Arun Duggal Centre of Excellence for Research in Climate Change and Air Pollution
Indian Institute of Technology Delhi
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Editorial

Dear Readers,

Ever since its formation in 2018, CERCA has made remarkable progress over the past three years to evolve as one of the country's important think tanks in the air pollution space. To build on this foundation and take it to a new level, CERCA has taken several important steps in 2021 aimed at raising the visibility of its research work and activities to address the impending problems of air pollution in the country. On a smaller, yet still significant note, CERCA has expanded the scope of its activities in 2021 to include climate change as well, to reflect its new focus on global issues affecting the environment. From retrofitting old classics to organizing CERCA Monthly expert talks/workshops on themes like crop burning, EVs, health effects of air pollution, emission reduction technologies and indoor air quality, collaboration with state pollution control boards, the industry and citizens through citizen science projects, CERCA has been making consistent efforts in bringing the academia, industry and the citizens together to promote high-quality scientific research on air pollution & climate change issues which is becoming an important input for policymakers and other stakeholders. Various initiatives of CERCA such as AQM Modelling network for the Indo-Gangetic Plain (IGP) region in India using the Greenhouse gas and Air Pollution Interactions and Synergies (GAINS) model with the World Bank including Annual state of air quality progress report for India in partnership with UNEP and TERI are serving as powerful new drivers for promoting innovative approaches for managing air pollution in India. CERCA is also leading the air pollution theme for the Delhi Research implementation and innovation initiative of the GOI to accelerate actions that will help in improving the air quality in Delhi.

In 2022 also, CERCA will not only continue to act as a science driven action centre at IIT Delhi by combining the best practices from the entire ecosystem working for clean air and climate change in the country but also continue to fill the required gap in citizen awareness generation aimed at bringing about a direct positive impact on the lives of people through several new initiatives and research-based policy recommendations.

Let us continue to envision a better India, where we all will breathe cleaner air and lead a healthier life.

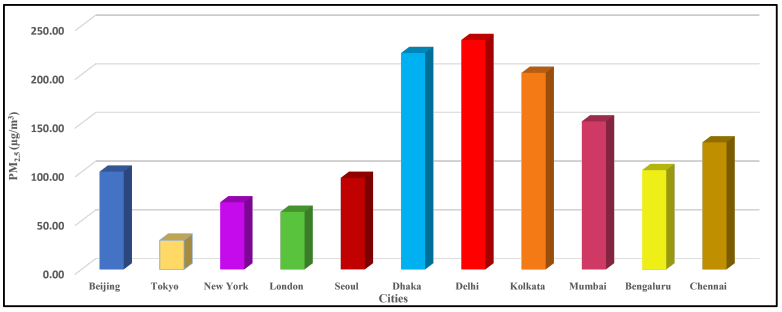
Yours sincerely,

Hemant Kaushal
Pr. Coordinator
Arun Duggal Centre of Excellence for Research in climate change and Air Pollution

Air Quality Trends

Indian & International Cities- January 2022

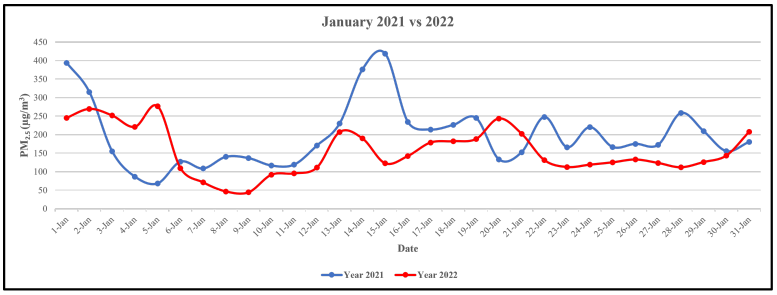
Delhi has the highest Air Pollution among all the major International Cities



Data Source : aqicn.org

The graph above shows the daily average $PM_{2.5}$ for the month of January 2022. Amongst the popular cities worldwide, Delhi has shown the highest concentration of $PM_{2.5}$ followed by Dhaka and Kolkata. Delhi and Kolkata, within India, rank amongst the topmost polluted cities worldwide while the other Indian cities in the graph are amongst the top 10 metropolitan cities.

Delhi $PM_{2.5}$ (24 hr. daily average) Trend
January 2021 Vs January 2022



Data Source : CPCB

January in 2022 witnessed intense rainfall this year, the most in January in at least 121 years, according to IMD. Foggy days were less and western disturbances caused rain as well as temperature and wind speed to rise which helped in improving the quality of air. Hence, $PM_{2.5}$ has decreased by 41.80 µg/m^{3}on an average in January 2022 as compared to January 2021 making air quality better with respect to last year. But as the month ends, $PM_{2.5}$ levels are showing an increasing trend. A long-running decline in COVID-19 cases resulted in an increase of social gatherings and anthropogenic activities whose impact is visible on the Delhi Air Quality, which can be clearly correlated and observed in the graph.

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.

To register for this February 2022 Talk Series, Click here

Global health burden of ambient $PM_{2.5}$ and the contribution of anthropogenic black carbon and organic aerosols

Sourangsu Chowdhury, Andrea Pozzer, Andy Haines, Klaus Klingmüller, Thomas Münzel, Pauli Paasonen, Arushi Sharma, Chandra Venkataraman, Jos Lelieveld

- This study used a data-informed global atmospheric model and recent exposure–response functions to calculate the health burden of ambient $PM_{2.5}$ from ten source categories.
- It distinguished contributions and major sources of black carbon (BC), primary organic aerosols (POA) and anthropogenic secondary organic aerosols (aSOA) which make up to ~20% of the total $PM_{2.5}$ in South and East Asia and East Africa.

- It also found that domestic energy use by the burning of solid biofuels is the largest contributor to ambient BC, POA and aSOA globally.
- Epidemiological and toxicological studies indicate that these compounds may be relatively more hazardous than other $PM_{2.5}$ compounds such as soluble salts, related to their high potential to inflict oxidative stress.

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Robust relationship between ambient air pollution and infant mortality in India

Priyanka N. deSouza, Sagnik Dey, Kevin M. Mwenda, Rockli Kim, S.V. Subramanian, Patrick L. Kinney

- This study estimates the associations between in-utero and perinatal exposure to $PM_{2.5}$ and infant, neonatal and post neonatal mortality in India and evaluates the sensitivity of this association to two widely used exposure assessments.
- It linked nationally representative anthropometric data from India's 2015–2016 Demographic and Health Survey (n = 259,627 children under five across 640 districts of India) with satellite-based $PM_{2.5}$ concentrations during the month of birth of each child.
- It was found that $PM_{2.5}$ impacts infant mortality primarily through neonatal mortality.
- Child sex was a significant effect modifier, with $PM_{2.5}$ impacting mortality in infant girls more than boys.
- The results revealed a robust association between ambient exposure to $PM_{2.5}$ in the latter period of pregnancy and early life with infant and neonatal mortality in India.

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Child Survival and Early Lifetime Exposures to Ambient Fine Particulate Matter in India: A Retrospective Cohort Study

Jiawen Liao, Yang Liu, Kyle Steenland, Ajay Pillarisetti, Lisa M. Thompson, Sagnik Dey, Kalpana Balakrishnan, and Thomas Clasen

- The study estimated the association between $PM_{2.5}$ exposure and child survival in India.
- It constructed a large, retrospective, and nationally representative cohort of children <5 years of age, born between 2009–2016, from the publicly available, cross-sectional 2015–2016 Demographic Health Surveys in India.
- *In utero* and post-delivery lifetime average ambient $PM_{2.5}$ exposures were estimated with data from satellite remote sensing, meteorology, and land use information.
- It used Cox proportional hazards regression to estimate the association between both average *in utero* and post-delivery lifetime $PM_{2.5}$ and all-cause child mortality, controlling for individual- and household-level covariates, seasonality, location, and meteorology.
- This study adds to the growing body of evidence about the adverse health effects of $PM_{2.5}$ by demonstrating the association between exposure, both *in utero* and post-delivery, on child survival at the national level in India.

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Bengaluru's pollution levels higher than WHO standards: Greenpeace report

All 10 air quality monitoring stations in the city of Bengaluru have recorded pollution higher than World Health Organisation (WHO) standards. The report underlined cities across India are breathing polluted air and that pollution is not limited to north Indian cities. Despite the repeated lockdown on account of the pandemic, the annual average values of $PM_{2.5}$ and PM_{10} of all studied 10 south Indian cities exceeded the WHO's revised standards. Bad roads, poor planning, and increasing private vehicles have led to the rapid degradation in the quality of life in Bengaluru, which was once known as India's garden city.

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Animated films to clear the haze on air pollution

To grab public attention on the catastrophe, Asar, a private organization in collaboration with India Climate Collaboration (ICC) has released animated films which focus on key areas of air pollution including sources, impacts on health and solutions. These 90-second to 140-second films are currently being circulated in three languages — a combination of English and Hindi, Marathi, Punjabi. These videos deliver what is essential to make it understandable to everyone. The films are unbranded and freely available for anyone to use as part of their educational programs, campaigns, and other communications to amplify conversations on air pollution.

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NITI Aayog's Shoonya campaign urges Indians to adopt EVs for clean mobility

NITI Aayog, RMI and RMI India have launched the Shoonya ad campaign to accelerate the Electric Vehicle (EV) adoption in India. The campaign aims to promote the use of electric vehicles (EVs) for deliveries and rides through a corporate branding program and EV awareness drive. As part of the awareness drive, the Shoonya coalition launched an ad campaign on January 25, 2022, to highlight the air quality, environmental and cost benefits of EVs. The brand film is available on all digital-led

Bees, butterflies and moths 'confused' by air pollution

Research led by the University of Reading found that insects including bees, flies, moths and butterflies were being impaired by air pollution, reducing pollination rates by as much as 31%. With 70% of the world's crops, including apples, strawberries, and cocoa, relying on insect pollination, scientists are concerned that the impact of common air pollutants goes far beyond impacts on human health. Bees and butterflies are 'confused' by air pollution, making them less able to seek out the crops that both humans and insects

platforms. In addition to the consumer awareness drive, the Shoonya campaign also incorporates a corporate branding program, through which deliveries, rides, associated vehicles, and infrastructure are branded with the Shoonya logo.

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depend upon. In some cases, the presence of pollutants such as nitrogen oxides and ozone resulted in as much as a 90% decline in flower visits by pollinators. Air pollution obscures the sweet smell of flowers, making it much harder for pollinators to find them.

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Living near or downwind of unconventional oil and gas development linked with increased risk of early death: Harvard Study

Elderly people living near or downwind of unconventional oil and gas development (UOGD) -- which involves extraction methods including directional (non-vertical) drilling and hydraulic fracturing, or fracking -- are at higher risk of early death compared with elderly individuals who don't live near such operations, according to a large new study from Harvard T.H. Chan School of Public Health. Compared with conventional oil and gas drilling, UOGD generally involves longer construction periods and larger well pads (the area occupied by equipment or facilities), and requires larger volumes of water, proppants (sand or other materials used to keep hydraulic fractures open), and chemicals during the fracking process.

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The world's oceans saw record warming in 2021 as climate change continues apace

According to a report published in Advances in Atmospheric Sciences, Ocean temperatures in 2021 were “the hottest ever recorded by humans,”. The increased concentrations of greenhouse gases in the atmosphere from human activities trap heat within the climate system and result in massive changes in the climate system. According to the report, the seas that are warming fastest are the Atlantic, Pacific, and Indian oceans. While factors such as El Niño and La Niña weather patterns continue to help determine short-term water temperature conditions, greenhouse gas emissions that trap solar radiation and warm the planet’s atmosphere are the bigger factor for increasing ocean warmth.

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