



Original Article

Effects of Wastewater and Industrial Pollution on Ahmedabad Drinking Water Quality

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Abstract

Water pollution is a serious problem for the environment and public health, particularly in rapidly expanding cities like Ahmedabad, India. This study examines how sewage and industrial pollution affect the quality of drinking water in Ahmedabad, highlighting the sources, levels of contamination, and associated health risks. Untreated sewage discharge and industrial effluents from the chemical, textile, and pharmaceutical industries are the main causes of high concentrations of heavy metals, nitrates, and microbiological contaminants in surface and groundwater sources. Water quality analyses reveal high amounts of toxins over the permissible limits set by regulatory bodies, which might lead to gastrointestinal infections, neurological disorders, and other long-term chronic illnesses. The report emphasizes the critical need for improved sewage treatment facilities, enhanced water quality monitoring, and stricter industrial wastewater regulations in order to safeguard the public. This research paper explores the adverse effects of wastewater discharge and industrial pollution on the quality of drinking water in Ahmedabad, a rapidly urbanizing city in Gujarat, India. With increasing industrialization and population growth, the discharge of untreated or inadequately treated industrial effluents and domestic sewage into nearby water bodies has become a major concern. The study highlights how pollutants such as heavy metals, chemical toxins, and biological contaminants enter the Sabarmati River and groundwater sources, which are primary suppliers of drinking water in the region. Using data collected from field surveys, water quality testing reports, and environmental studies, the research evaluates key parameters including pH, turbidity, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS), and the presence of hazardous substances. The findings reveal significant contamination that poses serious risks to human health, including gastrointestinal diseases, neurological disorders, and long-term organ damage. The paper further examines the failure of existing wastewater treatment systems and the lack of stringent enforcement of environmental regulations. Recommendations include stricter monitoring, sustainable industrial practices, improved treatment infrastructure, and public awareness initiatives. This study aims to contribute to the development of effective policies and community actions for safeguarding drinking water resources in Ahmedabad.

Keywords: Water contamination, Industrial effluents, Wastewater management, Sabarmati River pollution, Groundwater quality, Environmental health, Drinking water safety, Urban water crisis.

Introduction

A. A Synopsis of Water Sources in Ahmedabad:

Ahmedabad, one of the fastest-growing cities in India, relies on a range of water sources to meet its expanding drinking water demands. The Sabarmati River, a major surface water source that flows through the city center, has had its quality severely deteriorated by untreated sewage and industrial waste. Groundwater is another significant source, especially in rural and rural areas where bore and tube wells provide drinking water. However, pollution and over-extraction lead to declining water tables and poor quality. Additionally, the Narmada Canal of the Sardar Sarovar Project has emerged as a crucial alternative, reducing Ahmedabad's dependency on local water supplies and supplying it with clean water.

B. The Benefits of Pure Drinking Water for Health:

Access to safe drinking water is essential for maintaining public health, preventing waterborne infections, and guaranteeing general well-being.

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Cholera, typhoid, diarrhea, and other gastrointestinal diseases caused by tainted water can affect vulnerable populations, such as children and the elderly. Clean water is also necessary to sustain hygiene, food preparation, and economic activities. The World Health Organization (WHO) emphasizes the need for strict water quality monitoring and infrastructure development to ensure that everyone has access to clean drinking water.

C. Growing Fears That Water Quality Is Affected by Pollution:

Despite efforts to improve water supply infrastructure, Ahmedabad has serious water contamination problems due to rapid industrialization, urbanization, and inadequate waste management. Hazardous pollutants, including heavy metals, dyes, and poisonous chemicals, are discharged by industrial effluents from the textile, chemical, and pharmaceutical industries into the Sabarmati River and other bodies of water. In addition, untreated sewage and municipal waste increase chemical toxicity and microbial infestation, which degrades water quality. In addition to endangering the ecological balance, these contaminants pose serious health risks to the residents who depend on these sources for drinking water. These problems require immediate attention, which includes promoting sustainable water management practices, strengthening wastewater treatment, and enforcing stricter pollution control laws. The next sections will go into further detail on the extent of sewage and industrial pollution, how it affects drinking water quality, and potential solutions to mitigate Ahmedabad's problem.

Sources of Pollution:

A. Pollution from Industry:

Ahmedabad's fast development has resulted in significant water contamination. The textile, chemical, pharmaceutical, and dyeing industries discharge untreated wastewater containing heavy metals, dangerous chemicals, and colors into the Sabarmati River and groundwater. These pollutants degrade water quality, making it unsafe for human consumption and posing major health risks.

B. Pollution from Wastewater:

The city's inadequate sewage treatment system results in the direct disposal of untreated household and municipal waste into aquatic bodies. High levels of bacteria, nitrates, and organic waste lead to environmental degradation and waterborne infections. The system is further burdened by the increasing urban population, which has raised the risks of pollution.

Effect on the Purity of Water Used for Drinking:

A. Pollution by Chemicals:

Industrial effluents and agricultural runoff inject fluoride, nitrates, and heavy metals (lead, chromium, and mercury) into water sources. Because prolonged exposure to these chemicals can cause cancer, kidney damage, and neurological problems, it poses a major risk to the public's health.

B. Biological Agent Pollution:

Untreated sewage is the source of the high concentration of coliform and *E. coli* bacteria in drinking water. Children in low-income regions with limited access to clean water are

primarily affected by cholera, typhoid, and diarrhea outbreaks caused by these bacteria.

C. Modification of Physical Characteristics:

Pollution alters the physical characteristics of water, making it more turbid, odorous, and unpalatable. By making the water aesthetically unfit for human consumption and indicating the presence of harmful pollutants, these changes further erode public confidence in the quality of the water.

Effects on Health and the Environment:

A. An Increase in Waterborne Infections:

Particularly in low-income and densely populated areas, typhoid, cholera, hepatitis, and diarrhea have all increased as a result of tainted drinking water. Inadequate sanitation and water treatment exacerbate these health risks and often lead to disease outbreaks.

B. Prolonged Exposure to Heavy Metals:

Long-term exposure to water contaminated with lead, mercury, arsenic, and fluoride can cause neurological disorders, liver damage, renal failure, and developmental issues in children. Long-term exposure increases the risk of developing cancer and other debilitating illnesses.

C. Aquatic Ecosystem Degradation:

Pollution from sewage and industry disturbs aquatic life in the Sabarmati River and other water bodies. Toxic chemicals and low oxygen levels affect the ecosystem and livelihoods that rely on fishing and water resources, resulting in fish fatalities, biodiversity loss, and ecological imbalance.

Government Responses and Policy Reactions:

A. The Gujarat Pollution Control Board's (GPCB) and local governments' roles:

The Gujarat Pollution Control Board (GPCB) and local authorities are responsible for monitoring water quality, enforcing pollution control laws, and regulating industrial discharge. They conduct regular inspections and offer advice to companies and sewage treatment plants in an effort to lessen pollution.

B. Implementing Wastewater Treatment and Pollution Control Measures:

Improvements have been made to sewage treatment plants (STPs) and effluent treatment plants (ETPs) in an attempt to reduce the quantity of pollutants that enter Ahmedabad's water sources. Pollution is intended to be decreased via stricter industrial effluent discharge laws and initiatives like the Namami Gange project. The increase of the Narmada Canal water supply has also reduced reliance on polluted sources.

C. Enforcement Problems and Policy Deficits:

Outdated infrastructure, insufficient funding, and a lackadaisical enforcement of laws all hinder effective pollution control. Many businesses operate without proper treatment facilities or get around regulations, and sewage treatment capacity is still insufficient. Strengthening legislation, improving supervision, and increasing public knowledge are necessary to ensure long-term water safety.

Potential Remedies and Suggestions:**A. Tightening Industrial Wastewater Treatment Regulations:**

Businesses may be ensured to treat wastewater properly before releasing it into the environment by frequent inspections, stronger enforcement of effluent treatment requirements, and harsh penalties for violations. By encouraging zero liquid discharge (ZLD) systems and offering rewards for eco-friendly behavior, industrial pollution may be further reduced.

B. Expanding Capacity and Improving Infrastructure for Sewage Treatment:

Sewage treatment plants (STPs) need to be modernized, their capacity expanded, and their operational efficiency ensured in order to prevent untreated sewage from contaminating water sources. Investing in decentralized wastewater treatment can help expand coverage, especially in areas that are rapidly urbanizing.

C. Promoting Public Awareness and Community Involvement:

Educational programs on proper sanitation practices, pollution prevention, and water conservation may all help to encourage responsible water usage. Community-led initiatives, such as neighborhood cleanup drives and water monitoring programs, can help safeguard sources of drinking water.

D. Using Cutting-Edge Water Purification Technology:

Reverse osmosis (RO), ultraviolet (UV) filtration, and bio-remediation techniques can all be used to improve drinking water quality at the municipal and home levels. Supporting nature-based solutions, such as wetlands for wastewater treatment, can also help achieve sustainable water purification.

Conclusion:**A. An overview of the urgent need for action:**

Ahmedabad's drinking water is contaminated by sewage and industrial pollutants, which poses serious health and environmental risks. Growing concentrations of heavy metals, microbes, and chemical pollutants underscore the pressing need for improved water management and stricter pollution control measures.

B. The Benefits of Sustainable Industrial and Urban Development:

Long-term solutions require sustainable industrial practices, thoughtful urban planning, and efficient sewage treatment to prevent further water pollution. Wastewater recycling, environmentally friendly infrastructure, and pollution control technologies can all help to ensure safer water sources for coming generations.

C. Calling on Government, Business, and the Public to Work Together:

To guarantee safe drinking water, stricter laws, corporate accountability, and proactive public participation are required. Government agencies must enforce stricter laws, companies must dispose of waste properly, and individuals must conserve water. A collaborative effort is required to protect Ahmedabad's drinking water and public health.

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Conflicts of interest

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