

Review Article

IMPACT OF INDUSTRIAL POLLUTION ON OUR SOCIETY

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ABSTRACT: Industrial pollution is considered an important factor to contaminate the environment. It results in environmental degradation and imposes heavy costs on society as well as on human health and safety. Textile, cement, glass, plastic, sugar, tanning, petroleum are major polluting industries. Little or no attention is paid to this grave issue of industrial pollution. There is no systematic approach used by many industrial sectors for proper disposal and drainage of their harmful effluent. The industrial sector should be held accountable for their responsibilities towards proper management of waste effluent, as it contributes to about 50% of the environmental pollution. It creates great social costs in a developing country like Pakistan. Currently there is no effective management and controlled practices for pollution prevention and control, but authorities have started to pay attention in this regard. Pollution control has become the primary concern of the environment today. The objective of this paper is to explore the impact of environmental pollution on the environment and society. To develop an understanding of environmental degradation, the study discusses the various types of effluents that impact the environment adversely. Recommendations for alternative measures that can be helpful for controlling pollution.

Keywords: Industrial pollution, air, land, water, protection, industries, environment.

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INTRODUCTION

Due to rapid economic development, environmental pollution has escalated over the last few decades. It is mainly due to manufacturing and industrial sectors, which is the backbone of a country's economy. Statistics show that about 50% of pollution is due to industries and manufacturing units¹. The biotic and abiotic factors of the environment are severely affected due to industrial pollution. It also threatens the people's safety, their lives and wealth, and causes many interrelated social problems. Industrial pollution causes many changes in the environment like energy patterns, radiation, chemical and physical constituents of the environment. These factors alter water supply, which affect agricultural output directly or indirectly. It is necessary to consider industrial waste in order to lessen or eradicate pollution from the environment. Major industrial pollutants include chemical compounds, concrete, dirt, ammonia gas, nitrogen compounds, gravel, scrap metal, oil and heavy metals. It accounts for wide ranging environmental damages. It includes pollution (land, water, and air), noise control, and waste disposal, health, and safety aspects.

This irreversible destruction which includes waste production, degrading soil, water bodies pollution, is a serious challenge to the natural ecosystem and human health. There is a great need to create mass awareness for environmental degradation and its implications. Self-

monitoring and reporting system can make the industry owner held accountable for systematic reporting and monitoring and reporting of their environmental performance¹. There must be a basic monitoring system to implement environmental protection policies. The resulted data will help the government and its various regulating agencies to promote awareness on a national and global level to take actions or measures to reduce their pollution level.

The objective of this study is to evaluate the socio-economic impacts of industrial pollution and then recommending possible measures to face this overgrowing issue of pollution that are friendly to both human health and the environment. This paper will further explore industrialization in a developing country like Pakistan and its consequences on socio-economic degradation.

Developing countries like Pakistan have on the industrial sector but also cause a threat to the natural environment or loss of biodiversity. Industrial operations have adverse impacts on the ecosystem, environmental degradation which is the primary concern of a society today². Great efforts have been made to control the pollution but still, there needs a strong monitoring system and policy implementation procedures. Foreign investments, privatization in the industrial sector are expected to increase the efficiency of industries which also limit the adverse impacts of pollution.

Pakistan faces different environmental pollution

related to industries, our industrial sector not follow the safety standards and quality standards due to which country phases the adverse impact of pollution. NEQS limits not following in majority of the industries which impact oceanic life and as well as on our society.

MATERIALS AND METHODS

The article based on the qualitative and descriptive research approach for gathering and analyzing data. The data obtained for research purposes and review of the articles collected through secondary sources from published research papers, journals and the internet.

Industrial Sector in Pakistan: Pakistan's industrial sector consists of small, medium, and large units having new and old technology. Most industries situated in urban areas, include cities like Karachi, Lahore, Faisalabad, Multan. But there are no treatment facilities available in all these cities that are grossly responsible for environmental degradation². Following are some sub industrial sectors of Pakistan²:

- a) Textile
- b) Cement
- c) Pharmaceutical
- d) Leather
- e) Dyes and fibers
- f) Steel mills
- g) Mining industries
- h) Oil
- i) Paper
- j) Dairy
- k) Garments

There are some key factors that are said to be responsible for the environmental pollution which are; location, technology, level of operations, growth, and sector change. 80% of export-oriented industries are surgical, textile, carpets, sports and leathers. There is growing pollution due to industrial growth and urbanization. Large quantities of industrial waste paved their way to water bodies directly which results in water pollution and also has an adverse effect on the agricultural system of the country, which is a major contributor to the country's GDP. Oxides of sulphur, nitrogen, and carbon go on increasing day by day. It is all due to a lack of a proper monitoring system.

There are various industrial toxic chemicals that are produced and entered into our environment. The industrial sector produces 250-tonne carbon monoxide (CO), 162-tonne nitrogen oxides, 378 tonne oxides of sulphur, and other various chemicals of 3700 tonne, which includes cadmium, mercury, and other organic pollutants. Pakistan's environmental protection law and various agencies contribute to reducing the pollution levels in Pakistan³.

Social Impact of Industrial Pollution: The industrial

revolution also revolutionized the economy by creating various opportunities for the working class of people to earn their livelihood. The economic and social equality can be obtained through a better state of living due to industrialization. The working environment changes the style of people⁹. They begin to feel part of the economy. It revolutionized their thoughts. Where increasing industrial sector rises employment and productivity in the country where it also causes destruction to the environment socially and environmentally.

Major Industrial Pollutants: Due to the advancement of science and technology, the industrial revolution emerged. However, the industrial revolution has also generated industrial pollution. With the advancement in industrial sectors, pollution becomes an ever-growing phenomenon, which needs to be addressed on urgent basis. Industrial pollution not only affects biotic component but also a-biotic component of the environment. Both components are interdependent on each other and maintain a balance in the environment and this balance is lost due to pollution. Industries cause pollution due to certain reasons such as the burning of fossil fuels, like coal, oil and natural gas, chemicals used in tanning and dyeing industries.

Following are various causes of industrial pollution:

- a) There is a lack of policies and monitoring systems, which resulted in mass-scale pollution.
- b) Unplanned growth of industries also causes pollution.
- c) Old technology that is still in-use generates a large amount of waste.
- d) Lack of responsibility on the part of an individual sector or organization.
- e) A large number of small scale industries also aids in generating pollution.
- f) There are no proper methods for waste disposal. This inefficiency causes many chronic problems related to health and the environment.

There are two types of environmental issues that Pakistan is facing:

1. **Green nature issues:** Green nature issues include mainly rain-fed land, forests, irrigated agricultural system.
2. **Brown nature issues:** Brown nature problems include industrial pollution, domestic pollution, traffic pollution, air pollution, water pollution.

Environmental Damages Due to Industries: Most Pakistani industries that are located in major cities of Pakistan continuously polluting the water bodies such as streams, rivers, oceans without treating waste. It is openly added to these bodies or it gets accumulated on landfills. Major contaminants are heavy metals, fertilizers, cement, sugar, paper pulp, textile and chemicals harmful

industrial effluents that are not disposed of properly creates ecological imbalances and early deaths of humanity globally⁴.

Role of Industry in Air Pollution: The gaseous pollutants include Sulphur dioxide (SO₂), nitrogen dioxides (NO₂), ozone (O₃), carbon monoxide (CO), hydrogen sulfide (H₂S). These pollutants released from large industries like cement industry, power plant, manufacturing, smelters, and refineries⁴. These are the primary source of environmental damage and cause many respiratory disorders in human and can also vision impairment⁴.

Due to urbanization and industrialization and increasing demand for energy, the burning of fossil fuels and waste products in industries intensify this serious issue of air pollution. Certain units like cement, sugar, power plants release much amount of sulphur and nitrogen that are present in atmosphere in the form of various oxides of nitrogen, sulphur, and carbon. These oxides when combining with water resulting in acidic rain which also deteriorates soil, water, human-animal, and plant health as well². These air pollutants can directly or indirectly affect the plants or can cause acid raining which depletes the earth's crust. Various contaminants suspended in the air causes acid rain and settle down on the ground surface causes land and water pollution.

Smog: During the past decade, Pakistan is witnessing the serious issue of smog, particularly during winter. According to the World Health Organization, Pakistan has declared the second most polluted country in 2019⁴. Every year about 4.2 million people are dying as a result of exposure to air pollution worldwide⁴. The increasing growth rate in industrial sectors releases more oxides of harmful gases which are the main cause of smog and bring breathing comfort, respiratory disorders.

Role of Industry in Water Pollution: All industrial units release wastes (chemicals or solid materials) on open ground or water channels with minimal or no treatment. These effluents are highly toxic organic chemicals, inorganic salts, heavy metals and mineral acids. Water used as cleaning agents in industries is directly released out around industrial areas and populated cities. When these effluents enter certain water bodies like; lakes, rivers, oceans, the result is the pollution of water rendering it harmful and cause many environmental problems.

These effluents reduce the quantity of dissolved oxygen which affects the aquatic life and ecosystem. This polluted water damage soil, crops, plants, and animals and causes diseases in humans such as cancer, gastro, which affect kidneys, liver, and brain.

The industrial effluents also enhance the algal growth, which deteriorates the aesthetic quality of lakes and rivers². In Karachi, almost all industrial units release

their effluents directly to the sea without treatment, which contain heavy metal, toxic chemicals, solvents, radioactive materials which deteriorates the underwater storage leading to land pollution and has made the water unfit for drinking purpose¹¹. It has become a serious threat to overall human health. Similarly, industrial units in Lahore, Faisalabad and Multan directly or indirectly release their industrial chemicals to water bodies without treatment.

Role of Industry in Land Pollution: Industrial pollution is the biggest contributor to land and soil pollution and it is increasing by 2% every year⁴. It is typically caused by industrial activities and the processing of heavy metals like zinc, chromium, and lead, copper. There are no proper systems to treat these metal wastes and they are openly thrown out on land and water bodies. This improper disposal of waste material is a serious threat to soil pollution. The storage of toxic material in landfills has an adverse effect on soil. Soil pollution also pollutes underground water storage bodies. These effluents affect soil properties, change the PH of the soil, and make soil acidic or alkaline². Soil salinity is increasing. The use of bleaching agents and chlorination solvents is increasing day by day in these sectors. Acidic or alkaline soil indirectly affects the decomposition process and the nutrients cycle, and creates ecological imbalances.

Due to urbanization, there is no distinction between societal and residential areas and industrial areas. They are merged and industrial areas are situated now within the vicinity of residential areas which is certainly a threat to human health.

Land pollution has several negative impacts on humans and plants. Plants were grown in acidic or alkaline soil, accumulated in plant bodies and when these plants are eaten by animals, the accumulated salts pass on to the next affecting the entire food chain.

Percentage of Industrial Pollutants in Pakistan:

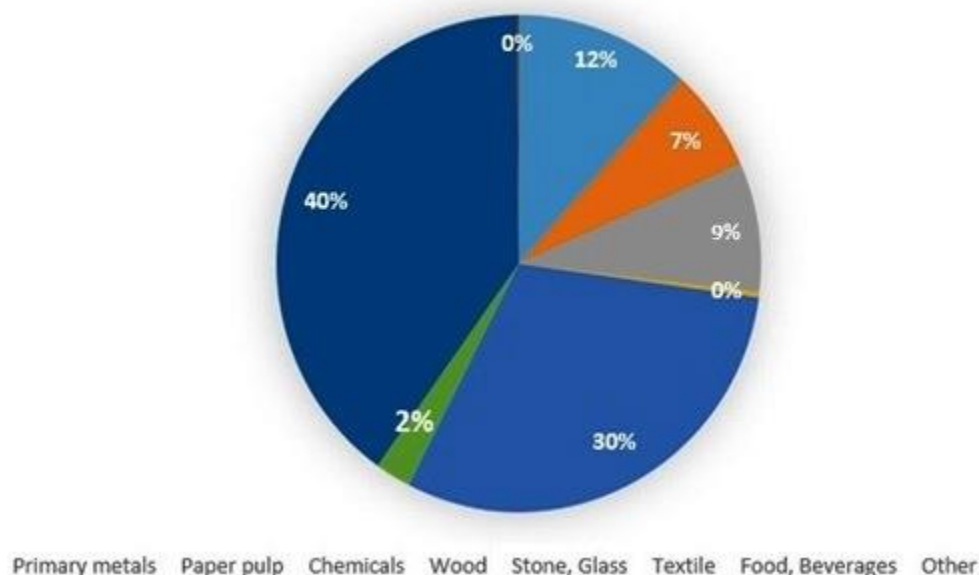
Regional or Global Environmental Concerns and Problems: Due to industrial pollution, various issues like global warming, ozone depletion, ocean and land pollution, natural resource degradation, rising sea level, poisoned air, and food contaminated with pesticides are serious threats regionally and globally. Human can solve these problems to some extent if they work collaboratively by recognizing their responsibilities towards society. There are various challenges for it, so there is a great need to work for a cleaner and healthier environment⁸.

In the 21st century political change, rising economy, advancement in science and technology has reshaped the world⁴. Overpopulation has created an unending demand for food, shelter, energy, and cloth. It is not merely the problem of only a single country. Many are held responsible for it and they all have to work for it.

Climate Change: It is a broader term used for overall changes that are happening in the environment on a continuous basis. We can say that global warming, a threat to biodiversity, ozone depletion, comes under the

umbrella term of climate change. Pakistan is facing many abnormal climate changes today. Every such single factor is a contributor to climatic changes at regional or global level⁴.

Percentage of Industrial Pollutants in Pakistan



Global Warming: Major changes in weather patterns due to ever-growing heat in the environment causing global warming. Human activities are altering the climate. The burning of oil, fossil fuels are increasing day by day and the result is global warming and the greenhouse effect. Radiation passing down to earth due to this phenomenon results in various diseases in humans and animals along with major changes in tropical regions including rising sea level, and change in weather pattern⁴.

Loss of Biodiversity: Loss of biodiversity is a major consequence of removing forests for human activities, rapid growth in population, urbanization, and land pollution. Another contributing factor to the loss of biodiversity is deforestation for potential gains such as for getting timber, agricultural products, and pharmaceutical products⁶. Loss of biodiversity is mainly due to deforestation. A number of species have gone extinct and endangered due to soil erosion and loss of natural habitat.

Ozone Depletion: Ozone layer that surrounds the globe and protects the life on earth from ultraviolet rays of the sun. This layer is beneficial to human life. But due to pollution, it gets depleted. Its depletion enables ultraviolet rays from the sun to reach earth that cause various skin diseases in human and animals. It disturbs the food chain; change climatic conditions such as wind patterns. Asian and Pacific regions are affected greatly⁸.

Urban Growth: Due to overpopulation and industrial growth, people fled to cities for employment. Increasing demand for shelter and food results in migration of people from rural to urban areas which cause cities to overcrowded, noisy, and polluted.

Poverty and Population Growth: It also contributes to environmental degradation, which results in soil degradation, marine and coastal damage, and industrial and environmental pollution. Overpopulation of humans requires construction and infrastructure for their living, which results in land pollution and industrial pollution⁴.

Environmental Impact of Industrial Operations: All three natural environmental components air, land, and water are severely affected due to various industrial operations. It has an adverse impact on biotic (humans animals, plants, microorganisms) and a-biotic (air, water, land, soil) components of the environment. Untreated industrial effluents cause serious degradation of the environment. Residential areas in urban cities are also affected badly due to increasing pollution. Because of the harmful impacts of industrial operation, society as well as the economy has to pay heavy costs³. It is evident from various reports that industrial effluents account for major portion of environmental degradation. Industrial sectors in various cities of Pakistan have no governmental assistance for growth and infrastructure to development.

These industries are situated within residential cities and use domestic sewage systems for releasing harmful effluents. The important industrial sector includes cloth weaving and processing, garments, iron foundries, glass, plastic, metallurgical products, cement, and paper pulp². All these are within municipal limits and cause great havoc to cities.

Environmental Harm of Tanning Operations: Tannery operations in industries inflict a heavy cost on society. Human skin is suffering badly due to these operations. Tannery industries are responsible for surface water pollution. Various respiratory problems, nervous disorders are the main health concerns due to these effluents of tannery activities. Bad odor is another important factor contributing to environmental pollution.

Various effluents like hydrogen sulfide, carbon monoxide, and carbon dioxide are the main environmental hazards. All these factors have an adverse impact on the quality of surrounding areas and productivity of fertile land. Tannery effluents contain 3.5 to 7 % of solid content⁶. Chromium is a very harmful effluent of this sector. Another side effect is a bad odor to contaminate the air.

Environmental Impact of Paper Pulp Operations: Toxic chemicals, which are applied in pulp operations, seriously affect the environment. Surface water pollution is another big challenge due to pulp operations, which severely affects the aquatic life. The soil erosion reduces the productivity of land. Water pollution due to paper and pulp industries is increasing the toxicity level of surface water and soil⁷. Various skin-related problems, children's respiratory issues, diarrhea and stomach issues, waterborne diseases are some major problems created by these pulp industries.

Impact of Fertilizer Operations: The most harmful impact of fertilizer operation is inland water pollution. Due to untreated effluents, the surface water becomes polluted, which causes various diseases in humans as well as in animals. Soil pH, land fertility or productivity, water pollution, land pollution, acid rain is some major environmental hazards⁴. The various chemical used in making fertilizer products can deplete the fertility of the soil, quality of soil, alkaline nature of the soil, and also pollute water bodies.

Impact of Textile Operations: Various bleaching and dyeing chemicals, which are used in textile industries cause diseases in humans related to the eye and skin. Many skin irritant constituents are used in textile operations. The effluents, which are generated by textile industries, contain solid materials, dyeing and bleaching agents, acidic waste, chemicals like chromium, chlorine, which results in serious health issues in humans⁴. These effluents seriously affect aquatic life and land, contaminated water resources, and produce many health

hazards. Major effluents have chlorine. Brine and mercury penetrate into water bodies. These effluents drained into the sewage system. Organic matter, grease, and heavy metals are also major harmful effluents of this sector.

Impact of Cement Plant Operations: The human respiratory system is mainly affected by cement plant operations. Other diseases include water-borne diseases, such as diarrhea, stomach issues, and skin issues. The respiratory system is adversely affected due to dust generated by metallurgical operations. The greenhouse effect is also increasing due to emissions of effluents released by these operations¹⁰. Other areas affected by these effluents are land erosion, the salinity of grazing land, fertility of agricultural land, acid rain, water pollution, and poisonous gasses.

All the above-mentioned harmful effluents are mostly responsible for the huge social costs to the environment. According to the World Health Organization, about 70% of all diseases are due to water pollution¹. The pollution generated by various industrial sectors has been increasing day by day in the developing countries. The situation related to pollution is more complex as these countries are less advanced.

Environmental Protection in Pakistan: In the developing countries like Pakistan, laws are unfortunately not able to address the grave environmental problems. Pakistan lacks appropriate laws for effective control of the industrial pollution. Some constraints to the effective protection of the environment include⁶;

- a) Governmental and political instability
- b) Economic recession
- c) Lack of awareness
- d) Lack of individual responsibility on the part of industries
- e) Lack of administration
- f) Weak reporting and information system related to environment and environmental management plans
- g) Lack of corporate social responsibility
- h) Lack of enforcement of rules and policies.

Pakistan's industrial environmental concerns are not only increasing rapidly but also have a significant and worsening impact on human health and life. Effective environmental protection policies and control measures have a significant impact on industries and their attempt to reduce the potential environmental problems. Environmental assessment projects at each level must be designed to ensure the conservation of natural resources. A regulatory authority must command and address all the issues for all the industrial sector projects. Environmental protection agencies have outdated method rather than an effective plan to implement.

The Environmental Protection Ordinance: The main

aim of this legislation is to provide control measures for pollution and preservation of the environment. Following are some key factors of the ordinance:

- a) The establishment of the effective environment protection council to ensure the enforcement of quality standards of the environment.
- b) The enforcement of the Federal Environmental Protection Agency (FEPA) which performs various functions to the enforcement of quality standard and protection policy.

Pakistan Environment Protection Act: This act enforces the conservation, protection, and improvement policies in the environment.

Self-Monitoring and Reporting System: It takes into account the individual industry effluents and level of emission. It makes industrial cooperate and held responsible for their systematic monitoring and appreciate their effort to make long-term environmentally friendly policies and strategies⁶.

Environmental Policies Initiatives: There are two major initiatives under this policy:

- a) The Pakistan National Conservational Strategy (NCS)⁶
- b) Environmental Planning and Resource Conservation Protection (EPRCP)⁶

The objectives of these initiatives are to ensure natural resource preservation and strengthening environmental protection programs. These initiatives focus on the management of natural resources and creating public awareness about environmental concerns.

Pakistan's Policy Response to Environment: The main goals of this policy response are the following:

- a) To formulate the action plan for preserving natural resources.
- b) Development of monitoring cells at each level of planning.
- c) Enforcement of Pakistan's environmental protection laws and policies.
- d) Implementation of World Bank environmental supported planning, Implementing policies that are directly related to resource conservation.
- e) Monitoring of command and control practices
- f) Rehabilitation policies of the natural environment.

An International Comparison of Industrial Growth and Pollution: There are certain factors that contribute to industrial development such as sector-wise change, use of latest technology, level of operation, and growth rate. On the basis of these factors, environmental impact can be compared to other Asian countries. In recent years industrial output increases two folds, which increases the environmental deterioration. According to the survey report, total output has increased from 18.3 to 27.2%

during 1976-86 from most polluting industries of Pakistan³. In India, sector wise growth has also increased by 30%. During 1970-74 in India, the more polluting industries have lower output³. Within technological advancement and sector wise growth, the level of pollution has also been increased with respect to other Asian countries.

SUGGESTIONS

Suggestions for Controlled Practices: A lot of attention is needed to be paid to industrial pollution. The industrial sector is both, the major consumer and major polluting agent of natural resources. So, there are also some responsibilities imposed on the industrial sector and the government to make contingency plans related to environmental issues. In this regards collective efforts should be made to preserve the environment and all-natural resources.

Strengthening the Monitoring and Regulatory System: Currently, there are not effective monitoring policies. Some important are given below to consider:

- a) Improving management and administration.
- b) Strengthen the monitoring policies and plans for industries.
- c) Updating to existing physical infrastructure.
- d) Ensuring of effective implementation of policies.
- e) Government assistance to financial constraints for each industry for proper disposal system of industries.

Training of Small Industrial Sectors: In Pakistan, no attention is paid to formal training and management of small and medium industrial sectors. There is a need to develop such training policies in this regard for cleaner and pollution-free production and environmental pollution control plans.

Strengthening Local Domains: Strengthening local government is another important factor that can help to control pollution. Decentralization of authority at the local domain can help in taking corrective steps to develop environmental performances. Local government can set performance criteria for limiting the amount of industrial pollution. By implementing SEPA regulations strictly for each industry around Pakistan to insure controlled emission of gases and effluent. Controlling NEQS (National Environmental Quality Standards) limits is also one of the tools to use for the controlled environment.

Environmental policy also presents the following recommendations:

- a) Regulatory system should be strengthening.
- b) Effective control and monitoring system must be ensured.
- c) Training and management policies for industry

- owners and workforce.
- d) Strengthening of environmental protection policies.
 - e) Establishment of wastewater and solid waste management system
 - f) Green belt must be created through plants.
 - g) Awareness campaigns must be established among workers.
 - h) Better drainage and disposal system must be established.
 - i) Devising a strategy for uniform control and reporting system
 - j) Awareness training of human resources.
 - k) Providing knowledge and effluents treatment facilities to control pollution
 - l) A comprehensive program for implementing environmental regulation
 - m) Integrated environmental infrastructure for better management of industrial waste.
 - n) Stimulate corporate responsibility for preserving natural resources.

DISCUSSION

The study focuses on various industrial solution impacts on the environment and society. Heavy duties are imposed on an industrial sector to reduce their industrial effluents that pollute the environment day by day. The study found that in our society there is no formal management and administration system to recall this issue yet. As the industrial sector is the major consumer of natural resources, but this sector is also a major pollutant factor of the environment. Industries have environmental responsibilities to certain contexts such as their level of operations, production techniques, plant sites, location, noise and waste control, disposal system, drainage system, safety, and health concerns.

A lot of attention is needed to be paid to all these factors. It is a major threat to both developed and underdeveloped countries. The need for pollution control practices became apparent due to dynamic environmental conditions now a day. Global warming, greenhouse effect, gradual shifts of seasonal change are a serious threat to the world today. Results of the study show that industrial harmful effluents have an adverse impact on the environment and socio-environmental condition as well as it has become a threat to human health and safety. Furthermore, there are no effective management and administration in taking effective control practices to form a government. Lack of responsibility is another factor that plays a major role in this regard. The study also suggests some corrective measures that are crucial to understanding. Government, society, and the industrial sector need to work collaboratively to take initiative and corrective steps in pollution control and saving the environment.

Conclusion: Industrial pollution has an adverse impact on environmental biotic and a-biotic factors. Due to the presence of harmful chemicals and pollutants, it contaminates all the natural resources air water, and soil. When these pollutants and harmful chemical come in contact with humans, various health-related issues are created such as respiratory, nervous, digestive disorders. There is an urgent need for the awareness of pollution and a uniform management and administration system in Pakistan to address this issue. Policymakers and environmental protection agencies need to pay attention to this grave issue and must save the country from the harmful effects of pollution.

The findings of the study provide information to implement such policies and practices that can preserve the environment from harmful hazards. Regulatory bodies must show their concern and response to the harmful impact of the industrial sector. They need to implement such control measures and practices that uncover the huge loss of the environment and society due to industrial pollution. It should make clear and apparent to industries and societies that our aim must not be short-term social gain or benefit but a commitment to a safe and secure environment for the next generation.

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