



**THE ENERGY AND  
RESOURCES INSTITUTE**

*Creating Innovative Solutions for a Sustainable Future*



**TERI'S  
SOLUTIONS FOR  
SUSTAINABLE  
DEVELOPMENT**





# **TERI'S SOLUTIONS FOR SUSTAINABLE DEVELOPMENT**



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## **MESSAGE FROM DR VIBHA DHAWAN, DIRECTOR GENERAL, TERI**

The Energy and Resources Institute (TERI) had championed the cause of sustainable development long before many had delved into this space. As we enter the momentous 50th year of our journey, we look back with immense pride at our extensive repository of practice and knowledge, cutting across various disciplines, and take a bold resolve to realize our dream for a greener and resilient planet.

From a documentation centre based out of a single room in Mithapur, Gujarat, TERI has come a long way, evolving into a multifaceted, independent research institute and think tank. It is unique in its active engagement in developing need-based solutions by leveraging technology for ground-level innovations, and inclusive decision making.

In the last five decades, TERI has splendidly showcased the importance of developing products and solutions that are green, including energy efficient technologies and policy frameworks. These have contributed towards promoting the cause of sustainability across our country and globally, while also amplifying environmental and climate issues to a wide range of fora comprising policymakers, researchers, and other key players.

In its efforts to address the multifaceted and intertwined challenges associated with sustainable development, TERI has built a legacy of striving tirelessly to experiment, develop, demonstrate, and upscale a wide range of ideas and models. While working for the public good across the world, TERI is cognizant of its responsibility to give back noteworthy solutions for the advancement of sustainable development.

*TERI's Solutions for Sustainable Development* underscores TERI's long standing commitment and accountability towards local and global community. The research publication reflects a vast array of work the organization has been doing since 1974 and TERI's solution-based approach in tackling global problems pertaining to environment, energy and climate. The research professionals of TERI have immensely contributed in developing these solutions through their unceasing effort and dedication.

I am glad to place before you a compendium of TERI-led solutions for sustainable development which could trigger a meaningful dialogue and a multi-partner engagement. This publication comes with a resolution that we at TERI will continue engaging with a wide range of stakeholders to ensure a sustainable and equitable future for all.



# INTRODUCTION

*TERI's Solutions for Sustainable Development* is a compilation of 60 'knowledge products' to instill the practice of sustainability for a wide range of stakeholders. These solutions are the tangible pathways for effective realization of sustainable development by the global community.

The curated solutions are categorized into: Sustainable Agriculture, Climate Change, Energy, Environment which includes Forestry and Biodiversity, Air, Water Resources, Biotechnology, and Waste Management, followed by Resources, Habitat, Health and Nutrition, Social Transformation, and Outreach.

For sustainable agriculture sector, the solutions such as nanofertilizers and climate-resilient agriculture are some of the essential aspects for which farmers need timely interventions from research fraternity. Similarly, the sericulture and aquaculture solutions are aimed at improving efficiency and sustainability of the resources.

Solutions under climate change are the tools that include early warning systems for floods, inventory of GHG emissions, building resilience, and adaptation. The solutions also specifically address needs of policymakers to develop suitable responses to minimize repercussions of climate change by utilizing scientific models-based information.

The solutions on energy are aimed at achieving domestic and industrial energy use efficiency, alternatives for clean energy for rural community, especially improved cook stoves and industrial sectors. In spite of deeper penetration of LPG cylinder in India, firewood dependence still persists, principally attributable to limited economic affordability for LPG refilling. In such conditions, improved cook stoves along with LPG for rural households could accrue social, environmental, and family health benefits. This would also aid decision-makers at developing decarbonization pathways.

The forestry and biodiversity sector solutions provide opportunity for augmenting carbon credits from plantation, agroforestry, and forest conservation-based carbon finance projects. Devising biodiversity strategy and action plans and provisioning of quality planting material are much-needed, site-specific requirements. Degraded and mixed areas are also tackled to restore ecosystem services.

Handling air pollution through source apportionment studies, environmental auditing, and airshed management provide viable solutions. TERI also has an NABL-recognized environmental laboratory for a wide range of users to take the advantage of sample analysis.

Water Resources section provides the solutions targeting water-use efficiency, water-positive business, TADOX® Technology for wastewater treatment. Glacier vulnerability assessment and monitoring are significant sources for the efficient functioning of hydropower dams in the Himalayas.

Biotechnology-based solutions are extensively utilized for the bioremediation of toxic waste lands, microbes-based oil recovery, and paraffin deposition mitigation. Biogenic methane production from

coalbed and carbon dioxide utilization for value-added product development are relevant from the perspective of climate change. TERI has a state-of-the-art, NABL-accredited Environmental and Industrial Biotechnology (EIB) Laboratory to assess water quality (drinking, surface, and ground) and carry out petroleum hydrocarbon-testing for the stakeholders across India.

Waste management solutions provide comprehensive assessment of bio and plastic waste. This would strengthen implementation of waste management, subsequently leading to the mitigation of emissions.

Resources section provides pragmatic approach for economic development from the perspective of sustainable development. Our tested examples of Just Transition processes, green budgeting and green public procurement, and responsible consumption do provide a systematic way forward.

The section on habitat provides the solutions pertaining to urban lifestyle with resource-efficient building designs, emission calculator for urban transport, urban freight systems, and smart city options.

TERI's NABL-accredited Laboratory for food testing for health and nutrition is an important unit to recognize food safety. Micro-bioalgal plant provides a range of byproducts, notably in the form of food supplements and biofuel.

Social transformation section demonstrates the examples of model village development through corporate social responsibility (CSR) and augmenting job opportunities through Green Skill Development programmes for youths and women-led energy enterprises along with improved working conditions for loom workers.

Outreach section provides solutions pertaining to educate young generation on sustainable development that has viable application in developing school campuses as well as responsible tourism like coastal eco-tours. To illustrate, 'Kumaon Vani Community Radio' is an effective medium of establishing communication with remote rural communities. TERI also provides E-learning platforms to customize the education needs of all the involved stakeholders, based on our vast knowledge resources developed and curated over the five decades.

Developing such solutions is a prime mandate of TERI and hence such solutions would continue to get evolved and revised to cater to the needs.



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## **SUSTAINABLE AGRICULTURE**

- Micropropagation Technology for Climate-resilient Agriculture
- Biogenic Nanofertilizers for Sustainable Agriculture
- Technologies for Sericulture
- Capacity Building for Climate-resilient Aquaculture

# MICROPROPAGATION TECHNOLOGY FOR CLIMATE-RESILIENT AGRICULTURE



**Purpose:** Rapid and large-scale micropropagation of climate-resilient planting material for climate-smart agriculture in a limited space and time, all round the year

**Process:** Selection of quality planting material, culture initiation, multiplication, shoot elongation, rooting, and hardening of plant to acclimatize under natural conditions

**Outcome:** Producing climate-resilient plants that can adapt to under extreme environmental conditions to realize better yield and quality

**TERI's expertise:** With an expansive experience of more than three decades in the field, Micropropagation Technology Park (MTP) of TERI has produced and supplied more than 70 million quality planting material all over the country

**Upscaling potential:** The MTP has an upscaling potential to standardize and produce as per specific needs of plants which could play a decisive role in climate-resilient plantation of particular variety of a species

**Stakeholders:** Ministry of Ayush, horticulture and forest departments, private nurseries, and commercial growers

**SDGs addressed:** 1, 2, and 13

**Query and coordination:** Dr Vibha Dhawan (vibhad@teri.res.in)

# BIOGENIC NANOFERTILIZERS FOR SUSTAINABLE AGRICULTURE



**Purpose:** Providing benign alternatives to conventional fertilizers for enhancing nutrient-use efficiency and crop yield, reducing demand of conventional chemical fertilizers, restoring soil, and saving water, soil, and air from chemical pollution

**Process:** Biogenic synthesis of nanofertilizers for realizing 50% reduction in the application dosage of conventional fertilizers

**Outcome:** Enhanced nutrient-use efficiency and crop yield, reduction in greenhouse gas (GHG) emission, soil, and water pollution

**TERI's expertise:** Development of highly efficacious and environmentally safe biogenic nanofertilizers

**Upscaling potential:** The technology could give beneficial outcomes to the farmers in India and South Asia

**Stakeholders:** Fertilizer companies, farmers, and state and central agriculture ministries

**SDGs addressed:** 2, 13, 14, and 15

**Query and coordination:** Dr Pushplata Singh (pushplata.singh@teri.res.in)



# TECHNOLOGIES FOR SERICULTURE



**Purpose:** Provide efficient and labour-friendly solutions for the sericulture sector

**Process:** Establish heat recovery units (HRUs) to enhance efficiency, biomass-based pupae dryer unit to improve indoor environment quality for workers, common facility for using solar-passive building for silkworm rearing, efficient reeling, dyeing, and beaching of silk yarn

**Outcome:** An HRU reduces the waiting time between batches and fuel consumption. It prevents pupae from decaying and ensures effective drying, emanates odour of pupae. Apart from reducing fuel consumption, gasifier technology, improves the silk quality, lowers carbon and suspended particulate matter (SPM) levels

**TERI's expertise:** TERI through a number of combinations of solutions has demonstrated how improvements to the sericulture industry can be introduced

**Upscaling potential:** Viable solutions can be applied at silk units in states like Karnataka, Jharkhand and Silkworm Seed Technology Laboratories across India

**Stakeholders:** Sericulture departments, district administration, silk manufacturers, silkworm rearers, local communities, and Central Silk Board

**SDGs addressed:** 1, 3, 7, 8, 9, 10, 11, and 12

**Query and coordination:** Yabbati Nagaraju (nagaraju@teri.res.in)

# CAPACITY BUILDING FOR CLIMATE-RESILIENT AQUACULTURE



**Purpose:** To strengthen capacity building in climate-resilient farming practices in aquaculture, adapted in the light of the local context, chiefly to fulfil the needs of women

**Process:** Capacity building is achieved via relevant trainings and demonstrations

**Outcome:** Capacity building and development of alternative livelihood for the economic security of coastal communities, increased adoption of climate-resilient practices, and improved access to climate-resilient inputs and technologies, increased awareness and understanding of coastal ecosystems

**TERI's expertise:** Over a decade of experience in baseline assessments, training design, technology and knowledge transfer, and monitoring and evaluation, and vulnerability assessments with respect to climate change

**Upscaling potential:** The outcomes are of practical significance to fish-rearing community, especially in India and South Asia

**Stakeholders:** Smallholder fish farmers, entrepreneurs, state and central fisheries ministries

**SDGs addressed:** 4, 12, 13, and 14

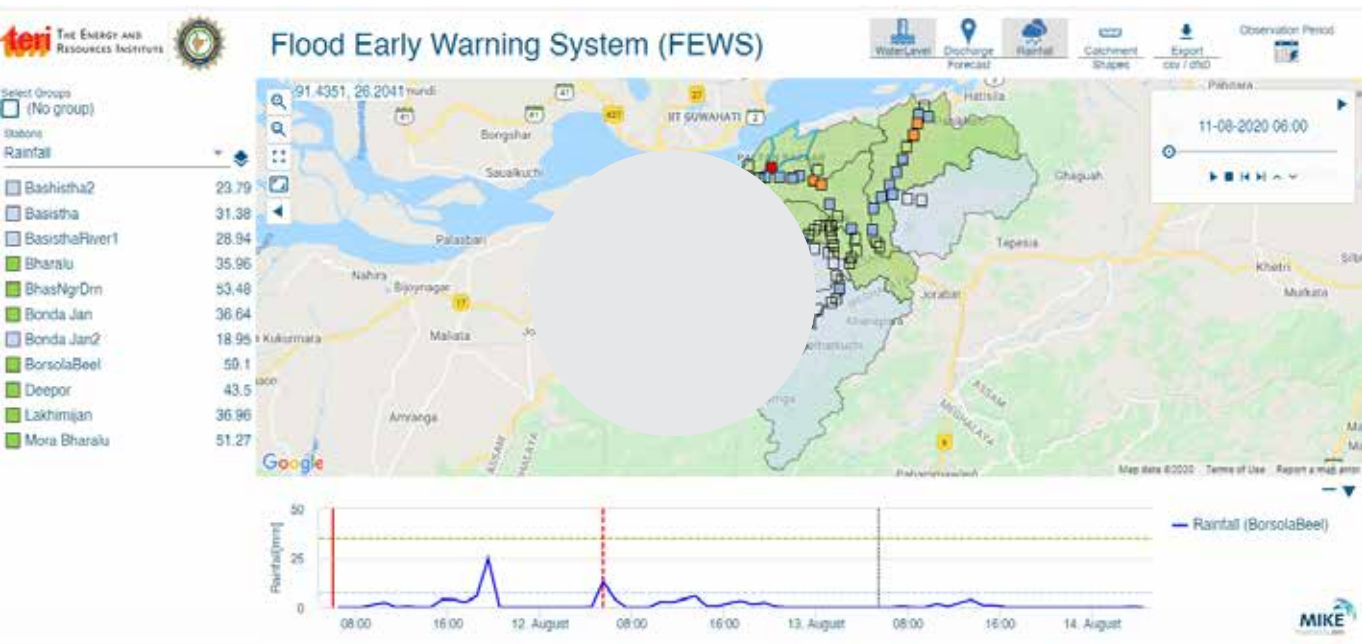
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## **CLIMATE CHANGE**

- Early Warning Solution for Disaster Resilience
- Climate Adaptation and Risk Resilience
- GHG Inventory and Net-zero Pathways
- TERI Climate Tool



# EARLY WARNING SOLUTION FOR DISASTER RESILIENCE



**Purpose:** Disaster risk reduction and enhance resilience for flood

**Process:** The FEWS (Flood Early Warning System) uses hydrodynamic simulation models for estimation of flow to generate spatial inundation maps on the basis of weather forecasting by the India Meteorological Department (IMD)

**Outcome:** To serve as a valuable and efficient instrument for managing risks, notably at city level. It provides inundation forecast and early warning for flooding situation in the selected geography. This information is utilized in developing suitable response and planning pertinent to flood management

**TERI's expertise:** TERI is well equipped with modelling tools and technical capabilities in developing solutions aimed towards reinforcing resilience for disasters

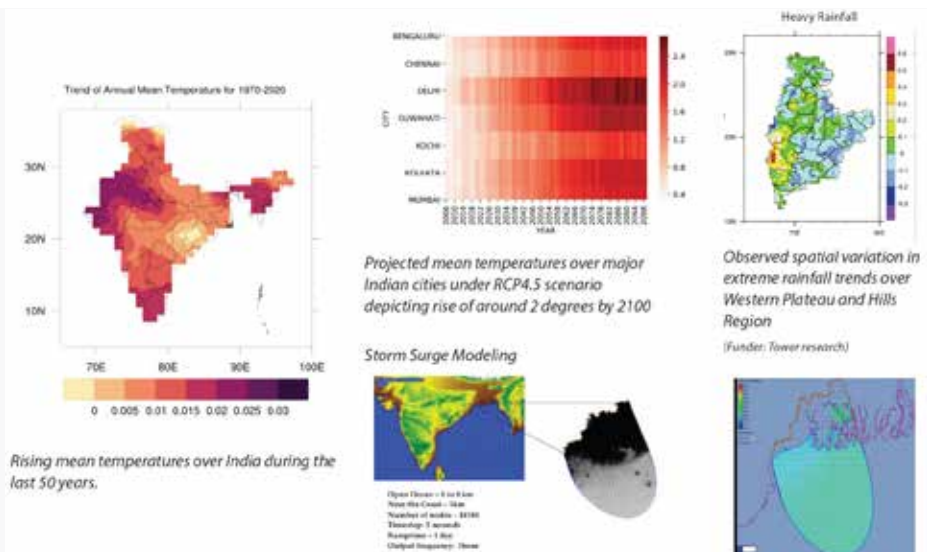
**Upscaling potential:** Climate-vulnerable geographies across India and South Asia can make use of FEWS to mitigate floods

**Stakeholders:** Municipalities and disaster management authorities

**SDGs addressed:** 3, 6, 11, and 13

**Query and coordination:** Prasoon Singh (prasoon.singh@teri.res.in)

# CLIMATE ADAPTATION AND RISK RESILIENCE



**Purpose:** Carrying out analysis and mapping of emerging climate risks and associated impacts to provide adaptation solutions

**Process:** Identification of specific risks and threats are imperative to design strategies for risk mitigation management. TERI works closely with communities, national, sub-national, and local actors to devise strategies and solutions for effective and efficient resource utilization and risk management across sectors

**Outcome:** To improve adaptive capacities and climate resilience through building knowledge on biophysical impacts of climate change, socio-economic drivers of vulnerability, and gender differentiated coping capacities

**TERI's expertise:** Since 1988, TERI has been actively developing knowledge base and products for clients across geographies on climate change adaptation and resilience, leading to informed action at subnational, national, and global levels

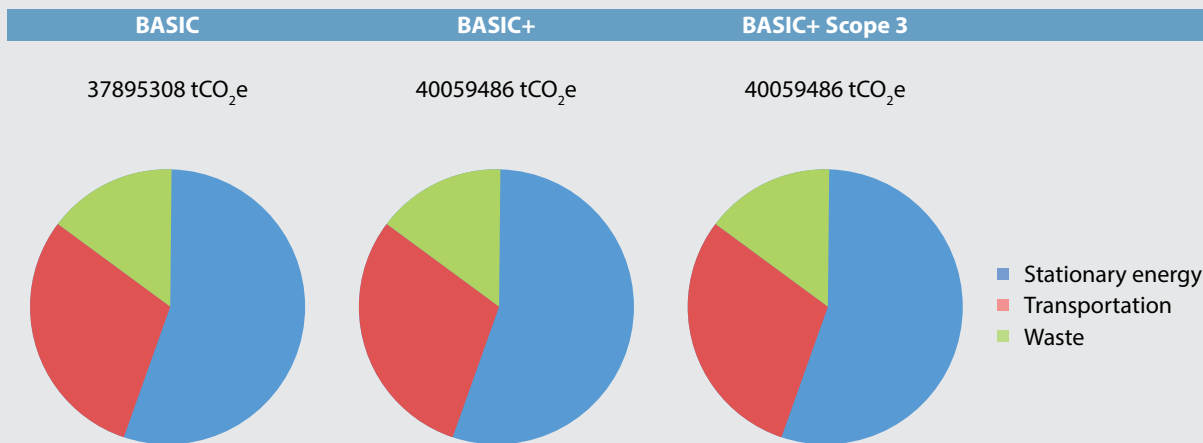
**Upscaling potential:** States and other entities could invest in strengthening their adaptation and resilience strategies, along with undertaking capacity building and policy engagement

**Stakeholders:** Communities, governmental and non-governmental organizations, academia, bi-lateral and multi-lateral agencies, industries and businesses

**SDGs addressed:** 1, 2, 3, 4, 5, 9, 10, 11, 12, 13, and 17

**Query and coordination:** Suruchi Bhadwal (suruchib@teri.res.in)

# GHG INVENTORY AND NET-ZERO PATHWAYS



**Purpose:** To report greenhouse gas (GHG) emissions from various sources and accordingly achieve net-zero by balancing emissions with removals or offsets

**Process:** GHG inventory involves collecting data and calculating emissions using established methodologies. These GHG emissions are further assessed to propose reduction targets and strategies, while also continuously monitoring the progress

**Outcome:** GHG inventory will help identify emission hotspots and trends, in addition to promoting transparency and accountability

**TERI's expertise:** TERI specializes in developing state and city-level GHG inventory, mitigation strategies, and GHG inventory for corporates

**Upscaling potential:** To develop and assess GHG emission profiling along with net-zero targets at different levels

**Stakeholders:** States, local, regional departments, environment departments, regional, and corporates

**SDGs addressed:** 7, 11, 12, and 13

**Query and coordination:** Veena C. P. (veena.cp@teri.res.in)

# TERI CLIMATE TOOL



**Purpose:** To help decision-makers to become 'climate ready' and assist policy planning by aiding research

**Process:** TERI Climate Tool (TCT) consists of spatially referenced data visualized on multiple web interfaces, its users can evaluate vulnerabilities, risks, and actions for specific locations by interpreting climate-related data at various levels (using AR5 projections)

**Outcome:** The portal provides development practitioners a resource to explore, evaluate, synthesize, and learn about climate-related vulnerabilities and risks at multiple degrees of detail, and to enable policy development

**TERI's expertise:** TCT is a climate atlas in the form of a web-based platform to assist accessible in capacity building and knowledge development. The Tool can be accessed via: <http://tct.teriin.org/ClimatePortal/Default.aspx>

**Upscaling potential:** TCT has immense potential to be used for numerous impact layers such as agriculture, health, infrastructure, etc. It has the capability to add more thematic layers and updated data sets (AR6), in addition to providing information at the village level

**Stakeholders:** State and central governments, public and private sector players, policymakers

**SDGs addressed:** 11 and 13

**Query and coordination:** Suruchi Bhadwal ([suruchib@teri.res.in](mailto:suruchib@teri.res.in))

## **ENERGY**

- Improving Household Energy Efficiency Through Energy Audits
- Improving Industrial Energy Efficiency Through Industrial Energy Audits
- Improved Cookstoves and Retrofits
- Clean Energy Transportation
- Decarbonization Pathways for the Power Sector in India
- Biomass Gasifiers for Heat Applications

# IMPROVING HOUSEHOLD ENERGY EFFICIENCY THROUGH ENERGY AUDITS



**Purpose:** Cutting emissions by improving energy efficiency in homes for electrical appliances utilized for heating, lighting, and cooling purposes

**Process:** Carrying out home energy audits (HEAs) for appropriate accounting, quantification, verification, monitoring, and analysis of energy use by various energy-consuming appliances in a household, followed by suggesting solutions and recommendations for improving energy efficiency

**Outcome:** The HEAs will help consumers map energy usage in their households, conserve energy, improve energy efficiency, and thereby, maximize their household's energy and cost savings

**TERI's expertise:** Residential equipment audit for Bureau of Energy Efficiency (BEE), township audits, etc. along with conducting webinars and training programmes (for students and parents) on home energy conservation and management

**Upscaling potential:** To extensively engaged with utility and electric appliance manufacturers including but not limited to ceiling fan, air conditioners, refrigerators, and washing machines

**Stakeholders:** State utilities, appliance manufacturers, and green fund bankers

**SDGs addressed:** 7, 8, 9, and 11

**Query and coordination:** T. Senthil Kumar (tsenthil@teri.res.in)

# IMPROVING INDUSTRIAL ENERGY EFFICIENCY THROUGH INDUSTRIAL ENERGY AUDITS



**Purpose:** Achieving efficient industrial energy consumption

**Process:** Conducting industrial audits for appropriate accounting, quantification, verification, monitoring, and analysis of energy usage by various energy-consuming equipment and processes, accordingly suggesting solutions and recommendations for introducing efficiency in energy utilization

**Outcome:** These audits help industries to map their energy usage, conserve energy, improve energy efficiency, and thereby, optimize their power consumption and realize cost savings

**TERI's expertise:** TERI has carried out more than 2000 industrial energy audits, covering sectors like power plants, cement, steel, textiles, FMCG, chemicals, amongst others

**Upscaling potential:** Alongside continuing our work in the existing sectors, the scope of industrial audits is always extending to the new sectors brought under the ambit of BEE. Worth quoting examples include pharmaceutical, mining, sugar, DISCOM, port, railways, and buildings

**Stakeholders:** Industries, state utilities, equipment manufacturers

**SDGs addressed:** 7, 8, 9, and 11

**Query and coordination:** T. Senthil Kumar (tsenthil@teri.res.in)



# IMPROVED COOKSTOVES AND RETROFITS



**Purpose:** Developing improved cookstoves and retrofits for various applications

**Process:** Technology customization for natural and forced draft cookstoves and required biomass

**Outcome:** Saving firewood, kerosene, achieving reduction in charcoal use, reduced indoor air pollution, and reusing heat from flue gas

**TERI's expertise:** Based on requirements and use, TERI has developed different variants of cookstoves, for instance, pyrolyzer stove, top-loading forced draft cookstove, front-loading forced draft cookstove, low-cost two pot stove, bio-oil based pressurized cookstove, and for cookstove with heat recovery unit (HRU)

**Upscaling potential:** Improved cookstoves can be installed on national scale, especially for rural households and road-side eateries

**Stakeholders:** Rural energy departments, Panchayati Raj institutions, local NGOs, CSR foundations

**SDGs addressed:** 3, 7, 9, 10, and 12

**Query and coordination:** Yabhati Nagaraju (nagaraju@teri.res.in), R. C. Pal (rcpal@teri.res.in)



# CLEAN ENERGY TRANSPORTATION



**Purpose:** Development of road maps for the electrification of public transport in cities, covering both passenger and freight transportation

**Process:** Planning and assessment of uptake of electric vehicles (EV) in the city, traffic survey and site feasibility analysis, assessing integration of renewable energy sources for EV charging, and drawing a strategy for GHG emission reduction

**Outcome:** City-level development of public transport fleet strategies and road maps

**TERI's expertise:** Prepared Public Transport Electrification Road Map for Kolkata

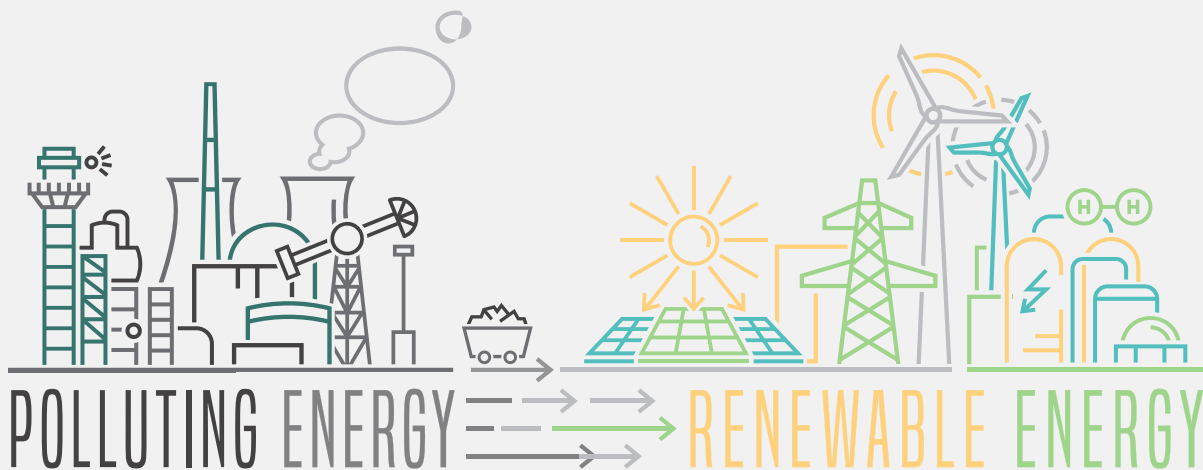
**Upscaling potential:** The study is replicable for any city in the country

**Stakeholders:** Power department, transport department, and environment department of the concerned states

**SDGs addressed:** 9, 11, and 13

**Query and coordination:** A. K. Saxena (ak.saxena@teri.res.in)

# DECARBONIZATION PATHWAYS FOR POWER SECTOR IN INDIA



**Purpose:** Outlining feasible and cost-effective pathways for India's power system to achieve high levels of variable renewable energy in medium (2030) and long terms (2050)

**Process:** Integrated demand-supply study including electricity demand profile projections, electricity generation to meet the projected demand profile, and analysis of the existing policies and regulations, developing and modelling different scenarios for the Indian power sector, considering various factors like technological advancements, cost projections, etc.

**Outcome:** Road map with potential decarbonization pathways covering technical, policy, and regulatory recommendations to help meet the target for renewables

**TERI's expertise:** Decarbonization pathways study for the power sector, renewable power pathways, modelling the integration of wind and solar by 2030

**Upscaling potential:** The study can be customized at sub-national and national levels, periodically taking note of the changes in technologies and cost projections

**Stakeholders:** Government, power companies, renewable energy companies, financial institutions, and funding organizations

**SDG addressed:** 7

**Query and coordination:** A. K. Saxena (ak.saxena@teri.res.in)

# BIOMASS GASIFIERS FOR HEAT APPLICATIONS



**Purpose:** Scaling-up of biomass gasifiers for heat applications, particularly as substitutes for fossil fuel-based systems, can significantly increase India's renewable energy (RE) usage, reduce GHG emissions, and help achieve net-zero goals

**Process:** Study of respective stakeholders such as micro, small, and medium enterprises (MSME) clusters to assess the potential for introducing biomass gasifiers, followed by awareness generation events, along with technology demonstrations and customization

**Outcome:** To provide assistance in reducing the carbon intensity of the economy by approximately 45% by 2030 and net-zero by the year 2070, South-South knowledge transfer for replication in the Global South countries

**TERI's expertise:** Over 800 TERI-designed thermal gasifier systems, with a cumulative field installed capacity of 75 megawatt (MW) have been installed across India and in the South Asian countries. Several trained and licensed gasifier manufacturers have been established in different locations

**Upscaling potential:** Indian and South Asian industries engaged in using heat energy

**Stakeholders:** Engagement with governmental departments, institutes at national and state levels, bilateral and multilateral organizations, private foundations, consulting organizations and financial institutes, and Global South countries

**SDGs addressed:** 1, 3, 5, 7, 8, 9, and 12

**Query and coordination:** Dr N. K. Ram (nkram@teri.res.in)

## **ENVIRONMENT**

### **FORESTRY AND BIODIVERSITY**

- AFOLU Carbon Finance Projects in Voluntary Carbon Market
- Restoration and Rehabilitation of Degraded, Deforested, and Mined Landscapes
- Biodiversity Conservation Strategy and Action Plans
- Developing Quality Planting Material and Nursery Establishment

# AFOLU CARBON FINANCE PROJECTS IN VOLUNTARY CARBON MARKET



**Purpose:** Developing carbon credits for offsetting GHG emissions under afforestation, reforestation, and revegetation (ARR), improved forest management (IFM), and reducing emissions from deforestation and forest degradation (REDD+)

**Process:** Based on the assessment of the type of interventions such as plantations, halting forest degradation, etc. voluntary carbon finance projects are developed by choosing the suitable platform to issue the carbon credits

**Outcome:** Obtained carbon credits can be used for net zero of project proponent or revenue from trade of carbon credits can be given to project beneficiaries as carbon incentives

**TERI's expertise:** Currently, TERI is developing over 28 (ARR and REDD+) carbon finance projects for voluntary carbon markets across India

**Upscaling potential:** India has over 25 million hectares (Mha) of land under agroforestry and more than 30 Mha of forests. In partnership with zone-specific local communities, this extensive area can be potentially tapped for developing carbon credits

**Stakeholders:** Farmers, agroforestry farmer producer organizations (FPOs), forest, agriculture, and horticulture departments of the Indian states

**SDGs addressed:** 1, 2, 5, 13, 14, and 15

**Query and coordination:** Dr J. V. Sharma (jv.sharma@teri.res.in)

# RESTORATION AND REHABILITATION OF DEGRADED, DEFORESTED AND MINED LANDSCAPES



**Purpose:** Restoration and rehabilitation of degraded, deforested, and abandoned mined landscapes

**Process:** Through customization of restoration techniques and technologies, degraded and deforested lands, mined dump (for example, red mud) areas, etc., are restored to have natural vegetation cover

**Outcome:** Through these efforts, degraded areas are brought under natural vegetation, making them fit for providing ecosystem services

**TERI's expertise:** Different types of mined dumps such as iron ore, bauxite, aluminum, fly ash, and oil spills among others, have been restored all over India

**Upscaling potential:** Every closed mine needs a closure plan implementation as compliance, hence restoration and rehabilitation of mined landscapes could be carried out for realizing environmental amelioration

**Stakeholders:** Mining organizations

**SDGs addressed:** 1, 13, 14, and 15

**Query and coordination:** Dr J. V. Sharma (jv.sharma@teri.res.in), Dr Syed Arif Wali (syed@teri.res.in)



# BIODIVERSITY CONSERVATION STRATEGY AND ACTION PLANS



**Purpose:** Developing biodiversity conservation strategies and action plans (BSAPs) from local to national levels

**Process:** Strategy and action plans are developed, chiefly governed by the local requirements, ecological conditions, and geographical extent

**Outcome:** Achieving biodiversity conservation on community and other types of terrestrial and aquatic ecosystems

**TERI's expertise:** For states, protected areas, and community conservation areas strategies and action plans have already been developed

**Upscaling potential:** Over 2.5 lakh biodiversity management committees, corporate social responsibility (CSR) projects, and pharma companies with access and benefit sharing compliance could be provided assistance for developing workable BSAPs

**Stakeholders:** National Biodiversity Authority and state biodiversity boards, drug developers

**SDGs addressed:** 1, 2, 5, 13, 14, and 15

**Query and coordination:** Dr J. V. Sharma (jv.sharma@teri.res.in), Dr Yogesh Gokhale (yogeshg@teri.res.in)

# DEVELOPING QUALITY PLANTING MATERIAL AND NURSERY ESTABLISHMENT



**Purpose:** Providing quality planting material through various propagation techniques from the mother plants to mass propagate plants, along with complete nursery solutions

**Process:** Developing quality planting material of medicinal plants, clones of timber, other forestry, horticultural, and vegetable species through quality seeds, clones, cutting and tissue culture, using a well-established advance nursery (mist chamber, greenhouse, and net house) and micro tissue culture plant (MTP). Producing vermicompost from bio-waste (dry leaves, grass, and kitchen waste) using high-quality earthworms (*Eisenia fetida*)

**Outcome:** Produced 50,000 saplings through advance nursery, 4,000,000 saplings of various kinds of clonal and other species, and 40 tonnes of vermicompost in one cycle

**TERI's expertise:** Over 30 years of experience and a collection of 20 high-yielding clones of economically important species, such as poplar, eucalyptus, and sheesham, germplasm bank of important forestry species (*Acacia nilotica*, *Cassia fistula*, *Azadirachta indica*, etc.), Bambusetum with germplasm of important bamboo species, and herbal garden with more than 50 medicinal plant species

**Upscaling potential:** Commercial cultivators of agroforestry and horticulture species and varieties

**Stakeholders:** Government and private entities, farmers, urban bodies, and residential societies

**SDGs addressed:** 2, 3, 8, 11, 13, and 15

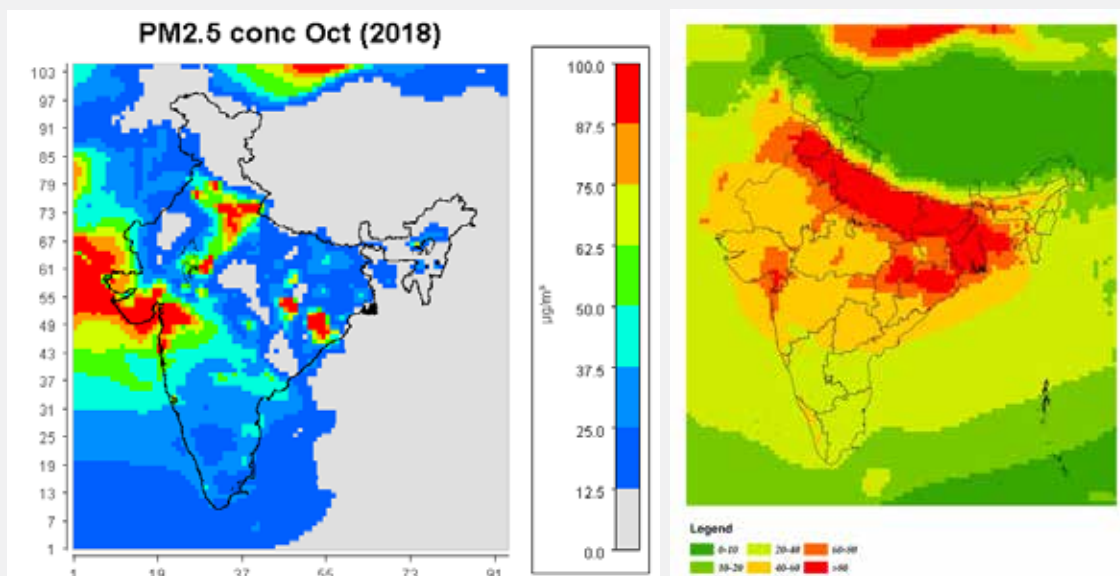
**Query and coordination:** Vinay Pathak (vinay.pathak@teri.res.in), Kapil Kumar (kapil.kumar@teri.res.in)



## **AIR**

- Real-time Source Apportionment and Forecasting for Advance Air Pollution Management in Indian Cities
- Environmental Auditing
- Airshed Management
- NABL-accredited Environmental Laboratory

# REAL-TIME SOURCE APPORTIONMENT AND FORECASTING FOR ADVANCE AIR POLLUTION MANAGEMENT IN INDIAN CITIES



**Purpose:** To understand the real-time effects of various pollution sources including vehicles, dust, biomass burning, stubble burning, and smoke emanating from industries, etc. and to adopt effective measures for air pollution management

**Process:** Identification of major sources of air pollution, estimating emissions of pollutants resulting from these sources, model simulations to understand the contributing sources, forecasting for next three days, setting-up supersite for real-time assessment of sources, and suggesting measures to reduce air pollution

**Outcome:** Based on the results obtained, short-term daily and weekly actions are suggested to systematically assess, reduce, and prevent air quality deterioration for the foreseeable future

**TERI's expertise:** Suggested actions are currently being implemented for effective management of air pollution in Delhi and NCR. Source apportionment studies have been completed in five cities and are being carried out in 12 more cities

**Upscaling potential:** All urban regions across India and South Asia require pollution management strategies where the research can be implemented

**Stakeholders:** Central Pollution Control Board (CPCB), state pollution control boards, city corporations, and the South Asian region

**SDGs addressed:** 1, 3, 7, 9, and 13

**Query and coordination:** Suresh Ramasubramaya Iyer (sureshr@teri.res.in)

# ENVIRONMENTAL AUDITING



**Purpose:** To assess the status of environmental quality in terms of air, water, wastewater, and waste and assess the nature and extent of the risk with respect to harm to human health

**Process:** Gather data and relevant information, evaluate overall performance, identify areas of improvement, and report the findings and recommend actions accordingly

**Outcome:** Managing the risk of harm to human health or environment by recommending apt measures

**TERI's expertise:** Experience of working over two decades on the subject along with an NABL-accredited laboratory used for sampling and analysis. Assignments have been undertaken for different industries, including power plants and office areas.

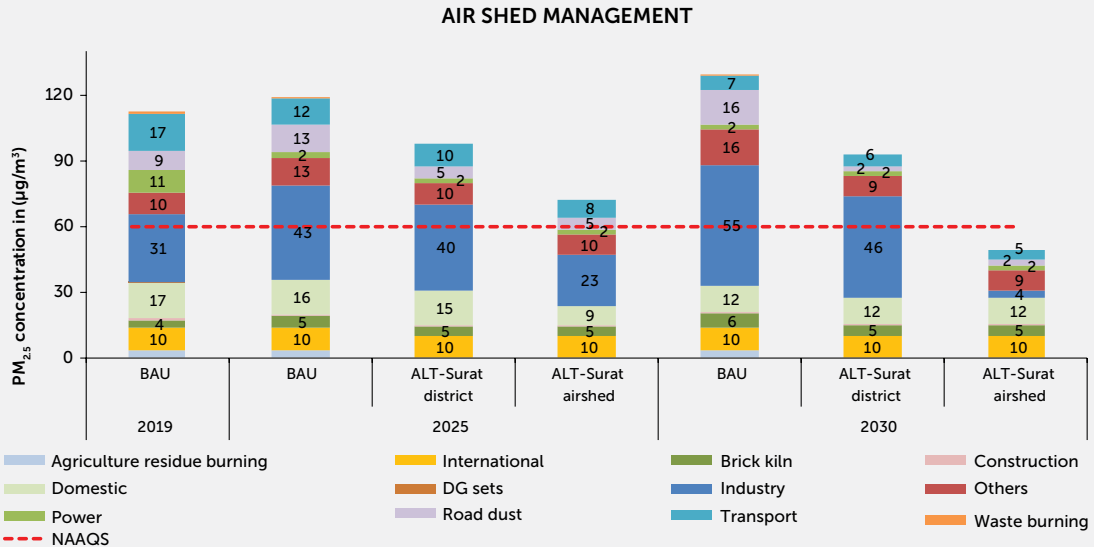
**Upscaling potential:** Environmental auditing is an essential process every industry needs to carry out in periodic intervals

**Stakeholders:** Industrial units

**SDGs addressed:** 1, 3, 7, 9, and 13

**Query and coordination:** Suresh Ramasubramaya Iyer (sureshr@teri.res.in)

# AIRSHED MANAGEMENT



**Purpose:** To contribute towards achievement of the targets defined under the National Clean Air Programme (NCAP), through the airshed approach

**Process:** Understand source contribution and the potential of different interventions for control, identification of prioritized sectoral strategies to control air pollution, and advancing implementation of sector-specific interventions for air pollution reductions

**Outcome:** Strengthen state capabilities for air quality management and planning

**TERI's expertise:** TERI provided airshed assessment study-based recommendations for Surat city while those suitable for Uttar Pradesh are being developed with a focus on Lucknow and other cities

**Upscaling potential:** Since the airshed approach is a part of the NCAP objectives, it has immense potential to be replicated in other parts of the country to improve urban environment quality

**Stakeholders:** Central Pollution Control Board (CPCB), state pollution control boards, environment departments, and municipal corporations

**SDGs addressed:** 1, 3, 7, and 9

**Query and coordination:** Suresh Ramasubramaya Iyer (sureshr@teri.res.in)

# NABL-ACCREDITED ENVIRONMENTAL LABORATORY



**Purpose:** To provide ambient air quality and stack emission testing services across India

**Process:** TERI's Environmental Laboratory has been granted NABL accreditation for 12 parameters, namely: sulphur dioxide (SO<sub>2</sub>), ammonia (NH<sub>3</sub>), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM<sub>10</sub>/PM<sub>2.5</sub>) in ambient air, carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), oxygen (O<sub>2</sub>), particulate matter (PM), and sulphur dioxide (SO<sub>2</sub>) in the flue gas.

**Outcome:** A systematic and organized NABL-accredited laboratory provides ambient air quality and stack emission test reports, strictly in accordance with the guidelines laid down by the Bureau of Indian Standards (BIS) and the Central Pollution Control Board (CPCB)

**TERI's expertise:** TERI's NABL-accredited laboratory is well equipped with skilled manpower capable of handling sampling and chemical analysis of different pollutants in ambient air and flue gas using sophisticated instruments

**Upscaling potential:** Air quality analysis has become a crucial requirement of all urban and newly-urbanized regions across India and a reliable laboratory can provide prerequisites for testing air quality samples

**Stakeholders:** Central Pollution Control Board (CPCB), state pollution control boards, Bureau of Indian Standards (BIS), academic and research institutes, industries, NGOs, National Accreditation Board for Testing and Calibration Laboratories (NABL), Quality Council of India (QCI), and other air quality testing laboratories

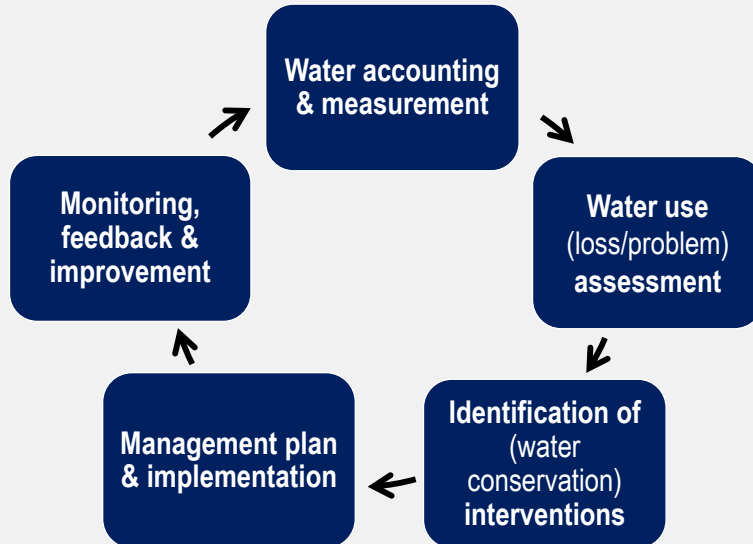
**SDGs addressed:** 3 and 9

**Query and coordination:** Ved Prakash Sharma (vpsharma@teri.res.in)

## **WATER RESOURCES**

- Industrial Water Use Efficiency
- Irrigation Water Management
- Sustainable and Efficient Water Treatment Systems
- TERI's Advanced Oxidation (TADOX®) Technology for Wastewater Treatment
- Glacier Vulnerability Assessment for Hydropower Dams in the Himalayas
- Source Vulnerability Assessment and Transition Towards Water Positivity

# INDUSTRIAL WATER USE EFFICIENCY



**Purpose:** Enhancing water use efficiency of an industry across its operation, value chain and facility

**Process:** Undertaking water audits to identify opportunities and facilitating implementation for improving industrial water use efficiency with ultimate pathway for water neutrality

**Outcome:** Enhanced water use efficiency, reduced specific water consumption (for example, for thermal power plants by 15-33; heavy engineering by ~47%), water neutral or positive operations with co-benefits in energy saving, treatment costs, water quality improvement, pollution abatement

**TERI's expertise:** State-of-the-art tools, models, and infrastructure for scientific design and implementation of interventions for efficient water management including water conservation, water use efficiency, wastewater recycle and reuse; more than three decades of experience in water-intensive industries such as thermal power plants, heavy engineering, textile, pulp & paper, iron & steel, modules for water optimization, end-to-end solution

**Upscaling potential:** There is a significant scope for water-intensive industrial sectors such as thermal power plants, heavy engineering, textile, pulp & paper, iron & steel, sugar, beverage to reduce their water uptake by improving water use efficiency

**Stakeholders:** Industrial sector, MSMEs, hotels, institutions, schools, and hospitals

**SDGs addressed:** 3, 6, 7, 9, 11, and 13

**Query and coordination:** Anshuman (anshuman@teri.res.in)



# IRRIGATION WATER MANAGEMENT



**Purpose:** Improving agricultural water use efficiency

**Process:** Promoting water efficient and climate-resilient irrigation through demonstration of best practices and efficient technologies along with capacity building and policy interventions

**Outcome:** Improved water use efficiency in agriculture, improvement in crop and water productivity, climate-resilient agri-practices, water and energy co-benefits, enhancement in farmer capabilities and livelihood

**TERI's expertise:** TERI assisted farmers in Punjab in reduction of water and energy consumption by 6 to 30% through demonstration-based agri-interventions. The Institute also carried out projects pertaining to practical solutions for water efficient and climate smart agri-irrigation practices, community demonstration and capacity enhancement, and multi-stakeholders' engagement

**Upscaling potential:** A range of successful models/solutions, technologies, and policy options can be upscaled to the wider farming communities at district and state levels with customized and region-specific interventions

**Stakeholders:** Farmers, state government, local NGOs, line departments, agricultural institutions, KVKs, local panchayats, etc.

**SDGs addressed:** 2, 3, 6, 8, 12, 13, and 15

**Query and coordination:** Anshuman (anshuman@teri.res.in)



## SUSTAINABLE AND EFFICIENT WATER TREATMENT SYSTEMS



**Purpose:** To provide clean and safe water supply through sustainable and cost-efficient technologies

**Process:** Water treatment technologies provide access to clean and safe water supply to meet the drinking, domestic and irrigation standards, customization of cost-effective technologies to efficiently tap surface water

**Outcome:** Water treatment systems enable users to switch from using untreated surface waters to cleaner water, thus providing access to clean and safe water supply to meet the drinking, domestic, and irrigation standards

**TERI's expertise:** TERI has implemented the River Bank Filtration (RBF) technology along several major rivers in Kali River, Krishna River, Tungabhadra River, and Kapila River in Karnataka, Sal River in Goa, and Chaudder Lake in Cortalim, South Goa

**Upscaling potential:** To all communities across India that don't have access to clean water and rely on untreated surface water

**Stakeholders:** Urban and local communities interested in tapping surface water

**SDGs addressed:** 1, 6, 13, 14, and 15

**Query and coordination:** Kavita Patil (kavitah@teri.res.in)

# TERI'S ADVANCED OXIDATION (TADOX®) TECHNOLOGY FOR WASTEWATER TREATMENT

## TERI Advanced Oxidation (TADOX®) Technology to treat Wastewater, achieve ZLD and enhance Water Reuse



### Industrial

#### Pre-TADOX®



5 h

#### Post-TADOX®



- COD: 1000 mg/L
- BOD: 112 mg/L
- Total Nitrogen: 223 mg/L

- COD: 256 mg/L
- BOD: 40.6 mg/L
- Total Nitrogen: 10.4 mg/L

### Municipal

#### Pre-TADOX®



5 h

#### Post-TADOX®



- COD: 160 mg/L
- BOD: 45 mg/L
- TSS: 184 mg/L

- COD: 40 mg/L
- BOD: 6.2 mg/L
- TSS: 6.0 mg/L



**ONSITE PLANT:** 20 KLD TADOX® Plant in 100 sq ft space, in Textile CETP in Kanpur funded by NMCG, MoJS, GoI

**Purpose:** Abatement of point source pollution

**Process:** The technology treats municipal and highly polluted industrial wastewater, undertaking Stage I study (50 L sample size), Stage II study (5000 L, pilot plant run), and Stage III (on-site) deployment through licensee partners. TADOX® can be adopted as a decentralized wastewater treatment plant, or can be retrofitted at existing sewage treatment plants (STPs), common and combined effluent treatment plants (CETPs), or effluent treatment plants (ETPs)

**Outcome:** Helps industries achieve zero-liquid discharge (ZLD) in a much affordable, sustainable, and resource and energy-efficient manner, allows urban local bodies (ULBs) to enhance treated water reuse efficiency

**TERI's expertise:** Being TERI's patented technology, a 10-KLD TADOX® Plant treating mixed sewage is functional at TERI Gram campus. A 20-KLD plant has been commissioned in Kanpur by the National Mission for Clean Ganga (NMCG), Ministry of Jal Shakti

**Upscaling potential:** Application of TADOX® can treat industrial effluents, municipal sewage, open drains, and landfill leachates, and put a cap on extensive water pollution resulting from these sources

**Stakeholders:** Industries, urban local bodies, wastewater companies, state governments, CETP associations

**SDGs addressed:** 6, 9, and 14

**Query and coordination:** Dr Nupur Bahadur (nupur.bahadur@teri.res.in)

# GLACIER VULNERABILITY ASSESSMENT FOR HYDROPOWER DAMS IN THE HIMALAYAS



**Purpose:** To ensure operational sustainability of hydropower dams in the Himalayas

**Process:** An integrated assessment of impacts of global warming on climatic parameters of the region and their influence on ice melting, discharge, and sediment flux, helps in monitoring the variability in river runoff pattern

**Outcome:** Improved operational planning and decision making for the dam projects, ensure better preparedness for anomalous changes in the river runoff

**TERI's expertise:** TERI's glacier research stations located in Kashmir, Uttarakhand, and Sikkim are equipped with the latest instruments to measure hydro-meteorological parameters. TERI has produced several publications for improving understanding about melt response of the Himalayan glaciers to climate change parameters

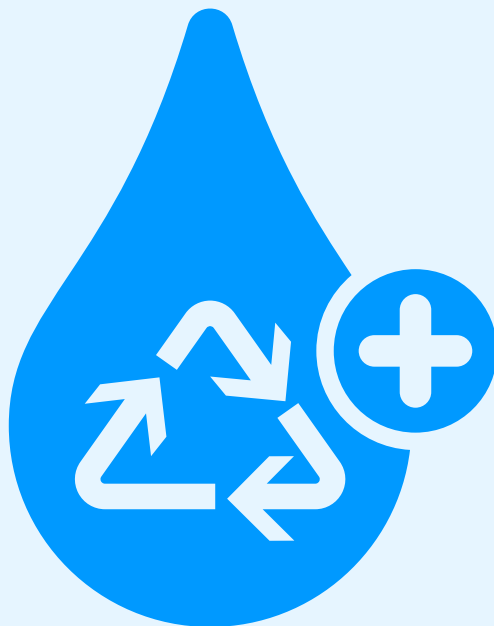
**Upscaling potential:** India has over 75 hydropower dams located in the Indian Himalayas that receive input from snow or glacier catchments in the upstream region where such system can be installed for monitoring

**Stakeholders:** Hydropower dams, financial institutions, and insurance companies

**SDGs addressed:** 6, 7, 12, and 13

**Query and coordination:** Anshuman (anshuman@teri.res.in)

# SOURCE VULNERABILITY ASSESSMENT AND TRANSITION TOWARDS WATER POSITIVITY



**Purpose:** To improve water use efficiency, reduce water footprints, and ensure sustainability of water availability for industries

**Process:** Conduct source vulnerability assessment of water available from rainwater, surface, and groundwater, and its sectoral demand within a region. An application of modelling tools helps in developing plausible future scenarios and a source water protection plan (SWPP) to ensure the transition of business operations towards water positivity

**Outcome:** The assessment will help in reducing water footprints, ensure sustainability of water availability, along with facilitating the attainment of water positivity by the industry

**TERI's expertise:** TERI has conducted a hypothetical testing of water-neutral electricity production in the country

**Upscaling potential:** With increasing environmental compliance, every industry needs to transition their business operations from water intensive to water neutral

**Stakeholders:** Thermal power plants, steel, cement, chemical, and textile industries

**SDGs addressed:** 6, 12, and 13

**Query and coordination:** Anshuman (anshuman@teri.res.in)

## **BIOTECHNOLOGY**

- Bioremediation of Oil-contaminated Land, Water Bodies, and Oily Waste Generated by Oil Companies
- Microbial Enhanced Oil Recovery
- Biogenic Methane Production from Coalbed
- Microbial Mitigation of Paraffin Deposition
- Reclamation of Pesticides and Other Persistent Organic Pollutants'-contaminated Dumpsites
- CO<sub>2</sub> Utilization for Production of Value-added Products
- NABL-accredited Environmental and Industrial Biotechnology Laboratory



# BIOREMEDIATION OF OIL-CONTAMINATED LAND, WATER BODIES, AND OILY WASTE GENERATED BY OIL COMPANIES



**Purpose:** Bio-remediation of marine oil contamination and oil-contaminated soil, oily sludge, oil-contaminated agriculture land, hazardous wastes dump-sites

**Process:** Through microbial-based Oilzapper technology, hydrocarbon-contaminated dump-sites are remediated and restored to hazard-free conditions

**Outcome:** After bioremediation the oil spill sites, oily sludge, oil-contaminated soil become free from hydrocarbons. The sites are rejuvenated and water bodies are restored

**TERI's expertise:** The Oilzapper microbe production bioreactor facility now has a 15,000-L capacity and will be accordingly upgraded depending on future demand

**Upscaling potential:** Reclamation of oil spill sites contaminated with petroleum hydrocarbon, pesticide pharma industrial waste, oily sludge generated by oil refineries, and organic pollutants in India, West Asia

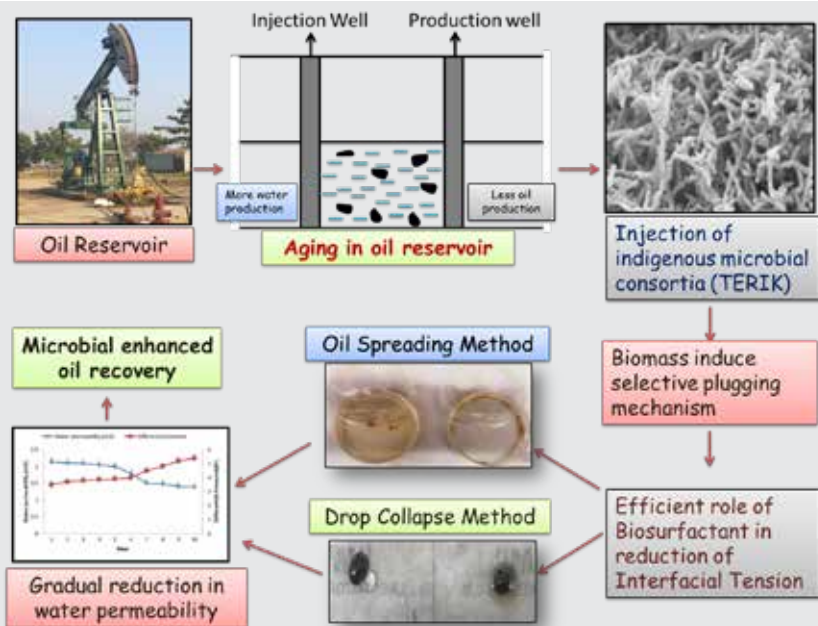
**Stakeholders:** Oil-producing companies and oil refineries

**SDGs addressed:** 1, 3, and 15

**Query and coordination:** Dr Banwari Lal (blal@teri.res.in), Dr Veeranna Channashettar(veerac@teri.res.in)



# MICROBIAL ENHANCED OIL RECOVERY



**Purpose:** Sustainable biotechnological solution for microbial enhanced oil recovery for oil wells

**Process:** The Microbial enhanced oil recovery (MOER) process of oil recovery offers advantages over conventional methods of oil recovery plus the added strengths of the microbes for extracting oil from less productive wells

**Outcome:** Significant increase in incremental oil recovery

**TERI's expertise:** Development of highly efficient and Sustainable microbial process for enhanced oil recovery in stripper oil wells. The technology has solved an age-old problem that perplexed the oil industry

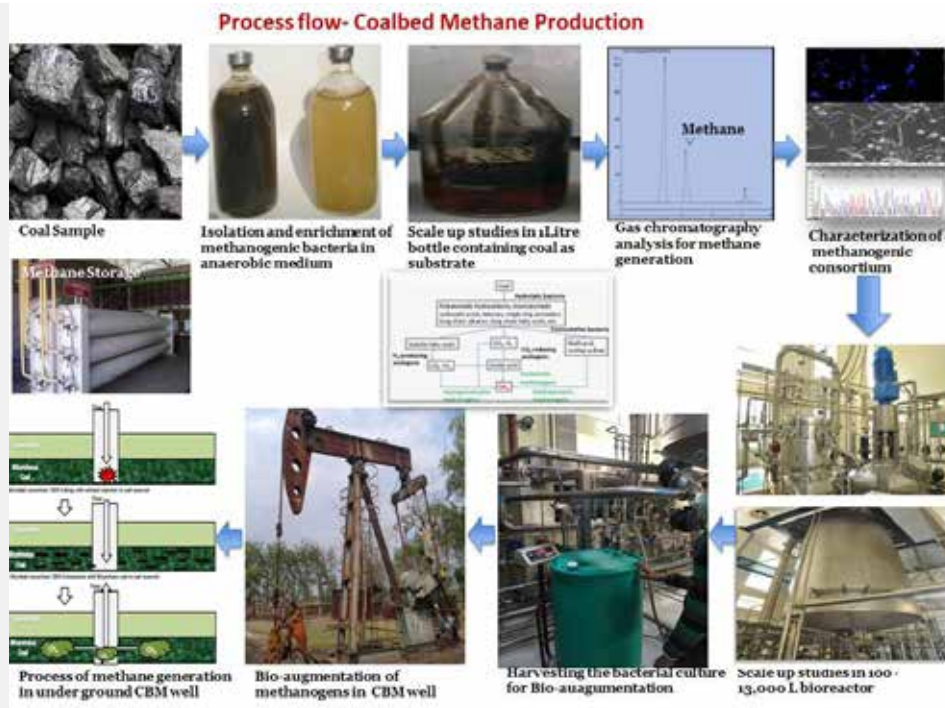
**Upscaling potential:** Developed technology is being applied in 107 oil wells in India and has also been demonstrated internationally

**Stakeholders:** Oil and Natural Gas Corporation Limited, Oil India Limited, Cairns India (Vedanta)

**SDGs addressed:** 7, 9, and 13

**Query and coordination:** Dr Banwari Lal (blal@teri.res.in), Dr Meeta Lavania (meetal@teri.res.in)

# BIOGENIC METHANE PRODUCTION FROM COALBED



**Purpose:** Provide alternative biotechnological solutions for enhancing coalbed methane (CBM) production, leading to affordable clean energy

**Process:** Bio-stimulation and bio-augmentation processes for enhancement and generation of coalbed methane

**Outcome:** Enhance methane recovery from coalbed methane wells

**TERI's expertise:** Developed biological processes demonstrated in more than 10 CBM wells of Oil and Natural Gas Corporation Limited and Essar Oil and Gas Exploration and Production Limited

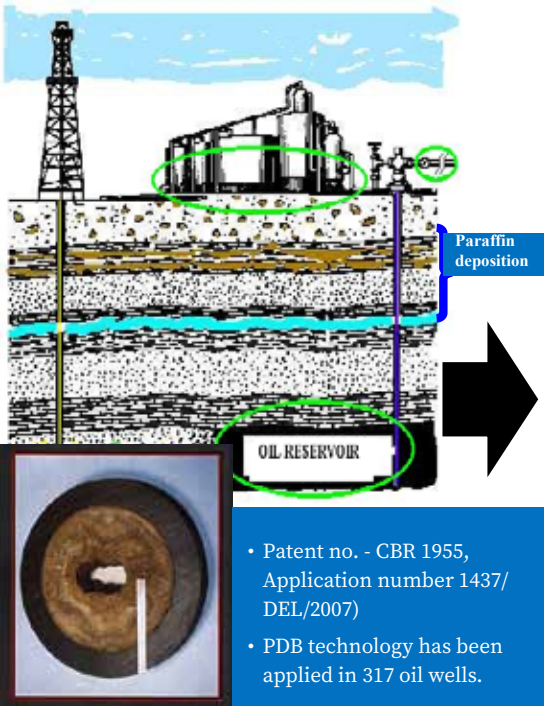
**Upscaling potential:** Provide the services for enhanced biogenic methane production in CBM wells

**Stakeholders:** Oil and Natural Gas Corporation Limited, Essar Oil and Gas Exploration and Production Limited, Great Eastern Energy Corporation Limited, and other CBM operators

**SDGs addressed:** 7, 9, and 13

**Query and coordination:** Dr Meeta Lavania (meetal@teri.res.in)

# MICROBIAL MITIGATION OF PARAFFIN DEPOSITION



**Purpose:** Prevention of paraffin deposition in oil well tubing to increase oil flow from the tubing

**Process:** Biotechnological solution for mitigation of paraffin deposition in oil well tubing and surface flow lines using paraffin degrading microbes PDS-10

**Outcome:** Process implemented have given success ratio of 84% with average scrapping free period being 5–6 months against daily/alternate day/weekly scrapping.

**TERI's expertise:** Process has been used in 341 oil wells of oil producing companies

**Upscaling potential:** Provide services on mitigation of paraffin deposition to oil producing companies

**Stakeholders:** Oil and Natural Gas Corporation Limited (ONGC), Oil India Limited (OIL), Cairns India (Vedanta)

**SDGs addressed:** 8 and 9

**Query and coordination:** Dr Banwari Lal (blal@teri.res.in), Dr Meeta Lavania (meetal@teri.res.in)

# RECLAMATION OF PESTICIDES AND OTHER PERSISTENT ORGANIC POLLUTANTS'- CONTAMINATED DUMPSITES



**Purpose:** Restoration of land contaminated with pesticide by using microbial bioremediation technology

**Process:** Lab-based research tested in the field and successfully demonstrated the degradation of pesticides and other pollutants by using bacterial strains applied in the field, upscaled in the bioreactor at larger scale and delivered at site. After a few months land will be restored as bacteria would consume the contaminants from the soil as their sole source of carbon and energy

**Outcome:** Contaminated soil present at site shall be restored and native vegetation would return

**TERI expertise:** Infrastructure facility to undertake such projects at commercial scale in India and overseas

**Upscaling potential:** TERI has complete set up for upscaling of bacterial products and potential to work with other remediation technology partners and stakeholders

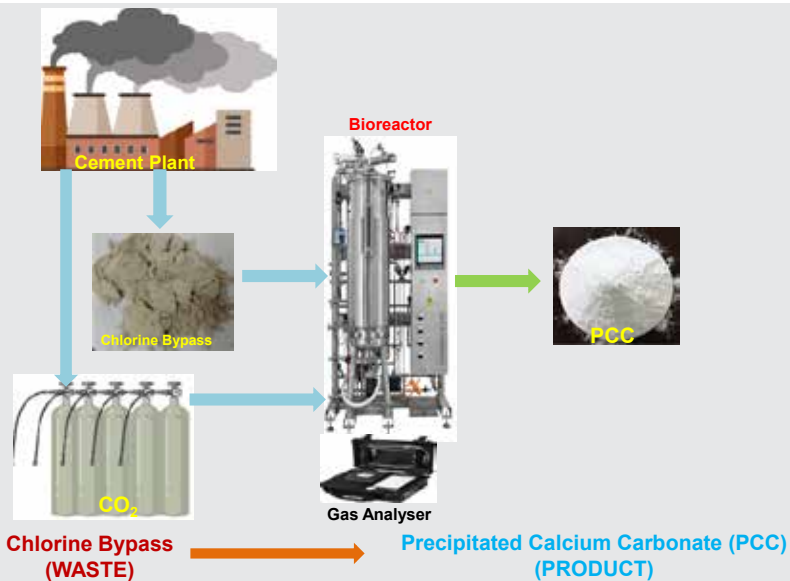
**Stakeholders:** Pesticide industries, government agencies in India and overseas, municipal corporations, smart city development authorities

**SDGs addressed:** 9, 11, 12,13, and 15

**Query and coordination:** Dr Subhasis Das (subhasis.das@teri.res.in), Dr Veeranna Channashettar(veerac@teri.res.in)



# CO<sub>2</sub> UTILIZATION FOR PRODUCTION OF VALUE-ADDED PRODUCTS



**Purpose:** CO<sub>2</sub> capture and utilization, followed by production of value-added products to achieve net-zero emission

**Process:** Laboratory-based research

**Outcome:** CO<sub>2</sub> and waste by products are utilized and a value-added product is produced from the process. We can achieve zero-waste concept from this technology

**TERI expertise:** Lab-based successful demonstration of utilization of CO<sub>2</sub> for production of precipitate calcium carbonate (PCC) by using CaO containing waste by-product generated from cement plant. The purity of the product is more than 90% from our process

**Upscaling potential:** TERI has complete set up for upscaling of bacterial products and potential to work with other remediation technology partners and stakeholders

**Stakeholders:** Cement industry, steel industry, power plants, government agencies in India and overseas, municipal corporations, smart city development authorities

**SDGs addressed:** 9, 12, 13, and 15

**Query and coordination:** Dr Subhasis Das (subhasis.das@teri.res.in)

# NABL-ACCREDITED ENVIRONMENTAL AND INDUSTRIAL BIOTECHNOLOGY LABORATORY



**Purpose:** To provide water quality (drinking, surface, and ground) and petroleum hydrocarbon testing services

**Process:** TERI's Environmental and Industrial Biotechnology (EIB) Laboratory, is NABL accredited for 32 parameters, namely hexane extractable total petroleum hydrocarbon, fraction of total petroleum hydrocarbon, total aliphatic hydrocarbon, total aromatic hydrocarbon, Estimation of polynuclear aromatic, water discipline (ground, surface, and drinking water) pH measurement, electrical conductivity, total hardness (as  $\text{CaCO}_3$ ), total dissolved solids, calcium, magnesium, chloride, sulphate, total dissolved solids, total suspended solids, enumeration of E coli

**Outcome:** A systematic and organized NABL-accredited laboratory provides water quality and petroleum hydrocarbon test reports based on the methods followed strictly in accordance with the guidelines laid down by Bureau of Indian Standards and Central Pollution Control Board

**TERI's expertise:** Adequate and well-equipped laboratory with NABL-recognized trained manpower capable of handling chemical testing of different pollutants in the water and petroleum hydrocarbon using sophisticated instruments

**Upscaling potential:** Water quality analysis has become a crucial requirement of all the urban and newly urbanized regions across India

**Stakeholders:** CPCB, state pollution control boards, Bureau of Indian Standards, Quality Council of India, petroleum refineries, Municipal Corporation of Delhi (MCD), Delhi Jal Board, Department of Health and Family Welfare, Public Health Foundation of India, Chennai Petroleum Corporation Limited, Oil India Limited, Oil and Natural Gas Corporation Limited, Bharat Petroleum Cooperation Limited

**SDGs addressed:** 3, 6, 7, 9, and 13

**Query and coordination:** Dr Meeta Lavania (meetal@teri.res.in)

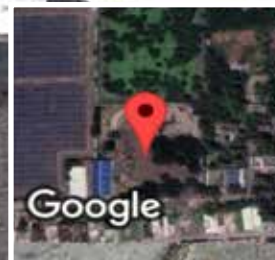


## **WASTE MANAGEMENT**

- Bio-waste Management and Biomethanation Potential Assessment
- Long-term Plastic Flux Monitoring and Assessment Using Technological Interventions
- Information, Education, and Communications for Promoting Sustainable Waste Management Practices
- Sustainable Organic Waste Management
- Advancing Waste Management and Mitigating GHG Emissions

# BIO-WASTE MANAGEMENT AND BIOMETHANATION POTENTIAL ASSESSMENT

Coimbatore, Tamil Nadu, India  
1, Anbu Nagar Main Rd, near TNSCB 1, Anbu Nagar, Ukkadam,  
Coimbatore, Tamil Nadu 641001, India  
Lat 10.983597°  
Long 76.97146°  
18/10/23 12:35 PM GMT +05:30



**Purpose:** Potential assessment of feedstock for bioenergy generation

**Process:** Feasibility assessment for bio-waste such as municipal solid waste, agricultural residues, industrial waste, etc., in identified regions, followed by bio-methanation potential experiments to determine feedstock's biogas or methane generating potential

**Outcome:** Resource mapping of available feedstock and further evaluation of the potential biogas/methane production, will assist stakeholders in installation of commercial biogas/CBG plants to contribute to the country's bioenergy target and solid waste management

**TERI's expertise:** With over 25 years of experience in the bioenergy sector, several BMP tests and biomass feasibility assessment projects have been undertaken in order to enhance the biogas sector in India

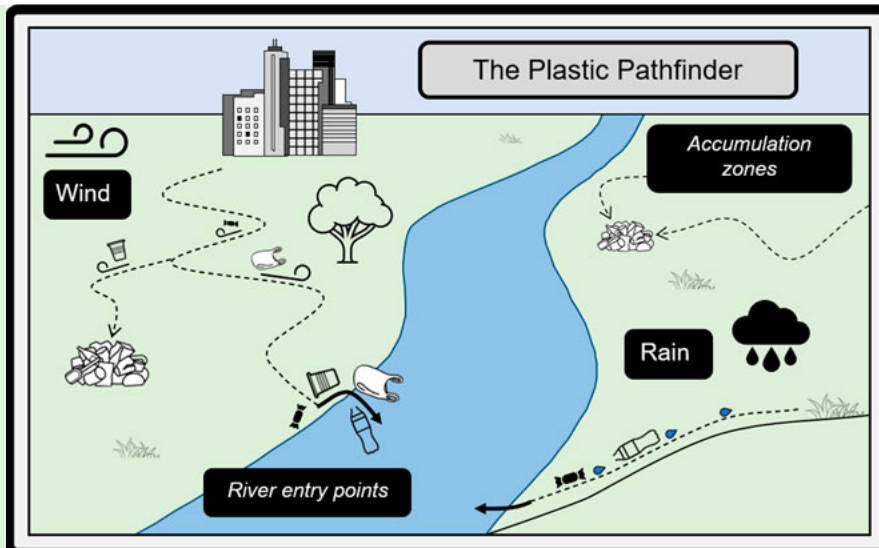
**Upscaling potential:** The technology can be deployed to sugar industries, food, fruit processing industries, and municipal corporations across India

**Stakeholders:** Developers, manufacturers, farmers, municipal corporations, industrialists, and corporates

**SDGs addressed:** 1, 2, 3, 7, and 8

**Query and coordination:** Nagendra Kumar (nagendra.kumar@teri.res.in)

# LONG-TERM PLASTIC FLUX MONITORING AND ASSESSMENT USING TECHNOLOGICAL INTERVENTIONS



Source - <https://www.frontiersin.org/articles/10.3389/fenvs.2022.979685/full>

**Purpose:** Assessment of existing state of plastic pollution in the water bodies in and around metropolitan cities in coastal areas, to implement feasible cleanup solutions

**Process:** Estimating amount of plastic waste load with the help of monitoring equipment (solar powered time lapse, RMS cameras installed at strategic locations near to waterbodies) coupled with debris identification, drone survey, analysing meteorological data, and recommended the most feasible cleanup technologies

**Outcome:** Inhibiting leakage of plastic waste, generated from different sources (human settlements, landfills and commercial-industrial applications/operations), from inner waterbodies to creeks, seas, and oceans

**TERI's expertise:** TERI has collaborated with international organizations (for instance, The Ocean Cleanup, the Netherlands) for assessment in Mumbai metropolitan region (MMR)

**Upscaling potential:** There is vast potential for conducting research and deployment of effective cleanup solutions, considering the extent of plastic waste leakage through inland waterbodies across India

**Stakeholders:** Government institutions such as urban local bodies (ULBs), state pollution control boards, state's environment department, fishermen, ferry boat communities, rag-pickers association, plastic manufactures, waste recyclers, research institutes

**SDGs addressed:** 14, 12, 6, 11, 15, 13, and 17

**Query and coordination:** Manish Bhaskar Asodekar (m.asodekar@teri.res.in)

# INFORMATION, EDUCATION, AND COMMUNICATIONS FOR PROMOTING SUSTAINABLE WASTE MANAGEMENT PRACTICES



**Purpose:** To promote extensive public engagement and enhance awareness regarding the importance of segregating municipal solid waste

**Process:** The Information, education, and communications (IEC) campaign begins with comprehensive data collection and compilation, including statistics and case studies, utilizes a strategic communication plan to raise awareness, engaging communities and educating the public about waste segregation, continuous evaluation and knowledge-sharing drive the campaign's evolution and potential replication in similar waste management contexts

**Outcome:** By instilling a culture of segregating waste effectively, these campaigns encourage individuals and households to actively participate in sustainable waste management and the sorting and recycling of dry waste materials, reducing the overall burden on waste disposal systems and landfills

**TERI's expertise:** TERI knowledge and experience are foundational to the success of 'Shop With Your Waste' campaigns in Goa and similar initiatives aimed at fostering sustainable waste management practices

**Upscaling potential:** Such campaigns are practically applicable to all urban and rural residential areas across India

**Stakeholders:** National government, state governments, union territories, public and private enterprises

**SDGs addressed:** 3, 5, 11, 12, 13, 14, and 15

**Query and coordination:** Dr Suneel Pandey (s.pandey@teri.res.in)

# SUSTAINABLE ORGANIC WASTE MANAGEMENT



**Purpose:** To efficiently handle organic municipal solid waste and manage sewage treatment plant sludge, along with aligning it with the broader goal of resource recovery and sustainable waste management

**Process:** Establishment of a bio-methanation plant using the modified TEAM (TERI's Enhanced Acidification and Methanation) technology for anaerobic digestion of organic waste

**Outcome:** Efficiently manages organic waste, reducing environmental impact, and generates surplus electricity from biogas aiding local energy needs, curtails greenhouse gas emissions as well

**TERI's expertise:** TERI's pioneering role in establishing this bio-methanation plant demonstrates its expertise in sustainable waste management, renewable energy generation, and environmental conservation.

**Upscaling potential:** The experience gained by the Udaipur Municipal Corporation serves as a valuable model for enhancing waste-to-energy endeavours not only within Rajasthan but also in other states of India

**Stakeholders:** National government, state governments, and municipal corporations

**SDGs addressed:** 7, 12, and 15

**Query and coordination:** Dr Dinesh Pant (dpant@teri.res.in)



# ADVANCING WASTE MANAGEMENT AND MITIGATING GHG EMISSIONS



**Purpose:** To enhance capabilities through scientifically-based training, incorporating ground-truth pilot projects for recovering resources from municipal solid waste and performing bio-methanation on wet organic waste, and targeting a reduction in greenhouse gas (GHG) emissions associated with waste management

**Process:** Establishment of a material recovery facility for the processing of dry waste and the implementation of anaerobic digestion technology for the management of organic waste. This technology not only generates biogas for energy but also produces digestate, which can be used as organic fertilizer

**Outcome:** The outcomes of this endeavour are two-fold: it advances waste management practices and concurrently reduces GHG emissions through practical, on-the-ground technological interventions

**TERI's expertise:** TERI brings the necessary local knowledge and expertise regarding climate change and waste management. TERI has rich experiences of working in Indian cities for strengthening waste management by implementing low-carbon based interventions

**Upscaling potential:** The technical implementation and support provided to urban local bodies (ULBs) as seen in Ayodhya have the potential to be replicated in various parts of cities across India and other South Asian nations grappling with similar constraints

**Stakeholders:** Municipal corporations, local NGOs, state governments, development authorities

**SDGs addressed:** 7, 12, 13, and 15

**Query and coordination:** Dr Suneel Pandey (s.pandey@teri.res.in)



## **RESOURCES**

- Green Budgeting
- Green Public Procurement
- Inclusive and Equitable Growth—Just Transition
- Promotion of Sustainable Consumption

# GREEN BUDGETING



**Purpose:** A planning and self-assessment tool to institutionalize and integrate environmental sustainability in various government initiatives and promote environmental awareness

**Process:** Capacity building of government departments to comprehend the concept, procedure and data collection, identify relevant schemes, collect allocation and expenditure data for the fiscal year, map them against SDGs, themes, activities, and overall budget analysis

**Outcome:** Enhance green budgeting for the state-level activities

**TERI's expertise:** TERI worked with Government of Bihar to enhance the state's green budget by over INR2000 crore in 2022/23. Green Budget of the Union Territory of Puducherry increased by 153% in FY 2023/24.

**Upscaling potential:** The process can be replicated at the central level and could be extended to other states and UTs with standardized reporting. The process is worthy of international application

**Stakeholders:** Government departments/ministries—finance, environment, planning

**SDGs addressed:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, and 17

**Query and coordination:** Dr Shailly Kedia (shailly.kedia@teri.res.in)

# GREEN PUBLIC PROCUREMENT



**Purpose:** It takes into account environmental goals during the procurement of goods, services, and works carried out by public institutions in order to strengthen climate action

**Process:** Analysis on green public procurement (GPP) readiness and prioritization through employing indicators and monitoring frameworks. Considering the readiness on GPP, recommendations are deduced on the basis of phased approach with mandates and flexibility

**Outcome:** Develop green procurement system to strengthen climate action

**TERI's expertise:** TERI has undertaken comprehensive analysis of readiness of all states (36) and union territories (8), along with studies on market readiness of various sectors on GPP

**Upscaling potential:** GPP can be scaled across federal units as well as across sectors for eco-labelling and creating demand for green products

**Stakeholders:** Federal government, state government, union territories, public and private enterprises, and MSMEs

**SDGs addressed:** 9, 11, 12, 13, 15, and 17

**Query and coordination:** Dr Shailly Kedia (shailly.kedia@teri.res.in)

## INCLUSIVE AND EQUITABLE GROWTH—JUST TRANSITION



**Purpose:** Developing inclusive and equitable pathways for energy transition—from fossil fuels to renewables

**Process:** Implementing mixed method research tools such as in-depth interviews, focused group discussions (FGDs), key persons' interviews (KPIs) along with household survey

**Outcome:** To develop a national and state-level framework to facilitate development of policies and action plans for inclusive and equitable energy transition

**TERI's expertise:** Hands-on experience of conducting assessments in the major coal-producing states of India—Jharkhand, Odisha, Chhattisgarh, and Madhya Pradesh.

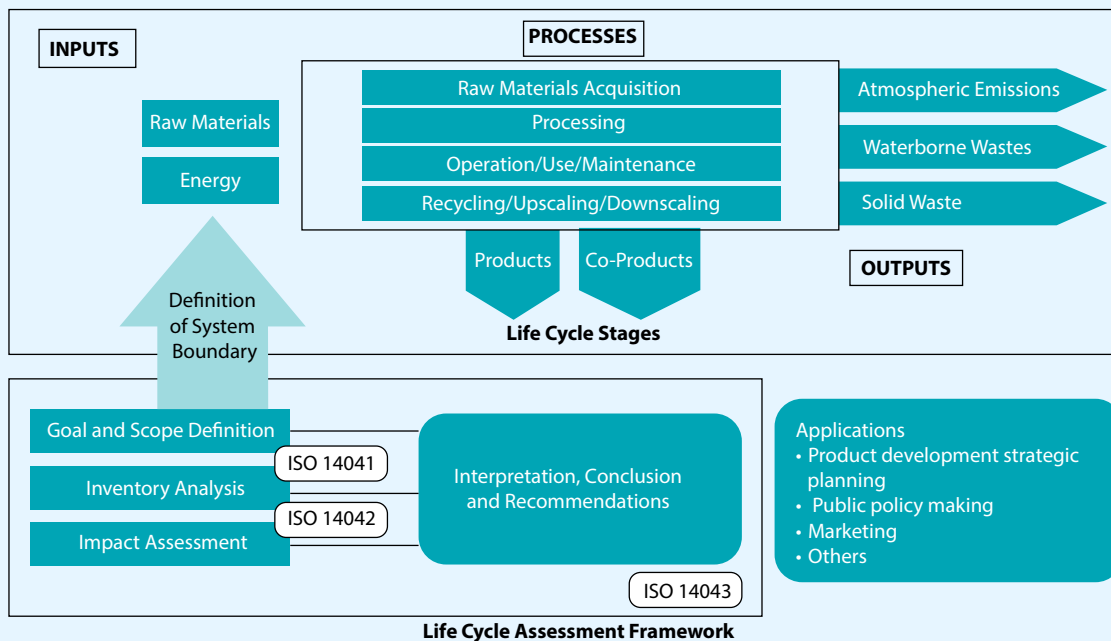
**Upscaling potential:** Fossil fuel-intensive states in India and South Asia can accrue significant benefits from implementing just transition framework

**Stakeholders:** Coal mining officials, state and district-level government officials, coal-dependent communities, formal and informal workers, civil society organizations, and CSR departments

**SDG addressed:** 8

**Query and coordination:** Dr Jayanta Mitra ([jayanta.mitra@teri.res.in](mailto:jayanta.mitra@teri.res.in))

# PROMOTION OF SUSTAINABLE CONSUMPTION



**Purpose:** Promotion of sustainable packaging in the Indian market to work towards reduction of waste generation from the packaging sector

**Process:** Conduct a life-cycle assessment study to create evidence of environmental impact due to consumption, identify causal relationship to suggest solutions, including policy recommendations

**Outcome:** Ensuring financially viable transition from conventional to sustainable packaging

**TERI's expertise:** TERI has carried out detailed analysis for various sectors including beverage, automotives, steel, poultry, etc., across India and Southeast Asia

**Upscaling potential:** Such assessments can be applied to industries and supply chains that intensively use packing material such as FMCG, household goods, etc.

**Stakeholders:** Pollution control boards, Indian beverage manufacturers, GST Council, MoFPI, MoC&I, MoEFCC, MoF

**SDGs addressed:** 11, 12, and 13

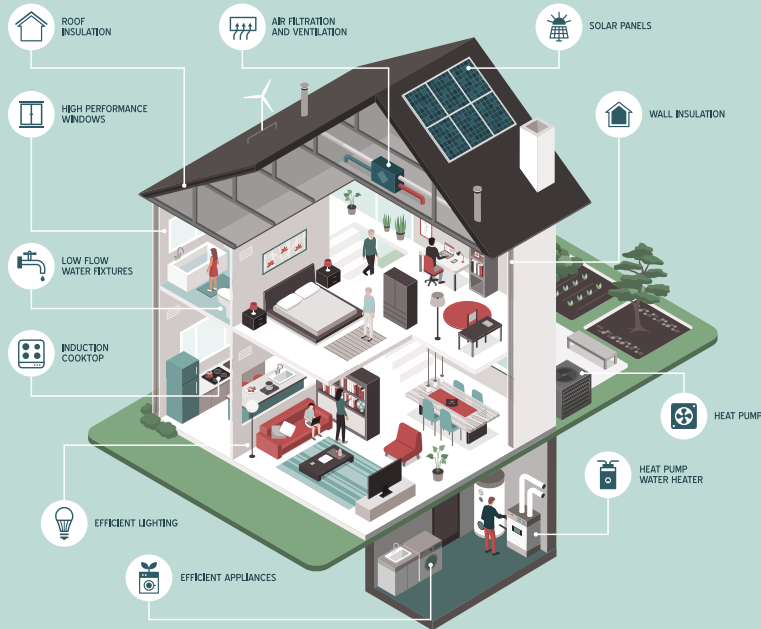
**Query and coordination:** Souvik Bhattacharjya (souvik.bhattacharjya@teri.res.in)

## **HABITAT**

- Resource Efficient Building Design
- Shade SMART Buildings
- GHG Emission Calculator for Transport Sector
- Sustainable Urban Freight
- Urban Living Labs for Sustainable and Smart Cities in India



# RESOURCE EFFICIENT BUILDING DESIGN



**Purpose:** To minimize resource intensity of buildings in their entire life cycle

**Process:** Buildings are accountable for consuming resources in the form of material, energy, and water. In addition, they generate substantial amount of waste. The process involves optimization of the building design using passive techniques, efficient systems and low-embodied building material, and recycling and reuse of waste generated

**Outcome:** Through resource efficiency design advisory, resource consumption of a building can be brought down, emissions could be reduced to the extent of 25–30% during construction and 30–50% during operations

**TERI's expertise:** TERI has provided support to the design teams of architects, developers, and building projects for achieving their sustainability goals

**Upscaling potential:** Advisory activities can be extended to urban development authorities as well as private developers across India and South Asia

**Stakeholders:** Builders and developers, corporates, housing industry

**SDGs addressed:** 3, 6, 9, 11, and 13

**Query and coordination:** Sanjay Seth (sanjay.seth@teri.res.in)

## SHADE SMART BUILDINGS



**Purpose:** Reducing direct solar heat gain inside a building by more than 75%, at the same time, allowing natural daylight using cost-effective, movable, smart external shading products

**Process:** An innovative retrofittable, manually operable smart shading apparatus for house windows (residential buildings) and an automated intelli-smart shading apparatus for commercial buildings to cut down the direct heat ingress

**Outcome:** Translates to direct savings in the cooling and lighting energy demand of an office building, climate action in minimizing refrigerant-based cooling systems and related emissions, a locally developed and manufactured green technology

**TERI's expertise:** TERI has designed and developed Shade SMART, integrated it into the model demo habitat for demonstration purposes. Shade SMART is a patented technology of TERI

**Upscaling potential:** Applicable and relevant for modern (both residential and commercial building) infrastructure across India

**Stakeholders:** Builders and developers, housing industry, built environment professionals, building industry associations

**SDGs addressed:** 3, 7, 9, and 13

**Query and coordination:** Sanjay Seth (sanjay.seth@teri.res.in)

# GHG EMISSION CALCULATOR FOR TRANSPORT SECTOR



**Purpose:** Identify the GHG emissions from a company's transport-related activities

**Process:** The transport activity data such as distance, type of vehicle, fuel, frequency of travel is collected and processed to estimate the associated emissions

**Outcome:** The developed calculators help entities to foresee impact of the chosen travel mode besides aiding in estimating the potential emission savings by opting for environment friendly modes of transport

**TERI's expertise:** Freight GHG emission calculator for logistics division, rail green points for Indian Railways, Scope 3 emission calculator for ABB, and CarbonLite Metro Travel for DMRC have been developed by TERI

**Upscaling potential:** TERI can develop transport-specific emission estimation calculators for freight and passenger travel carried out by an organization

**Stakeholders:** Logistics companies, e-commerce companies, private companies and organizations

**SDGs addressed:** 3, 9, 11, 12, and 13

**Query and coordination:** Sharif Qamar (sharif.qamar@teri.res.in)

# SUSTAINABLE URBAN FREIGHT



**Purpose:** To assist government and private organizations to shift to sustainable urban freight transport

**Process:** The fleet demand and characteristics of a given organization are mapped and analysed to understand the fleet patterns and vehicle requirement, based on the range and payload required, suitable electric vehicles are identified, cost-benefit analysis is carried out in terms of monetary savings and emission savings are developed

**Outcome:** Technical support helps organizations to switch to cleaner vehicles and resolve any concerns related to new technology adoption

**TERI's expertise:** Detailed studies for various applications in Surat, Delhi, and Bengaluru, road map for electrification for SLMG beverages (Coco-Cola) and Department of Posts have been executed by TERI

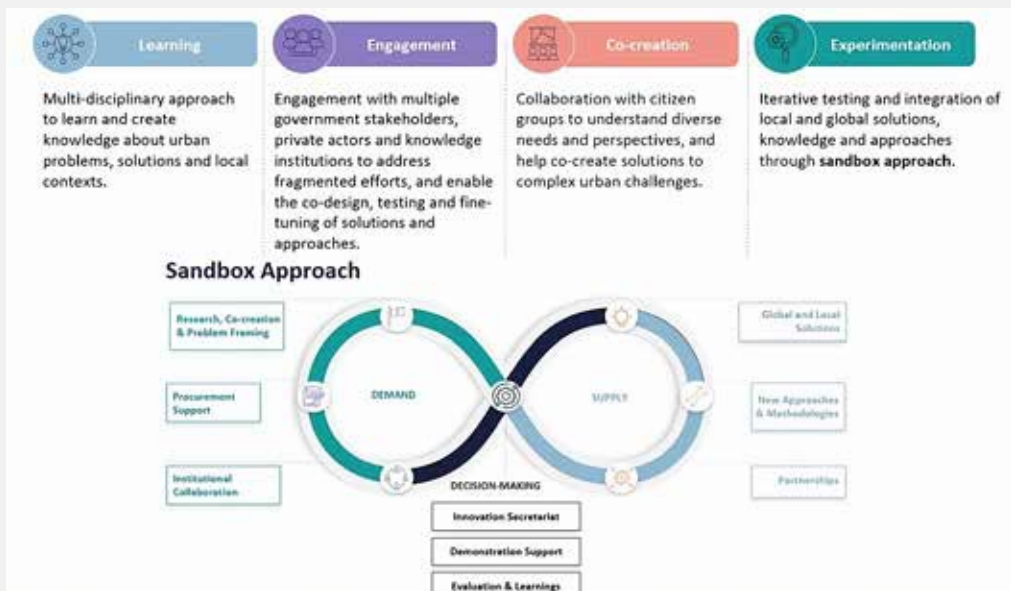
**Upscaling potential:** TERI can help logistics providers and e-commerce companies for transitioning to clean technology vehicles

**Stakeholders:** Logistics companies, e-commerce companies, private companies, and organizations

**SDGs addressed:** 3, 9, 11, 12, and 13

**Query and coordination:** Sharif Qamar (sharif.qamar@teri.res.in)

# URBAN LIVING LABS FOR SUSTAINABLE AND SMART CITIES IN INDIA



**Purpose:** To provide a real-life test and experimentation environment via establishment of an urban living lab (ULL) where users and producers could co-create innovations

**Process:** Institutional, regulatory and technical support for pilots, assisting with contextualizing solutions and supporting the government in measuring the impact of the testing

**Outcome:** ULLs provide avenues for adapting to and learning from global urban practices, taking into account user needs and local contexts for incubating solutions, for sustainable and resilient development challenges

**TERI's expertise:** The Project Urban Living Lab, Panaji (PULL) is India's first urban living lab—other cities can use our learnings to replicate a similar approach to solve their urban challenges. TERI is a knowledge partner to the Royal Danish Embassy and has developed two knowledge products with the objective of integrating global solutions to the local context. Currently, TERI is also setting up a ULL in Visakhapatnam

**Upscaling potential:** ULLs are accompanied by substantial potential to be scaled up since they are piloted solutions in a city for wide-scale implementation

**Stakeholders:** Government, private sector, civil society organizations, and academia

**SDGs addressed:** 3, 9, and 11

**Query and coordination:** Shiren Pandita (shiren.pandita@teri.res.in)



## **HEALTH AND NUTRITION**

- NABL-accredited Food Testing Laboratory
- Bio-products from Microalgae



# NABL-ACCREDITED FOOD TESTING LABORATORY



**Purpose:** The Laboratory provides food testing services to the food business operators in water and food matrices apart from promoting capacity building in the food testing sector

**Process:** Compliance for the required parameters in packaged drinking water

**Outcome:** Standardized National Accreditation Board for Testing and Calibration Laboratories (NABL)-accredited report to testify the credibility of the tested food products to the federal and regulatory authorities, including Food Safety and Standards Authority of India (FSSAI)

**TERI's expertise:** A well-equipped laboratory with skilled manpower, capable of handling chemical and microbiological analyses of drinking water and food matrices, including analysis for pesticide residues and heavy metals

**Upscaling potential:** All food categories as specified by FSSAI could be brought under the testing-scope of the lab in due course of time. The lab is also seeking APEDA and FDA recognition for international credibility

**Stakeholders:** Food Safety and Standards Authority of India (FSSAI), Bureau of Indian Standards (BIS), National Accreditation Board for Testing and Calibration Laboratories (NABL), Quality Council of India (QCI), Agricultural and Processed Food Products Export Development Authority (APEDA), The International Laboratory Accreditation Cooperation (ILAC), Food and Drug Administration (FDA), and all categories of food business operators (FBOS)

**SDG addressed:** 3

**Query and coordination:** Dr Naba Kumar Goswami (nabakg@teri.res.in)



# BIO-PRODUCTS FROM MICROALGAE



**Purpose:** To develop bio-products such as food, feed, health supplements, , biofuels and other bio-commodities

**Process:** Outdoor algal cultivation and processing systems are set up in marginal (non-agricultural) lands, preferably at coastal locations, using seawater

**Outcome:** Bio-products such as food, animal feed, health supplements, biofuels and other bio-commodities utilizing microalgae as a sustainable feedstock

**TERI's expertise:** TERI specializes in outdoor algal production systems, pilot-scale algal-processing methods, extensive algal culture collection, and development of select promising products

**Upscaling potential:** There is ever-growing demand for products sourced from algae. India's long coastline with seawater availability and estimated 0.5–1 million hectares (Mha) marginal lands can provide with an ideal ground to set up cultivation and processing systems

**Stakeholders:** Animal feed and aqua-feed industries, health supplement industry, oil marketing companies, governments

**SDGs addressed:** 3, 7, 8, 13, and 14

**Query and coordination:** Dr K Dheeban Chakravarthi (dheeban.kannan@teri.res.in)

## **SOCIAL TRANSFORMATION**

- Development of Model Villages Through Corporate Social Responsibility
- Green Skill Development Programme
- Setting Up of Women-led Energy Entrepreneurship
- Energy Access for Livelihood Promotion of Power Loom Weavers

# DEVELOPMENT OF MODEL VILLAGES THROUGH CORPORATE SOCIAL RESPONSIBILITY



**Purpose:** Improving operational reliability and service quality of rural villages of India through provision of clean and reliable infrastructure

**Process:** Projects are designed in a manner that facilitates action and research to bring about social transformation through socio-technical study, clean energy demonstration and replication, training, capacity-building interventions, and handholding of the local community to achieve change towards sustainability

**Outcome:** Creation of 'model villages', where along with dissemination of clean energy systems, upliftment of skills of all segments of the society is targeted

**TERI's expertise:** TERI has successfully created 'model villages' in several Indian states such as West Bengal, Himachal Pradesh, Uttarakhand, Jharkhand, and Madhya Pradesh

**Upscaling potential:** The industrial sector across India is committed to corporate social responsibility and such models are needed for effective realization of sustainable development

**Stakeholders:** Corporates, rural communities, youth, women SHGs, and marginalized communities

**SDGs addressed:** 3, 5, 7, 10, 8, and 12

**Query and coordination:** Dr Amit Kumar Thakur (akthakur@teri.res.in)

# GREEN SKILL DEVELOPMENT PROGRAMME



**Purpose:** Skill development in different sectors to enable India's youth to get gainful employment or self-employment

**Process:** The Green Skill Development Programme (GSDP) conducts short/long duration trainings in 25 courses across India

**Outcome:** To enable India's youth to get gainful employment

**TERI's expertise:** Successfully conducted 25 residential GSDPs—each spanning 240 hours (solar) and 300 hours (waste)—in Assam, Bihar, Jharkhand, Maharashtra, Meghalaya, Odisha, Tamil Nadu, Uttarakhand, Uttar Pradesh, and West Bengal. Around 4500 students and unemployed youths were trained in technical knowledge related to solar energy systems and waste management

**Upscaling potential:** All organizations including corporates aiming for mainstreaming of sustainable development models.

**Stakeholders:** Rural unemployed youth, ITI, polytechnic, diploma holders, BSc, BTech, MSc and graduates are amongst the direct beneficiaries

**SDGs addressed:** 4, 8, and 11

**Query and coordination:** Dr Amit Kumar Thakur (akthakur@teri.res.in)

# SETTING UP OF WOMEN-LED ENERGY ENTREPRENEURSHIP



**Purpose:** To establish a woman-led energy entrepreneur (WEE) model—a rural clean energy enterprise set up and managed by a woman, on a sustainable and profitable basis

**Process:** Training, capacity building, and regular mentoring of the enterprise to facilitate capacity enhancement, development of relevant business plans, and mobilization of desired financial resources for clean energy dissemination

**Outcome:** Sensitization among the community on renewable energy products along with woman empowerment, sale of different renewable energy products, aftersales services of renewable energy products

**TERI's expertise:** TERI has implemented WEE models in collaboration with rural financial institutions and the local micro financial institutions (MFIs) in major Indian states (Bihar, Uttar Pradesh, Jharkhand, Odisha, etc.). We have also collaborated with JEEVIKA, Bihar in 5 districts and disseminated 25000 integrated domestic energy systems (IDES)

**Upscaling potential:** WEE models can be replicated for numerous SHG initiatives at the national level, including NABARD

**Stakeholders:** Rural women SHGs, micro finance institutions, and all other development organizations

**SDGs addressed:** 3, 5, 7, 9, 13, and 17

**Query and coordination:** Dr Amit Kumar Thakur (akthakur@teri.res.in)



## ENERGY ACCESS FOR LIVELIHOOD PROMOTION OF POWER LOOM WEAVERS



**Purpose:** Installation of hybrid solar charging units for regular power supply to power looms to enable consistent production, higher revenue, regular income, and environmental protection

**Process:** Hybrid solar charging unit (solar array, power conditioning unit, transformer and lithium batteries) is designed and installed at weaver's premise through corporate and community co-funding support

**Outcome:** Higher revenue, optimal utilization of time, and seamless production along with being environmentally friendly

**TERI's expertise:** Design of technology, customization with manufacturers, fund mobilization, community outreach  
**Upscaling potential:** In partnership with local communities, such installations can be implemented in multiple states (Uttar Pradesh, Madhya Pradesh, Odisha, Andhra, Telangana, and Maharashtra) and millions of weavers

**Stakeholders:** Weavers, funding organizations, technology partners, and local institutions

**SDGs addressed:** 1, 3, 7, 9, 13, and 17

**Query and coordination:** Jitendra Tiwari (jitendra.tiwari@teri.res.in)

## **OUTREACH**

- Education for Sustainable Development
- Developing School into Sustainable Campus
- Knowledge Partnership for E-learning and Sustainable Development
- Empowering Communities Through Community Radio
- Guided Coastal Eco-tours in Goa



# EDUCATION FOR SUSTAINABLE DEVELOPMENT



**Purpose:** Educating and communicating about sustainable development to the future citizenry to inculcate environmentally responsible behaviour, thereby translating knowledge into action, leading to adaptation and living sustainably

**Process:** Adopting effective pedagogy comprising workshops, discussion forums, competitions, out-of-class training, experiential learning, ecotourism exercises, etc. These demand-driven initiatives are developed in close consultation with schools and colleges

**Outcome:** Interdisciplinary learning environment, such that behavioural changes and sustainable lifestyles are embedded at a very young age

**TERI's expertise:** TERI spearheads education for sustainable development (ESD)-related interventions with schools and colleges in India and abroad. It also represents UNESCO's 'ESD for 2030' network that helps in leveraging global connect, GREEN Olympiad is a flagship initiative of TERI

**Upscaling potential:** TERI's on-going education programmes outreach to over 200,000 students annually, the programme can cater to all schools and colleges in India and other countries

**Stakeholders:** School and college students in age range of 8–25 years, Aanganwadis, parents, communities, and school neighbourhoods

**SDGs addressed:** 4, 7, 11, 12, 13, 14, and 15

**Query and coordination:** Dr Livleen K. Kahlon (kahlonl@teri.res.in)

## DEVELOPING SCHOOL INTO SUSTAINABLE CAMPUS



**Purpose:** Showcasing sustainability of campuses of schools and colleges to facilitate experiential learning through examples such as layout of rainwater harvesting, energy conservation and enhancing efficiency, grey water treatment, demonstration of organic farming, or herbal garden

**Process:** Develop baseline of the campus and an action plan along with strategies that could be further adopted, followed by customization as per layout, dedicated area, and financial resources

**Outcome:** Demonstrating areas or sections where environmental, social, and economic cohesion can be observed by students in order to enhance learning on sustainable practices

**TERI's expertise:** The varied knowledge resources within TERI, combined with an expertise gained working with educational institutions could be utilized for catering the varied needs of educational campuses

**Upscaling potential:** The programme could be a viable ground for fostering meaningful sustainability not only in schools and colleges of India but also of the neighbouring countries

**Stakeholders:** Schools and college administrators, Ministry of Education, and state education departments

**SDGs addressed:** 4, 7, 11, 12, 13, 14, and 15

**Query and coordination:** Dr Livleen K. Kahlon ([kahlonl@teri.res.in](mailto:kahlonl@teri.res.in))



# EMPOWERING COMMUNITIES THROUGH COMMUNITY RADIO



**Purpose:** To link remotely located communities with the outside world to exchange knowledge and disseminate information

**Process:** Community radio (CR) broadcasting plays a significant role at the grassroots level for addressing rural development, issues of poverty, agriculture, gender inequality, education, social problems, among others could be the focus for communication

**Outcome:** The distinctive quality of CR enhances community engagement and makes it a major tool in development efforts, which is essential for the 2030 Agenda for Sustainable Development

**TERI's expertise:** TERI runs a community radio named 'Kumaon Vani (90.4 MHz)' in the hilly terrain of Mukteshwar, Nainital District of Uttarakhand, reaching up to 500 villages, producing content, radio campaigns, and public service announcements on sustainable agriculture, water and sanitation, forestry and biodiversity, health, gender and education, delivery of government welfare programmes, and accountability in local governance

**Upscaling potential:** Remote and hilly locations across India, focused geographies and campaigns which need an efficient medium of communication

**Stakeholders:** Central and state government departments, farmer welfare groups, self-help groups, academic institutions, NGOs, civil society group, etc.

**SDGs addressed:** Caters to all SDGs

**Query and coordination:** Sumit Bansal (sumit.bansal@teri.res.in)

## GUIDED COASTAL ECO-TOURS IN GOA



**Purpose:** To encourage responsible travel to coastal ecosystems with focus on protecting the environment, helping local communities, reducing marine litter, and sensitizing visitors on conservation and protection efforts

**Process:** Provide guided tours to mangroves, 'Khazan ecosystems', along with aquaculture demonstrations

**Outcome:** Foster a broader sense of sustainability and positive attitude in the participants and promote the well-being of local people and environment

**TERI's expertise:** TERI's biodiversity and aquaculture expertise provides participants, particularly students and youth, with rich information and background, addressing issues related to marine litter

**Upscaling potential:** Such programmes are applicable to the tourism sector and schools across coastal India

**Stakeholders:** Tourists, students, teachers, fishermen, salt-farmers, coastal communities

**SDGs addressed:** 4, 5, 12, and 13

**Query and coordination:** Asha Giriyan (ashag@teri.res.in), Elroy Pereira (e.pereira@teri.res.in), Ashwini Pai Panandiker (ashwini.panandiker@teri.res.in)













**T**ERI's *Solutions for Sustainable Development* is dedicated to a constructive discourse on viability and replicability of sustainable solutions. This publication manifests a minuscule, yet complete, footprint of TERI's 50 years of unwavering commitment and contribution towards the common good. Being an environmentally conscious and socially responsible think tank, TERI follows a research-driven pathway in tracing root causes of challenges that the global community is grappling with. The compendium offers sixty sustainable solutions that cover diverse topics including but not limited to climate change impacts, mitigation of air; soil; and water pollution, effective waste management, urban needs of smart buildings, sustainable agriculture technologies, biodiversity conservation, nature-based solutions, augmenting carbon credits, corporate social responsibility models, etc.

The compendium establishes that sustainable development is not an ambiguous construct or a utopia. Sometimes, even a simple change introduced to an established procedure encapsulates the true essence of sustainable development. The contents of this compendium have been structured broadly around—consumption, conservation, community, and cooperation—the 4Cs of sustainable development. With its lucid narrative, the book is a universal ready reckoner as the application of these innovative solutions transcends civilizational challenges and boundaries.

