



Webinar Report

Clean Air Goals for India

September 7th, 2020

Centre of Excellence for Research on Clean Air (CERCA), IIT Delhi has organized a Webinar on "Clean Air Goals for India" on 7th September 2020 on the occasion of "International Day of Clean Air for Blue Skies". The objective of this Webinar is to deliberate on the air pollution goals and policy perspectives for India through Technical sessions on Air Quality Measurement, Science and Mitigation Plans. This Webinar aims to bring together various Domain Experts from the Government, Think Tanks, Academia, and Private sector and covered a range of topics such as Real-time PM Speciation and Gas Measurements, Source contribution to PM_{2.5} pollution and solutions, Open Data Resources for Energy, Emissions, & Air Pollution Analysis in India, Looking beyond PM in India, Air-pollution climate interaction and co-benefit opportunities, Pursuing a clean air agenda during the COVID crisis, Citizen science, Roadblocks to clean air action plan implementation, Integrating health outcomes to policy.

The webinar inaugural session began with opening remarks by Mr. Arun Duggal, Founder of CERCA. He shared his thoughts on progress and availability in health, education, mobility, information technology etc. which comes at a tremendous cost to the environment and approach adopted by the government for clean development. He also said that air pollution and other environmental challenges can be solved through concentrated efforts and we can make substantial progress over time. He also mentioned his personal experience during his stay in Tokyo when air pollution was raised gradually. He talked about the inception of CERCA at IITD and further expansion and growth of the centre to set up a School of environmental sciences at IITD where researchers can collaborate with policy makers to provide them with research feedback to enact new policies. The centre also aspires to collaborate with industry and to provide technology and help the industries to review their carbon Footprint.

Followed by opening remarks, Mr. Hemant Kaushal, Coordinator CERCA, presented a glimpse of CERCA activities carried out during the year 2019. He informed about major research projects which are funded by CERCA and other activities including collaboration with state pollution control boards, hosting conferences, Exhibition on air pollution control technologies., installation of BAM at IIT campus etc.

After that Prof. Sagnik Dey, Faculty Coordinator CERCA, shared about CERCA activities for restoring blue sky which involved alternate monitoring of air pollution through satellites that complement the ground based monitoring in India and changes in air pollution in the last two decades. He also mentioned a recent improvement in air quality during 2016 - 2020. He informed about the other monitoring methods including mobile monitoring and a low cost sensor network called SAMOSA (Surface based air pollution monitoring observatory in South Asia) in collaboration with CEEW, NASA, RTI and UC Berkeley to provide a network all across the Gangetic plain. He talked about another effort in which Satellite data is used for tracking power plant emission. He also mentioned other ongoing projects on Electric vehicles feasibility, charging network and reverse logistical model. He also briefed about the Indoor air quality project in collaboration with the Society of Indoor Environment in which we already took up the baseline survey of indoor air in various microenvironments of Delhi.

Prof. Sagnik outlined CERCA's involvement in capacity building activities at the state level in West Bengal and Bihar. He also conveyed the CERCA lead in the Air Quality Management Tool for Indo Gangetic Plain with technical support from IIASA and NEERI and financial support from World Bank. A centralized unit will be set up at IIT for overall AQ Modelling. This entire effort is in collaboration with State Pollution Control Boards and Knowledge Network partners of NCAP. Prof. Sagnik also talked about two important initiatives taken up by CERCA, one is called DRIIV (Delhi Cluster Research implementation and Innovation) to solve air pollution issues in Delhi in collaboration with several institutions and think tanks. Another is "Svacchh Vayu Sarvekshan" in which CERCA will be instituting an award for clean cities called the "CERCA Clean air City ranking" (C3R) Award.

To the inaugural end, we have placed the next session in the hands of Mr. Hemant Kaushal who moderate the important session on the theme of Science of Air pollution. The aim of this session was to focus on the atmospheric science of pollutants and their percentage contribution to overall air pollution directly or indirectly. In this session, the first talk was given by Prof. Tripathi from IIT Kanpur. He started his presentation on real time PM speciation and Gas measurements and talked about different kinds of measurement methods and how we can use them for near real time information about the sources for air quality management. He explained his experiments at three locations in Delhi where they have deployed a complete set of instruments for real time monitoring and developed a source finder tool SoFi to get environmental feasible source apportionment and shared inferences from these experiments. He recommended that this measurement information can be used by regulators to understand how sources change during the lockdown. He also particularly mentioned the unique measurement of daytime Nitrogen pentoxide peak in Delhi using the box model and its implication on new particle formation.

Next talk was given by Dr. Sumit Sharma, from TERI, discussing the chemical transport model to estimate the source contribution to PM_{2.5} pollution and possible solutions. He shared his experiment results showing seasonal variations during summer 2019 and winter 2019. Based on the transport model, he explained about relative source contribution to PM_{2.5}. He further elaborated on the analysis using the same model and compared the concentration during 2019 and 20. He shared his conclusions during the lockdown period from March to May and estimated a 30% average reduction in PM_{2.5} concentrations in India. He indicated a sectoral share change in Delhi during the period of lockdown which contributed a wider share in overall concentrations. He talked about the use of AI Technique for PM_{2.5} forecasting during the lockdown. He also discussed the issues related to air quality management in India and mentioned a slight improvement in air quality in some cities through implementation of regional scale planning and Euro VI LPG etc. He outlined some of the lagging issues which need to be focused on. He also shared some recommendations to strengthen NCAP by regional scale assessments, assessment and control of secondary pollutants, use of speciation networks to track progress, integrating policies for control of air quality and climate, Prioritisation of strategies for control, developing business models for implementation of control strategies, use of low cost models, NCAP can implement efforts for climate change mitigation, strengthen enforcement through technological support, enhancing budgets for control etc.

Next to speak was Dr. Sarath Guttikunda, from Urban Emissions on Open Data resources for energy, emissions & air pollution. He emphasized on the source and usage of data for further processing. He explained the two sides of air quality data one is for monitoring and the other is for modelling. He mentioned some of the monitoring data portals for quick accessibility and other links for satellite feeds. He also stressed upon the need for the GIS information required for mapping, backend modelling or for any spatial analysis and mentioned various links and feeders where we can easily access information. He further elaborated on how compiled emission data can be used for modelling exercise and understanding of both temporal and spatial allocation that takes a lot of emission data. Other sectors he mentioned on forest and agricultural fires data which is extensively available by different groups who post information on their portals both as raw satellite feed and processed feed. He also briefed about another important aspect of reanalysis data for an understanding of spatial and temporal trends in pollution, can be accessed by various portals mentioned in his presentation. Likewise every sector has its own database available for the public. At last he shared some of the key messages and requirements of improvement on the monitoring side as well as institutional support for training.

Next presentation was given by Prof. Sri Harsha Kota from the department of Civil Engg. IITD on the topic of “Looking beyond Particulate Matter in India” in which he covered majorly about the status of air quality in India and learnings from the effect of lockdown on air quality in 22 Indian cities. He mentioned the top 30 polluted cities in the world mostly clustered in India and evidence from the WHO report of 2019. While discussing the status of PM related air pollution in India, he highlighted the pollution level difference in northern and southern parts of the country. Based on chemical transport modelling results, he showed seasonal variations in predicted PM_{2.5} in India. He further explained the monthly changes in fractions (%) of PM_{2.5} components at different cities where primary organic aerosols followed by SO₄ fraction in total PM_{2.5} were maximum in north and eastern states of India and NO₃ was maximum in winters and minimum in monsoon. He also talked about premature mortality figures for major states in India and years of life lost due

to PM_{2.5} by giving an example of Delhi where PM_{2.5} alone is responsible for life loss of 2 years. Then he briefed about the understanding of source contribution to total PM_{2.5} concentration and regulation of dominant sources which significantly contribute to air pollution. He vividly highlighted the status of COVID 19 in India and a timeline of related events and shared the results of PM_{2.5} concentration reduction in different cities due to restricted activities. They have conducted the study in 22 cities from the period of March 16th - April 14th from 2017-2020 and measure PM_{2.5}, PM₁₀, NO, NO₂, SO₂, O₃ and CO. He indicated that apart from PM_{2.5}, other pollutant levels are in increasing trend. Ozone levels are increasing in some regions. He concluded with the recommendation to consider other secondary pollutants in addition to the PM in Action plans for air quality management in India.

The final speaker of this session was Prof. Dilip Ganguly from Centre of Atmospheric Sciences IITD, presented the air pollution climate interaction and co-benefit opportunities. He started with a general classification of air pollutants and its complex relationship with Climate change on the basis of the physical and chemical characteristics of the pollutants. He explained how short lived air pollutants affect strong local and regional perturbations to climate irrespective of their own residence time. He vividly explained the aerosol induced intensification of the cooling effect of clouds during Indian summer monsoon which can lead to large monsoon break followed by heavy precipitation events. He also particularly mentioned the consequences of controlling the precursors of certain secondary pollutants like O₃ which are not always clear. He clarified the control of particulate air pollutants which is a precursor for secondary pollutants by giving the example of SO₂ and NO_x which can lead to warming of the environment. He shared some inferences from the simulation using the WRF Chem Model during the lockdown period to understand the contribution of different emission sectors and percentage level reduction in overall pollution. They performed a series of numerical experiments using the above model to understand its impact on regional air quality and consequences on climate. The results showed that shutting down the 5 major emitting sectors leads to a reduction in primary pollutant concentration by 5-20 % and changes in secondary pollutants such as ozone are found to be more complex and non linear in nature. He concluded that it can be tricky business to reduce committed species within the targeted sector which could lead to a complex mix of chemistry and climate perturbations. He also recommends that the scientific community must work towards developing combined policies for effective tackling of both climate change and air pollution problems.

Following the comprehensive inputs by speakers, the session moderator invited all participants to share their queries.

After Q/A, Prof. Sagnik Dey was invited to moderate the next session on Mitigation and Policy. The first Presentation of this session was given by Dr. Santosh Harish, from the Centre for Policy Research. He presented his work on pursuing a Clean Air Agenda during the COVID crisis. He shared his analysis outcome which reveals that COVID disruptions are likely to result in three sections offering a different call to action. There are new opportunities to accelerate transition for beneficiaries to the environment and health, for example LPG subsidies, transition from paddy, scraping of old vehicles, reduction of private commuting etc. These outcomes set as opportunities for setting a new agenda to provide impetus to ongoing efforts or accelerate behavioural changes that are well aligned with improved air quality outcomes. He further explained the potential regressive outcomes arise from government efforts to dilute environmental safeguards, non compliance with power plant emission norms, weaker regulation, over reliance on public transport. He also mentioned some areas where there has been steady but significant development in air quality governance over the last couple of years that need to be sustained which includes strengthening the NCAP framework by prioritizing and implementing actions in parallel with developing the knowledge base. We also need to engage ULBs to invest in sustainable infrastructure and public services. He advocates for effective allocated resources both NCAP and FC grant processes need to move towards airshed level management for actual improvement in air quality levels.

The second presentation of this session was presented by Dr. Karthik Ganesan from CEEW. He touched upon the concept of citizen science and defined it as scientific research conducted, in whole or in part, by amateur or non professional scientists. He briefed about the fundamentals pillars of citizen science in terms of citizen concerns and needs and citizens themselves could produce reliable scientific knowledge. Another important thing to get more people interested in a cause by providing them adequate information and giving a sense of community. He mentioned three popular citizen science initiatives across the world namely, eBird, Zooniverse and inaturalist, joined by millions of people. He explained how

these initiatives can work on a bigger scale by keeping track, creating useful data, crowdsource identifications etc. He shared the statistics from Galaxy Zoo and inaturalist to convey how citizen science can actually engage the people to work towards their area of interest. He further elaborated on how citizen science can leverage air pollution, as most of the information on monitoring is centralized and sources of pollution are local and we are unaware of it. He shared the conclusion from a survey in central Uttar Pradesh for the general level of awareness in people, in which 90% of people believe the air in their vicinity is clean despite high PM levels. He expressed his belief that education plays a very important part in understanding the air quality and its impact on human health. The Majority of people in rural areas didn't perceive any changes in air quality during the lockdown. He advised on bridging the gaps in understanding of sources of air pollution by critically observing the surrounding polluting sources. He also stressed on the need for metrics used to convey the severity of air pollution because less than 40 % of urban and 25 % of the rural population are aware of AQI. He concluded his talk suggesting the need to change the perception around air quality and the importance of clean air, making air pollution monitoring ubiquitous. He also stated that the government should facilitate people's awareness to encourage more people to take cognisance of the air they breathe. He put forth the idea of a small network that responds to local needs, that coalesce to then represent the interest of larger and large communities.

Next to speak was Dr. Anumita Roy Chowdhury from the Centre for Science and Environment, apprised the overall observations essentially on key roadblocks from the perspective of implementations of clean air action plans under NCAP. Major points she has discussed on the perspective of the effectiveness of the action plans, timebound compliance across all sectors and meeting the specified targets set by NACP and finance commission which certainly gain a lot of credence, credibility and importance. She emphasized the idea of prioritization of actions in the cities to show an effective impact over time. She explained how to understand prioritization in relation to the key drivers of the actions with respect to science which is expected to bring more precision and accuracy, the interconnectedness of factors to inform actions. Other drivers she has mentioned are legal compliance, monitoring framework, institutional capacity, funding and community demand for clean air. From the state perspective she informed about quarterly reporting of cities to the CPCB and monitoring committee and the requirement of reality checks to understand the account of these drivers. She appreciates the NCAP mandate for science based air quality management, better monitoring, investing more in air quality monitoring for data, high level analytics and pollution forecasting. But she has also raised the question about the scale and replicability across the regions. She put forth the idea of grid design for exposure mapping and quality control of data in addition to all other parameters which need attention. She said that the exposure mapping and grid should be adequately designed for mapping of the sensitive population as we don't need any deep legal reform and these are already mentioned in current CPCB guidelines for monitoring. She made another important point about airshed approach regional approach, the use of alternative methods like satellite, need of an operative framework to design regional level plans. She outlined other major roadblocks regarding the science of designing solutions and prioritization. She stated that there are no baseline assessment actions that have not been carried out to understand the gap identification based on what should be critical guiding principles to reach the target. Therefore, it is very important to understand that a weak programme design makes prioritization meaningless and compliance ineffective. So action plans should be adequately designed and defined with clear indicators on the technology interventions, infrastructure design, service level improvement fiscal strategy, as applicable with a strong outcome level. She further elaborated on the state pollution control board role to improve air quality which needs to identify the specific strategies with detailed indicators of solutions and to ensure compliance in large scale industries and as well in small scale industries. She also informed that the clean air action plans are not aligned with larger sectoral policies for example in the transport sector, waste management and construction sector. Some of the state's programmes are also not coming under the reporting of NCAP. She also said that we need investment optimization for cross sector budgetary alignment for clean air goals. She recommended that NACP monitoring has to identify clearly what state role and central role and both have to be tracked together. For effective compliance and monitoring, we need to look into legal reform, institutional capacity across implementing agencies and departments. She particularly mentioned the pandemic situation and economic slowdown during which the biggest challenge is how we maintain a level

of ambition. She concluded her talk with the need for improvement in baseline abilities of states and a well defined criteria to be addressed in the current crisis that linked with green recovery.

The final talk of this session was given by Dr. Harshal Salve, from AIIMS. He briefly discussed integrating health outcomes into policy. He outlined the effects of air pollution on the human body and informed us about new health outcomes that affect the neurological system, cognition, development at early childhood, and mental illness. He advocates the need for health outcomes to be prioritised to work on high burden diseases including cardiovascular diseases, respiratory diseases, mental burden depression which are easily measurable and having preventable morbidity and mortality and also diseases among vulnerable populations. He informed the audience regarding various sources of health data in India and ongoing studies on the health effects of air pollution. He particularly mentioned 33 HDSS sites in India which continuously monitor their vital status morbidity, where we can actually analyze the impact of air pollution using such data sets. He also briefed about MINErVA (Mortality in India established through verbal autopsies) formerly known as Million death study which covers 9000 sampling units, run by AIIMS with a network of 23 partners and 250 doctors. He also covered the challenges in the linkage of exposure and health outcome data in his presentation. He highlighted various parameters under this such as outcome assessment, exposure assessment, exposure - response relationship, source and characteristics of particulate matter and health risk, assessing suitability and vulnerability and lack of local research and data. He also suggested opportunities for researchers to conduct accountability research with respect to regulatory actions, emission related actions, ambient air quality reduction. He explained on communicating research findings which are critical steps of the research, to the wider population and policy makers because of non communication of research in the manner it has to be communicated. He emphasized on customizing the research findings with respect to the audience. He concluded with the recommendations for the need for quantification of the problem, prioritizing health outcomes, clear cut linkages with diseases and risk factors, collateral benefits of risk reduction, specific interventions and economic and livelihood implications.

Following the conclusion of this session, the session moderator invited the delegates for their questions.

In the end, Prof. Sagnik Dey concluded and proposed a vote of thanks to speakers, audiences and organizers and wrapped up the webinar.