International Day Of Clean Air For Blue Skies

7th September, 2022

There is the need for collective understanding, accountability and action to solve the pernicious issue of poor air quality in India. To this end, IIT Bombay celebrated the *International Day Of Clean Air For Blue Skies* on September 7, 2022 through two events at the school level and at the Institute level.

(A) Details of half day event organized by ESEA, ESED

A three-hour, flash presentation series was organized for students in the boarder research area of air quality. A total of 18 students from the Environmental Science & Engineering Department, Aerospace Engineering Department, Chemical Engineering Department, Centre for Urban Science & Engineering and Interdisciplinary Program in Climate Studies participated in this event. They presented their ongoing research in 5-7 minute long presentations that were followed by a discussion panel. The topics were diverse and ranged from characterization of emissions sources, low-cost monitoring, air quality modelling, environmental justice and indoor air quality. The three house session saw 40-50 attendees. All participants actively interacted in the panel discussions and helped towards capacity building by identifying knowledge sources and resources in the larger peer group.

ESEA strongly believes in advocating for sustainable environmental practices. This event has helped

1. Raise awareness of the pernicious issue of air pollution at both the school and the university level
2. Helped with knowledge building through the presentations of ongoing research
3. Capacity building by helping students establish networks to collectively improve research practices, identifying challenges and solutions in collecting and sharing of data, and developing solutions to better characterize and solve air pollution challenges.

The detailed programme is provided in the table below.

Venue: Environmental Science and Engineering Department (ESED)

(Time: 2-5 pm)

2:00 PM	**Welcome**		
Start time	**Sr. No.**	**Name**	**Title**
2:05 PM	1	Ganesh Gupta	Application of a high-resolution emission inventory management system to assess linkages in air pollution and climate change over India
	2	Navinya Chimurkar	Laboratory based assessment of carbonaceous aerosols from different secondary lighting sources
	3	Anurag Kumar Gupta	Estimating spatial heterogeneity and drivers of fired clay brick industry across India using remote sensing
	4	Sohana Debbarma	Characteristics of real-world fine particulate PAHs measured in an Indian highway tunnel and their emission factors
	5	Pooja Manwani	Examining chemical composition of PM2.5 during biomass burning events and its impact on regional air quality in North India
Presenter Panel Q/A			
2:50 PM	6	Arushi Sharma	Impacts of non-formal emission sources and aerosol radiative effect on India's air quality
	7	Aakash Thakur	Estimation of fugitive road dust emissions
	8	Deepakshi Babbar	Environmental dilemma of agriculture production in India: A study of Nr
	9	Prince Vijay	Examining the spatial and temporal variation in the indoor gaseous, PM2.5, BC in urban homes in India.
Presenter Panel Q/A			
3:30 PM	10	Vikas Kumar	Ensemble machine learning approach for PM2.5 reconstruction using MERRA-2 and long-term analysis for India (1980-2021)
	11	Vasudev Malyan	Fundamental issues with low-cost particle sensors: evidence from a field sampling campaign
	12	Taveen Singh Kapoor	Estimation of real-time brown carbon absorption: An observationally constrained Mie theory-based optimization method
	13	Shruti Tripathi	Secondary organic aerosols in the urban atmosphere
	14	Mahim Dawar	Weather modelling for air quality applications

Presenter Panel Q/A			
4:15 PM	15	Raj Lal	PM2.5 exposures increased for the majority of Indians and a third of the global population during COVID-19 lockdowns: a residential biomass burning and environmental justice perspective
	16	Kamlika Gupta	Human hair and nail as bioindicators of environmental toxic metal exposures in adult women in India
	17	Umangi Mehta	CFD studies on potential mitigation measures for particulate from stockpiles of dusty cargo
	18	Archita Mullick	Study of indoor ventilation strategies for mitigation of COVID-19 using CFD and chemical reactor model

	19	Pushpesh Singh	Indoor ventilation in classroom
	20	Vallary Gupta	Low energy buildings for improved thermal comfort in the tropics
Presenter Panel Q/A			
5:00 PM	Final remarks		

(B) Essay writing in schools

An essay writing contest was conducted on the topic of air pollution. 32 students in the 8th, 9th and 10th grade age group from the Kendriya Vidyalaya School and 20 students from the Campus School participated in the event. These students provided very well written, informative and insightful essays on why air pollution is an issue affecting all of us and identified strategies to help solve it for the city of Mumbai. All the participants will be awarded a participation certificate and highlights from their essays will be featured on social media platforms managed by Environmental Science and Engineering Association (ESEA).

(C) Summary of participation of faculty in various events/workshops

Contributions from the Air Resources Group Faculty, Environmental Science and Engineering Department (ESED), IIT Bombay

(i) Key Extension activities in last one year:

Abhishek Chakraborty

- Member, NCAP (National Clean Air Programme) city level committee, Thane Municipal Corporation (TMC)

Srinidhi Balasubramanian

- Instructor: Training course on Chemical transport models and Lagrangian models. Week long training program organized by Indian Institute of Toxicology, Lucknow.

(ii) Conferences/Symposia/Workshops/Seminars (Participated/ Papers Presented):

International

1. Mandal D., Tripathi S., Chakraborty A. (2022) "Indoor Air Quality in three different microenvironments of a residential academic institution" International Conference on Environmental Science and Engineering' (ICESE-2022), IIT Bombay, 20-22 January 2022, Mumbai.
2. Tripathi S., Mandal D., Chakraborty A. (2022) "Secondary Pollutant levels in the residential region under the influence of traffic emissions" International Conference on Environmental Science and Engineering' (ICESE-2022), IIT Bombay, 20-22 January 2022, Mumbai.

3. Raparthi N, Phuleria HC. 2021. Optical properties of light-absorbing carbonaceous aerosols from on-road vehicles, Poster presentation at *24th ETH-Conference on Combustion Generated Nanoparticles (ETC-CGN)*, Virtual meeting, June 22-24, 2021.
4. Patra A, Phuleria HC. 2021. Is metro railway a commute friendly option? An environmental health perspective, Poster presentation at *33rd Annual Meeting of the International Society of Environmental Epidemiology (ISEE)*, Virtual meeting, August 23-26, 2021.
5. Vijay P, Anand A, Jahan P, Schikowski T, Phuleria HC. 2021. Spatial variation of outdoor and indoor NO_2 in metropolitan cities in India, Poster presentation at *33rd Annual Meetingof the International Society of Environmental Epidemiology (ISEE)*, Virtual meeting, August 23-26, 2021.
6. Raparthi N, Dubey S, Gupta K, Phuleria HC. 2021. Oxidative potential of $PM_{2.5}$ from on-road vehicles from the road-tunnel measurements, Platform presentation at *European Aerosol Conference (EAC)*, Virtual meeting, August 30 – September 2, 2021.
7. Dubey S, Vijay P, Yadav S, Phuleria HC. 2021. Examining oxidative potential of residential outdoor $PM_{2.5}$ in metropolitan cities, Poster presentation at *31st Annual Meeting of the International Society of Exposure Science (ISES)*, Virtual meeting, August 30 – September 2, 2021.
8. Yadav S, Dubey S, Kapoor TS, Duhan S, Laura JS, Venkataraman C, Phuleria HC. 2021. Examining the light-absorbing properties of water-soluble and insoluble organic aerosols at a regional background site in India, Poster presentation at *31st Annual Meeting of the International Society of Exposure Science (ISES)*, Virtual meeting, August 30 – September 2, 2021.
9. Jyotsana J, Gupta AK, Navinya C, Phuleria HC. 2021. Estimation of $PM_{2.5}$ Exfiltration factor from biomass cooking, Platform presentation at *39th Annual Conference of American Association for Aerosol Research (AAAR)*, Virtual meeting, October 18-22, 2021.
10. Vijay P, Dubey S, Phuleria HC. 2021. Intra and inter-urban variability in chemical characteristics of fine particulate matter in metropolitan cities in India, Poster presentation at *39th Annual Conference of American Association for Aerosol Research (AAAR)*, Virtual meeting, October 18-22, 2021.
11. Navinya C, Phuleria HC, Gupta AK, Lokhande P, Habib G, Venkataraman C, Chatterjee A, Abisheg D, Goel A, Jehangir A, Liang Y, Mandal TK, Nagendra S, Qureshi A, Sunder Raman R, Saikia BK, Sinha B. 2021. Fine particulate matter and black carbon emissions from Non-Cooking Residential sector activities over rural India, Poster presentation at *39th Annual Conference of American Association for Aerosol Research (AAAR)*, Virtual meeting, October 18-22, 2021.
12. Debbarma S, Raparthi N, Venkataraman C, Phuleria HC. 2021. Developing carbonaceous aerosol emission profiles from measurements at urban and inter-city road tunnels in India. Poster presentation at *American Geophysical Union (AGU) Fall Meeting*, Virtual meeting, Dec 13-17, 2021.
13. Manoranjan Sahu, Calibration of low-cost sensor by application of machine learning (ml) algorithms for real time air pollution assessment, international modern scientific research congress june 4-5, 2021, Turkey.

14. Vikas kumar, Manoranjan Sahu, 221, Evaluation of nine machine learning regression algorithms for calibration of low-cost PM2.5 sensor, International Aerosol Modeling Algorithms Conference 2021, dec 7-10, USA.
15. M. Sahu, 2022, Key Note talk on Application of Machine Learning in Air Pollution Monitoring and Modeling, International conference in Environmental Science and Engineering (ICESE), 20th Jan 2022.
16. Aiswarya A Kumar, Vasudev Malyan, Manoranjan Sahu, 2021, Comparative analysis of different indoor particle control technologies, 6th Indian International Conference on Air Quality Management (IICAQM 2021) Measurement, Modelling, Health Risk and Public Policy, 16 dec 2021, India.
17. Saptarshi Ghosh, Manoranjan Sahu, 2021, Phthalate Esters Removal from Aquous systems Using Semiconductor Photocatalysis, International conference in Environmental Science and Engineering (ICESE), 20-22 Jan, 2022.
18. Vikas Kumar, Manoranjan Sahu, 2022, Application of Machine learning algorithim for calibration of Low cost sensor, Air Sensors International Conference, May 2022
19. Chinmoy Mandal, Manoranjan Sahu, International conference in Environmental Science and Engineering (ICESE), 20-22 Jan, 2022.
20. Balasubramanian, S (2022), “The food we eat, the air we breathe: Air pollution health impacts from the global food system”. International Conference on Environmental Science and Engineering' (ICESE-2022), IIT Bombay, 20-22 January 2022, Mumbai. Online mode.

(iii) Conferences/Symposia/Workshops/Seminars (Coordinated/Chaired by Faculty)

International conference on Environmental Science and Engineering (ICESE 2022) 20-22th Jan 2022.

(iv) Invited Lectures:

1. Phuleria HC, 2022. "E*xposure Assessment & Health in Strategizing Air Quality Management*" at Maharashtra Pollution Control Board, Sion, Mumbai on 7th Sep, 2022
2. Phuleria HC, 2021. “Research methods: Data analysis plan, plotting and diagnostics” in the week-long *Research Methodology Workshop for Science Scholars*. Organized by UGC-HRD Centre, University of Kashmir, Srinagar, Virtual meeting, 17 Nov, 2021.
3. Phuleria HC, 2021. “Monitoring and Modelling the long-term air pollution exposures in various urban/ rural micro-environments” in 5-day FDP on “*Green Technology & Sustainability Engineering*”. BIT Durg, Chhattisgarh, Virtual meeting, 10 Nov, 2021.
4. Phuleria HC, Anand A, 2021. “Assessing air pollution exposures in urban slums” in *Air, Noise and & Odour Pollution (ANOP) Conference.* NIT Surat, Surat, Virtual meeting, 23 Oct, 2021.
5. Phuleria HC, 2021. “Urban air pollution: Why you should care!” in the *Abhyas Mahotsav. O*rganized by B.K. Birla College, Kalyan, Virtual meeting, 12 Aug, 2021.

6. Phuleria HC, Raparthi N, 2021. “Estimating air emissions from real-world on-road vehicular fleet” in the *ATAL FDP on Air, Noise and Odour Pollution (ANOP-2021),* organized by SVNIT Surat, GJ, Virtual meeting, 19 Jul, 2021.

7. Phuleria HC, 2022. “Assessing air pollution exposures in vehicular cabins in urban metropolitan cities” in the *Indian International Conference in Air Quality Management (IICAQM 2021)*. Jointly organized by IIT Madras and IIT Guwahati, Virtual meeting, 17 Dec, 2021.

8. **Srinidhi Balasubramanian, 2021.** Keynote lecture on “Lessons from Agricultural Air Pollution for Air Quality Managers”. Keynote lecture in the 2021 MARAMA Air Monitoring Training Committee Workshop. November 2021. Online.

9. **Srinidhi Balasubramanian, 2022.** Expert lecture on “The food we eat, the air we breathe” in Shastri Indo-Canadian Institute (SICI) Symposium on Sustainable Developments in Local Land and Food Systems: Socioeconomic, Technological, and Environmental Aspects. 22 March 2022 – Online.

The link to the event photos is here:
https://drive.google.com/drive/folders/1hV7lMiiA5GfVBsVB_AGls61M63Qcq8mg?usp=sharing

(D) Electric vehicles in IIT Bombay

- In IIT Bombay, there are currently six 11-seaters e-vehicles and 10 electric bicycles.
- There are 4 charging points for electric vehicles.
- Upcoming: Two 4-seater shuttles, two 6-seater shuttles, upto 5 electric autos
- Future plan: Ten 11-seater shuttles, 50 electric bicycles and upto 15 e-autos (if auto model works successfully)

Image: E-Vehicle

Image: E-Cycle

(E) Vanmahotsav report and photographs

In an endeavour toward maintaining the green cover of the campus and spreading the message of conserving nature, the Indian Institute of Technology Bombay (IIT Bombay) celebrated Van Mahotsav – the annual tree plantation drive on its campus. About 400 saplings were planted by IIT Bombay faculty, staff, and students along with students and teachers of Kendriya Vidyalaya and Campus School (both located within the IIT Bombay campus). The saplings of various native forest tree species (Jamun, Taman, Mahogany, Laxmanphal, Arjun, Chinch, Ashoka, Jack fruit, Ficus, Badam) were planted on the hill slope behind the Udaygiri building within the IIT Bombay campus. On the occasion, Director Prof. Subhasis Chaudhuri along with Deputy Director (AIA) Prof. S. Sudarshan, Deputy Director (FEA) Prof. KVK Rao planted saplings of Ashok. Prof. Chaudhuri spoke about the significance of trees in our lives and encouraged the students to help build a greener environment by planting more trees. Prof. Tom Mathew, Dean (Infrastructure Planning and Support), IIT Bombay was also present along with Prof. Vedagiri Perumal, Associate Dean (IPS) – I and Prof. Anurag Garg, Associate Dean (IPS) – III. Together, they encouraged the participants to develop a sense of responsibility for the saplings. Cultural performances by the students of Campus School and Kendriya Vidyalaya, highlighting the importance of trees in our lives, were much appreciated by the gathering. The event was organized by the Horticulture Section of the Estate Office, IIT Bombay, which takes due care of the saplings planted at Van Mahotsav throughout the year.

Photos link: https://archive.library.iitb.ac.in/items/show/5125