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## Unravelling the Ecological Impact: The Effect of Waste, Effluents, and Agricultural Practices on Biodiversity in Major River Basins of Bangladesh

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Fish biodiversity in Bangladesh is rapidly deteriorating due to a combination of anthropogenic activities and climate change impacts. This study examines the impacts of land use, land cover changes, and agricultural practices on biodiversity in the Ganges-Padma, Brahmaputra-Jamuna, and Borak-Meghna basins. To provide a comprehensive analysis, the research also evaluates water quality parameters to assess the ecological health of these critical river basins. Field tests were conducted to measure key water quality indicators, including dissolved oxygen and pH, at various sampling locations within the basins. These real-time measurements offered immediate insights into the conditions of aquatic habitats. Additionally, laboratory analyses of water samples were performed in reputable facilities at Bangladesh Agricultural University and the Bangladesh Institute of Nuclear Agriculture. These tests examined parameters like turbidity, conductivity, heavy metals, and nutrient levels, providing a detailed understanding of potential pollutants and their impact on aquatic ecosystems.

Data interpretation reveals that over the past three decades, agricultural intensification in the basins has led to a significant increase in crop production, largely driven by the extensive use of inorganic fertilizers, pesticides, and herbicides. While this has boosted food production, it has also contributed to the severe pollution of rivers, *beels*, and canals. On the other hand, the disposal of households and municipal wastes and industrial effluents has degraded the rivers near urban areas, particularly the Buriganga River. One of the study's critical findings is the detrimental impact of invasive species, such as the sucker-mouth catfish. These species have decimated native fish populations during the monsoon season, only to perish in the polluted waters during winter. This invasion, coupled with habitat destruction, has resulted in a sharp decline in fish diversity, massive fish kills at downstream, such as the Meghna River near Satnal of Cummilla district, and severely affecting the livelihoods of local fishers. Many have been forced to abandon their traditional occupations, leading to a measurable decline in their quality of life. The study also notes a dramatic shift in agricultural practices within wetland areas, with a 95% increase in land area used for cropping. As water levels drop, digging ponds in wetlands and using submersible water pumps have become common. Despite a shift from organic to inorganic fertilizers, the use of chemical fertilizers and pesticides has tripled, further threatening floral and faunal diversity. Alarmingly, 46% of fish species have become extinct in the study area. Local perceptions attribute this loss to various factors, including changes in land use, chemical fertilizer and pesticide use, and the introduction of hybrid and exotic fish species. However, the study identifies the introduction of exotic fish species and other anthropogenic activities as the most significant drivers of biodiversity loss.

This research underscores the critical need to explore the conditions necessary for sustaining and flourishing native species, with a strong emphasis on restoring biodiversity and safeguarding livelihoods in these vital ecosystems. To achieve these goals, it is essential to restrict insecticide imports, mandate the implementation of effluent treatment plants in industries, and promote organic agriculture. These measures can significantly contribute to the revival of native fish populations by reducing pollution, restoring aquatic habitats, and fostering a healthier, more resilient ecosystem.

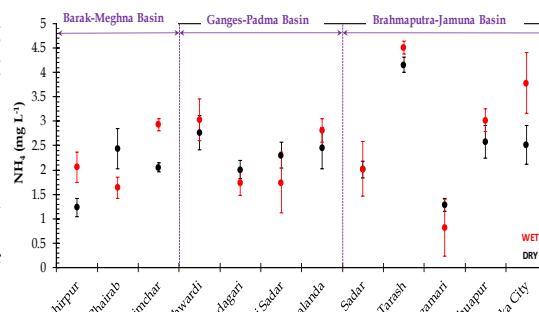


Figure: NH<sub>4</sub> conc. in the three major river basin