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Review Article

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The Cost of Pollution: Environmental and Health Impacts

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Abstract

*This article explores the complex array of effects resulting from pollution, analysing its environmental, health, and economic implications. It highlights the pressing need for comprehensive measures to tackle the worldwide issue of air, water, and soil pollution. The environmental consequences, characterised by disturbances in ecosystems and alterations in climatic patterns, are linked with widespread health implications, notably impacting groups who are more susceptible. The economic impact is considerable, placing a heavy load on healthcare systems and requiring huge expenditures in mitigation. Over 50 pieces of literature were initially examined concerning cost of pollution, 17 selected work were incorporated into the comprehensive review. Results shows that more than 50% of premature deaths of children under 5years are caused by pollution, 3.8 million deaths annually arises from non communicable diseases. However, there have been advancements in regulatory frameworks, the issue of enforcement and compliance continues to pose significant obstacles. The article posits potential remedies, calling for the implementation of sustainable practises, the enforcement of severe rules, and the provision of incentives to encourage companies to embrace cleaner technology. In essence, this statement functions as a persuasive appeal, underscoring the need of addressing the financial burden of pollution and ensuring the protection of the Earth for future generations.*

**Keywords:** Cost, Pollution, Air, Water, Land, Environmental Impact, Health Impact

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Introduction

In the constant quest of development and industrialization, mankind has unintentionally created an intricate web of environmental and health issues. The major issue at hand is on the widespread and harmful existence of pollution, an omnipresent and covert phenomenon that surpasses territorial limits, affecting both ecosystems and human welfare at a worldwide level

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(Guo et al., 2017). This article aims to explore the complex array of repercussions resulting from pollution, with a specific emphasis on its two interconnected aspects: environmental deterioration and the significant impact it has on human health.

In the context of rapid economic growth and technological progress, our ecosystems are facing significant challenges due to elevated levels of pollution. This includes the presence of harmful gases in the atmosphere, the infiltration of contaminants in water bodies, and the gradual deterioration of soil quality. The ramifications of this pervasive pollution are many and diverse, beyond the evident visual indicators of hazy urban horizons and tainted waterways (WHO, 2020).

Concurrently, with the pervasive presence of pollution in our surroundings, there is a growing awareness of its detrimental effects on human health. The detrimental effects on human health range from acute respiratory discomfort resulting from the inhalation of polluted air to the hidden dangers present in contaminated water supplies. This study aims to explore the complex mechanisms via which pollution emerges as a covert aggressor, disproportionately impacting marginalised communities and imposing a significant burden on public health.

As the researchers start their investigation into the economic implications of pollution, it is crucial to acknowledge that this issue extends beyond ecological concerns. It represents a multifaceted intersection of environmental deterioration and human hardship. The need to tackle this matter is emphasised by the interconnected aspects of economic consequences, healthcare costs, and the need to protect the fragile equilibrium of our ecosystems. It is important to have a thorough understanding of the interrelationships among these components in order to devise efficacious strategies and policies that address the economic burden of pollution and facilitate the transition towards a sustainable and improved future.

### **Concept of Pollution**

Pollution is an adverse outcome resulting from human actions that disturb the intricate equilibrium of the natural environment, hence causing a lasting impact on the ecosystems of the Earth. The phenomenon involves the entry of detrimental chemicals or pollutants into the atmosphere, hydrosphere, and lithosphere, resulting in detrimental consequences for the intricate interconnectedness of life that upholds our planet (Moore, 2009).

Within the domain of air pollution, human activities emit a diverse range of contaminants into the atmosphere, therefore modifying its composition and overall quality. The process of burning fossil fuels, the release of pollutants from industrial activities, and the emissions from vehicles result in the discharge of various pollutants such as carbon dioxide, sulphur dioxide, and nitrogen oxides. These harmful substances not only contaminate the atmospheric

composition but also play a significant role in exacerbating the concerning phenomenon of climate change, therefore contributing to the dynamic nature of the global atmosphere (USGCRP, 2009).

Water pollution, an additional aspect of this complex environmental issue, emerges as a result of the release of contaminants into aquatic ecosystems. Industrial effluents, agricultural runoff containing pesticides and fertilisers, and untreated sewage permeate water bodies such as rivers, lakes, and seas, resulting in the contamination of aquatic environments. The consequences have a broader impact that extends beyond the realm of marine life, permeating our sources of drinking water and posing a threat to the well-being of both aquatic ecosystems and human populations.

Land pollution, a sometimes overlooked but equally consequential issue, arises as a consequence of the deposition of harmful compounds into the Earth's crust. The soil is adversely impacted by the presence of industrial waste, inadequate chemical disposal methods, and agricultural practises that include the excessive use of synthetic fertilisers. These factors contribute to soil contamination, which in turn leads to diminished fertility and compromised plant health. The repercussions propagate across the ecological food web, presenting risks to both plant and animal life, and eventually, to human welfare (Eze et al., 2014).

The notion of pollution extends beyond its environmental implications, since it poses a direct threat to public health. The presence of a combination of harmful substances in the atmosphere leads to the contamination of air, resulting in the development of respiratory disorders and the worsening of pre-existing illnesses such as asthma. The presence of contaminants in water leads to the emergence of waterborne diseases, resulting in the widespread transmission of illnesses without facing consequences. The association between prolonged exposure to pollutants and a range of health conditions, including cancer and developmental abnormalities, has been shown, therefore significantly impacting the overall health and welfare of present and forthcoming populations.

Pollution epitomises the harsh truth of the unforeseen repercussions of contemporary lifestyles. The stealthy invader in question poses a significant threat to the fundamental structures of the ecosystems that support and maintain life. Comprehending and mitigating the phenomenon of pollution is not just an environmental need, but also a shared obligation aimed at safeguarding the Earth for its diverse array of living forms. It necessitates a state of peaceful cohabitation with the natural environment, whereby human endeavours align with the intricate orchestration of the Earth (Manisalidis et al., 2020).

## **Environmental Impacts of Pollution**

### **Air Pollution**

Air pollution arises from a multitude of origins, mostly anthropogenic activities such as industrial operations, emissions from vehicles, and the combustion of fossil fuels. Industrial facilities emit various pollutants into the atmosphere, such as particulate matter, nitrogen oxides, and volatile organic compounds. Moreover, transportation networks provide a substantial contribution to environmental pollution by means of the burning of petrol and diesel fuels. Agricultural practises, including the use of certain fertilisers, are known to emit pollutants into the atmosphere (Manisalidis et al., 2020). Comprehending the many origins of air pollution is vital in formulating efficacious solutions to alleviate this environmental issue.

The ramifications of air pollution transcend localised regions, exerting influence on the whole of the atmosphere. Increased concentrations of pollutants may result in the creation of smog and acid rain, so detrimentally impacting the quality of the air. Upon their discharge into the atmosphere, these pollutants engage in intricate chemical interactions, resulting in the formation of secondary pollutants that provide more complications. The depletion of the ozone layer, which serves a crucial function in safeguarding life on Earth from detrimental UV radiation, may occur as a result of certain atmospheric pollutants. This depletion presents significant risks to both human well-being and ecological systems (Marlon et al., 2019).

The relationship between air pollution and climate change is complex, since air pollution plays a significant role in the modification of global climatic patterns. The emission of greenhouse gases, such as carbon dioxide and methane, into the Earth's atmosphere due to human activity, results in the entrapment of thermal energy and subsequently contributes to global warming. The greenhouse effect, a well recognised phenomenon, plays a crucial role in driving climate change. The combustion of fossil fuels, which serves as a significant contributor to atmospheric pollutants, not only deteriorates the overall air quality but also exacerbates the existing difficulties linked to increasing temperatures, modified precipitation patterns, and heightened occurrences of severe weather phenomena (Kelishadi and Poursafa 2010). Therefore, the mitigation of air pollution is crucial in addressing the wider consequences of climate change.

### **Water Pollution**

Water contamination is a significant environmental concern characterised by complex origins, stemming from many sources and contributors. The main contributors to water pollution are industrial discharges, agricultural runoff, and untreated sewage, which introduce a variety of contaminants, including heavy metals, chemicals, and nutrients, into aquatic environments. Water contamination has significant and extensive impacts on aquatic ecosystems. Increased concentrations of pollutants may disturb the intricate equilibrium of aquatic ecosystems, resulting in the reduction of oxygen levels, modification of water temperature, and deterioration of habitat conditions (Lin et al., 2022). The alterations in question may result in

significant ramifications for aquatic creatures, including fish, invertebrates, and plants, so posing a threat to their existence and the total variety of the ecosystem.

Furthermore, the detrimental impact of water pollution is exacerbated by its ability to adversely affect human populations via the ingestion of polluted water. The presence of contaminants in drinking water sources may give rise to significant health hazards, hence impacting persons who depend on these sources for their daily water requirements. Waterborne infections, such as cholera and dysentery, have the potential to propagate, resulting in a significant prevalence of sickness and, in some instances, mortality.

The ramifications of water contamination on human well-being extend beyond just immediate health consequences (Lin et al., 2022). Communities that rely on contaminated water supplies may also have economic challenges as a result of escalated healthcare expenses, diminished labour efficiency, and the need for water treatment initiatives. Therefore, it is vital to examine the origins and outcomes of water pollution, as it not only has ecological implications but also plays a critical role in protecting the welfare of aquatic ecosystems and human communities.

### **Land Pollution**

Pollution of the land is a significant environmental concern that is mostly caused by industrial and agricultural practises. The extensive tracts of land have become repositories for many contaminants, resulting in detrimental effects on the ecosystems they sustain and the agricultural activities carried out on them. The release of dangerous chemicals, untreated effluents, and solid waste from industries and agriculture makes a substantial contribution to land contamination. Industrial activities often result in the emission of contaminants, including heavy metals, chemicals, and non-biodegradable substances, into the surrounding soil. Likewise, agricultural methodologies include the utilisation of fertilisers, insecticides, and herbicides, which possess the potential to induce soil contamination as time progresses.

The presence of land pollution has a negative impact on the plant and animal life that relies on the affected regions. The introduction of deleterious compounds into the soil disturbs the inherent equilibrium, resulting in the loss of soil fertility and the reduction of plant biodiversity. Animals, in a reciprocal manner, encounter the repercussions when they consume tainted flora or water sources, resulting in adverse health effects and, in some instances, placing them at risk of being endangered or becoming extinct (WHO, 2020).

The consequences of land contamination have far-reaching implications for the agricultural sector, presenting enduring challenges to the stability of food supply. The presence of contaminated soil poses a hindrance to the development of crops and diminishes agricultural production. The continuous use of chemical inputs in agricultural practises is a significant

factor in the deterioration of soil quality, posing a growing obstacle for farmers in their efforts to maintain sustainable and productive agricultural systems (Hashim and Boffeta 2014). Therefore, the ongoing cycle of pollution may result in lasting ramifications for the land's capacity to facilitate the growth of vital crops and maintain sustainable agricultural practises over an extended period of time. The mitigation of land pollution necessitates a comprehensive strategy that comprises the implementation of responsible waste management practises within industry, the adoption of sustainable farming methods, and the establishment of legislative frameworks aimed at restricting the release of detrimental compounds into the soil. The maintenance of soil health is of paramount importance, as it plays a vital role in supporting ecosystem integrity and guaranteeing the long-term sustainability of agricultural practises that provide sustenance for human societies.

### **Health Impacts of Pollution**

Air pollution is mostly caused by the release of emissions from cars, industrial activities, and the burning of fossil fuels, resulting in the introduction of a diverse range of airborne contaminants into the atmosphere (Kan et al., 2012). The presence of pollutants such as particulate matter, nitrogen oxides, and volatile organic compounds may have a substantial negative impact on respiratory health (Guo et al., 2017). The occurrence of respiratory disorders such as asthma, bronchitis, and chronic obstructive pulmonary disease (COPD) is strongly associated with exposure to pollution. Specific demographic cohorts exhibit heightened susceptibility to the deleterious impacts of air pollution. Certain demographic groups, including children, the elderly, and persons with pre-existing respiratory disorders, are exposed to increased vulnerabilities. The susceptibility of youngsters to long-term harm is attributed to the ongoing development of their respiratory systems, while the greater sensitivity of the elderly may be attributed to the weaker state of their immune systems. Individuals who have pre-existing respiratory conditions, such as asthma patients, may encounter intensified symptoms when exposed to heightened levels of air pollution (Hashim and Boffetta 2014).

The contamination of drinking water sources is a consequence of water pollution, which is mostly caused by industrial discharges, agricultural runoff, and insufficient waste management practises. The infiltration of water resources by pathogens, pollutants, and heavy metals presents substantial health hazards to communities who depend on these sources for consumption. The consumption of water that has been polluted may result in the development of many waterborne illnesses, such as gastrointestinal infections, cholera, and dysentery. Waterborne infections have consequences that go beyond individual instances, affecting whole communities via widespread epidemics. Contaminated water sources act as carriers for the fast dissemination of diseases, particularly in regions where there is restricted availability of hygienic water and sanitation infrastructure. Populations residing in developing countries

have a disproportionate impact, characterised by heightened occurrences of waterborne infections as a consequence of inadequate infrastructure and inequities in resources.

The occurrence of serious health disorders, such as cancer and chronic illnesses, has been linked to prolonged exposure to environmental toxins. The presence of carcinogenic chemicals in the atmosphere, hydrosphere, and lithosphere plays a significant role in the onset and advancement of many types of malignancies (Eze et al., 2014). Moreover, prolonged exposure to certain pollutants has been associated with the initiation of cardiovascular illnesses, neurological problems, and other enduring health complications. The presence of environmental contaminants has been shown to have adverse impacts on both reproductive health and foetal development. The potential consequences of prenatal exposure to pollutants include a range of adverse outcomes, including but not limited to birth abnormalities, preterm births, and developmental delays. In addition, the presence of endocrine-disrupting substances in the environment might disrupt the delicate hormonal equilibrium, hence exacerbating reproductive complications and presenting potential hazards to the well-being of subsequent generations (Burden of Disease from Ambient and Household Air Pollution, accessed, 2023).

### **Economic Costs of Pollution**

The extensive influence of pollution on the well-being of the general population leads to a substantial economic strain on healthcare systems. The expenses linked to the identification and management of illnesses caused by pollution, including respiratory disorders as well as persistent chronic problems, provide a significant contribution to the total healthcare outlays. In addition to the explicit monetary costs associated with medical treatments, the adverse health effects resulting from pollution have a detrimental impact on the overall productivity of the workforce. The combination of absenteeism, reduced job performance, and heightened disability claims all impose a significant fiscal burden on firms and the whole economy (Manisalidis et al., 2020).

The presence of pollution requires substantial endeavours in the remediation and restoration of impacted ecosystems. The allocation of financial resources necessary for the remediation of air, water, and soil pollution hotspots, together with the rehabilitation of ecosystems affected by pollutants, represents a significant share of both public and private expenditures. Various industries, particularly those that contribute to environmental contamination, have significant economic consequences. Industries often find themselves compelled to allocate resources towards innovative technologies and processes due to the presence of rigorous rules and the need of compliance, resulting in supplementary financial burdens. In addition, occurrences associated with pollution may give rise to legal obligations, financial penalties, and harm to the standing of corporations, so exerting further influence on the economic sustainability of

enterprises engaged in polluting activities (Kelishadi and Poursafa 2010). The larger economic ramifications include employment declines, diminished competitiveness, and stressed economic sectors that are intimately interconnected with the polluting industries. The consideration of environmental issues is not just a matter of ethics, but also a prudent decision for ensuring long-term economic viability.

### **Policy and Regulatory Framework in Nigeria**

Nigeria has implemented a comprehensive framework of national standards aimed at effectively regulating and overseeing pollution, including concerns pertaining to the quality of air, water, and soil. The purpose of these guidelines is to protect the environment and promote public health by establishing acceptable thresholds for certain contaminants. The regulatory framework contains a set of norms that pertain to various sectors, transportation systems, and waste disposal practises. Its primary objective is to maintain a harmonious equilibrium between economic activity and the preservation of the environment. Furthermore, Nigeria has been a party to many international accords that are designed to tackle worldwide environmental issues, in addition to adhering to national norms (Ogunkan, 2022). These accords include obligations to mitigate greenhouse gas emissions, save biodiversity, and address trans-boundary pollution. Through its active engagement in these agreements, Nigeria exhibits a profound commitment to the promotion of global environmental sustainability, while also recognising the inherent interdependence of environmental issues (Bulkeley and Mol 2003).

Nigeria has notable difficulties in the efficient implementation and enforcement of environmental legislation, despite the presence of legal structures. Enforcement agencies may have limitations in resources, such as inadequate personnel and financial support. Furthermore, it is worth noting that there may exist discrepancies in the coordination efforts across various regulatory entities, resulting in incongruities in the oversight and implementation of regulations. The legal system may also exhibit deficiencies and uncertainties that impede the successful prosecution of environmental infractions (Ogunkan, 2022).

Acknowledging the existing difficulties, there are prospects for enhancing the enforcement and compliance systems in Nigeria. Enhancing institutional capacity is of utmost importance via the allocation of additional financial resources and provision of comprehensive training programmes for enforcement agencies. Improved coordination among regulatory agencies and increased engagement with other stakeholders, such as industry and communities, may facilitate the integration of activities and foster a more holistic approach to achieving environmental compliance (Akamabe and Kpae 2017). Furthermore, the act of examining and revising current laws in order to fill in any loopholes and improve comprehensibility would

serve to strengthen and optimise the regulatory system. Public awareness campaigns and education programmes are significant in promoting a culture of environmental stewardship and fostering compliance among companies and the general population. By implementing these steps, Nigeria has the potential to strengthen its regulatory capability and effectively harmonise its policies with sustainable environmental practises.

### **Implications for Nursing Practice**

The field of nursing is greatly influenced by the wide-ranging effects of pollution on both the natural environment and the well-being of the general population. Within the domain of environmental health, nurses assume a crucial role in mitigating the consequences of pollution. Due to the inherent interdependence between environmental variables and health outcomes, it is imperative for nurses to actively support and advocate for policies that effectively address pollution and foster sustainable practises.

Air pollution is a significant issue that has direct ramifications for the field of nursing, especially in regions characterised by elevated levels of pollution. It is important for nurses to possess comprehensive knowledge in the identification of respiratory symptoms linked to air pollution, comprehension of groups who are particularly susceptible, and the delivery of appropriate healthcare interventions. Furthermore, it is important for nurses to actively participate in community education initiatives aimed at increasing public knowledge of the detrimental health implications associated with air pollution (Kan et al., 2012; Lin et al., 2022). Additionally, nurses should lobby for the implementation of more stringent air quality regulations to ensure cleaner air for the general population.

The presence of waterborne infections caused by pollution imposes an extra workload on nursing staff. It is important for nurses to possess the necessary skills and knowledge to effectively recognise indications of waterborne diseases, provide education to communities on proper water safety practises, and engage in collaborative efforts with other healthcare practitioners to tackle the underlying factors contributing to water contamination. In areas where there is limited access to uncontaminated water, nurses may assume a prominent role in implementing preventative strategies and engaging in health promotion initiatives.

The proactive management of pollution in nursing practise is crucial due to its association with long-term health consequences, such as an increased susceptibility to cancer and chronic illnesses. Nurses has the capacity to make valuable contributions via the integration of environmental health education into patient care, prioritising lifestyle adjustments aimed at minimising exposure, and actively lobbying for comprehensive healthcare policies that effectively target the underlying causes of health problems associated with pollution.

From an economic perspective, the presence of pollution leads to a rise in healthcare expenditures, hence imposing extra pressure on healthcare systems (Hou et al., 2010). It is essential for nurses to actively engage in healthcare cost management strategies, advocating for the adoption of preventive care measures in order to mitigate the enduring financial consequences associated with illnesses caused by pollution. Furthermore, individuals have the capacity to actively support and promote policies that place a higher emphasis on the preservation of environmental well-being, therefore mitigating the financial strain on healthcare establishments.

In summary, the ramifications for nursing practise within the realm of pollution are diverse and complex. Nurses have a crucial role in identifying, managing, and mitigating the health consequences of pollution, both on an individual and societal scale. Nurses may make a substantial contribution to addressing the wider social consequences of pollution by incorporating environmental health issues into their professional practise.

### **Recommendations**

In order to effectively tackle the complex issues presented by pollution, it is essential to adopt a comprehensive and well-coordinated strategy. First and foremost, it is crucial to enhance and implement existing environmental legislation at both domestic and global scales. This encompasses the implementation of thorough surveillance of industrial emissions, the establishment of severe criteria for pollutant concentrations in both air and water, and the prompt enforcement of sanctions for any instances of non-compliance.

Moreover, it is essential to take a proactive approach in order to provide incentives for companies to embrace sustainable and environmentally-friendly practises. It is advisable for governments to contemplate the provision of tax incentives, grants, and subsidies to enterprises that engage in the adoption of environmentally-friendly technology and the implementation of measures aimed at mitigating pollution. The establishment of partnerships between public and commercial sectors has the potential to facilitate the development of innovative solutions and expedite the implementation of environmentally sustainable practises.

Education and awareness initiatives play a crucial role in the implementation of pollution reduction strategies. Efforts focused on disseminating information to the general public on the adverse health implications linked to pollution, as well as fostering the adoption of conscientious consumption patterns, have the potential to foster a society that is more educated and ecologically aware. It is essential for governments, non-governmental organisations (NGOs), and the corporate sector to collaborate in order to effectively execute comprehensive educational initiatives. Moreover, the promotion of international collaboration

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is of paramount importance. The issue of pollution transcends geographical boundaries, necessitating a collective international effort to address it. It is essential for nations to engage in collaborative research endeavours, exchange knowledge on optimal approaches, and jointly strive to mitigate the adverse effects of pollution that transcend national borders.

The prioritisation of investment in research and development of green technology is crucial. It is essential for governments to dedicate financial resources towards the implementation of novel strategies aimed at mitigating pollution at its origin and facilitating the restoration of contaminated landscapes. This includes progress in the field of renewable energy, innovations in waste management systems, and the adoption of sustainable agriculture practises.

### **Conclusion**

The adverse environmental effects, which are evident in the contamination of air, water, and soil, not only disrupt the intricate equilibrium of ecosystems but also make a substantial contribution to the phenomenon of climate change. In the meanwhile, the health consequences are widespread, impacting respiratory systems, infections transmitted by water, and presenting enduring risks to general welfare, especially among susceptible demographics. In addition to its impact on human well-being, pollution imposes a significant economic burden by increasing healthcare expenditures and requiring huge investments in environmental repair. This article explores the intricate relationship between environmental stewardship and economic sustainability, emphasising the need of a fundamental change towards sustainable practises and the implementation of rigorous regulatory frameworks.

Upon analysis of the current policy and regulatory framework, it becomes apparent that despite notable progress, there are ongoing difficulties in the implementation and adherence to these measures. It is crucial to enhance existing rules, both domestically and globally. Concurrently, the cultivation of an environmentally responsible culture, together with the provision of incentives for enterprises to embrace cleaner technology, presents a viable approach to facilitate constructive transformation.

Based on these aforementioned observations, the present study puts forward a set of solutions and suggestions. The urgency is evident in the need to adopt sustainable practises across sectors and advocate for more rigorous environmental regulations. It is vital that we take urgent action to mitigate pollution and protect the world for future generations. The ramifications of pollution go beyond the immediate damage of the environment, permeating several aspects of human existence, including health, economy, and the intricate equilibrium of ecosystems. This paper advocates for a collective and worldwide effort to reduce the

economic burden of pollution, emphasising the incalculable and irreplaceable worth of a pristine environment. The time for action is now.

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