Water Purification Techniques and the Significance of the Ganges: Maha Kumbh 2025

Dr Bindu Rathore
Dean
Faculty of Pharmacy Major SD Singh University, Farrukhabad
Email: deanpharmacy@msds.ac.in

Sumit Kumar
Assistant Professor
S.B.S. Daddu Ji College of Pharmacy, Major SD Singh University, Farrukhabad
Email: sumit.sk697@gmail.com

Deepak Kumar
Research Scholar
Department of Chemistry, Bundelkhand University, Jhansi
Email: deepakdhanoliya8@gmail.com

Mrs. Shila ghosh
Assistant Professor
S.B.S. Daddu Ji College of Pharmacy, Major SD Singh University, Farrukhabad
Email: ghoshshila838@gmail.com

Abstract

The Ganges River is not only spiritually and culturally significant in India but also plays a crucial ecological role. During Maha Kumbh 2025, when millions of devotees take a dip in the river, maintaining its purity and cleanliness becomes a major challenge. To keep the Ganges clean and pollution-free, it is essential to utilize both traditional and modern water purification techniques.

This research paper highlights traditional and modern water purification methods such as bioremediation, nano-filtration, phytoremediation, and advanced oxidation processes. Additionally, it analyzes the role of the Namami Gange Project and community efforts in preserving the cleanliness of the Ganges. The study emphasizes balancing faith and science to ensure both the sanctity and environmental sustainability of the river.

Maha Kumbh 2025 provides an important opportunity to maintain the purity of the Ganges by integrating modern water purification techniques and sustainable management policies, thereby setting new standards for water conservation. This research integrates traditional knowledge, scientific advancements, and government policies to emphasize the need for preserving the sanctity of the Ganges for future generations.

Key Points

- The Ganges is India's **cultural, religious, and ecological heritage**.
- Industrial and domestic waste have affected the water quality of the Ganges.
- **Traditional and modern techniques** are essential for water purification.
- Techniques such as **bioremediation, nano-filtration, and phytoremediation** can be highly effective.
- Government initiatives like **"Namami Gange"** play a crucial role in Ganges conservation.

Community participation is essential to ensure cleanliness during Maha Kumbh 2025

1. **Introduction**

Introduction

The Ganges River is not only a sacred entity in Hinduism but also a crucial ecological and economic resource for millions of people. Revered as a symbol of purity and spiritual liberation, it is believed that bathing in its waters cleanses sins and grants *Moksha* (liberation from the cycle of birth and death). One of the most significant religious gatherings associated with the river is the *Maha Kumbh Mela*, held every twelve years, where millions of devotees participate in ritual bathing. The upcoming *Maha Kumbh Mela 2025*, scheduled from January 13 to February 26 in Prayagraj, presents both a spiritual occasion and an environmental challenge, as the massive influx of pilgrims, industrial waste, and urban pollution threaten the sanctity and quality of the river's water.

The Sangam, the confluence of the Ganges, Yamuna, and the mythical Saraswati rivers, is one of the holiest sites in India, especially during the Maha Kumbh Mela. Water is a vital resource that sustains life on Earth, playing a crucial role in ecosystems, human health, agriculture, industry, and economic growth. While freshwater is often used directly for various purposes, its quality varies across different locations. Pollution significantly impacts water clarity and safety, making contaminated rivers a major source of waterborne diseases. In developing countries, poor water quality leads to severe health crises, affecting millions each year.

The river's water is life itself. It not only maintains environmental balance but also serves as a vital resource for human civilization, agriculture, industry, and biodiversity. Preserving the purity and availability of water is essential, as a healthy life is impossible without clean water. Rivers like the Ganges hold immense spiritual, cultural, and ecological significance, making their conservation a shared responsibility. Keeping these rivers free from pollution ensures that future generations continue to benefit from their life-sustaining waters.

Maintaining the purity and cleanliness of the Ganges requires a balance between faith and science. While traditional beliefs emphasize the river's self-purifying ability, modern environmental studies stress the urgent need for sustainable conservation efforts. This research explores various traditional and modern water purification techniques, including bioremediation, nano-filtration, phytoremediation, and advanced oxidation processes. Additionally, it evaluates the role of the *Namami Gange Project* and community-driven initiatives in preserving the river's ecological health.

2. Current Status of Ganges Water & Bacteria in Sangam Waters at Maha Kumbh

2.1 Major Factors Affecting Ganges Water Quality

- **Industrial waste:** Discharge of chemicals, heavy metals, and other pollutants into the river (CPCB Report, 2022).
- **Municipal waste:** Flow of domestic sewage and untreated wastewater into the river.
- **Religious and tourism activities:** Immersion of idols, flowers, plastics, and other materials

- **Agricultural pollution:** Entry of pesticides and fertilizers into the water.


2.2 Causes of Bacterial Contamination at the Sangam

1. **Mass Bathing & Rituals** – Millions of devotees take a holy dip, increasing microbial load in the water.
2. **Sewage & Human Waste** – Inadequate sanitation facilities lead to direct discharge of human waste into the river.
3. **Industrial & Agricultural Waste** – Chemical and organic pollutants from upstream sources enhance bacterial growth.
4. **Decomposing Organic Matter** – Offerings of flowers, food, and ashes contribute to microbial activity.

2.3 Health Impacts of Contaminated Water

The presence of pathogenic bacteria in Sangam waters poses severe health risks, including:

- **Gastrointestinal Infections** – Diarrhea, cholera, dysentery.
- **Skin & Eye Infections** – Rashes, irritation, conjunctivitis.
- **Respiratory Issues** – Inhalation of aerosolized bacteria can cause pneumonia and bronchitis.
- **Typhoid & Hepatitis** – Long-term exposure can lead to chronic infections.

Studies and reports from the Central Pollution Control Board (CPCB) and National Environmental Engineering Research Institute (NEERI) indicate the presence of several bacterial species in the Ganges, especially during Maha Kumbh.

3. Traditional and Modern Water Purification Techniques

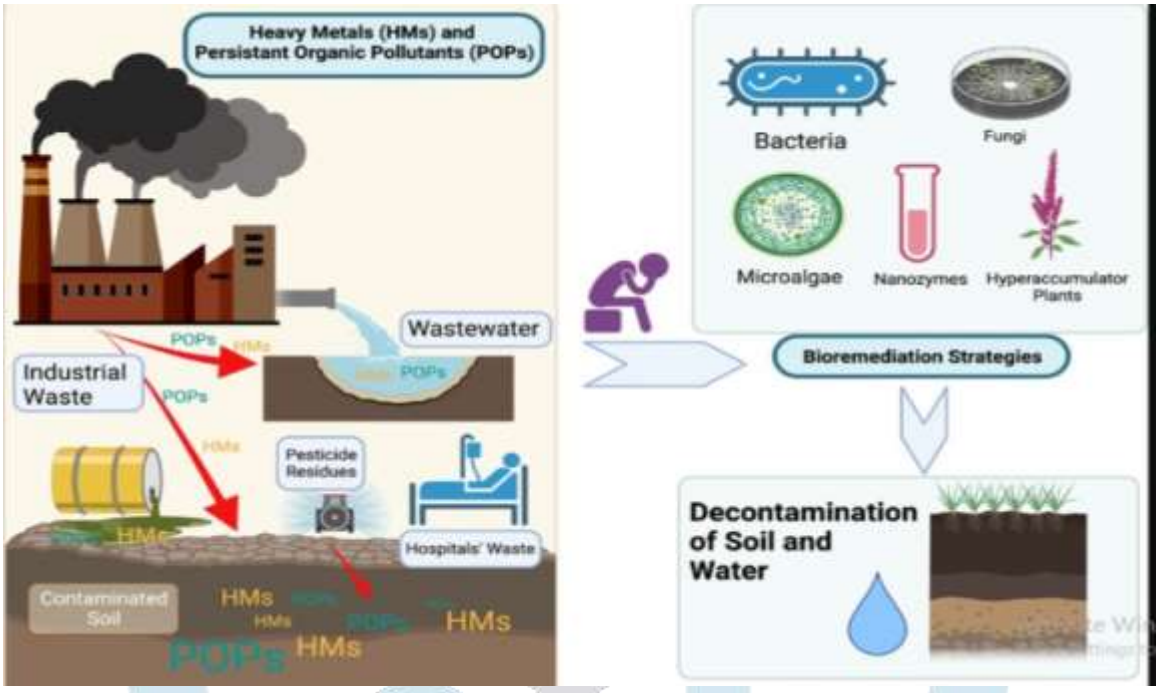
3.1 Traditional Water Purification Methods

- **Purification using cow urine and medicinal herbs**: Ancient texts mention the antimicrobial properties of cow urine and Ayurvedic herbs such as Tulsi, Neem, and Amla.
- **Natural filtration techniques**: Filtration using sand, clay, and charcoal.
- **Water storage in copper vessels**: Copper ions possess natural antimicrobial properties, reducing microbial contamination (Ayurvedic Research, 2021).
- **Solid Waste Management**: Deployment of extensive waste collection and disposal mechanisms.
- Ban on plastic and promotion of biodegradable materials for religious offerings.
-

3.2 Modern Water Purification Techniques

- **Bioremediation**: Use of microorganisms to remove harmful elements from water (Kumar & Sharma, 2021).
- **Nano-filtration**: Advanced membrane technology for removing heavy metals and microbial contaminants.
- **Phytoremediation**: Use of plants like water hyacinths and vetiver grass to absorb pollutants.
- **Advanced oxidation processes**: Purification using ozone, UV radiation, and hydrogen peroxide.

- **Reverse osmosis (RO) and UV-based water purification techniques**: Advanced methods for large-scale water purification.



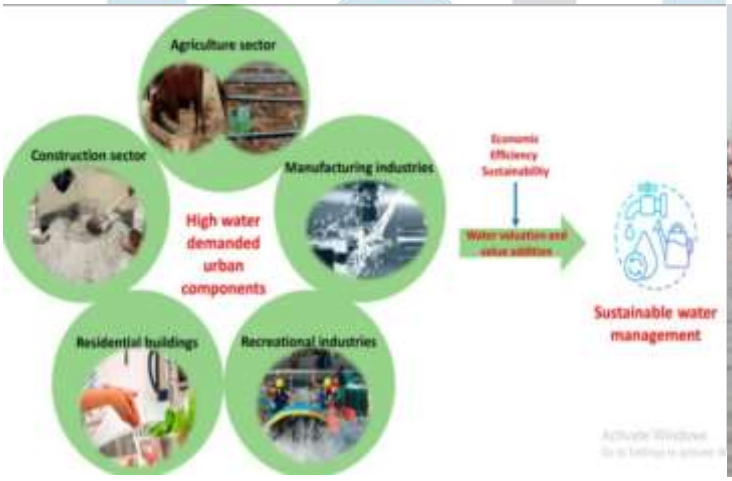
4. Government Schemes and Policies

- **Namami Gange Program (2014)**: A comprehensive project for cleaning and rejuvenating the Ganges (Government of India Report, 2023). This initiative aims to prevent sewage and pollutants from entering the river, ensuring cleaner water.
- **National River Conservation Plan (NRCP)**: Focuses on preventing pollution and restoring river health.
- **Ganga Action Plan (GAP)**: One of the earliest initiatives to clean the Ganges.
- **Local administration-led cleanliness drives**: Community participation and awareness campaigns.
- **Jal Shakti Abhiyan:** The Jal Shakti Abhiyan (Water Power Mission) was launched in 2019 to address the water scarcity and ensure the conservation of water resources. The mission focuses on five key intervention areas: water conservation and rainwater harvesting, renovation of traditional water bodies, reuse of treated wastewater, interlinking of rivers, and implementing groundwater recharge measures. Under this mission, more than 1.54 lakh water bodies have been renovated or constructed.
- **Water Treatment Plants** – Advanced water purification plants are being set up to maintain water quality at the confluence of the Ganga, Yamuna, and Saraswati rivers.
- **Sewage Treatment Plants (STPs)** – STPs have been established to treat wastewater from cities and nearby areas before it reaches the river.
- **Surface Cleaning of the River** – Special machines and boats are being used to remove floating waste, plastic, and debris from the river surface.
- **Chemical Testing & Monitoring** – Regular scientific tests are being conducted to monitor water quality and control pollution effectively.

- **Community Participation** – Awareness programs and cleanliness drives are encouraging devotees and locals to actively participate in keeping the river clean.

5. Maha Kumbh 2025: Opportunities and Challenges

- **Potential water pollution**: The large influx of devotees may increase pollution levels.
- **Challenges in maintaining cleanliness**: Proper waste management and sanitation measures are needed.
- **Need for implementing sustainable water purification solutions**: Integration of modern purification techniques.
- **Integration of religious and scientific perspectives**: Promoting awareness among pilgrims and local communities.



6. Conclusion and Recommendations

This research paper highlights the need for an integrated approach that combines traditional and modern techniques to maintain the cleanliness of the Ganges.

Recommendations:

- Raising awareness among local communities and devotees about Ganges cleanliness.
- Implementing advanced water purification techniques during Maha Kumbh 2025.
- Promoting collaboration between government and non-governmental organizations.
- Imposing strict regulations on industrial units polluting the Ganges.

If these recommendations are effectively implemented, the sanctity of the Ganges can be preserved for the long term, making it an inspiration not only from a religious perspective but also in terms of environmental and scientific conservation.

References

1. Central Pollution Control Board (CPCB). (2022). Ganges Water Quality Report. Government of India.
2. Government of India. (2023). Namami Gange Project Report. Ministry of Jal Shakti.
3. Kumar, S., & Sharma, R. (2021). Bioremediation Techniques in Water Purification. Environmental Science Journal, 12(3), 56-78.
4. Ministry of Environment and Water Resources. (2022). National River Conservation Plan. Government of India.
5. Ayurvedic Research Institute. (2021). Traditional Methods for Water Purification. Ayurvedic Science Journal, 9(2), 45-60.
6. Dixit, K. (2022). High levels of fecal bacteria in Sangam waters at Maha Kumbh. Environmental Monitoring Reports.
7. Prasad, J., & Singhal, S. (2023). Maha Kumbh 2025: Ganga & Yamuna's Long-Term Sustainability Depends on Continuous Monitoring, Improved Wastewater Treatment, and Public Cooperation. Journal of Water Resources, 15(4), 112-130.
8. Sosale, S. M. (2023). Impact of Kumbh Mela Celebration on Water Quality of Sangam River, T Narasipura, Mysore District. Environmental Impact Studies, 18(1), 75-92.