Pollution in River Ganga (Kanpur): Causes and Cures

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***Abstract*—In India, the river Ganga is seen as a goddess and is worshipped by people. Even though there is a lot of respect for the river, its condition is getting worse, and Indians are not able to keep it clean. The Ganga is a river of faith, devotion, and worship. Indians consider its water to be "holy," and they believe it has "curative" powers.**

The river is not only important for these beliefs but also serves as a major water source, supporting life for Indians since ancient times. The Ganga and its tributaries start from cold springs fed by Himalayan glaciers, which are pure and untouched by pollution. However, as the river flows downstream, it passes through heavily populated cities before joining the Bay of Bengal. From its source to its end, the water changes from clear and pure to dirty and filled with trash and sewage. For thousands of years, the Ganga and its tributaries have provided spiritual, cultural, and essential support to millions of people living in the river basin.

Today, due to increasing urbanization, the Ganges basin supports more than 45 percent of the population. With the growing population and fast industrial development along its banks, the river Ganga has reached an alarming level of pollution.

***Index Terms*—Ganga River, water pollution, river pollution, India.**

I. INTRODUCTION

Water is one of the most important natural resources which is essential to life; thus, its management and proper utilization are as serious at a global level as at a local level. River Ganga (Ganges) is considered the longest and the holiest river of India, which originated from Gangotri glacier, at Gomukh, and ends at Bay of Bengal located in the East of India. It travels a distance of about 2,525 km during its entire course, and the total area covered by its basin is about 86,1404 sq.km.[1]

The water of the Ganges, which is also known as the “blue gold”, is the major source of water to northern India, but because of the continuous growth of India’s population and its economy, it is being over-exploited. River Ganga occupies a unique position in the cultural ethos of India. According to the Vedas, after long and arduous prayers made by King Bhagirathi for his deceased ancestors' salvation, the river has descended from heaven to earth. From immemorial times, the Ganga has been India's river of faith, devotion, and worship. Millions of Hindus treat it as a holy river. Even today, people from all over the country and abroad carry treasured Ganga water because it is "holy" water and known for its "curative" properties.

The Ganga is a holy and historically significant river of India, but due to its large population of over 400 million, unplanned urban expansion, fast industrialization, deforestation because of urban development, and increased use of water for agriculture and industries, pollution in the river is increasing. In 2007, the Ganga was ranked among the world's five most polluted rivers. In Kanpur the main cause of pollution in river ganga is the discharge of leather influence and industrial waste.

II. THE POLLUTION OF GANGA RIVER IN KANPUR

The River Ganga has become extremely polluted because of fast urban growth and industrial development across its area. While many Indians still see it as pure and believe it has special spiritual power, the river is often called a "biological nightmare" because of the large amount of waste that is poured into it from 48 cities and 66 major towns along its banks. The Ganga River is losing its ability to function properly due to the huge amount of untreated sewage and harmful industrial waste that is poured into it.

Main Causes of Pollution are:

- Sewage and Industrial Waste: A lot of sewage is directly dumped into the Ganga or its tributaries. The amount of sewage produced from towns is

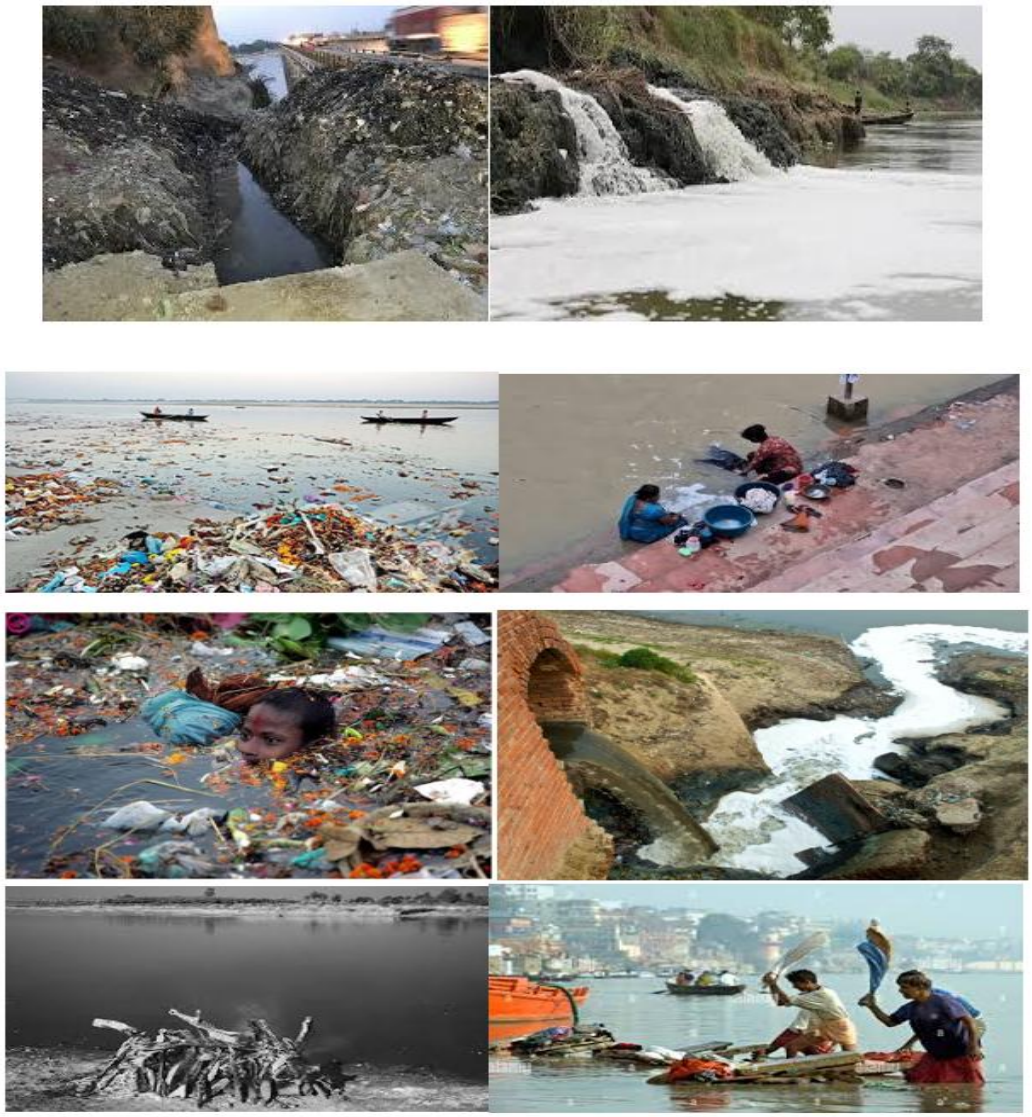
more than the capacity of the treatment plants. Around 38,000 million litres of sewage is created, but only 12,000 million litres can be treated.[2]

- Cremation of Dead Bodies: Many bodies are thrown into the Ganga because people believe it is a sacred river. They think that if the body is cremated and placed in the river, the soul of the dead person reaches liberation (moksha).[3]
- Runoff from Farming: Modern farming methods use a lot of chemicals like pesticides and fertilizers.[4] These chemicals wash into the river through runoff. The Indo-Gangetic plain supports 40% of India's population and uses around 60,000 metric tons of pesticides[5].
- Disposal of Solid and Biomedical Waste: Domestic and other solid waste is often dumped directly or indirectly into the river. Hospital and nursing home waste, which should be treated properly, is often dumped untreated into the river, leading to diseases.
- Waste by Human: People who wash clothes, known as dhobis, often use river water. The detergents and chemicals used for washing mix with the river water causing pollution. During religious events, flowers, incense, and colors used for worship are thrown into the river. After festivals like Durga Pooja or Ganesh Pooja, large statues made of materials that do not dissolve in water are also thrown into the river. In India, cows are left to graze, and their owners often use river water to bathe them, which is a direct source of pollution.
- Industrial Waste: With more cities and factories, the waste from industries is poured directly into the rivers or nearby ponds and lakes. This waste eventually flows into the river through runoff.
- Intake of excess water by human: A lot of water is taken from the river for homes and industries, which reduces the river's water level and increases the concentration of pollutants.
- Deforestation and Construction of Dams: Cutting down trees in the area around the river leads to more runoff, which increases pollution. Dams and other big structures in the river's catchment area led to higher levels of contamination in the river. The Tehri Dam in Uttarakhand on the Bhagirathi River controls the flow of the Ganga, as do many other hydroelectric projects along the river's path.

III. ENVIRONMENTAL AND HEALTH IMPACT

The pollution levels have reached a point where the water is often unfit even for bathing, let alone drinking.
Biodiversity Loss: The Ganges River Dolphin, an endangered species, is facing extinction due to toxic water and habitat loss.
Waterborne Diseases: High levels of fecal coliform (bacteria from human waste) have led to widespread outbreaks of cholera, typhoid, and various skin infections among the populations living downstream.
Bio-accumulation: Heavy metals like mercury and lead enter the food chain through fish, posing long-term neurological risks to humans.
When the river flows into the plains, a lot of polluted water from various sources joins it, making the river more polluted. According to the Central Pollution Control Board, the main causes of pollution are urban sewage, industrial waste, runoff from solid waste sites, and waste from practices such as bathing cattle and disposing of bodies. About 30% of the pollution is from industrial activities, and the remaining 70% is from municipal waste.
India is known as a major pilgrimage and tourist site. Kanpur is considered a Ganga city and an important place in Hinduism. The water quality of the Ganga is very different in sacred cities like Kanpur. The water from the source is clean and blue, but in Kanpur (Jajmau), it is dark brown and polluted, with sewage and waste from nearby tanneries coming out of the water in some places It has a high level of pollution in the Ganga because of a large amount of domestic and industrial waste. In survey report it was notice that every year, about 3,000 half-burnt bodies, 6,000 animal carcasses, 140-200 tons of flesh, and 200-300 tons of ash (from burning 11,000 tons of firewood) are added to the river. This extreme level of pollution is due to the different Shmashana, where it is believed that the deceased reach liberation. Rivers have been used as a source of water for eons. The Ganga was designated as a National River by the Indian government in 2008 due to its significance [7].According to them water pollution is therefore defined as alterations to the physical, chemical, and biological properties of water that may hurt aquatic life as well as humans[8]. Water pollution is a result of both forced and unforced human activity. These days, water pollution is taken into consideration with conservation, aesthetics, and the preservation of

natural resources and beauty in addition to public health. Therefore, to guarantee safe water for agricultural purposes, water quality should be assessed. If ingested, the presence of indicator microorganisms raises the possibility of harm to the human population [9]. Among all the natural resources found on Earth, water is among the most vital [10]. Water exists on Earth in three different states: solid, liquid, and gas. It is an essential component of the ecosystem. It makes up the hydrosphere, or roughly three-fourths of the earth's surface when it is liquid. Over 80% of the 768 million people who lack access to a sufficient water supply globally reside in rural regions [11-12]. Only 3% of the water on Earth has a suitable level of salt in it, with the majority of the water being saline at 97%. Routine uses account for just 1% of the water supply [13]. According to WHO research, 1.1 billion people do not have access to clean drinking water [14]. Over the past century, water consumption has increased twice as fast as global population growth [15]. Since the beginning of human civilization, rivers have been an essential component of human rights. A large portion of the world's needs for drinkable water are met by rivers. Referred to as a sizable natural water body that empties into the ocean, lake, or other bodies of water, rivers are usually nourished by tributaries that converge along their path [16]. Only a small percentage of this freshwater meets human needs for freshwater. There is an urgent need to increase water conservation globally owing to the freshwater scarcity caused by water pollution [17].



IV. PROJECTS RUN BY GOVERNMENT FOR GANGA

With the growing rate of population, the rate of pollution in the river Ganges is also increasing. Therefore, looking after the ever-increasing effects of pollutants on the river and its harmful impacts on the people, one must vigorously think over the matter and implicate proper measures. After realizing that the rivers of the country were in a severe stage of degradation, a step towards its restoration was made by the launching of the Ganga Action Plan (GAP) in 1985. It was introduced as a comprehensive program of river conservation with the objective of improving water quality.

It was also visualized that the program would be enlarged in due course, and other major rivers of the country would also be covered. There are three major problem areas that need to be addressed to find a comprehensive solution to Ganga pollution:

1. Inadequacy of water flow caused by waste and garbage disposed into the river.

2. Increasing amount of untreated sewage discharged from cities along the river.

3. Lack of enforcement against point-source pollution from industries discharging waste into the river.

Adding further efforts, the Government of India launched an Integrated Conservation Mission for the river Ganga as the 'Namami Gange Programme' (Flagship Programme) in June 2014 to restate the status of the Ganga.[6]

Below are the latest projects and updates related to the Ganga as of December 2025:

1. Namami Gange Mission 2.0 (The Current Phase)

The mission has been extended to March 2026 with a total budgetary outlay of ₹22,500 crore.

Infrastructure Milestone: As of late 2025, over 157 Sewage Treatment Plants (STPs) have been commissioned, creating a total treatment capacity of 3,722 MLD (Million Liters per Day).

Recent Completions: In the second half of 2024-25, 15 major sewerage projects were completed in Uttar Pradesh, Bihar, and Delhi (Yamuna), costing approximately ₹3,184 crore.

2. Project "Arth Ganga" (Economic Rejuvenation)

Introduced to make the cleaning process self-sustainable, this project links the river's health to the local economy. Its latest 2025 initiatives include:

Natural Farming: Promotion of chemical-free farming in a 5-km to 10-km corridor on both sides of the river to prevent pesticide runoff.

Jalaj Centres: Over 40 centers have been established to promote eco-tourism (like Dolphin Safaris) and sell local products made by "Ganga Praharis" (volunteer community members).

Treated Water Reuse: New MoUs have been signed with the Ministry of Power and Railways to reuse treated sewage water for industrial purposes instead of fresh river water.

3. Biodiversity and "Gyan Ganga" (Science & Conservation)

Indian Skimmer Project (Dec 2025): The 68th Executive Committee of the NMCG approved a first-of-its-kind project to protect the breeding habitats of endangered sandbar-nesting birds like the Indian Skimmer in Bijnor, Narora, and Prayagraj.

Dolphin Conservation: The Gangetic Dolphin population has shown a significant increase, rising from ~3,000 in 2015 to over 6,300 in 2024-25, thanks to intensive habitat protection.

Wetland Conservation: Five priority wetlands in UP, Bihar, and Jharkhand have been sanctioned for restoration to act as natural filters for the river.

4. Urban River Management & "River Cities Alliance"

River-Sensitive Master Plans: The NMCG has launched the Action Plan 2025 under the River Cities Alliance (now comprising 145+ cities).

Goal: To integrate river health into the urban planning of cities like Kanpur, Patna, and Kolkata, ensuring that future city growth doesn't further pollute the river.

Summary Table: Status at a Glance (Dec 2025)

Metric	Achievement Status
Total Sanctioned Projects	513 Projects
Total Investment	~₹42,000 Crore
Completed Projects	344 Projects
STP Capacity Created	3,806 MLD (operational)

Water Quality	"Good" to "Moderate" across 50+ locations; dissolved oxygen levels meet bathing standards in most stretches.

V. RESULT AND DISCUSSION

In India, rivers are a main source of water, spread across the country, providing clean water, helping with farming, generating electricity, and supporting transportation. They are also important for many people's jobs. Hence, it is our duty to protect them and not let them die. The government has been spending a lot of money over the years to reduce river pollution and prevent it, but we haven't seen any real improvement yet, and it won't happen until there are meaningful actions.

Strategies to improve the water quality might include:

- Defensive Steps: Improving sewage networks, upgrading treatment facilities, and stopping pollution from tributaries.
- Agricultural Reform: Teaching farmers in the basin not to use excessive chemical fertilizers and pesticides.
- Cremation Changes: Encouraging wood-based cremation centers and electric cremators to stop the practice of throwing bodies or ashes directly into the river.
- Holy Ponds: Building separate holy ponds filled with Ganga water for religious offerings to keep the main river clean.
- Afforestation: Planting more trees along the riverbanks to help control soil erosion and pollution.
- Monitoring: Better sanitation systems for new colonies and stricter monitoring of wastewater disposal.
- Preventing tanneries (Kanpur) effluent in river Ganga:We should prevent the flow of waste coming for tannery in river Ganga industrial waste causes many diseases and also increase the death rate of living organism river ganga.

Everyone needs to take part in reviving the Ganga River through education and awareness. We need to spread awareness about the causes and effects of river pollution through meetings and awareness programs.

India is rich in its natural water sources and has rightly been referred to as the "Land of Rivers". Different people throughout the country worship these rivers as goddesses. But the reality is that we often do not think before polluting them through selfish activities. The Ganga river seems to be dying slowly because millions of tons of untreated domestic and industrial waste are disposed of into the water.

Continuous rising pollution is a matter of grave concern, directly and indirectly affecting the country. Over-exploitation and unsustainable water extraction result in deteriorating water quality and harmful impacts on the river's ecosystem. Local populations become victims of many water-borne diseases due to polluted water. To make the Ganges a lasting resource, every person living in India and using its water must learn from their mistakes and take initiative at individual and community levels. Cleaning the river is a mammoth task, primarily because of the country's population, which has already exceeded one billion. It is our responsibility to save our ecosystem by saving our rivers.

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