy, and Development (JREaD)

This journal provides a forum for comprehensive investigation, analysis, and review of subjects in the fields of energy, environment, and natural resource management that confront decision-makers, planners, consultants, politicians, and researchers.

TERI Energy & Environment Data Diary and Yearbook (TEDDY)

It is the only comprehensive energy and environment yearbook in India that provides updated information on the energy supply sectors (coal and lignite, petroleum and natural gas, power, and renewable energy sources), energy demand sectors (agriculture, industry, transport, household, buildings), and environment (local and global).

Akshay Urja

TERI Publishing Solutions area provides editorial and designing services to facilitate the publication of *Akshay Urja* magazine, published by the Ministry of New and Renewable Energy (MNRE) with support from GIZ. The magazine focuses on various aspects of renewable energy including rural and urban applications of RE in India, detailed case studies/ success stories of PV applications, commentaries on key schemes and initiatives, feature articles on new innovations, technologies, implementation, and education.



SUSTAINABLE DEVELOPMENT AND OUTREACH

CENTRE FOR SUSTAINABLE DEVELOPMENT RESEARCH AND LEADERSHIP

Themes and Commitments

Thematic Focus

The Centre for Sustainable Development Research and Leadership (CSDRL) under the Sustainable Development and Outreach Division focuses on promoting systemic change to accelerate green growth and sustainable development goals. Through policy research and innovation like green budgeting and green public procurement, we integrate sustainability across various issues. Our work aims to enhance the voice of the Global South through research and dialogues. The analytical lens of political economy and network analysis enables us to critically examine the interface between sustainable development goals and various initiatives. Our work also extends to research on international cooperation, geopolitics, strengthening multilateralism, and climate negotiations.

As the Secretariat for TERI's flagship initiative, the World Sustainable Development Summit (WSDS), we facilitate leadership and knowledge-based dialogues. Our Act4Earth initiative, comprising the SDG Charter and COP Compass, conducts research to strengthen synergies between sustainable

development and climate action, particularly to enhance global governance mechanisms.

Larger Goals and the Context

One of our key initiatives is the promotion of green growth through policy innovations of green budgeting and green public procurement. Green budgeting involves planning, tagging and mapping budget allocations to environment and Sustainable Development Goals (SDGs), thematic areas and activities along with unique budget codes. Similarly, green public procurement prioritizes sustainable practices by incorporating environmental goals into procurement processes, thereby promoting accountability and transparency in sustainability measures. The SDG Blueprint project delves into interlinkages between SDGs and critical issue areas such as sustainable agriculture. By understanding synergies and trade-offs, we can develop more holistic and effective strategies to address complex sustainability challenges and enhancement of policies.



As TERI's WSDS progresses towards its 25th edition, it continued to progress global cooperation on sustainability and climate change. This year the most important stakeholders, including the President of the IPCC and the Environment Minister from Brazil, the hosts of the upcoming COP, were at WSDS and delineated pathways to international collaboration on climate change even as the world faces severe headwinds in coming together for this most consequential of challenges for humankind and our planet.

Ambassador Manjeev Singh Puri,
Distinguished Fellow, TERI

The WSDS serves as a crucial global forum for exchanging knowledge, ideas, and best practices. By bringing together stakeholders from around the world, WSDS facilitates collaboration and cooperation, ultimately advancing leadership and contributing to the achievement of SDGs and the goals outlined in Agenda 2030 and the Paris Agreement. Act4Earth, another flagship initiative, plays a pivotal role in driving global leadership and fostering dialogue among diverse stakeholders. Through platforms like the SDG Charter and COP Compass, we not only initiate conversations but also research to strengthen the narratives underpinning climate action and sustainable development. This not only raises awareness but also empowers decision-makers with the knowledge needed to drive meaningful change.

Our Accomplishments

Major Projects

- World Sustainable Summit 2025
- Act4Earth 2024 – SDG Charter and COP29 Compass
- Green Public Procurement for agriculture and Synthesis report
- Technical Support to the UT of Puducherry for Strengthening Green Budgeting
- Innovations for Advancing Climate Action and Green Economy in Assam
- Political economy of global climate neutrality of ELEVATE Project

Aggregate Numbers

Green Budgeting: TERI engaged in technical engagement on green budgeting for the Union Territory of Puducherry, Bihar, and Assam.

258%	Puducherry's Green Budget has increased from ₹190.81 crores in FY 2022–23 to ₹683 crore in FY 2025–26 (BE), representing a 258% increase over this period

- **Potential for Green Public Procurement (GPP) in India's Agriculture Sector**: A scoping study using landscape analysis examined the agriculture value chain (pre-production, production, and post-production) to assess GPP opportunities. The team consulted 23 stakeholders including the Ministry of Agriculture and Farmers' Welfare, Ministry of Chemicals and Fertilizers, National Agricultural Cooperative Marketing Federation of India Ltd (NAFED), and Indian Council of Agricultural Research, and industry leaders.

71	Agriculture-related national policies and schemes were studied and mapped across the agricultural value chain to identify areas relevant to GPP.

Further, undertook a GPP in India synthesis paper consolidating findings from stocktaking study covering all 36 States and union territories of India along with sector-specific studies, including for road, energy, water and urban development, and buildings.

- **TERI's 100-Day Green Agenda for the New Government**: As part of the Act4Earth initiative, TERI outlined 18 actionable policy measures across key sectors to accelerate India's environmental and climate commitments for the new government.

18	Key actionable policy measures suggested including green budgeting, climate-linked devolution, green lending, enhanced GPP, plastic neutrality, biogas, resource efficiency, and Trees Outside Forests for carbon sink among others.

ELEVATE 4.1: A structured Excel-based template was developed to assess the political economy of global carbon neutrality, focusing on three major international mitigation mechanisms: Internationally Transferred Mitigation Outcomes (ITMOs), Carbon Removal Obligations (CROs), and Loss and Damage (L&D). The study adopted a comprehensive methodology spanning six dimensions—economic, technological, socio-cultural and demography, institutional, geophysical and climate, ecological, and political. 77 unique indicators were mapped to evaluate the feasibility and political economy implications of these mechanisms.

77	Unique indicators were identified and mapped across six feasibility dimensions to enable scenario evaluation of global carbon neutrality policies by capturing the scale, timing, and disruptiveness of transformative change.

Approach and Innovation

- The team uses the theory of change rooted in constructivism and stakeholder engagement for advancing the cause of integrating and mainstreaming sustainable development across various sectors. From community engagement to engaging with global leaders, CSDRL prides itself in integrating policy research and outreach to foster innovative change and policy making.
- The team's expertise lies in green policy innovations of green budgeting and green public procurement, a pivotal component in promoting sustainability in the intersections of finance and environment policies.
- We aim to map both synergies and tradeoffs of various issue areas with SDGs to promote holistic and system-wide approaches.
- Emerging areas of work include South-South cooperation, international cooperation, multilateralism, political economy and international organization frameworks to critically examine and strengthen international cooperation.

Inspirational Evidences

WSDS 2025

WSDS 2025, the 24th edition of the World Sustainable Development Summit, was held under the theme 'Partnerships for Accelerating Sustainable Development and Climate Solution.' The Summit convened 1,527 in-person delegates and featured 40 sessions, including plenaries, thematic tracks, and special segments. It saw the active participation of one Head of State or Government, 12 ministers, and 361 speakers—48% of plenary speakers were women, reflecting a strong emphasis on gender diversity. With 29 partner organizations and 116 participants from business and industry, WSDS 2025 underscored its collaborative ethos. The exhibition featured 19 booths, while digital outreach exceeded 500,000 social media impressions and attracted over 140,000 website users. More than 700 instances of media coverage further extended the Summit's visibility. TERI proudly conferred the Sustainable Development Leadership Award (SDLA) 2025 on His Excellency Dr Bharrat Jagdeo, Hon'ble Vice President of Guyana, and Her Excellency Ms Marina Silva, Hon'ble Minister of Environment and Climate Change, Brazil, during the inaugural session on March 5, 2025. Key speakers at the Summit included H.E. Brigadier (Retd) Mr Mark Phillips, Prime Minister of Guyana; H.E. Ms Marina Silva, Minister of Environment and Climate Change, Brazil; Shri Bhupender Yadav, Hon'ble Minister for Environment, Forest and Climate Change, India; Prof. Jim Skea, Chair, Intergovernmental Panel on Climate Change; and Ms Dia Mirza, Actor, Producer, UNEP Goodwill Ambassador, and UN Secretary-General's Advocate for the SDGs. Additionally, the *TerraGreen WSDS Special Issue* was launched at the inaugural, highlighting key perspectives on sustainability and climate solutions. This edition emphasized the vital role of partnerships in addressing the global climate crisis and underscored the urgency of collective action to advance equitable and responsible conservation.



➢ **WSDS 2025 was inaugurated by esteemed dignitaries including H.E. Brigadier (Retd) Mr Mark Phillips, Prime Minister of Guyana; H.E. Ms Marina Silva, Hon'ble Minister of Environment and Climate Change, Brazil and Shri Bhupender Yadav, Minister of Environment, Forest, and Climate Change, Government of India**





➢ **Sustainable Development Leadership Award 2025 was conferred to H.E. Dr Bharrat Jagdeo, Hon'ble Vice President of Guyana and H.E. Ms Marina Silva, Hon'ble Minister of Environment and Climate Change, Brazil**

MoU with Assam Government

At the Advantage Assam 2.0 Investment Summit, TERI and Finance Department through Assam Society for Comprehensive Financial Management System (AS-CFMS) signed an MoU to work together on green finance, green budgeting, and green public procurement. This includes support for green budgeting, green public procurement, and developing climate-related finance strategies. The MoU was signed by Dr Dipankar Saharia (Senior Director, TERI) and Smt. Laya Madduri, IAS (Finance Department, Government of Assam).



➢ **MoU signing between TERI and Assam government at Advantage Assam 2.0 to work together on green finance, green budgeting, and green public procurement budgeting**

The MoU aims to strengthen the policy ecosystem to accelerate Assam's transition towards a greener economy. It will support AS-CFMS in integrating sustainability into public finance systems through initiatives such as green budgeting, green public procurement, and climate-focused financial strategies. The collaboration will also strengthen frameworks for Green Budget reporting and Green Procurement in Assam, while building the capacity of Administrative Departments and engaging stakeholders to promote awareness and drive meaningful action.

SDG Blueprint Tool

Within the framework of the SDG Blueprint for Sustainable Agriculture project, we have developed a valuable resource known as the SDG Blueprint Tool. This tool serves as an open-access knowledge repository, offering insights into the national policy alignment between SDGs and sustainable agriculture. It functions as a readily accessible guide for policymakers, researchers, and civil society stakeholders, empowering them to make informed decisions and take action in the realm of sustainable agriculture in India.

Link: https://teriin.org/SDG-Blueprint-tool-for-Sustainable-Agriculture

Impact We Created

COP29 Engagement at Baku, Azerbaijan

The team organized the UNFCCC official side event 'Governance for Strengthening SDG-Climate



Synergies' on November 18, 2024 at COP29. The session focused on integrating governance frameworks to align sustainable development and climate action. Key discussions highlighted multilateral processes, climate-related water emergencies, and financing solutions that require adaptive, cross-sectoral governance to address global challenges effectively. A policy brief, 'Synergies between Climate Action and SDGs: Implications for Multilateralism' was also launched during the event.

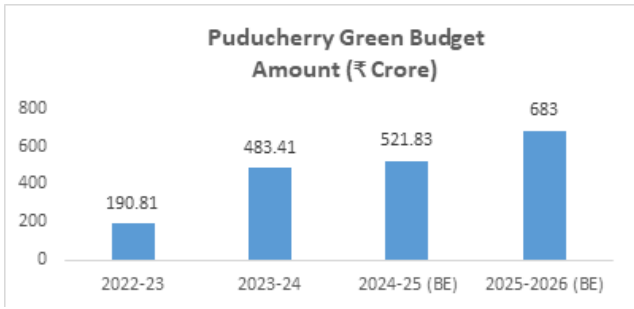
Additionally, the team hosted a pavilion event on 'SDG-Climate Synergies and Multilateralism: Implications for Energy Futures' on November 13, 2024. The session underscored the role of multilateralism and adaptive governance in enabling inclusive energy transitions and strengthening SDG-climate linkages. A Policy Brief 'Internationalizing Sustainable Lifestyles for Climate Justice' was also launched during the session.



➢ COP29 UNFCCC official side event: Governance for Strengthening SDG-Climate Synergies

Technical Support for Green Budgeting

The Green Budgeting project supports Indian states, with a notable impact in the Union Territory of Puducherry, Bihar, and Assam. Puducherry's Green Budget has increased from ₹190.81 crore in FY 2022–23 to ₹683 crore in FY 2025–26 (BE), representing a 258% increase over this period (Figure 1). The budget witnessed a 153% rise between FY 2022–23 and FY 2023–24, followed by an 8% increase in FY 2024–25 and a further 31% increase in FY 2025–26. Bihar's schemes rose from 103 to 281, with the budget soaring from INR 5,694 crore to INR 13,824 crore from FY 2020–21 to FY 2024–25. The team provided review support to the Government of Assam for Green Budget for FY



➢ Figure 1: Puducherry Green Budget



➢ COP29 Pavilion event on SDG-Climate Synergies and Multilateralism: Implications for Energy Futures

2025–26. The green budget for this year is ₹44,446 crore, which is 36% of the total state budget. This is an increase of over ₹10,000 crore and 5.6% compared to the previous year.

The knowledge resource portal established by TERI further enhanced awareness and understanding of green budgeting practices; it can be accessed from https://greenbudgeting.teriin.org/index.php. The initiative's success in Bihar and Puducherry underscores the potential for systemic change, with the knowledge resource portal serving as a valuable tool for wider adoption and understanding.

Knowledge Building and Dissemination

Road to Baku: The New Collective Quantified Goal on Climate Finance	Read Here
Internationalizing Sustainable Lifestyles for Climate Justice	Read Here
Green Public Procurement for Advancing Sustainable Development in India: Policy Nudges for Promoting Sustainable Consumption and Production	Read Here
Synergies between Climate Action and SDGs: Implications for Multilateralism	Read Here
Emissions and Consumption: An Approach to Climate Justice	Read Here
TERI's 100-day Green Agenda for the New Government	Read Here
WSDS 2025- Summit Overview Document	Read Here
Transition to a Low-carbon Economy and Sustainable Consumption and Production – The Role of GALERI	Read Here
Decentralized Renewable Energy (DRE) Systems: A Pathway to Just Energy Transitions in Vulnerable Communities	Read Here
TerraGreen WSDS Special Issue	Read Here

Partnerships and Networks

CSDRL was able to successfully mobilize partnership and support from various national and international agencies. Our partners include:

- Bloomberg Philanthropies
- Royal Norwegian Embassy
- Foreign, Commonwealth & Development Office
- The International Climate Initiative (IKI), German Government
- Tata Capital Limited
- Asian Development Bank
- Johnson Controls
- TERI School of Advanced Studies
- State Bank of India
- Natural Resources Defense Council
- Tata Power
- Hero Future Energies
- Delhi Metro Rail Corporation
- Hind Rasayan
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
- INOPOL (India-Norway cooperation project on capacity building for reducing plastic and chemical pollution in India)
- National Bank for Agriculture and Rural Development (NABARD)
- Mercedes-Benz Research and Development India
- Climate Champions Team
- POP Movement
- World Sustainable Development Forum
- Climate Group
- Foreign Correspondents' Club
- Press Club of India
- Kheoni
- TV9 News Network
- International Solar Alliance
- Asia Society Policy Institute
- Bangladesh Environmental Lawyers Association (BELA)
- WBGU (German Advisory Council on Global Change)
- TERI School of Advanced Studies



TERI COUNCIL FOR BUSINESS SUSTAINABILITY

TERI Council for Business Sustainability (CBS) serves as the interface for TERI's research work to be connected to the corporate world. The Council is a network of Indian business leaders working on a shared commitment to mainstream sustainability in business strategies and practices. Set up in 2001, member companies of the Council include public and private sector, including multinational companies (MNCs) – representing various industry sectors, sizes and geographies. Activities of the Council are governed by an executive committee from amongst member companies.

Thematic Focus

TERI CBS engages with the core issue of what businesses must do to shape and lead in sustainability. The Council co-creates business solutions with member companies to address national sustainability challenges; curates common interest forums of member companies with the participation of board members and Chief Sustainability Officers; undertakes policy advocacy through Thought Leadership reports and industry dialogues; and builds capacity through trainings,

learning visits, webinars, conferences, etc. With individual member companies, the Council provides a range of tailor-made advisory services. These comprise sustainability strategy development, performance assessment and improvements, capacity building and facilitates showcasing best practices in national and international forums.

The year 2024 was a crucial moment for sustainable development. All the three Rio sister conventions on climate change, biodiversity and combating desertification convened to discuss the way forward in taking positive actions. Despite arriving at a less than expected new climate finance goal, COP29, however, managed to reach an agreement on operationalizing global carbon markets. Likewise, for TERI, 2024 witnessed some defining moments. We are proud to have celebrated our golden jubilee in June 2024, where leaders gathered to commend the 50-year journey of TERI's solutions for sustainable development.

Throughout 2024, TERI Council for Business Sustainability strived to ensure that pressing concerns relating to energy transition, sustainable agriculture practices, water-use efficiency and more were embedded in our engagements with the corporate world, and with our partners. During this time, TERI Council for Business Sustainability (CBS) witnessed enthused participation of national



➢ **Green Livelihoods, Assam Summit 2025**

and global partners along with government stakeholders at the subnational, national, and regional levels. Across the year, the network of TERI CBS helped build a system that provides policymakers with reliable, relevant and real-world evidence from businesses to support the translation of NDCs and sustainability goals into effective policies and regulations, and the Council aims to keep strengthening this system in years ahead.

We indeed are thankful to the support from all our partners and the companies in the Council's network, who helped build a system that provides policymakers with reliable, relevant and real-world



➢ **CEO Forum 2025**

evidence from businesses to support the translation of NDCs and sustainability goals into effective policies and regulations.

Larger Goals and the Context

The inclusion of – Sustainable Solutions for Climate Change and Sustainable Energy Transition; Inclusive Global Value Chains; Employment generation, social protection and skilling – in the G20 New Delhi Leaders Declaration of 2024 brought to centrestage the solutions that will shape future development pathways. All these have been integral components of our 2024–25 engagements with Council member companies and C-suite dialogues. The G20 reconfirmed one of the major messages from the G7 Hiroshima Summit, stressing that there should be "various pathways" for our energy transitions. Such message recognizes the needs, the vulnerabilities, the priorities as well as the different national circumstances of the developing countries. This message of various pathways is very important and has been evident in our study findings and recommendations.

India has massive ambitions. It wants to become a $5 trillion economy in the next few years. By 2025, it wants to add over 30,000 km of highways, 400 Vande Bharat trains, over 200 airports and double our port capacity. By 2030, it plans to leapfrog Japan and Germany to become the third-largest economy in the world. However, to get there, the government will need to invest massive sums of money across the board. Governments, firms, institutions, civil society groups and citizens across the world need to act with the utmost sense of urgency on climate now. Carbon emissions must be brought down to zero at the earliest. This means we need a strategy, sector by sector, for a rapid reduction in carbon emissions. Leadership initiatives of our Council members and signatory companies of the Industry Charter for Near-Zero Emissions Ambition by 2050, instituted by TERI, clearly depict that these strategies need to be evolved by each country and should ideally combine a top-down as well as a bottom-up approach.

TERI CBS: Business-Policy-Research interface on Environmental Sustainability

India, like other developing countries, still faces domestic energy trilemma of ensuring energy security, energy equity, environmental



➢ CEO Forum 2025

sustainability for its people while decarbonizing. A clean energy transition is the way forward to overcome the trilemma. Herein, collaborative approaches assume significant importance. Such collaborations should leverage capabilities of non-state actors to accomplish the goals of a sustainable and resilient planet. Individual challenges such as decarbonization are not standalone but are part of dynamic and complex organizational processes and systems that are intertwined with each other. The Council observes that forward-thinking Indian businesses will have a critical impact on India's success. We are delighted that during 2024–25 continued support and regular participation of the Council members have enabled us to host several high-level convenings – both focussed on sectors as well as national level.

The High-Level Convenings at the United Nations annual Climate Conference – COP29, convened by TERI in partnership with global partner organizations and Indian industry representatives brought together global thought leaders and business leaders to discuss the urgency for transformative leadership for climate actions in relationship to the expected COP29 outcomes. Overall, the perspectives on interdependencies and low carbon transition plans across industry sectors and the power of collective action by connecting businesses, environmental groups, researchers, and governments were highlighted.

The focus on 'Just Transition' as part of energy transitions and in view of achieving the Sustainable



➢ **COP29 Panel Session with IPCC Chair**



➢ **COP29 RT session with BCG**

Development Goals (SDGs) of 2030 was well recognized in the New Delhi Leaders' Declaration. Enthused participation from the Council members emphasized that companies have a critical role in advancing a just transition by taking concrete actions that address the social impacts of climate change mitigation and adaptation in partnership with other actors such as workers, unions, communities, and suppliers. Given the scale of the climate crisis, our engagements in 2024–25 pointed out that there is an urgent need for the private sector to enhance its ambition, commitments and actions for a just transition to an environmentally sustainable economy that leaves no one behind. Under the aegis of the T20 Task Force 4 'Refuelling Growth: Clean Energy and Green Transitions', TERI in partnership with Thomson Reuters Foundation (TRF) organized a day-long convening 'Building a Resilient Future'. Sessions under the convening discussed key enablers (resources) – finance and green skills – required to ensure just transitions in the society.

The Council recognizes that as key drivers of energy transition in the Indian economy, Indian businesses will be required to mobilize resources, especially financial resources. TERI's 'Expert Group on Financing India's Long Term Low-Carbon Development Strategies (LT-LEDS) has been initiated to evaluate India's financial strategy with respect to its LT-LEDS especially in the context of hard-to-abate industries and the ancillary MSME sectors. Comprising members from the Industry and Financial sector, the Expert Group will analyse



➢ COP29 Session with Lord Adair Turner

policy frameworks and investment markets that favour financing technology transfers and share recommendations that help strengthen existing policy and regulatory frameworks that promote green investments whilst ensuring just transitions.

TERI CBS has consistently engaged with policymakers at the subnational, national and bilateral levels as a knowledge partner and convening multiple stakeholders. The high-level convening of Industry Charter and the interactive session with Indian Chief Sustainability Officers hosted in the sidelines of TERI's annual flagship event, World Sustainable Development Summit 2025, recorded key actions needed by CXOs and CSOs to accelerate sustainability across the value chain of businesses. At the CEO Forum 2025, a Chief Sustainability Officer Competency Framework was unveiled. TERI, along with Becquerel Institute, hosted a private sector pavilion for International Solar Alliance. On the occasion of the third edition of TV9 signature thought fest – 'What India Thinks Today', TV9 and TERI have collaborated to explore how India can ensure it navigates its way through the energy trilemma of ensuring energy security, energy equity, environmental sustainability for its people while decarbonizing while still being on track in its decarbonization journey. The session pointed out that to realize the aspirations of Viksit Bharat by 2047, it is important that the medium-term growth outlook of India be assessed in the context of emerging global realities of Geo-Economic Fragmentation and how investments in several sectors, more noticeably in industry sub-sectors like steel and cement are vital for flagship initiatives.

Vibrant Network and Strengthened National and International Outreach

Our engagements with leading Indian industries have gained consistent traction to advance



➢ COP29 Trialogue Session - TERI, ISA & BI



➢ **Expert Group Consultation in Mumbai**

agenda of industry decarbonization and circular economy. Our technical proposals on why storage of electricity is necessary for meeting demand round the clock and the details of range of possible mitigation strategies for Net Zero steel sector have witnessed significant uptake by Indian industries, while garnering concurrence from global partners. In 2024–25, at an aggregate level, the Council directly engaged with over 300 Indian companies, while reaching out to over 500 companies in the CBS Network. As an advisory partner to the India Net Zero Alliance, TERI supported organization of webinars discussing actions that will enable sectors such as buildings, cement & concrete, chemicals and, cement & concrete to become net zero. The year 2024–25 marked strengthened outreach by TERI CBS, through providing thought leadership at various fora for Indian industries.



➢ **ISA Pvt. Sector Pavilion**

TERI's outreach on the challenges faced by businesses as they look to decarbonize their operations and the necessary support required in industry transitions have been undertaken at the highest levels of decision making. At COP29 in Baku, Azerbaijan, TERI CBS hosted high-level convenings with business leaders bringing forth the challenges in industry decarbonization, and how these can be overcome. With BCG and Invest India, TERI organized a high-level roundtable discussion 'Transformative Leadership for Climate Actions on Finance, Technology and International Cooperation'. Focusing on the Sixth Assessment Report (AR 6) of the Intergovernmental Panel on Climate Change (IPCC), TERI jointly with World Green Economy Organization organised an interactive session with Prof. Jim Skea, Chairman of the IPCC and Indian business leaders. Highlighting that sectoral development is needed in terms of innovation, demonstrating viable low-carbon technologies, and developing markets to ensure the commercial feasibility and competitiveness of low-carbon products, TERI in collaboration with World Green Economy Organization organized a high-level panel discussion themed 'Energy Sustainability as an Industry Growth Agenda to Shape Global South's Climate Ambition'; featuring a keynote address by Lord Adair Turner, Chair, Energy Transition Commission. At the World Investment Conference in Riyadh, TERI in association with Invest India hosted a High-Level Roundtable on the 'Discourse at COP 29 – Implications and Opportunities for the Investment Community.' The high-level roundtable deciphered the outcomes of the COP29 conference, including the implications and opportunities for the finance and investment community. The roundtable delved into key decisions, and mechanisms to foster innovative and inclusive solutions to close the finance gap.

Our Accomplishments

The engagements with industry representatives from steel and cement sectors have increased on building a narrative on importance of technological innovation and low carbon industry transition with steel sector representing 45% of market share and cement sector representing more than 42% of market share.



➢ JMA Experiential Learning Session at TERI, Gwal Pahari

- Industry charter on commitment to Near Zero Emissions Ambition by 2050 was launched during New York Climate Week of 2020 with 6 signatory CEOs which increased to 94 Indian CEOs on-board as of March 2025.
- Collaborating with the International Solar Alliance, TERI demonstrated how India strengthens Global North-Global South partnership for accelerating solar energy transitions. TERI's work on energy transitions, skilling & just transitions initiatives alongside initiatives of Council member companies and global partners were showcased at the global platform.
- Voluntary actions on climate change by the signatory companies of the Industry Charter were showcased at a High-Level Convening at the annual UN climate Summit COP29 in Baku, Azerbaijan where Prof. Jim Skea, Chairman of the IPCC and Indian CXOs from major Indian industry conglomerates launched an online portal that presents a library of resources on practices and solutions adopted by the Indian industry to decarbonize their operations.
- At the World Investment Conference in Riyadh, global financial institutions convened at a joint session with Invest India to address the significant role they play in supporting developing countries to take climate action.

Testimonials

1. Mr Amit Kumar, General Manager - Sustainability, Tata Projects (at the Roundtable Meeting of Chief Sustainability Officers hosted by TERI)

"What is important is putting KPIs into your organization which will help you achieve (sustainable) goals. And for that you need a person who can drill down details. You may not require



➢ Leadership Visit of Tata Projects



➢ Sustainability Session with TV9 Global Summit

a really technical person, but one who asks 'what next?'"

2. **Mr Vaibhav Dalvi, South Asia – Energy Storage – BASF New Business** (at the Private Sector Pavilion hosted by TERI and Becquerel Institute at the International Solar Festival)

"BASF is active in developing batteries at different levels of the value chain... Sodium Sulphur batteries are one of the alternative battery options being developed by BASF."

3. **Mr Rajiv Kanoria, Advisor, Digital Supply Chain, SAP India Pvt. Ltd.** (at the Solar EPC Week organized by Solar Quarter)

"Advanced analytics, real-time tracking, and digitization efforts play a key role in scaling, and enhancing the efficiency of operations."

4. **Dr Pradeep Panigrahi, Head - Corporate Sustainability, Larsen & Toubro** (at the Chief Sustainability Officers' Forum organized by TERI)

"The TERI team should be complimented for talking about the importance of Chief Sustainability Officers. Given the expectations that have



➢ World Investment Conference



➢ WTC Expo Photo

increased, and the rising regulations crowding, the role of the Chief Sustainability Officer becomes more important."

5. **Mr Koushik Chatterjee, Executive Director & Chief Financial Officer, Tata Steel Ltd** (at TERI's 'Panel Discussion with IPCC Chair and Indian Business Leaders' hosted at COP28 in Dubai)

"We cannot achieve climate positivity without nature positivity. The role of public policy is facilitating the pace of decarbonization. Carbon market and carbon pricing including voluntary carbon markets will become very critical for a country like India."

6. **Mr Rajat Gupta, Chief Financial Officer, Avaada Group** (at TERI's 'Panel Discussion with IPCC Chair and Indian Business Leaders' hosted at COP28 in Dubai)

"Solar and wind together, hybrid energy can help meet requirements of 18–19 hours a day, but how do we meet round-the-clock power? We, are, therefore trying to develop more of hybrid plans and pumped hydro storage projects"

7. **Mr Koushik Chatterjee, Executive Director & Chief Financial Officer, Tata Steel Ltd** (at TERI's 'Panel Discussion with IPCC Chair and Indian Business Leaders' hosted at COP28 in Dubai)

"We cannot achieve climate positivity without nature positivity. The role of public policy is facilitating the pace of decarbonization. Carbon market and carbon pricing including voluntary carbon markets will become very critical for a country like India."



REGIONAL CENTRES

Serving as bridges to propagate the organization's work throughout the nation, Regional Centres help establish a strong base for TERI's activities and projects at the grassroots level. They help in further diversifying and broadening the knowledge repository as well as the scope of the organization's operations.

TERI NORTH-EASTERN REGIONAL CENTRE, ASSAM

Thematic Focus

TERI's North-Eastern Regional Centre (NERC), Guwahati, works across multiple domains including agriculture, horticulture, sericulture, medicinal plants, waste management, water quality improvement, wastewater treatment, food testing, village development planning, quality planting material production, livelihood enhancement, and documentation of traditional knowledge.

Through these diverse initiatives, the Centre aims to enhance production capabilities, generate livelihood opportunities, empower communities, promote a cleaner and healthier environment, and develop the skills and competencies of stakeholders across sectors. The Centre's work revolves around the integration of science, policy, and practice to address region-specific developmental challenges in the North-Eastern states.

Rejuvenation of Jamuna Drinking Water Supply Storage Pond through Bioremediation at Golaghat

TERI is currently implementing a project for the restoration of the Jamuna water storage tank, encompassing planning, design, execution, management, and maintenance of bioremediation treatment infrastructure and biological treatment systems aimed at improving water quality. The primary objective of this initiative is to efficiently remove or reduce harmful pollutants, thereby significantly enhancing the quality of water in the storage pond. However, this restoration endeavour encounters several challenges. To effectively treat the pond water through biological methods, a range of bioremediation strategies have been employed including designing, installation, and commissioning of floating islands, oxygenation of the pond water, development of subsurface horizontal constructed wetlands (reed beds) equipped with a biofilter and deployment of lab-optimized microbial consortia in the form of eco-friendly activated mudballs. These interventions have led to a notable reduction in biological oxygen demand (BOD) and chemical oxygen demand (COD), improved water clarity, effective odour control, and overall enhancement of water quality for community use.

Zero-Waste Campus Initiative at Raj Bhavan, Assam

TERI-NERC collaborated with Raj Bhavan, Assam, to transform the Raj Bhavan campus into a Zero-Waste Campus. This initiative focuses on developing and implementing standardized waste management practices to foster a sustainable waste-free



➢ **Promotion of waste management practices at Raj Bhavan-Assam**

environment within the Raj Bhavan campus. As part of this effort, TERI has been actively involved in daily collection, segregation, and processing of household and campus waste at an on-site Material Recovery Facility (MRF) for compost production. Additionally, black and grey water are treated through specialized reed bed systems, reinforcing the project's commitment to holistic and environmentally responsible resource management.

Planting Material Production at TERI's Byrnihat Centre

TERI's Byrnihat Centre in Assam has emerged as a pivotal facility for the production of high-quality planting materials, catering to the diverse ecological and agroforestry needs of the northeastern region. During the reporting year,



➢ **MRF at Raj Bhavan Assam for resource recovery**

the Centre focused on propagating a wide array of species including indigenous timber trees, fruit-bearing plants, plantation crop species and spices suited to the region's agro-climatic zones. Adopting sustainable nursery practices and scientific propagation techniques, the Centre ensured the availability of healthy, robust seedlings to support plantation drives, biodiversity restoration efforts, and community-based greening initiatives. The planting materials have been supplied to institutions, and grassroots organizations, reinforcing TERI's commitment to ecological restoration, rural livelihoods, and landscape-level conservation across Northeast India.

TERI Food Testing Laboratory at NERC

The Food Testing Laboratory (FTL) of TERI at its Northeastern Regional Centre, Guwahati, Assam partially funded by the Ministry of Food Processing Industries (MoFPI), Government of India, has been developed to offer analytical services covering chemical, physical, microbiological, elemental, and organoleptic parameters in food and drinking water. As one of the few NABL-accredited food testing laboratories in Assam and the northeastern region, FTL has consistently maintained its standards. Following a successful reassessment by the Quality Council of India (QCI) in June 2024, its accreditation has been renewed until June 2026, with a testing scope that now includes 30 test parameters.

Our Accomplishments

The Centre focuses on key areas including research and development, consultancy, project implementation, capacity building, and research networking. Projects are supported through diverse funding sources, including government schemes and corporate social responsibility (CSR) initiatives, enabling effective execution of activities and impactful outcomes on the ground.



➢ **Front view of Food Testing Laboratory**

Rejuvenation of Jamuna drinking water supply storage pond through Bioremediation

This project aimed to restore the Jamuna water supply storage pond by removing or reducing harmful contaminants and improving overall water quality through bioremediation techniques. As part of the initiative, key infrastructure was designed, installed, and commissioned—including floating treatment islands and a site-specific sub-surface horizontal constructed wetland integrated with a biofilter system. These interventions were tailored to enhance the pond's ecological balance and ensure sustainable water quality improvement.

Zero-waste campus in Raj Bhavan, Assam

The Centre has been implementing the project "Raj Bhavan Assam—A Zero-Waste Campus". The initiative focuses on developing and executing a standardized waste management protocol to transform the Raj Bhavan campus into a model zero-waste facility. Key activities include daily collection, segregation, and processing of biodegradable waste at the Material Recovery Facility (MRF) for compost production. Additionally, black and grey water is treated through specially designed reed bed systems, promoting sustainable and circular resource management within the campus.

Food Testing Laboratory at TERI-NERC

The Food Testing Laboratory at TERI-NERC has commenced testing of tea, one of Assam's leading export commodities and a key driver of the regional economy. The lab has also expanded its services to include the analysis of spices, with a particular focus on turmeric, a widely cultivated and traded agricultural product across the northeastern states. Additionally, the laboratory now offers testing services of various drinking water samples, including packaged drinking water, natural mineral water, and other commercially available variants, thereby supporting food safety and quality assurance in the region.

Key accomplishments of the Food Testing Laboratory at TERI-NERC

- Initiated testing of regionally significant products such as tea and turmeric, and expanded services to include packaged drinking water and natural mineral water.
- Enhanced testing capabilities to cover 50–55 physical, organoleptic, proximate, and chemical parameters, including 30 NABL-accredited test parameters. The scope includes tea, turmeric, spices, black pepper, and drinking water.
- Launched commercial testing services for both NABL-accredited and non-accredited parameters, with a steady increase in customer sample submissions and service inquiries.
- Introduced testing of additional products such as fruits, mustard oil, wheat flour, and rice. These will be added to the commercial portfolio following method standardization and validation.



➢ Sample preparation for GC

Approach and Innovation

The research and development initiatives of TERI, NERC focus on delivering impactful scientific solutions aimed at improving water quality, optimizing wastewater treatment, managing waste effectively, enhancing agricultural productivity and promoting the responsible use of natural resources. The Centre is also in the process to offer analytical services for a wide range of products, including drinking water, tea, spices, cooking oils, cereals, fruits, vegetables, and other food items. The Centre addresses critical environmental challenges by integrating innovative approaches that prioritize resource recovery, waste minimization and recycling



➢ Floating Island at Jamuna water storage tank-Golaghat-Assam

and comprehensive food safety and quality assurance services across key food categories thereby contributing to a more sustainable future.

Inspirational Evidences

- The pioneering waste management initiative at Raj Bhavan, Assam, serves as a model for innovative and sustainable practices within a residential campus. The project highlights the importance of source segregation, the transformation of waste into valuable resources, and active community participation. It stands as a compelling example of how localized, practical solutions can effectively address the growing waste management crisis while promoting environmental responsibility.
- Testing capabilities have been expanded to cover 50–55 physical, organoleptic, proximate, and chemical parameters, including 30 NABL-accredited parameters. The scope includes analysis of tea, turmeric, spices, black pepper, and drinking water.

Knowledge Building and Dissemination

TERI is actively engaged in knowledge generation and dissemination through its strategic initiatives in natural remediation and food quality research. By promoting eco-friendly technologies for the management of solid and liquid waste, TERI has developed and demonstrated innovative bioremediation solutions such as constructed wetlands with bio-filters, artificial floating



➢ Chemical testing of food sample



➢ Reedbed for waste water treatment

Impact We Created

Zero-waste campus at Raj Bhavan, Assam	
Tangible	**Intangible**
• Over 115.99 metric tonnes (115,990 kg) of solid waste have been successfully processed at the Raj Bhavan campus in Assam, demonstrating the effectiveness of the implemented waste management system. • The project demonstrated high treatment efficiency using constructed wetlands, effectively addressing both black and grey water. Key outcomes included a 74% reduction in biochemical oxygen demand (BOD), 80% removal efficiency for ammonia, and a 70% decrease in total hardness for black water. Additionally, the system achieved a 60% reduction in chemical oxygen demand (COD), a 76% decrease in total dissolved solids (TDS), a 88% reduction in total suspended solids (TSS), a 70% decrease in total volatile solids, and an 83% elimination of faecal coliform. These results underscore the system's effectiveness in improving water quality through nature-based solutions.	• The project improves environmental and public health by reducing pathogenic microbes through regular waste management and grey and black water treatment using nature-based solutions like constructed wetlands, fostering a cleaner and more sustainable campus.
Rejuvenation of Jamuna drinking water supply storage pond through bioremediation	
The implementation of scientifically formulated treatments and the deployment of floating islands have significantly enhanced water quality in the Jamuna Pond, as confirmed by analytical data. Key improvements include a pH reduction from 8.0 to 7.0 and a reduction in turbidity from 10 mg/L to 4 mg/L. Total dissolved solids (TDS) dropped from 406 mg/L to 144 mg/L, total hardness (as $CaCO_3$) declined from 131 mg/L to 68 mg/L and total alkalinity (as $CaCO_3$) decreased from 82 mg/L to 66 mg/L. Notably, nitrate concentrations reduced sharply from 15.9 mg/L to 0.7 mg/L. BOD decreased from 2.4 mg/L to 1.8 mg/L, and COD dropped from 10.8 mg/L to 10 mg/L. Additionally, concentrations of microelements such as chloride, calcium, magnesium, and sulphate also showed proportional reductions throughout the treatment period.	The water quality of the Jamuna drinking water supply storage pond has shown continuous improvement due to initiative taken towards bioremediation of pond water, nutrient removal through floating island plants, removal of aquatic plants, enhancement of oxygenation process and commissioning and operationalizing of a reed bed system at the strategic location.

treatment wetlands, and activated microbial mud balls. These interventions are backed by scientific research and field applications, contributing to a growing body of knowledge in sustainable waste and water management. Simultaneously, the Food Testing Laboratory at TERI-NERC serves as a critical knowledge hub, offering analytical services to academic and research institutions while advancing research in food adulteration detection, shelf-life enhancement, and nutrient profiling. The Centre actively disseminates insights and findings through training programmes, stakeholder workshops, technical publications, and collaborative platforms, fostering capacity building and informed decision-making among practitioners, researchers, and policymakers.

Partnerships and Networks

TERI's North-Eastern Regional Centre (NERC) has established partnerships with a diverse range of government bodies and research institutions to drive sustainable development initiatives across the northeastern region. Key regional collaborators include Assam Agricultural University, Krishi Vigyan Kendras (KVKs), the Assam Science Technology and Environment Council (ASTEC),

Assam Energy Development Agency (AEDA), Department of Environment, Forest and Climate Change, the Department of Indigenous and Tribal Faith and Culture, Government of Assam and the Bio-Resources Development Centre (BRDC), Government of Meghalaya. TERI-NERC has also partnered with national-level institutions such as the ICAR–Directorate of Medicinal and Aromatic Plants Research, Anand, the Central Ayurveda Research Institute, M S University of Baroda. These collaborations have facilitated effective project implementation, fostered knowledge exchange, and enabled the co-creation of research and proposal frameworks, thereby enhancing the Centre's impact and outreach across the northeastern region.

Short, Medium, and Long-term Partnership

TERI-NERC has established long-term collaborations with several organizations, including the Assam Science Technology and Environment Council (ASTEC), Assam Energy Development Agency (AEDA), Guwahati Biotech Park, the Science and Technology Department, Government of Assam, Gauhati University, The International Centre for Integrated Mountain Development (ICIMOD) and Balipara Foundation through formal Memorandum of Understandings (MoUs). A significant long-term partnership has also been established with Assam Agricultural University and Gauhati University for joint implementation of various projects. These partnerships aim to foster sustained cooperation in advancing research, innovation, and sustainable development in the region.

Centre for Himalayan Studies: A collaborative initiative for climate change adaptation and resilience

The Eastern Himalayas, known for their rich biodiversity and cultural heritage, are increasingly vulnerable to climate change impacts such as rising temperatures, erratic rainfall, ecosystem degradation, and development pressures. Given the intricate linkages between climate change, livelihoods, health, agriculture, migration, and gender dynamics, there is a pressing need for comprehensive research to develop adaptation and mitigation strategies tailored to this region.

In March 2025, The Energy and Resources Institute (TERI), Gauhati University, the International Centre for Integrated Mountain Development (ICIMOD), and Balipara Foundation formalized and entered into a strategic collaboration through the signing of a landmark Memorandum of Understanding (MoU) at Gauhati University. A key outcome of this collaboration is the establishment of the Centre for Himalayan Studies envisioned as a dedicated platform for interdisciplinary scientific research, policy dialogue, and community-led conservation across the Eastern Himalayas, while enhancing the region's capacity to respond to climate risks. Through actionable research, pilot field interventions, and inclusive capacity-building efforts, the Centre seeks to influence climate-resilient planning and governance at both state and regional levels. This joint endeavour aspires to position Northeast India as a leader in sustainable development and a model for collaborative, transboundary approaches to climate adaptation in the Eastern Himalayas.

Strategic Focus Areas

The Centre's core thematic areas include:

- Ecosystem-based adaptation
- Biodiversity conservation
- Energy and water security
- Climate-resilient livelihoods

To build local capacity, the Centre will introduce short-term certificate courses for students, youth, and conservation professionals. These programmes will cover themes such as environmental sustainability, traditional ecological knowledge, sustainable finance, ecosystem service valuation and nature-based solutions among other sustainable and resilient development themes. The initiative also aims to promote community and youth entrepreneurship by equipping local innovators with the skills and resources needed to develop nature-positive enterprises and conservation-oriented economic activities.

TERI SOUTHERN REGIONAL CENTRE (SRC), BENGALURU

The Southern Regional Centre (SRC) is conducting applied research focused on enhancing energy productivity to support economic growth, a cleaner environment, and improved energy security, affordability, and reliability. Achieving net zero and decarbonizing all sectors by reducing greenhouse gas (GHG) emissions requires an integrated, multi-faceted approach. SRC emphasizes that optimizing energy use is a critical first step before the integration of renewable energy. Achieving meaningful decarbonization involves a mix of strategies, including energy efficiency, renewable energy adoption, and the direct use of low-carbon fuels. These sustainable industrial practices go beyond GHG reduction, offering additional benefits such as reduced operating costs. As the nation's economy expands, improved energy productivity is becoming a key driver of sustainable growth. SRC is committed to supporting corporations and governments in advancing energy efficiency and







accelerating the adoption of renewable energy to significantly reduce emissions.

The Industrial Energy Group (IEG) supports initiatives and strategies that promote efficient energy use across residential, commercial, and industrial sectors. Our strength lies in a unique consortium of institutional clients working collaboratively under a common platform to drive energy efficiency improvements. One of our key areas of engagement is the implementation of the Perform, Achieve, and Trade (PAT) scheme—a flagship initiative of the Bureau of Energy Efficiency (BEE) and the Ministry of Power (MoP), Government of India. During the current financial year, IEG has extended its support to designated consumers, particularly in sectors such as thermal power, cement, iron and steel, petrochemicals, and textiles. In addition, energy efficiency studies were carried out across other sectors including chemicals, pharmaceuticals, ports, FMCG, and commercial buildings such as airports. The IEG also provided technical support to the Karnataka Electricity Regulatory Commission (KERC) through prudence check studies for transmission and distribution utilities in the state.

The IEG has refocused its institutional and international collaborative efforts to promote energy efficiency as an essential near-term solution for addressing global energy demands and mitigating climate change. As part of this initiative, IEG provided technical assistance to the Government of the Republic of Guyana, with a



focus on the implementation of renewable energy projects. Under the Resource Efficiency in Agri-food Production and Processing (REAP) programme, energy efficiency assessments were conducted across small-scale industries in Uzbekistan and Tajikistan. Additionally, an energy optimization study was undertaken at a packaging plant in Nepal.

The SRC is primarily focused on addressing environmental pollution resulting from improper or unconventional disposal of plastic waste. Leveraging its technical expertise, the group has been engaged by GIZ India to assess the impact of sanitary waste streams on urban waste sustainability, with a particular emphasis on plastic waste generation and the development of a national mitigation strategy. The SRC has been engaged by the Watershed Development Department (WDD), Government of Karnataka, Bengaluru, to serve as the Process Monitoring Agency (PMA) for the 'Rejuvenating Watersheds for Agricultural Resilience through Innovative Development (REWARD)' programme. In



addition, the SRC has launched a new initiative to provide Monitoring, Evaluation, Learning, and Documentation (MEL&D) services under the Comprehensive Environmental Planning for Mining Impact Zones (CEPMIZ) framework. The EKOenergy ecolabel, Finland funds Solar energy integration for clean drinking water supply to rural communities in Karnataka state.

CENTRE FOR SUSTAINABLE RESOURCE MANAGEMENT (CSRM), TERI MUMBAI

Thematic Focus

The Land Resources Department in Mumbai's Centre for Sustainable Resource Management (CSRM) Division is dedicated to environmental management and reporting, food security and livelihoods, and plastic waste management. A strong network of stakeholders has been built by the Centre through the execution of diverse projects and key partnerships with government agencies, corporations, and bilateral organizations. Further, in close collaboration with its headquarters in Delhi, the Centre plans to expand its programmes to include ESG (Environmental, Social, and Governance) initiatives, sustainability management, biodiversity evaluation, and carbon assessment and sequestration.

Key Programmes Delivered and Underway of CSRM Area

Project name: Innovative Interventions in Mokhada Block of Palghar district to address malnutrition and enhance the livelihood of Scheduled Tribe (ST) Communities.

Sponsor: Department of Science and Technology (DST) for a period of 3 years (2023–2026)

The project aims to combat malnutrition and generate livelihood opportunities for the tribal communities in the Mokhada district, Palghar block, by establishing a Science and Technology Innovation (STI) Hub. This hub will focus on two key technological interventions:

1. Training and capacity building for the production, fortification, and market linkages of Single Cell Protein (SCP) through mushroom and Azolla cultivation.
2. Cultivation of aromatic plants (patchouli, palmarosa, and citronella) and the extraction of essential oils, supported by market linkages and an assured buyback mechanism.



➢ **Oil Distillation Unit under construction**

Following a comprehensive baseline survey aimed at assessing the ground realities and identifying community needs, the project has made noteworthy strides over the past year. One of the key achievements includes the successful organization of two orientation sessions and four practical, hands-on training programmes focused on mushroom and Azolla cultivation. These sessions have empowered local farmers and Self-Help Groups (SHGs) with valuable knowledge and skills, contributing to enhanced livelihood opportunities.

In parallel, a dedicated nursery has been established for the propagation of high-value aromatic plants such as patchouli, citronella, and palmarosa. As a pilot initiative, citronella slips were planted on farmers' fields and have grown successfully. Furthermore, a steam oil distillation unit has been installed at the project site, marking a critical step towards value addition and local processing of aromatic crops. The construction of the STI Hub is



➢ **Training for Mushroom and Azolla**

also in progress, which will serve as a central facility for training, research, and innovation, further strengthening the project's long-term impact and sustainability.

Impact We Created

4	5	170
Awareness Programmes	Hands-on Training – Mushroom and Azolla Training	Local SHGs and Farmers Sensitized

Project name: Long-term plastic flux monitoring in Mumbai Metropolitan Region (MMR)

Sponsor: The Ocean Cleanup

In collaboration with The Ocean Cleanup, this project focuses on identifying plastic leakage hotspots across the Mumbai Metropolitan Region (MMR). As part of this initiative, TERI and The Ocean Cleanup (TOC) conducted a joint field survey to assess key areas impacted by plastic pollution. During the survey, potential sites were identified for installing solar-powered cameras that will help monitor the seasonal patterns and intensity of plastic waste accumulation.

Project name: Air Quality Status Report of Maharashtra 2023–24 and Water Quality Status Report of Maharashtra 2023–24.

Sponsor: Maharashtra Pollution Control Board

These statistical reports play a crucial role in assessing the status of air and water quality across the state. They help maintain a robust database on the condition of local natural resources while tracking pollutant levels. Air quality data is gathered from approximately 167 active ambient air monitoring stations to compute the Air Quality Index (AQI). Similarly, the Water Quality Index (WQI) is calculated based on data collected from around 294 monitoring stations across the state. The insights provided support to policymakers and decision-makers in implementing timely and effective measures to mitigate environmental issues that could pose risks to human health and the ecosystem.

Project name: RECAP4NDC Implementation Phase (2023–28)

Sponsor: Deutsche Gesellschaft Fur Internationale Zusammenarbeit (GIZ) GmbH

A cross-divisional project in collaboration with the Centre for Forest Management & Governance Area, with an objective to support India's goals for restoring degraded forests and landscapes and achieve country's committed nationally determined contributions (NDCs) under the Paris Agreement, improving both ecosystem resilience and livelihoods for three Indian states, viz., Maharashtra, Gujarat, and Uttarakhand and UTs (Delhi-NCR) under the project. In the project, TERI shall lead efforts on financing Forest and Landscape Restoration (FLR) by identifying funding sources, developing innovative financing mechanisms, engaging with the private sector to explore CSR through in-person meetings, and exploring PPPs. The Mumbai Team has successfully conducted Maharashtra's state-level stakeholder consultation workshop in collaboration with forest department and conducted in-person financial convergence meetings within the forest and allied departments in the selected four districts, viz., Jalgaon, Nashik, Pune and Ahilyanagar (Ahmednagar) in order finalize public finance and raise awareness among department officials.

Project name: Developing Biodiversity Strategy for Capgemini 2024–25

Sponsor: Capgemini Pvt. Ltd

The project focuses on conducting baseline biodiversity assessments at Capgemini's eight sites across India. It is a cross-divisional initiative in collaboration with the Centre for Forest Management & Governance Area. The Mumbai team was responsible for the assessments at the Mumbai and Pune sites, which included on-site biodiversity evaluations and stakeholder consultations. The team co-delivered the baseline biodiversity assessment report, a strategy document outlining recommended biodiversity interventions, and an approach paper for broader conservation measures across India.

Partnerships and Networks

- A grant secured from DST to implement a 3-year project on implementing innovative interventions to address malnutrition and generate alternate livelihood for tribal stakeholders in Mokhada block, Palghar, Maharashtra.
- Working with private sector — Capgemini Pvt. Ltd, International Union for Conservation of Nature (IUCN).
- Working with The Ocean Cleanup (TOC), a Netherlands-based organization for a long-term research collaboration to monitor and assess the extent of plastic waste in waterbodies located in the MMR.
- Long-term association with government organizations such as Forest Department, Maharashtra Pollution Control Board (MPCB) for projects related to environmental reporting, Indian Council of Forestry Research and Education (ICFRE), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) for RECAP.

Way Forward

The Centre is in the process of developing a strategic plan to engage with corporate and industrial stakeholders, specifically those located in the MMR. The aim is to initiate collaborative projects in key emerging domains such as carbon sequestration and assessment, the blue economy, ESG (Environmental, Social, and Governance) frameworks, and sustainability reporting. With a robust framework and technical expertise already established at the Delhi office, the centre is well-positioned to expand its footprint into these high-impact sectors in the near future.

Details on Knowledge Building; Partnerships and Networks can be viewed via the following URLs:

1 https://teriin.org/files/Knowledge-Contributions.pdf

2 https://teriin.org/files/Partnerships-and-Networks.pdf

WESTERN REGIONAL CENTRE – GOA

The Western Regional Centre - Goa is mandated to provide best possible science and technology-driven services for the conservation and sustainable utilization of coastal, marine and adjacent inland resources through research, capacity building, and consulting efforts in close collaboration with both international and national partners. These activities are grounded in an impact-focused interdisciplinary and transdisciplinary method, developing operational excellence and combining natural and social sciences by monitoring measurement-based approach and awareness training programme.

Thematic Focus

The Coastal Ecology and Marine Resources Centre (CEMRC) Area works towards strengthening the institutional support required for managing coastal and marine resources. Conserving coastal ecosystems through best management practices and community-based approach has always been a core expertise of this Centre. The Centre is engaged in carrying out research that focuses on sectors such as marine ecology, aquaculture activities, and impact and vulnerability assessment of coastal resources to climate change. Through capacity-building programmes for climate-resilient fish farming, the Centre aims to address key challenges on declining fish stocks and climate adaptions for smallholder fishers across freshwater ecosystems. The Centre is also actively involved in examining and analysing objectives under SDG 14 that are critical to address sustainable development of the Indian Ocean both domestically and internationally. With regards to imparting training, TERI has established the Coastal Educational Hub which brings attention to our priceless coastal habitats and resources for student education, entrepreneurship training and development, woman empowerment, and creating awareness among the public.

Water Resource Management and Water Technologies

Apart from Coastal Resource Management we also address issues pertaining to water resource management with focus on water remediation technologies and watershed development projects. Primarily, we provide sustainable and cost-efficient solutions aligned with the needs of the stakeholders, based on measurements, in-depth analysis, field testing, and demonstrations with their collaborations. Our focus is to provide affordable and clean water supply solutions to the community. The varied activities under this programme also touch upon SDG 6 and SDG 15.

Rural Development and Environment

Rural development and environmental conservation through sustainable practices is another focus area of the CEMRC. The projects emphasize capacity building, sustainable resource use, agriculture extension activities and the diversification of income streams, contributing to economic resilience and ecological sustainability in rural regions.

Our Accomplishments

Under the Watershed Project (2022), TERI developed a comprehensive Detailed Project Report (DPR) outlining the implementation of various soil and moisture conservation activities. As part of the preparatory phase, multiple Participatory Rural Appraisal (PRA) exercises were conducted across selected villages, covering approximately 900 households.

The DPR has been completed, and its implementation is currently ongoing. As part of capacity-building efforts under the DRO component, a Watershed Yatra was organized to promote mass mobilization and raise awareness about the participatory approach to implementation of watershed development Programme under PMKSY WDC 2.0.

The 'Watershed Yatra' is a nationwide outreach campaign launched by the Union Minister Shri Shivraj Singh Chouhan on February 5, 2025, to promote community participation and raise awareness about watershed development activities under the Watershed Development Component of the Pradhan Mantri Krishi Sinchayee Yojana (WDC-PMKSY 2.0)



UNDP-Small Grants Programme in the Indian Coastal Region

TERI is implementing Seventh Operational Phase of GEF Small Grants Programme in India (SGP-OP7) in Indian Coastal Region (ICR) funded by the Ministry of Environment, Forest and Climate Change (MoEFCC), in collaboration with the United Nations Development Programme (UNDP). The project aims to build capacities of local communities to take collective action for conservation and sustainable development, thereby generating global environmental benefits in Maharashtra and Tamil Nadu of ICR.



➢ **Flag-off of the deployment**



➢ **Artificial reef deployment**

TERI also emphasizes capacity building by conducting workshops and training programmes to raise awareness and equip local fishing communities with necessary skills.

Aggregate Numbers

SDG 14 Project Map: The governance framework specifically in the context of the Goals that are critical to address sustainable development of the Indian Ocean both domestically and internationally, would be examined and analysed. The project would provide a comprehensive analysis of SDG 14 apart from the key data and scrutiny that can aid in drafting the next Voluntary National Review and provide input to the SDGs NIF progress report. Institutional mapping would provide the framework to address gaps and challenges in governance and policy pathways to achieve the SDG. Assessment of 10 targets of SGD 14 in the context of India's progress and country-level evaluation for the fisheries sector, marine pollution, biodiversity conservation and protection, climate change impacts, economic measures and marine governance will be carried out. This would serve as a vital component to build the SDG index for Goal 14 in India. Discussions with relevant stakeholders are ongoing to assess the status of India's progress in meeting SDG 14. A final report would be produced and an outreach workshop would be conducted to disseminate its results.

ADB

Another ongoing ADB project (2024) on capacity building for climate-resilient fish farming will addresses key challenges such as declining fish stocks, climate change impacts, and limited access to resources for smallholder farmers. By promoting sustainable practices and enhancing financial literacy, the project will create new economic opportunities, especially for marginalized and vulnerable communities.

Science Technology and Innovation Hub (STI –HUB)

The Science Technology and Innovation Hub in Gaondongrem Village is a project funded by DST-SEED. The project aims to uplift rural communities

primarily the scheduled tribes, by fostering a self-sustaining rural economy. Benefiting 800 individuals, the project integrates organic farming, mechanization, and sustainable water management practices such as rainwater harvesting sustainable agricultural practices and entrepreneurial opportunities.

Through this project, workshops and training have been conducted to take a step towards mechanization to increase organic farming output, provide healthier produce, and increase farmers' incomes. Sustainable water management solutions such as rainwater harvesting will further improve water availability and enhance agricultural productivity. Additionally, the project focuses on providing alternate livelihood options through value addition, agri-business start-ups, and eco-tourism ventures, which will diversify income streams, empowering villagers, especially the youth and women. This holistic approach is being implemented through the supportive association of the farmers, which will not only revitalize agriculture but also foster a vibrant, self-sustaining rural economy.











➢ **A step towards self-reliance: Official launch of local products (STI –HUB)**



➢ **Empowering communities through skill development: Local product training workshop**

Approach and Innovation

Coastal Education Hub

The TERI Coastal Education Hub has made significant strides in disseminating education regarding Goa's coastal habitats and traditional coastal occupations among students and the general public. The Hub is dedicated to fostering entrepreneurship development and livelihood diversification opportunities, thereby contributing to sustainable coastal development.

Inspirational Evidences

Success Stories and Sustainable Solutions from TERI's 50th Year Celebration Event in Goa: On the occasion of TERI's 50th year celebration, the event focused on 'Pioneering Sustainable Solutions: Goa's Journey towards the 2030 SDGs,' emphasizing partnerships to foster sustainability and resilience. Major highlights are provided below:

- **Chief Minister's Address**: The Hon'ble Chief Minister of Goa, Dr Pramod Sawant, emphasized Goa's progress in waste management, including:
  - E-waste plant proposal by the Goa Waste Management Corporation (GWMC)
  - Functional biowaste plant in Kundaim
  - Plans for a 'construction and demolition' debris plant
  - Wealth from waste: The Goa Government is focusing on creating wealth through effective waste management.
- **Global and Local Challenges**: Discussions led by Shri Suresh Prabhu highlighted both global and local sustainability challenges. He urged Goa Government to assess the carrying capacity of the state of Goa to determine how much load Goa can handle to maintain its fisheries agriculture, sustainable tourism and good practices, and suggested that TERI can be approached for this initiative.
- A memorandum of understanding (MoU) was signed between TERI and Goa Chamber of Commerce & Industry (GCCI) Collaboration to equip policymakers, businesses, and communities to make informed sustainable decisions.

The Government of Goa signed an MoU with TERI to advance the revival of Khazan lands and to establish a 'Centre of Excellence for Natural Resource Management and Ecotourism' in the state. The MoU was signed in the presence of Shri Pramod Sawant, Hon'ble Chief Minister of Goa, and Dr Vibha Dhawan, Director General, TERI.

Impact We Created

We have actively contributed to building sustainable models for educating and empowering rural local bodies, fishing communities, self-help groups (SHGs), and farming communities. Through the DST SEED project, we have supported the socio-economic upliftment of Scheduled Tribe (ST) communities by establishing an STI-Hub aimed at fostering a self-sustaining rural economy.



➢ **The Government of Goa signed an MoU with TERI**

TERI's Research and Development Initiatives in the Himalayan Region: Nurturing Sustainable Livelihoods

TERI's research and development centres in the Uttarakhand Himalayas, primarily through TRISHA (TERI's Research Initiative at Supi for Himalayan Advancement) and its extension, the TERI Paharpani Research Centre. Rooted in the understanding that agriculture forms the backbone of the hill economy, our efforts remained focused on empowering marginalized farmers by fostering sustainable agricultural practices and creating robust value chains.



About TRISHA

TRISHA, Supi: Situated at an altitude of 7,500 feet in Mukteshwar, Nainital, TRISHA has, since its inception in 2003, served as a hub for research, innovation, and extension activities tailored to the unique challenges of Himalayan agriculture. These challenges, including fragmented landholdings, rainfed cultivation, wildlife conflict, unsustainable farming practices, and limited market access, continued to inform our strategic interventions.

Our approach at TRISHA centres on enhancing land and crop productivity through a blend of sustainable and organic biotechnological approaches, integrating modern technologies with valuable traditional knowledge.



Key highlights of our work during the reporting period include:

- **Farming Sustainability for Livelihood Enhancement**: We continued to promote affordable technologies suitable for small landholders in the hilly terrain. Our well-equipped facilities, including vermicomposting units, polyhouses, glasshouses, solar greenhouses, and mechanical dryers, facilitated research and demonstration of these sustainable practices.
- **Promotion of Medicinal and Aromatic Plants (MAPs):** Recognizing the potential of MAPs to provide financial security in the face of climate change and water scarcity, we actively promoted their large-scale cultivation and conservation. Our herbal garden served as a valuable resource for research and the provision of quality planting material.
- **Income Generation for Rural Women**: We implemented targeted programmes aimed at enhancing the income of rural women farmers through the promotion of traditional crops and value addition.
- **Technical Handholding and Capacity Building**: Providing comprehensive technical support remained a priority. We offered farmers and producers training and capacity-building programmes on herb cultivation and other sustainable agricultural practices, supported by the resources at our knowledge-cum-training centre.
- **Nutritional and Environmental Security**: Our initiatives actively promoted the cultivation

of local food crops to enhance nutritional security while emphasizing environmentally sound practices. Rainwater harvesting models demonstrated at the Centre underscored our commitment to water conservation.

- **High-Tech Nurseries and Quality Planting Material**: The establishment and maintenance of high-tech nurseries ensured the availability and distribution of superior quality seeds and planting material to local farmers, a crucial step towards improving crop yields and quality.
- **Advanced Mountain Farming Technologies**: We continued to introduce and promote advanced technologies tailored to the specific needs of mountain farming, aiming to improve efficiency and productivity.
- **Formation of Farmer Producer Organizations (FPOs):** Recognizing the importance of collective action, we actively facilitated the formation and strengthening of FPOs to enhance market access and bargaining power for the farmers.

The tangible outcomes of TRISHA's efforts are reflected in the success of the Supi Sugandh brand. This initiative represents a direct link between the farmers around Supi and the consumers, offering pure and natural products grown and processed locally under TERI's guidance. By eliminating intermediaries and ensuring market linkages, Supi Sugandh has created a win-win situation, providing farmers with assured markets and better returns while offering consumers high-quality, authentic Himalayan produce.





TERI Paharpani Research Centre

Established in 2013 as an extension of TRISHA, the Paharpani Research Centre, located 20.4 km away in the Dhari Block of Nainital district, further expanded our reach and impact. With a focus on holistic community development, the Centre actively engaged farmers in the region, promoting eco-friendly techniques for sustainable livelihoods. The facilities at Paharpani, including vermicompost unit, polyhouses, oil distillation units, solar dryers, and a food processing training unit, supported initiatives aimed at:

- **Developing Holistic Community Development Programmes**: Engaging farmers in the region to adopt eco-friendly techniques for sustainable livelihood enhancement remained a priority.
- **Establishing Essential Infrastructure**: The centre's facilities, including polyhouses, oil distillation units, solar dryers, and a food processing training unit, supported local farmers in value addition and income generation.
- **Capacity Building and Training**: Similar to TRISHA, the Paharpani centre conducted training programmes on sustainable agriculture, food processing, and other relevant skills to empower the local community.
- **Promoting Rainwater Harvesting**: Demonstrating and implementing rainwater harvesting

TERI Himalayan Centre, Mukteshwar

TERI Himalayan Centre is nestled in Mukteshwar, a secluded hill station located 350 km from Delhi and 46 km from Nainital. The nearest railway station is at Kathgodam, 56 km from Mukteshwar. The weather here ranges from pleasant to cold, which makes it an ideal year-round destination. It is a self-sustainable retreat that runs on solar energy and a rainwater harvesting system—perfect structure to save resources and nurture Mother Nature.

Beyond agricultural research and development, the TERI Himalayan Centre in Mukteshwar served as a self-sustainable retreat, powered by solar energy and a rainwater harvesting system. During FY 2024–25, the Centre actively promoted eco-tourism programmes for students and groups. These programmes provided a unique opportunity to learn about sustainability in a practical setting, fostering a deeper connection with the environment and promoting community development.

Key highlights included visits to TRISHA's bio-farm, interaction with the Kumaon Vani radio station, village immersion experiences, and eco-adventure activities.

TERI Leadership Camp: Leveraging the serene and sustainable environment of the Himalayan Centre, we continued to organize leadership camps for young minds. These camps aimed to cultivate leadership skills and promote an understanding of sustainability through action-oriented activities and sessions, nurturing future leaders committed to the common good.

Kumaon Vani 90.4 FM: Amplifying Voices for Sustainable Development: Uttarakhand's first community radio station in Nainital district,





established by TERI in Supi village in 2010, has continued to serve as a vital communication tool for communities across the Kumaon region. Run by local youth under TERI's supervision, the radio station broadcasted content relevant to the local farming community, focusing on:

- **Promoting Sustainable Agriculture**: Sharing information on organic farming practices, climate-resilient agriculture, and successful local initiatives.
- **Enhancing Livelihoods**: Broadcasting information on market opportunities, value addition techniques, and income-generating activities.
- **Raising Awareness on Social and Environmental Issues**: Addressing topics often overlooked by mainstream media, contributing to informed decision-making within the community.
- **Providing a Platform for Local Voices**: Empowering community members to share their experiences, knowledge, and perspectives, fostering a sense of ownership and participation in local development.

Current Project

Herbal Kingdom Project

The project aims to promote large-scale cultivation and conservation of medicinal plants, contributing to the economic empowerment of rural communities. This document will highlight key achievements, financial overview, village-wise progress, training initiatives, and upcoming plans.

This initiative focuses on establishing a sustainable supply chain for medicinal plants within the

Uttarakhand Himalayas. Building upon the success of the I & II phase, Phase III, scheduled for the FY 2024–25, will concentrate on the cultivation, nurturing, and harvesting of selected medicinal plants. This will occur within the natural habitat of designated Van Panchayat Forests in Pichal Tanda, Sakuna and surrounding villages of the Ramgarh block, Nainital district, Uttarakhand.

Partnerships

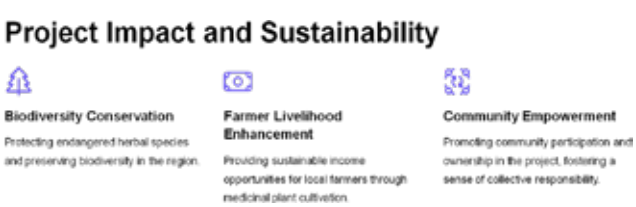
- **Technical Partner**: The Energy and Resources Institute (TERI)
- **Funding Agency**: Jivanti Welfare and Charitable Trust (JWCT) and Dabur India Ltd.

Collaboration Framework

- A Memorandum of Understanding (MoU) has been formalized between TERI, JWCT, and Dabur India Ltd., outlining the collaborative framework for the cultivation and supply of medicinal plants.

Key Objectives

- Develop and maintain a sustainable supply chain for medicinal plants
- To promote selected plants/tree species for large-scale cultivation of livelihood security
- Cluster base approach for cultivation and economic strengthen to Van Panchayat as well as individual farmers
- Dove-tailing with Government Programmes and Forest Department
- Training and capacity building of local project beneficiaries as well as Van Panchayat Members for scientific cultivation technologies
- Promote responsible cultivation and harvesting practices
- Support the conservation of biodiversity in the region
- Enhance the livelihoods of local communities



Identified Species

- Karkatshringi (*Pistacia integerrima*): Forest produces galls
- Tomar (*Zanthoxylum armatum)*: Forest produces seeds
- Sugandhbala (*Valreana wallichii):* Forest produces roots
- Talispatra (*Taxus baccata*): Forest produces leaves and bark

Farming Sustainability through Affordable Technologies for Small Land Holding Farmers of Hilly Areas of Uttarakhand Supported by ONGC

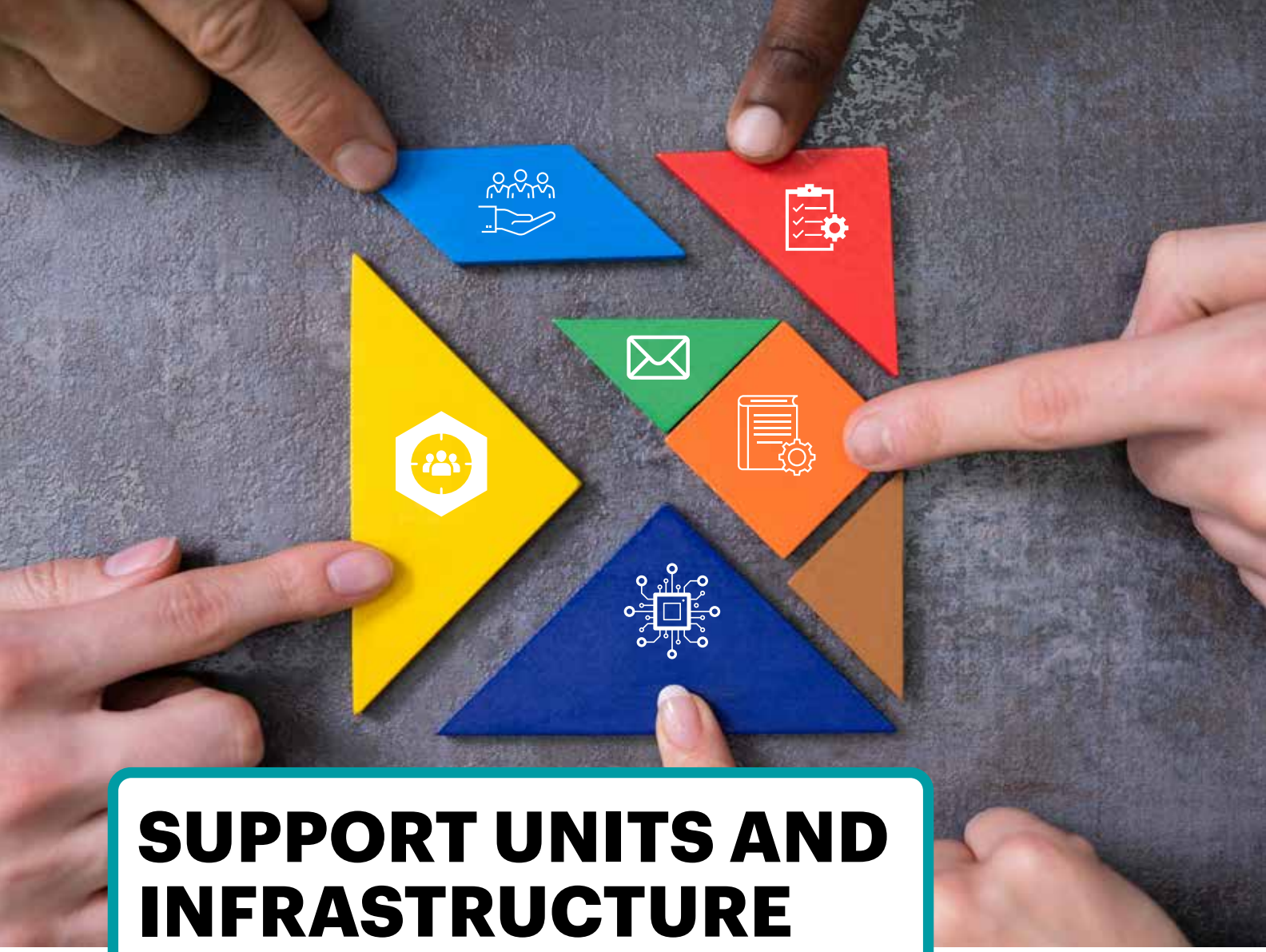
The activities in addition to conduction of awareness generation programmes delineated under the project to achieve desired objectives are in Nainital and Champawat District, Uttarakhand:

- Establishment of nursery/herbal garden to promote organic and natural farming
- Establishment of poly-house
- Establishment of community-based solar dryer
- Demonstration of organic composting techniques and organic pesticides for crop protection
- Establishment of low- cost rainwater harvesting structures and organicmulching
- Promotion of eco-tourism and the concept of homestays

Formation of Farmers Producer Organization- NABARD, Uttarakhand

Farmer Producer Organization (FPO) Lohakham Farmer Producer Self-Reliant Cooperative in Block Okhalkanda, Nainital

- Farming Cluster Development under NABARD guidelines
- Promotion and marketing of locally available grains/pulses/vegetables/fruits
- Cooperative base marketing systems
- Training and capacity building



SUPPORT UNITS AND INFRASTRUCTURE FACILITIES

Support Units assist TERI in its efforts on climate resilience, renewable energy technologies, participatory forest management, and knowledge generation. They ensure smooth and timely management of operations throughout TERI, helping it to emerge as a premier think tank. TERI's infrastructure facilities are crucial for facilitating its research work. Equipped with the latest advancements, these facilities enable the various programmes to succeed in their initiatives.

INFORMATION TECHNOLOGY AND SERVICES

The Information Technology and Services Division (ITSD) continues to play a pivotal role in supporting TERI's mission by delivering reliable, secure, and innovative technology solutions. The Division ensures seamless IT operations across the organization, enabling efficient functioning of all departments.

Core Responsibilities

- Managing and maintaining TERI's IT infrastructure, including networks, servers, and databases.
- Providing end-user support and ensuring uninterrupted access to digital resources.
- Implement robust data security measures to safeguard institutional information.

Key Initiatives

- Supported various divisions with customized IT solutions to enhance operational efficiency.
- Upgraded systems and applications to align with evolving technological needs.

The Division remains committed to adopting emerging technologies and strengthening TERI's digital capabilities to support research, collaboration, and innovation.

In 2024¬–25, the Division played a pivotal role in organizing online events using platforms such as Cisco Webex and Microsoft Teams, ensuring seamless virtual engagement across stakeholders.

The team is currently managing approximately 40 websites hosted on Azure and AWS cloud platforms.

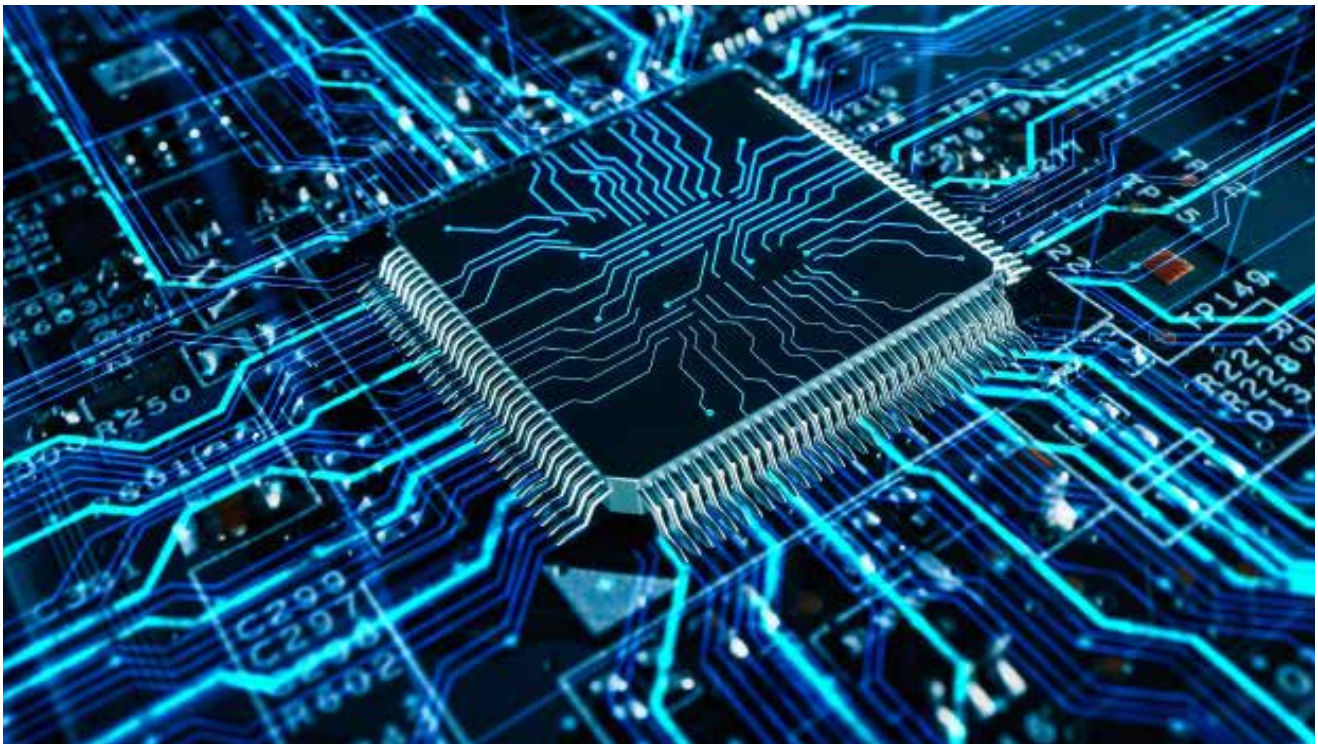
To enhance cybersecurity and streamline access, the team has successfully implemented Multi-Factor Authentication (MFA) and Single Sign-On (SSO) mechanisms to strengthen user authentication and reduce security risks.

Online Assessment Application

As part of our digital transformation initiatives, the IT department successfully developed and deployed an online assessment application to streamline the employee assessment process for grade change.

Key Improvements

- Eliminated manual, paper-based workflows that were time-consuming and prone to delays.
- Digitized the entire assessment process through the ESS (Employee Self-Service) application.
- Pre-filled forms using existing data from the ERP module, reducing manual entry and errors.
- Enabled eligible employees to submit assessments online.
- Feedback and approvals from the Director, Programme Director, and Director General (DG) are now handled digitally.



- Automated notifications and tracking ensure timely completion and transparency.

SGP-Online Monitoring System (OMS)

OMS is a cloud-based grant monitoring system developed for GEF Small Grants Programme area. It helps in defining new grants, registering NGO under grant, online approvals, grant disbursement, and expenditure booking.

Web URL: https://monitor.sgp-india.org/

The monitoring system has the following features:

- Secure: Only authorized user can access the system
- Web-based access from anywhere, anytime
- Online data entry – the data entry forms for:
  - ➢ o Grant opening
  - ➢ o NGO registration
  - ➢ o Grant disbursement
  - ➢ o Assign budget
  - ➢ o Indicators
  - ➢ o NGO indicators
  - ➢ o Voucher submission
- Online Approval for enrolment of NGOs in Grant, expenditure booked by NGO and technical report submitted by NGO
- Online Dashboard for financial and technical monitoring and analysis
- Admin users: The system is controlled by Admin user who would be able to add/update any NGO by providing admin credentials.

Technology Stack

- Front end: Angular
- Data Source: MySql
- Visualization Tool: Microsoft Power BI (for creating interactive dashboards and reports)

Staff Directory

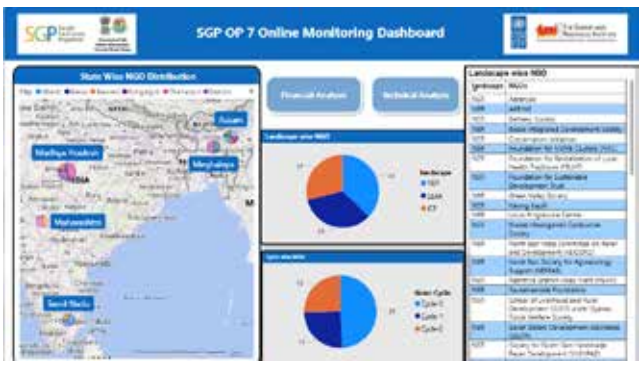
To allow TERI employees to quickly search for and retrieve contact information of other staff members using partial name inputs.

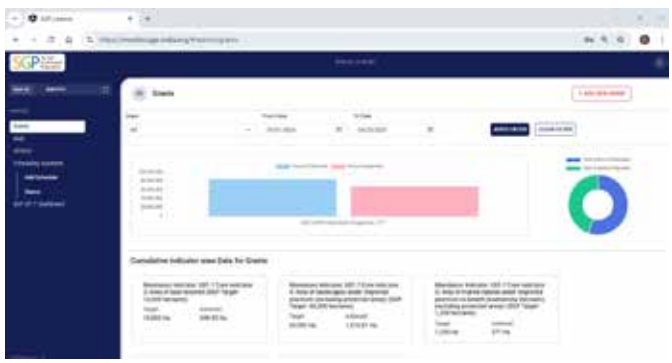
- Search Functionality
- Input: First name, last name, or initials.
- Output: Matching staff profiles with:
- Full name
- Contact number
- Email ID
- Extension number
- Department (optional)



Financial Dashboard

A Financial Dashboard is a powerful visual tool that provides a real-time overview of an organization's financial performance. It consolidates key financial metrics and data into a single, interactive interface, enabling stakeholders to monitor, analyse, and make informed decisions quickly and efficiently.





Benefit

Financial dashboards offer numerous benefits for businesses and individuals alike. Here are some key advantages:

1. Real-Time Monitoring: Dashboards offer real-time or near-real-time data, enabling users to make informed decisions promptly.
2. Data-Driven Decision-Making: By consolidating data from various sources, financial dashboards help in making data-driven decisions, leading to better financial management and strategic planning.
3. Efficiency and Productivity: They streamline the process of financial analysis, saving time and improving productivity.
4. Visibility and Transparency: They provide a clear and concise view of financial performance, promoting transparency and accountability among stakeholders.
5. Improved Communication and Collaboration: They facilitate better communication and collaboration among team members by providing a unified view of financial data.

Technology Stack

- Data Source: Oracle Database
- Visualization Tool: Microsoft Power BI (for creating interactive dashboards and reports)

Security and Access

- Used Row-Level Security (RLS) in Power BI to restrict data access.
- Ensured Oracle roles and permissions are properly configured.

The following is the list of important projects that the IT Division undertook during 2024–25:

IKI Website

https://iki-india.com/public/index.php

Energy smart materials

https://energysmartmaterials.com/public/index.php

TERI Industry Charter

https://teriindustrycharter.in/

WSDS 2025

https://wsds.teriin.org/2025/

The 6th RD20 Conference

https://teriin.org/event/6th-rd20-conference

Youth Climate Conclave competitions

https://wsds.teriin.org/2025/youth-climate-conclave-5.php

SGP Tool

https://monitor.sgp-india.org/#/login

GRIHA Conclave

https://www.grihaindia.org/conclave/





PROJECT MANAGEMENT UNIT

The Project Management Unit (PMU) serves as TERI's central hub for managing all project-related activities. At any given time, over 350 projects—spanning research, development, and implementation would be underway.

The PMU's core objective is to ensure efficient and effective project management from inception to completion.

Key Responsibilities:

- Identifying funding opportunities and dissemination channels
- Facilitating the preparation and submission of bids
- Managing teams and relationships, including clear communication of roles and responsibilities
- Ensuring timely delivery of contractual obligations, including interim, mid-term, and final reports
- Administering contracts and controlling budgets
- Maintaining quality standards across all project phases
- Facilitating optimal resource utilization
- Generating Management Information System (MIS) reports
- Maintaining a comprehensive knowledge repository

TERI's PMU employs robust project management methodologies and customized software tools to ensure timely delivery of high-quality outcomes. It also ensures that all projects are thoroughly documented and archived in TERI's knowledge repository.

Human Resources Division

The Human Resources (HR) Division aims to engage the workforce to ensure a growth enabling, progressive working environment, which facilitates the realization of the vision and mission of TERI. The HR Division has been instrumental in facilitating learning and development initiatives for staff to keep them in sync with the changing business environment and plays a crucial role in promoting and maintaining a positive and productive work environment at TERI.

The Division's primary objectives are as follows:

1. **Fostering engagement:** The Division focuses on actively engaging the colleagues, ensuring colleagues are motivated, satisfied, and committed to the TERI's goals and values with the aim to implement various programmes and initiatives to enhance morale and well-being.
2. **Growth enablement:** The HR Division works towards creating an environment that fosters growth and development. This involves talent management, performance evaluations, career planning, and opportunities for skill enhancement.
3. **Progressive working environment:** The HR Division strives to maintain a forward-thinking and innovative workplace. With the aim to implement policies and practices that encourage creativity, collaboration, and adaptability, HR department is able to establish a progressive culture.
4. **Realization of vision and mission:** The Division aligns HR practices with TERI's vision and mission, ensuring that employees are working towards the TERI's overarching goals and objectives.
5. **Learning and development:** The HR Division is responsible for designing and implementing learning and development initiatives. These programmes help employees acquire new skills and stay updated with industry trends and best practices. HR Department aims to establish 'Total People Development Plan'.
6. **Internship and career development:** Our HR department plays a pivotal role in providing internship opportunities to top graduates from leading institutes in the country. These interns work closely with researchers on various projects, ensuring that TERI has access to the best talent available.Furthermore, we are strong proponents of a work-education culture. Through our employee-friendly policies, we create a conducive environment for researchers to pursue PhD programmes at renowned global universities, thus helping them realize their full potential.
7. **Commitment to diversity and inclusion:** Diversity and cultural sensitivity are highly valued within TERI's ecosystem, as they are essential for establishing and maintaining a respectful and engaging workplace environment. We take pride in specializing in providing cross-divisional work and career opportunities, enabling professionals to contribute their expertise in areas beyond their primary research, thereby enhancing our interdisciplinary capabilities and contributions to a sustainable world.
8. **Employee well-being and transparent work culture** The HR places a strong emphasis on its employees' well-being. We provide wellness programmes that include training and guidance to motivate and enable our employees to lead healthy lifestyles, ultimately enhancing their work productivity. Our commitment to transparency and employee engagement is reflected in the work culture fostered by TERI's Administrative Services.

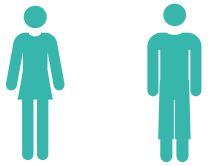
Human Capital and Infrastructure Facilities

The Administrative Services Division also looks after The RETREAT (Resource Efficient TERI RETREAT for Environmental Awareness and Training). The RETREAT Centre is a training and conference facility at TERI Gram. It provides organizations an opportunity to use its

facilities for holding training programmes, workshops, and conferences with an objective of linking the process of corporate growth and training with the expression of corporate responsibility towards protecting the environment. The facility provides a unique experience of doing things in an unconventional yet viable way.

TERI's growing reach and visibility make it an integral part of the itineraries of many international dignitaries and delegates, including heads of governments. The professional coordination and conduct of all such visits continues to receive appreciation from the heads of missions in New Delhi.

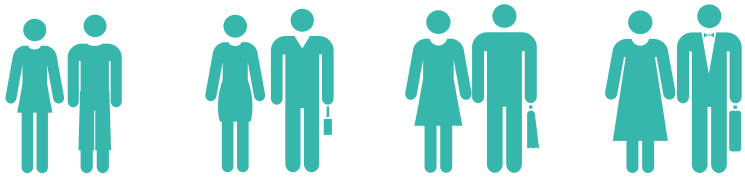
GENDER



31% Female

69% Male

AGE DISTRIBUTION



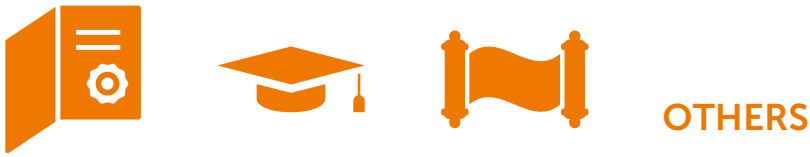
19% AGE 22-30 YEARS

29% AGE 31-40 YEARS

27% AGE 41-50 YEARS

25% AGE 51 AND ABOVE

QUALIFICATION



17% GRADUATE

31% POSTGRADUATE

11% PhD

OTHERS 41%

SPECIALIZATION



2% SOCIAL SCIENCE & AWARENESS

4% BIOTECH & AGRICULTURE

4% ECONOMICS

5% ENERGY



8% ENGINEERING

2% INFORMATION & TECHNOLOGY

7% ENVIRONMENT

68% OTHERS

ADMINISTRATIVE SERVICES

TERI's Administrative Services primarily focus on streamlining activities related to the extensive research conducted by TERI. In essence, our core mission is to reinforce research endeavours. We achieve this by offering administrative and maintenance support services across multiple locations, including TERI Headquarters at India Habitat Centre, regional centres in Bengaluru, Goa, Guwahati, and Mumbai, as well as the campuses at TERI Gram in Gurugram and TERI Himalayan Centre in Mukteshwar, Uttarakhand.

Our responsibilities also extend to managing, maintaining, and operating amenities and utilities in alignment with international standards and norms. Notable examples include our Quality Management System (QMS) certified to ISO 9001:2015 standards, Health and Safety Management System in compliance with ISO 45001:2018, and Environmental Management System adhering to ISO 14001:2015.

One of our core responsibilities is the management of the RETREAT (Resources Efficient TERI RETREAT for Environmental Awareness and Training) located at TERI Gram. This unique facility offers a sustainable and unconventional approach to training and conferences, reflecting TERI's commitment to environmental awareness and practical sustainability.

As TERI's reach and visibility continue to expand, we have become an integral part of the itineraries of many international dignitaries and delegates, including Heads of Governments. This underscores our growing influence and impact on the global stage.



INFRASTRUCTURAL FACILITIES

TERI requires state-of-the-art, modern, and vital infrastructure facilities, which are instrumental in facilitating research and development on a large scale. TERI has developed a host of infrastructure facilities, across the length and breadth of the country, which have continued to propel the Institute throughout its history.

CMCC Germplasm Bank

The Centre for Mycorrhizal Culture Collection is stepping into its second-generation level with an objective of supplying well-characterized mycorrhizal cultures to researchers and industry. The Bank has three temperature-controlled greenhouses at Gual Pahari which house 2,800 isolates of Arbuscular Mycorrhizal Fungi (AMF) and 285 cultures of Ectomycorrhizal Fungi (EMF) collected from different soil types from India and around the globe. Our molecular biology and biochemical labs are equipped with avant-garde equipment which aid in characterizing each isolate and help in generating an information database which is available on the CMCC website (http://mycorrhizae.org.in/CMCC).

Solar Smart Mini-grid Facility

TERI has established solar hybrid smart mini-grid at its Gual Pahari campus. The mini-grid has inhouse developed controller for load scheduling and load & grid management including prioritizing of solar PV utilization.

Mass Production Technology

In vitro mass production technology produces viable, healthy, genetically pure, and high-quality mycorrhizal propagules without any pathogenic contamination in a sterile environment.

DNA Fingerprinting and Molecular Breeding Lab

The DNA fingerprinting facility is a state-of-the art laboratory for varietal identification, mapping of genetic diversity, and marker assisted breeding. The facility harbours a LICOR 4300 DNA analyser and other molecular biology-related equipment. The facility is being used for providing DNA fingerprinting services to state horticulture departments and genotyping services to plant breeders for their breeding programmes.

Plant Genetic Transformation and Functional Genomics Laboratory

This laboratory has all the basic equipment such as Real Time–PCR, gel electrophoresis systems, and plant culture room. It works on developing genetically modified plants for better quality and productivity under changing environments.

Micropropagation Technology Park

Complete with infrastructural facilities ranging from modern laboratories and greenhouses to nurseries that are required for mass production of tissue-cultured plants, the facility has an annual production capacity of over two million plants.

Herbal Garden at Supi

The herbal garden is home to more than 60 different varieties of fresh and dry exotic vegetables, fruits, and herbs such as all in lower case font.

TERI–Deakin Nanobiotechnology Research Centre

The Centre bridges the gap between industry

and academia through research and collaboration of leading international experts to generate effective solutions for a sustainable future. This Centre is working towards a greener and more advanced use of nanotechnology for resolving challenges in agriculture, biofuel production, and biomedical issues through nanoparticles, nano-biosensors, nanocarrier-formulations, nanodelivery of agrochemicals, and seed coating formulations (details available at: http://tdnbc.teriin.org).

Fermentation Technology and Research Centre

The Centre is a state-of-the-art fermentation with a pilot-scale platform to carry out studies. It has a series of fermenters of working volume ranging from 3.5 litres to 13,000 litres. Apart from mass-scale production of indigenously developed oil degrading bacterial cultures, the facility has capacity to carry out research on anaerobic fermentation processes in pilot and large industrial scale.

Microbial Biotechnology Laboratory

The Laboratory is an experimentation facility for the exploration of microbial diversity to provide biotechnological solutions in the field of environmental protection and sustainability, especially in the sector of oil and gas. The facility has state-of-the-art set ups for petrochemicals, petroleum microbiology, petroleum hydrocarbons, and molecular biology with automated facility and real-time PCR systems. Infrastructure for both aerobic and anaerobic microbiology facility is also available. The laboratory is supported by analytical facility that is equipped with Gas Chromatography, High Performance Liquid Chromatography, Gas Chromatography-Mass Spectrometry, GC-headspace systems with other requisite instrumentations.

Supercomputer to Enhance Climate Modelling Capabilities

TERI has a well-equipped climate modelling infrastructure, which consists of a supercomputer with a peak performance of 12TeraFLOPs - to carry out the climate simulations at various spatial and temporal scales with varying global and regional horizontal resolutions. High-end servers are also present for running impact models at ultra-high resolutions. TERI's research in climate science and associated modelling spans a whole range of activities beginning with the understanding of the climate system through the use of state-of-art modelling tools like Global Climate Models, viz., CCSM, CESM and NorESM; Regional Climate Models, viz., PRECIS, WRF and COAWST and impact models, viz., ADCIRC (for storm surges and coastal inundation), MIKE-11 (for inland flooding), SWAT (for water resources), DSSAT (for agriculture), and DIVA (for coastal zones).

TERI Water Laboratory

Recognized and certified under the Environment (Protection) Act of 1986 by the Ministry of Environment and Forest (now, Ministry of Environment, Forest and Climate Change), Government of India, the laboratory is equipped



➢ *Himalayan Centre at Latey Bunga, Mukteshwar*

with field sampling, monitoring equipment, and analytical instruments. The laboratory provides multi-disciplinary water quality and quantity monitoring, testing, and related services.

TRISHA

TERI's Himalayan Centre at Latey Bunga, Mukteshwar exemplifies 'ideal' green environment. It is a symbol of optimum use of natural resources such as solar and other forms of renewable energy.

TERI's Research Facility in Bengaluru

The TERI Southern Regional Centre building is a judicious blend of technology and tradition that promotes energy efficiency and sustainable development. The centre has a state-of-the-art environmental laboratory at Bengaluru office, which includes:

- Sophisticated instrumentation, such as atomic force microscopy and FTIR spectroscopy;
- Polymer-processing equipment such as Dynisco table top twin-screw extruder, Microwave reactor, Brabender plastic order, and compression moulding;
- Testing instruments such as Extensometer, EMI shielding analyser, Delta mode systems, and Specific gravity tester.

Knowledge Resource Centre

TERI library houses a wide array of resources on energy, environment, and sustainable development—from books, journals, and papers to the world's leading academic databases. A book digitization scanner—Bookeye 4—is installed in the Library and Information Centre.

TERI Gram

TERI Gram is located on the outskirts of Delhi. It is a sustainable habitat consisting residential as well as conference facilities, powered by a specially designed renewable energy system to meet its energy requirements.

Test Bed Facility, Gual Pahari

TERI and Somfy India Private Limited had partnered to set up a Test Bed Facility at Gual Pahari in the year 2015/16. The main objective of setting up this facility is to derive the benefits of Somfy Roller Blinds in
test building.

TADOX® Wastewater Treatment Plant

TERI Advanced Oxidation Technology (TADOX®) for the treatment of industrial and municipal wastewater is currently being demonstrated at TRL-7 with a wastewater treatment plant of 10 KLD (10,000 L per day) capacity. The USP of this technology is that it can treat in few hours and bypass any kind of biological treatment and directly utilizes Advanced Oxidation Nanotechnology for the treatment of sewage and mixed effluents from the campus.

Mahindra Centre for Excellence

A joint research initiative of Mahindra Lifespace Developers Limited (MLDL) and TERI, the vision of the Mahindra-TERI Centre of Excellence (MTCoE) for Sustainable Habitats is to foster sustainability by developing innovative and resource-efficient solutions tailored to the Indian building sector and climate.

The CoE, a SVAGRIHA 5-star rated facility, has received accreditation from National Accreditation Board for Testing and Calibration Laboratories (NABL) for testing the thermal properties of building materials. It is equipped with a one-of-its-kind 'Guarded Hot Box', that was fabricated under the close guidance of TERI researchers. The facility has a 'Sky Scanner' installed to monitor the sky conditions of Gurugram city. The findings of the study would throw light on the impacts of climate change and provide a fresh perspective on the way we design buildings today. The water sustainability city-level assessment, building-level water audits, and a web-based tool generate awareness among



➢ MTCoE Lab

relevant stakeholders, mitigate potential risks, and ensure efficient water management at micro and macro levels. A web-based EcoNiwas Samhita Design aider tool has been developed to ease the implementation of the residential building code at the design level. To know more about the CoE, please visit the website Mahindra-TERI Centre of Excellence (mahindratericoe.com).

TERI Food Testing Laboratory at NERC

The Food Testing Laboratory partially funded by the Ministry of Food Processing Industries (MoFPI) has been developed for testing of packaged water, food, and beverages for determining chemical, microbial and elemental parameters. The Laboratory has been accredited as NABL testing lab for testing of Packaged Drinking Water (As per IS: 14543) for some chemical parameters. Apart from the scopes for ensuring food safety, in due course of time nutritional profiling and GMO testing will also be included in the scope of services of this lab.

Nano Production Technology

The National Centre of Excellence for Advanced Research in Agricultural Nanotechnology is the first-of-its-kind research platform in India, which endeavours to carry out end-to-end research to innovate green nanoproducts including nano-fertilizer, nano-pesticide and nanocarrier products and technologies. Safe and efficacious nanoproducts will be developed by the Centre in order to meet the global food demand along with protecting environment and human health.

Centre of Excellence in Agriculture and Environment

We make significant contributions to the development of the research and scholarly capabilities of the future generation in partnership with TERI SAS in India and Deakin University in Australia.

Nursery Development at STI Hub, Mokhada

As part of ongoing livelihood initiatives, the TERI team continued nursery development activities at the STI Hub site in Mokhada. In parallel with Oyster Mushroom and Azolla cultivation training, efforts focused on preparing land for the propagation of aromatic plant species used in essential oil



extraction. Local labour was employed for weed removal and land levelling, ensuring proper drainage and a uniform soil structure to support healthy plant growth and efficient irrigation. Four nursery beds (10 m x 2 m) were established for cultivating citronella, palmarosa, and patchouli, while an additional bed (2 m x 1 m) was prepared for Azolla cultivation. These initiatives aim to enhance income-generating opportunities for the ST communities in the region.

Monitoring and Supervision of Essential Oil Distillation Unit Construction at STI Hub, Mokhada

The TERI team conducted regular monitoring of the preliminary construction activities for the essential oil distillation unit at the STI Hub site. During the site visit, Mr Ajay Kumar Chaubey, Senior Project Engineer, provided on-site guidance to the labour force, ensuring that construction followed project specifications. Key aspects such as site preparation, structural integrity, and adherence to timelines were closely reviewed. The team's active supervision was instrumental in addressing



Foliar spray with TERI Nano Urea



Farmer's Practice, 100% Urea

➢ **Evaluation of TERI Nano urea product under drone application in Chilli**



➢ **Azolla demonstration unit**



➢ **Nursery beds prepared**

technical challenges, offering timely solutions, and ensuring that the construction met the required standards for the successful set-up of the distillation unit.

TERI Food Testing Laboratory at NERC

The Food Testing Laboratory at TERI-NERC, partially funded by the Ministry of Food Processing Industries (MoFPI), has been established to conduct comprehensive testing of drinking water, food, and beverages across chemical and biological domains. The laboratory is accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) for chemical testing of drinking water, tea, and spices. To further enhance its testing capabilities, the laboratory plans to expand its scope to include heavy metal and pesticide residue analysis, as well as chemical testing of fats and oils, and cereals and cereal-based products.





➢ **Supervision of construction of oil distillation unit**



➢ **Oil distillation unit under construction**

FINANCIAL SUMMARY 2024/25

INFLOWS (₹ in Lakh)



96.46%
₹27,907.91
INCOME FROM PROJECTS



1.83%
₹529.52
INCOME FROM INVESTMENTS



1.71%
₹494.92
INCOME FROM OTHERS

TOTAL **100%** (₹28,932.35)

OUTFLOWS (₹ in Lakh)



32.68%
₹7659.12
SALARIES



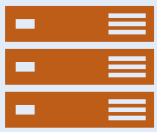
4.59%
₹1075.91
EQUIPMENT



55.39%
₹12,981.10
RESEARCH MATERIAL, TRAVEL



6.61%
₹1549.05
RENTAL,UTILITIES, INFRASTRUCTURE AND MAINTENANCE



0.73%
₹171.18
ADMINISTRATIVE EXPENSES

TOTAL **100%** (₹23,436.36)

About TERI

The Energy and Resources Institute (TERI) is an independent, not-for-profit research organization advancing innovative solutions in energy, environment, climate change, and sustainable development. Headquartered in New Delhi, with regional centres in Gurugram, Bengaluru, Guwahati, Mumbai, Panaji, and Nainital, TERI is powered by a 1,000+ strong multidisciplinary team of scientists, engineers, economists, and sociologists engaged in action-oriented research and implementation.

In its journey of more than 50 years, TERI has shown unparalleled dedication to multidisciplinary research, advocacy, and development of policies and technologies in energy, energy efficiency transitions, sustainable agriculture, eco-friendly transportation, sustainable development, efficient building practices, and climate action.

A leader in innovation and visionary approach, TERI is committed to identifying measures and intervention towards green solutions since it started as TATA Energy Research Institute in 1974. Over the years, we have expanded beyond conventional and renewable energy sources too, actively exploring cleaner alternatives besides engaging passionately in addressing climate-related issues, corporate social responsibility (CSR), and a host of other critical areas of concern.

Backed by rigorous research, active engagement in policy formulation, capacity building, development of innovative technologies, and the implementation of on-the-ground projects, TERI today is widely acknowledged for making a tangible difference in the world.

We take immense pride in developing ourselves into an institute which is influencing policymakers to grassroots workers in rural India and providing localized solutions with global vision.

As we gear up for the next 50 years, TERI is determined to carry forward the legacy of its multidisciplinary approach, of providing holistic solutions, and playing a pivotal role in crafting eco-friendly and equitable solutions for India and neighbouring countries.

THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future

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