

Environmental Pollution and Health Concerns in India: Regulatory Measures and Public Activism

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Abstract

Environmental pollution affects human health significantly and is a major global problem. This chapter goes into great length on the various types of environmental pollution that affect the air, water, and soil, along with their primary causes. By analyzing the many health problems associated with each type of pollution, it draws attention to the complex link that exists between pollutants and human health. Reproductive issues, cancer, neurological problems, cardiovascular diseases, and respiratory ailments are some of the main health effects linked to environmental pollution. The surroundings and improvement are twin issues of high national importance while the diverse components approach of surroundings are intimately inter-related, the improvement system is alongside a long historical multidimensional system and is reflected in human interplay with the environment causing most of the environmental issues and pollutants is one in all of them. Environmental pollution is the result of misuse and overuse of sources due to loss of training, consciousness, and wrong control. The growing population, industrialization, urbanization reason environmental pollution with an ultimate concerning human health and hygiene's, sanitation, and ecological imbalances. This bankruptcy uses in-intensity case research, including the Bhopal fuel disaster and the Flint water disaster, to highlight the detrimental influences of pollutants and the want for stringent regulatory measures. The origins of environmental pollutants are soil, water, and air in addition to their effect on human fitness are the main factors of interest.

Keywords: Environment pollution, public health, sustainable environmental management, health effects, human health

INTRODUCTION

Environmental pollution is becoming a prevalent public health issue worldwide. This includes situations where pollutants pollute the air, water, or soil and destroy the energy of the population. A strong regulatory framework and public awareness initiatives are needed to reduce environmental pollution. This scholarship looks at many types of environmental pollution, its causes, and its risks to human health. Despite all the modern global conveniences and achievements, environmental

deterioration remains a silent threat that cannot be noted. This pervasive issue stems from the creation of hazardous materials in our air, water, and soil. These pollutants is a primary threat to humans' health and disturb the delicate equilibrium of the atmosphere. They are frequently the effects of the human body.

The rapid increase in population, modernization, urbanization, housing, congestion, and industrialization, have posed adverse impacts on the environment and have adversely affected human health, hygiene, and ecological balance. Pollution not only causes deterioration of the environment and creates health hazards but also causes loss to the

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national economy. The misutilization and exploitation of natural resources, infrastructural, opencast mining and quarrying, lime and brick kiln work, and industrial developments have not only degraded the surrounding environment but have also led to a change in the ecological balance in the city. To maintain the ecological balance and human welfare, the viable attempt is essential for rational utilization of resources and improvement of the environment instead of haphazard use which is disastrous to local inhabitants [1].

Both need to cooperate for curbing the imbalance in natural resources and take necessary steps for improvement in the surrounding environment. Imbalances in nature emerged largely due to adverse relationships and interactions between natural resources and technology. Thus, on the one side, there are problems with society's current and future demands, the use of the natural environment for agricultural and industrial purposes, population settlements, etc., and on the other hand, it deals in the most economic ways of meeting this demand with due regard for scientific and technical recommendations and results of development work. Due to the complexity of the problem, interdisciplinary research and efforts need to be emphasized. Thus, the effective development to protect the environment is vital. For this purpose, these should be adopted on trial-and-error basis, aiming at purposive transformation and protection of environment for sustained development [2].

With increase in population pressure, housing congestion, urbanization, industrialization a boon for economic growth, the surrounding natural environment is being contaminated by numerous pollutants due to mining, quarrying, and other development activities. Industrialization is mostly responsible for the nation's success in terms of employment and financial standing, but it also has certain unfavourable consequences on the local, national, and international environments.

This widespread problem, a result of human activity, is not limited by geography and has a significant impact on public health. This study explores the complex connection between pollution in the environment and human health. We will look at the several types of pollution – noise, water, land, and air – and how they affect our surroundings. Next, we will examine the alarming health implications linked to every kind of pollution, emphasizing both immediate and long-term impacts. The most common health issues associated with pollution will be highlighted such as cancer, heart disease, respiratory disorders, and developmental issues.

TYPES OF ENVIRONMENTAL POLLUTION

There are many distinct types of environmental pollution, and each one poses special challenges to ecosystems, human health, and the health of the world. The main categories of environmental contamination are as follows:

- *Air Pollution:* Air pollution is the term used to describe the presence of hazardous elements in the atmosphere from both natural and man-made sources. Human interest releases over one billion tonnes of pollution into the atmosphere. The most frequent and threatening fitness troubles added on by way of gaseous pollutants are wheezing, chest congestion, and bronchitis. decreased exposure to pollution can mitigate those results.
- *Water Pollution:* Water pollution involves the pollution of water sources (lakes, rivers, seas, and groundwater) with heavy metals, chemicals, microbes, and plastic trash. Industrial emissions and runoff from agriculture (pesticides and fertilizers), untreated sewage, oil spills, and plastic debris [3]. Waterborne diseases (cholera, dysentery), neurological disorders, reproductive issues, and various cancers [4].

The concentration of chemical pollutants in drinking water supply systems can vary, ranging from barely detectable to potentially harmful to human health. It is challenging to assess the possible health impacts of these pollutants, particularly since our understanding of how some chemicals interact with the body to cause disease and cell damage is still incomplete. Chemical toxic dosages can have short-term or long-term negative impacts on health. An acute effect typically happens very instantly after a high dosage of a drug.

- *Soil Pollution:* The introduction of hazardous materials into the soil, such as pesticides, heavy metals, and industrial waste, is known as soil pollution. Inappropriate waste management may be the cause of this disposal, industrial accidents, and agricultural practices. Contaminated soil can negatively impact plant growth, contaminate food crops, and harm organisms living in the soil [5].

Compared to air and water pollution, soil pollution is given less attention. But these days, soil contamination is receiving greater attention. Without a doubt, the environmental matrix that soil provides is essential for the flourishing of all terrestrial plants. However, the rate of urbanization and population growth is outpacing the ecosystem's capacity for sustainability and recovery. Soil contamination has practically been the effect of this. Soil is the foundation of agriculture. It is necessary for all crops used as animal feed and human meals. This valuable natural resource is being lost to us in part due to rapid corrosion. Furthermore, massive amounts of sludge and other byproducts from recently constructed waste treatment facilities, as well as contaminated water, are contributing to or perhaps creating soil pollution.

- *Noise Pollution:* Noise pollution arises from unwanted or excessive sounds that disrupt the natural soundscape. It can originate from traffic, construction activities, airplanes, and recreational activities [6]. Noise pollution is the term manage to describe the presence of excessive, bothersome, or undesirable noise in the surrounding area. Urbanization, industrial activity, and transportation are often the causes of noise pollution. In addition to other health troubles, extended publicity to noise pollution can cause strain, listening to loss, and restless nights. high decibel stages are a regular supply of strain, hypertension, sleep difficulties, and hearing loss. it may have a bad effect on mental health, main to tension and cognitive impairments.
- *Plastic Pollution:* The ecosystem is seriously threatened by it. Both animal and human health are negatively impacted by the accumulation of plastic goods and particles (such plastic bottles, bags, and microbeads) in the environment. Plastic pollution is the term for this issue [7].
- *Seas and oceans:* Marine life may be harmed by plastic waste, which is a serious issue in the oceans. Ingesting plastic trash can cause malnutrition and entanglements in animals, or it can consume the debris and kill the animal.
- *Rivers and lakes:* Fish, birds, and other species may be harmed by plastic pollution in freshwater environments.
- *Land:* Plastic pollution may affect wildlife and trash the environment when it occurs on land. Additionally, it can decompose into micro plastics, which are little plastic particles that people and animals may consume.
- *Radioactive Pollution:* Radioactive pollutants is the presence of radioactive substances inside the environment, that could result from nuclear energy era, nuclear weapons testing, or wrong disposal of radioactive waste [8].

The strength, sorts, and amount of radiation, as well as the individual's age and the body portion exposed, all affect how radiation impacts fitness. the subsequent biological consequences of ionizing radiation may additionally occur in people.

- *Thermal Pollution:* Thermal pollution occurs when an industrial or power plant operation discharges heated or cooled water into a natural water body, causing a detrimental change in the water temperature [9].

Thermal pollution is the term used to describe the abnormal rise or reduction in water temperature, usually brought on by human activity. The most frequent offender is usually a rise in water temperature, although a sharp drop can also be harmful.

- *Power plants:* These establishments release hot water back into rivers or lakes after consuming massive volumes of water for cooling.
- *Industrial Processes:* Cooling systems that produce hot water as a by-product are necessary for many sectors, including manufacturing facilities.

- *Urban Runoff*: During hot weather, storm water runoff from concrete surfaces can raise the temperature of neighbouring rivers.

PESTICIDE USES AND EFFECTS ON HUMAN HEALTH

Since the world's population is growing and consuming more food annually while the amount of arable land available for farming is decreasing, modern agriculture must primarily rely on the application of various agrochemicals to close the gap between food production and consumption. Worldwide, the usage of various agrochemicals (fertilizers, pesticides or plant protection agents, and plant growth hormones) is rising for this reason. Pesticides are one of the key agricultural chemicals used to reduce crop output losses from pests and illnesses and to keep crops healthy. These fall into three primary categories: herbicides, insecticides, and pesticides. Both synthetic and biological substances can be used to create them. FAO (2022) reports that over a thousand insecticides are utilized globally [10]. Due to their ability to spread via the air, seep into the soil and groundwater, and runoff into surface water, pesticides have an impact on a variety of industries in addition to agriculture [11].

Pesticide misuse and poisoning are more common in poor countries. Furthermore, because many pesticides linger in the environment for extended periods of time, there is a chance of contamination lasting decades [12]. Likewise, unintended pesticide poisonings represent a significant burden on public health; approximately 11,000 fatal occurrences of this type of poisoning occur year, affecting 385 million individuals.

While pesticides play a vital role in Indian agriculture, their use must be managed carefully to minimize health risks. A balanced approach that includes stringent regulations, effective enforcement, education, and promotion of alternative practices can help protect human health and the environment. Collaborative efforts between the government, industry, and communities are essential to achieve a sustainable and healthy future for all.

HEALTH CONCERNS ASSOCIATED WITH ENVIRONMENTAL POLLUTION

- *Respiratory Issues*: exposure to air pollution, especially fine particulate matter (PM_{2.5} and PM₁₀), can worsen and exacerbate respiration conditions along with allergies, chronic obstructive pulmonary sickness (COPD), and bronchitis [13] studies have shown a sturdy correlation between high ranges of air pollutants and increased health center admissions for respiratory illnesses.
- *Cardiovascular Diseases*: Air pollutants is a sizable danger aspect for cardiovascular sicknesses such as coronary heart assaults, strokes, and high blood pressure. pollutants along with NO₂ and PM can trigger inflammatory responses and oxidative stress, leading to cardiovascular troubles [14]. Long-term exposure to high stages of air pollution is related to a better incidence of cardiovascular mortality.
- *Neurological Effects*: Recent research has linked exposure to environmental pollutants with adverse neurological outcomes. Heavy metals, like lead and mercury as well as air pollutants like PM_{2.5}, have been implicated in cognitive decline, developmental disorders in children, and neurodegenerative diseases such as Alzheimer's and Parkinson's [15].
- *Cancer*: Positive environmental pollutants are acknowledged cancer agents. as an instance, extended publicity to asbestos fibers can cause lung cancer and mesothelioma, whilst benzene exposure is associated with leukemia. Water infected with arsenic can cause skin most cancers and bladder most cancers [16].
- *Reproductive and Developmental Issues*: Pollution along with phthalates, bisphenol A (BPA), and heavy metals can disrupt endocrine characteristic, main to reproductive fitness issues and developmental troubles in children. these chemicals can intervene with hormone regulation, ensuing in infertility, beginning defects, and developmental delays [17].

REGULATORY MEASURES AND PUBLIC AWARENESS FOR ENVIRONMENT POLLUTION

Efforts to combat environmental pollution and protect public health involve various international and national regulations. Key international agreements include the Paris Agreement, which aims to limit global warming, and the Stockholm Convention on Persistent Organic Pollutants (POPs) [18].

International

- *Treaties and Agreements:* International accords establish norms and regulations pertaining to the management of pollution. The Kyoto Protocol addresses climate change, the Montreal Protocol addresses ozone depletion, and MARPOL addresses ship pollution are a few examples.
- *International Organizations:* Organizations that supply scientific data, coordinate global environmental activities, and promote best practices include the United Nations Environment Programme (UNEP).
- *Trade Measures:* Countries may be encouraged to enact stronger rules by including environmental concerns in international trade agreements.

National

National regulations vary but generally include air quality standards, water quality standards, and soil contamination guidelines:

- *Environmental Laws and Regulations:* These establish national emission regulations, waste disposal guidelines, and pollution restrictions. For some projects, they could also demand environmental impact evaluations
- *Pollution Control Agencies:* In the US, governmental organizations, such as the Environmental Protection Agency (EPA), are responsible for issuing licenses, monitoring pollution levels, and enforcing environmental laws.
- *Economic Tools:* Companies can be encouraged to lessen their environmental effect by offering subsidies for clean technology or by imposing taxes on pollution.

ISO 14001 and Environmental Pollution

Organizations can play an important function with regards to the surroundings. they could accidentally damage it with various activities, including industrial methods, unsuitable waste disposal, excessive resource use, and forget about of environmental rules. To mitigate their effect and defend the surroundings, they must prioritize sustainability and responsible aid management.

The international agency for Standardization (ISO) posted the worldwide standard ISO 14001 about environmental management structures or EMS. Innovation could be implemented and sustained with the help of this standard. This way, the system is enhanced for firms that integrate their practices with ISO 14001 required procedures. While incorporation of more advanced waste disposal methods might be one of the goals for such enterprises whose attention is focused on environmental sustainability through ISO sustainability strategies.

Public Awareness and Community Action in Protecting Against Environmental Pollution

Environmental contamination is putting the health of our planet at greater risk, so we need to take a holistic approach. To create a wave of good change and improve public awareness, community involvement and technical advancements are just as crucial as regulations. Public awareness campaigns and community involvement are critical within the fight against environmental degradation. Public awareness campaigns can influence lifestyle changes and neighbourhood clean-up projects. They teach people about pollution sources and how they harm health. Communities can also set up monitoring programs to spot nearby pollution sources and help enforce laws. Programs to educate are crucial to enable citizens to act based on facts. People are teaching the public approximately diverse pollution, where they come from, and the way they affect ecosystems and human health.

CONCLUSIONS

Pollution in the environment poses major health threats requiring us to adopt multiple strategies that combine strict regulations public awareness campaigns, and grassroots initiatives. By grasping the sources of various pollutants and their health effects, we can develop practical solutions to minimize pollution's toll and safeguard people's health. To grow and maintain public health, we must reduce environmental pollution. Government companies, neighbourhoods, and citizens need to join forces to lower pollution and decrease its negative health impacts. By employing wide-ranging methods that

blend fresh approaches, learning, community involvement, and new laws, we can enhance everyone's life quality and build healthier communities.

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