

# Critical Analysis of Water Pollution: Its Consequences and Management in Jind District (Haryana)

Neeru

Ph. D. Scholar, Department of Geography, MCBU Chhatarpur, Madhya Pradesh (India)

Email: [sainineeru182\[at\]gmail.com](mailto:sainineeru182[at]gmail.com)

**Abstract:** *Water pollution means the mixing of harmful substances into water. When natural and man-made pollutants mix with surface and underground water of various water sources (river, lake, stream, ocean, aquifer, or other water body), the water becomes polluted and becomes unhealthy for drinking. The main aim of this research work is to analyze water pollution, its effects, and management in Jind district of Haryana. This study is based on primary and secondary statistics. Human activities are the main reasons for water pollution. Polluted water poisons the natural and human environment. The majority of the population of Haryana state lives in rural areas. Water pollution is promoted due to an excess of primary economic activities (agriculture, animal husbandry, mining, etc.). According to the perception of the people in the research area, the main causes of water pollution are increasing population, toilet pits, chemical fertilizers and pesticides, domestic and animal waste, underground storage leakage, and other human activities. Various environmental and human problems are occurring in the district as a result of polluted water. Considering the severity of these growing problems, it is necessary to manage polluted water. Contaminated water can be controlled by creating awareness among rural people regarding water pollution and adopting water purification methods. This research work presents detailed information related to water pollution scenarios, effects, and management in the context of Jind district. It is hoped that this research work will prove to be helpful in providing analytical information to policy makers and future researchers regarding water pollution in the study area (Jind).*

**Keywords:** Water Pollution, Environment, Human Health, Impact, Water Quality, Surface and Ground Water, Management and Conservation

## 1. Introduction

Water, a fundamental element for sustaining life on Earth, is often emphasized through the proverb that while a person can endure a few days without food, survival without water is impossible. Freshwater, constituting a mere 3% of the Earth's surface, plays a critical role in supporting life. At present, the problem of water pollution is increasing day by day throughout the world. According to the Water Pollution Act (1974), contamination of water or harmful change in the physical, chemical, and biological properties of water or discharge of any sewage, trade effluent, liquid, gaseous, or solid substance directly or indirectly into water is water pollution. Such water is injurious to biological health, domestic, commercial, industrial, agricultural, or other uses. According to UNESCO, water pollution is defined as the introduction into water of any substance in undesirable concentration. For example, microorganisms, chemicals, waste, or sewage renders the water unhealthy for its intended use. In other words, water pollution is defined as an alteration in the physical, chemical, and biological characteristics of water that may cause harmful effects on the environment, humans, and aquatic life. Anthropogenic activities are the major factor in water pollution (Igwe, P. U. et al.2017). Due to escalating pollution from various sources such as sewage, plastics, agriculture, toxins, and industrial and petroleum waste, a substantial portion of this limited freshwater is becoming contaminated. This has evolved into a significant environmental concern, spanning from rural areas to a global scale. At present, approximately one-third of the world's population lives in moderate to high water stress countries, and worldwide freshwater consumption increased six fold between the 1900 and 1995 years, more than twice the rate of population growth. Thus, many

regions of the world are facing the problem of water scarcity due to limited water resources coinciding with growing populations (United Nations Environmental Programme, UNEP, 2002). Like many other countries in the world, India is also facing the dire problems of water scarcity and water pollution on a large scale due to rapidly growing population, rapidly expanding industries, increasing pesticide quantity in agriculture, and other effective factors. More than 70% of the fresh water available in our country is not potable (Dwivedi, Anil K.2017). Haryana, primarily an agricultural state where farming activities prevail, faces considerable water pollution challenges. Jind district, situated in the heart of Haryana, grapples with alarming levels of water contamination. The objective of this research is to shed light on water pollution in the district by obtaining information from primary and secondary sources. This problem has become even more serious due to the increase in human activities, which is having adverse effects on both the environment and human welfare. Consequences of water pollution include acidification, ecosystem degradation, water scarcity, climate disruptions, bad human health, and economic loss. These natural effects adversely affect human health, leading to an increase in diseases. It is essential to immediately control the increasing harmful effects of water pollution. It is necessary to manage and conserve water for the present and future generations to ensure a balanced and sustainable life for all living beings.

## 2. Research Problem

In the state of Haryana, approximately 65% of the population resides in rural areas, with a significant portion actively involved in agriculture as their primary economic pursuit. Given the prevalence of agriculture across the state,

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the use of various chemical fertilizers to enhance productivity has become common place. However, this intensification of agricultural practices, coupled with the escalating population and a range of natural and human activities, has resulted in a concerning rise in water pollution. The adverse environmental impact of these factors necessitates an in - depth examination to understand the extent of the issue and explore potential solutions.

### Objectives of the Study

- To identify and examine the key factors contributing to water pollution in the rural areas of Jind district.
- To evaluate the environmental and human impacts resulting from water pollution in the study region.
- To present the sustainable practices and strategies that can be implemented to mitigate and prevent water pollution in the rural context of research area.

### 3. Study Area

Jind stands as one of the oldest districts in Haryana, deriving its name from the headquarters town, Jind, which has roots in Jaintapuri. With historical ties dating back to the Mahabharata era, legends suggest that the Pandavas constructed a temple honouring Jainti Devi, giving rise to the town of Jaintapuri, later known as "Jind." Raja Gajpat Singh officially established the district in 1776, and post - independence, it became a part of Indian Territory. In 1948, it became a segment of Sangrur district, eventually gaining separate district status in 1966 and further division into two tehsils, Jind and Safidon, in 1967. The district encompasses 2702 square kilometres. Positioned between 29° 03' 00" and 29° 51' 00" North latitude and 75° 53' 00" and 76° 47' 00" East longitude, the average elevation is 239 meters above sea level. Forest cover in 2021 accounted for 0.83% of the geographical area. The climate experiences intense heat in summers and moderate cold in winters, with most rainfall occurring during the monsoon season. The recorded rainfall in 2021 - 22 was 687.2 mm. The district is divided into four sub - districts, six towns, and 306 villages. Hindi serves as the official language, and it holds the district code of 77th in the state of Haryana. Jind district, formed on 1 November 1966, has its headquarters located in Jind, approximately 182 km from the state capital. As of the 2011 census, Jind district comprises 2, 44, 582 households and a total population of 13, 34, 152. The population density is 494 persons per square km. The sex ratio is 871 females per 1000 males, and the child ratio is 838 females per 1000 males. The major religion is Hinduism (95.69%), with a literacy rate of 71.44%. The primary language spoken is Hindi (96.97%).

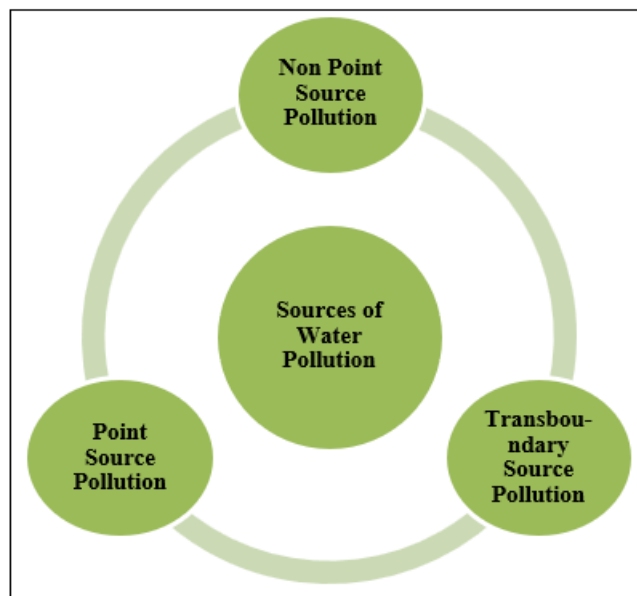
### 4. Research Methodology and Result Analysis

The research study, titled "Critical Analysis of Water Pollution: Its Consequences and Management in Jind District (Haryana)" employs a combination of primary and secondary data collection methods. The primary data is gathered through a random sampling approach, involving approximately 400 households across six villages within the district. The collection of primary data is executed through face - to - face interviews, utilizing a structured questionnaire to ensure consistency and reliability in

responses. In addition to primary data, secondary data is sourced from published books, journals, and research papers. To analyse and interpret the gathered data, various statistical methods have been applied. These scientific approaches contribute to the rigor and depth of the research study. The utilization of statistical methods enhances the reliability of the findings and aids in drawing meaningful conclusions.

### Source of Water Pollution

- **Point Source Pollution:** Point sources are identifiable single sources that release pollutants into water bodies. Examples include emissions from factories directly into water. Point source pollution occurs when the origin of water pollution is known and can be traced back to specific sources such as industrial discharges, storm water drains, sewage, and pipe discharges. This type of pollution is distinguishable and can be isolated from other pollution sources.
- **Non - Point Source Pollution:** Non - point source pollution involves the discharge of pollutants from multiple sources. Contaminated water resulting from rainfall passing through various areas is considered a non - point source. Unlike point source pollution, non - point source pollution is challenging to trace back to a single origin. It arises from diverse sources such as pesticides, fertilizers, and industrial effluents. Non - point source pollution is a significant contributor to water pollution, particularly in the United States.
- **Trans - boundary Source Pollution:** Trans - boundary source pollution occurs when contaminated water from one country enters the waters of another country. Examples include radioactive waste transported by ocean currents. The international movement of water pollution or pollutants from one country to another beyond their borders characterizes trans - boundary pollution sources.



### Types of Water Pollution

There are mainly two types of water pollution:

- **Surface Water Pollution:** Surface water encompasses water bodies on the Earth's surface, including rivers, ponds, lakes, and oceans. Surface water, generated from rainfall and a combination of surface runoff and groundwater, is interconnected with groundwater.

Surface water pollution occurs when harmful substances, such as chemicals and heavy metals, contaminate these water resources. Human activities, including the discharge of pollutants from farms, factories, and cities, contribute to surface water pollution.

- **Groundwater Pollution:** Groundwater refers to water stored in underground aquifers, essential for irrigation. Groundwater becomes polluted when contaminants, such as pesticides and fertilizers, or waste from landfills and septic systems reach the aquifer. Groundwater contamination arises from man-made products like gasoline, oil, road salt, and chemicals entering groundwater. In rural areas, pesticides and chemicals applied to crops and soil during rainfall contribute to groundwater pollution. Contaminated groundwater can further contaminate rivers, lakes, and oceans, posing risks to human health and ecosystems. Removing pollutants from groundwater is exceptionally challenging. Understanding these sources and types of water pollution is crucial for developing effective strategies to mitigate and prevent the adverse impacts on water quality and ecosystems.

**Table 1:** The Major Causes of Water Pollution

Sr. No.	Major Causes	Percentage
1	Detergent powder	81
2	Acid rain	26
3	Industrial waste	36
4	Sewage and wastewater	44
5	Mining activities	16
6	Marine dumping	27
7	Toilet pit	84
8	Global warming	13
9	Urban development	4
10	Animal waste	79
11	Illegal digging of bore well	11
12	Underground storage leakage	37
13	The burning of fossil fuels	48
14	Chemical fertilizers and pesticides	69
15	Leakage from sewer lines	26
16	Dust – particles	76

Source: personal survey, 2022 (400 Household)

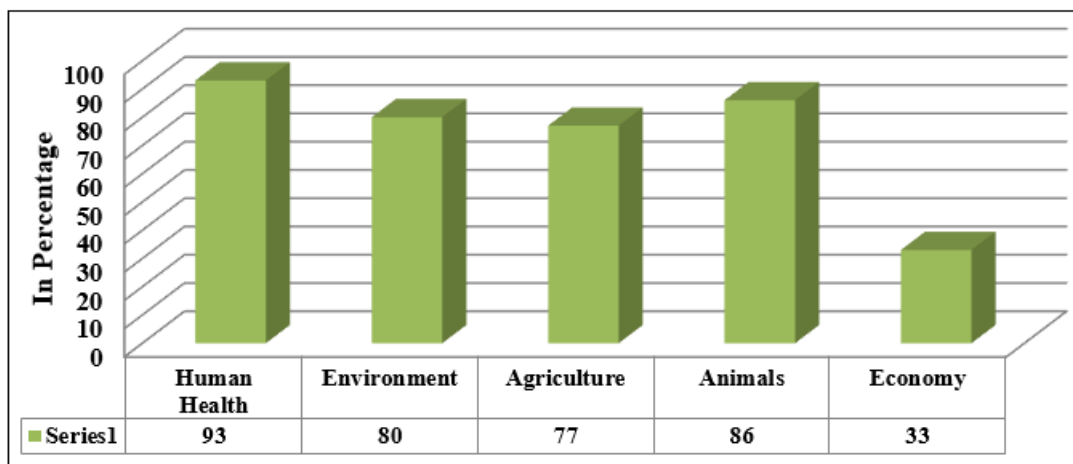
The provided data presents the percentage distribution of various major causes of water pollution, obtained from a personal survey conducted in 2022. Let's delve into the analysis and interpretation of each major cause: Detergent powder emerges as a significant contributor, accounting for 81% of water pollution. The high percentage suggests that the use or disposal of detergent powder, possibly containing harmful chemicals, plays a substantial role in degrading water quality. Acid rain is identified as a contributor to water pollution, representing 26%. Acid rain, often a

consequence of industrial emissions, can have detrimental effects on aquatic ecosystems and water bodies. Industrial waste contributes to 36% of water pollution. This indicates that improper disposal or release of industrial effluents into water sources significantly impacts water quality. Sewage and wastewater represent a substantial portion at 44%. Inadequate treatment or direct discharge of sewage into water bodies is a major cause of water pollution. Mining activities contribute to 16% of water pollution. The extraction processes and associated runoff can introduce pollutants into water sources. Marine dumping, with a contribution of 27%, signifies the impact of waste disposal into oceans and seas on water quality.

Toilet pit pollution is notably high, constituting 84%. This indicates that improper sanitation practices, possibly from inadequate toilet waste disposal, significantly contribute to water pollution. Global warming is identified as a factor in 13% of water pollution. This suggests a connection between climate change and its impact on water quality. Urban development contributes to 4% of water pollution. This may involve the expansion of urban areas leading to increased impervious surfaces and altered water flow patterns. Animal waste is a major contributor, representing 79%. Agricultural runoff and improper waste management from livestock farming contribute significantly to water pollution. Illegal digging of bore wells contributes to 11% of water pollution. This could result in changes in groundwater levels and contamination. Underground storage leakage, at 37%, highlights the impact of leaks from storage facilities on water quality. The burning of fossil fuels contributes to 48% of water pollution. This indicates that pollutants released into the air can eventually find their way into water bodies. Chemical fertilizers and pesticides are significant contributors, representing 69%. Agricultural practices play a crucial role in introducing these pollutants into water sources. Sewer line leakage accounts for 26% of water pollution. This emphasizes the importance of maintaining and upgrading sewage infrastructure. Dust particles contribute significantly, with 76%. This may be associated with construction activities, deforestation, or other sources releasing particulate matter into water bodies (**Table.1**).

### Impact of Polluted Water

Water, covering more than 70% of the Earth's surface, is a fundamental necessity for survival and plays a crucial role in supporting aquatic life and ecosystems. However, water pollution has emerged as a serious environmental problem, exerting detrimental effects on human health, wildlife, aquatic life, and the overall environment. The impacts of water pollution are extensive and devastating, affecting both rural and urban regions.



**Figure 1: Impact of Water Pollution**  
Source: Personal Survey, 2022 (400 Household)

According to the research results, water pollution has a direct and indirect effect on the natural and human environment. According to 93% of the people in the research sample, water pollution has the greatest effect on human health. Water pollution causes many diseases in the human body. 86% of the people said that water pollution also has a negative effect on animals. Consumption of polluted water increases many diseases in animals and reduces the amount of milk in milch animals. Water pollution also causes degradation of environmental elements. According to 80% of the people in the study area, polluted water on earth contributes to environmental degradation. 77% people have said that water pollution remains the main factor in crop degradation. Water pollution negatively affects crop growth and quality. Apart from this, 33% people believe that water pollution also affects the human economy, because the use of various techniques for purifying polluted water involves a lot of cost. Thus, in the present times, water pollution has become a major factor in the degradation of natural and human resources (figure.1).

**Impact on Environment:** Water pollution has a profound impact on wildlife and aquatic ecosystem. Pollutants can disrupt the natural balance of aquatic habitats, leading to the decline of various species. Fish and other aquatic organisms can be directly harmed by toxins, affecting their reproduction, growth, and overall survival. Water pollution disrupts the delicate balance of ecosystems. The introduction of pollutants can lead to the decline of certain species, the proliferation of harmful algae, and overall biodiversity loss. This disruption ripples through the food chain, affecting other organisms dependent on the health of aquatic ecosystems. Excessive nutrients from pollutants, such as nitrogen and phosphorus, can lead to the proliferation of algae blooms in water bodies. These blooms create "dead zones" where oxygen levels are depleted, harming fish and other aquatic life. Algae blooms can also release toxins, further impacting water quality. Water pollution jeopardizes the safety of drinking water sources. Contaminants such as industrial pollutants, pesticides, and microbial pathogens can make their way into drinking water supplies, posing serious health risks to communities that rely on these sources. Runoff from agricultural activities, carrying fertilizers and pesticides, contributes to water pollution. This runoff can degrade water quality, harm aquatic ecosystems, and impact

downstream communities that rely on water for irrigation and other purposes. Polluted water bodies can lead to the degradation of soil quality, loss of vegetation and agriculture in rural areas, and negative impacts on terrestrial ecosystems connected to water sources. Water pollution contributes to overall environmental degradation.

**Impact on Human:** Contaminated water poses significant risks to human health. Consuming polluted water can lead to waterborne diseases, including gastrointestinal issues, infections, cholera, typhoid, jaundice, Diarrhea, Cancer, neurological ailments, lung diseases, and other waterborne illnesses (Rakhecha, PR (2020)). Human diseases spread rapidly among rural people because there is lack of sanitation, awareness and health facilities in rural areas. Thus polluted water proves to be harmful to human health. The availability of safe and clean drinking water is essential for preventing public health crises. The economic consequences of water pollution are substantial. The costs associated with treating polluted water for consumption, managing impacts to agriculture, health care, and restoring ecosystems can be extremely high, affecting both local and national economies.

**Table 2: Controlling Methods of Water Pollution**

Sr. No.	Methods	Percentage
1	Timely Repairing of Leakage of Taps/ Pipes	55
2	Afforestation	65
3	Control Climate Change	38
4	New Conservation Technology	45
5	Education/Awareness	56
6	Meeting With Farmers	16
7	Cleaning of water	70

Source: personal survey, 2022 (400 Household)

A significant percentage, 55%, indicates that respondents consider timely repairing of tap and pipe leakages as an effective method for controlling water pollution. This suggests that addressing infrastructure issues and preventing water leaks are viewed as crucial measures. Afforestation, with a high percentage of 65%, is recognized as an effective method for controlling water pollution. Planting trees and increasing green cover can contribute to soil stabilization, preventing runoff and improving overall water quality. While climate change is a complex issue, 38% of

respondents believe that controlling climate change is essential for addressing water pollution. This may involve measures to mitigate the impacts of climate change on water bodies. The adoption of new conservation technology is acknowledged by 45% of respondents as a method to control water pollution. This could include innovative approaches and technologies aimed at reducing pollutant discharges and improving water management.

Education and awareness programs receive significant support, with 56% of respondents recognizing them as effective in controlling water pollution. This suggests a belief in the power of knowledge dissemination and behavioural change to address water - related issues. A lower percentage (16%) indicates that meeting with farmers is considered less effective as a method for controlling water pollution. This may suggest that there is room for improvement in engaging with the agricultural community to address pollution from farming practices. This underscores the importance placed on maintaining and preserving local water sources. The highest percentage, 70%, is attributed to the cleaning of water as an effective method for controlling water pollution. This may encompass various efforts, including the removal of physical debris and pollutants from water bodies (Table.2).

## 5. Conclusion

Based on the conclusion of the research result, it can be said that water pollution is a serious problem in the study region. In the present society, water pollution has become a serious problem all over the world, and its negative consequences are becoming increasingly visible. The continuously increasing population of the research area, domestic and animal waste, water leakage, climate change, increasing amounts of chemical fertilizers and pesticides in crops, industrialization, and other natural and human activities are the main causes of water pollution. In the present society, the harmful effects of water pollution have increased due to the changing natural elements and human uses of water. The most affected field of water pollution is human health, due to which many diseases are occurring in the human body. Water pollution has led to high - level degradation of the environment. The cover of unhealthy environments is spreading everywhere. This impure environment is harmful for every living creature on the surface. Apart from this, agriculture and animal husbandry have also suffered losses due to polluted water. Water pollution has also impacted the human economy. Thus, because of these harmful consequences, control of water pollution has become extremely important. Hence, the natural and human activities on the surface contribute to water pollution, and its affected field is very wide. It is essential to solve this problem immediately for a healthy and balanced life for the present and future generations. This problem can be controlled by appropriate steps taken by the local people and the implementation of government schemes.

## 6. Recommendations

The problem of water pollution can be solved by the efforts of local people and implementation of government schemes.

The following suggestions can prove to be helpful in the prevention of water pollution at the local level:

- The most responsible factor for water pollution is human activities. Therefore, programs should be run at the local level to acquaint the people of the concerned area about the factors contributing to water pollution, its harmful effects and the importance of water.
- The water quality of all the water resources present in the research area should be checked by water experts from time to time.
- The flow of polluted water in rural areas should be directed towards the outside areas, so that this polluted water cannot mix with clean water resources and pollute them.
- Gram Panchayats and Municipal Corporations should formulate and implement useful schemes for controlling pollution in various water resources.
- The government should make provisions for fines and appropriate punishment for people and institutions promoting water pollution.
- Polluted water should be purified using modern technology and used for other water needs. Local people should also consider water conservation as their moral duty along with controlling water pollution at their level.
- Thus, the problem of water pollution can be solved with the help of appropriate steps taken by the local people and government and non - government organizations.

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