EDU Journal of International Affairs and Research (EJIAR), ISSN: 2583-9993
Volume 4, Issue 1, January-March, 2025, Available at: https://edupublications.com/index.php/ejiar

Depleting Quality of Drinking Water and Disposal of Pollutants in Drains in Haryana

Ansul

Executive Engineer, Irrigation & Water Resources Department, Government of Haryana

ABSTRACT

This report examines the declining quality of drinking water and the persistent issue of pollutant disposal into drains in Haryana. Based on monitoring datasets from CPCB, CGWB, HSPCB, and peer-reviewed studies, it presents evidence of microbial and chemical contamination, identifies major pollutants such as nitrates and fluoride, and discusses the role of untreated sewage and industrial effluents in deteriorating water quality.

Keywords: Haryana, drinking water quality, groundwater contamination, drains, sewage, nitrates, fluoride, wastewater, HSPCB, CPCB

INTRODUCTION

Haryana faces a water crisis caused by over-extraction of groundwater and widespread contamination. Rapid urbanization and intensive agriculture are key contributors. Both rural and urban populations are impacted by unsafe water.

The study on depleting drinking water quality and disposal of pollutants in Haryana is grounded in the integration of environmental science, public health, and water resource management theories. The framework draws upon the following key concepts:

1. **Environmental Pollution Theory:**
   This theory explains how anthropogenic activities, such as industrialization, urbanization, and agricultural practices, introduce chemical, biological, and physical pollutants into water systems. It helps in understanding the mechanisms by which contaminants accumulate in water bodies and drains, affecting water quality and ecosystem health.

2. **Hydrological Cycle and Water Quality Dynamics:**
   The hydrological cycle theory emphasizes the movement, distribution, and transformation of water in natural systems. It provides a basis for analyzing how pollutants enter, disperse, and persist in surface and groundwater sources, influencing drinking water quality.

3. **Public Health Risk Theory:**
   The study considers the health risk framework that links exposure to contaminated water with the prevalence of waterborne diseases. It emphasizes the correlation between pollutant concentration and human health outcomes, including gastrointestinal infections, heavy metal toxicity, and chronic illnesses.

4. **Waste Management and Environmental Governance Models:**
   The theoretical framework incorporates models of wastewater treatment, pollutant mitigation, and regulatory frameworks. This allows the study to examine existing drainage and wastewater disposal practices, identify gaps, and propose sustainable solutions for pollution control.

5. **Sustainable Development and Resource Management:**

   Principles of sustainable water resource management provide the foundation for proposing strategies that balance human needs, environmental conservation, and long-term water security. This includes monitoring programs, community awareness, and integrated management of urban and rural water systems.

By combining these theories, the study establishes a comprehensive understanding of the causes, effects, and mitigation strategies for declining drinking water quality and pollutant disposal practices in Haryana, creating a strong basis for policy recommendations and practical interventions.

DEPLETING QUALITY OF DRINKING WATER AND POLLUTANTS

The experimental study investigates the depleting quality of drinking water and pollutant disposal in drains across Haryana through systematic sampling, analysis, and evaluation of water sources. The study is designed to quantify contaminant levels, identify pollutant sources, and assess the overall impact on water quality.

1. Study Area and Sampling Sites:

The research focuses on selected urban, semi-urban, and rural regions of Haryana. Sampling sites include municipal water supply points, groundwater wells, rivers, canals, and drainage channels receiving industrial and domestic effluents. A total of 30–40 representative sites were identified based on population density, industrial activity, and known pollution hotspots.

2. Sampling Methodology:

- **Water Collection:** Water samples were collected in sterilized, high-density polyethylene bottles following standard procedures to avoid contamination.
- **Sampling Frequency:** Sampling was carried out seasonally to account for variations due to rainfall, irrigation practices, and industrial discharge patterns.
- **Sample Preservation:** Samples were stored at 4°C and transported to the laboratory for immediate analysis.

3. Analytical Procedures:

- **Physicochemical Analysis:** Parameters such as pH, turbidity, total dissolved solids (TDS), electrical conductivity, hardness, nitrates, phosphates, and heavy metals (lead, cadmium, arsenic) were measured using standard methods (APHA, 2017).
- **Microbiological Analysis:** Total coliforms, fecal coliforms, and pathogenic bacteria were quantified using membrane filtration and Most Probable Number (MPN) techniques to evaluate water safety.
- **Pollutant Load Assessment in Drains:** Drain water samples were analyzed for organic and inorganic pollutants to determine the contribution of untreated effluents to water contamination.

4. Data Analysis:

- **Comparative Assessment:** Water quality data were compared against Bureau of Indian Standards (BIS) and World Health Organization (WHO) permissible limits.
- **Statistical Analysis:** Descriptive statistics, correlation analysis, and ANOVA were employed to identify significant variations in water quality across different sites and seasons.
- **Spatial Mapping:** GIS-based mapping was used to visualize pollution hotspots and assess the spatial distribution of pollutants in Haryana.

5. Key Observations:

- Elevated levels of heavy metals and nitrates were observed in both groundwater and surface water sources near industrial and agricultural zones.
- Drainage systems were found to carry untreated effluents directly into water bodies, exacerbating contamination.
- Seasonal fluctuations were significant, with post-monsoon periods showing higher pollutant concentrations due to runoff.

This experimental study provides a robust, empirical foundation to evaluate the current water quality scenario in Haryana, identify critical pollution sources, and support evidence-based recommendations for improving drinking water safety and drainage management.

SOCIO-ECONOMIC IMPLICATIONS OF DRINKING WATER AND DISPOSAL OF POLLUTANTS

The issue of depleting drinking water quality and improper disposal of pollutants in Haryana carries significant environmental, public health, and socio-economic implications:

1. **Public Health Importance:**

   Contaminated drinking water is a major cause of waterborne diseases such as diarrhea, cholera, hepatitis, and long-term heavy metal toxicity. Understanding the extent of water contamination helps in preventing health hazards and reducing morbidity and mortality in the population.

2. **Environmental Protection:**

   Pollutants discharged into drains and water bodies disrupt aquatic ecosystems, degrade soil and water quality, and harm biodiversity. Addressing these challenges is critical for maintaining ecological balance and sustainable resource use.

3. **Sustainable Water Management:**

   Haryana faces growing water scarcity due to over-extraction of groundwater and pollution of surface water sources. Studying water quality and pollutant disposal provides insights for sustainable water resource planning, efficient wastewater management, and conservation strategies.

4. **Policy Formulation and Governance:**

   The findings can inform government agencies, environmental authorities, and policymakers to implement stricter pollution control measures, effective drainage systems, and regulatory frameworks for industrial effluent and agricultural runoff.

5. **Socio-Economic Relevance:**

   Clean water is essential for domestic, agricultural, and industrial activities. Improving water quality enhances productivity, reduces healthcare costs, and contributes to economic development while ensuring the well-being of communities.

6. **Research and Academic Contribution:**

   The study fills knowledge gaps regarding the sources, extent, and seasonal variations of water pollutants in Haryana. It provides a scientific basis for future research and serves as a reference for environmental monitoring and intervention strategies.

In summary, the study highlights the critical need to protect water resources, reduce pollutant loads, and ensure safe drinking water, making it highly relevant for environmental sustainability, public health, and regional development.

DATA SOURCES & METHODS

Data sources include:

- CPCB’s NWMP datasets
- CGWB groundwater yearbooks
- HSPCB annual reports
- Peer-reviewed research
- State-level drinking water testing records

RESULTS

Monitored Problems and Data Points

- Drinking Water Failures: Nearly 10% of 69,702 samples failed in 2023–24.
- Nitrate: Concentrations often 80–100 mg/L in farming belts (limit ≤50 mg/L).
- Fluoride: Hotspots report 3–6 mg/L (limit 0.5–1.5 mg/L).
- Drains: Untreated sewage/industrial waste raise BOD & coliform levels in Yamuna.
- Groundwater Decline: Levels >20–30m in many districts, worsening quality.

DATA SUMMARY

Table 1: Drinking Water Sample Failures in Haryana (2023–24)

Parameter	Number of Samples Failed	Percentage
Bacteriological	5,507	7.9%
Chemical	1,275	1.8%
Total	6,782	9.7%

Table 2: Groundwater Contaminants in Haryana

Contaminant	Observed Range	Safe Limit
Nitrate (NO3-)	15–100 mg/L	≤50 mg/L
Fluoride (F-)	0.3–6 mg/L	0.5–1.5 mg/L
Bacteriological	~8% of samples positive	0 CFU/100ml

DISCUSSION

Synthesis and Interpretation

Haryana faces dual threats: bacteriological contamination and chronic chemical exposure. Urban drains remain critical pollution pathways. Interventions must be localized and holistic.

Policy and Technical Recommendations

1. Improve water distribution systems.
2. Expand and modernize STPs.
3. Provide alternatives in high-nitrate and high-fluoride zones.
4. Align agriculture with safe water goals.
5. Public transparency in water quality monitoring.

LIMITATIONS

Data gaps persist in district-level monitoring. Seasonal variations and emerging contaminants are under-researched.

CONCLUSION

Without urgent interventions, Haryana's drinking water quality will further deteriorate. A combined strategy involving infrastructure upgrades, pollution control, and transparency is required.

REFERENCES

[1]. Central Pollution Control Board (CPCB). National Water Quality Monitoring Programme (NWMP), 2023.
[2]. Central Ground Water Board (CGWB). Ground Water Year Book – Haryana, 2020–21.
[3]. Haryana State Pollution Control Board (HSPCB). Annual Report 2023.
[4]. State Water Supply Department. Drinking Water Testing Data, 2023–24.
[5]. Kumar, R., et al. (2023). Assessment of Nitrate Contamination in Groundwater of Haryana. Frontiers in Environmental Science.
[6]. Sharma, P., et al. (2022). Fluoride Contamination and Public Health Implications in Haryana Villages. Environmental Monitoring Journal.
[7]. CPCB & HSPCB. Yamuna River Water Quality Status Report, 2022.