



**Centre of Excellence for Research on Clean Air (CERCA)**

**Indian Institute of Technology Delhi**  
Research on Air Pollution and Climate Change

Monthly Newsletter **May 2021**



## ***Editorial***

### **Covid and I**

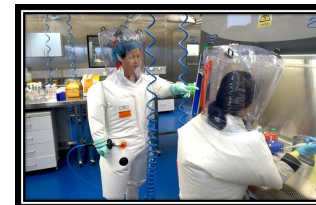
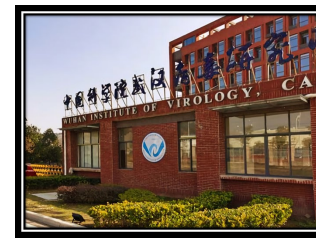
Dear Readers,

It has been an entirely one-sided and very cruel war. Most of the casualties last year have been elderly people particularly ones with co-morbidity but now we are losing even younger people. This war has also sapped the confidence and mental peace of the entire population. The enemy, Covid Virus, is so strong, so devious, so mobile, so deadly, and is ever-changing into newer mutations. The latest research indicates that it is airborne, so only washing hands and social distancing may not be enough to stop its spread. The political establishments around the world have failed to respond effectively to this powerful enemy which has so far claimed 3.4 Million human lives in the world. Some estimates put the number much higher. The economic impact, except in China, has been devastating around the world.

Only bright spot is the science, the speed of its response to this pandemic. The development of Vaccines, in an unprecedentedly short time frame, and in several countries, has been a remarkable success of R&D to fight a common enemy. Vaccination of population to a level of herd immunity seems to be the only long-term solution. But I worry about science too. What if this was all started in Wuhan Institute of Virology, a major research institute of China. I have this nightmare of a research scientist Zhengli Shi, in

a white Lab Coat, in Wuhan Institute. She is holding in her hand a glass test tube filled with a newly discovered virus strain. She accidentally or otherwise drops the test tube. Her records have been sealed by the Chinese authorities. And WHO blames poor bats the nearby wet market for starting the spread of Wuhan virus. My personal response to the Virus has been defensive: Run and Hide. We spent most of last year in our 150-year-old home in Kasauli, which is a small quaint military Cantonment hill station near Shimla. Clean fresh air, cool, lovely mountains, and no Covid insight. In winter when it became too cold and snowed, we moved down south and hid ourselves in Coorg in a lovely coffee plantation, Then, back to Delhi to take two doses of Covishield, to fortify us against the enemy. And now we are in New York, where things seem to be under control. Vaccine and Testing are free and freely available. In 2018, "CERCA": Centre for Clean Air, was founded in my Alma mater IIT Delhi to help deal with the severe Air Pollution in Delhi and in most of North India. Now, we have expanded CERCA's scope to fight air pollution not only due to particulate matters like  $PM_{2.5}$  and other pollutants but also due to viruses, pathogens, and bacteria. The defense from Covid Virus by vaccination, masks, social distancing, and avoiding crowded spaces remains most important. But it has become clear that the Covid Virus can be infected thru airborne transmission and mere Defense is not enough. We have therefore decided to move on the offensive: to fight The Virus by finding it and killing it. Indoor environment such as homes, classrooms, restaurants, offices, etc. where we spend 80% of our time is the battleground. We have started three new research projects at CERCA in IIT Delhi in collaboration with Honeywell Company relating to Indoor Air Quality.

The First is to research to develop a small, low-cost, portable Device to measure the viral load (including Covid) in a microenvironment like home, classroom, restaurant, office, etc. We have checked but such a low-cost Device does not seem to be available anywhere in the world. It will take a lot of effort to experiment with several technologies to develop such a device. After all, RADAR was developed in the 1920s to locate an enemy aircraft hundreds of miles away. With some luck, we should be able to develop a simple Device to locate the enemy right under our nose. The Second is to develop a "Composite Air Purification System" to clean indoor air not only of particulate matters like  $PM_{2.5}$  and other pollutants but also viruses, pathogens, and bacteria. This will involve redesign of the HVAC system to include HEPA filters, Electrostatic Precipitators, carbon filters, and Ultra Violet light. This system could also be incorporated in the portable room Air Purifiers we use in homes, offices, and schools, etc. These room air Purifiers will need to be redesigned to be hung close to the room ceiling (rather than be kept on the floor) for better circulation/purification of air but also to keep the UV light source above 7 feet for human health reasons. Significant R&D work needs to be undertaken to ensure systems effectiveness, safety, in particular since it involves UV Light and power efficiency. The Third is to study ways to measure and reduce  $CO_2$  levels in any room or other microenvironments like a classroom, restaurant, office, car, or bus. If you have 4/5 people in a room without adequate ventilation, the  $CO_2$  levels will in quickly rise to double or triple the safe limit of 400 ppm.  $CO_2$  level can also be a proxy for the viral load and risk even if there is one infected person in the room. Of course, opening a window or an exhaust fan can lower the  $CO_2$  level, but in an Air-Conditioned environment, automatic

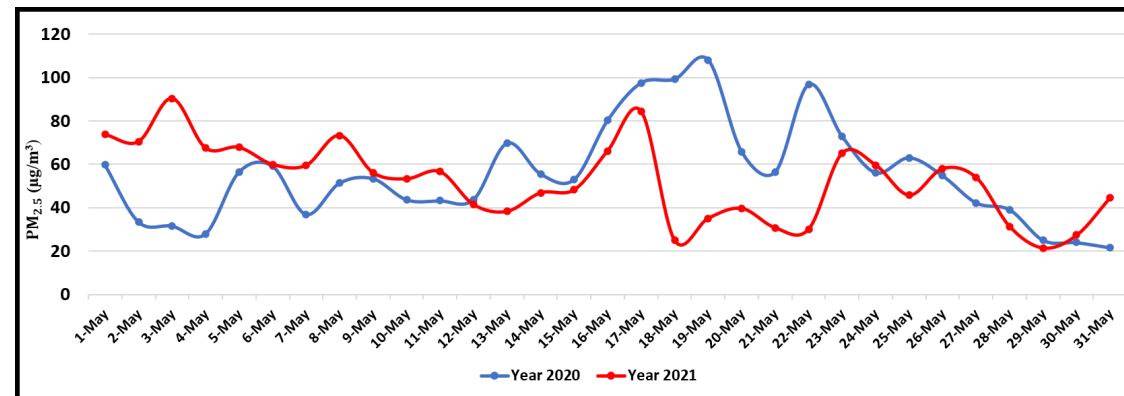


sensors/ damper control for increasing the fresh air intake in the system will be necessary.

It is highly recommended that in every Indoor Environment such as Classroom, Office, Restaurant, Bus, it should be mandatory to have an Indoor Air Quality Measuring device displaying the level of Air Pollutants of including  $PM_{2.5}$ ,  $CO_2$ , VOC, etc. I am sure similar efforts are underway in many other institutions around the world on ways to find the Virus and kill it. I am confident that these will be successful not only to defeat the Covid Virus but its future variants, common cold, flu, viral infections, and other air-borne diseases afflicting us.

**Arun Duggal**  
Founder, CERCA

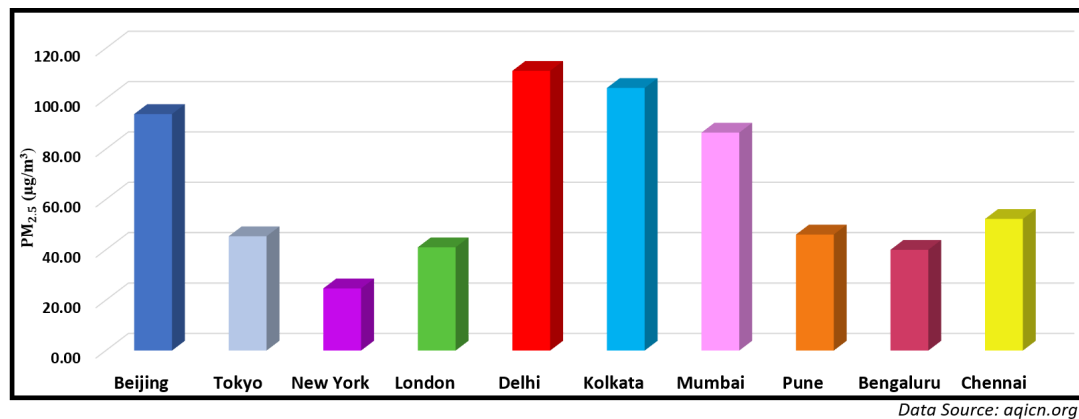
### Air Quality Trend for Delhi: One of the Most Polluted Cities in the World



Data Source: CPCB

Due to increasing Covid-19 positive cases, Delhi has been extending the lockdown period in phases. The impact of declining anthropogenic activities on the Delhi Air Quality can be clearly observed and correlated in the graph, as the previous year (May 2020) lockdown was waived off and Delhi returned to routine activities.

### Air Quality Trend (May 2021) for different national & international cities



The graph shows the daily average PM<sub>2.5</sub> for the May month of 2021. Amongst the popular cities worldwide, Delhi has shown the highest concentration of PM<sub>2.5</sub> followed by Kolkata. Beijing is the third polluted city at the international level. Delhi and Kolkata rank among the topmost polluted cities worldwide while the other Indian cities in the graph are among the top 10 metropolitan cities.



From Air pollution to Climate change, CERCA virtual Expert 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.

In this Series, CERCA is pleased to organize a Panel discussion on **June 05, 2021, at 4:00 PM (IST)**, in collaboration with the Department of Law, Maharaja Agrasen Institute of Management Studies, and ICMR-NIIRNCD, Jodhpur. The theme for this panel discussion is **"Delhi's Air Quality Control- A QUEST FOR VIABLE SOLUTIONS!"**. The expert panel consists of 05 eminent speakers from the National Green Tribunal (NGT), MoEFCC, CERCA IITD, ICMR-NIIRNCD, and the World Bank Group. We are also very delighted to have the keynote address delivered by former Chairman of NGT Honorable Justice Sh Swatantra Kumar. The panel discussion aims to breed analytical thoughts and knowledge on the issue amongst the citizens of Delhi/NCR and thus ignite young minds by churning practical and viable solutions to this crisis. The Panel discussion would be followed by Q & A/Discussion.

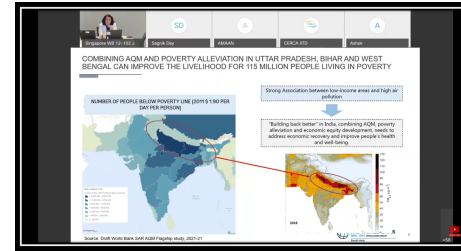
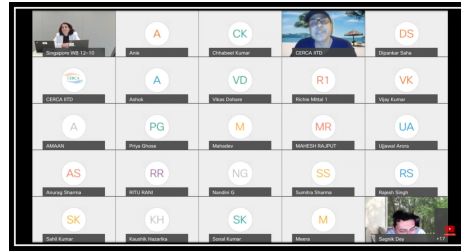
To register for this informative panel discussion, [click here](#).



**Expert Talk delivered by Ms. Karin Shepardson on May 07, 2021**

[Ms. Karin Shepardson](#) of the World Bank delivered a talk on "Airshed Management: Converging Science

and Policy at the Impact Scale” on May 7<sup>th</sup>, 2021. She presented an overview of the World Bank’s global work on air quality management & discussed why the World Bank capacity support & investments places such a strong emphasis on the need for airshed management. If you have missed this seminar, the link below will take you to the recorded video.



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## CERCA Expert Opinion and Research Outcomes

### “Rethinking clean air planning in a Post-Pandemic World” - An Opinion Paper by Ms. L. S. Kurinji

Ms. L. S. Kurinji is a Research Analyst at Council on Energy, Environment, and Water (CEEW), New Delhi.

India’s coronavirus lockdown shut factories, kept vehicles off the roads, caused power demand to plummet, and reduced particulate levels in cities by 20-50 percent early last year. During the pandemic, temporary improvements in air quality, both at home and abroad, offered a glimpse of what we could achieve through strategic and sustained efforts to rein in major pollution sources.

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### Effective protection of healthcare workers from SARS-CoV-2 airborne transmission *Sara Romano-Bertrand, Yolène Carré RN, Ludwig-Serge Aho Glélé & Didier Lepelletier*

- An aerosol can contain both liquid (droplets) and solid (droplet nuclei) particles of various sizes.
- Small particles of matter serve as a vector for SARS-CoV-2.
- Current scientific evidence suggests that surgical and N95/FFP2 masks confer equivalent protection against airborne viral infections to HCWs engaged in routine care.
- While the airborne transmission is possible, the major route of transmission in healthcare settings is droplet-mediated.

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## CERCA in Circulation



### India can become EV superpower with robust vehicles and changes in ecosystem

The transportation sector has witnessed rapid growth in the last few decades. While this growth has contributed significantly to the mobility of the population and their economic progress, the development has come at a huge cost to human well-being and sustainability. There has been a lot of talk around EVs – the GoI's vision of electric new vehicles by 2030, setting up charging infrastructure, issues of range, high overall price, and so on.

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### 43 of World's 100 cities at greatest environmental risk are in India

Asian cities are at greater risk from Environmental concerns like natural disasters and [air pollution](#), as per a report by research firm Verisk Maplecroft. Out of 100 most vulnerable cities, 99 are in Asia itself. Of those, 43 are in India, and 37 are in China, the world's third and first biggest emitters of greenhouse gases respectively. In the case of India, Delhi is the world's 2nd highest risk city, followed by Chennai at 3rd, Agra at 6th, and Kanpur at 10<sup>th</sup>.

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### TEMPO air pollution sensor treks toward satellite integration



### EU aims at 'zero pollution' in air, water and soil by 2050

Cambridge, MA – A NASA-Smithsonian satellite instrument that will measure air pollution over North America reached another key milestone this week. The [Tropospheric Emissions: Monitoring of Pollution](#) (TEMPO) instrument, which will take hourly daytime pollution measurements at an unprecedented resolution, shipped from Ball Aerospace in Colorado, to Maxar Technologies' satellite manufacturing facility in California.

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The European Commission on 12th May unveiled a plan to reduce pollution to levels that are no longer harmful to human health and natural ecosystems by 2050 - when the EU aims to become climate neutral. "New green technologies already here can help reduce pollution and offer new business opportunities," said the EU commissioner in charge of the Green Deal, Frans Timmermans, arguing that recovery funds can support this goal.

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