

"Impact of Climate Change and Water Pollution on Aquatic Biodiversity at Kanpur River Ganga"

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ABSTRACT

Kanpur City is city of Uttar Pradesh situated on the bank of River Ganga where river Ganga flows through the bank of many Ghats. According to Hindu methodology the origin of river Ganga was brought from heaven to earth by Rishi Bhagirathi ji, whose velocity was very high. Lord Shankra Jee, contained the stream of ganga in his Jata by doing regulated the speed of Ganga and in this way Rishi Bhagirathi satisfied his ancestors through Ganga and gave them Moksha. River Ganga is Goddess and Worship by People.

Recently urbanization too much increasing. The Ganga basin supports. More those 45% of the population with the growing population and industrial development along its banks. The river Ganga has reached on alarming level of population. Physiochemical parameters of such as pH, (DO), (BOD), (COD), (TDS), of water were changed due to the various factor such as Ecological - Biological Environment relationship the changed of pH value after he pollutant 6.8 to 8.2 and (DO) level were also fluctuated between 4.0 to 8.5 mg/L (BOD) level were 4.2 to 6.5 mg/L with under trial pollutant (COD) level varied from 10 to 35 mg/L with (TDS) of water 504.56 mg/L. The physiochemical nature of water quality and habitat changed for fish and other aquatic animal diversity in the Ganga River.

Key words: Ganga River, Water Pollution, River Pollution, Kanpur, Fish and Aquaculture, Flora and Fauna.

INTRODUCTION

$(DO \propto 1/T)$ here (DO) is decreased when temperature is increased.

The (IPCC) is currently drafting the (AR7) assessment published in (2025) instead marked on climate changed and cities and methodology report in division three grouped, grouped one physic science basis, grouped second impacts, adaptation and vulnerability and group third reported mitigation of climate changed. The global averaged combined land and Ocean temperature showed warming to day by day now +.89 increase (+0.69 to 1.08). Each degree of warming is decrease renewable water resources by atleast +20 more than. The problem of water quality due to of increases in temperature,

sediment, nutrient, pollutant, drought under the diverse factor of climate change the river one un-safed (Durance and Ormerod, 2005). Polluted water and increased temperature of climate affected on ecological, biological properties of Aquatic ecosystem impact of water quality caused change physical and chemical. Morphological in plant, algae, diatoms to increased salinity to enhance the toxicity such as heavy metals. Pesticides, organic and inorganic chemical compounds. Change aquatic biological fauna, bio-transformation mechanism of contamination impairing homeostasis and affecting physiological, morphological, neurological. Endocrinological, reproductive organs, migration behaviour, schooling of fishes were very complex interaction between climate and toxicant contaminants (Mahjabi Khan (Noyes et al, 2009), (CPCB, 2021), (Sarkar, 2012).

River Ganga is longest and the holiest river of India, which originated from Gangotri glacier at Gomukh and ends of Bay of Bengal located in the East of India. It level distance about 2525 km. during its entire course and total area covered by its basis about 861404 sq. km. The population in growth of India's and economically were exploited.

In the Ganga was ranked among the world's five most polluted rivers. In Kanpur the main cause of Pollution in river Ganga is the discharged of leather influences and industrial waste. The large amount of waste poured into it from 48 cities and 66 major towns along its bank. Ganga river is losing its ability to function and property due to the largest amount of waste that is paused the status of pollution and other ecological problems associated with the context of regional climate change and weather variation to the complex relation among pollution problem and climate stressors acting the Ganga river basis. Climate impact of water system increasing mean annual maximum and minimum temperature and decline of rainfall (Tripathi and Singh, 2013). Report of Director and Department Head of water Quality Management (CPCB) spanned over three sampling dates July 10, July 24, August 22. The reports reveals that a significant portion of the Ganga stretching from Bithoor to Fatehpur in Kanpur is now severely polluted rising grave concern among the resident and environmentalist (Table 1). Sample water of 27 drains in Kanpur and also with Unnao.

The water collected from the Ganga near Budhiya Ghat (Jajmau) drain revealed extreme contamination. Water exhibited a disconcerting (BOD) 580 mg/lit. and (COD) 920 mg/Lit. pH levels in Ganga water have been rising rapidly. Reaching above the recommended pH of 7 at multiples locations including Narora Garh, Bithoor, and Fatehpur High pH value levels of water can have detrimental effect on aquatic life and the environment. (Singh, et al., 2021) (Bhargava, 2006).

Table 1: Effect of Industrial Waste Discharge on Water Quality of River Ganga at Kanpur.

Sampling site	DO mg/lit.	BoD mg/lit.	CoD mg/lit.	Toxicant mg/lit.
Pariyar Ghat to Rani Ghat up stream area	6.8	2.4	18	0.01
Parmat Ghat to Balu Ghat Mid-stream	4.5	39	115	0.13
Gola Ghat to Dopeswar Ghat down stream	1.11	130	410	0.68
Bhudhiya Ghat to Sidhnath Ghat down stream	1.0	155	410	0.78
Deodhi Ghat to Naagapurghat down stream	2.9	95	245	0.44

Some tanneries in Kanpur can currently treat a maximum of 9 MLD tannery effluents, currently upto 50 MLD of toxic tannery waste water generated daily according to Central Leather Research Institute 9 MLD can treated almost 40 MLD Industrial effluents does not even reached the IPS for treatment and dumped directly into Ganga through over flowing drain like the one at "Dabka Nala" Dapeshwarghat Kanpur generated +450 MLD of sewage every day. Infrastructure can only treated is 160-170 MLD. Sisamau drainage the biggest sewage drainage in Kanpur was to be treated 210 sewage treatment plant (STP). The Infrastructure has not been created to make the sewage from the drains contents will continue to flow into the Ganga. (Juhi Chaudhary, 2017) (Sharma et al. 2020) (Chaturvedi 2026). In pollution increased in river aquatic organisms are the first to be affected in Kanpur region there are the decline in the numbers of many fish species due to lack of dissolved oxygen and excess of heavy metals and organic pollution in the Ganga river on January 2, 2026 a dolphin was found dead due to blackish colour polluted water between Golaghat to Depeshwarghat (Jajmau) (Singh 2023). A variety of fish species and reptiles are found as part of the river's Aquatic biodiversity. However industrial pollution and sewage discharge have reduced the growth of population for several species for example major species are Rohu, Catla, Mrigal Singhi, Channa, Magur, Bagarius, Hilsa, Chilwa, Grass Carp etc. and also reptiles found in the Kanpur Ganga river. Gharial, Crocodile, Shoft shell turtle, Indian flap shall turtle, water snake and other aquatic creatures Indian's national aquatic animals, Dolphin. Aquatic fresh water, Prawn, Shrimp, Mollusca, Zooplankton, phytoplankton, amphibians, Aquatic birds, Herons, Kingfisher Rivertern Skimmer migratory duck.

Picture of Dead fishes due to more toxicant under in the River Ganga

MULTIPLE IMPACTS OF BIODIVERSITY OF GANGA RIVER

Pollution from the leather industries are not only polluting the Ganga but are impacting the ground water and agricultural field as well. One there is no proper disposal system for the solid sludge that is generated during the treatment process and dumped in the open which can leach into the soil and from there to ground water (Sinha, et al. 2001) Impact of environmental abbreviation on fisheries of the Ganga (Mall, et al. 2006) water resources and climate change.

Unorganised manufacturing units of cheap glue and Chicken and pot feed are mushrooming on the bank of the river. These used waste from the tanneries as raw material it contaminate the soil. (Pandey, et al. 2015) and air and also taking over the agriculture fields of the local peoples. At Piyondi village in Jajmau, due to hexavalent chromium and others heavy metals pollution farm productive has come down Rose plantations grown up polluted water contaminated chromium in the soil.

$$\text{BOD} \uparrow \rightarrow \text{DO} \downarrow$$

The pollution level have reached a point where the often unfit bathing lit alone drinking Biodiversity loss. The Ganga River Dolphin an endangered species is facing extinction due to toxic water and habitual loss. Water borne diseases high level fecal coliform have led to widespread outbreak of cholera, typhoid living downstream Bioaccumulation heavy metal like Hg, and pB, enter the food chain through fish, poisoning long term neurological risk to humans. About 20% of the pollutions from Industrial activities and remaining 70% is remaining municipal waste. In survey report it was notice that every year about 3000 half burn bodies, 6000 animal carcasses, 140-200 tons of flesh, and 200-300 tons of ash (Dead body were cremation) are added in the river these large level of pollution is due to different Shamshana Ghat near a bank of Ganga river (MOWR, 2014). According to WHO 1.1 billion people do not drinking cleaned water there is need to urgent increased water conservation globally owing to fresh water caused by water pollution. (Kedzoir, et al. 2014)

PROJECTS RUN BY GOVERNMENT FOR GANGA RIVER

There are three major problems areas that need to be addressed to find a comprehensive solution to Ganga Pollution.

1. In adequacy 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 industrial discharged waste into the river.

Adding further reports the Govt. of India launched an integrated conservation mission for

the river Ganga as the "Namami Ganga Programme" in June 2014 to restate the status of the Ganga. Below are the latest project and updates related to the Ganga as of December, 2025.

4. Namami Ganga Mission, current phase extended to March 2026 with a total budget of Rs.22,50 crore. Recent competitions in the second half of 2024-2025. 15 major sewage projects were completed in Uttar Pradesh, Bihar and Delhi Rs.3184 crore.

5. Arth Ganga Project: Introduced to make the cleaning process self-sustainable. This project link the river health to the local economy. Its latest 2025 initiative includes natural farming in a 5 km. to 10 km. corridor on both side of the river to prevent pesticide or insecticide run off Jalj centers over 40 centers have established to promote eco-tourism and sell local product made by "Ganga Praharis".

6. Biodiversity and "Gyan Ganga". Indian Skimmer Project (Dec. 2025). The 68th Executive Committee of the NMCG approved a first of its kind project to project breeding habitat of endangered Sandbar-nesting birds like the Indian Skimmer in Bijnore, Narora, and Prayagraj.

Dolphin Conservation: The Gangetic Dolphin population has showed a increased in numbers from Rs. 3000 in 2015 to over 6300 in 2024-2025 wetland conservation, five priority wetlands in U.P., Bihar, and Jharkhand have been sanctioned for the restoration to act as natural filters for the river.

(NMCG, 2025) under the river cities Alliance to integrated to river health.



Picture of Dolphin in River Ganga at Kanpur (Atal Ghat)

RESULT & DISCUSSION

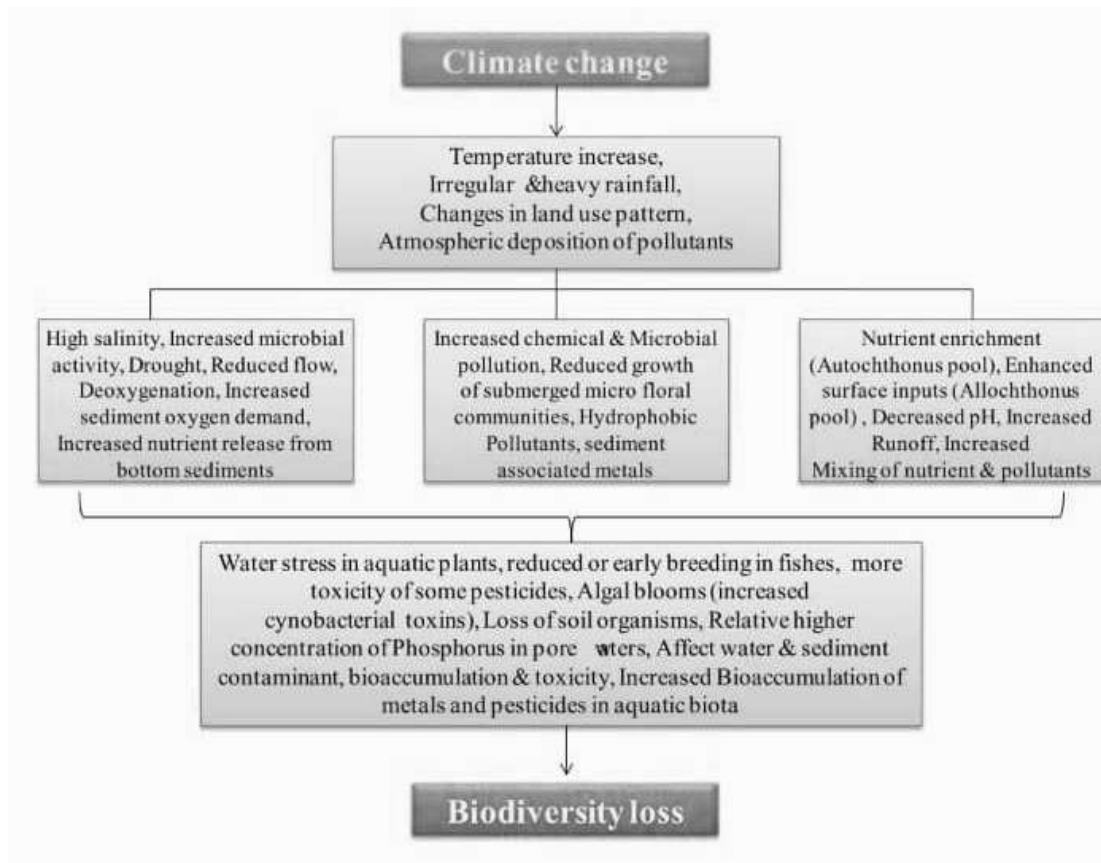


Table 2: Overview of the climate change interaction with pollution problems and their combined impacts

Pollution problems in River Ganga are now being viewed with broader aspect with various Dimensions of the climate change these was largest experimental evidences by intriguing climate variable and pollutant interaction to understand pollutant dispersion and transformation and their effect in water sediments and biota. The river basin management authority should acquire bowlines information on water flow and related water quality disturbances interacting with climate change to develop comprehensive scenarios of the impacted of climate change in this river basin the ecosystem working in Ganga River in conjugated with research output establishing climate interactions with pollutions to reduce the water abstraction affected optimum flow determination in various segments of the Ganga River is urgently needed public participation is important for river Ganga conservation to proper waste disposal and reduced pollution eco-friendly industrial technology reduced plastic used and sustainable agriculture can help prefect the river ecosystem. Water pollution in the River Ganga at Kanpur has become a major environmental issued affected aquatic biodiversity, industrial waste sewage agricultural runoff and solid waste degraded water quality and exposed aquatic organisms including the endangered Riverine species such as turtle, dolphin, public participation are should be must restoring

the ecological health of the Ganga and conservation its biodiversity for future coming generation.

CONCLUSION

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 river and as Goddesses". The Ganga river seemed to be died slowly because millions of tons of untreat domestic and industrial waste are disposed into the water biotic and abiotic factors affecting the ecosystem affect the environment. As if technologies is making its place in the field them along with its also harming the environment due to which the biodiversity of the ecosystem is completely affected and public awareness policy to improve river water quality and biodiversity conversation programme for monitoring of Aquatic ecosystem such as fish sanctuaries, breeding restore, protection of endangered species.

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