Arun Duggal Centre of Excellence for Research in Climate Change and Air Pollution
Indian Institute of Technology Delhi
Monthly Newsletter November 2021

Editorial

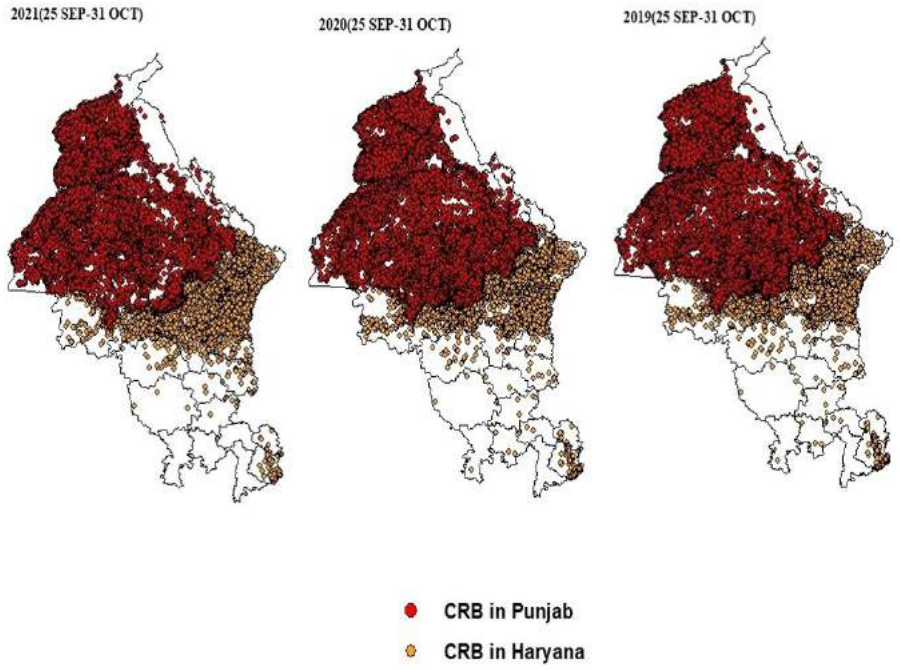
Year round sustainable clean air solutions are needed to solve Delhi's toxic air problem

Dear Readers,

The onset of winter has become synonymous with toxic air pollution in north India, especially Delhi every year. This year again like previous years, the governments will have to face the crucial test of addressing the winter haze. Even during the best of times, Delhi is counted amongst the most polluted cities across the world with its air quality failing to meet NAAQ Standards for most days of the year. The year 2020 was an exception and an unusual year with pollution levels dropping due to the Covid-19 induced lockdown followed by a good monsoon. However, back in 2021, the situation seems to have taken a U-turn again as emissions from automobiles, coal-powered plants, construction sites and lately stubble burning is making the air toxic again. With Diwali approaching, Delhi has already put in place under the Graded Response Action Plan (GRAP) and has banned sale, storage, and use of firecrackers. Neighbouring states have rolled out a host of measures to incentivize and even penalize farmers to deter them from setting their fields on fire. But it will have to be seen how these measures will solve the problem at hand? We also need to understand how other countries regulate the use of firecrackers and revisit the political economy of the farm sector by providing competitive incentives to farmers for adopting crop diversification, focusing on year-round solutions and developing enforcement capabilities and capacities. It is time that we start acknowledging the nexus between air, water and land related issues and start working on a yearly action plan by getting different players to join hands for creating the pathway for transition to blue skies.

Season`s Greetings and wishing you all a very happy Diwali!

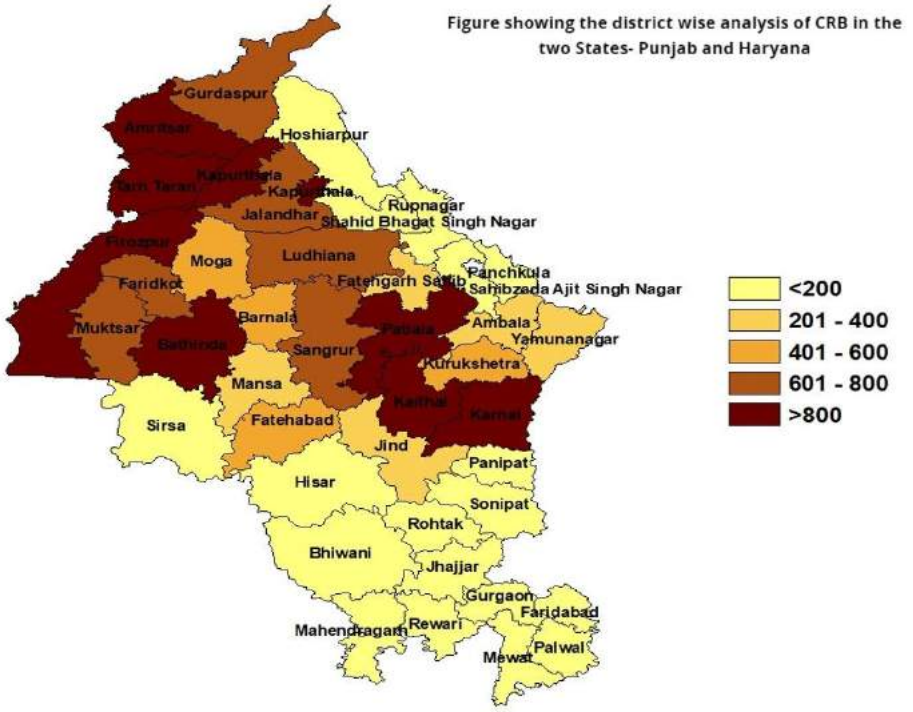
Regards,
Hemant Kaushal
Pr. Coordinator
Arun Duggal Centre of Excellence for Research in Climate Change and Air Pollution (CERCA),
Indian Institute of Technology Delhi



Every winter, stubble burning metamorphoses into a crisis as the air in Delhi including NCR turns into a smoke chamber. Crop Residue burning (CRB) over northern India is a major air quality and human health issue. This concern has resurfaced again as farmers have resumed the crop residue burning. The figure above shows the status of CRB in Punjab (red color) and Haryana (yellow color). This analysis has been performed for three consecutive years for a specific time period (25 September - 31 October).

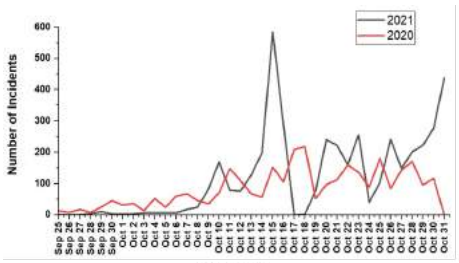
A total number of 13826 incidents of CRB have been reported so far in Punjab (25 September - 31 October) this year. In the year 2020, for the same period, the number of incidents were 19405 as against 17740 in 2019. Additionally, Haryana recorded 4331 incidents, so far this year 2021 (25 September -31 October). In the year 2020, the reported fire incidents were 3053 as compared to the same period last year 4086 in 2019.

As shown in the figure below, the major hotspots in Punjab includes Tarn Taran, Firozpur, Amritsar, Patiala, Bhatinda.Similarly, the major hotspots in Haryana are Karnal, Kaithal, Kurukshetra, Fatehabad, Jind.

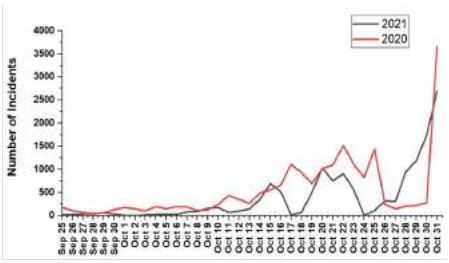


Overall, the number of fire counts of Punjab and Haryana have been analysed in the figure below with

respect to previous years 2020 and 2021, but air pollution concerns have now resurfaced in northern India and is still a matter of grave concern. The government measures and efforts would hopefully help in battling this problem of alarmingly high air pollution as well as stubble burning.



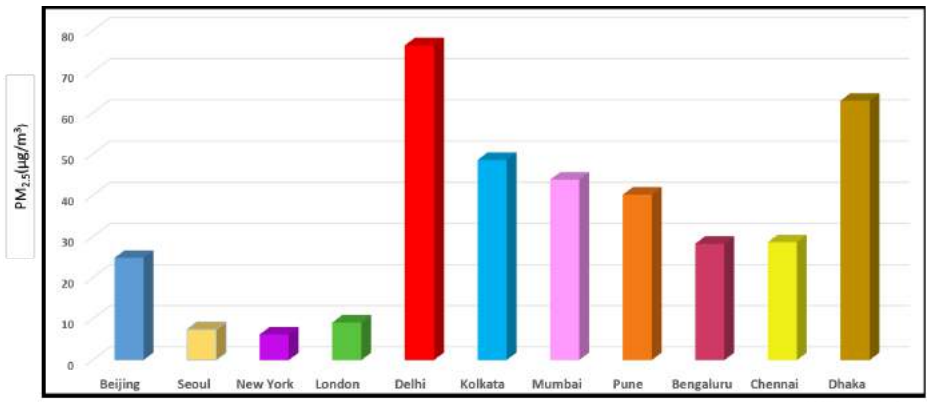
Haryana



Punjab

Indian & International Cities- October 2021

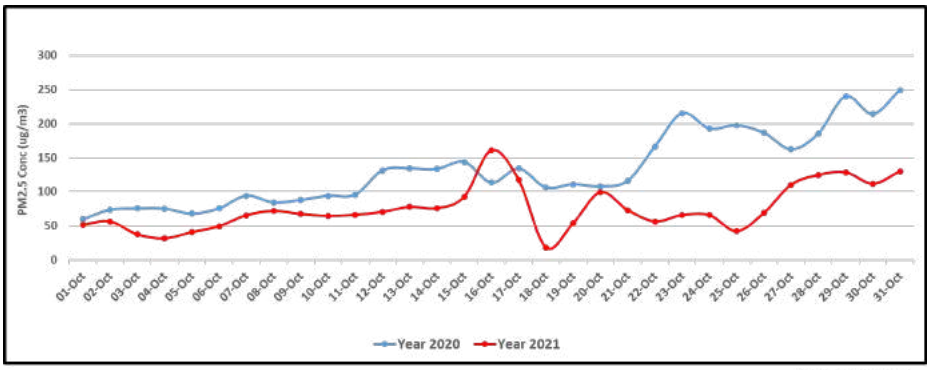
Delhi is found to be the highly polluted city



Data Source: berkeleyearth.org

The graph shows the daily average PM2.5 for the month of October 2021. Amongst the popular cities worldwide, Delhi has shown the highest concentration of PM2.5 followed by Dhaka and Kolkata. Delhi and Kolkata rank amongst the topmost polluted cities worldwide while the other Indian cities in the graph are amongst the top 10 metropolitan cities.

Delhi: October 2020 Vs October 2021



Data Source: CPCB

As Covid-19 cases in October 2021 are on a steep decline, almost negligible, Delhi has been fully unlocked with all the economic activities resumed. The impact of exceptionally high rainfall in this month is quite evident with the decrease in PM2.5 levels relative to last year. This decrease can also be attributed to the low crop residue burning count this year. The increase of anthropogenic activities on the Delhi Air Quality can be clearly correlated and observed in the graph with some jumps in the levels. PM2.5 has decreased by 57.48 µg/m^3 on an average in October 2021 as compared to October 2020.

CERCA Monthly Lecture Series

From Air pollution to Climate change, CERCA virtual **Expert Monthly Talk series** spotlights a range of contemporary issues while providing a platform for renowned speakers from around the world to share their knowledge and views.

UPCOMING EVENT

To register for this Talk Series, Click here

CERCA Events

Expert Talk delivered by Professor Mayank Kumar **on 26 October,2021**

Prof. Mayank Kumar, delivered a talk on "***Insights from Real Time Source Apportionment of Ambient PM 2.5 at IIT Delhi Supersite***" on October 26th, 2021. He presented his study on quantifying the impact of Diwali Fireworks and Stubble Burning on PM 2.5 concentration in Delhi. He discussed the source apportionment of Black Carbon over Delhi in the light of extreme biomass burning events and festival of Diwali. Also, He showed how the sources impacting the air quality in Delhi varied, during the COVID Lockdown. If you have missed this event, the link below will direct you to the recorded video.

Watch the complete Expert Talk Series Here.!

CAPHER -India Workshop on Air Pollution and Health Effects Research in India

CAPHER-India is a collaboration between the All India Institute for Medical Sciences (AIIMS), Indian Institute of Technology-Delhi (IIT-D) and supported by the Health Effects Institute (HEI), Boston, USA The workshop was conducted on virtual mode from 21st -23rd October, 2021 (5 PM - 8.30 PM, IST). The workshop brought together a range of researchers with an interest in air pollution and health effects research in India. The workshop introduced the CAPHER-India network and enabled discussion on opportunities for research collaborations, training and capacity building, and production of timely and policy-relevant research. International and National experts delivered their talk during the workshop. Workshop was attended by researchers and academicians from India

CERCA Expert Opinion and Research Outcomes

"Is Ex-Situ Crop Residue management a Scalable Solution to Stubble Burning? – A Punjab Case Study "

A Report by Council on Energy, Environment and Water (CEEW)

This study focuses on ex-situ residue management methods and understanding the economics involved in the effective supply chain management (SCM). It compares the delivered cost of various types of biomass products and investigates the viability of the use of paddy residue in coal-fired power plants to supplement the use of coal in the state. It also identifies tangible solutions to support the biomass supply chain and scale up ex-situ management in Punjab.

Key recommendations of the study range from establishing a dense network of straw banks and ex-situ supply chain ecosystem, boosting demand for biomass to regulating the prices of crop residue and its products. In addition to this, creating a database of end-users mapped to their annual crop residue demand would result in optimal planning for storage and logistics. A digital platform on the lines of eNAM should facilitate farmers to raise a request for collecting crop residue, hence encouraging decentralized sourcing.

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Variations in chemical composition of aerosol during Diwali over mega city Delhi, India

Garima Kotnala, Mukesh Kumar, Arun Kumar Sharma, Surendra Kumar Dhaka, Ranu Gadi, Shivani, Chirashree Ghosh, Mohit Saxena, Sudhir Kumar Sharma, Anindita Roy Saha, Aparna Nautiyal, Ashima Sharma, Chhemendra Sharma, Ravindra Kumar Kotnala, Tuhin Kumar Mandal

- This study investigated the spatio-temporal variation in concentrations of PM2.5 and its chemical constituents during pre-Diwali, Diwali, and post-Diwali days (13-30th October 2017) in Delhi.
- PM2.5 has been collected from seven strategic locations spread across the city.
- High concentrations of ambient particulate matter (PM), organics, trace gases, and elements was observed due to the massive burning of firecrackers during the Diwali festival.
- A significant increase in trend during the festive period was clearly observed in the mass concentrations of the markers for biomass and firecrackers burning and in mass ratios.

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Assessment of exposure to airborne aerosol and bio-aerosol particles and their deposition in the respiratory tract of subway metro passengers and workers

Amit Passi , S.M. Shiva Nagendra , M.P. Maiya

- Aerosol monitoring and bio-aerosol sampling were conducted along the metro line and inside metro stations.
- The deposition of aerosol and bio-aerosol particles in the respiratory tract of healthy adult males and females was calculated using the Multipath Particles Dosimetry Model.
- The exposure assessment revealed that exposure to fine airborne particles (<1 μm) was dominant; Higher deposition dose of particles was observed in males in comparison to females.
- In the journey along the metro line, a high deposition dose was found during in-train travel and in the underground metro station and significantly higher in subway metro workers due to the longer exposure duration

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CERCA in Circulation

Now, know sources of Pollution in Delhi in next 5 days by Decision Support System

The Decision Support System (DSS), which has been developed by Indian Institute of Tropical Meteorology-Pune forecasts the sources of local and regional pollution. DSS is a numerical based

Delhi air pollution: 75% of children experience breathlessness, says study

With the onset of winters, Delhi's air quality worsens every year. The climatic change leaves more than 75 percent of the children feeling suffocated, as per the TERI report that stated the air in Delhi has

framework for identifying sources of particulate matter pollution in Delhi. It forecasts the sources of pollution for the next 120 hours, and predicts the share of emissions from the different sectors.

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a high concentration of major pollutant PM2.5, which it claimed is pushing Delhiites, especially children, towards respiratory and heart diseases. The children in the survey aged between 14-17 years.

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Landmark UN resolution confirms healthy environment is a human right

The United Nations Human Rights Council (HRC) recognized for the first time that having a clean, healthy and sustainable environment is a human right. It is considered as a breakthrough moment for environmental justice. This acknowledges the damage inflicted by climate change and environmental destruction on millions of people across the world. It is a significant step in the fight against the triple planetary crisis - climate change, nature and biodiversity loss and pollution and waste.

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Real-time measurement of GHGs offers data-led approach to tackling air pollution, climate change

A dense sensor network to directly measure levels of CO2 and GHGs in the atmosphere in real time, as part of a pilot project, is being established in Glasgow, host city to the COP26 summit in November. The Glasgow project uses low-cost sensors. The data generated by the sensors need to be interpreted and inverse modelling techniques used to identify the sources of CO2 samples that have been observed. This would offer policymakers a much more detailed picture on the sources of GHGs and provide insight into the effects of any decisions to tackle emissions and pollution.

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