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REVIEWER'S REPORT

Manuscript No.: IJAR-54185

Title: Mapping Anthropogenic Pressures in the Bandama River Basin (CÃ´te dÂ'Ivoire): A Multicriteria Approach Integrated with GIS

Recommendation:
Accept as it is

Rating	Excel.	Good	Fair	Poor
Originality		√		
Techn. Quality		√		
Clarity	√			
Significance		√		

Reviewer Name: Dr. Manju M **Date:** 04-10-2025

Detailed Reviewer's Report

1. Introduction to Anthropogenic Pressures in Tropical Aquatic Ecosystems

Human activities such as infrastructure development, land use change, and population growth impose significant pressures on tropical aquatic ecosystems. These pressures disrupt natural water systems, affecting ecosystem health and the livelihoods dependent on them.

2. Study Area: Bandama River Basin

The Bandama River basin, the largest in Côte d'Ivoire, encompasses varied landscapes and supports diverse human activities. It is crucial for regional water supply, agriculture, and biodiversity, but is increasingly vulnerable to anthropogenic disturbances.

3. Objective and Importance of the Study

The study aims to quantify and spatially map anthropogenic pressures across the basin using a combination of analytical tools. This spatial understanding is essential for guiding sustainable water resource management and prioritizing conservation efforts.

4. Methodological Framework: Integration of AHP and GIS

The study utilizes the Analytic Hierarchy Process (AHP) to objectively weight different pressure factors, combined with Geographic Information Systems (GIS) for precise spatial mapping. This integrated approach enhances the reliability of pressure assessments.

5. Key Anthropogenic Pressure Factors

- **Hydraulic Infrastructures (56%)**: Dams, reservoirs, and irrigation systems modify natural flow regimes, sediment transport, and aquatic connectivity.
- **Land Use Changes (32%)**: Agricultural expansion, urbanization, and deforestation increase runoff, erosion, and pollution.
- **Population Density (12%)**: Drives water demand, pollution, and expansion of infrastructure, indirectly intensifying hydrological impacts.

6. Quantitative Results and Spatial Distribution

Hydraulic infrastructures dominate the anthropogenic pressures, followed by land use and population density. Spatial mapping reveals a clear North–South gradient, with highest pressures concentrated near

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Korhogo, Ferkessédougou, Yamoussoukro, and Toumodi—areas of intensive development and infrastructure presence.

7. Hydrological Impacts of Anthropogenic Pressures

These pressures lead to altered river flow regimes disrupting aquatic habitats, increased surface runoff causing erosion and sedimentation, and accelerated reservoir siltation reducing water storage capacity and quality.

8. Spatial Gradient and Climatic Interactions

The northern and central parts of the basin face higher pressures due to a combination of irregular rainfall and intensified human activities like agriculture and population growth, heightening hydrological vulnerability and water stress.

9. Policy and Management Implications

The study underscores the urgent need for Integrated Water Resources Management (IWRM) strategies that balance infrastructure development with ecosystem conservation, sustainable land use, and participatory governance involving local stakeholders.

10. Recommendations for Sustainable Management

- Continuous monitoring of anthropogenic pressures.
- Enhanced collaboration among stakeholders for basin-wide planning.
- Promotion of reforestation and sustainable agricultural practices to mitigate runoff and erosion.
- Integration of climate change scenarios to improve hydrological resilience.

11. Methodological Advances and Future Directions

The use of AHP and GIS provides a robust framework for pressure assessment, but future research should incorporate additional criteria such as water quality, pesticide use, and projected climate impacts for a more comprehensive analysis.

12. Conclusion: Toward Resilient Water Systems

Human activities have a dominant influence on the Bandama basin's hydrology, significantly altering water flow and ecosystem health. Addressing these pressures requires adaptive, integrated, and participatory water management policies tailored to regional climatic and socio-economic contexts to ensure long-term water security and ecosystem resilience.

13. Significance of the work

This study reveals how human activities reshape the Bandama River basin's water and ecology, highlighting key pressures like infrastructure, land use, and population. Using AHP and GIS, it maps these impacts to inform targeted, sustainable water management strategies. It promotes an integrated water resources approach, balancing development and ecosystem health. The methodology offers a replicable model for other basins worldwide. Recommendations include addressing climate change and sustainable land use to boost resilience. Overall, it supports evidence-based policies vital for long-term water security and livelihoods.

14. Limitation of the work

The main limitation of this study is the reliance on available data, which may lack temporal detail and accuracy. Additionally, the AHP method involves subjective weighting that could influence results. The spatial analysis might not capture all local variations in pressures. Finally, climatic factors were considered secondary, potentially underestimating their combined effects with human activities.