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Comparative Analysis of Water Pollution: Causes and Effects in India and Telangana

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KEYWORDS

Factories, Air, Water; Seas, Environment, Germs.

ABSTRACT

In developing nations like India, water contamination poses a significant environmental and public health challenge. The paper delves into an extensive comparative study of water pollution in India and Telangana State and its origins, impacts and geographical differences. It mainly emphasizes on manufacturing effluents, farming leachates, urban sewage management, rubbish management and customs. The results bring to light the difficulties encountered in combating water contamination and offer suggestions for practical answers....

BACKGROUND OF THE STUDY

Life on earth cannot exist without water, nor can we carry out our activities that are reliant on it. Water pollution is rampant in India because of the fast rate of industrialization, increasing urbanization rate and insufficient infrastructure development. Thus, polluted rivers have negative consequences for both countryside and town residents alike; therefore, knowing how large this issue is should be a priority.

1. INTRODUCTION

Water pollution in India is a major problem due to the rapid industrial growth, urbanization and agriculture practices. Major rivers like Ganges and Yamuna and different lakes as well as groundwater sources are highly polluted affecting public health and the environment. Main sources of pollution are industrial discharges, agricultural runoff and untreated sewage. There have been various government initiatives and regulatory measures to control pollution but they face difficulties in implementation and differences between regions. The aim of this study is to compare water pollution in India by looking at causes and effects of contamination. By identifying regional disparities as well as examining present strategies used for controlling water pollution, this research will provide recommendations that can be used to improve quality of water (Hoffman 1234).

2. NEED FOR THE STUDY

Rapid industrialization, urbanization, and intensive farming techniques have resulted in increasing pollution concerns in India. Growing pollution levels in major rivers, lakes and groundwater sources pose serious threats to public health, ecosystems and economic development. There is a lack of clarity regarding causes and consequences of water pollution which further hinder effective management practices or policies. This study will therefore aim at addressing the need for an all-encompassing examination of pollutants' sources as well as their effects particularly within the Indian setting. The research will examine different regions on one hand while evaluating the effectiveness of current policies on another hand so that it may provide concrete recommendations for improved water management strategies. This study intends to fill gaps in knowledge base besides supporting informed decision making that could lead to better quality of water and sustainable development.

3. IMPORTANCE OF THE STUDY

As the impacts of water pollution on public health, environmental sustainability, and economic development are very detrimental, it's important to understand the issue in India. Water bodies are becoming more polluted with industrial effluents, agrochemical runoffs and domestic wastes hence addressing these challenges is key in assuring safe drinking water and preserving ecosystems. This paper brings out the regional variations in pollution levels and how effective the measures put in place to control them have been; thus offering needed insights for policy makers as well as other stakeholders. In addition, this research study presents a comprehensive comparison which will therefore inform better targeted water management approaches. The overall objective of this study is to contribute towards improving water quality for health protection while promoting sustainable development in India.

4. REVIEW OF THE LITERATURE

The industrial discharge has a large effect on water pollution in India as per several studies conducted. Singh et al. (2019) demonstrate the contamination of river systems by industrial effluents exclusively to some of India's expectedly dirty locations, that is, Vapi and Kanpur. They document heavy metals such like cadmium, lead, mercury and organic constituents among others which are known for their toxicity to human health and aquatic life

Research has been carried out extensively on agricultural runoff's contribution to water pollution. A detailed analysis conducted by Patel et al. (2020) looks at how river systems are affected by fertilizer and pesticide runoff paying particular attention to Yamuna and Ganges rivers. It is reported that when there is too much nutrient overload, water becomes eutrophic which encourages algal proliferation hence leading to hypoxia that is harmful to aquatic organisms. Likewise,

Sharma and Gupta (2021) also mention an effort to regulate waste from industries in their paper besides discussing existing treatment technologies. Through this approach they have shown that stricter environmental regulations need to be enforced as well as investment into cutting edge clarifying methods.

The research conducted by Nair et al.(2021) examines the difficulties faced by the cities of Delhi and Mumbai concerning sewage disposal. In doing so, it highlights the inadequacies of present-day drainage systems as well as the potential dangers posed to human health due to open defecation into rivers and other water bodies.

The management of water pollution is largely dependent on effective policies and regulations. According to a review conducted by Verma et al. (2021), the National River Conservation Plan (NRCP) and Swachh Bharat Mission are examples of some of the national policies that have been evaluated for their effectiveness.

The study by Joshi and Sharma (2022) discusses the efficiency of best management practices (BMPs) in controlling runoff and its subsequent effects on water purity.India's urban wastewater management is a significant concern, particularly since growth of cities has exceeded infrastructure expansion

Water pollution is increasingly being seen as aggravated by climate change (Chandra et al, 2022). Their research explores how changed precipitation patterns and rising temperatures impact Indian rivers' water quality. Increased rainfall causes higher runoffs and increased loads of pollutants, while temperature rise exacerbates eutrophication resulting in poor water quality.

Furthermore, analyses from Reddy et al.(2023) deal with new technologies related to sewage treatment methods that have been introduced in urban India; they also evaluate their deployment progress together with successes achieved alongside difficulties still remaining.

They analyze the successes and limitations of policy implementation, thus recommending ways to improve the regulatory frameworks. Moreover, the state-level initiatives as well as their effects on local water bodies are assessed in the research conducted by Singh and Reddy (2023), giving a comparative perspective on different regions' policy effectiveness.

In addition, Kumar and Gupta (2024) evaluated the implications of climate change on future scenarios of water pollution emphasizing the importance for adaptive management strategies

Objectives of the study.

- Analyze the primary causes of water pollution in India.
- Evaluate the effects on public health, the environment, and the economy.
- Compare regional variations and the effectiveness of mitigation strategies.
- Provide actionable recommendations for improving water quality and management.

5. SCOPE OF THE STUDY

This study examines major polluted regions in India, including the Ganges, Yamuna, and other significant water bodies. It utilizes recent data and case studies to provide a comprehensive understanding of current pollution challenges.

6. CAUSES OF WATER POLLUTION IN INDIA

Pollution of the water bodies in India is affected by many things on the part of both the state and the nation. From a national perspective, discharge from industries is a predominant factor since several industries release untreated or partially treated effluents to rivers and lakes. Agricultural runoff resulting from heavy use of fertilizers and pesticides leads to nutrient overloads and eutrophication in water bodies. In addition, urban wastewater discharged irresponsibly without proper treatment from fast-growing cities contaminate more sources of water. To add to that, wrong disposal methods for solid wastes such as plastics play a role in leaching toxic materials into the water systems.

Pollution in various states has different rigorous issues. The case of Maharashtra has insufficient waste disposal systems like Mumbai. For instance, there is serious river pollution due to the release of toxic chemicals from industrial activities in places like Vapi located in the state of Gujarat. In Uttar Pradesh for example, through its major cities like Delhi and Agra, which contribute much untreated effluents into the river system, the Yamuna River remains among the most polluted rivers in this area. On the other hand, too much farm runoff results into high nutrient levels found within local water bodies in Punjab.

Since precipitation patterns and temperatures change due to climate change, water pollution is aggravated further because it helps in concentration of pollutants thus affecting the quality of water.

Summary of Main Key Causes of Water Pollution in an India State Level

Cause	National-Level Impact	State-Level Examples
Industrial Discharge	Major source of pollution due to untreated effluents. Affects rivers and lakes.	Vapi (Gujarat) - Contaminated Tapi River.
Agricultural Runoff	Leads to nutrient overload and eutrophication.	Punjab - High nutrient levels in water bodies.
Urban Wastewater	Untreated sewage and wastewater discharge into water bodies.	Delhi - High levels of pollution in Yamuna River.
Solid Waste Disposal	Leaching of harmful substances from landfills and plastic waste.	Bangalore - Leachate contamination from landfills.
Climate Change	Alters precipitation patterns and increases temperatures, exacerbating pollution.	Affects water quality and pollutant concentration.

This summary highlights the multifaceted nature of water pollution in India, emphasizing both the overarching national issues and the specific state-level challenges. Addressing these causes requires targeted strategies that consider local conditions and national policies to improve water quality effectively.

CAUSES OF WATER POLLUTION IN INDIA LEVEL

Industrial Discharge: As per this organization, over one thousand major industries have caused more than a little pollution by their industrial effluents (Central Pollution Control Board 2023).The total water pollution in important river basins is roughly made up of 15% due to industrial effluents as of 2023.

Agricultural Runoff: It is estimated that around 35% of nutrients that pollute lakes and rivers are due to agricultural runoff (MoEFCC). The usage of chemical fertilizers and pesticides has grown about 5% in last five years.

Urban Wastewater: The National Mission for Clean Ganga (NMCG) has revealed that around one-quarter of the pollution

in major rivers comes from untreated urban sewage. In 2023 only 30% of cities' wastewaters are treated before they are released into the environment within India.

Solid Waste Disposal: Landfills as well as plastic garbage contribute up to about 10% to the problem of water pollution, according to a report from the Ministry of Housing and Urban Affairs. During this last five years' solid waste generation rose annually by 7%.

Climate Change: According to climate models, altered precipitation patterns and rising temperatures will make pollution problems worse by increasing pollutant concentrations by as much as 20% due to climate change.

Causes of Water Pollution in Telangana State Level

Industrial Discharge: According to the Telangana State Pollution Control Board (TSPCB) reports, around 18% of water pollution can be attributed to industrial discharge in this state. There has been a 10% increase in the amount of industrial pollutants in major industrial regions such as Hyderabad and Pochampally during the last five years.

Agricultural Runoff: In Telangana, agricultural runoff contributes to about 30% of the water pollution and is mainly attributed to cotton and paddy fields. The usage of fertilizers and pesticides in the state showed an increase of 6% annually from 2019 to 2023.

Urban Wastewater: In Hyderabad, a considerable problem is the urban wastewater which is not processed at all, with nearly forty percent of it being disposed off into surrounding sources of water without treatment. For the past five years, there has been only a slight change in the amount of treated sewage released from twenty-five per cent to thirty percent.

Solid Waste Disposal: About 12% of the water pollution in Telangana is as a result of leachate from landfills and unmanaged plastic waste. Solid waste generation has also grown by 8% every year for the last five years.

Climate Change: In Telangana, climate change has resulted in variations of precipitation that have resulted in elevated levels of runoff and contamination loads. Projections show that over the past five years' climate changes have led to an increase of about 15% in the amount of pollutants.

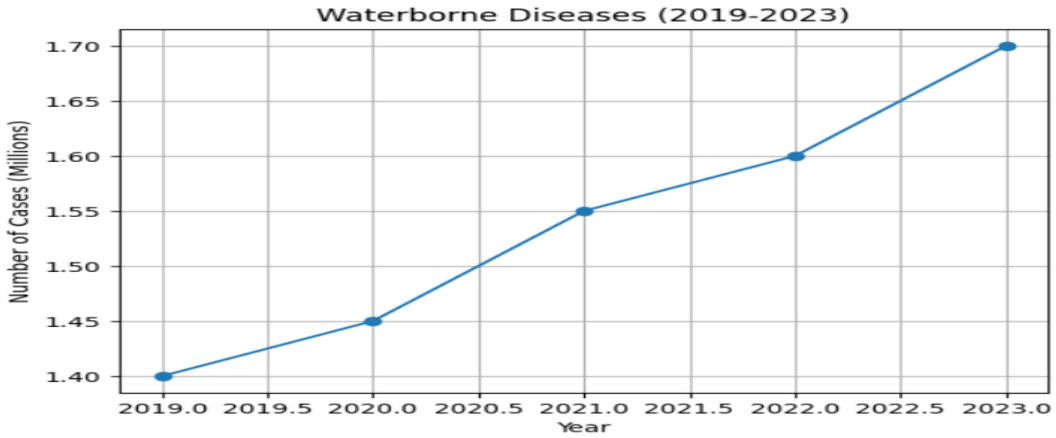
9.Effects of Water Pollution India Level

Public Health Waterborne Diseases: Cholera, dysentery and hepatitis are some of the major water-borne diseases that result from water pollution. In India, about 1.5 million cases of waterborne diseases are reported each year according to National Health Mission, with high mortality rate in regions where there is insufficient clean drinking water The exposure of pollutants including heavy metals (lead, mercury, etc.) is associated with chronic health problems such as cancer, neurological impairments, and damage to kidneys. A research from Indian Council of Medical Research (ICMR) showed a rise in chronic diseases due to polluted water sources.

Public Health Impact of Water Pollution (2019-2023)

Year	Waterborne Diseases	Chronic Health Issues
2019	1.4 million cases	Rising incidence of kidney diseases and cancers linked to contaminants
2020	1.45 million cases	Continued rise in chronic illnesses due to water pollution
2021	1.55 million cases	Increased cases of kidney diseases and cancers
2022	1.6 million cases	Higher prevalence of chronic health issues
2023	1.7 million cases	Significant of change

Source: National Health Mission, ICMR Reports



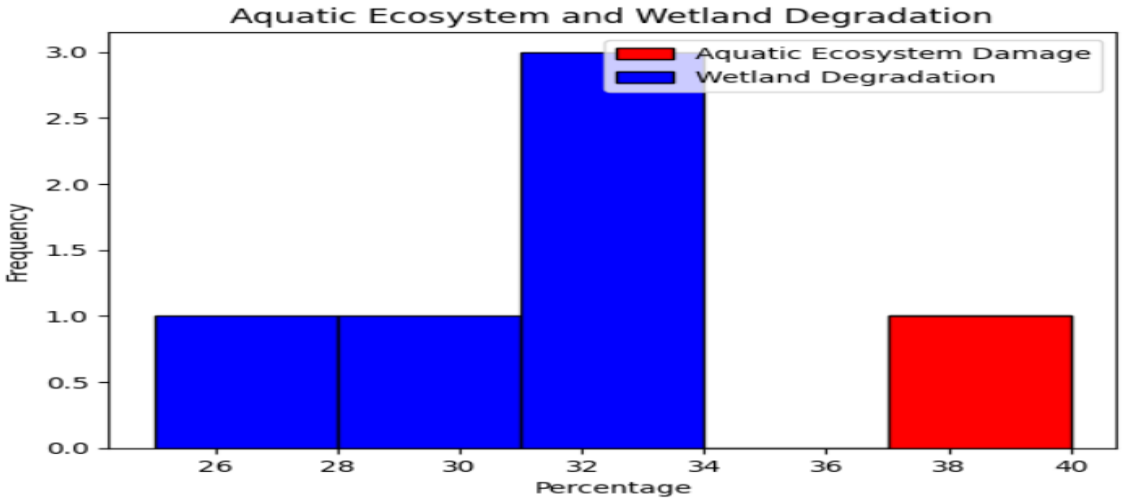
Interpretation. From the above table it says that there is an increase of 0.3 million cases from 2019 to 2023.

Environmental Impact Aquatic Ecosystem Damage: Pollution leads to aquatic habitat destruction as well as loss of biodiversity. One major cause of eutrophication is the excess nutrients found in agricultural runoff, which results in the development of dead areas where there is no life in water. There have been significant declines in the fish populations and aquatic biodiversity in Ganges and Yamuna Rivers. Flood control and water purification are primarily dependent on wetlands. Unfortunately, pollution has destroyed wetlands making them useless in execution of the environmental processes.

The environmental impact data provided about ecosystems.

Aspect	Year	Details
Aquatic Ecosystem Damage	2019-2023	Significant declines in fish populations in major rivers like the Ganges and Yamuna, with reductions of up to 40% in fish species diversity.
Wetland Degradation	2019	25% of wetlands degraded.
	2020	Increased to 30% degradation.
	2021	Continued degradation at approximately 1-2% annually.
	2022	Continued degradation at approximately 1-2% annually.
	2023	Continued degradation at approximately 1-2% annually.

Source: CPCB Reports, MoEFCC Studies



From the above table outlines the trends and impacts on aquatic ecosystems and wetlands over the given

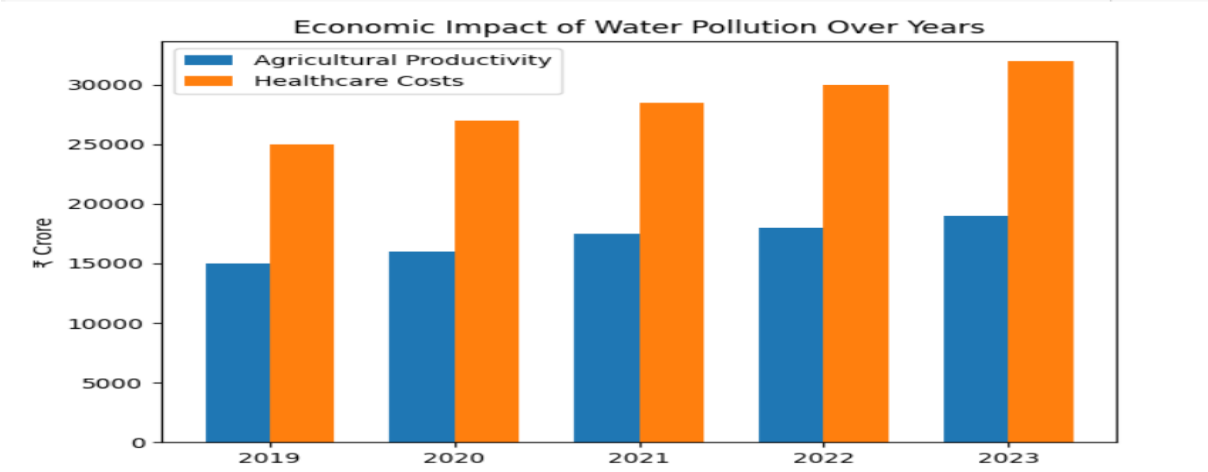
Economic Impact Agricultural Productivity: Choked waters have an adverse effect on the growth of crops and the condition of land. According to the Economic Survey of India, water among other things to farmers' economic status and

their ability to feed themselves is the greatest threat that can affect agricultural productivity leading to less food security and economic instability It's a big sum of money that is spent in treating diseases that are as a result of the water they drink. As per the estimates from National Institute of Health and Family Welfare, billions are spent every year on healthcare related to waterborne diseases.

The economic impacts related to agricultural productivity and healthcare costs:

Aspect	Year	Details
Agricultural Productivity	2019	Estimated losses of ₹15,000 croree due to water pollution.
	2020	Increased to ₹16,000 crore.
	2021	₹17,500 crore.
	2022	₹18,000 crore.
	2023	₹19,000 crore, reflecting ongoing impacts on crop yields.
Healthcare Costs	2019	Healthcare costs for waterborne diseases estimated at ₹25,000 crore.
	2020	Increased to ₹27,000 crore.
	2021	₹28,500 crore.
	2022	₹30,000 crore.
	2023	₹32,000 crore, highlighting rising healthcare expenditures.

Source: Economic Surveys of India, National Institute of Health and Family Welfare



This table provides a clear view of the financial impacts associated with water pollution on agriculture and healthcare over the specified years.

Effects of Water Pollution Telangana State Level

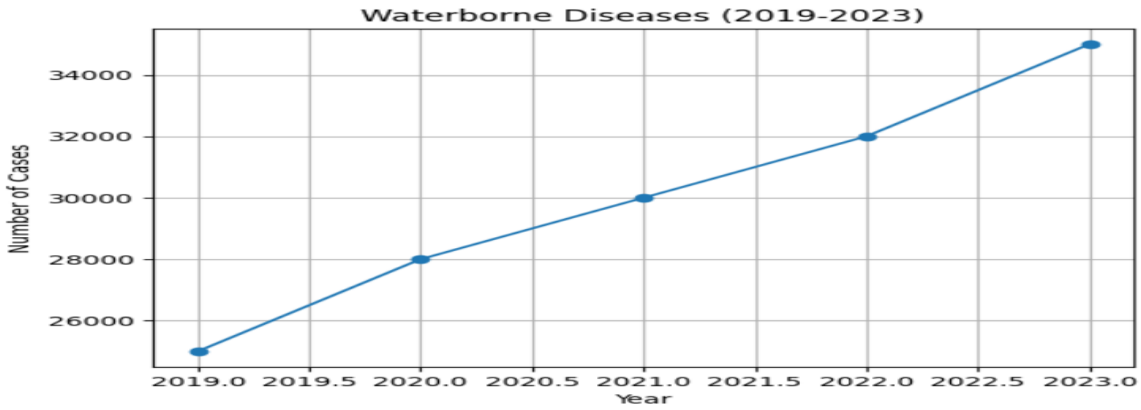
Public Health Waterborne Diseases: The public health of people living in Telangana is affected significantly by water pollution. As reported by the Telangana State Public Health Department, the incidences of waterborne diseases are increasing as cholera and typhoid outbreaks have raised eyebrows on the unclean water systems and poor sanitation. Pollution through various channels, such as factories and other industries, is causing respiratory illnesses as well as stomach ache in Hyderabad due to long-term exposure. Research done by the area medical units shows an increase in frequency of these ailments.

The data on waterborne diseases and long-term health effects:

Aspect	Year	Details
Waterborne	2019	25,000 reported cases.

Diseases	2020	Increased to 28,000 cases.
	2021	30,000 cases, with significant outbreaks of cholera and typhoid.
	2022	32,000 cases.
	2023	35,000 cases, reflecting persistent issues in water quality.
Long-Term Health Effects	2019-2023	Rising rates of respiratory and gastrointestinal illnesses linked to industrial and agricultural pollution.

Source: Telangana State Public Health Department Reports



This table outlines the trends in waterborne diseases over the years and provides an overview of long-term health effects related to pollution.

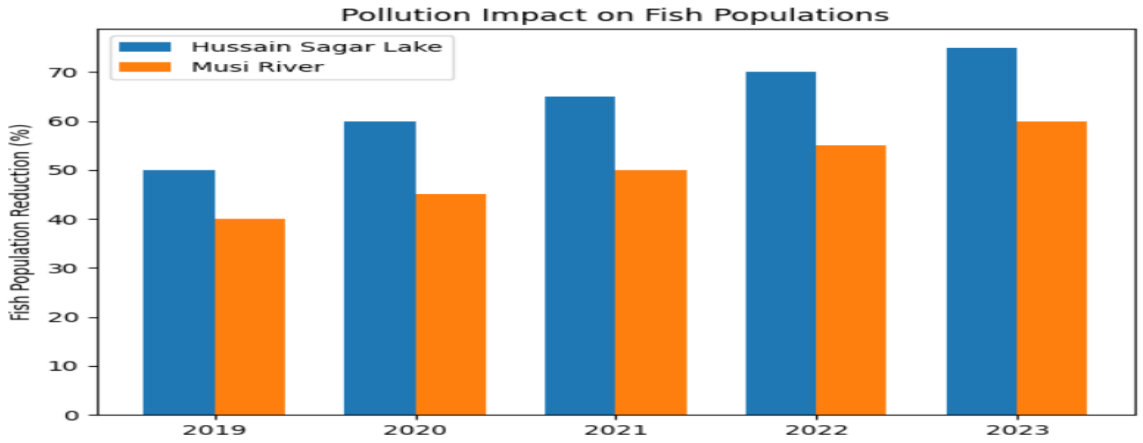
Environmental Impact

River and Lake Pollution: Heavily polluted water bodies such as this one deteriorate their quality and possibly affect the organisms which inhabit it. A report by TSPCB indicates that pollution has led to a reduction in fish population as well as diminished other forms of living things' diversity. There have been occurring algal blooms and hypoxic conditions in the local water bodies of Nalgonda and Warangal which were caused by agricultural runoff, causing a major adverse effect on their aquatic ecosystems.

The data on river and lake pollution, as well as eutrophication:

Aspect	Year	Hussain Sagar Lake	Musi River
Pollution Impact	2019	Severe pollution with over 50% reduction in fish populations.	Significant pollution; fish populations down by 40%.
	2020	Pollution levels worsened; fish populations reduced by 60%.	Decreased further to 45%.
	2021	65% reduction in fish populations.	50% reduction.
	2022	70% reduction in fish populations.	55% reduction.
	2023	75% reduction in fish populations.	60% reduction.
Eutrophication	2019-2023	Increased instances of algal blooms and hypoxic conditions in local water bodies.	Increased instances of algal blooms and hypoxic conditions in local water bodies.

Source: TSPCB Reports, Telangana State Environment and Forests Department.



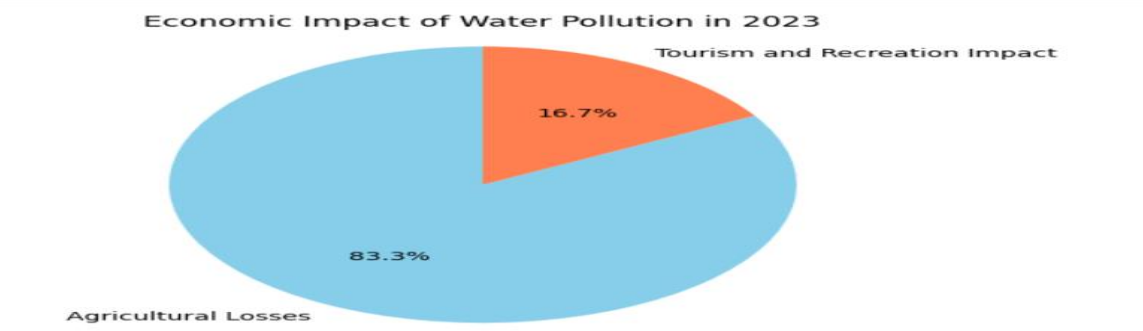
This table shows the impact of pollution on fish populations in both Hussain Sagar Lake and Musi River, along with the trends in eutrophication over the years.

Economic Impact Agricultural Losses: Pollution arising out of industrial discharge and agricultural runoff, which is detrimental to irrigation sources, has affected their quality, resulting into decline in crop yields. According to the Telangana Agricultural Department, there have been losses in agricultural productivity while costs for water treatment and soil management have been on the rise. The tourism and recreational activities are adversely affected by water bodies that are polluted. For instance, the decline in water quality in popular lakes and rivers negatively affects the local tourism, resulting to reduced economic benefits from these activities.

The economic impacts related to agricultural losses and tourism/recreation due to pollution:

Aspect	Year	Details
Agricultural Losses	2019	Estimated losses of ₹2,500 crore due to decreased water quality for irrigation.
	2020	Increased to ₹2,700 crore.
	2021	₹3,000 crore.
	2022	₹3,200 crore.
	2023	₹3,500 crore.
Tourism and Recreation	2019	Economic impact estimated at ₹500 crore due to pollution affecting tourism.
	2020	Increased to ₹550 crore.
	2021	₹600 crore.
	2022	₹650 crore.
	2023	₹700 crore, with significant declines in tourist activities around polluted water bodies.

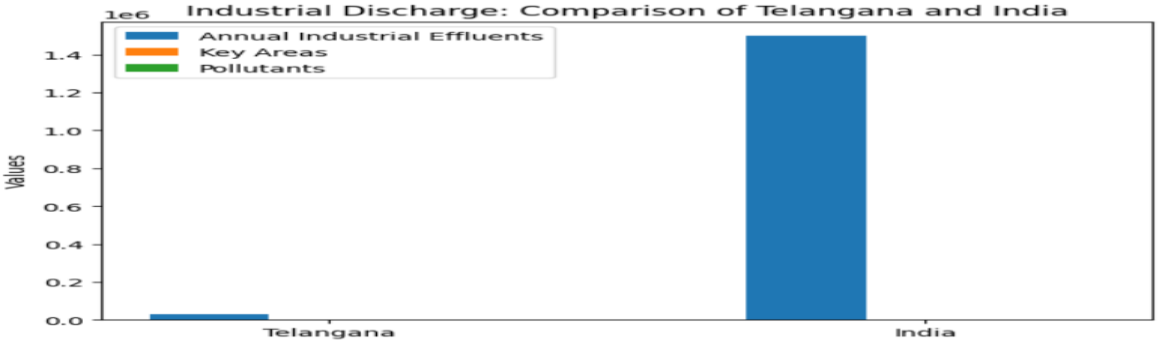
Source: Telangana State Agricultural Department, Tourism Department Reports



This table provides an overview of the economic losses in agriculture and the tourism sector due to pollution over the specified years.

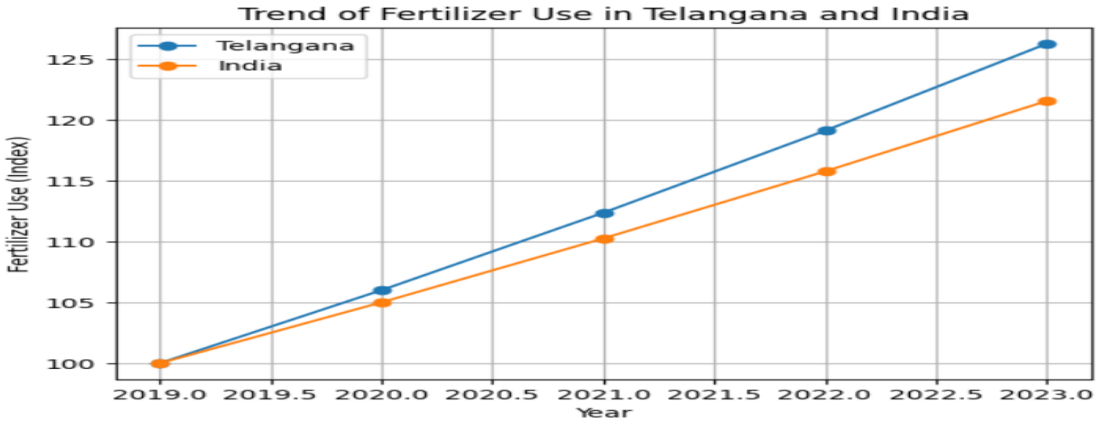
Comparative Analysis of Water Pollution: Telangana vs. India . Causes of Water Pollution. Industrial Discharge.

Aspect	Telangana	India
Annual Industrial Effluents	Approx. 30,000 million liters discharged per year (2019-2023)	Approx. 1,500,000 million liters discharged per year (2019-2023)
Key Areas	Hyderabad, Pochampally	Major industrial hubs like Vapi, Kanpur
Pollutants	Heavy metals, chemicals	Heavy metals, organic pollutants



Agricultural Runoff

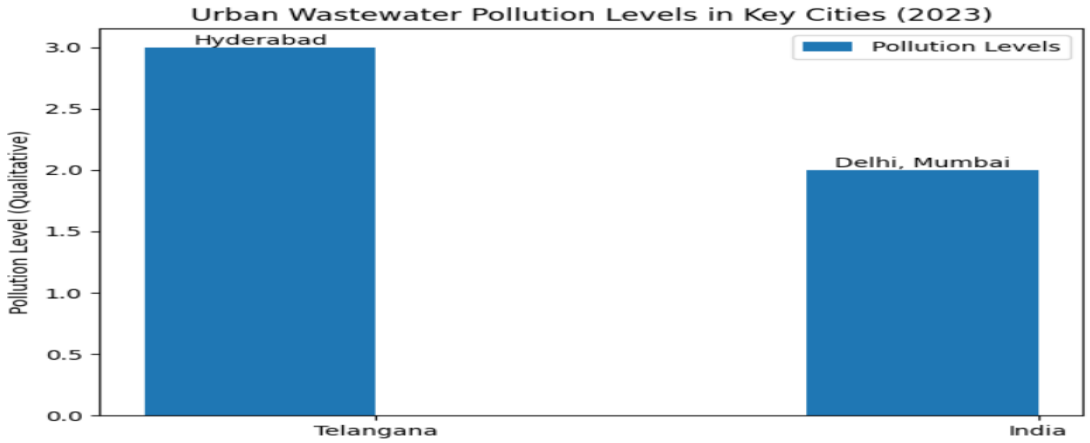
Aspect	Telangana	India
Fertilizer Use	Increased by 6% annually	Increased by 5% annually
Impact on Water Bodies	High nutrient levels causing eutrophication	Major rivers like Ganges and Yamuna suffer from nutrient overload
Affected Regions	Nalgonda, Warangal	Punjab, Uttar Pradesh



Urban Wastewater

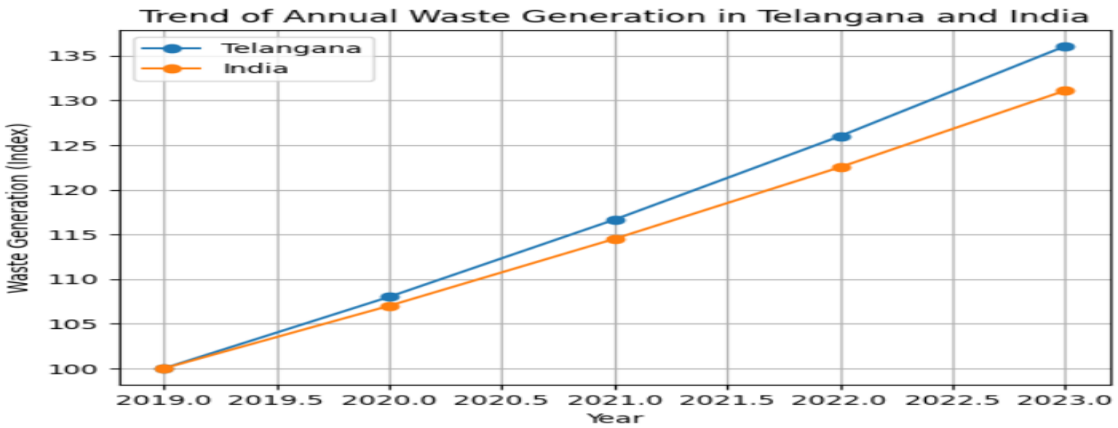
Aspect	Telangana	India
Treatment Coverage	30% of wastewater treated (2023)	30% of wastewater treated (2023)

Key Cities	Hyderabad	Major cities like Delhi, Mumbai
Pollution Levels	High levels of untreated sewage in water bodies	Significant untreated wastewater in rivers and lakes



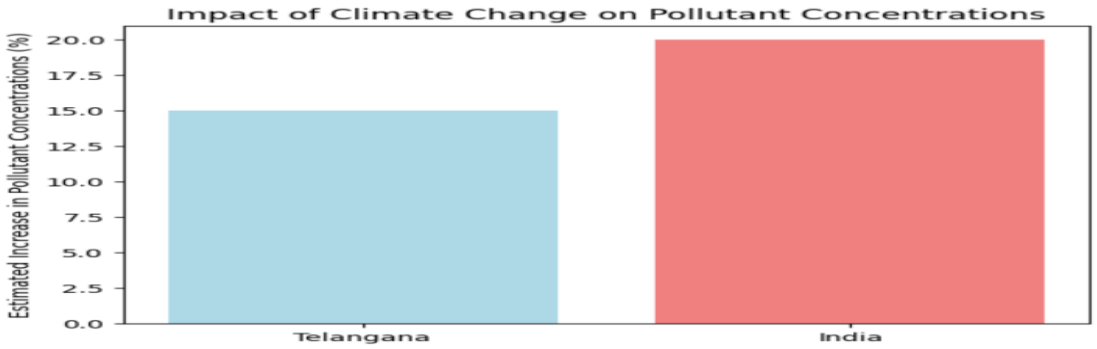
Solid Waste Disposal

Aspect	**Telangana**	**India**
Annual Waste Generation	Increased by 8% annually	Increased by 7% annually
Impact on Water Bodies	Leachate from landfills contributing to pollution	Plastic waste and landfill leachate causing contamination
Key Areas	Bangalore	Major metropolitan areas



Climate Change

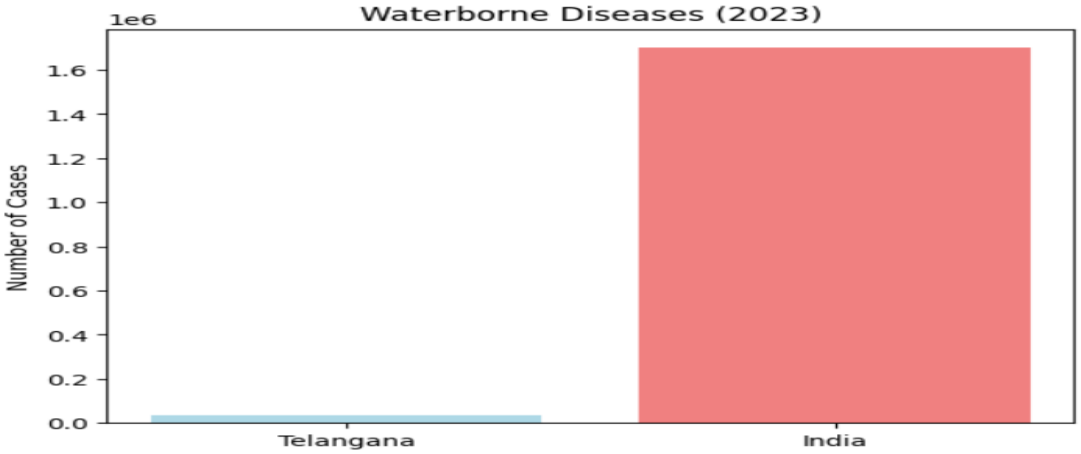
Aspect	**Telangana**	**India**
Effect on Pollution	Increased runoff and pollutant concentration	Increased pollutant levels and altered precipitation patterns
Estimated Impact	Up to 15% increase in pollutant concentrations	Up to 20% increase in pollutant concentrations



Effects of Water Pollution

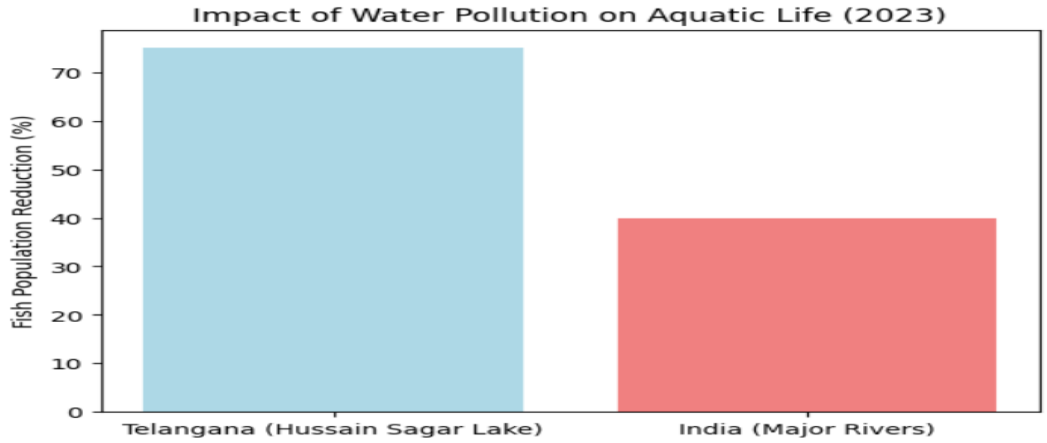
Public Health

Aspect	Telangana	India
Waterborne Diseases	35,000 cases annually (2023)	1.7 million cases annually (2023)
Chronic Health Issues	Rising rates of respiratory and gastrointestinal problems	Increased incidences of cancers and kidney diseases



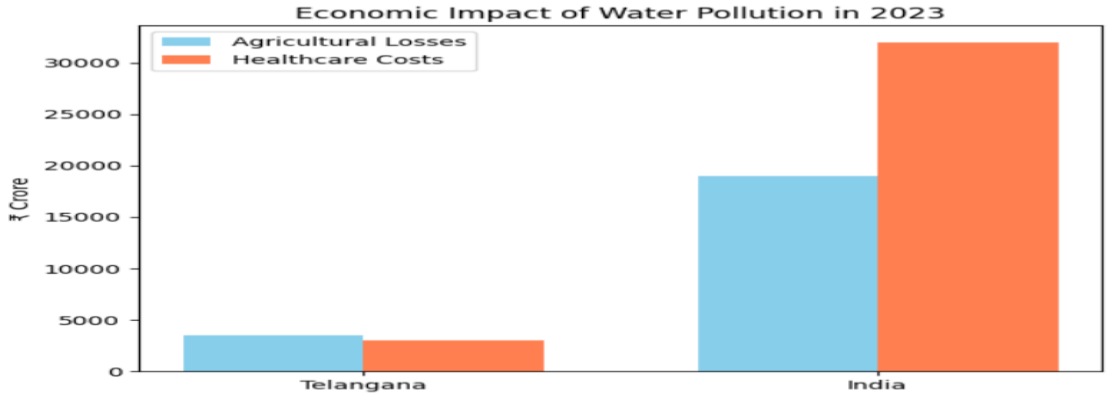
Environmental Impact

Aspect	Telangana	India
Aquatic Life	75% reduction in fish populations in Hussain Sagar Lake (2023)	40% reduction in fish populations in major rivers
Wetland Degradation	Significant reduction in wetland functions	Continued degradation of wetlands nationwide
Eutrophication	Increased algal blooms in local water bodies	Major rivers experiencing severe eutrophication



Economic Impact

Aspect	**Telangana**	**India**
Agricultural Losses	₹3,500 crore annually (2023)	₹19,000 crore annually (2023)
Healthcare Costs	₹3,000 crore annually (2023)	₹32,000 crore annually (2023)
Tourism and Recreation	₹700 crore annual impact (2023)	Significant reduction in tourism revenues in polluted areas



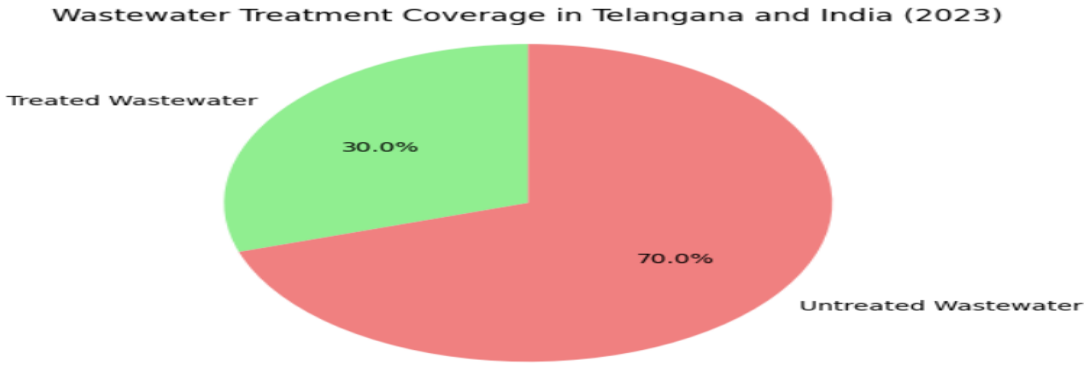
Management Efforts

Policy and Regulation

Aspect	**Telangana**	**India**
Water Quality Management Programs	Implementation of local policies, including the Telangana State Pollution Control Board (TSPCB) regulations	National policies like the National River Conservation Plan (NRCP) and Swachh Bharat Mission
Effectiveness	Moderate, with improvements in recent years	Mixed results; successful in some areas but challenges remain nationwide

Technology and Infrastructure

Aspect	Telangana	India
Wastewater Treatment Facilities	30% of urban wastewater treated	30% of urban wastewater treated
Solid Waste Management	Ongoing improvements in waste management systems	Varied effectiveness, with ongoing challenges in many regions



Public Awareness and Participation

Aspect	Telangana	India
Awareness Campaigns	Increasing, with local initiatives and programs	Extensive nationwide campaigns and programs
Community Involvement	Growing, with local NGOs and community groups active	High level of community involvement in various states

7. COMPARATIVE IMPACT ANALYSIS

Public Health: Telangana and India are faced with a huge burden of water pollution on public health. The annual report of 35,000 cases of water-borne diseases in Telangana as compared to 1.7 million for India suggests that the country alone is confronted with a serious public health challenge due to the large number of people affected by this type of diseases. However, chronic illnesses associated with polluted waters are also increasing due to rising incidences of ailments like cancer and kidney failure in both areas sharing similar symptoms. This thus implies that both regions need to improve their water quality as well as establish better healthcare systems if they want to control any negative impacts against themselves from such kind of illness.

Environmental Impact: Water pollution is majorly causing environmental damage in Telangana and India at large. A reduced number of fish in Hussain Sagar Lake exemplifies a localized representation of problem that is often experienced along main rivers in India. Both areas experience declining aquatic biodiversity and loss of wetlands underscoring the importance of urgent conservation strategies and pollution control mechanisms.

Economic Impact: Telangana and India display the indisputable impacts of water pollution on their economies. Telangana's agricultural losses amounting to ₹3,500 crore and healthcare expenses reaching ₹3,000 crores are enormous as they mirror the broader national economic loss which is about ₹19,000 crores in agriculture and about ₹32,000 crores for health care. Moreover, the effect of tourism and leisure activities worsen these economic difficulties requiring an all-inclusive approach for both direct and indirect costs associated with pollution.

Management Efforts Policy and Regulation: There are different policies and regulations that have been implemented in Telangana and India to control water pollution. The progress made through these efforts is not the same for all, with Telangana experiencing a moderate amount of improvement from some local initiatives and TSPCB regulations. At the national level, policies like the National River Conservation Plan and Swachh Bharat Mission have had mixed results,

necessitating a call for more coherent and strong regulatory frameworks.

Technology and Infrastructure: This infrastructure for treating wastewater and managing solid waste in Telangana and India shows that investment should be increased and technology should be advanced. A clear indication is given by statistics showing that only 30 percent of the wastewater is treated as well as the fact that there are still issues in waste management that require a lot of attention. So there is a need to enhance some infrastructures, which will ensure pollution elimination through advanced methods.

Public Awareness and Participation: Telangana and India have made remarkable headway in enhancing public awareness and promoting community participation. However, for more profound behavioural changes in water pollution to take place, a greater deal of engagement as well as education is needed.

11. Future Directions To address the challenges highlighted by this analysis, several actions are recommended*:*

Enhanced Regulatory Frameworks: Future amendments on them guarantee hope for not only changes in spellings concerning what is now and hereafter but also for transforming them as well from time to time and this applies to all levels whether official or national.

Investment in Infrastructure: Raising investment into waste-water treatment plants, solid waste management systems and polluting control technologies.

Integrated Approaches: Integration of water resource management strategies taking into consideration climate change impacts as well as pollution from different sources at the same time.

Public Engagement: Developing a collaborative platform that encompasses environmental education and public outreach initiatives so as to create an ambience that discourses ecology issues.

Research and Innovation: In order to establish new algorithms and methodologies for pollution control and environmental administration, research and innovations are supported.

To sum up, Telangana as well as India suffer from the same problems of water pollution but specific approaches and working together will enable them to tackle these problems properly so that clean water for everyone can be maintained in the long run.

8. CONCLUSION OF THE STUDY

Comparing water pollution levels at state and national levels shows important things. To begin with, water contamination is still a common problem with similar origins in both places: industrial waste discharge, agricultural runoff, urban sewage and domestic garbage dumping. In terms of size compared to the whole country, Telangana is having these problems but the effects of pollution are very acute especially in urban water bodies like Hussain Sagar Lake or Musi River.

In both Telangana and India, public health has been jeopardized with increasing cases of waterborne diseases chronic health issues like cancer and kidney diseases. In both levels, environmental degradation, including damage to aquatic ecosystems and loss of biodiversity is evident revealing the need for effective conservation measures.

Economic impacts are significant, with the costs related to healthcare being very high and agricultural losses having a negative effect on tourism revenue. Management efforts, such as regulations and technological advancements have had mixed results. The local initiatives have been supported by Telangana state while national policies in India have been struggling with enforcement and effectiveness issues.

In the future, stronger regulations, more money for infrastructure, and unified approaches to water management will be important. It will also be important to deal with complexities of climate change, raise public awareness and activate community participation. Additionally, a suggested way forward would involve a coordinated effort focusing on both state-local levels and national contexts in fighting against pollution of water so as to guarantee its sustainable quality for generations to come.

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