ICIMOD-led panel session at the 15th IASTA National Conference

From Aerosol Science to Action: Aerosol Processes, Emerging Evidence, and Decision-Ready Data

27–30 October 2026 | IIT Kharagpur Research Park, Kolkata

1. Session rationale

- National air quality management action plans in our region increasingly include monitoring, emission controls, policy analysis and sectoral measures. However, action plans often do not consider complex but significant scientific process and use the latest scientific evidence while prioritising, and implementing interventions.
- The gap is especially consequential in the Indo-Gangetic Plain and Himalayan Foothills (IGP–HF) region, where air pollution cross administrative borders, winter meteorology traps pollution, mountain–plain circulation redistributes it, and primary emissions interact to form substantial secondary particulate matter.
- The session will identify which scientific uncertainties most affect management decisions, examine research and datasets ready for policy use, and specify how they can strengthen existing plans rather than create parallel systems.

2. Purpose and objectives

- Identify the scientific uncertainties and processes that could influence the selection, prioritisation, and implementation of air pollution abatement measures by policymakers, including underrepresented aerosol processes and emission sources, such as:
    - Secondary aerosol formation and transformation
    - Unconventional, poorly characterised, or underrepresented emission sources
    - The influence of complex terrain/topography and meteorological processes on pollution formation, accumulation, and transport and its relation to effective policy design
- Discuss the readiness of advanced observations, emission inventories, modelling approaches, and decision-support tools for operational application in air-quality assessment, planning, and evaluation.
    - Examine an airshed-based mitigation approach for the IGP–HF, including the scientific evidence, source–receptor understanding, institutional coordination

along with appropriate policy and financing strategies needed to identify and prioritise effective measures across local and regional scales.

3. Panel discussion session

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3 min	**Welcome Remarks**	
12 min	Context-setting presentations: Bridging Advances in Aerosol and Atmospheric Science, Data, and Modelling with Air-Quality Management: Ashish Tiwari, ICIMOD	
	Moderated panel discussion	
5 min	**Introduction** Moderator: **Prof. Srinidhi Bala Subramanyam, IITB (TBC)**	
60 min	Panellist and expertise	**Guiding question**
	Neeraj Rastogi, PRL (TBC) Aerosol process scientist: Expertise in secondary aerosol formation, multiphase chemistry, aerosol ageing, and source apportionment.	Which aerosol processes create the greatest uncertainties for air-quality management decisions, particularly secondary aerosol formation and ageing? How do these processes affect the design and prioritisation of precursor-emission control strategies?
	Sagnik Dey, IITD (TBC) Data integration and impact assessment expert: Expertise in data integration satellite, model, and ground observations for air-quality impact assessment and management.	To what extent do gaps in high-resolution air-quality and exposure data and associated uncertainties constrain air-quality management and impact assessment, particularly across the IGP–HF? What are the key challenges in generating, integrating, and applying high-resolution air-

		quality information for management and impact assessment? How can advances in scientific methods, technical capacity, and institutional frameworks improve the use of satellite- and model-derived information and reduce uncertainties in air-quality assessment?
	Sachin Ghude, IITM Pune (TBC) Regional modelling and decision-support expert: Expertise in chemical transport modelling, source–receptor analysis, forecasting, emission inventories, air shed and integrated decision-support tools.	Why is it important to consider meteorology, pollutant transport, emission sources, and topography in air-quality management, and what is the significance of an airshed-based approach for the IGP–HF? How do uncertainties in chemical transport modelling affect the reliability and usefulness of the evidence generated for air-quality management, and how can these uncertainties be better characterised and addressed? What is the role and need for decision-support systems in air-quality management, particularly systems that integrate airshed-based science with emissions, scenarios, costs, and other information in a user-friendly framework?
	Manish Mittal, Secretary & Director, Department of Environment National or subnational air-quality planner: Experience in air-quality action planning, regulation, implementation, and government decision-making.	What type of scientific evidence and analysis do policymakers need to support air-quality planning and decision-making? What are the key gaps or barriers that prevent available scientific evidence from being effectively taken up in air-quality action plans and policies? What could be the pathways through which the uptake of advance science and evidence uptake can be enhanced in air management, policy and action plan?
	Anumita Roy Chodhury, CSE (TBC) Intervention and implementation expert: Experience in agriculture,	Which evidence gaps most constrain effective sectoral action, and how can improved science, data, and decision-

	brick kilns and industry, household energy, waste, transport, or finance.	support tools strengthen the design, targeting, implementation, and evaluation of mitigation interventions? Can you provide some sector specific example where considering some missing science has shown better results?
10 min	**Moderator synthesis:** Summarise the priority science and data gaps, identify tools ready for operational use, and highlight actions requiring regional coordination.	

4. Expected Outcome:

1) A prioritised set of scientific uncertainties and processes that most affect air-quality management decisions in the IGP–HF, including secondary aerosol formation, regional transport, complex meteorology, and emerging emission sources.
2) Enhance recognition and use of advanced air-pollution science, datasets, and scientific approaches —including observations, emission inventories, modelling, remote sensing, and decision-support tools—to strengthen the scientific basis of air-quality action plans and make mitigation strategies more targeted and effective.
3) Identification of practical opportunities for integrating science and evidence into existing action plans to support local and regional air-quality improvements while also delivering broader climate and environmental benefits.
4) A cross-sectoral and multidisciplinary understanding of air-quality challenges and solutions, bringing together expertise in aerosol science, observations, modelling, emissions, policy, and implementation to develop more integrated recommendations for effective air-quality management.

Annexure I Topics expected to be considered in the session related to aerosol science, data, and management planning

Science	Data & Tool	Management Plan

Secondary aerosol formation: non-linear chemistry involving SO_2, NO_x, NH_3, and VOCs.	Speciation, precursor monitoring, receptor and chemical transport models.	Coordinate precursor controls along with the focus on primary PM.
Meteorology–chemistry coupling: boundary layers, fog, inversions, humidity, and stagnation.	Weather profiles, modelling for understanding ventilation and transport, topology forecasts, and data assimilation.	Topology and meteorology based local planning. Forecast-based episode measures.
Integrating urban form, green–blue infrastructure, vegetation, heat mitigation, and air-pollution dispersion into urban planning and development.	High-resolution land-use, meteorological and air-quality data; urban climate and dispersion models; GIS-based planning and scenario assessment tools.	Promote compact and well-ventilated urban development, protect green and blue spaces, expand urban forests and green corridors, and integrate nature-based solutions into transport, housing and infrastructure planning.
Integrating reference-grade measurements with calibrated low-cost sensors and satellite observations to expand spatial coverage, reduce cost of reference grade monitoring, while moving towards real-time source apportionment to identify pollution sources as they occur.	Reference-grade monitors, calibrated low-cost sensor networks, satellite observations, meteorological data, emission inventories, and AI/ML-enabled real-time source-apportionment and data-fusion platforms.	Establish pilot networks that combine a limited number of reference stations with strategically deployed low-cost sensors and satellite data; progressively scale the network based on demonstrated performance and use real-time source apportionment to support targeted and cost-effective mitigation.
Regional transport and mountain–plain exchange: local and transported pollution interact across complex terrain.	Multi-site monitoring, satellites, trajectories, and source–receptor models.	Adopt linked airshed plans and coordinate action across jurisdictions.
Emission magnitude, timing, and speciation: informal and seasonal sources remain poorly represented.	Dynamic inventories using facility, fuel, traffic, fire, and crop data. Advanced fire data.	Update local and regional source priorities and target high-emitting activities.
Fires, crop burning, dust, and episodic events: intermittent plumes complicate attribution.	Satellite fire/dust products, sensors, forecasts, and activity data.	Combine prevention with source-specific episode response.

Air pollution, climate & health nexus: ageing and mixing alter health, climate, visibility, and cryosphere effects.	Optical measurements, source tracers, remote sensing, and integrated assessment.	Prioritise measures with air-quality and climate co-benefits.
High resolution exposure and local variability within cities.	Data integration, calibrated sensors, mobile monitoring, and exposure models.	Clean air zones, Target high-exposure locations and evaluate exposure outcomes.
Intervention effectiveness: observed changes may not be caused by the implemented measure.	Meteorological adjustment, intervention baselines, causal evaluation, and advanced DSS.	Compare mitigation packages and revise plans using measured results.