



Multidecadal assessment of environmental variables in the river Ganga for pollution monitoring and sustainable management

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Abstract The Ganga River is the major source of drinking water for humans over the decades. It is also the ecological niche for millions of relict species, i.e., for a variety of planktons, benthic organisms, fish, and various other aquatic organisms. The blasting population resulted in an enhanced rate of pollution in the river system emanating from various anthropogenic activities and industrialization in the bank of river Ganga. The study was made in the middle and lower stretch of the river to monitor the decadal changes in the water quality of river Ganga from 1960 to 2019 at six different study sites. In the present study, various water quality parameters such as dissolved oxygen, pH, free carbon dioxide, total alkalinity, conductivity, total dissolved solids (TDS), hardness, chloride, and nitrate have been studied during 2015–2019. The data for 1960 to 2006 were taken from ICAR-CIFRI publications. Based on the studied parameters, National Sanitation Foundation (NSF)—water quality index (WQI) was calculated. In the present study, it was found that the calculated NSF-WQI was 69.24 in 1960–1961 which increased up to 113.39 during 2001–2006. But, with the implementation of various rejuvenating strategies, the WQI of the river got reduced to 106.48 during 2015–2019.

This reflected the positive changes in the riverine system. Different water quality parameters such as dissolved oxygen, pH, and hardness were observed mostly within the permissible range as based on the drinking water guidelines for humans and survival of the aquatic organisms as well, except a few location-specific observations.

Keywords River Ganga · Multi-decadal · WQI · Ecological niche · Anthropogenic

Introduction

River Ganga is the fifth largest river system in the world and the largest in India, flowing a distance of 2525 km and covers 8,61,404 km² basin area which is 26.3% of the country's total landmass (Trivedi, 2010). It is a substantial source of livelihood for more than 530 million people (Tare et al., 2013). Due to the multifaceted use of river water in diverse sectors like domestic household use, drinking water, irrigation, transport, tourism, and fisheries, the river is considered as the lifeline for a sheer number of people living within and around the catchment area. (Samanta, 2013). River Ganga is also an ecological niche for many relict organisms including plankton species, benthic organisms, and fish, which are key organisms of the aquatic ecosystem (Sinha, 2015). The blasting population has resulted in a multifold rise in industrialization (Coxl, 2006) which often discharges untreated wastes in the river. The construction of dams,

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