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Integrated Assessment of Water Pollution in the Gomti River, Lucknow: Source Identification, Environmental and Health Impacts, and Pathways for Sustainable Management

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Abstract: *The Gomti River, an essential tributary of the Ganges and the lifeline of Lucknow, has experienced significant degradation as a result of rampant urbanization, industrialization, and insufficient waste management practices. This study examines the magnitude, origins, and consequences of water pollution in the Gomti River, particularly in the section that flows through Lucknow. Analyses of physical and chemical properties indicate alarmingly low levels of dissolved oxygen, increased biological oxygen demand, high concentrations of total dissolved solids, and pH measurements that suggest alkaline conditions. High levels of heavy metals, including lead (Pb), cadmium (Cd), and chromium (Cr), have been found, surpassing the safety limits set by WHO, which presents significant risks to both the environment and public health. The presence of microbial contamination, especially with fecal coliform counts surpassing 100,000 MPN/100 ml in specific areas, highlights the consequences of untreated sewage, as more than 130 million liters per day (MLD) continue to be released directly into the river. The study emphasizes the ecological impacts of riverfront development, such as habitat loss and altered hydrology. Health risk evaluations indicate non-carcinogenic threats, particularly for children in downstream regions. In light of ongoing initiatives to enhance sewage treatment systems, pollution levels continue to be alarmingly high. This study highlights the importance of cohesive river basin management, enhanced wastewater treatment, ecological restoration, and community involvement to rejuvenate the Gomti River. The findings point out the need for policymakers, scientists, and civil society to focus on sustainable and evidence-based river rejuvenation initiatives.*

Keywords: Water Quality Degradation, Heavy Metal Contamination, Environmental Health Risks, Waterborne Diseases, Sewage

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