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The Role of Green Chemistry in Mitigating Climate Change Impacts on Aquatic Ecosystems

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Climate change significantly threatens aquatic ecosystems, affecting water quality, biodiversity, and environmental health. This study explores how green chemistry principles can mitigate the adverse effects of climate change on these vital ecosystems. We conducted field and laboratory experiments to assess key indicators of aquatic health, such as pH, dissolved oxygen, nutrient levels, and pollutant presence. Utilizing green chemistry techniques, we focused on minimizing hazardous substances and employing sustainable methods for analysis. Advanced analytical methods, including green extraction techniques and eco-friendly solvents in gas chromatography-mass spectrometry (GC-MS) and high-performance liquid chromatography (HPLC), were utilized to detect and quantify organic pollutants. Our results indicate a notable increase in water temperature and acidity, reducing biodiversity, particularly among sensitive species like certain fish and invertebrates. Additionally, we observed elevated nitrate and phosphate levels, likely due to increased agricultural runoff exacerbated by changing precipitation patterns. To counter these challenges, we propose integrating green chemistry principles into environmental monitoring and pollutant regulation. Sustainable agricultural practices, such as organic farming and bio-based fertilizers, are recommended to reduce runoff and nutrient loading in aquatic ecosystems. Our research emphasizes the necessity of a holistic approach, combining scientific innovation with practical applications to foster environmental sustainability.

Keywords: Aquatic ecosystems, climate change, green chemistry, sustainability.

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