

Mechanism and Impact of smog (classical smog & Photochemical Smog) on Public Health

Abstract

Smog is a pervasive form of outdoor air pollution that poses severe threats to human respiratory health and global ecosystems. This paper examines the two primary classifications of smog. Smog has evolved from a simple industrial byproduct into a complex chemical soup driven by solar radiation and fossil fuel combustion. This paper synthesizes the current understanding of smog - distinguishing between classical smog & Photochemical smog, examining the physiological damage inflicted on human respiratory system and analysing contemporary policy and technical technological solution.

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Received on: 07.05.2026

Revised on: 21.05.2026

Accepted on: 31.05.2026

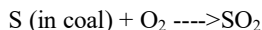
Keywords: Impact, Smog, Public Health.

Introduction:

Poisonous gases like SO₂ and NO₂ Produced by Burning of Fossil fuels in Homes, Industries and automobiles mix with tiny droplets of Fog suspended in air near the surface earth smog is formed. i.e. the droplets of fog which contain Poisonous gas SO₂ & NO₂ get Condensed on the Solid Particles of smoke a Colloidal dispersion is formed i.e Classical smog. Gases which released by automobiles contain oxides of Nitrogen and Unburnt hydrocarbon, CO and CO₂ these released gases absorbed to U.V. radiation undergoes Photolysis produce atomic oxygen. This atomic oxygen reacts with hydrocarbon and give a variety of free hydrocarbon radicals (i.e. RHO, RHO₂ and RHO₃) O₃, Aldehydes and PAN (Per Oxy Acetyl nitrate) All these are substances of Photochemical Smog

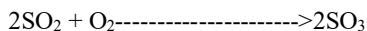
How Classical Smog Forms:

1st step: Released SO₂ Combined with O₂ on Combustion



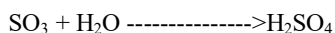
IInd Step: In humid air a Floating soot particles trap the gas. The SO₂ reacts with O₂ and oxidized into SO₃.

Catalyzed by



Soot Particles

IIIrd Step: This SO₃ reacts with moisture (fog droplets) in humid air and produce tiny air borne droplets of sulphuric acid.



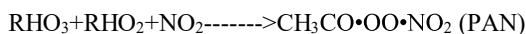
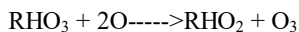
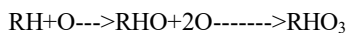
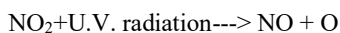
IVth Step: This microscopic sulphuric acid droplets condense around the floating soot particles. Thus it creates

a chemical reducing atmosphere of yellowish-brown or gray colour.

How to Photo Chemical smog forms

The oxides of Nitrogen absorb to U.V. radiation and produce atomic oxygen. Atomic 'O' reacts with Hydrocarbon and produce a quantity of free hydrocarbon radicals.

The mixture of all these substances are called Photo chemical pollutants.



Harmful Effect on Human Health:

The classical smog produced respiratory problems in human beings

- Many Persons suffered from Bronchitis, Asthma and heart Problems.
- Classical smog creates irritation to eyes, nose and throat.
- Classical smog has an adverse effect on growth and development.
- Classical smog reduces visibility Cause accident. road Accident.

Harmful effect of Photochemical Smog:

- Ground level ozone damages lungs tissue . It causes chest Pain Coughing, shortness of Breath Finally Produce chronic Condition like — Asthma, Bronchitis Photochemical smog
- Component like PAN and Acrolein are tear—producing substance. They Cause redness and itching in the eyes. Alongside irritation in nose and throat.
- Prolonged exposure reduces the lungs ability to fight off bacteria and viral infection.
- The strain of reduced lungs function forces the heart to hard work, Increase the risk of the cardiovascular system.

Mitigation Frameworks and Conclusion

Effectively addressing urban smog requires a twin-track approach targeting both fuel chemistry and urban infrastructure.

1-Vehicle Fleet Electrification: Because light duty vehicles generate up to 50% of urban NO_x and volatile organic compounds, shifting consumer transit to battery electric vehicles severs the primary chemical pipeline fueling.

2-Catalytic Converter Evolution: For internal combustion vehicles, modern selective catalytic reduction systems utilize ammonia or urea injection to convert hazardous NO_x back into harmless N₂ gas.

3-Strict Ambient Air Quality standards: Implementing cap and trade programs for industrial emission alongside automated.

Ultimately, smog is not an inevitable byproduct of modernization, but environmental market failure. Mitigating it demands rigorous scientific monitoring paired with policy mandates that transition energy grids away from combustion altogether.

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