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Air Pollution and its Legal Control in India: An Overview

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ABSTRACT

Environmental pollution has become a grave and much discussed problem today. This is particularly so with regard to air. Air pollution is not one of recent origin. The references in classical and early records to the ill effects of 'noxious air' clearly indicate that the problem of air pollution is a historical one. Air pollution means many things to people. To the motorist and the pilot it means reduction of visibility. To the public health worker it is a source of chronic and acute effects on health of people which lead to increased death rates. To the ecologist it means environmental degradation. Air pollution in urban areas arises from multiple sources, which may vary with location and developmental activities. Anthropogenic activities as rampant industrialization, exploitation and over consumption of natural resources, ever growing population size are major contributors of air pollution. The purpose of this paper is to examine various aspects of air pollution in India and control legislation, along with some landmark judgments regarding air pollution.

I. INTRODUCTION

Air pollution is one of the most serious environmental problems confronting modern society. Mining, building, transportation, industrial operations, agriculture, smelting, and other human-caused activities are commonly blamed. Natural processes such as volcanic eruptions and wildfires can contaminate the air, but they are rare and have a limited influence, compared to human activities, which are ubiquitous sources of air pollution and contribute to global air pollution on a daily basis. The continuing deterioration of ambient air quality in India's cities necessitates efficient air pollution control methods. Though the Government of India has proposed many policy initiatives to minimise vehicle and industrial emissions, but because of Lack of infrastructure, insufficient financial resources to implement advanced infrastructure innovations, people's dispositions in accepting green solutions are some of the major roadblocks to environmental protection that our country appears to be struggling to overcome today.

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II. DEFINITION OF AIR POLLUTION

The presence of hazardous chemicals or compounds in the air (including those of biological origin) at levels that are damaging to human health is referred to as air pollution. Air pollution, in a larger sense, refers to the presence of chemicals or compounds in the air that are not ordinarily present and impair the air quality or have a detrimental influence on human health (such as the damaging of the ozone layer or causing global warming).

Any chemical, physical, or biological component that contaminates the interior or outdoor environment and affects the atmosphere's natural qualities is referred to as air pollution. Household combustion devices, motor vehicles, industrial operations, and forest fires are all prominent sources of air pollution.[3]

III. CAUSES OF AIR POLLUTION

1. The Burning of Fossil Fuels

The burning of fossil fuels such as coal, oil, and gasoline to generate energy for power or transportation is responsible for the majority of air pollution. Carbon monoxide emissions at high levels reflect how much fossil fuel is burnt. Other harmful contaminants are also released into the atmosphere as a result of this. Inhaling polluted air caused by the combustion of natural gas and fossil fuels impairs the heart's capacity to pump adequate oxygen, resulting in respiratory disease.[4]

According to the report, air pollution from fossil fuels is responsible for 30.7 percent of fatalities in India, or slightly under 2.5 million people, and 3.9 million in China.

Coal is responsible for a significant portion of these emissions. To keep up with its rising economy, the country has nearly quadrupled its coal use in the previous decade, with the cheap fossil fuel providing around 70% of its power. Rather than curtailing its usage, the government has announced plans to develop coal-fired power stations and mines.[5]

India's Environment Minister Bhupender Yadav insisted that developing economies are "entitled to the responsible use of fossil fuels" while speaking at the COP26 climate summit in Glasgow, Scotland, where delegates struggled to agree on a deal described by UK Prime Minister Boris Johnson as "the beginning of the end for coal power." Critics

[3] . Particulate matter, carbon monoxide, ozone, nitrogen dioxide, and sulphur dioxide are all dangerous to people's health. Outside and inside, air pollution is a major cause of respiratory and other illnesses, as well as a substantial source of morbidity and mortality Information available at https://www.who.int/health-topics/air-pollution
[4]https://indianexpress.com/article/india/deaths-from-fossil-fuel-emissions-higher-than-previously-thought-71812 31/
[5] Ibid

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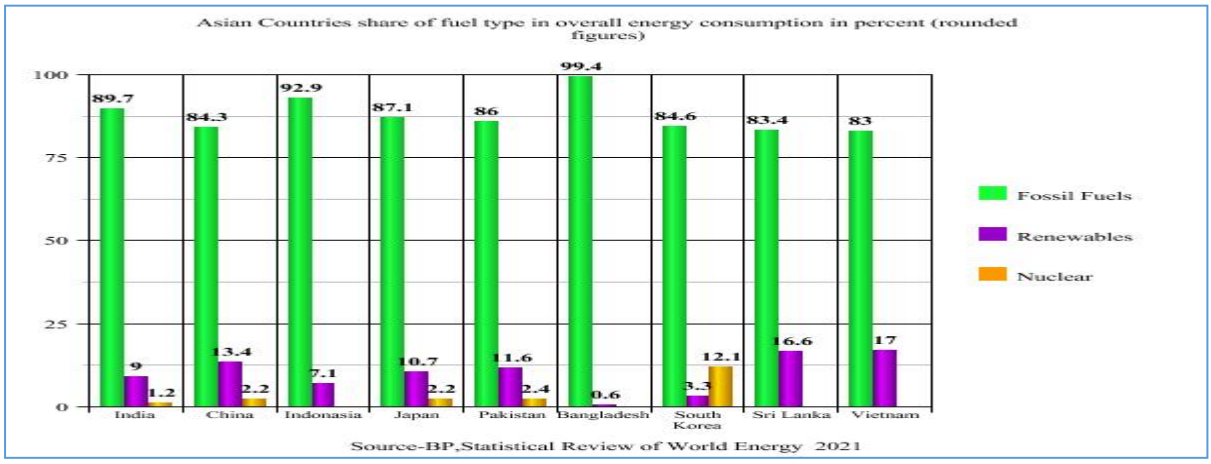
say big polluters like India and China intervened at the last minute to dilute anti-coal promises and "phase down" rather than "phase out" coal, putting the world's climate ambitions at risk.[6]

However, Environment Minister Yadav claimed that developing nations, with their greater average incomes and rates of economic development, should not be lumped in with the world's largest per-capita polluters.[7]

"How can anybody expect poor nations to make pledges of phasing out coal and fossil fuel subsidies in such a situation?" he asked. India has pledged to become carbon-neutral by 2070, ten years after China and decades after other big polluters such as the United States and the European Union.[8]



Air pollution has been related to miscarriages, anaemia, and even shorter lifespans in previous research, with India reporting the highest number of baby fatalities due to air pollution in 2019. As a result, air pollution has been related to greater Covid19 fatality rates during the worldwide epidemic. However, whereas prior research looked at air pollution produced by a variety of variables, the current study focuses solely on pollution generated by fossil fuels, and the results are still serious.[9]

2. Industrial Emission

Industrial operations release a variety of pollutants into the atmosphere, affecting air quality in ways we can't even conceive. Particulate matter 2.5 and 10, nitrogen dioxide, sulphur dioxide, and carbon monoxide are some of the major pollutants released by

[6] Ibid
[7] Ibid
[8] https://www.dw.com/en/india-air-pollution-coal-lockdown-climate/a-59837396
[9] https://theswaddle.com/air-pollution-from-fossil-fuels-responsible-for-30-of-indias-annual-deaths-harvard-study- finds/

enterprises that use coal and wood as their principal energy sources. The health impacts of industrial pollution can vary from irritation in your eyes and throat to breathing problems, and can even lead to chronic sickness.

Top three industries responsible for air pollution

a) Waste from industrial chimneys

There are a variety of industries that contribute to air pollution. Petroleum refineries, for example, generate gases such as sulphur dioxide (SO2) and nitrogen oxide (NOx) (NOx). Cement manufacturers can generate waste that is hazardous to human health. Additional pollution sources are stone crushers and hot blend facilities. Furthermore, hazardous waste and corrosive fumes from the food and fertiliser sectors are potentially damaging to the environment.

b) Thermoelectric power plants

In India, there are several power plants including superwarm power plants. One of these is the National Thermal Power Corporation (NTPC), which has built four massive coal-fired power plants in the states of Uttar Pradesh, M.P., Andhra Pradesh, and West Bengal. The primary pollutants, however, are fly powder, SO2, and other gases and hydrocarbons.

c) Automobiles

Along with thermal power plants, vehicular exhaust emissions are a major cause of air pollution. As a result, the automobile industry's continual development raises the danger of air pollution, lowering air quality.

Unburned hydrocarbons, carbon dioxide (CO), nitrogen oxide (NOx), and lead oxides are also produced by the fumes. There are also signs of artificially generated aldehydes, esters, ethers, peroxides, and ketones, which combine to form an exhaust cloud in the presence of light. Similarly, due to the unstable nature of gasoline, evaporation from the fuel tank leads in hydrocarbon output. When the motor is turned off and warm air is released, evaporation occurs through the carburetor. During this procedure, up to 12 to 40 ml of gasoline is wasted each extended quit, resulting in hydrocarbon discharge. (n.d., The & Metals).[10]

[10] https://www.projectguru.in/air-pollution-india/

AIR POLLUTANTS	INDUSTRIAL SECTORS
Particulate, dust, SPM, RPSM	Abrasion, stone mining, fuel combustion in automobiles, civil construction, mining power station
Oxides of sulphur	Powerhouse, smelters, coal and fossil fuel combustion, sulphuric acid plants, refining process, petroleum and natural gas industries
Oxides of nitrogen	Refining of petroleum, combustion of fuel, natural gas, oil and coal, acid manufacturing
Hydrogen sulphide	Powerhouse, smelters, coal and fossil fuel combustion, sulphuric acid plants, refining process, petroleum and natural gas industries
Hydrocarbon	Motor vehicles, refuse burning, combustion of coal, natural occurrence
Hydrogen fluoride	Glass and ceramics, cement factories, steel and aluminum industries, phosphate fertilizer plants, brick plants
Carbon monoxide	Metabolic activity, fuel combustion, auto mobile exhaust
Ozone	Photochemical reactions, storm centers
Lead	Automobile exhaust
Mercury	Pesticides, paints, laboratories
Organic solvents	Paints, pesticides, cooking, cosmetics
Chlorine	Petroleum refineries, glass industry, plastic incineration, scarp burning,

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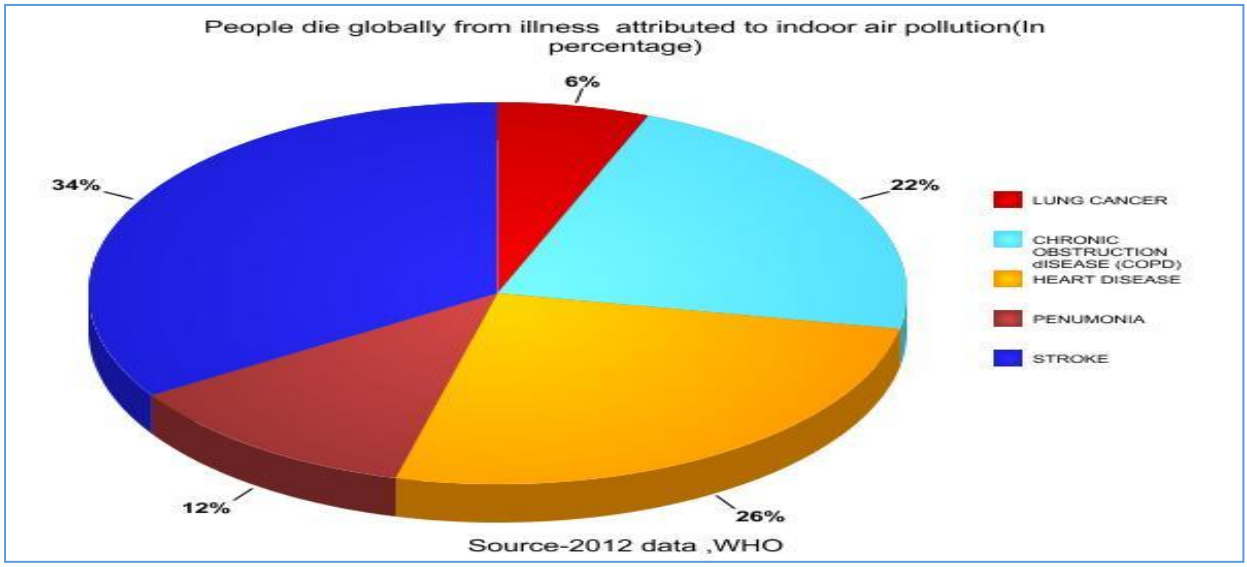
	accidental spills
Ammonia	Spillage of anhydrous ammonia, leaks and breakdown in industries operation, feedlots and stock yards

3. Indoor Air Pollution

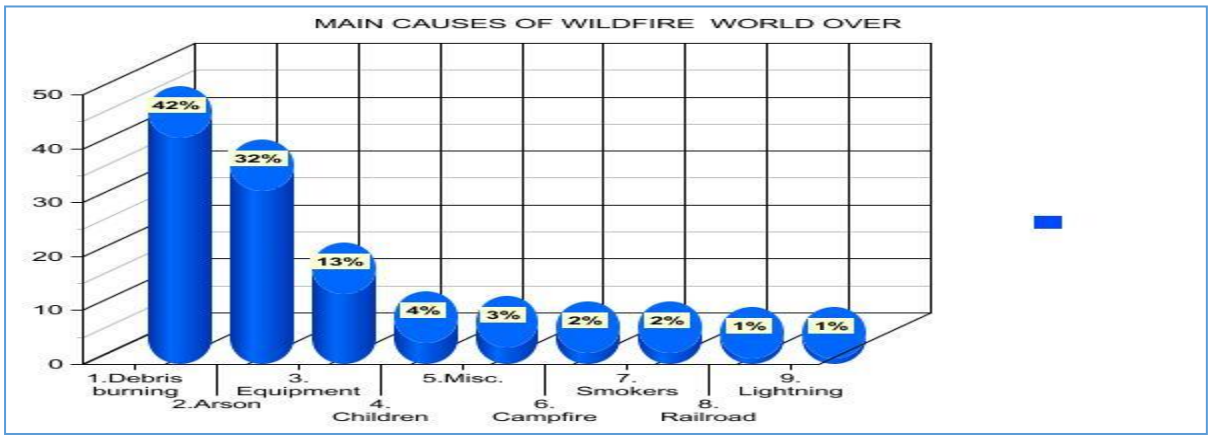
Indoor air pollution is the degradation of indoor air quality caused by toxic chemicals and other pollutants, and it may be up to ten times more dangerous than outside air pollution. This is because enclosed locations allow possible contaminants to accumulate more quickly than open ones. According to statistics, the health effects of interior air pollution substantially surpass those of outdoor air pollution in developing nations. In most cases, poor indoor air quality just causes discomfort. When the source of pollution is removed, most individuals feel much better. Some contaminants, on the other hand, might induce ailments that manifest years later, such as lung disorders or cancer. Ensure that your structure is adequately ventilated.[11]



4.. Wildfires

Climate change is causing not just an increase in wildfires, but also an increase in air pollution. Wildfire is also fueled by the burning of stubble and farm leftovers. Increased PM2.5 levels in the air combine with other dangerous chemicals such as chemical gas and pollen, resulting in smog. Smog makes the air cloudy, making it difficult for people to breathe.

[11] https://eduindex.org/2020/06/12/be-aware-towards-indoor-pollutants/. The use of a wood fire or space heater can raise humidity levels, which can have a direct impact on a person's health in a short period of time.



Wildfires have also raged throughout India in recent years, causing considerable damage. It took five days and the mobilisation of massive resources, including Indian Air Force choppers, to put out the fire at the Bandipur Tiger Reserve in Karnataka in February 2018. The catastrophe resulted in the loss of around 4,800 hectares of forest. A group of trekkers was caught in a tragic wildfire in Theni, Tamil Nadu, the following month. The state then banned trekking in forests from February 15 to April 15, which is considered fire season. .People who live near forests frequently set fires on purpose to encourage grass growth for animal grazing or crop rotation. [12]

Forest fires have a direct impact on the environment and economy, since a chemical imbalance is formed in the atmosphere. "Emissions of greenhouse gases have increased as a result of forest fires," according to the report.[13]

From 2003 to 2017, a team of researchers from ISRO's National Remote Sensing Centre (NRSC) in Hyderabad studied an area of 51,23,270 sq km in Afghanistan, Pakistan, India, Nepal, Sri Lanka, Bhutan, and Bangladesh. In February, the findings were published in Springer Nature.

[12] In India, approximately 30,000 forest fires were reported in 2019, according to the India State of Forest Report 2019..According to a Forest Survey of India (FSI) assessment on fire-prone forest areas, more than 36% of Indian forest cover (657,000 sq km) is prone to regular forest fires, with 10% of it being very prone. According to the latest forest survey, almost 21% of the total forest cover is highly to extremely fire prone..Dry deciduous woods, such as those in tropical and subtropical latitudes, are more prone to fire than others because they receive low rainfall, have 5-6 dry months, and have nutrient-poor soil. Odisha, Chhattisgarh, Madhya Pradesh, and the southern states are among the affected areas. In hilly states, chir pine woods are similarly vulnerable.According to the FSI technical assessment, human activities are the primary cause of fires in India, with anthropogenic causes accounting for almost 95 percent of fire incidences. https://thewire.in/environment/most-forest-fires-in-india-are-due-to-human-activity.

[13] According to the latest Forest Survey of India (FSI) study, 36 percent of India's forests are at risk of fire, with 95 percent of these fires being caused by human activity. The study discovered that Central India had the most forest fires in terms of acreage, while fires were more often in Northeast India owing to changing farming. Electric sparks, cigarette smoking, or bare flame, in addition to natural fire, are some of the frequent sources of fire in Indian woods, according to the FSI study from 2019.

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Mizoram, Manipur, Assam, and Meghalaya placed first and second, respectively, among Indian states with the most forest fire incidences documented during the research period. However, the number of new hotspots was said to be increasing throughout Madhya Pradesh and Chattisgarh.The majority of forest fires in India are attributed to human activities, according to forest officials.The researchers documented a total of 5,22,348 fire occurrences of various intensities and kinds throughout a 15-year period. The majority of fires broke

out in the other nations in the research during March and April, owing to the region's hot and dry weather conditions, as well as the land's geography, according to the experts.

Only 14.7 percent of South Asia's entire surface is covered in forest, with agriculture accounting for 43 percent. The remaining 19.9% is a desolate wasteland.[14]

5. Microbial Decaying Process

Carbon monoxide, hydrocarbons, chemicals, and organic compounds are all released by the manufacturing, chemical, and textile sectors, contaminating our environment. Bacteria and fungus play an important part in nature's biogeochemical cycles. They're the first signs of a problem with the environment. The decay of these microbes in the environment produces methane gas, which is extremely harmful. Inhaling harmful gases such as methane can be fatal.[15]

6. Transportation

Vehicle pollution is undeniably the most significant source of air pollution, particularly in metropolitan areas. When an automobile consumes gasoline, contaminants are released into the air that are as dangerous as smoking ten cigarettes per day. Carbon monoxide, hydrocarbons, nitrogen oxide, and particulate matter are all released by your vehicle. When car pollution levels are high in the atmosphere, it causes a hole in the ozone layer, resulting in smog and a variety of health problems.

[14]https://indianexpress.com/article/india/india-saw-largest-area-wise-forest-fires-in-south-asia-from-2003-17-finds-isro-study-6305733/.

[15] Information available at https://www.aqi.in/blog/here-are-the-10-main-causes-of-air-pollution/#:~:text =Microbial% 20Decaying %20Process&text =They%20are%20the%20key% 20indicators, methane% 20may%20lead%20to%20death.

The widespread usage of chemical chemicals has now become a worldwide concern. Only its indented use is required of the perfect chemical substance. When it is no longer desirable, the environment is contaminated. The negative consequences of a chemical compound used in the pollution process. For nore information please visit: https://www.omicsonline.org/microbial-diversity-and-degradation-of-pollutants-2155-6199.1000e128. php?aid =9953

Transportation contributes roughly 11% of India's carbon emissions and is a major cause of pollution in a number of cities across the country. According to the WHO, India has 14 of the top 20 most polluted cities in the world. In fact, the severity of the problem has led the Indian government to move immediately from the present Bharat Stage IV (BS IV) emission requirements to the substantially cleaner Bharat Stage VI (BS VI) emission standards.[16]

7. Open Burning of Garbage Waste

Garbage burning in the open is far more hazardous to your health and the environment than you would believe. Delhi Air Pollution, according to Engage EPW, is suffocating public health. Delhi produces 9500 tonnes of rubbish each day, making it India's second-largest waste disposal city. Exposure to open rubbish burning poses a major health risk, including cancer, liver problems, immune system damage, and reproductive dysfunction; it can even harm the developing neurological system.[17]

8. Construction and Demolition

The Central Pollution Control Board (CPCB) recorded the greatest number of air pollution complaints in the Delhi NCR owing to construction pollution and demolition activities during the clean air act campaign. Construction and destruction are part of the national capital's ongoing growth phase, as the city's population grows. Several building sites and raw materials such as bricks and concrete produce haze and filthy air, endangering people, particularly youngsters and the elderly.[18]

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[16] With approximately 25 million autos added to the roads each year, India is the world's fifth-largest automotive market. As the number of petrol and diesel automobiles grows, so does air pollution .https://www .financialexpress .com/auto/car-news/vehicle-sharing-the-solution-to-hazardous-air-pollution-in-india/1494231/

[17] Open garbage burning discharges a number of hazardous chemicals into the air, as well as aggravating soil pollution, water pollution, and food poisoning. Open garbage burning emits a large amount of greenhouse gases into the environment. Carbon dioxide, methane, and particulate matter are examples of such substances, which are commonly connected with air pollution and can cause serious respiratory sickness. Open burning of \swaste is especially associated with the emission of persistent organic pollutants. Polycyclic aromatic hydrocarbons, dioxins, and furans, for example, are all carcinogenic and have been related to a number of disorders. https://regions20.org/wp-content/uploads/2016/08/OPEN-BURNING-OF-WASTE-A-GLOBAL-HEALTH-DISASTER_R20-Research-Paper_Final_29.05.2017.pdf

[18] Land clearing, diesel engine operation, demolition, burning, and working with hazardous chemicals are all examples of construction operations that contribute to air pollution. Construction and demolition operations lead to windblown dust concerns, also known as fugitive dust, that can linger in the air for days or even weeks. Diesel engine exhaust from diesel generators, cars, and heavy equipment is a major source of PM 2.5 on construction sites. Oils, glues, thinners, paints, treated timbers, plastics, cleansers, and other hazardous chemicals often used on construction sites add to air pollution as well. https://www.airveda.com/blog/Pollution-due-to-construction-Is-it-solvable

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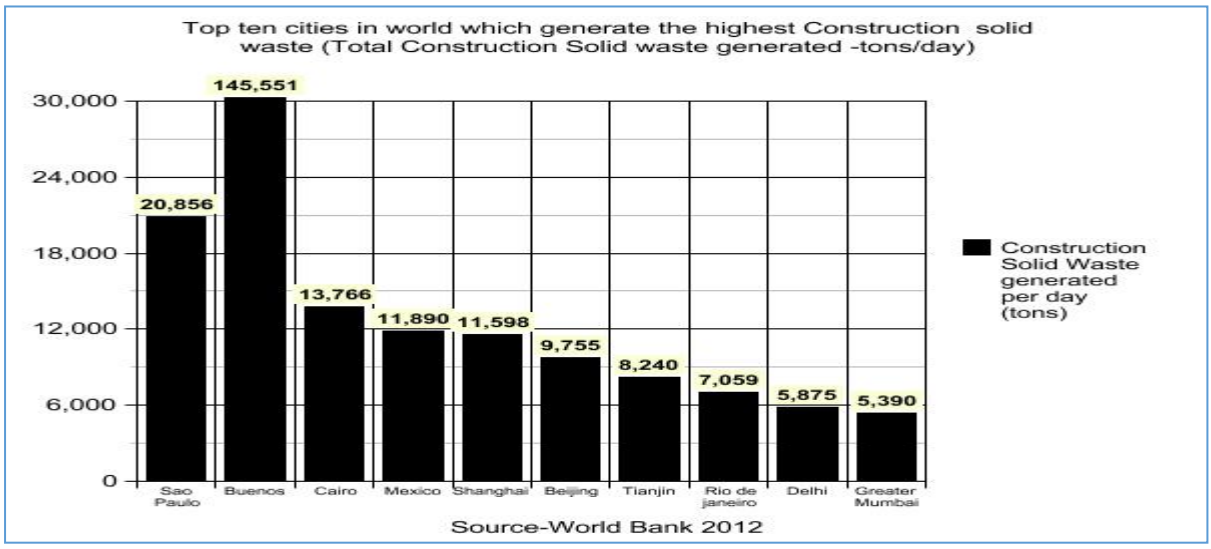
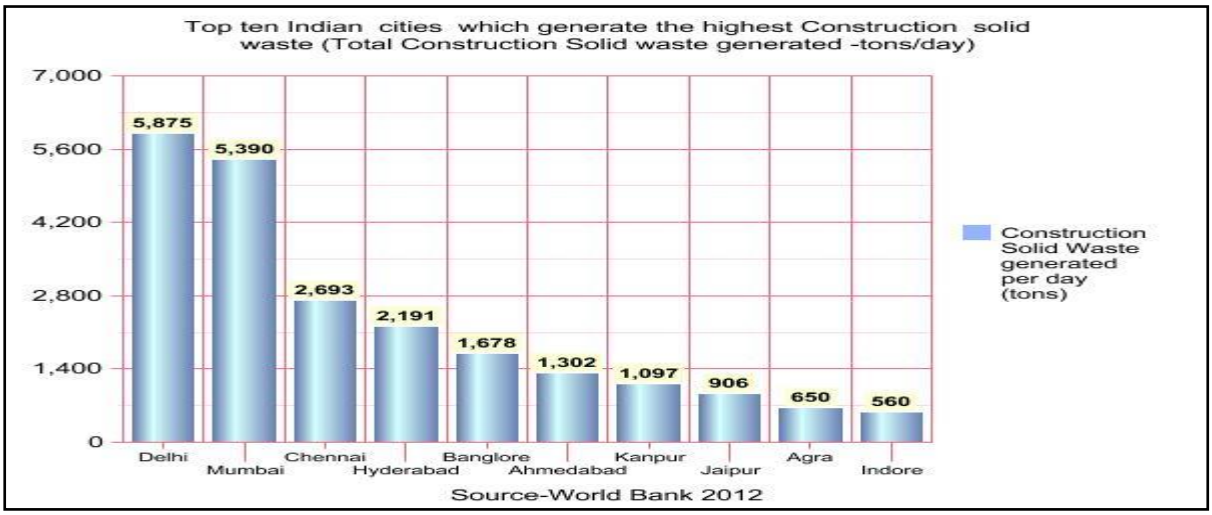


According to a 2012 World Bank research, Delhi produces 5,875 tones of municipal solid trash per day, while Mumbai produces 5,390 tones. In terms of building waste, the two metros are among the top ten cities in the globe. Other metros, including as Chennai, Hyderabad, and Bangalore, also create large volumes of building trash, according to the research.[19].



According to a research conducted by the Centre for Science and Environment, 70 percent of India's building stock has yet to be completed. This means that by 2030, the built-up area will have increased from 21 billion square feet in 2005 to 104 billion square feet. According to the Technology Information, Forecasting, and Assessment Council, new

[19] The construction industry is developing at a rate of 5.5 percent per year throughout the world, while it is growing at a rate of 10% per year in India. India's building industry accounts for 10% of the country's overall gross domestic output

development has contributed 5.75 billion square metres of floor area since 2005, with about a billion square metres added in 2013.[20]

9. Agricultural Activities

Agriculture has had a significant influence on the deterioration of air quality. To begin with, pesticides and fertilisers are the primary sources of air pollution. Pesticides and fertilisers are now being blended with new invasive species that are not present in nature in order to speed up the growth of crops and plants. The pesticides' odour and impact are remained in the air after they've been applied. Some combine with water, while others seep into the earth, destroying crops while also causing a slew of health problems.[21]

10. Use of chemical and synthetic products

When it comes to air pollution, we always consider outside air pollution to be hazardous to our health, but we seldom discuss inside air pollution. Indoor air pollution is ten times more dangerous than outside air pollution due to household goods. Paints, cleansers, and personal care items like perfume and deodorants contain volatile organic compounds (VOCs), which are linked to a variety of health problems. Other concerns caused by breathing poor indoor air quality include asthma and other respiratory disorders, as well as lung illness.[22]

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[20] The Ministry of Environment and Forests established a construction waste working group to develop a solid waste management road map. The committee stated in 2010 that data on the amount of construction debris generated in the country, the separation of construction waste at the source, the development of institutional mechanisms for waste collection, the imposition of charges on construction waste generators, and the formulation of waste standards were all critical. The Municipal Solid Waste Management Rules of 2000 should also be changed, and recyclable building materials should be included and certified for usage, according to the report. However, building debris management and the committee's suggestions are not mentioned in the current draught of the Municipal Solid Waste Management Rules, 2013. https://scroll.in/article/681432/construction-debris-is-choking-india-and-blocking-our-rivers.

[21] Agriculture takes up the majority of land usage by humans. In 1999, pasture and crops accounted for 37% of the total land area on the planet. Agriculture consumes more than two-thirds of all human water. In Asia, four-fifths of the market is accounted for. According to a recent study published in the journal Nature Sustainability, dangerously high levels of air pollution in New Delhi throughout the fall and winter months are mostly the result of post-harvest agricultural waste burning. Crop burning pollutes the air to such an extent that it rivals fossil fuel emissions during the summer months. https://e360.yale.edu/digest/burning-crops-are-a-top-source-of-air-pollution-in-india-study-finds.

[22] Despite the fact that vehicular pollution is a major source of air pollution in cities around the world, a recent study shows that the source of ambient air pollution in urban spaces has shifted to other VCPs, or everyday products, such as pesticides, coatings, printing inks, adhesives, cleaning agents, and personal care products. Organic solvents, often known as Volatile Organic Compounds (VOCs), are key pollution causes (VOCs).Pollution from chemical items used indoors is usually more damaging than pollution from outside sources, according to a study conducted by the
National Oceanic and Atmospheric Administration (NOAA). https://www.aqi.in/blog/here-are-the-10-main-causes-of-air-pollution/

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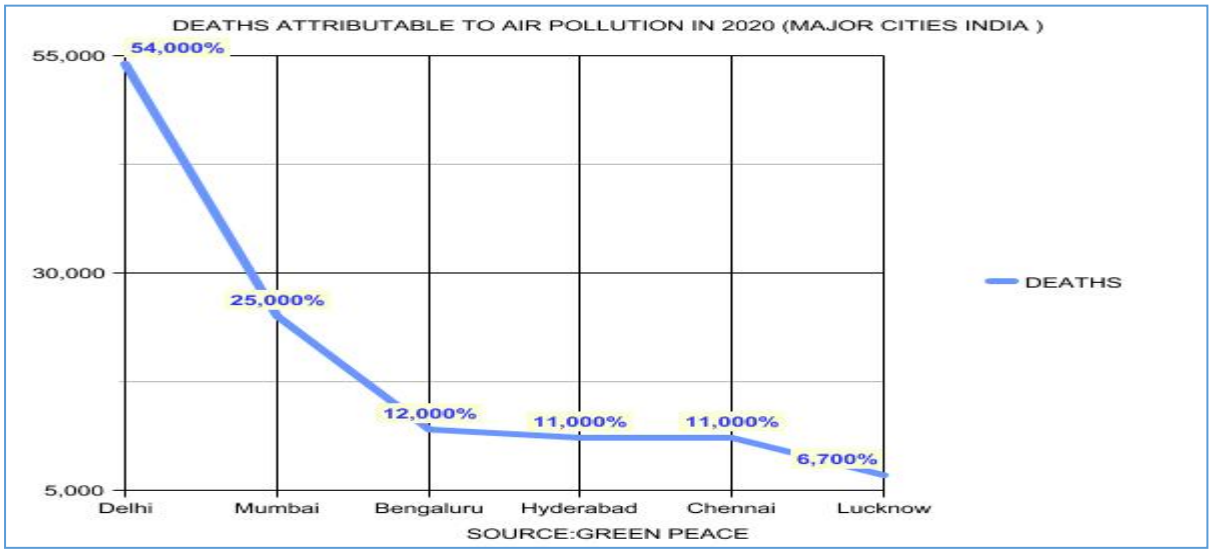
IV. Effect of Air Pollutants

Particulate and gaseous pollutants are the two types of air pollutants. Solid and liquid particles are among the particulate substances. The term "gaseous" refers to compounds that are gaseous at room temperature and pressure. Humans, animals, flora, and buildings are all affected by air pollution. Pollutants in the air also have an impact on the planet's climate. Air pollution has an impact on a person's aesthetic sense. The following are the many air contaminants and their effects:

(A) Heart and Respiratory Issues

The consequences of air pollution are grave. They have been linked to a variety of respiratory and cardiovascular diseases, including asthma, chronic bronchitis, emphysema, heart attacks, and strokes, as well as cancer. Several million people are thought to have died as a result of air pollution, either directly or indirectly.[23]



(B) Child Health Problems

Premature delivery, autism, asthma, and spectrum disorder in early children are all caused by exposure to high amounts of air pollution during pregnancy. It also has the potential to harm a child's early brain development and cause pneumonia, which kills almost a million children under the age of five. In regions where air pollution are present, children are more likely to develop short-term respiratory infections and pulmonary illnesses.[24]

[23] Stroke, heart disease, lung cancer, and chronic respiratory disorders are estimated to be the cause of 4.2 million deaths per year owing to ambient air pollution. Approximately 91 percent of the world's population lives in areas where air quality exceeds WHO standards.

[24] In low- and middle-income countries, air pollution causes more than half of acute lower respiratory infections in children under the age of five. Asthma, childhood malignancies, chronic illnesses, impaired lung function, pneumonia, and other acute lower respiratory infections are all possible outcomes. https://idronline.org/article/

(C) Global Warming

Another direct result of global warming is the current changes that the planet is experiencing.Increased global temperatures, rising sea levels due to melting ice from colder places and icebergs, relocation, and habitat loss have already foreshadowed an oncoming crisis if preservation and normalisation measures are not done quickly. The recent increase in greenhouse gas pollution traps extra heat and causes global warming. Greenhouse gases such as carbon dioxide are examples of air pollution. Greenhouse gases capture heat from the Sun in the Earth's atmosphere, causing the temperature to warm.[25]

(D) Acid Rain

When fossil fuels are burned, harmful chemicals such as nitrogen oxides and sulphur oxides are emitted into the environment. When it rains, the water droplets interact with the contaminants in the air, becoming acidic and falling to the earth as acid rain. Acid rain has the potential to harm humans, animals, and agriculture.[26] Sulfur dioxide and nitrogen oxides are particularly easy to dissolve in water and may be transported a long distance by the wind. As a result, the two compounds are able to travel vast distances and become part of the rain, sleet, snow, and fog that we encounter on some days. These pollutants cause acid rain.[27]

Acid rain is mostly caused by human activities. Humans have released so many different chemicals into the air over the last several decades that the mix of gases in the atmosphere has altered. When power plants burn fossil fuels like coal to generate electricity, they emit the bulk of sulphur dioxide and a significant amount of nitrogen oxides. Furthermore, automobiles, trucks, and buses emit nitrogen oxides and sulphur dioxide into the atmosphere. [28]

(E) Eutrophication

Eutrophication is a phenomenon in which a large quantity of nitrogen found in some pollutants accumulates on the sea surface and transforms into algae, causing harm to fish, plants, and animals.The presence of this chemical is solely responsible for the prevalence of green-colored

health/the-impact-of-air-pollution-on-child-health.

[25] A rise in ozone pollution, or smog, is triggering warming in the Arctic areas, according to a NASA research. The troposphere's ozone is both a greenhouse gas and a health threat. During the winter and spring months, ozone pollution produced in the Northern Hemisphere is transferred to the Arctic, causing warming. The location where ozone pollution originates has the most influence, thus certain places are warming more than others. https://scied.ucar.edu/learning-zone/air-quality/air-quality-and-climate-change.

[26] When sulphur dioxide and nitrogen oxides are discharged into the air, a chemical reaction occurs, resulting in acid rain. These compounds may ascend to great heights in the sky, where they mix and react with water, oxygen, and other molecules to produce additional acidic pollutants, which are known as acid rain. https://www3.epa.gov/acidrain/education/site_students/whatcauses.html#:~:text=Acid%20rain%20is%20caused%20by,pollutants%2C%20known%20as%20acid%20rain.

[27] Ibid

[28] Ibid

algae in lakes and ponds. Sulfur dioxide and nitrogen oxides are particularly easy to dissolve in water and may be transported a long distance by the wind. As a result, the two have formed a compound. Nitrogen N and phosphorus P are the two most frequent nutrients that cause eutrophication. Runoff from agricultural land is the primary source of nitrogen pollution, but the majority of phosphorus pollution originates from homes and industry, notably phosphorus-based detergents. Air, surface water, and groundwater all contribute to the nutrient input in aquatic environments..[29]

(F) Wildlife Impact

Animals, like people, are subjected to the harmful effects of air pollution. Toxic substances in the air can compel animal species to relocate and modify their environment. Toxic contaminants settle on the water's surface, posing a threat to sea life. Acid rain, heavy metals, persistent organic pollutants (POPs), and other harmful compounds are all pollution concerns.Insects, worms, clams, fish, birds, and mammals all have diverse methods of interacting with their surroundings. As a result, each animal's exposure to and sensitivity to the effects of air pollution is unique.[30]

The chemistry and quality of soils and water can be altered by acid rain, caused by air pollution. For example, some creatures may be unable to live or perform normal physiological processes if water bodies become excessively acidic. Acid rain, on the other hand, can promote the discharge of heavy metals like aluminium from soils into aquatic environments. As a result, heavy metals are more readily available in the water column, which are extremely harmful to many creatures, including fish.[31]

[29] The majority of commercially fixed nitrogen and mined phosphorus is used to make fertiliser. The necessity to fulfil the nutritional demands of our fast growing human population has driven up fertiliser consumption. Because more application leads in more runoff, and the proportion of fertiliser wasted from fields increases with intensity of application, the growth in intensive fertiliser use has major consequences for coastal ecosystems.Landscape preservation and restoration, particularly at land-water interfaces, increases denitrification and helps to reduce nutrient runoff to coastal waterways. Fish farming in land-based recirculating systems, along with the use of little animal feed, can help to mitigate eutrophication caused by mariculture. http://www.coastalwiki.org/wiki/What_causes_eutrophication%3F

[30] Many types of air pollution, such as smog, particulate matter, and ground-level ozone, to name a few, are likely to have comparable effects on animal health as they do on humans, including hurting the lungs and cardiovascular systems. The way an animal breathes affects its sensitivity to pollution, whether it employs lungs, gills, or some other kind of gas exchange, such as passive diffusion through the skin's surface. https://www.canada.ca/en/environment-climate-change/services/air-pollution/quality-environment-economy/ecosystem/wild-animals.html.

[31] Many heavy metals, toxics, persistent organic pollutants (POPs), and other air pollutants have an impact on animals because they penetrate the food chain and contaminate food supply and quality.Many of these contaminants gather and are kept in the tissues of animals after they have been ingested. These contaminants continue to accumulate and rise in concentration when animals are consumed by other creatures farther down the food chain. Bioaccumulation is the term for this process. Predators at the top of the food chain, such as bears and eagles, are particularly vulnerable to the bioaccumulation of these contaminants

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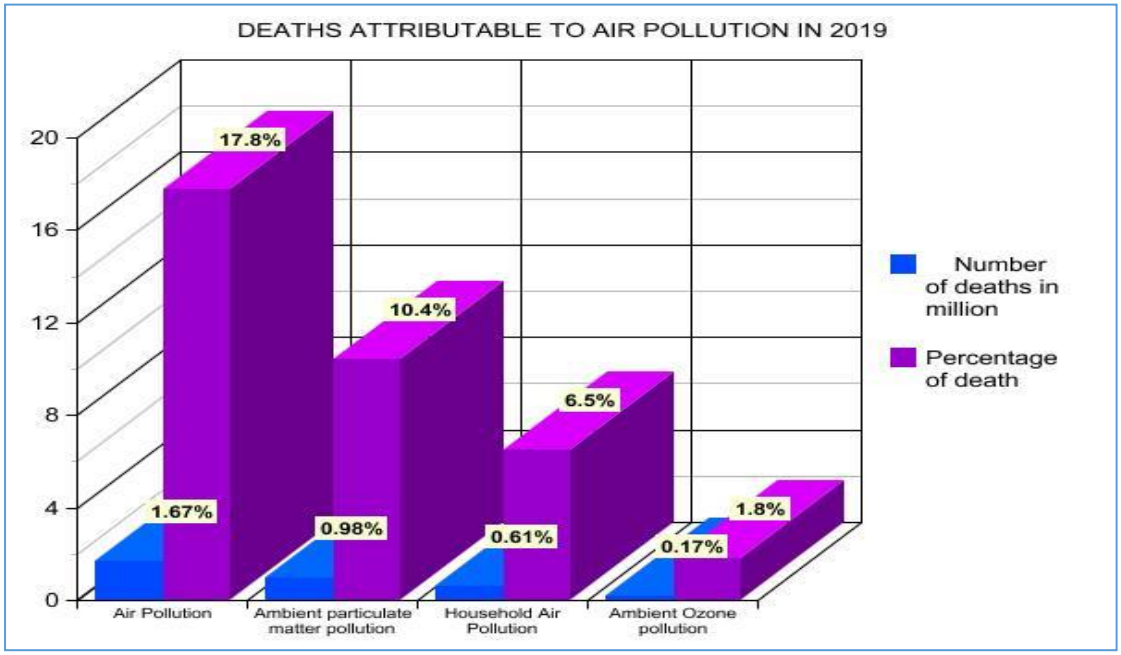
(G) Ozone Layer Depletion

Ozone is found in the stratosphere of the Earth and protects humans from dangerous UV radiation. The presence of chlorofluorocarbons and hydro chlorofluorocarbons in the atmosphere is causing the ozone layer on Earth to deplete.As the ozone layer thins; damaging rays will be sent back to Earth, causing skin and eye ailments. UV radiation may harm crops as well.[32]

V. AIR POLLUTION AT GLANCE IN INDIA

(A) Deaths attributable to Air pollution in India

According to a paper published in the multidisciplinary journal Lancet Planetary Health in 2019, 1.7 million Indians died as a result of air pollution in 2019.The 'India State-Level Disease Burden Initiative' calculates the health and economic costs of air pollution, including indoor and outdoor.[33] According to a study issued on December 21, 2020, India's death toll accounted for 18% of the country's total deaths. For India, the study includes both good and bad news.According to the analysis, indoor, or home, air pollution caused 64% fewer fatalities in the previous two decades (1990-2019).[34]



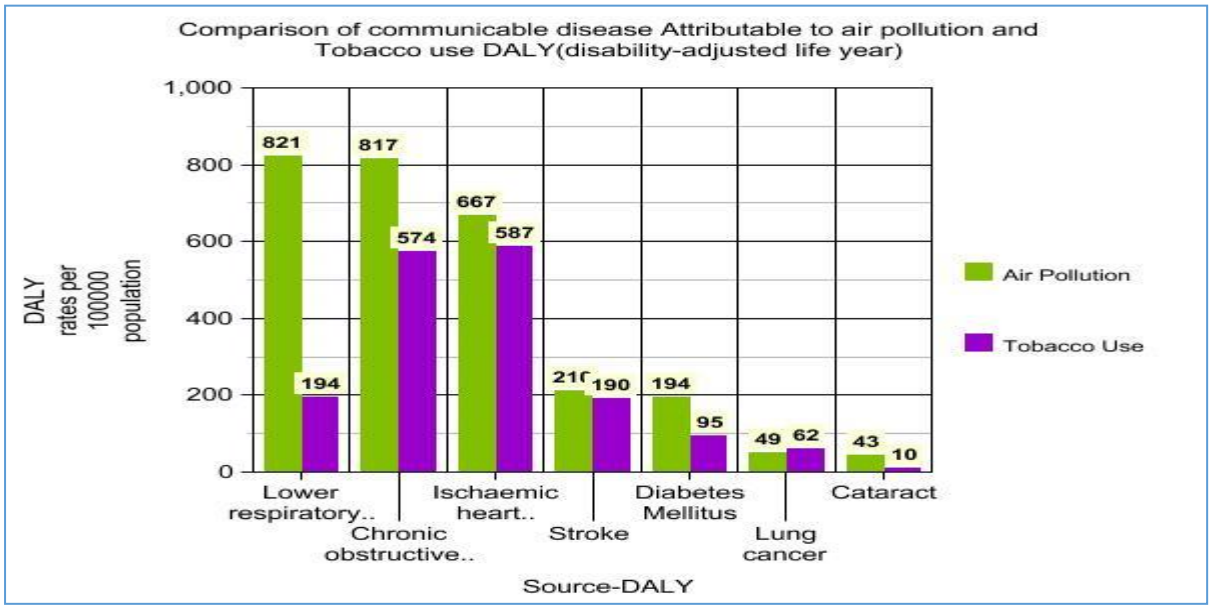
[32] According to studies, the quantity of UVB detected at the surface in the Antarctic might double during the yearly ozone hole The quantity of UVB that reaches the Earth's surface rises as the ozone layer depletes. UVB induces non-melanoma skin cancer and has a key role in the development of malignant melanoma, according to laboratory and epidemiological research. UVB has also been related to the formation of cataracts, a clouding of the lens of the eye. https://www.epa.gov/ozone-layer-protection/health-and-environmental-effects-ozone-layer-depletion

[33] https://www.downtoearth.org.in/news/air/air-pollution-killed-1-7-million-indians-in-2019-lancet-report-74737

[34] Ibid

(B) In India air pollution causes more deaths than tobacco

Air pollution is responsible for one out of every eight deaths in India, making it the country's biggest cause of mortality. As a result, air pollution is a larger cause of disease than tobacco. Both tobacco use and air pollution are known to increase the risk of respiratory disorders, heart disease, and diabetes. As a consequence, the study analysed the illness burden attributable to air pollution and compared it to the disease burden attributed to cigarette smoking for diseases caused by both risk factors. [35]



(C) Gurugram, Noida among 7 Indian cities in world's 10 most polluted, 2019 report

According to one of the survey conducted by Swiss-based IQAir AirVisual and non-profit organisation Greenpeace in 2019 seven of the top ten most polluted cities in the world were in India. Gurugram, in the National Capital Region, was also named the most polluted city, according to the survey. In 2018, the most polluted capital in the world was Delhi, which had an average PM 2.5 concentration of 113.5 micrograms per cubic metre. Ghaziabad, Faridabad, Bhiwandi, Noida, Patna, and Lucknow are among the other Indian cities on the list of most polluted cities in the world.

(D) Air pollution decreased during Covid 19 period in Delhi (India)

This is the first time in Delhi since 2016 that the lowest levels were reported in March during the spring season. The cleanest week of the year was the final week of March 2020, which was

[35] It was discovered that the illness burden attributed to air pollution was substantially larger than the disease burden attributable to cigarette smoking for lower respiratory infections. The burden attributed to air pollution was as large as that attributable to tobacco use for chronic obstructive pulmonary disease, heart disease, stroke, diabetes, lung cancer, and cataract.According to a study conducted by DALY (disability-adjusted life year)It has been found that air pollution kills more people in India than tobacco use.

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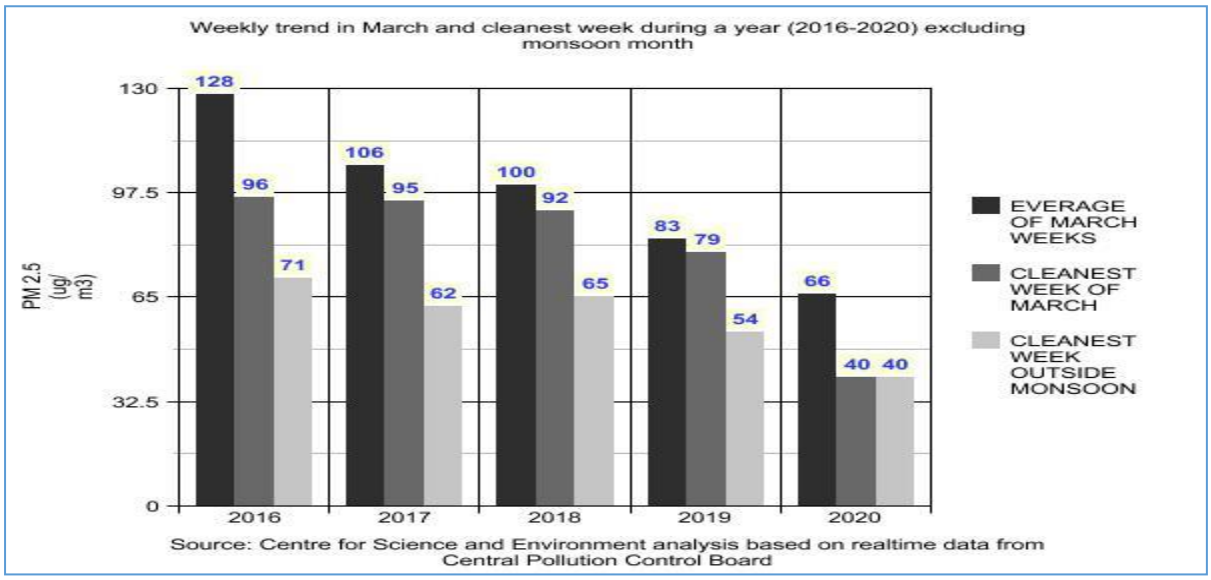
26% better than the cleanest week of 2019. (week ending June 26, 2019). The daily PM2.5 readings have been significantly below the 24-hour guidelines this week.



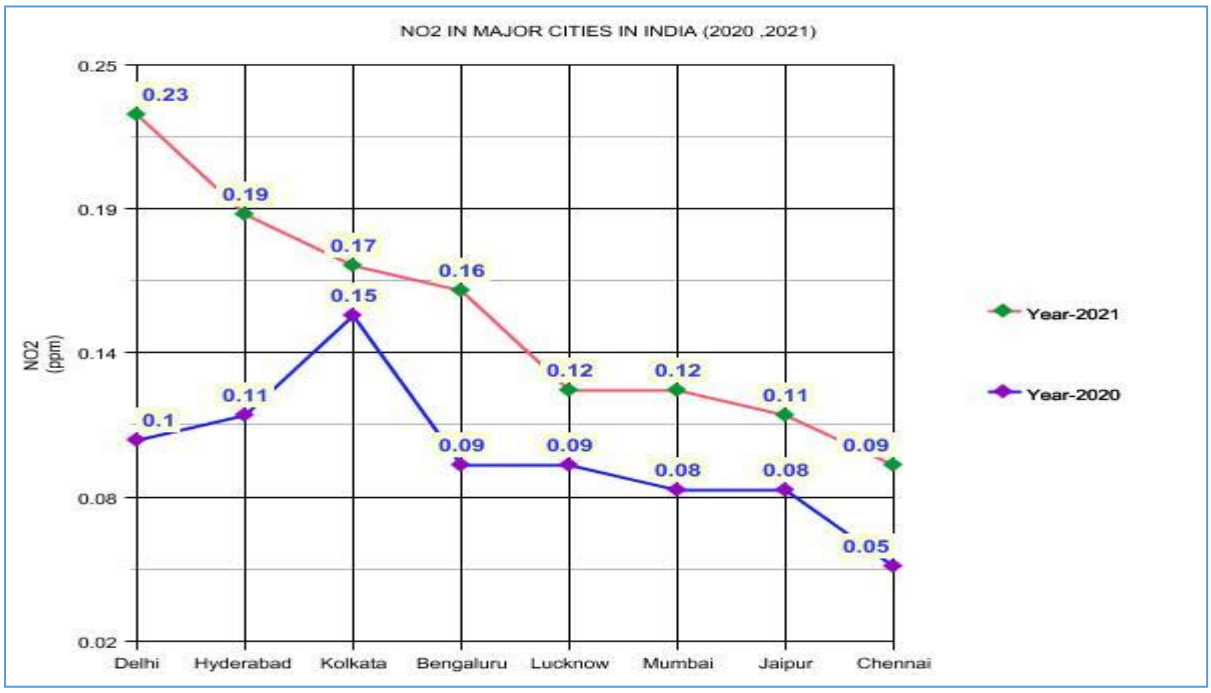
The winter haze in the national capital begins to dissipate in the spring. However, pollution levels in the spring do not always fall to the same levels as they did in March. This difference may be seen in the crisper, more breathable air and the blue sky.[36]

(E) NO_2 Levels is Increasing in Indian Major Cities (Data 2020 and 2021)

NO_2 can transform into ground-level ozone, which poses a major risk to human respiratory systems. The American Lung Association has stated NO_2 causes a range of harmful effects on the lungs, and people who are suffering from lung cancer face greater threat from NO_2. New research found air pollution linked with other health problems including cardiovascular, low birth weight & premature death. According to the Greenpeace report, NO_2 pollution levels have increased in every major Indian city in 2021 compared to 2020. Smart Air analyzed NO_2 quality data for eight major Indian cities: Delhi, Mumbai, Kolkata, Chennai, Hyderabad, Bengaluru, Lucknow, and Jaipur. [37]

[36] The winter haze in the national capital begins to dissipate in the spring. However, pollution levels in the spring do not always fall to the same levels as they did in March. This difference may be seen in the crisper, more breathable air and the blue sky.This led CSE to conduct a quick and preliminary examination of the daily and weekly trend in PM2.5 levels during the locked-down month of March, as well as how it compares to Marches in previous years since 2016.The lockdown, a major experiment, has provided monitoring agencies an opportunity to discover how low pollution may fall during this season, even if for unexpected reasons. https://www.downtoearth.org.in/news/air/ air-during-covid-19-lockdown-march-s-last-week-cleanest-so-far-in-delhi-70193

[37] https://smartairfilters.com/en/blog/no2-pollution-increased-dramatically-india-2021/



VI. LEGISLATIVE PROVISIONS TO TACKLE PROBLEM OF AIR POLLUTION IN INDIA

(A) The Factories Act, 1948

This is India's first indirect action to address air pollution. Sections 13, 14, and 15 of Chapter III of this act deal with adequate ventilation, dust, fumes, and humidity as they pertain to worker health.[38]

(B) The Industrial (Development and Regulation) Act,1957

This was the first legislation to provide the federal government the authority to order investigations into scheduled industries or industrial activities. The scope was confined to the preservation of any national resources that are used in the industry, as well as the regulation of production and industrial growth.[39]

(C) The Mines Act, 1952

The Mines Act of 1952 includes issues of health, safety, and welfare measures for workers in coal, metalliferous, and oil mines. The Act establishes the owner's responsibilities for managing mines and mining operations, as well as the health and safety of miners. It also

[38] The Factories Act of 1948 also protects workers' health, ensures workplace safety while dealing with equipment, improves workplace physical conditions, and offers welfare facilities. The Act only applies to factories.

[39] An industry is the division of labour that produces commodities or provides associated services. The Industries (Development and Regulation) Act (IDRA), which came into force on May 8, 1952, as a result of a Central Government notification published in the Indian Gazette, has discussed and dealt with development and regulation.

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specifies the amount of hours that miners must work, as well as minimum wage rates and other relevant issues. The Ministry of Labor and Employment is in charge of enforcing the Act.[40]

(D) The Inflammable Substances Act, 1952

An Act declaring certain compounds to be extremely flammable and regulating their import, transportation, storage, and manufacture by applying the Petroleum Act of 1934 and its provisions, as well as other things related to such control.This act was indirectly stirring up air pollution. [41]

(E) The Atomic Energy Act, 1962

With the primary objective of controlling atomic energy and radioactive chemicals, the legislation addressed exclusively the health effects and safety of radioactive substances.[42] The Act applies to all types of pollution, including air, water, soil, and noise.It establishes safe environmental criteria for the presence of certain contaminants.It forbids the use of dangerous materials unless the Central Government gives approval first.It enables the federal government to delegate authority to authorities in various areas to carry out the Act's provisions.[43]

(F) The Air (Prevention and Control of Pollution) Act, 1981

This is the first law enacted solely for the goal of preventing, controlling, and reducing air pollution. It was created to carry out the purposes of boards, such as conferring and allocating powers and functions pertaining to the subjects at hand to such boards. At the United Nations Conference on the Human Environment in Stockholm in June 1972, which India attended, decisions were made to take appropriate steps for the preservation of the earth's natural resources, which included, among other things, the preservation of air quality and the control of air pollution.[44]

(G) The Environment (Protection) act, 1986

This act was enacted on May 23, 1986, to provide for the protection and enhancement of the

[40]https://www.teamleaseregtech.com/resources/acts/article/102/the-mines-act-1952-mines-rules-1955/

[41] The act's sole goal was to declare specific compounds to be highly flammable and regulate them under the Petroleum Act of 1934.

[42] On the 15th of September 1962, it got President assent after being passed by both chambers of Parliament. This Act would govern and manage the use of atomic energy, directing its benefits toward the welfare of the country's people while also encouraging advancement and development.

[43]https://blog.ipleaders.in/atomic-energy-act-1962/

[44] The purpose of the Air Act of 1981 is to protect air quality and limit pollution. The powers and functions of boards are covered in Chapter 3 of this legislation. The Central Board and State Boards are the two types of boards. Some of their key responsibilities include improving air quality and preventing, controlling, or abating air pollution in the country, as well as advising the government on any issues relating to air quality and pollution prevention.

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environment, as well as things related to it. In 1986, the Environmental Protection Act was passed. This act's goal is to take necessary actions to protect and develop the environment, as well as to prevent threats to humans, other living things, plants, and property.[45] It authorises the Central Government to create authorities [under section 3(3)] concerned with preventing all types of environmental contamination and addressing specific environmental issues that are unique to different sections of the country.[46] For a variety of reasons, the Act is unique. First, it has the only purpose of assuring environmental protection, pollution prevention, and reduction, as well as the ability to take stern action against violators. Second, it is a law that supersedes all other laws. This implies that if an act is committed that might be prosecuted under various statutes, including this Act, the EPA 1986 will be given priority. Third, the Act compelled the country to take significant notice of environmental degradation.

(H) Motor Vehicle Act 1988

The Indian Parliament approved the Motor Vehicles Act in 1988, which governs practically all elements of road transport vehicles. It containd requirements for traffic laws, vehicle insurance, motor vehicle registration, permit management, and fines. The Act went into effect on July 1, 1989.[47]

(I) The Ozone Depleting Substances (Regulation and Control) Rules, 2000

Article 5 paragraph 1 of the Montreal Protocol Regulation on the production and use of ozone depleting chemicals applies to India. This legislation addresses the ban of new investments in ozone depleting compounds, as well as the regulation of the import, export, and sale of items created with or containing ozone depleting substances, as well as reporting and monitoring requirements. The Ozone Cell, which was established by MOEF(Multiple Option Financing Facility) and has been tasked with carrying out all responsibilities related to the phase-out of ozone-depleting compounds.

[45] The EPA's origins may be traced back to the United Nations Conference on the Human Environment (Stockholm Conference), which India attended in June 1972 and aimed to adopt necessary measures to enhance the human environment.

[46] https://www.google.com/search?rlz=1C1VDKB_enIN989IN989&q=environmental+protection+act,+1986+notes& sa=X&ved=2ahUKEwj2mqz1rrv3AhWURmwGHeW1APQQ1QJ6BAhDEAE&biw= 1364 &bih =665&dpr=1

[47] The Government of India, in cooperation with state transport ministers, drafted the Motor Vehicles (Amendment) Bill to make amendments to the Motor Vehicles Act, 1988, in order to make roadways safer. On April 10, 2017, the Lok Sabha passed the Motor Vehicles (Amendment) Bill, 2017.

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VII. JUDICIAL RESPONSE TO COMBAT AIR POLLUTION IN INDIA

(A) Taj trapezium case[48]

This writ suit was brought by Mr. M.C.Mehta in reaction to pollution at the Taj Mahal in Agra. Major sources of air pollution included iron foundries, ferro-alloys industries, rubber processing, lime processing, engineering, chemical industries, brick kilns, refractory units, the Mathura Refinery, Ferozabad bangles, and glass manufacturers. Acid rain has harmed the magnificent white marble in this area.[49]

(B) Municipal Council, Ratlam Vs. Shri Vardhichand [50] - Some Ratlam residents filed a complaint with the Sub-Divisional Magistrate, stating that the municipality is not creating sufficient drains and that surrounding slum inhabitants are causing a lot of stench. The Ratlam district's Sub-Divisional Magistrate ordered the municipality to produce a proper development plan within six months. The Municipality then filed an appeal with the Supreme Court of India, alleging that it lacked the necessary financial resources to comply with the sub divisional magistrate's orders. Furthermore, the respondents said that runoff from a neighbouring alcohol production pollutes the water, resulting in malaria.

The Supreme Court ordered the Ratlam Municipal Corporation to implement the ruling of the Ratlam City Sub Divisional Magistrate and take all necessary actions to protect the region from pollution caused by the alcohol factory. The court also stated that it has the authority to increase its demand for financial assistance from the state government.

(C) Subash Kumar case[51]- In Subash Kumar, the Supreme Court declared that the right to life guaranteed by article 21 includes the right to clean water and air for the full enjoyment of life. The right to a healthy environment was recognised as a basic right to life by the court in this instance. Municipalities and other concerned government entities, according to the court, could no longer afford to wait for pollution abatement and prevention measures to be implemented. They may even be obliged to do environmentally friendly initiatives.

(D) M C Mehta vs. Union of India [52]- In this case (the Oleum Gas Leak case) the Supreme Court introduced a new notion of absolute liability for any accident stemming from the storage or use of hazardous materials from their factories . Regardless of whether the enterprise was negligent or not, it must guarantee that no harm is caused to anybody.

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[48] 1987 SCR (1) 819
[49] https://www.legitquest.com/legal-guide/top-7-landmark-cases-of-environmental-protection-act
[50] **1981 SCR (1) 97**
[51] AIR 1991 SC 420
[52] AIR 1987 965

(E) Orissa State (Prevention and control of pollution) Board Vs Orienr Paper Mill & Others[53]**-** On 7.10.95, the SDJM filed charges against the respondents under Section 37(1) of Air Prevention and control of Pollution Act-1981 for failing to comply with Sections 21 and 22 of the Act. The respondent, feeling offended, filed a Criminal Revision in the Sessions Court, arguing that there was no evidence to indicate that the area in which the industry-respondent No.1 is located is an area declared as an Air Pollution Control Area in compliance with legislation, namely Section 19 of the Act.

The respondent's argument that the State Government illegally notified an area as an Air Pollution Control Area in the absence of rules prescribing the manner for declaring an area as such does not appear to have found favour with the learned Magistrate on the grounds that the word used in Section 19 is "may" and not "shall," and thus it was not mandatory for the State to prescribe the manner for declaring an area as an Air Pollution Control Area.

(F) Vardhaman Kaushik v. Union of India[54] - It was a public interest litigation (PIL) brought in response to increased air pollution in Delhi, which has forced residents to migrate to greener, pollution-free areas. Various steps were directed by the NGT, including a ban on 10-year-old diesel cars and the issuing of instructions for the covering of building construction materials when being carried or stored, rubbish burning, and so on. The goal of these initiatives was to create fundamental and required environmental conditions for living, such as excellent air quality.

(G) MC Mehta v Union of India[55]**-** MC Mehta filed a Public Interest Litigation (PIL) at the Apex Court of India in 1985 in response to the increasing air quality in New Delhi. He raised the issue of increased air pollution in New Delhi in his plea, accusing the administration of breaching both the right of Delhi residents to breathe clean air and the country's environmental laws. The Court ordered that all commercial vehicles in the capital be converted to CNG and that old commercial vehicles be phased out, that the number of public buses on Delhi's highways be increased, and that specific fuels be banned from being sold or used within the city.

(H) Arjun Gopal & Others Vs Union of India & Others[56] -The Supreme Court of India issued an order on October 23, 2018, in the case of Arjun Gopal & Others Vs Union of India & Others, addressing the worrisome worsening of air quality in Delhi, which has resulted in

[53] [2003] Insc 160 (***10 March 2003***).
[54] 2017 SCC OnLine NGT 7584, order dated 09.11.2017]
[55] AIR 2002 SC 1696
[56] (2019) 13 SCC 523

severe air pollution. The appeal acknowledges that poor air quality in Delhi and the National Capital Region is due to a variety of factors. At the same time, it is emphasised that air pollution reaches a nadir around Diwali due to indiscriminate usage of firecrackers, the chemical composition of which elevates dangerous particulate matter such as PM2.5 or PM10 to alarming levels, resulting in a "emergency" scenario.

VIII. CONCLUSION

Rigorous legislative measures combined with the application of new technology and infrastructure might significantly reduce air pollution. Despite the fact that strict rules and procedures are in place to reduce vehicular and stack emissions, most Indian towns lack the technological and physical capabilities to do so. Financial restrictions experienced during the timely design and execution of sophisticated urban infrastructure upgrades in a growing country like India might constitute a severe barrier to air pollution reduction techniques (Gurjar and Nagpure 2016).Court has done all possible efforts to prevent air pollution through various judgements, , everything has come to a halt when it comes to execution and the executive's participation in it. Individuals should be aware of their rights as well as their responsibilities to the environment and its improvement. Despite the fact that the judiciary and other government organs are attempting to remove and manage air pollution levels via various measures, each individual should participate at their own level to ensure the environment's sustainability for future generations.

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