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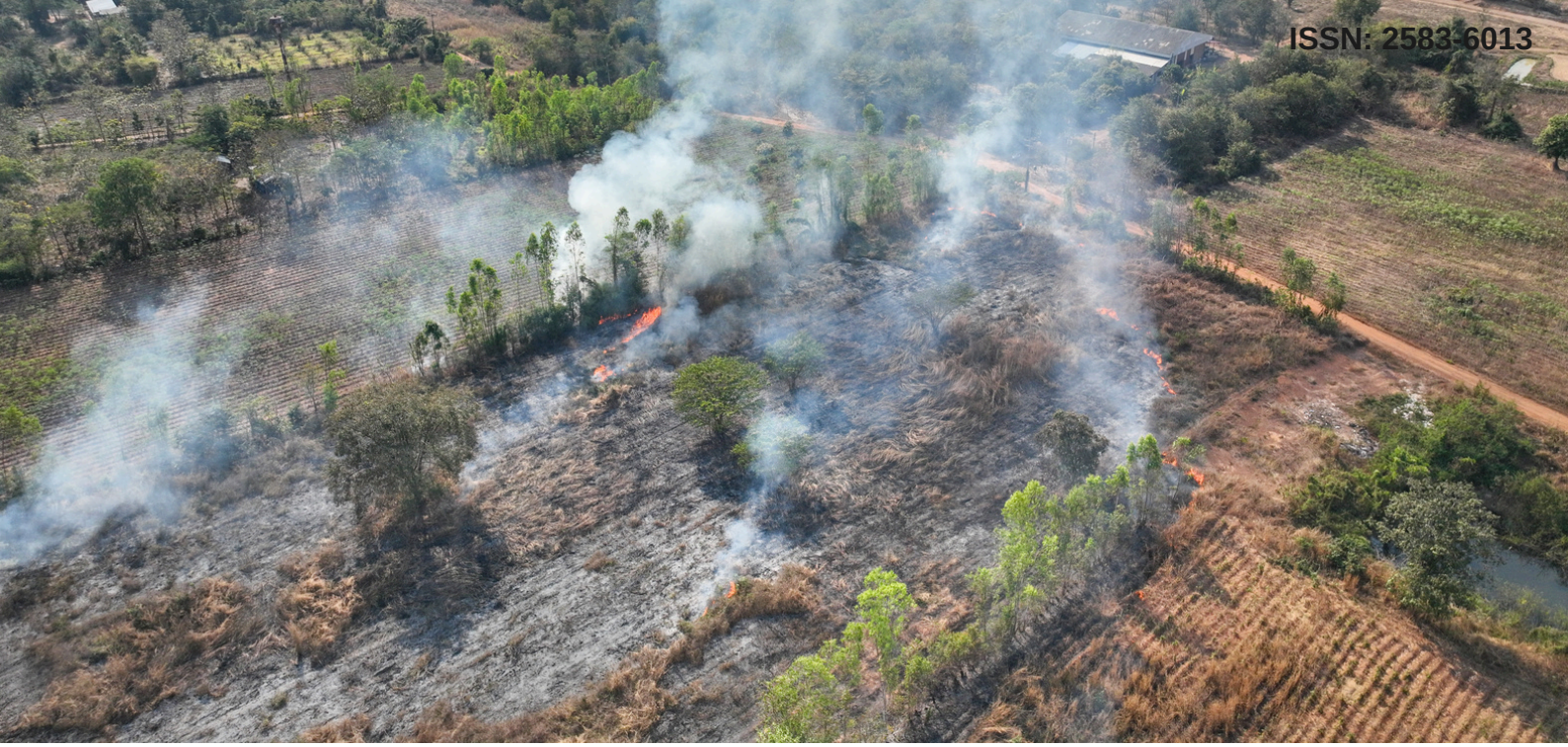

# BLACK CARBON: THE INVISIBLE THREAT TO CLIMATE AND HEALTH

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We are all familiar about carbon dioxide, but few have heard about Black carbon. It is an aerosol and the second most common air pollutant after $CO_2$, which emerges from the burning of fossil fuels, wood, and organic matter. It is also one of the most significant contributors to global warming as it traps heat from the sun, which leads to a rise in atmospheric temperature. Unlike carbon dioxide, which remains for several years in the atmosphere, whereas black carbon has a very short atmospheric lifetime, 4 to 12 days, causing a significant effect on the environment.

It reduces the visibility and causes the health hazard due to its size, which is less than 2.5 micrometers. It is the most intense in tropical regions with high solar radiation. There is seasonal and temporal variation in the black carbon level. The concentration of black carbon in the atmosphere is affected by meteorological factors like wind, humidity, mixing height and temperature. Moreover, the black carbon level is strongly influenced by lower mixing height and calm winds.

It travels long distances and ultra-fine forms atmospheric brown clouds extending up to 3-5km of altitude. Atmospheric brown clouds block solar radiation, which reduces surface sunlight and affects the precipitation patterns, imbalances in cloud formation. Black carbon, when it deposits on snow and ice which darkens the surface and increases the rate of melting of snow, especially in the Himalayas and the Arctic region, leading to the albedo effect.

Black carbon has ultrafine particles, so it easily penetrates deep into the lungs, causing chronic bronchitis, asthma attacks, and other respiratory diseases. When these particles enter into bloodstream, it leads to atherosclerosis (hardening of arteries), increase blood pressure, and can cause heart attacks and strokes.

India is one of the significant contributors to black carbon emissions into the environment. The Indo-Gangetic plain has a major source of black carbon due to biofuels, fossil fuels, and biomass burning. In Delhi, Black carbon is the major seasonal contributor to air pollution, with peaks in colder months when atmospheric dispersion is poor, lower during the monsoon, and consistent in other months. It palys a key

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role in smog events, has significant health implications, and its variability is strongly tied to local meteorological conditions.

Promoting clean cooking techniques like L.P.G (Liquid Petroleum Gas), biogas, electric stoves and solar stoves, enforcement of strict rules on vehicle emission standards, promotion of electric vehicles, use of residue crops to form compost and bioenergy instead of open burning, improvement in forest fire management strategies, etc. These mitigation strategies can help in lowering down the black carbon concentration in the atmosphere.

Black carbon poses a threat to both the environment and human health. As a short-lived climate pollutant, it affects human health and may cause millions of premature deaths due to global warming. Cutting down the black carbon emission can save human loss and the environment. Strong legislative frameworks, investment in environment-friendly technologies and determined global efforts are needed to achieve a black carbon-free earth. Therefore, the addressing of black carbon is both a humanitarian and environmental concern. By acting now, we can achieve cleaner air, healthier populations, and a more stable climate.