

## Smog in Lahore, Pakistan

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**How to cite:** Azeem I, Razzaq A, Smog in Lahore, Pakistan. JAIMC 2024;22(3): 74-75

Pakistan is currently facing a dire smog crisis, particularly evident in Lahore. Lahore is the second-largest city of this third world country, which has now become synonymous with hazardous air quality. For the last two months in Lahore there has been an increase in cases with respiratory illness and ischemic heart disease. Hospitals are overburdened and there has been suffocating environment for residents; Punjab government has declared health emergency. Lahore's air quality has reached critical lows for last few years, which has disturbed the social and political fabric of the country. A report from the Energy Policy Institute at the University of Chicago reveals that air pollution has decreased the average life expectancy in Pakistan by 3.8 years, with a dramatic reduction of up to 7 years in the most polluted areas.<sup>1</sup>

In early 1900s, H. A. Des Voeux first used the term 'smog' to describe the atmospheric conditions prevalent in many towns across Britain. Smog refers to a mixture of smoke and fog produced by air pollution, which reduces the air visibility.<sup>2</sup> Smog is a complex mixture of various pollutants such as volatile organic compounds, nitrogen oxides (NO<sub>2</sub> & NO), sulfur dioxide (SO<sub>2</sub>), ozone (O<sub>3</sub>) and particulate matter. Primary sources of smog include industrial coal burning, vehicle emissions, crop burning, construction activities, fireworks, and smoke from brick kilns.<sup>3</sup> Smog can be of two types: industrial (classic) smog and photochemical smog. Industrial smog forms in cool, foggy weather, commonly seen in places like London. It is caused by a high concentration of sulfur oxides in the air,

primarily from burning sulfur-rich fossil fuels, especially coal. On the other hand, photochemical smog develops in hot, dry climates like those of Los Angeles and Mexico City. This type of smog originates from nitrogen oxides and hydrocarbon vapors emitted by vehicles and other sources, which then undergo photochemical reactions in the lower atmosphere to form ozone.<sup>4</sup>

The Air Quality Index (AQI) is a numerical system used to assess the level of air pollution in a specific area. In 2022, Lahore was ranked as the most polluted city globally by IQAir, an air quality technology company, when its AQI reached 173. As of January 31, 2024, Lahore's AQI stands at 207, with PM2.5 as the primary pollutant, placing the air quality in the "Very Unhealthy" category. Health implications of smog are profound. The fine Particulate matter PM2.5 and other toxins in the air penetrate deep into the respiratory system, leading to a surge in respiratory problems such as asthma and chronic obstructive pulmonary disease (COPD). Cardiovascular problems and even premature deaths have been linked to prolonged exposure. According to the World Bank's estimates, air pollution in Pakistan accounts for approximately 22,000 premature adult deaths annually and results in the loss of almost 163,000 disability-adjusted life years (DALYs).<sup>5</sup> Research on the long-term impact of the Great London Smog of 1952 revealed that smog exposure within the first year of life raised the risk of developing childhood asthma by 19.87%.<sup>6</sup> Beyond its impact on human health, smog wreaks havoc on the environment. Reduced sunlight hampers agricultural productivity, while acidic components in the air corrode buildings and infrastructure.

Given the harmful effects of smog, it is crucial to implement effective measures to enhance air quality. Pakistan needs a multifaceted approach to combat this public health crisis. The government must intensify its efforts by enforcing stricter regulations

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Submission Date: 18-07-2024  
1st Revision Date: 23-08-2024  
Acceptance Date: 12-09-2024

on industrial emissions, vehicular pollution and crop burning, which are the primary contributors to deteriorating air quality. Moreover, public awareness campaigns play a vital role in educating individuals about the causes and dangers of smog, and to promote sustainable practices like carpooling and waste management.<sup>7</sup> Implementing a robust monitoring system using advanced technology, such as drones and real-time air quality sensors, can help identify and penalize violators effectively. Community involvement is also the key, with local clean-up drives and initiatives to empower citizens to take action. By fostering collaboration among government agencies, environmental organizations, and the community, we can develop innovative solutions that not only mitigate smog but also enhance overall air quality. Beijing, once infamous for its severe smog, has seen significant improvements in air quality over the past decade. Through initiatives like shutting down coal-fired power plants, promoting electric vehicles, and enforcing stricter emission standards for industries, the city reduced its PM<sub>2.5</sub> levels by nearly 50% between 2013 and 2020. Public transportation improvements and tree-planting campaigns also contributed to these successes. Together, these steps can lead to a cleaner, healthier future for Pakistan, where smog no longer compromises the air we breathe.

### Author's Contribution

All the authors were involved in designing, drafting and reviewing the manuscript.

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