

# Centre for Environmental Studies



THE ENERGY AND  
RESOURCES INSTITUTE

*Creating Innovative Solutions for a Sustainable Future*



## About Us

Under the umbrella of the Natural Resource Management program, The Centre for Environmental Studies (CES) operates as an area in the division of Earth Sciences and Climate Change (ESCC). The group addresses environmental problems and assesses the relationships between energy and environment in urban, industrial, and rural settings.

CES has undertaken various projects to study the ambient air quality associated with urbanization, industrialization, and other anthropogenic activities. Various work components of the centre includes

- Regional scale assessment of air quality
- Assessment of impacts of air pollution on human health and, agriculture
- Assessment of indoor air quality in rural and urban buildings
- Management of emissions from the transport and industrial sectors
- Spatial mapping and forecasting
- Real-time source apportionment study
- Development of emission factors of pollutants for anthropogenic activities
- Linking air quality to climate change
- Analysis of governmental policies related to air quality
- Training and capacity building in air quality



Study the impact of various economic activities as well as resource-use patterns on ambient environment (air and soil) quality and explore strategies to mitigate the adverse effects. The group conducts applied and policy research to address burgeoning challenges of air pollution, Carbon emission and develop sustainable options for economic development and air quality nexus.

# Work We Do



## ⌘ Urban and regional air quality assessment

The CES group involves in urban/regional air quality management studies involving monitoring of air pollutants, inventurisation of source emissions, state of the art simulations and modelling of air quality, and development of air quality management plans. The group was involved in the pioneering source apportionment study for Bengaluru city and has also been working for many years on the use of state-of-the-art three dimensional multi-grid air quality models (ISCST3, AERMOD, WRF, C-MAQ, etc), to predict urban/regional scale pollution of criteria as well as emerging pollutants, like ozone. The group has also been monitoring aerosols and their properties particularly in the Himalayas to assess regional scale pollution.

## ⌘ Spatial mapping and forecasting

TERI with technical support from VITO Belgium, has developed a model using Artificial Neural Networks (ANN) to forecast pollutant concentration of  $PM_{10}$ ,  $PM_{2.5}$ ,  $NO_2$ , and  $O_3$  for the current day and subsequent 4 days in a highly polluted region to possibly mitigate forthcoming high air pollution episodes, but also to plan for reduced exposures of resident. Also spatial mapping of air pollutants is used to predict pollutant concentrations in highly polluted regions with high spatial variability at locations devoid of adequate monitoring stations. Recently we have carried out a study for CPCB for spatial mapping and forecasting of air pollutants for Delhi and the results were found to be satisfactory and can be replicated to other parts of India.

## ⌘ Real-time source apportionment study

The area has now ventured into real time source apportionment study partnering with IITK and IITD. There is a need of the hour that one should move from low temporal resolution source apportionment to high-resolution source apportionment studies i.e., real-time source apportionment. This enhancement will provide instant results and quick decision making for timely control of air pollutant emissions.





### ⌘ **Industrial Emission Management**

The group works towards developing strategies for minimizing pollution in different industries and industrial clusters with its technical and policy capabilities. The group has prepared a comprehensive industrial document (COINDS) for the Indian automobile industries and submitted to the Central Pollution Control Board. The group has also undertaken a comprehensive assessment of the brassware industrial cluster of Moradabad from the Ministry of Environment, Forest & Climate Change (MoEFCC) and suggested various technical options to minimize waste generation in the industry.

### ⌘ **Assessment of indoor air quality in rural and urban buildings**

CES has also conducted several studies to assess indoor air quality at both regional and urban scales. The group in association with Project Surya, has already gone a long mitigate black carbon and greenhouse gas emissions through large scale adoption of improved cooking and lighting devices with co-benefits of improved community health.

Recently, in association with University of California, San Diego (UCSD), TERI has initiated an indoor air quality (IAQ) monitoring and exposure assessment study in Odisha, where improved cook stove were implemented. The group also conducted studies related to different fuel-use in the rural households and related behavioural assessment in National Capital Region.

The group assessed the effect of intervention measures like improved cookstoves to reduce the health problems in rural women in the remote villages of Sunder ban with the Ministry of Health, Government of India. The group has monitored air pollutants and assessed the exposure in different work environments like, urban offices, toll booth plaza and petrol pumps etc.

### ⌘ **Transport emission management**

The transport sector plays an important role in air pollution particularly in the urban area. The group has also worked in close association with different industrial stakeholders to develop a policy framework to improve the fuel use efficiency in Heavy Duty Vehicles (HDV), which in other way reduces the tail-pipe emission from the HDVs. Scientific maintenance of the vehicular fleet is important to control their tail-pipe emissions. The group has developed recommendations to improve in-use vehicle Inspection and Management (I&M) program in India after working in close association with policy makers, industrial stakeholders and common people.





## ⌘ Training and Capacity Building

CES has also been active in providing assistance to national and international government bodies for the formulation of State of environment reports and environmental policies. The group assisted MoEF in the preparation of the draft National Environment Policy and has also been recognized by the Institute for facilitating development. The group continues to strengthen and build capacity and spread awareness on different environmental issues including air pollution. Training programs are regularly conducted for different stakeholders to build their capacity in Air Quality Modelling, Exposure Assessment, Indoor Air Pollution, Environmental Pollution & Health and other related environmental issues.

## ⌘ Policy analysis and reporting

The group has been active in providing assistance to government bodies for the formulation of State of environment reports and environmental policies. The group assisted MoEF in the preparation of the draft National Environment Policy and has also been recognized by the MoEF as one of the National Host Institute for facilitating development of State of Environment Reports at the state level. The group has also been focused on providing state level policy recommendations through several source apportionment studies which guided state level regulatory authorities to develop local action plans for control of air pollution and its impacts. The group has made several policy submissions to highest levels in the government in the field of air quality management. Latest in the series is a report on 'Breathing clean air - Ten scalable solutions for Indian Cities' which identifies solutions for clearing up the air in India. Works closely with the Government and assisted in drafting and designing of N-CAP document. As directed by CPCB, TERI is identified as Institute of Repute (IoR) for providing technical inputs to emissions inventory, source apportionment and carrying capacity reports for all concerned million plus cities/non-attainment cities & provide guidance to concerned cities for preparation of micro action plan.





# Collaborations

## ⌘ International collaboration

The area has long term collaboration with Finnish Meteorological Institute, Finland related to aerosol measurement, The University of California, Davis, USA related to health impact of indoor air pollution and The University of California, San Diego related to simulation of ambient air quality. Other collaborators are Toyota Motor Corporation, Bloomberg Philanthropies, UNEP, VITO Belgium, Swiss Agency for Development and Cooperation, GIZ, DFID, ExxonMobil, RICARDO, LoREAL Group, etc.

## ⌘ National collaboration

CES works in collaboration with different National research institutes and Universities namely, Automotive Research Association of India (ARAI), Pune, CSIR-National Physical Laboratory (NPL), New Delhi, TERI School of Advance Studies, New Delhi, University of Calcutta, West Bengal etc. CES has also worked closely with different local NGOs based on the requirement to accomplish related project work. Some of these NGOs are, Baikunthapur Sishu Seva Kendra, Sunder ban, West Bengal; Child in Need Institute (CINI), West Bengal, SGS Foundation, Keonjhar, Odisha. The area work closely with government bodies, such as MoEF&CC, CPCB, DPCC, SPCBs, etc. Other potential national collaborators include IITs, ARAI, etc.



# Major on-going projects

Project	Client
Developing strategies for control of air pollution in India and its cities and Air Pollution activities under the Bloomberg Bridge grant	Bloomberg Philanthropies, National Philanthropic Trust
Clean air project in India: In view of supporting the NCAP, The Swiss Agency for Development and Cooperation (SDC) started the long-term 'Clean air project in India' with an overall aim of supporting India's efforts to improve air quality, while contributing to public health, environment and climate change mitigation.	Swiss Agency for Development and Cooperation
Natural Gas in Mitigating Industrial Air Pollution	Federation of Indian Petroleum Industry
Emissions inventory study - Second stage - Exxon Mobil	EXXONMobil Research and Engineering Company
Sustainability Assessment of the Thermochemical Conversion	LOReal Group, Paris
Biochar to Address Air Pollution, Climate Change, Food Security and Farmers' Income	University of Aberdeen, UK
Develop an Air Quality Progress Report (AQPR) for India	UNEP
Development of Sustainable Biochar Briquette Industry	The Araville Green Energy Ventures Pvt Ltd
Source apportionment study and preparation of emission inventory for Rishikesh city	Uttrakhand Pollution Control Board.
Source apportionment study and preparation of emission inventory for Kashipur city	Uttrakhand Pollution Control Board.
Reduction of air pollution in three selected cities - GIZ study	Deutsche Gesellschaft Fur Internationale Zusammenarbeit (GIZ) GmbH
Consultancy services for suggesting measures for strengthening air action plan for three Indian cities	Ricardo Energy & Environment
Development of emission standards for diesel locomotives	RITES

# Resources

- Highly qualified, experienced and dedicated team of professionals drawn from different disciplines.
- Specialization in environmental science, Crop land, atmospheric sciences, civil engineering, physics, and chemistry.
- Support to and from a large pool of professionals working in the areas of energy, urban development, climate change, economics, ecology, bio-technology, and GIS (geographical information systems).
- Well-equipped accredited laboratory.
- State-of-the-art field sampling and analytical instruments (for environmental monitoring and analysis– air, water, land, and noise– RDS, cascade impactor, particulate (PM10 & PM2.5) speciation sampler, personal exposure monitor, automatic carbon monoxide and ozone monitors, VOC samplers, stack emission monitor, automatic weather monitoring system, carbon analyser, ion chromatograph, atomic absorption spectrophotometer, gas chromatograph, noise level meter, etc.
- Well-established QA/QC system accredited by the British Standards Institution for fully complying with ISO 9001:2000.
- Other technologies/tools required for environmental investigations, namely mathematical models (air quality / water quality / noise profiling), GIS, advance statistical software, etc., are some of the other assets available to CES.





# Area Members



Ms Suruchi Bhadwal

Senior Fellow &  
Director (ESCC)



Mr R Suresh

Fellow & AC



Ms V B Suneetha

Area Secretary



Ms Valsa Charles



Ms Anju Goel



Dr Arindam Datta



Ms Asfiya Begum

Fellows



Mr Ved Prakash  
Sharma

Lab Manager



Mr Nimish Singh



Md Hafizur Rahman



Ms Vidhu Kapur

Associate Fellows



Mr Surender  
Singh Negi



Mr Mahesh Kumar



Mr Kulwant Singh



Mr K Johnson

Lab Staff



Ms Shivani Sharma



Mr Justin Jacob



Ms Varsha Gupta



Mr Prabhat Sharma

Research Associates



Mr Dheeraj Mehra



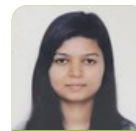
Mr Divyanshu Shukla



Ms Pooja Mallick



Ms Ashwini Kamble



Ms Devansi Dixit

Project Associates

# Gallery



**For further details,**

**Mr. R. Suresh,**

Area Convenor, Centre for Environmental Studies

TERI, Darbari Seth Block, IHC Complex,

Lodhi Road, New Delhi – 110 003,

Tel: +91 11 2468 2100

Fax: +91 11 2468 2144 | E-mail: [sureshr@teri.res.in](mailto:sureshr@teri.res.in)