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Research Paper

Rising Pollution in the Metro Cities of India

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Abstract:
It is important to note that air pollution affects metro cities more than industrial cities in India, contrary to assumptions. Air pollution in Indian cities is primarily caused by the burning of diesel, petrol, gas, coal, biomass, waste, and resuspended dust throughout the year. National Capital Delhi, Kolkata, Mumbai, Hyderabad, Bengaluru and Chennai all experienced an increase in air pollution levels in 2021, according to the annual average of PM2.5 in India.

Keywords: *Air Pollution, Polluted Metro Cities, Smoke, Smog*

1. Introduction –

Human health and the planet as a whole are adversely affected by air pollution, which involves the release of pollutants into the air. Nearly seven million deaths are caused by air pollution every year around the world, according to the World Health Organization (WHO). In low- and middle-income countries, nine out of ten people breathe air that exceeds WHO guidelines for pollutants.[1]

Air pollution affects the human body differently, depending on the type of pollutant and the level and length of exposure, as well as other factors, such as an individual's health risks and the cumulative effects of multiple pollutants.[2]

- **Soot and smog:** Smog, sometimes referred to as ground-level ozone, is caused by the reaction of fossil fuel emissions with sunlight. Meanwhile, soot, also known as particulate matter, is formed when tiny particles of chemicals, soil, smoke, dust or allergens combine in either gaseous or solid form and are distributed through the air. These two types of air pollution have similar sources - cars and trucks, factories, power plants and incinerators to name a few - all of which are powered by coal, gas or natural gas. Smog can be a menace to our eyes, throats and lungs, particularly those of children, seniors and people who work or exercise outside. Worse yet, asthma and allergy sufferers are at an even greater risk of experiencing exacerbated symptoms or suffering asthma attacks due to the added pollutants in the air. Furthermore, small particles of gas or solid matter can penetrate our lungs and bloodstream and all too often lead to bronchitis, heart failure, and even death. In 2020, Harvard's T.H. Chan School of Public Health issued a report on the effects of COVID-19 that showed mortality rates were higher in locales with greater soot pollution compared to areas with less exposure—a clear indication that long-term contact with microscopic particles influences the severity of this virus and highlights a serious environmental justice issue.[3]

- **Pollutants that cause health problems:** Various airborne pollutants are hazardous to health and can be deadly in small doses. There are almost 200 of them that are regulated by law, these include mercury, lead, dioxins and benzene; which primarily originate from the burning of gas or coal, or in the case of benzene it is part of gasoline. The EPA consider benzene a carcinogen; it brings about short term skin, lung and eye inflammation as well as long-term blood disorders. Dioxins too can be found in the air but in more considerable degree in food; these cause liver damage temporarily and have a deleterious effect on the immune system, endocrine system, reproductive functions and nervous system over time. Exposure to large amounts of mercury can affect the central nervous system while even small levels of lead can detrimentally influence children's IQ level and learning capacity. Traffic exhaust and wildfire smoke contain polycyclic aromatic hydrocarbons (PAHs), another class of toxic compounds. A study found that children of mothers exposed to

[1] "Jillian Mackenzie Jeff Turrentine. Air pollution: Everything you need to know. NRDC. Retrieved from https://www.nrdc.org/stories/air-pollution-everything-you-need-know"
[2] "Jillian Mackenzie Jeff Turrentine. Air pollution: Everything you need to know. NRDC. Retrieved from https://www.nrdc.org/stories/air-pollution-everything-you-need-know"
[3] "Jillian Mackenzie Jeff Turrentine. Air pollution: Everything you need to know. NRDC. Retrieved from https://www.nrdc.org/stories/air-pollution-everything-you-need-know"

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PAHs during pregnancy had slower brain processing speeds and stronger ADHD symptoms. In large amounts, they can cause eye and lung irritation, blood and liver problems, and even cancer.[4]

- **Emissions of greenhouse gases:** Greenhouse gases, such as carbon dioxide and methane, trap the earth's heat in the atmosphere, leading to rising temperatures and the onset of climate change - including sea level rise, extreme weather events, heat-related deaths and infectious disease transmission. Carbon dioxide dominated 2018 US greenhouse gas emissions at 81%, with methane making up 10%. Carbon dioxide largely results from combustion of fossil fuels with methane coming from both natural sources as well as industrial activities like oil and gas drilling. Hydrofluorocarbons (HFCs) are particularly potent heat-trapping gases; however, in October 2016 over 140 countries agreed to reduce their use over time and develop greener alternatives.

- **Mold and pollen:** Mold and allergens stemming from plants including trees, weeds, and grass are generally not regulated in the same way as air pollution generated by humans. However, due to climate change, these can be just as hazardous to health when present in the air. When homes, schools or businesses have been subject to water damage, mold can grow; this small growth can produce particles which are allergenic and potentially toxic if inhaled. In fact, even low levels of mold exposure can result in asthma attacks or allergic reactions. Due to rising temperatures, pollen allergies are becoming more severe. Research has revealed that plants producing pollen - especially ragweed - not only grow larger but also produce higher levels of it when exposed to an increased amount of carbon dioxide. It is also understood that the length of season for this type of production is lengthening, with some studies suggesting an even higher potency for the ragweed allergy. Ultimately, if true, this could lead to a huge spike in those suffering from its symptoms - runny noses, fevers and itchy eyes.[5]

2. Air Pollution in Metro Cities

A major environmental issue in India is air pollution. In 2019, 21 of the 30 world's most polluted cities were in India. As per a study based on 2016 data, at least 140 million people in India breathe air that is 10 times or more over the WHO safe limit and 13 of the world's 20 cities with the highest levels of annual air pollution are in India. In India, air pollution contributes to 2 million premature deaths every year. 51% of pollution is caused by industrial pollution, 25% by vehicles, 17% by crop burning, and 5% by other sources. A large portion of pollution in rural areas comes from biomass burning for cooking and heating. Emissions come from vehicles and industry. Agricultural fields burn large amounts of crop residue in autumn and spring, a cheaper alternative to mechanical tilling, and this creates a lot of smoke, smog, and particulates. In spite of India's low greenhouse gas emissions per capita, it is the third largest greenhouse gas producer after China and the United States. Nonsmokers have 30% weaker lung function than Europeans, according to a 2013 study.[6]

Climate change and air quality are adversely affected by human activities such as transportation, industrialization, urbanization, etc. Particulate matter (PM2.5 and PM10), one of the most common pollutants, is also among the most dangerous pollutants. An analysis of eight representative cities along the Indo-Gangetic Plain (metros and industrial) was conducted in order to understand the distribution of PM during lockdown and before.[7]

The contrast between air pollution suffered by metro cities and industrial cities in India was examined. Contrary to assumptions, the impact of air pollution on metro cities has been found to be even more serious than that of industrial ones. Recent CPCB CAAQMS readings from both Tier I and II cities demonstrate that the levels of PM2.5 & PM10 during festival periods excel those found within industrial townships. As India is already well-vaccinated against the COVID-19 virus, there has been a notable uptick in vehicular traffic and other activities during this period, resulting in raised pollution levels within metropolises and tier-II cities alike.[8]

2.1 Air Pollution in Delhi

22 of the world's 30 most polluted cities are located in India, including New Delhi, which has been named the world's most polluted capital city for the third consecutive year, according to the World Air Quality Report 2020 by Swiss organization, IQAir. While Delhi's air quality had improved by nearly 15 percent from 2019, it still ranked as the 10th most polluted city in the world and the most polluted capital.

[4] "Air Pollution. Nationalgeographic.org. Retrieved from https://education.nationalgeographic.org/resource/air-pollution/"
[5] "Air Pollution. Nationalgeographic.org. Retrieved from https://education.nationalgeographic.org/resource/air-pollution/"
[6] "Regan, Helen. "21 of the world's 30 cities with the worst air pollution are in India". CNN. Retrieved 2020-02-26."
[7] "Jillian Mackenzie Jeff Turrentine. Air pollution: Everything you need to know. NRDC. Retrieved January 12, 2023 from https://www.nrdc.org/stories/air-pollution-everything-you-need-know"
[8] "Jillian Mackenzie Jeff Turrentine. Air pollution: Everything you need to know. NRDC. Retrieved January 12, 2023 from https://www.nrdc.org/stories/air-pollution-everything-you-need-know"

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In its World Air Quality Report 2020, IQAir compiled air quality data for 106 countries using particulate matter PM2.5—airborne particles less than 2.5 microns in diameter—as an annual average. A prolonged exposure to PM2.5 can lead to deadly diseases such as cancer and cardiac problems.[9]

2.2 Air Pollution in Bangalore

According to a new analysis, air pollution continues to be a serious public health issue that also affects our economy, despite relatively better air quality last year. In a report released this year by Greenpeace Southeast Asia, Bengaluru, which fared better than Delhi and Mumbai, was estimated to have suffered an estimated 12,000 avoidable deaths as a result of PM 2.5 pollution. Bengaluru is better off than Delhi and Mumbai, but worse off than Chennai, Hyderabad, and Lucknow when compared with the six Indian cities included in the global analysis.

According to IQAir's 'Cost Estimator' online tool, the figures represent the real-time health impact and economic cost of fine particulate matter (PM 2.5) air pollution based on ground-level PM 2.5 measurements. [10]

According to a Greenpeace release, CEO of IQAir Frank Hammes commented on Cost Estimator's revelations: "Breathing shouldn't be dangerous." There were 160,000 deaths due to poor air quality in the five largest cities alone in 2010, especially in a year when air pollution levels were lower as a result of less economic activity in many cities."

2.3 Air Pollution in Mumbai

Air quality in Mumbai grabbed headlines as its overall Air Quality Index (AQI) dropped all the way down to 262 — a very poor ranking, far worse than the 'world's most polluted city' New Delhi. In addition, Mumbai has a higher concentration of PM2.5 (fine particulate matter) than Delhi, so at the same AQI level Mumbai could experience a more severe health impact. This, unfortunately, was no one-off spike in air pollution.[11]

Covid-19 lockdown measures have greatly reduced air pollution across 2020 and 2021, however the air quality in Mumbai has again taken a downward turn since this winter period. Following Diwali, Mumbai's AQI hit 304 (severe category), and it has remained at moderate to poor levels for weeks. The AQI of 188 is currently recorded in the city, with Mazgaon showing 210 and 188 in Bandra-Kurla Complex (BKC). Meanwhile, Vile Parle West showed an AQI value of 95, Vasai West had 89, Khadakpada 80 and Pimpleshwar Mandir 97.[12]

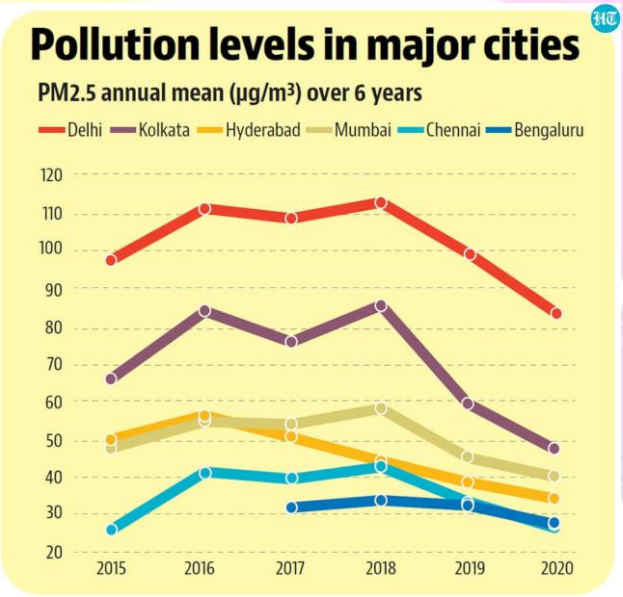

Fig 1. Pollution Level in Metro Cities in Last 5 Years

[9] "Home Ministry extends validity of FCRA registration certificates. India Development Review. Retrieved from https://idronline.org/news/home-ministry-extends-validity-of-fcra-registration-certificates/"
[10] "2021. 'Air pollution led to 12,000 deaths in Bengaluru last year.' Thehindu.com. Retrieved January 12, 2023 from https://www.thehindu.com/news/cities/bangalore/air-pollution-led-to-12000-deaths-in-bengaluru-last-year/article33874517.ece"
[11] "Business Today Desk. 2022. Mumbai pollution: 'Don't we deserve fresh air to breathe', say netizens after AQI hits 188. Business Today. Retrieved January 12, 2023 from https://www.businesstoday.in/latest/trends/story/mumbai-pollution-dont-we-deserve-fresh-air-to-breathe-say-netizens-after-aqi-hits-188-355826-2022-12-09"
[12] "Business Today Desk. 2022. Mumbai pollution: 'Don't we deserve fresh air to breathe', say netizens after AQI hits 188. Business Today. Retrieved January 12, 2023 from https://www.businesstoday.in/latest/trends/story/mumbai-pollution-dont-we-deserve-fresh-air-to-breathe-say-netizens-after-aqi-hits-188-355826-2022-12-09"

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Conclusion

In addition to harming our health and the environment, air pollution causes acid rain, reduces visibility, blocks sunlight, and damages forests, wildlife, and agriculture. Climate change is caused by greenhouse gas pollution, which affects the entire planet. Climate change caused by greenhouse gas pollution threatens ecosystems all over the world by melting ice sheets, warming oceans, and extreme weather conditions. When a species or a few species decline as a result of air pollution, the entire ecosystem can be upset.

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