

Columbia Climate School Clean Air Toolbox for Cities

# 6th Edition INDIA CLEAN AIR SUMMIT (ICAS) 2024

## The Participatory Future of Air Quality Management

26–30 August Venue: Sheraton Grand Bangalore Hotel at Brigade Gateway, Bengaluru

Supported by

**Bloomberg Philanthropies** 





## Sponsored by





Aurassure Be Aware, Live Secure







**Center for Study of Science, Technology and Policy** #18, 10th Cross, Mayura Street, Papanna Layout, Nagashettyhalli, RMV II Stage, Bengaluru - 560094, Karnataka, India CIN: U80302KA2005NPL036676



Dr Jai Asundi Executive Director, CSTEP

It is the sixth year of the India Clean Air Summit (ICAS), and I am delighted to hear that we will be discussing 'The Participatory Future of Air Quality Management'. I take this opportunity to express my gratitude to those who have participated in ICAS over the last 5 years. Your participation at ICAS has immensely contributed to the work we are doing, helping us identify gaps and develop comprehensive solutions that reflect the changing world.

Clean air is a birthright; many of our development goals hinge on the health and productivity of our people. Ensuring that citizens can lead a better quality of life will not be possible without clean air. Through Mission LiFE, we urge citizens to make behavioural changes that are essential for addressing climate change, adapting to its impact, and reducing pollution. The discussions at ICAS will reflect these themes, with an aim to advance our knowledge in the pursuit of clean air.

Over the years, ICAS has looked at various important aspects such as the lack of quality data, the health impacts of air pollution, the inter-connectedness of air pollution and climate change, and achieving Sustainable Development Goals through clean air. CSTEP collaborated with UC Davis for conducting the Air Sensors International Conference in India in 2022 and with the Indian Aerosol Science and Technology Association in 2023.

While the lack of data is an important concern today, we need to consider the quality of data. Further, understanding the science of air pollution has never been more pertinent as citizen groups and communities now look at low-cost sensors to understand air quality around them. Clean air benefits us all, and we need to invest in clean air right now to aim for a healthy and productive population.

In this edition of ICAS, we will utilise our learnings from the past years, looking at how we can enable quality participation in air quality management and address the challenges and risks. Through a participatory approach, we can create awareness on the science of pollution, its impacts on our health, and the interconnectedness of climate change and air pollution and strive towards cleaner air and healthier communities.

Full



**Dr R Subramanian** Sector Head, Air Quality CSTEP

Welcome to the India Clean Air Summit 2024. We could not do it without your participation and support. Thank you.

Over the past year, the erstwhile Air Quality group has expanded into the Air Quality Sector, adding 15 new team members (including me!) Our vision is two-fold:

- Build new (and improve existing) observational, modelling, and policy tools to develop new air quality management policies and track their implementation.
- Share these tools with other think tanks, Institutes of Repute, governments, and international partners so that we can collectively work towards clean air for all.

This year's ICAS is in partnership with the Clean Air Monitoring and Solutions Network (CAMS-Net), led by Dan Westervelt and Faye McNeill at Columbia University. Together, we have developed a packed agenda: training on modelling and measurement tools, and discussions on the role of air sensors in ensuring cleaner air at the neighbourhood scale and improving health and productivity through better indoor air quality.

At ICAS, we shall present our new policy brief on stubble management in Punjab. We are also launching a website where you can explore the sources of air pollution (our new emissions inventory) and recommended control measures for 76 non-attainment/million-plus cities across India. We welcome your feedback!

On Thursday, you will learn about source apportionment (including how our emissions inventory was developed) and air quality modelling – the core components of scientific air quality management. Next, we have eminent panellists presenting on sustainable development strategies and regulatory frameworks that can simultaneously tackle the twin crises of air pollution and climate change.

We end on Friday with a discussion of household air pollution, which still claims millions of premature lives and impairs child development. But I am inspired by our air quality champions, one of whom goes door to door in lower-income neighbourhoods to ensure everyone has access to clean cooking.

Science and technology. Fighting air pollution in the fields and in the streets. Citizen participation. National and international collaboration. This is the participatory future of air quality management needed to achieve clean air for all. Thank you for joining us in this journey.

Dr R Subramanian



# Prof V Faye McNeill

Professor and Vice Chair, Department of Chemical Engineering, and Professor, Department of Earth and Environmental Sciences, Columbia University

It is my great pleasure to join you in Bengaluru this week for the India Clean Air Summit (ICAS) 2024 and Clean Air Monitoring and Solutions Network (CAMS-Net) workshop. I extend my greetings and thanks in my capacities as the principal investigator (PI) of the Columbia University Clean Air Toolbox for Cities, co-PI of CAMS-Net, and current president of the American Association for Aerosol Research (AAAR). I look forward to listening and learning from all of you this week.

On the path towards cleaner air, high-quality data are needed at each stage to support progress. Neighborhood-level monitoring studies using carefully calibrated sensors have proven useful around the world and are gaining prominence across India.

This year, ICAS is preceded by a technical workshop hosted by CAMS-Net, a US National Science Foundation-funded project. CAMS-Net is aimed at creating an international 'network of networks' that facilitates the exchange of knowledge, ideas, and data to improve the usage and application of low-cost sensor air quality data. It offers a unique platform for South-South-North collaboration. CAMS-Net joining forces with ICAS this year offers a valuable opportunity for training and knowledge exchange with attendees from around the world.

When I attended ICAS 2023, I arrived already optimistic about the strides that had been made towards cleaner air in India. I left that week even more certain about the positive outlook for air quality in this great country. I was very impressed by the breadth of perspectives and depth of knowledge shared by my fellow attendees from every sector. What I learned spanned from technical research activities to government and grassroots initiatives. I strengthened connections with long-time colleagues and forged vibrant new collaborations. I hope that your experience this week will be as valuable.

Sincerely,

Prof V Faye McNeill



**Prof Daniel M Westervelt** Principal Investigator, CAMS-Net Lamont Associate Research Professor Columbia University, USA

On behalf of the 'Clean Air Monitoring and Solutions Network (CAMS-Net)', a United States National Science Foundation-funded project, I am delighted to share this message with you as we endeavour upon a week full of exciting discussions on use-inspired, policy-relevant, air pollution science. We are all gathered here this week because we are aware of and eager to do something about the global public health crisis, i.e. exposure to air pollution. This crisis is especially pertinent in the Global South, where there exists a major disparity in not only pollution levels but also our ability to monitor and therefore mitigate extreme air pollution. One of the major goals of the CAMS-Net project is to foster international collaboration to help close this air pollution monitoring gap and bring clean air to all.

The theme of ICAS this year is 'The Participatory Future of Air Quality Management', which reflects major themes in CAMS-Net. Clean air for all cannot be achieved without a diverse, broad representation across a variety of stakeholders. We must bring together scientists, engineers, government policymakers, private sector, civil society, NGOs, and more to achieve the goal of improved public health via reduced air pollution. Looking at the agenda ahead for this week, I am thrilled to see that this conference is already taking a major step forward in this direction.

An important focus of CAMS-Net is also the use of air sensors (so-called 'low-cost' sensors) to help democratise data and close the air pollution data gap. These sensors have enormous potential to provide stakeholders with actionable air quality data, but we must be both open and cognizant of the data quality challenges that are presented with sensor use. This is why facilities like the air quality Sensor Evaluation and Training Center for West Africa (Afri-SET) and its sister project Indi-SET are crucial in order to obtain useful, actionable data from air sensors. CAMS-Net has been proud to participate in these and similar sensor evaluation projects in recent years.

I wish everyone a very fruitful week and offer my tremendous gratitude to our hosts at the Center for Study of Science, Technology and Policy (CSTEP) for facilitating and organising such an important event.

Sincerely,

Joz ) // 5

# About CSTEP

## **CENTER FOR STUDY OF SCIENCE, TECHNOLOGY AND POLICY**

The Center for Study of Science, Technology and Policy (CSTEP) is one of India's leading think tanks, with a mission to enrich policymaking with innovative approaches using science and technology for a sustainable, secure, and inclusive society. Our work is in the areas of climate, environment, sustainability, energy, artificial intelligence for social impact, and new materials. Our research leverages innovative technology-based ideas to solve developmental challenges. Our vision is to be the foremost institution for policy analysis in India.



## **Policy Engagements**

- Member, Low-Carbon Technologies Committee formed by NITI Aayog (with a focus on policy solutions for enabling a Green Hydrogen economy in India)
- Member, India Climate and Energy Modelling Forum convened by NITI Aayog for developing India's long-term strategies
- Ministry of Environment, Forest and Climate Change (MoEFCC)
- NITI Aayog
- Ministry of New and Renewable Energy (MNRE)
- Governments of Karnataka, Andhra Pradesh, Bihar, and Madhya Pradesh
- Review Panel in the Clean Energy Ministerial
- Member of Science and Engineering Research Board, DST

## Air Quality Sector at CSTEP

Since the establishment of the Centre for Air Pollution Studies (CAPS) at CSTEP in 2018, our work in the realm of air pollution control has been driving change across the country. In July 2023, CAPS was expanded into the new 'Air Quality' sector that now works on three specialised areas: policy development and assessment, atmospheric composition modelling, and atmospheric composition observations. The sector's work towards clean air for all has brought about real change on the ground. The scientific evidence gathered on identifying the local sources of air pollution informs city-level Clean Air Action Plans (CAAPs) across the country.

Over the years, CSTEP has developed high-resolution emission inventories for over 80 non-attainment and million-plus cities, which has helped us identify targeted air pollution reduction measures. Our research uses air quality modelling and techno-economic assessments, along with a mix of monitoring and measurement technologies such as low-cost sensors, mobile monitoring, and satellite mapping. This has enabled us to share comprehensive recommendations to decision-makers for preparing state- and city-level CAAPs. Recognising the opportunities presented by sensor technology, we have set up an air pollution lab at the CSTEP office in Bengaluru to test and calibrate low-cost sensors. We are working with government and industry bodies to develop protocols for standardising sensors to ensure greater accuracy in the collection and use of data from low-cost sensors. Moving beyond the world of PM<sub>25'</sub> our studies target super pollutants such as black carbon and methane. These studies can be used at multiple levels of governance and in industries to improve air quality and reduce the climate footprint.

The India Clean Air Summit (ICAS), CSTEP's flagship event spearheaded by the Air Quality sector, stimulates purposeful dialogue and collaborative action. Entering its sixth year, ICAS is recognised today as India's premier event on air pollution. It brings together scientists, community-led organisations, policymakers, and influencers to leverage the latest scientific research and technology to improve policies and actions for reducing air pollution.

all is the

No K Mart

# INDIA CLEAN AIR SUMMIT (ICAS) - 2024

## 'The Participatory Future of Air Quality Management'

Date: 26-30 August 2024

### Venue: Sheraton Grand Bangalore Hotel at Brigade Gateway, Bengaluru

With the launch of the National Clean Air Programme (NCAP) in 2019, India has taken several measures to improve air quality and reduce the resulting health impacts. To further the cause of clean air for all, CSTEP announces the sixth edition of its flagship event on air pollution India Clean Air Summit (ICAS) 2024. ICAS 2024 is based on the central theme 'The Participatory Future of Air Quality Management' to drive collaborative action on air pollution in India and will be held from 26 to 30 August 2024.

This year, CSTEP is partnering with the Clean Air Monitoring and Solutions Network (CAMS-Net) for the sessions being organised from 26 to 28 August under the theme 'South–South–North Collaborations Towards Clean Air for All'.

The event aims to bring together multiple agencies and representatives from government bodies, think tanks, academia, citizens, funding agencies, and on-ground implementation partners to discuss and devise measures to improve outdoor and indoor air quality. This platform provides an opportunity for countries in the Global South, such as India, Ghana, Rwanda, Kenya, and Nigeria, to gain insights from successes in the Global North countries such as the United States and France (South–North) and from each other (South–South).

Air pollution sensors are a vital part of the fight against air pollution. However, data quality remains an important concern. The assessment of the performance of air sensors against reference-grade monitors, the ultimate quality assurance check, has been limited. The Air Quality Sensor Performance Evaluation Center (AQ-SPEC), AirParif Airlab Microsensors Challenge, air quality Sensor Evaluation and Training centre for West Africa (Afri-SET), and CSTEP's India Sensor Evaluation and Training (Indi-SET) centres have been established to independently evaluate commercially available sensors. At ICAS + CAMS-Net 2024, we shall look at their successes and challenges and chart the path to wider acceptance of air sensors for air quality management.

We will also look at applications to identify neighbourhood-scale pollution hotspots, fill in data gaps in rural or unmonitored regions where little to no monitoring infrastructure exists, facilitate fenceline monitoring of industrial emissions, and improve air quality at home and workplaces. Further, we shall bring together upcoming researchers from across India to discuss a new community of practice for better knowledge sharing to improve our mutual understanding on the effective use of low-cost sensors.

ICAS 2024 will cover a wide range of topics on air quality management to answer critical questions, including emission inventories (what are the sources of air pollution in your city?), air quality modelling (how much do local sources vs regional or transported pollution contribute to air pollution?), source apportionment (is there ground evidence on such sources and their contributions?). We shall hear from experts on how we can combine climate action with clean air action, as these twin challenges share many of the same causes. For example, diesel engines in buses, trucks, and generators emit both carbon dioxide and black carbon. Sustainability solutions will highlight efforts to tackle

climate-warming air pollution that can lead to climate and air quality win-wins. As we approach the time to revise India's Nationally Determined Contributions (NDCs) for climate goals and the next iteration of NCAP, we shall look at ways to harmonise the key governance structures to yield greater clean air benefits.

Finally, the event will provide an opportunity to be inspired by and learn from air quality champions making a difference in their own ways towards clean air for all.

11



Day 0/Training Day CAMS-Net   Monday, 26 August 2024		
Time	Session name	Speaker/Moderator name
8:00 AM-	-9:00 AM   Onsite re	gistration and badge pickup (Pre-function Area)
9:00 AM–1:00 PM	Demonstration of air quality information tools (SIM-Air and emissions inventory)	Dr Sarath Guttikunda, Founder and Director, Urban Emissions
	From sensing to sending data: Integrating hardware and firmware for low- cost sensors	Mr Ronak Sutaria and Dr Kevin Joshi, Respirer Living Sciences Pvt Ltd ( <i>Venue: Jupiter</i> )
	1:00 PM-	-2:15 PM   Lunch (Sheraton)
	Let's talk data! (Air quality data bootcamp)	Ms Garima Raheja, PhD Candidate, Columbia University, Lamont-Doherty Earth Observatory
2:15 PM-4:15 PM		Dr Saumya Singh, Assistant Professor, Indian Institute of Forest Management, Bhopal, India
4:15	PM-4:30 PM   Tea	break and poster mounting (Pre-function Area)
4:30 PM-6:30 PM	Empirical models for spatial air quality assessment	Dr Albert Presto, Research Professor, Department of Mechanical Engineering, Carnegie Mellon University
	6:30 PM-	8:30 PM   Dinner (Sheraton)
Day 1 CAMS-Net   Tuesday, 27 August 2024		
Time	Session name	Speaker/Moderator name
8:00 AM-9:00 AM   Onsite registration and badge pickup (Pre-function Area)		
9:00 AM-9:50 AM	Opening plenaries: South- South-North collaboration towards clean air for all	Moderator: Prof Dan Westervelt, Lamont Associate Research Professor, Columbia University, Lamont-Doherty Earth Observatory

		Prof V Faye McNeill, Professor and Vice Chair, Department of Chemical Engineering, and Professor, Department of Earth and Environmental Sciences, Columbia University	
		Dr R Subramanian, Head, Air Quality Sector, CSTEP	
		Dr Allison Hughes, Senior Lecturer, University of Ghana	
	9:50 AI	M–10:00 AM   Tea break	
	Which air pollution monitor? Ranking low- cost sensors and the path to standardised	Moderator: Ms Swagata Dey, Policy Specialist, Atmospheric Composition Observations, Air Quality Sector, CSTEP	
		Dr Mike Giordano, Executive Director, AfriqAir	
10.00 AM-11.30 AM		Ms Emil Varghese, Senior Analyst, Atmospheric Composition Observations, Air Quality Sector, CSTEP	
	testing	Mr Adrian Arfire, Metrology Engineer, Airparif (Virtual)	
	Towards clean air for all: Measuring air pollution in your neighbourhood	Moderator: Dr Anindita Dutta	
		Dr Saumya Singh, Assistant Professor, Indian Institute of Forest Management, Bhopal	
11:30 AM-1:00 PM		Ms Garima Raheja, PhD Candidate, Columbia University, Lamont-Doherty Earth Observatory	
11.30 AM-1.00 PM		Prof Kofi Amegah, Project Lead, Breathe Accra, and Associate Professor, Senior Member, University of Cape Coast	
		Dr Provat Kumar Saha, Associate Professor, Department of Civil Engineering, Bangladesh University of Engineering and Technology (Virtual)	
1:00 PM-2:30 PM   Lunch (Sheraton)			
2:30 PM-4:00 PM	Advanced data analytics for hyper-local air pollution action	Moderator: Dr Nidhi Malik, Consultant, Air Quality Sector, CSTEP	
		Prof Dan Westervelt, Lamont Associate Research Professor, Columbia University, Lamont-Doherty Earth Observatory	

		Dr Nirav Lekinwala, Senior Associate, Air Quality Sector, CSTEP
		Mr Mrinmoy Chakraborty, The University of British Columbia
		Dr Sathish Swaminathan, Postdoctoral Fellow, Columbia University
4:00 PM-4:15 PM   Tea break		
4:15 PM-5:45 PM	Breakouts sessions	Dr Albert Presto (Topic: Gas sensor performance), Research Professor, Department of Mechanical Engineering, Carnegie Mellon University
		Mr Ronak Sutaria (Topic: Industrial fugitive and fenceline emissions monitoring), Founder and CEO, Respirer Living Sciences Pvt Ltd
		(Venue: Jupiter)
5:45 PM-6:30 PM   Poster viewing time (Pre-function Area)		
6:30 PM-8:30 PM   CAMS-Net dinner (Sheraton)		

Day 2 CAMS-Net   Wednesday, 28 August 2024		
Time	Session name	Speaker/Moderator name
8:00 AM-9:00 AM   Onsite registration and badge pickup (Pre-function Area)		
9:00 AM-10:30 AM	Sensor applications	Moderator: Dr Jessica Seddon, Co-Founder, The Institutional Architecture Lab
		Dr Carl A Malings, Assistant Research Scientist, NASA Earth Science Applied Sciences (Virtual)
		Dr Sarath Guttikunda, Founder and Director, Urban Emissions
		Mr Jason Gu, Chief Technology Officer, Sensit Technologies
		Ms Victoria Owusu Tawiah, Kwame Nkrumah University of Science and Technology

10:30 AM–10:40 AM   Tea break		
Time	Session name	Speaker/Moderator name
10:40 AM-11:00 AM	Special address	Introduction by Ms Swagata Dey, Policy Specialist, Atmospheric Composition Observations, Air Quality Sector, CSTEP
		Special address by Dr Kalyan Rudra, Chairman, West Bengal Pollution Control Board
	Health and productivity through clean air at home and the workplace	Moderators: Dr R Subramanian, Head, Air Quality Sector, CSTEP, and Mr Kunal Jagdale, Senior Associate, Climate, Environment and Sustainability Sector, CSTEP
		Prof V Faye McNeill, Professor and Vice Chair, Department of Chemical Engineering, and Professor, Department of Earth and Environmental Sciences, Columbia University
11:00 AM-1:00 PM		Dr Yashkumar Shukla, Center Head and Principal Researcher, CARBSE
		Mr Guruprakash Sastry, Associate Vice President, Head – Climate action, Infosys
		Mr Ronak Sutaria, Founder and CEO, Respirer Living Sciences Pvt Ltd
		Dr Sameer Patel, Assistant Professor, Indian Institute of Technology Gandhinagar
1:00 PM-2:30 PM   Lunch (Sheraton)		
2:30 PM-4:30 PM	South Asia community of practice for air sensors: Building a network of young professionals	Moderator: Ms Swagata Dey, Policy Specialist, Atmospheric Composition Observations, Air Quality Sector, CSTEP
		Mr Shriram Manogaran, Portfolio Manager – Data, Clean Air Fund
		Mr Rajesh Shenoy, Head, Artificial Intelligence and Digital Platforms Sector, CSTEP
		Mr Ronak Sutaria, Founder and CEO, Respirer Living Sciences Pvt Ltd
		Ms Akanksha Priyadarshini, Co-Founder, Aurassure
		Dr Sofiya Rao, Principal Project Scientist, CAS, Indian Institute of Technology Delhi

		Dr Debashis Chakraborty, Sr Scientist, West Bengal Pollution Control Board
	CAMS-Net closing session: Way forward	Prof Dan Westervelt, Lamont Associate Research Professor, Columbia University, Lamont-Doherty Earth Observatory
		Prof V Faye McNeill, Professor and Vice Chair, Department of Chemical Engineering Professor, Department of Earth and Environmental Sciences, Columbia University
4:30 PM-5:30 PM		Dr R Subramanian, Head, Air Quality Sector, CSTEP
		Dr Albert Presto, Research Professor, Department of Mechanical Engineering, Carnegie Mellon University
	Certificate distribution for poster presentations	Moderator: Ms Anshika Srivastava, Senior Associate, Policy Development and Assessment, Air Quality Sector, CSTEP (Distributed by Dr R Subramanian and Prof Dan Westervelt)
5:45 PM-6:30 PM   Poster viewing time (Pre-function Area)		
6:00 PM-7	:00 PM   Onsite reg	istration and badge pickup (Pre-function Area)
6:00 PM-7	:00 PM   Onsite reg	istration and badge pickup (Pre-function Area) Moderator/Host: Dr R Subramanian, Head, Air Quality Sector, CSTEP
6:00 PM-7	:00 PM   Onsite reg	istration and badge pickup (Pre-function Area) Moderator/Host: Dr R Subramanian, Head, Air Quality Sector, CSTEP Dr Jai Asundi, Executive Director, CSTEP
6:00 PM-7	:00 PM   Onsite reg ICAS inaugural session	istration and badge pickup (Pre-function Area) Moderator/Host: Dr R Subramanian, Head, Air Quality Sector, CSTEP Dr Jai Asundi, Executive Director, CSTEP Shri Gaurav Gogoi, Honourable Member of Parliament, Lok Sabha
6:00 PM-7	:00 PM   Onsite reg ICAS inaugural session	istration and badge pickup (Pre-function Area) Moderator/Host: Dr R Subramanian, Head, Air Quality Sector, CSTEP Dr Jai Asundi, Executive Director, CSTEP Shri Gaurav Gogoi, Honourable Member of Parliament, Lok Sabha Smt Aparajita Sarangi, Honourable Member of Parliament, Lok Sabha ( <i>Virtual</i> )
6:00 PM-7 7:00 PM-8:30 PM	:00 PM   Onsite reg	<ul> <li>Istration and badge pickup (Pre-function Area)</li> <li>Moderator/Host: Dr R Subramanian, Head, Air Quality Sector, CSTEP</li> <li>Dr Jai Asundi, Executive Director, CSTEP</li> <li>Shri Gaurav Gogoi, Honourable Member of Parliament, Lok Sabha</li> <li>Smt Aparajita Sarangi, Honourable Member of Parliament, Lok Sabha (<i>Virtual</i>)</li> <li>Dr Santosh Harish, Program Officer, Open Philanthropy</li> </ul>
6:00 PM-7 7:00 PM-8:30 PM	Copped   Onsite reg	<ul> <li>Istration and badge pickup (Pre-function Area)</li> <li>Moderator/Host: Dr R Subramanian, Head, Air Quality Sector, CSTEP</li> <li>Dr Jai Asundi, Executive Director, CSTEP</li> <li>Shri Gaurav Gogoi, Honourable Member of Parliament, Lok Sabha</li> <li>Smt Aparajita Sarangi, Honourable Member of Parliament, Lok Sabha (<i>Virtual</i>)</li> <li>Dr Santosh Harish, Program Officer, Open Philanthropy</li> <li>Keynote Adress: Prof Adarsh Pal Vig, Chairman, Punjab Pollution Control Board</li> </ul>
6:00 PM-7	COPM   Onsite reg	Istration and badge pickup (Pre-function Area)Moderator/Host: Dr R Subramanian, Head, Air Quality Sector, CSTEPDr Jai Asundi, Executive Director, CSTEPShri Gaurav Gogoi, Honourable Member of Parliament, Lok SabhaSmt Aparajita Sarangi, Honourable Member of Parliament, Lok Sabha ( <i>Virtual</i> )Dr Santosh Harish, Program Officer, Open PhilanthropyKeynote Adress: Prof Adarsh Pal Vig, Chairman, Punjab Pollution Control BoardPresentations by
6:00 PM-7	COPM   Onsite reg	istration and badge pickup (Pre-function Area) Moderator/Host: Dr R Subramanian, Head, Air Quality Sector, CSTEP Dr Jai Asundi, Executive Director, CSTEP Shri Gaurav Gogoi, Honourable Member of Parliament, Lok Sabha Smt Aparajita Sarangi, Honourable Member of Parliament, Lok Sabha ( <i>Virtual</i> ) Dr Santosh Harish, Program Officer, Open Philanthropy Keynote Adress: Prof Adarsh Pal Vig, Chairman, Punjab Pollution Control Board Presentations by Ms Swagata Dey, Policy Specialist, Atmospheric Composition Observations, Air Quality Sector, CSTEP
6:00 PM-7	CAS inaugural session	istration and badge pickup (Pre-function Area)Moderator/Host: Dr R Subramanian, Head, Air Quality Sector, CSTEPDr Jai Asundi, Executive Director, CSTEPShri Gaurav Gogoi, Honourable Member of Parliament, Lok SabhaSmt Aparajita Sarangi, Honourable Member of Parliament, Lok Sabha ( <i>Virtual</i> )Dr Santosh Harish, Program Officer, Open PhilanthropyKeynote Adress: Prof Adarsh Pal Vig, Chairman, Punjab Pollution Control BoardPresentations byMs Swagata Dey, Policy Specialist, Atmospheric Composition Observations, Air Quality Sector, CSTEPMr Umang Bhola, Senior Consultant, GDi Partners

### 8:30 PM onwards | ICAS dinner (Sheraton)

Day 1 ICAS   Thursday, 29 August 2024		
Time	Session name	Speaker/Moderator name
9:00 AM-10	):00 AM   Onsite reg	istration and badge pickup (Pre-function Area)
10:00 AM-10:05 AM	Introduction	Dr R Subramanian, Head, Air Quality Sector, CSTEP
10:05 AM-10:15 AM	Welcome remarks	Ms Priya Shankar, India Director, Climate and Environment Program, Bloomberg Philanthropies
		Moderator: Dr R Subramanian, Head, Air Quality Sector, CSTEP
		(Tentative) Government of Karnataka Representative
10:15 AM-11:30 AM	Plenary panel: The participatory future of air quality management in India	Dr Soumya Swaminathan, Principal Advisor, Ministry of Health and Family Welfare; former Chief Scientist, WHO; and Chairperson, M S Swaminathan Research Foundation ( <i>Virtual</i> )
		Prof Kalpana Balakrishnan, Associate Dean (Research) and Director; WHO Collaborating Center for Occupational and Environmental Health; ICMR Centre for Advanced Research on Air Quality, Climate and Health; Department of Environmental Health Engineering, Sri Ramachandra University
		Shri HC Balachandra, Member Secretary, Karnataka State Pollution Control Board
11:30 AM-1:00 PM	Unlocking the secrets of the air you breathe: Source apportionment and emissions inventory	Moderator: Ms Emil Varghese, Senior Analyst, Atmospheric Composition Observations, Air Quality Sector, CSTEP
		Dr Shweta Yadav, Assistant Professor, Department of Environmental Sciences, Central University of Jammu
		Mr Anirban Banerjee, Senior Associate, Policy Development and Assessment, Air Quality Sector, CSTEP

		Dr Albert Presto, Research Professor, Department of Mechanical Engineering, Carnegie Mellon University
		Prof Deepika Bhattu, Associate Professor, Indian Institute of Technology Jodhpur
	1:00 PM-2	:30 PM   Lunch (Sheraton)
	Air quality modelling for improved clean air action	Moderator: Mr Kaushik Muduchuru, Senior Associate, Atmospheric Composition Modelling, Air Quality Sector, CSTEP
		Dr Sarath Guttikunda, Founder and Director, Urban Emissions
		Dr Sachin D Ghude, Scientist-F Head, Indian Institute of Tropical Meteorology
2:30 PM-4:15 PM		Prof Srinidhi Balasubramanian, Assistant Professor, Department of Environmental Science and Engineering, Indian Institute of Technology Bombay
		Prof Dan Westervelt, Lamont Associate Research Professor, Columbia University, Lamont-Doherty Earth Observatory
		Dr Piyush Bhardwaj, Research Scientist, Atmospheric Composition Modelling, Air Quality Sector, CSTEP
4:15 PM-4:30 PM   Tea break		
4:30 PM-6:00 PM	Sustainability solutions: Simultaneous air quality and climate win-wins	Moderator: Dr Jessica Seddon, Co-Founder, The Institutional Architecture Lab
		Shri Pushyamitra Bhargav, Mayor, Indore
		Mr Martin Raiser, Vice President, South Asia Region, World Bank ( <i>Virtual)</i>
		Dr Sameer Maithel, Founder, GKSPLGreentech Knowledge Solutions Pvt Ltd
		Prof Chandra Venkataraman, Professor, Department of Chemical Engineering, Indian Institute of Technology Bombay (Virtual)

6:15 PM-7:00 PM   Poster viewing time (Pre-function Area)		
Day 2 ICAS   Friday, 30 August 2024		
Time	Session name	Speaker/Moderator name
9:00 AM–10:00 AM   Onsite registration and badge pickup (Pre-function Area)		
	Join the fight: Air quality champions	Moderator: Ms Nidhi Jamwal
10:00 AM-11:00AM		Shri Gaurav Singh Sogarwal, IAS, Municipal Commissioner, Gorakhpur
		Ms Rama, ASAR Social Impact Private Limited
		Dr Amit Chakraborty, Chief Environment, Tata Steel
11:00 AM-11:30 AM	TBC	
11:30 AM-1:00 PM	Harmonising climate and clean air action: Rec- ommendations for NCAP 2.0 and NDC 2.0	Moderator: Ms Swagata Dey, Policy Specialist, Atmospheric Composition Observations, Air Quality Sector, CSTEP
		Shri Ashish Tiwari, IFS, Secretary, Environment, Forest and Climate Change Department, Government of Uttar Pradesh
		Dr Prashant Gargava, Director, NCAP
		Ms Anumita Roychowdhury, Executive Director, Research and Advocacy, Centre for Science and Environment
		Ms Aarti Khosla, Founder and Director, Climate Trends
1:00 PM-2:30 PM   Lunch (Sheraton)		

2:30 PM-4:00 PM Household air pollution: Impacts and solutions	Household air pollution: Impacts	Moderator: Shri T S Panwar, Advisor, Air Quality and Climate, CSTEP
		Mr Abhishek Kar, Senior Programme Lead, Council on Energy, Environment and Water
		Mr Roshan Wathore, Scientist, National Environmental Engineering Research Institute
	Prof Kalpana Balakrishnan, Associate Dean (Research) and Director; WHO Collaborating Center for Occupational and Environmental Health; ICMR Centre for Advanced Research on Air Quality, Climate and Health; Department of Environmental Health Engineering, Sri Ramachandra University (Virtual)	
4:00 PM-4:30 PM   Vote of thanks by Dr R Subramanian, Head, Air Quality Sector, CSTEP		

4:30 PM-5:00 PM | High tea (Sheraton)

# Poster Presentations

- 'Trends and insights into sources of PM2.5 in Kolkata, India from low-cost sensor network data' By Sandhya Sethuraman, Columbia University
- 'Assessment of PM2.5 in different microenvironments using low-cost sensor' By Awashesh Kumar Dwivedi, Central University of Rajasthan
- Witnessing the welding: An investigation on soft contact lens and deposition during welding' By Niveditha Muruganandam, Anna University
- 'Multiple-time-season-resolved source characteristics, patterns and apportionment of fine particulate matter using positive matrix factorization (PMF)' By Vikas Kumar, IIT Bombay
- 'Quantifying on-road transport PM emissions over non-attainment city: Relative contribution of exhaust and non-exhaust sources'
   By Vishal, IIT Tirupati
- 'Meeting clean air targets could reduce the burden of hypertension in women of reproductive age in India' By Taruna Singh, IIT Delhi
- 'Towards cleaner air: A comprehensive emission inventory of urban anthropogenic sources in Vijayawada, India, a non-attainment city' By Manuj Sharma, IIT Tirupati
- 'Examining the role of earth-based building materials in passively regulating indoor air quality (IAQ)'
   By Suchi Priyadarshani, *IISc*
- Surface ozone patterns changes during 1981-2020 over Indian subcontinent' By Tanu Gangwar, Banaras Hindu University
- 'Assessment of ground and MERRA2 reanalysis based data of PM2.5 in semi-arid regions of India' By Pritiranjan Singh, Central University of Rajasthan
- 'Mass absorption efficiency of elemental carbon in PM2.5 over north western Himalayas' By Konika Sharma, Central University of Jammu
- 'Characterization of particulate matter in multi-zonal residential apartment: Transport, exposure, and mitigation' By Alok Kumar Thakur, IIT Gandhinagar
- 'Experimental and field studies to control resuspension of dust from roads, open grounds, and material handling' By Umangi Mehta, IIT Bombay

- 'Comparing indoor air quality trends in vernacular and conventional dwellings' By Shreyata Khurana, *IISc*
- 'Air pollution in urban Ouagadougou' By Issoufou Ouarma, Université Nazi BONI
- 'Road transport and in-cabin air quality monitoring in public transport buses using an optical particle counter (OPC)'
   By Bertrand Tchanche Fankam, Alioune Diop University
- 'A case study of sensors. AFRICA air quality monitoring network' By Usman Ahmed, Code for Africa
- 'First estimation of public service vehicles exhaust emission factors in Nairobi City' By Paul Njogu, Jomo Kenyatta University of Agriculture and Technology
- 'Investigating the health effects of particulate air pollution and its composition on lung functions of the school children at megacity Dhaka' By Sanjida Ahmed, Jahangirnagar University
- 'Development of a low-cost air quality monitoring device using IoT' By Rose Alani, University of Lagos
- 'Challenges of using low-cost air quality sensors for regulatory compliance & enforcement' By Godwin Opinde, Kenyatta University
- 'The usefulness of participatory science in revolutionising and advancing air quality campaigns in Ghana' By Victor Ablo, Salvation Army Senior High School
- 'Household air pollutants, human milk composition and cognitive function of children' By Anindita Dutta, Independent
- 'Institutional perspectives and challenges of setting an air pollution monitoring network: The ModelArA case - Angola'
   By Evanilton Pires, Instituto Superior Politécnico Tundavala
- 'Evaluating and comparing machine learning models for sensor-wise air quality prediction using AQMS as a reference' By Nidhi Malik, CSTEP
- 'Particulate matter elemental characterization and respiratory tract deposition: Formal waste collection occupational exposure' By Sanmathi K R, Kumaragaru College of Technology
- 'Air quality impacts of long-term power sector transition pathways in India' By Devadathan Biju, World Research Institute

India Clean Air Summit 2024

- 'Assessment of key-short-lived climate pollutants (k-SLCPs) at a rural site in the Indo-Gangetic Plains (IGP) of India'
   By Anurag Sahu, Council on Energy, Environment, and Water
- 'Air quality decision support system (AQDSS) for Thane City' By Sneha Ignatious, Council on Energy, Environment, and Water
- 'Documenting Punjab's stubble management journey: Survey insights from eleven districts of Punjab'
   By Kurinji Kemanth, Council on Energy, Environment, and Water
- 'AtlasAQ: Data-driven air quality ranking and visualization portal for Indian cities' By Kevin Joshi, Respirer Living Sciences
- 'Utility of low-cost sensor measurement for predicting ambient PM2.5 concentrations: Evidence from a monitoring network in Accra, Ghana' By Patrick Attey-Yeboah, Breathe Accra Project



25

Studies Undertaken by the Air Quality Sector

#### Emission inventory study on 76 cities in India

CSTEP, with the assistance from 11 other Institutes of Repute (IoRs), developed emission inventories for 76 non-attainment cities under the aegis of the National Knowledge Network (NKN) to examine various polluting sectors in the cities and their contributions to air pollution.

The study estimated the shares of four major pollutants (particulate matter  $[PM_{10} \text{ and } PM_{2.5}]$ , sulphur dioxide  $[SO_2]$ , and oxides of nitrogen [NOx]) in the following sectors: residential, commercial cooking, open burning, industries (including electricity generation), transportation (tailpipe and resuspension of dust), airports, and marine ports. The study quantified sectoral emission contributions for the base year 2019–20 and projected the increase in emissions till 2030. The study also determined the emission reduction potential of selected control measures and their associated costs. Some of the key control measures evaluated were electrification of transportation, installation of diesel particulate filters in trucks, solid waste management, banning of open burning, and promotion of clean fuel usage in industries.

#### State-level strategies for reducing air pollution in Punjab

The National Clean Air Programme (NCAP) focuses on city-level actions, which do not address transboundary, peri-urban, and rural sources of pollution. CSTEP, supported by the Clean Air Fund, is working closely with the Punjab State Pollution Control Board and line departments to establish state-level strategies that would cover urban and peri-urban areas and rural hamlets, thus truly ensuring clean air for all (not just for city dwellers). Several important sources are beyond city jurisdictions (e.g. stubble burning) and are under the state's purview (e.g. freight transport and industry)

One unique approach to our work involves the assessment of the impact of state-level strategies using regional air quality modelling techniques vis-à-vis city-level actions. The success of the interventions from this initiative could be used to build a case for state-level strategies at large and then be replicated in more states across India. CSTEP also aims to conduct extensive capacity building exercises with various departments and inform the formation of a steering committee.

### Projects under evidence generation for NCAP

CSTEP has undertaken the following projects for evidence generation under NCAP.

**Development of state/national-level policy interventions for diesel-fuelled heavy commercial vehicles (HCVs):** The study will quantify state-level emissions due to diesel HCVs and based on different mitigation measures pollution reduction potential for the horizon year 2035. This study will provide a mitigation pathway and will estimate the probable associated costs.

**Evaluation of emissions from diesel generator (DG) sets in various clusters and recommendation of mitigation policies:** The study will quantify districtlevel emissions from DG sets and investigate viable alternatives and mitigation costs.

**Development of a regional strategy to achieve the National Ambient Air Quality Standards (NAAQS) in southern Indian states:** Clean Air Action Plans, which focus on curbing emissions within a city administrative region, are employed in cities under NCAP to achieve NAAQS. However, a critical oversight in such action plans is the exclusion of interstate and transboundary transport of pollutants. In this study, state-of-the-art models are used to quantify the relative contribution of sources located in one southern state to the other. The preliminary findings indicate that the interstate contribution of fine particulate matter changes seasonally from one state to another and a state may be upwind of the other states during some months and downwind during the other months.

In addition to evidence generation, CSTEP is involved with multiple government stakeholders as technical resources for awareness creation towards air pollution and NCAP and for formulating mitigation measures. Further, workshops aimed at addressing city-specific challenges in meeting air quality targets, providing NCAP training, and building scientific and technical expertise are periodically organised.

#### The case for action on black carbon

The report points to the gap between the growing evidence on black carbon's regional climate impacts and its absence from global climate strategies. Black carbon, a pollutant emitted from the incomplete combustion of fossil fuels, biomass, and waste, sits uniquely at the centre of climate and health crises. Black carbon significantly speeds up the melting of snow and ice in the Arctic, Himalayas, and Andes; disrupts monsoon patterns in West Africa and India; and worsens the effects of dangerous heatwaves. Black carbon is strongly correlated with increased blood pressure levels, a high-risk factor for cardiovascular disease. Exposure to black carbon during pregnancy has been linked to multiple adverse birth outcomes, including low birth weight. Case studies compiled from across the globe demonstrate cost-effective and practical solutions to reducing black carbon emissions immediately. These include transitioning to cleaner



28

technologies in the Arctic and Africa, introducing the 'zigzag' technology for firing brick kilns in Asia, and controlling wildfires through community engagement in forest management.

#### Emission inventory and pollution reduction strategies for Bengaluru

CSTEP developed an emission inventory for the airshed area (60 km × 60 km) of Bengaluru. The emission load for various polluting sectors was estimated using the Central Pollution Control Board (CPCB) and United States Environmental Protection Agency (USEPA) methodology. The study estimated particulate matter ( $PM_{10}$  and  $PM_{2.5}$ ), oxides of nitrogen ( $NO_x$ ), and sulphur dioxide ( $SO_2$ ) emissions for 2019.

## Identification of polluting sources for Bengaluru: Source apportionment study

CSTEP, under the aegis of Karnataka State Pollution Control Board (KSPCB), conducted a source apportionment of PM concentrations in Bengaluru. The study had three major components: (i) Sampling of  $PM_{2.5}$  and PM10 through a fine particulate sampler and respirable dust sampler, respectively; the study quantified the sources of  $PM_{2.5}$  and  $PM_{10}$  at 13 sites monitored by KSPCB in Bengaluru. (ii) Quantification of the chemical species through various analytical instruments. (iii) Source apportionment of  $PM_{2.5}$  and  $PM_{10}$  through receptor modelling using the chemical mass balance model. The quantified chemical data was then used as an input for running the receptor model to derive the sector-wise contribution to pollution.

### Satellite-based mapping and the quantification of PM<sub>25</sub> in India

The daily mean  $PM_{2.5}$  was estimated, and spatial maps (1-km spatial resolution) were generated using moderate resolution imaging spectroradiometer (MODIS) AOD for 2019 across select Indian regions. The study regions included the urban, peri-urban, and rural regions of Delhi-National Capital Region, Kanpur, and Bengaluru. An advanced statistical model was trained using open-access data sets (satellite, regulatory ground-based  $PM_{2.5}$ , and reanalysis meteorology) to estimate the daily mean  $PM_{2.5}$ . Annual and seasonal maps of  $PM_{2.5}$  were generated, and a hotspot analysis was performed to identify the spatial clusters of high  $PM_{2.5}$  grids within the study regions. Spatial gradients of  $PM_{2.5}$  were studied to understand the rural, peri-urban, and urban contrast in pollution levels.





# Best practices for deploying and maintaining a low-cost $\ensuremath{\text{PM}}_{2.5}$ sensor network

The affordability, portability, and availability of low-cost sensors (LCSs) make air quality data accessible to the general public. The best practices suggested in this study are expected to help stakeholders set up and maintain LCS networks efficiently. The points put forth are based on our experience in establishing a city-wide PurpleAir LCS network in Bengaluru and maintaining it for 2 years.

# Mapping air pollution in Bengaluru using low-cost sensors and mobile monitoring data

A hybrid approach that combines non-conventional, less-expensive, shortterm stationary, and mobile deployments may be a cost-effective solution. In the city of Bengaluru, India, we adopted such a hybrid measurement approach to generate high-spatial-resolution air pollution maps. The primary policy recommendations from the work are as follows: (1) regulatory monitors need to be installed in non-urban areas, (2) supplementary monitoring using LCSs needs to be pursued in select regions in addition to the regulatory monitoring in urban areas, and (3) a mitigation plan is needed to reduce traffic-related emissions in western Bengaluru.

## Mobile-monitoring campaign for air pollution studies in Bengaluru

This report summarises the outputs of an 11-month-long mobile-monitoring project, with the goal to produce a high-resolution pollution map of select parts of Bengaluru. The study investigated the feasibility of mobile-monitoring studies in middle-income countries, which often have poor road conditions, high background pollution levels, and heterogeneous sources of pollution.

## Comprehensive clean air action plan for the city of Patna

The Patna Clean Air Action Plan was prepared to identify source-specific control measures. A techno-economic assessment was performed on the control measures, and an emission inventory was developed. The study estimated that the emission level will increase by 42% in 2030 without any interventions. The study estimated that under high-, medium-, and low-emission reduction scenarios, the  $PM_{2.5}$  emission level can be reduced by 69%, 48%, and 30%, respectively, with reference to the BAU scenario.

## Comprehensive clean air action plan for Gaya

The Gaya Clean Air Action Plan was prepared to identify source-specific control measures. A techno-economic assessment was performed on the control measures, and an emission inventory was developed to estimate the total emission load from various polluting sources in the city. The study estimated that the total  $PM_{2.5}$  emission load in 2018 was around 10,000 tonnes/year and is estimated to reach around 16,000 tonnes/year by 2030 under the BAU scenario. Emissions from the transportation sector were found to be the highest.













### Comprehensive clean air action plan for Muzaffarpur

A clean air action plan was prepared for Muzaffarpur, under which an emission inventory was developed. Source-specific control measures were identified, and a techno-economic analysis of the control measures was performed. The study estimated that under high-, medium-, and low-emission reduction scenarios, the  $PM_{2.5}$  emission level can be reduced by 37%, 28%, and 19%, respectively, with reference to the BAU scenario in 2030. Under the high-emission reduction scenario, the city could save at least 800 lives by 2030.

#### Clean air action plan for Ramgarh

The Ramgarh Clean Air Action Plan aimed to help mitigate the impacts of air pollution in several cities in Jharkhand. The government identified multiple cities, including Ramgarh, to generate evidence on air pollution. In this context, CSTEP prepared this clean air action plan to identify major polluting sources and prioritise measures to control air pollution. Further, the pollution landscape in the city was examined, and data were collected through multiple interactions with policymakers.

#### Air pollution emission inventory for six cities in Jharkhand

The study aimed to better understand the air pollution scenario in non-attainment cities in Jharkhand and develop emission inventories for six cities, namely, Sahibganj, Dumka, Pakur, Chaibasa, Hazaribagh, and Ramgarh. Reduction in emissions in the study cities requires holistic approaches. Heavy commercial vehicles plying in the cities significantly contribute to transport emissions (owing to the presence of major roads within the cities and freight movement due to industries). New roads bypassing the city area need to be constructed to reduce the sectoral share of transportation. End-to-end pavement to reduce road dust and installation of dust suppression systems in the industries for fugitive dust control are needed. Further, industries should be encouraged to use cleaner fuels, along with mandatory compliance (with third party auditing), to significantly reduce emissions in these cities.







31



www.cstep.in

## **Sponsors**



### Pollution Protection Systems (PPS) Mumbai Private Limited-SENSIT Technologies

PPS is in the business of design, manufacturer, and supply of highly reliable, cost-effective gas and flame detection systems. It has been in this field for 25+ years, serving oil and gas and petrochemical industries, with a presence in Asia, Middle East, Africa. In association with SENSIT TECHNOLOGIES, it also offers air quality monitoring systems with new state-of-the-art technology product lines manufactured/integrated in India with a low cost of ownership.

The SENSIT<sup>®</sup> RAMP is an easily deployable, low-cost air quality monitoring platform that is capable of monitoring up to five gaseous chemical pollutants, temperature, humidity, particulate matter, and meteorological conditions. Other SENSIT<sup>®</sup> RAMP features include internal SD storage, optional solar charging, and global cellular integration for remote operation.

The SENSIT<sup>®</sup> SPOD is a highly advanced and innovative sensor system that is designed to detect VOC emission plumes and help locate the source of emissions. It is a low-cost and eco-friendly solution that uses wind and air pollutant concentration measurements to monitor the environment in real time. The system is perfect for applications within the fenceline where localised emissions may be present, and it is user-friendly with a small footprint. The Next Generation Emissions Monitoring (NGEM) sensor offers continuous monitoring and direct reading, reducing the overall cost. With its advanced features and affordability, the SENSIT<sup>®</sup> SPOD is a game-changer in the field of air quality monitoring.

The GAS TRAC<sup>®</sup> FMD is an active sampling system equipped with a tunable diode laser spectroscopy (TDLAS) cell capable of detecting methane as low as 200 PPB. When equipped with an anemometer, the fixed methane detector (FMD) is capable of localizing leaks as well as providing state-of-the-art data to aid in quantification. Outgoing data is transmitted via cellular to either SENSITConnect or the user's chosen server. Advanced analytics, alarms, and automated alerts are available via SENSITConnect. The FMD is designed for autonomous and continuous operation via solar panel or connected power. It weighs 15 pounds and can be deployed on a tripod, providing easy portability, or it can be permanently mounted to a pole. This system is the perfect addition to any continuous compliance monitoring or event survey strategy.



## AUTOSSUTE Aurassure Private Limited

Aurassure engineers solutions to understand and predict the surrounding environment by creating a highly cost-effective hyperlocal air quality sensor network for collecting reliable air quality information in real time. It focusses on validating and collecting data and establishing an air quality sensor network in an optimised manner for scalability and sustainability. Its solutions can be utilised by city municipalities, environmental consultants, and government organisations in city planning, infrastructure building, and environmental policy development to bring about drastic changes in regulations and decision-making systems. Moreover, their solid cloud-driven IoT infrastructure can help cities grow and ensure sustainable development.



#### **TSI Instruments India Private Limited**

TSI Instruments India Private Limited is involved in the sales and marketing of innovative precision instruments to measure flow, turbulence, temperature, particulate matter, and many other key parameters. TSI serves the needs of industry, governments, research institutions, and universities, with applications ranging from pure research to primary manufacturing. Every TSI instrument is backed by its unique blend of technical expertise and outstanding quality.

TSI instruments help people investigate, identify, and solve measurement problems and often play a pivotal role in designing or modifying production processes or testing procedures. For example, the Laser Doppler Velocimetry and Particle Image Velocimetry systems have helped researchers understand how new aircraft might better handle sudden downdrafts. The fluid mechanics products have been involved in breakthrough research aimed at building better heart valves.

Today, TSI is a recognised solution provider in several markets. Their staff and products are involved in resolving current global issues, such as diesel exhaust reduction, biohazard protection, homeland security, environmental pollution, workplace comfort, and facility monitoring. Data provided by the instruments are used in monitoring and research applications destined to have a long-term impact on humankind and the world around us.

# At a Glimpse ICAS 2019-2023



**SUMMIT 2020** 

AUGUST 25-26, 2020

DAY 1

Dr Sulekha Chattopadhyay ir Pollution Specialist, California Air Resources Board





INDIA CLEAN AIR SUMMIT, 2019

R

SUMMIT 2020

AUGUST 25-26, 2020

DAY 2













## INDIA CLEAN AIR SUMMIT 2022 Looking at air pollution through the climate lens

For the 1<sup>st</sup> time, the Air Sensors International Conference will come to India as part of ICAS 2022.



ऑफ साइंस किया जा सकता है। उन्होंने आगे एंड पॉलिसी बताया, ध्वाई सीएएस के आयोजन के जरिए सीएसटीईपी करेंगे कि अक्षय ऊर्जा की ओर की जरूरन और जमीनी स्तर पर एक ऐसे इकोसिल के निर्माण भारत के ऊर्जा अंतरण समाधान लागू करने के लिए Anti-Shared and area excenter who Children and

नीलिंगत समाधानों को स्थायी परिणाम प्राप्त करने और अधिक प्रमावी बनाने के लिए एकीकृत

पॉल्यूशन

एस) हारा सेंटर

**INDIA CLEAN AIR SUMMIT 2022** और इसके वि हे लिए पेशेवरों को एक लाने की करुपना एएसआईंसी अमेरिका में प्रति आयोजित किया जाता है और इस क्षेत्र के अंतर्रष्टीय पेशे

in the Serve

लाकर, हम पटना चाहते है ाधान की खे

(सम्प्रियास)











Bloomberg **Philanthropies** 









## 5th Edition **INDIA CLEAN AIR SUMMIT 2023 Clean Air for Sustainable Development and Mission LiFE**

23-25 August, 2023 | Venue: Radisson Blu Atria, Bengaluru

लखनऊ

रविवार 20 अगस्त 2023 वर्ष: 10, अंक: 72 पृष्ठ: 06 मूल्य 5.00 रुपये

UPHIN/2015/63343

रिक्सी, डींटच करीन एक समि

(अर्थसीपएस) का इन्हों अरणेजन सतत विवयस लक्ष्मी (एसरीजी) और विज्ञान लाइफ पर प्रतुषण के प्रचाय पर

RNI NO:

09 नई दिल्ली, रविवार, २० अगस्त २०२३ जालौन/माधेगढ़ यूपी

## सतत विकास लक्ष्यों को प्राप्त करने के लिए मुख्य क्षेत्रों की पहचान करेगा इंडिया क्लीन एयर समिट

किली, समाचार निदेश व्यूरो इंडिया क्वीन एयर लमिट (आईनीएएस) का असीन प्रथम गांधद (आईनीएएत) का उर्जा असीनन सतत कितना लाखी (स्वाडीन) के कितना खाड़ पर प्रपुष्ट के प्रसार पर पंतर से एक्नाला के से साम प्राय्तेन 23-25 अलग के सेचा सेन्दुर में असीनत किया जाता, हा प्राय्तेन का मध्यत किया जाता, हा प्रयुद्ध का साम किया का प्राय्तेन किया जाते का कि आह प्रयुद्ध के पाठा मा पाठी का कि आह प्रयुद्ध की की साम के के लिया पर प्रार्थन के साम क्रांतिन के लिया पर प्रार्थन के साम क्रांतिन के स्वार्थन का स्वान है.

पुर भारतको (प्राथमानुष्ठ) के संदर कार एस फोल्ड्रान एरदीत (मीराप्रेला)) ज़ान किया जा तडा है - जो भारत के जावती वैकि-अनुरोधान सिंग किंक में ये एक है. आईमेरिएल 2023 का लस्त एसडीजी और जावसानू प्रारंडियों की जनप्र करने संबंधी भारत की सीतार्थ में सम्प्रज्ञ



হয় জাঁ প্ৰাৰ্থকলা প্ৰচন জনৰ है. আইৰাহুৱে জি হয় ৰাজ জি আইতন ব বাল নীন আৰ্থা ই মাহিলে টি বাঁহি একাৰ रात तन अन्य पं रात्मल है जात आवस् के बारव दो के प्राप्तस्य आता पीत के के ताव दो के प्राप्तस्य आता पीत के के ताव उपस्य के प्राप्त प्रदेश गांधनां के के ताव उपस्य के प्राप्त के प्राप्त प्राप्त सारिय केंद्र के प्राप्तिक के प्राप्त आईआईटी, संयुक्त रहन्द्र प्रयोगरण

23-25 August, 2023 | Venue: Radisson Blu Atria, Bergalura भार्वज्ञय, गोराविमा विश्वविद्यालय और बालवेच ज्व्वविद्यांव वीसार दिवाल संस्थान के तियस प्रदेशका नैमाला एवंदा, उसका सरेवला के प्रक्रियर देखीला बुद्ध, दिरा धार पर्वलाक एवं औरविस्क दिरा धार पर्वलाक एवं औरविस्क अनुसंधाय प्रक्रिय - प्रदर्शन प्रवेतिक अनुसंधाय प्रक्रिय - प्रदर्शन प्रवेतिक प्रक्रेसवार्थ अनुसंध्या प्रक्रेसक जो एस के बोलान और चेस्टीज़्यूट इंस्टिट्यूट ऑफ पेडिकल एजुकेशन एंट दिसपे के इतितार और एतवाधानीतत हैल्स थी. त्वीः सेजल

रभीद को जात. आईविस्टल 2023 विभिन्न म्हादीजी पर मानु प्रकृत के प्राचन पर इस्कार टाडीका. जेवी कि बीतर सारस्था और जन कलका, सरफा और किपलाई कार्य, टिकाज सहर, प्रानवायु कार्रवाई और जैन विभिन्ना

संरक्षण, इसके साथ-साथ का इन तालों को प्राण करने के लिए सहयोग और सहोदारो

प्राप्त करने के लिए सार्वाव को स्वतिको पर से खाद केंद्रित करेता. पंरसंखर पर सालवा कि लिए तिरान रिवार्ग पर सालवा कि लिए तिरान रिवार्ग पर सालवा कर की लाग का सालवा करने की सह से जाने काल बार्व रहतार सार्वजीक सारका के के उद्देग्यों को प्राप्त करीं के किए खात है रास्ट्री पर सारका सीत्रा के किए खात है रास्ट्री पर सालका सीत्रा के किए आवेतन के जान बजा कि निर्म का निर्म अवेतन के जान बजा करने जेनके के बेहर करने, पिकन जितकाओं के बेहर करने, पिकन जितकाओं के बेहर करने, पिकन जितकाओं

स्रोगने.

खालन् जनवानु नीमधी और जुनोडावी के साथ क्रम्पा हवा को एसीमुल करने के सामल फेस कटडील, कट्रीन भौतिमी जेवलायं सोबंचे जनामु अने वीमनाओं में सारप्र हता को सावित करने आदि पर भी पार्चा को जाएंदे





इसके साथ-साथ यह इन लक्ष्यों को प्राप्त

हसान केदिन करेगा पैनलिस्ट यह प्रमा ल

नियंत्रण बोर्डे के प्रतिनिधि, बर्ड आईआईटी, संयुक्त राष्ट्र पर्यावरण कार्यक्रम, कोलक्रिया विश्वविद्यालय और भारतेग जगदेशीय मौसम विज्ञन संस्थान के विषय विशेषज्ञ: नेशनल प्रतिवृद्ध अभि अर्थन अपेक्स की प्रियेत्सुर अभि अर्थन अपेक्स की प्रोपेस्स देखेलिन कुंडू सेंटर और प्रतियों रिसर्च की फेले मुझे मिखाने मोप; पेज़निक एवं औद्योगिक अनुसंधन परिषद - राष्ट्रेय पर्यावरण इंजीनियरिंग अनुसंधान संस्थान (दिझी जोनल सेंटर) के मुख्य चैत्रानिक ठीं एस के मोपल और पोस्टोर्डनुस्ट प्रस के प्राथल आर पास्टवयुरः इंस्टिट्यूट और मेडिकन एजुकेशन एंड रिसर्च के प्रोफेसर औ? एनवायरनघेटल तेल्थ थी. रखेंद सीमाल-आईमीएर्स 2023 विभिन्न में शामिल है॰ लीति आयेंग के सहस्य एसदीजी पर वायु प्रकृतन के प्रभाव पर प्रकार प्रतिग, जैसे कि बेहतर स्वास्थ्य दों वी के सारस्वत, सांसद गौरव गेंगोई बन्नोटवा और उत्तर प्रदेश सरकारी के और जन कल्याण, स्वच्छ और नैकरताल, उब्ल्यूएचओ निवेतक डी विषयणती ऊर्जा, टिकाऊ 1977, जलवागु कार्रवाई और जेन विविधता महरेण नीग: केंद्रीय और राजा प्रदूषग

हिन्दी दैनिक

सतत विकास लक्ष्यों को प्राप्त करने के लिए मुख्य

संख्या, इसमें साथ-साथ यह इन लक्ष्वें को प्राप्त करने के लिए सहयोग और साझेवरी पर भी म्थरन केंद्रित अंत्रेण पैजलिस्ट यह पता लगाने के लिए विचार-विगर्श करेंगे कि स्वच्छ छन और एसदीजी कैसे अपस में जुड़े हुए हैं, एसदीजी हसिल करने की राठ में जाने वाली वाधार, बेहतर सार्वजनिक स्वारथ्य के लिए उन्हें दूर करने के तरीके और स्वच्छा तथा के उद्देश्यों को प्राप्त करने के लिए चारत में शहरी एवं राजीण जीतियों के बीच अंतरमंबंध वया-क्या है.आयोजन में ज्ञान सरझा करने संबंधी कमियों को दूर करने, विभिन्न हितच्चकों के बीच साम्रोम को बद्धवा देने के तत्रीके खोजने, जलवायु नेतियों और चुनीतियों के साथ स्वच्या हवा को एकीकून करने के सफल केस स्टडीज, राष्ट्रीय पॉलिसी प्रेमकर्क संकंध जलवाषु कार्य योजना जो में स्वच्छा हवा को प्रामिल करने आदि पर भी चर्चा वी जामी

सतत विकास लक्ष्यों को प्राप्त करने के लिए मुख्य क्षेत्रों की पहचान करेगा इंडिया क्लीन एयर समिट

के क्षेत्र केल्लुक के



त्रव जिन्छ । आमी मिठि ma film fer frår आसी मेरित-अनुसंध कि कि मेते एम है। आईपिश्टरा 2020 का लाग एमाठी जो का कान्यु प्रतिकां के बात्रों को कम कान्द्रे संधि बनडा जी मेरितों मेरकार तथा तो आइपिशास एक नाम्या है आईपैशिएम के दूस सात के कार्याप्रस मेराप तो कार्याप्र की की मेर सारकारा जोगा की मेरित के नीही आदेगे के प्रतास की की मेर सारकारा जोगा की 6 सिंहान जो मलित नेतव संविध और बच्च प्रमुख नियंत्रल सेहीते प्रतिक्रिं या पर्द स्वीतर्ही संमुक्त राष्ट्र प्रस्तेल सर्वातन, संदर्शना क्रिसीटवाला और

INDIA CLEAN AIR SUMMIT 2023

मोगार वेबेलिना जुड्या रोटर परि पतिली डिस्पॉची परंत पुषे किवानी पतिली डिस्पॉची परंत पुषे किवानी मान वरिषद – वन्द्रीय पर्यावल इंडीनियति उत्स्वार प्रेकार दिली जोगत पीटर्ज के मुख्य देवनियत जी वात्रान् वन्त्रवेश काकाकात्रा का बनीच जनदेशिय नेवल विवास विवास लेखन के जिया विविद्या विषय इंटीटाडूट और जर्मन जर्मपर्य की स्त केलोगरन और पीर्व्यसारट इतिह

विषेत्रः एसक्रिये पर वायु अञ्चय के अवस पर अलग जोगर, जैसे कि बेस्टर स्वरूप जोग जन कल्पान, बाराउ जेर विज्यादी जज्मे दियाफ अप कल काल, बन्दा न प्रमेण नीतियों के बीच ल्या-न्थ्या है। आयोजन लाहा करने संबद्धी कनि ् कर जरने विकिन्ध दिख्यालों के दे सहयोग को बहावा देने के लीने खेलने जलवा। विभिन्न १९९९ जनगणु जनगर्दे के के विके सा संवयन इसके साव-साध्यय हन निष्ट् विश्वार-किर्म क्रमें) कि इन्द्र और एसकिसी कैलेआफ Welt thank ridt or धाजनाओं में स्वच्छा हम हर है एसकीजी इस्तिल करने भी र ल्ले आदि पर में चर्च की जाएंचे

खेवत्तः) व सक्षीयी प



# Meet the Air Quality Team



Dr R Subramanian

Sector Head, Air Quality



Mr Anirban Banerjee Senior Associate



Dr Deepthi Yaparla Senior Associate



Mr Kaushik Reddy M Senior Associate



Ms Nidhi Malik Consultant



Ms Sanjukta Ghosh Senior Analyst



Ms Anita Kumar Member-Programme Management Office



Ms Emil Varghese Senior Analyst



Kavyashree N Kalkura Analyst



Mr Nirav Lekinwala Senior Associate



Ms Swagata Dey Policy Specialist



Ms Anshika Srivastava Senior Associate



Dr Gunta Paparao Senior Associate



Mr Marularadhya B M Consultant



Dr Piyush Bhardwaj Research Scientist



Mr Udhaya Kumar V Senior Associate



Ms Arundati Ganesh Consultant



Ms Harshitha K M Senior Analyst



Ms Meera Sudhakar Consultant



Mr Sameer Mishra Senior Analyst



Mr Vinod S Analyst



Mr Yashwant Pratap Singh Yadav Analyst



#### **CENTER FOR STUDY OF SCIENCE, TECHNOLOGY AND POLICY**

#### Bengaluru

No. 18, 10th Cross, Mayura Street, Papanna Layout, Nagashettyhalli (RMV II Stage), Bengaluru 560094, Karnataka, India

Art's

#### Noida

1st Floor, Tower-A, Smartworks Corporate Park, Sector-125, Noida 201303, Uttar Pradesh, India



www.cstep.in

+91-80-66902500

🗹 cpe@cstep.in

Follow us on



