

Water Pollution and its Effects on Ecosystem and Human Health

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Abstract: *Water pollution is one of the most critical environmental issues worldwide, affecting ecosystems and human health. Contamination from industrial waste, agricultural runoff, and domestic sewage introduces harmful substances into water bodies. These pollutants degrade ecosystems, reduce biodiversity, and cause serious diseases in humans. This paper analyzes the causes, effects, and consequences of water pollution using research data and presents results through graphical representation.*

Keywords: Water Pollution, Ecosystem Damage, Human Health, Environmental Impact, Sustainability

I. INTRODUCTION

Water is essential for life, yet increasing pollution has made many water sources unsafe. According to global reports, a significant portion of the population lacks access to clean drinking water [5].

Water contamination is caused by discharge of residential and industrial wastes, radioactive waste, and atmospheric deposition. Heavy metals and industrial waste may build up in lakes and rivers, harming people and animals. Environmental pollutants induce immunological suppression, reproductive failure, and severe poisoning [1]. Polluted water spreads illnesses including cholera, typhoid fever, diarrhoea, vomiting, skin and renal problems. Plant and animal diet directly impact human health [2]. Fishes, crustaceans and other sea creatures that people eat are being killed by water contaminants [8].

Polluted water spreads diseases such as cholera, typhoid, and diarrhea. Toxic substances also affect aquatic life and human health through the food chain[10]. The growing level of pollution has become a major environmental and public health concern.

II. OBJECTIVES

- ✓ To study the causes of water pollution
- ✓ To analyse its impact on ecosystems
- ✓ To evaluate its effects on human health
- ✓ To present results using graphical data
- ✓ To promote water conservation and sustainability

III. CAUSES OF WATER POLLUTION

A. Industrial Waste

Industrialization has significantly contributed to economic growth, but it has also led to severe environmental problems, particularly water pollution [9]. Industrial waste includes liquid effluents, solid waste, and chemical by-products released from factories into nearby water bodies. When untreated or poorly treated waste is discharged into rivers, lakes, or groundwater, it contaminates water resources and poses serious risks to ecosystems and human health [3].



B. Agricultural Runoff

Agricultural runoff is a major source of water pollution driven by excessive chemical use, poor farming practices, and improper waste management. Sustainable agricultural practices such as controlled fertilizer use, organic farming, and proper irrigation management are essential to reduce its impact and protect water resources. Fertilizers and pesticides contaminate water, leading to nutrient pollution [10].

C. Domestic Sewage

Domestic waste is a significant contributor to water pollution due to improper disposal and lack of treatment facilities. Effective waste management, proper sewage treatment, and public awareness are essential to reduce its impact. Sustainable practices such as recycling, reducing chemical use, and maintaining septic systems can help protect water resources. Untreated sewage introduces harmful microorganisms and organic waste [2].

D. Plastic and Solid Waste

Plastic and solid waste pollution has become one of the most pressing environmental challenges worldwide. Rapid urbanization, population growth, and increased consumption have led to a significant rise in waste generation. Improper disposal of plastic and other solid waste materials often results in their accumulation in rivers, lakes, and oceans, causing severe water pollution and ecological damage [1]. Sustainable waste management, reduced plastic consumption, and increased awareness are essential to minimize their impact and protect aquatic ecosystems.

IV. EFFECTS ON ECOSYSTEM

Water pollution has far-reaching effects on ecosystems, disrupting biodiversity, food chains, and natural habitats [5]. Protecting water resources through pollution control, sustainable practices, and environmental awareness is essential to maintain ecological balance and ensure the survival of future generations [11].

Water pollution leads to serious ecological damage:

- ✓ Loss of biodiversity
- ✓ Eutrophication (algal blooms and oxygen depletion)
- ✓ Disruption of food chains
- ✓ Habitat destruction

Pollution results in large-scale death of aquatic organisms and ecosystem imbalance.

V. EFFECTS ON HUMAN HEALTH

Water is essential for human survival, but polluted water poses serious health risks. Contamination from industrial waste, agricultural runoff, domestic sewage, and plastic waste introduces harmful substances into water sources [4]. Consumption or exposure to polluted water can lead to a wide range of diseases and long-term health problems [7].

Polluted water affects human health in multiple ways:

- ✓ Waterborne diseases (cholera, typhoid, diarrhea)
- ✓ Chronic diseases (cancer, cardiovascular issues)
- ✓ Skin and eye infections
- ✓ Neurological disorders due to toxic substances

Poor water quality is directly linked to increased disease burden worldwide.

VI. METHODOLOGY

This study is based on:

- ✓ Review of research papers
- ✓ Analysis of environmental data
- ✓ Comparative study of pollution impacts



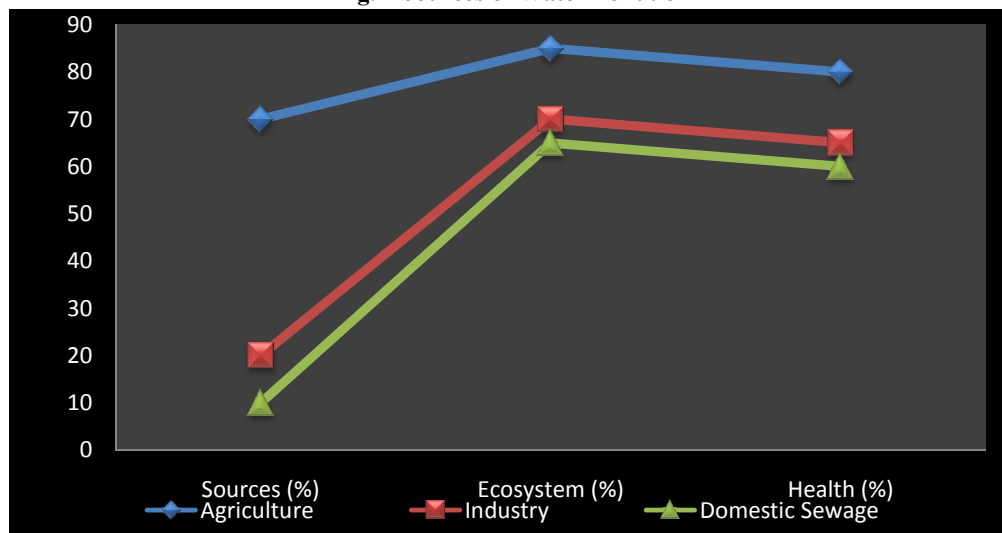
VII. RESULTS AND FINDINGS

Major Sources of Water Pollution (%):- The study analyses the major sources of water pollution and their impact on both ecosystems and human health. The results are presented using tables and graphs.

Table I: Sources of Water Pollution

Category	Sources (%)	Ecosystem (%)	Health (%)
Agriculture	70	85	80
Industry	20	70	65
Domestic Sewage	10	65	60

Fig. 1 Sources of Water Pollution



Based on the collected data, agriculture, industry, and domestic sewage are identified as the main contributors to water pollution. Among these, agriculture accounts for the highest contribution at 70%, mainly due to the excessive use of fertilizers, pesticides, and runoff from agricultural fields [12]. Industrial activities contribute around 20% through the discharge of untreated chemicals and waste into water bodies, while domestic sewage contributes 10%, primarily from household wastewater and improper sanitation system. Thus Agricultural activities are the dominant cause of water pollution.

B. Impact on Ecosystem (%)

Table II: Impact on Ecosystem

Category	Percentage
Ecosystem Damage	85 %
Biodiversity Loss	70 %
Habitat Loss	65 %



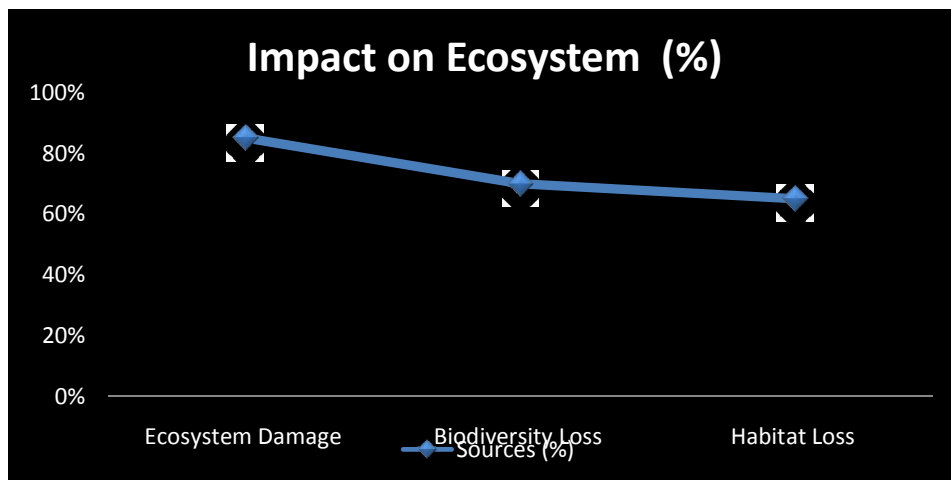


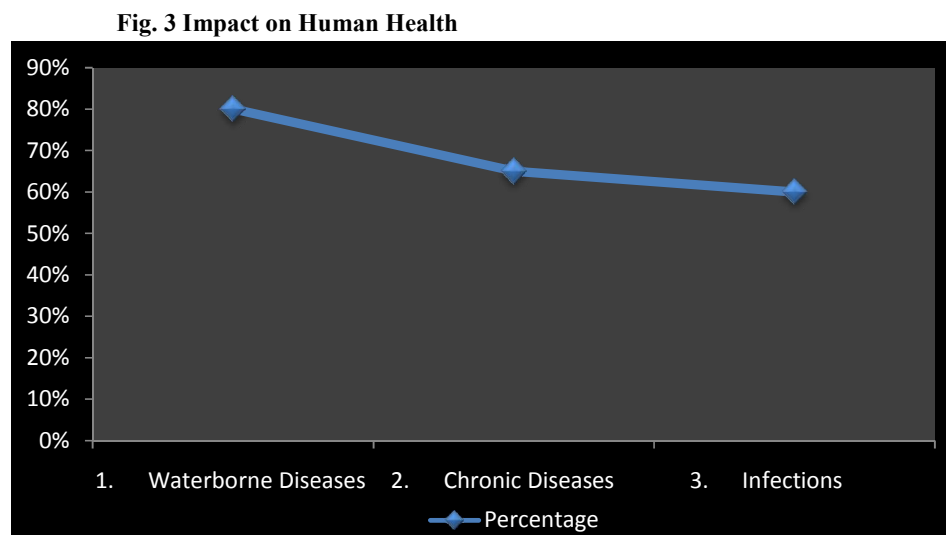
Fig. 2 Impact on Ecosystem

From Table II and graph, the highest impact is on overall ecosystem damage (80%), showing that pollution severely disturbs aquatic balance. Biodiversity loss (65%) indicates decline in plant and animal species due to toxic water. Habitat loss (60%) shows destruction of natural living environments for aquatic organisms. Hence water pollution significantly harms ecosystems, especially by damaging habitats and reducing biodiversity [13].

Impact on Human Health (%)

Table III: Impact on Human Health

Category	Percentage
Waterborne Diseases	80 %
Chronic Diseases	65 %
Infections	60 %



Furthermore, water pollution has serious consequences for human health. The study reveals that waterborne diseases are the most prevalent, accounting for 80%, including illnesses such as cholera, typhoid, and diarrhea caused by



contaminated water. Chronic diseases contribute 65%, resulting from long-term exposure to polluted water containing harmful chemicals and heavy metals. Infections, including skin and eye infections, account for 60%, further emphasizing the health risks associated with unsafe water. These results demonstrate that poor water quality directly affects human well-being and can lead to widespread health problems.

VIII. DISCUSSION

Overall, the findings suggest that water pollution has a slightly greater impact on ecosystems than on human health, although both are closely interconnected. The degradation of ecosystems leads to a decline in water quality, which in turn adversely affects human populations. Therefore, controlling pollution sources, especially agricultural runoff, is essential to protect both environmental and human health.

Industrial pollution reduces oxygen levels in water, killing aquatic life. Agricultural chemicals degrade water quality over time. Contaminated drinking water contributes to widespread health problems.

IX. CONCLUSION

Water pollution is a major global issue affecting both ecosystems and human health. Immediate action is required to control pollution sources and protect water resources for future generations.

X. RECOMMENDATIONS

- Proper treatment of industrial and domestic waste.
- Reduction in plastic usage.
- Sustainable agricultural practices.
- Government regulations and monitoring.
- Public awareness programs.

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