INDUSTRIAL POLLUTION IN INDIA

Industrial pollution takes many forms and has a negative influence on the land, water, and environment; they are also the causing factors of sickness and death around the world. Coal combustion, the combustion of fossil fuels such as petroleum, oil, natural gas, and chemical solvents used in the tanning and dyeing industries are the primary drivers of industrial pollution.

Furthermore, when fossil fuels such as coal and oil are used for power generation and transportation, they emit pollutants such as carbon dioxide, nitrogen, and sulphur dioxide, as well as fly ash, which damages the air, water, and land.

Types of Industrial Pollution

Air pollution occurs due to the presence of undesirable solid or gaseous particles in the air in quantities that are harmful to human health and the environment. Air may get polluted by natural causes such as volcanoes, which release ash, dust, sulphur and other gases, or by forest fires that are occasionally naturally caused by lightning. However, unlike pollutants from human activity, naturally occurring pollutants tend to remain in the atmosphere for a short time and do not lead to permanent atmospheric change. Pollutants that are emitted directly from identifiable sources are produced both by natural events (for example, dust storms and volcanic eruptions) and human activities (emission from vehicles, industries, etc.). These are called primary pollutants. There are five primary pollutants that together contribute about 90 percent of the global air pollution. These are carbon oxides (CO and CO2), nitrogen oxides, sulfur oxides, volatile organic compounds (mostly hydrocarbons) and suspended particulate matter. Pollutants that are produced in the atmosphere when certain chemical reactions take place among the primary pollutants are called secondary pollutants. Eg: sulfuric acid, nitric acid, carbonic acid, etc.

Effects of air pollution on living organisms

Our respiratory system has a number of mechanisms that help in protecting us from air pollution. The hair in our nose filters out large particles. The sticky mucus in the lining of the upper respiratory tract captures smaller particles and dissolves some gaseous pollutants. When the upper respiratory system is irritated by pollutants sneezing and coughing expel contaminated air and mucus. Prolonged smoking or exposure to air pollutants can overload or breakdown these natural defenses causing or contributing to diseases such as lung cancer, asthma, chronic bronchitis and emphysema. Elderly people, infants, pregnant women and people with heart disease, asthma or other respiratory diseases are especially vulnerable to air pollution.

Atmospheric changes induced by pollution contribute to global warming, a phenomenon which is caused due to the increase in concentration of certain gases like carbon dioxide, nitrogen oxides, methane and CFCs. Observations of the earth have shown beyond doubt that atmospheric constituents such as water vapour, carbon dioxide, methane, nitrogen oxides and Chloro Fluro Carbons trap heat in the form of infra-red radiation near the earth's surface. This is known as the 'Greenhouse Effect'.

Legal aspects of air pollution control in India

The Air (Prevention and Control of Pollution) Act was legislated in 1981. The Act provided for prevention, control and abatement of air pollution. In areas notified under this Act no industrial pollution causing activity could come up without the permission of the concerned State Pollution Control Board. But this Act was not strong enough to play a precautionary or a corrective role. After the Bhopal disaster, a more comprehensive Environment Protection Act (EPA) was passed in 1986.

Water Pollution-Although 71% of the earth's surface is covered by water only a tiny fraction of this water is available to us as fresh water. About 97% of the total water available on earth is found in oceans and is too salty for drinking or irrigation. The remaining 3% is fresh water. Of this 2.997% is locked in ice caps or glaciers. Thus only 0.003% of the earth' total volume of water is easily available to us as soil moisture, groundwater, water vapour and water in lakes, streams, rivers and wetlands. When the

quality or composition of water changes directly or indirectly as a result of man's activities such that it becomes unfit for any purpose it is said to be polluted.

There are several classes of common water pollutants. These are disease-causing agents (pathogens) which include bacteria, viruses, protozoa and parasitic worms that enter water from domestic sewage and untreated human and animal wastes.There are several classes of common water pollutants. These are disease-causing agents (pathogens) which include bacteria, viruses, protozoa and parasitic worms that enter water from domestic sewage and untreated human and animal wastes.degrade these wastes. Another cause of water pollution is a variety of organic chemicals, which include oil, gasoline, plastics, pesticides, cleaning solvents, detergent and many other chemicals. These are harmful to aquatic life and human health. They get into the water directly from industrial activity either from improper handling of the chemicals in industries and more often from improper and illegal disposal of chemicals.

While the foremost necessity is prevention, setting up effluent treatment plants and treating waste through these can reduce the pollution load in the recipient water. The treated effluent can be reused for either gardening or cooling purposes wherever possible. A few years ago a new technology called the Root Zone Process has been developed by Thermax. This system involves running contaminated water through the root zones of specially designed reed beds. The reeds, which are essentially wetland plants have the capacity to absorb oxygen from the surrounding air through their stomatal openings. The oxygen is pushed through the porous stem of the reeds into the hollow roots where it enters the root zone and creates conditions suitable for the growth of numerous bacteria and fungi. These micro-organisms oxidize impurities in the wastewaters, so that the water which finally comes out is clean

Soil Pollution- Soil is a thin covering over the land consisting of a mixture of minerals, organic material, living organisms, air and water that together support the growth of plant life. Several factors contribute to the formation of soil from the parent material. This includes mechanical weathering of rocks due to temperature changes and abrasion, wind, moving water, glaciers, chemical weathering activities and lichens.

Climate and time are also important in the development of soils. Extremely dry or cold climates develop soils very slowly while humid and warm climates develop them more rapidly. Under ideal climatic conditions soft parent material may develop into a centimeter of soil within 15 years. Under poor climatic conditions a hard parent material may require hundreds of years to develop into soil.

Soil erosion can be defined as the movement of surface litter and topsoil from one place to another. While erosion is a natural process often caused by wind and flowing water it is greatly accelerated by human activities such as farming, construction, overgrazing by livestock, burning of grass cover and deforestation. Loss of the topsoil makes a soil less fertile and reduces its water holding capacity. The topsoil, which is washed away, also contributes to water pollution clogging lakes, increasing turbidity of the water and also leads to loss of aquatic life. For one inch of topsoil to be formed it normally requires 200-1000 years depending upon the climate and soil type.

Irrigated lands can produce crop yields much higher than those that only use rainwater. However this has its own set of ill effects. Irrigation water contains dissolved salts and in dry climates much of the water in the saline solution evaporates leaving its salts such as sodium chloride in the topsoil. The accumulation of these salts is called salinization, which can stunt plant growth, lower yields and eventually kill the crop and render the land useless for agriculture.

Noise Pollution Noise may not seem as harmful as the contamination of air or water but it is a pollution problem that affects human health and can contribute to a general deterioration of environmental quality. Noise is an undesirable and unwanted sound. Not all sound is noise. What may be considered as music to one person may be noise to another. It is not a substance that can accumulate in the environment like most other pollutants. Sound is measured in a unit called the ‘Decibel’.

There are several sources of noise pollution that contribute to both indoor and outdoor noise pollution. Noise emanating from factories, vehicles, playing of loudspeakers

during various festivals can contribute to outdoor noise pollution while loudly played radio or music systems, and other electronic gadgets can contribute to indoor noise pollution. A study conducted by researchers from the New Delhi based National Physical Laboratory show that noise generated by firecrackers (presently available in the market) is much higher than the prescribed levels. The permitted noise level is 125 decibels, as per the Environment (Protection) (second amendment) Rules, 1999. The differences between sound and noise is often subjective and a matter of personal opinion. There are however some very harmful effects caused by exposure to high sound levels. These effects can range in severity from being extremely annoying to being extremely painful and hazardous.

Noise Regulation Rules under the Environment Protection Act, 1986 regulate noise levels ias follows

Type of area	Day Time	Night Tir
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence zone	50	40

Source: TNPCB

Causes of Industrial Pollution

- **Unplanned Industrial Growth-** In most countries, industrial development and urbanization have progressed unexpectedly. It is responsible for all types of pollution.
- **Use of Outdated Technology-** Many industrial units are slow to adopt new technology to address pollution.
- **Use of water for Industrial Processes-** Most of the industry units required a large amount of water. Water used in different production processes comes into contact with harmful chemicals, heavy metals, biological waste, etc.; after use, the water is dumped into water bodies causing water contamination.
- **Poor Implementation of Policies and Laws-** Many developing countries do not have effective environmental policies and laws.
- **Inefficient waste Disposal System-** With unplanned and rapid industrial development, all countries generate industrial waste quickly. All countries face

the challenge of effectively disposing of industrial waste, including e-waste, which contains toxic material.

- **Absence of Nation-Wide Pollution Tax-** There is no nationwide pollution tax imposed in all the countries. So, industrial pollution is very high.

Effects of Industrial Pollution

- **Effect on Human Health-** Industrial pollution has been responsible for the contamination of water, air and the natural environment. Moreover, it has affected the health of the people. Industrial toxic waste is responsible for diseases like cancer, lung infection, asthma, etc.
- Low Agricultural Productivity- The toxic materials dumped by the industrial units cause soil and groundwater contamination. It affects the fertility of the soil. In addition, the consumption of contaminated crops causes health problems.
- Global Warming- Global warming leads to rising water levels due to the melting of glaciers, a constant threat of natural disasters like tsunamis, and several Storms. Moreover, due to global warming, many animals and fishes are getting extinct.
- Effect of Wildlife- Industrial pollution and industrial activities have led to the destruction of animals' natural habitats. As a result, many wildlife species face extinction due to these factors.
- Depletion of Green cover and Biodiversity- The green cover helps balance temperature. Therefore, it is essential to protect areas and human health affected by rising temperatures due to global warming. Unfortunately, unregulated industrial activities have been responsible for the loss of green cover.
    - 1. Industrial wastes discharged into water bodies contain many toxic substances that make water unfit for drinking and bathing. Pollution of moisture also reduces the number of aquatic plants and animals due to the destruction of their habitat and nesting places.
    - 2. The wastewater released by factories and industries is rich in organic matter. The wastewater is rich in nutrients resulting in a thick growth of algae and many other weeds like ragweed, skunk, buckthorn, and horsemint, and these plants cover the entire surface of the water. The algae use so much oxygen; hence the aquatic animals and other plants die due to its lack.
    - 3. When industries release mercury, it contaminates with water, and it's used for drinking by human beings and animals; it causes numbness of

lips, tongue and limbs. Also, it leads to blurred vision and mental disorders.

Measures to control Pollution

The Government of India has adopted several measures and enacted rules and laws to control rising trend of Pollution

Water (Prevention & Control of Pollution) Act, 1974 is a comprehensive legislation that regulates agencies responsible for checking on water pollution and the ambit of pollution control boards both at the centre and states. The Water (Prevention & Control of Pollution) Act, 1974 was adopted by the Indian parliament with the aim of prevention and control of Water Pollution in India. It has norms for preventing he discharge of these pollutants in water bodies and has also laid down penalties for on-compliance of these rules.

The Air (Prevention and control of pollution) Act, 1982 makes provisions for the setting up of Central and state boards to restrict the emission of pollutants and set penalties. The Environment protection act 1986 was in response to the Bhopal gas tragedy of 1984 It empowers the central government to plan and execute nationwide pollution control strategies.The Public liability insurance act 1991 provides immediate relief to disability caused by handling hazardous substances. The Clean technology scheme, 1994 initiated a grant in and scheme for promoting clean technology in industries. In 2005, emission standards were adopted to control vehicular pollution.

Regulations to manage hazardous waste disposal were initiated since 1998, especially with respect to biomedical waste disposal into thousand municipal solid waste handling rules for adopted to dispose, solid waste in a scientific manner.

Central pollution control board CPCB is a statutory organization under the Ministry of environment, Forest and climate change. It was set up with the aim to promoting nationwide awareness monitoring air and water quality and also regulate noise pollution.

Life-cycle assessment LCA is a decision cum management tool which provides information on the environmental effects of various products or processes for minimum wages generation and optimum utilization of resources. It is conducted in sectors like pulp or paper steel and thermal power.

Environmental statistics and mapping-It provides a reliable information base and mapping of areas needing special attention for pollution, prevention and control. It also aims at development and promotion of cleaner technologies.

Legal norms- Local measures to reduce sulphur in diesel and its stringent enforcement by the Indian government has witnessed a decreasing trend over the years in air pollution. Likewise, a decreasing trend in sulphur dioxide levels in residential areas of many metropolitan pollution cities in India during the last few years could be due to the recently introduced, clean fuel standards and the increasing use of LPG in the place of traditional fuel for domestic purposes.

Control of environmental degradation. Environmental interpretation can be reduced by the following measures,

1. minimizing use of water for processing by reusing and recycling it in less or more successive stages

2.harvesting of rainwater to meet water requirements,

3.treating hot water and effluent before releasing them in rivers and ponds.

Treatment of industrial effluents

This can be done in three phases Primary treatment by mechanical means: This involves screening, grinding flocculation and sedimentation.

Second secondary treatment by the biological power

Tertiary treatment by biological, chemical and physical processes. This involves recycling of waste water.

Regulatory norms

Smoke can be reduced by using oil or gas instead of coal in factories

Machinery and equipments can be used and generators can be fitted with silencers

Redesigning of machines to increase energy efficiency and reducing noise.

Particulate matter in the air can be reduced by fitting smokestacks, factories with electrostatic precipitator is fabric, filters, scrubbers et cetera.

Increasing awareness and pollution control measures

Self education and adoption of healthy practices by every individual is an important step towards controlling environmental degradation.

for example

1.use of unleaded gas strive in personal vehicle

2.never use open forest to dispose waste

3.adopt 3RS of solid waste management, reduce, reuse and recycle of organic and inorganic materials like glass metals, plastic paper

4.reconnect with nature leaf green by using green power, implied abound, patronize, local food and goods

5.have a proper waste disposal system.

Strict enforcement of legislations 1.Industries should strictly follow applicable government regulation on pollution control.

2.They should monitor their omission regularly and ensure compliance with prescribed emission norms

3.use fuel with low sulfur content.