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The Governance of the Senegal River: Geopolitical, Environmental, and Economic Challenges

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Abstract: The Senegal River is a vital resource for four West African countries: Guinea, Mali, Mauritania, and Senegal. Its economic, environmental, and geopolitical significance makes it a major issue for regional cooperation. This article analyzes the environmental, economic, and diplomatic dimensions of its governance by drawing on several theoretical approaches in international relations, including realism, institutional liberalism, and critical approaches. The central hypothesis is that the management of the Senegal River constitutes both a unique model of inter-state cooperation in Africa and an illustration of the constraints imposed by state sovereignty and dependence on international donors. The results show that, despite notable institutional successes, the river's governance remains fragile and must evolve to address climate and social challenges.

Keywords: Senegal River; transboundary water governance; international relations; water sovereignty; climate change; water security

1. Introduction

The Senegal River constitutes a strategic resource shared by Guinea, Mali, Mauritania, and Senegal. Its management raises critical issues related to agriculture, energy, navigation, and food security. As one of the major waterways in the West African region, the Senegal River plays a crucial role in economic development, agriculture, fisheries, and the supply of drinking water for several countries, notably Guinea, Mali, Mauritania, and Senegal. However, this vital resource faces numerous challenges linked to environmental and economic pressures that threaten its sustainability and ecological balance.

The management of the Senegal River must therefore adopt a multidisciplinary approach that takes into account the complexity of interactions between human activities and natural processes. According to Diop et al. (2020), integrated water resources management constitutes an essential strategy for reconciling economic development with environmental preservation in this region. This in-depth study aims to analyze the specific issues related to the management of the Senegal River, highlighting environmental challenges such as ecosystem degradation, pollution, and climate variability, as well as economic challenges associated with resource exploitation and food security. Understanding these dynamics is indispensable for the formulation of effective and sustainable policies capable of meeting present needs while ensuring the long-term viability of this strategic resource for riparian populations.

3. Problem Statement

The management of the Senegal River constitutes a major challenge for the region,

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which is facing increasing environmental and economic pressures. The central issue lies in how local, national, and international actors can reconcile the preservation of this vital ecosystem with economic development, while ensuring sustainable management in the face of anthropogenic pressures and climate change. Indeed, the river, which flows through several countries including Guinea, Mali, Mauritania, and Senegal, is subject to growing use for agriculture, industry, and drinking water supply. This intensification generates tensions and risks for biodiversity and regional socio-economic stability (Diarra, 2019).

The complexity of this management challenge also stems from the need to establish effective transboundary policies that integrate the participation of local communities and the protection of natural resources, while simultaneously responding to the imperatives of economic growth. The key question that therefore arises is: how can integrated and sustainable management of the Senegal River be ensured in the face of environmental and economic challenges, while reconciling development, conservation, and regional cooperation? (Ngom, 2021).

Addressing this issue requires an in-depth analysis of existing strategies, the challenges encountered, and the opportunities for balanced and sustainable management of this essential resource (Kane, 2020). Accordingly, this study seeks to examine the following question: **How can the sovereign priorities of riparian states be reconciled with collective and sustainable governance of the Senegal River?**

4. Objectives

3.1 General Objective

The overall objective of this in-depth study on the management of the Senegal River in the face of geopolitical, environmental, and economic challenges is to conduct a detailed analysis of the strategies, policies, and practices implemented to ensure the sustainable management of this vital resource. The study aims to identify the major challenges related to preserving the river ecosystem while supporting the economic development of riparian communities. It also seeks to assess the effectiveness of existing measures, propose recommendations for integrated and balanced management, and strengthen cooperation among local, national, and international actors involved in river governance. By adopting a multidisciplinary perspective, this research aspires to contribute to a better understanding of the complex issues surrounding the sustainable management of the Senegal River, taking into account environmental, social, and economic dimensions, in line with the principles of sustainable development (Smith, 2020).

3.2 Specific Objectives

1. Identify the environmental challenges related to the Senegal River and their impact on the sustainability of water resources.

2. Examine the economic issues, particularly irrigation, hydroelectric power generation, and river-based trade.

3. Analyze the geopolitical and diplomatic dimensions, including the role of the OMVS and international actors.

4. Assess the limitations and prospects of regional cooperation for the sustainable and equitable management of the Senegal River.

4. Research Hypotheses

4.1 General Hypothesis

The management of the Senegal River represents a crucial challenge for environmental preservation and the economic development of the region, requiring an integrated and sustainable approach that takes into account both ecological imperatives and the socio-economic needs of riparian populations. In the face of geopolitical challenges, environmental pressures such as ecosystem degradation, pollution, reduced river flow, and threats to biodiversity, as well as economic issues related to agriculture,

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fisheries, hydropower, and tourism, a balanced and coordinated management of the river appears essential to ensure the long-term viability of natural resources while promoting local and regional socio-economic development. This in-depth study aims to analyze current management strategies, identify major challenges, and propose pathways for integrated, sustainable, and equitable management of the Senegal River, taking into account geopolitical, environmental, and economic issues, in accordance with the principles of sustainable development.

4.2 Specific Hypotheses

As part of an in-depth study on the management of the Senegal River in the face of environmental and economic challenges, it is essential to formulate specific hypotheses that guide the research and enable exploration of the different dimensions of the subject. The following hypotheses are proposed:

- **Hypothesis 1:** The management of water resources in the Senegal River is positively influenced by the implementation of integrated water management policies that take into account both environmental and economic concerns (Diarra, 2020).
- **Hypothesis 2:** The degradation of water quality in the Senegal River is directly linked to the increase in agricultural and industrial activities in the region, thereby compromising the ecological and economic sustainability of the river (Sarr, 2019).
- **Hypothesis 3:** Community participation and local awareness play a crucial role in preserving the river in the face of environmental and economic pressures (Ndiaye, 2021).
- **Hypothesis 4:** The transboundary management of the Senegal River, involving several countries, constitutes a major challenge for the effective implementation of conservation and sustainable exploitation strategies (Faye, 2018).
- **Hypothesis 5:** Investments in hydraulic infrastructure and the modernization of agricultural techniques can mitigate negative impacts on the river while supporting regional economic development (Ba, 2022).

Overall, these hypotheses provide a solid framework for analyzing the complex interactions between the management of the Senegal River, environmental challenges, and their economic and geopolitical implications. Their validation or rejection will help guide public policies and sustainable river management strategies, taking into account both local and transboundary specificities.

5. Literature Review

The governance of transboundary resources has been widely examined in the academic literature. According to Zeitoun and Warner, water-related conflicts are often linked to the domination exercised by certain states over shared resources. Diop emphasizes that the Organisation for the Development of the Senegal River (OMVS) represents a rare model of cooperation in Africa, although it faces institutional and financial constraints. Niang highlights the impact of climate change on hydrological variability and its consequences for irrigated agriculture. The literature also shows that dependence on international donors can limit the autonomy of riparian states. These studies make it possible to situate the present analysis within an existing scientific debate and to identify the gaps that this article seeks to address.

The governance of transboundary resources constitutes a crucial field of study for understanding the management of natural resources shared by several states. According to Zeitoun and Warner (2006), water conflicts are often associated with the domination of certain states over these resources, which can lead to diplomatic tensions and sovereignty issues. Their analysis underscores the need to establish cooperation mechanisms in order to

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prevent such conflicts and promote equitable management.

Diop (2010) points out that the Organisation for the Development of the Senegal River (OMVS) represents a rare example of successful cooperation in Africa. Despite its achievements, the organization faces institutional and financial constraints that sometimes limit its effectiveness. The governance of such institutions requires continuous adaptation to local and regional challenges, as well as the strengthening of institutional capacities.

Niang (2015) highlights the impact of climate change on hydrological variability, which complicates water resource management for irrigated agriculture. Increased variability in rainfall and rising sea levels affect water availability, making innovative adaptation strategies necessary to ensure food security and the resilience of rural communities.

Moreover, dependence on international donors appears as a factor limiting the autonomy of riparian states (Kone, 2018). This dependence can influence national and regional policies by steering priorities toward externally funded projects rather than locally identified needs. Sovereignty in resource management thus becomes a central issue in the context of transboundary governance.

Studies by Smith (2012) stress the importance of integrating social, economic, and environmental dimensions into water resource governance. A holistic approach allows for a better understanding of complex dynamics and the development of more sustainable and equitable policies. The participation of local communities is also essential to ensure the legitimacy and effectiveness of management frameworks.

6. Research Methodology

The study adopts a qualitative approach based on documentary and comparative analysis:

1. **Corpus:** Reports from the OMVS, scientific publications, and international reports (World Bank).

2. **Method:** Thematic analysis of documents to identify environmental, economic, and geopolitical issues, as well as relationships among riparian states.

3. **Case Study:** The Senegal River as an example of transboundary cooperation in West Africa.

4. **Triangulation:** Cross-validation of information from academic sources, institutional documents, and international reports in order to strengthen the reliability of the findings.

7. Theoretical and Conceptual Framework

7.1 **Realism:** Emphasizes rivalries among national interests, which are evident in the distribution of water-related benefits.

7.2 **Institutional Liberalism:** Highlights the importance of cooperation mechanisms such as the OMVS.

7.3 **Critical and Postcolonial Approaches:** Question power asymmetries and dependence on international donors.

7.4 **Key Concepts:** Water sovereignty, environmental diplomacy, regional governance.

8. Analysis and Results

A. **Environmental Dimension:** Climate change affects precipitation variability and disrupts river ecosystems. Deforestation and agricultural pollution further exacerbate this vulnerability.

B. **Economic Dimension:** The Senegal River is essential for irrigated agriculture, hydroelectric power generation, and riverine trade. Divergent priorities among the riparian states complicate cooperation.

C. **Geopolitical and Diplomatic Dimension:** The OMVS represents a unique institution in Africa for the joint management of a river basin. Power asymmetries and the influence of external actors reveal the limits of genuine regional sovereignty.

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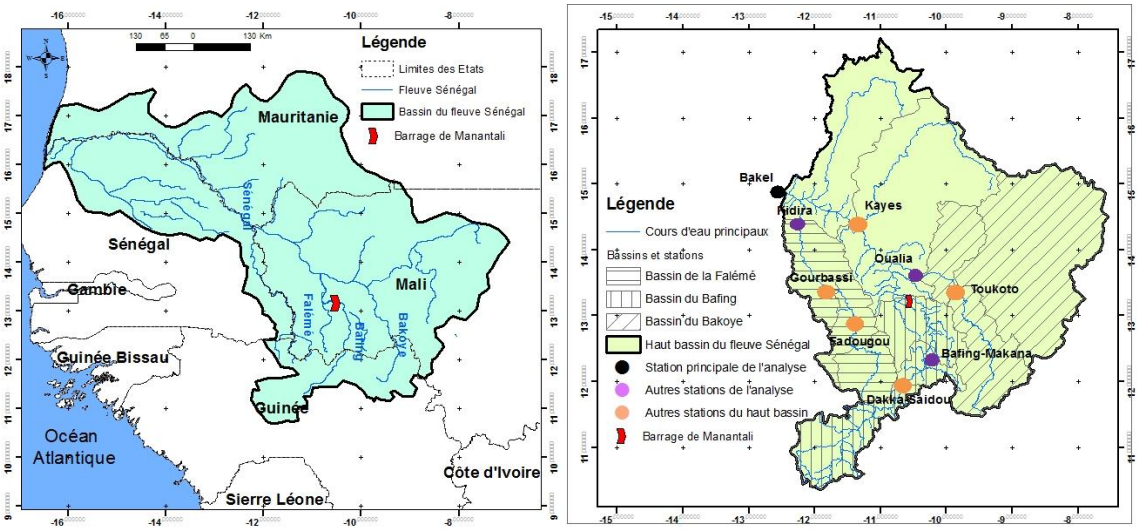
Figure 1. Location of the upper Senegal River basin, sub-basins, and the hydrometric stations of the study.



As part of preparations for the implementation of the framework directive on global changes—particularly climate change—decision-makers may be interested in anticipated future trends. Such insights can help propose local mitigation or adaptation measures. However, before quantifying the magnitude of future changes, a preliminary step is to establish a diagnostic of past and present conditions based on existing discharge time series, in order to identify whether trends are already detectable. To this end, statistical tests can be used to detect breaks or linear upward or downward trends and to assess whether observed changes are statistically significant. This raises the question of the role and relevance of such an approach.

Given the succession of extreme events (floods and low-flow periods), climate change is often invoked to explain their increase, without sufficient reliance on data analysis. Before drawing any conclusions, however, two preliminary questions must be addressed: (1) Are the observed changes in river discharge statistically significant? (2) Could recent changes in discharge or flow regimes be attributable to these changes? Discharge data from the basin at the Bakel station were therefore analyzed to obtain initial elements of response to these two questions.

Accordingly, this study is based on the application of several existing tests and procedures that make it possible to characterize hydrometric variability in the basin at the Bakel station. The statistical tests and procedures used include, among others, the Pettitt test and the Mann–Kendall test. These parameters make it possible to determine the persistence of strong hydrometric irregularity and/or drought over the period 1950–2014.

9. Discussion

The governance of the Senegal River is often cited as an example of regional cooperation in Africa, illustrating the possibility of effectively managing a resource shared by several countries. However, this experience presents significant limitations that must be addressed in order to strengthen integrated water resources management in the region. Among these limitations, the slow pace of institutional processes, the weak involvement of civil society, and external dependence are major challenges that must be overcome to ensure sustainable and equitable management of the river.

One of the main weaknesses identified concerns the slowness of institutional processes. Bureaucracy and insufficient coordination among the various institutions

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involved slow down decision-making and project implementation. According to Smith (2018), effective governance requires flexible and responsive institutional structures capable of adapting to the evolving challenges of water management. Institutional reform should therefore aim to simplify procedures and strengthen intersectoral coordination in order to accelerate decision-making.

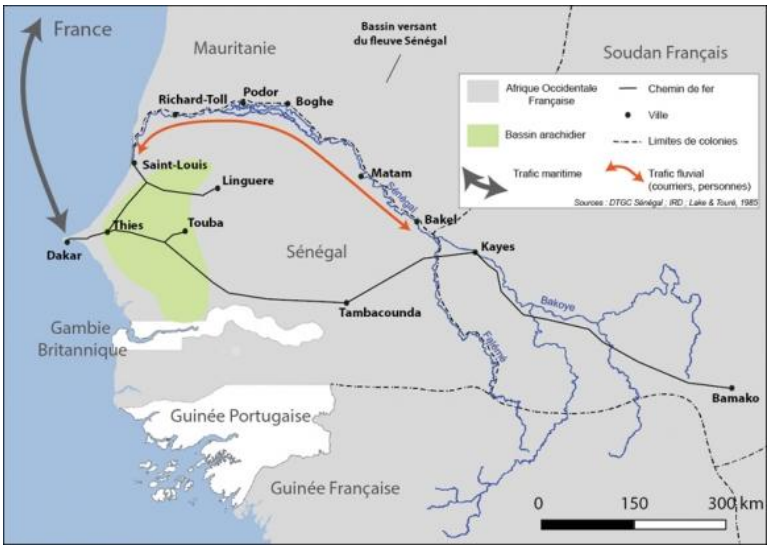
Furthermore, the limited involvement of civil society constitutes a major obstacle to participatory governance. Community participation and the awareness of local populations are essential to ensure sustainable water resource management. Johnson (2020) emphasizes that the engagement of non-state actors enhances the legitimacy and effectiveness of water policies. The establishment of inclusive dialogue mechanisms, such as local forums or consultative committees, could strengthen this involvement and promote more transparent management.

External dependence, particularly on international aid and foreign funding, limits the sovereignty of riparian countries and their ability to manage their resources autonomously. Lee et al. (2019) recommend developing a more proactive water diplomacy and further integrating non-state actors into the decision-making process. Reducing this dependence also requires strengthening local capacities in management, training, and technological innovation, as suggested by Diarra (2021).

In comparison with other river basins, such as the Nile, the Senegal River model demonstrates that regional cooperation is achievable, but it requires a strengthening of water diplomacy. Foster et al. (2020) stress the importance of greater inclusion of civil society, NGOs, and local economic actors in governance frameworks. Their involvement is crucial to addressing challenges related to climate change and population growth, which intensify pressure on water resources.

Finally, an integrated and multisectoral approach is essential to strengthen the governance of the Senegal River. Coordination among the agriculture, energy, environment, and health sectors must be improved. Traoré (2022) highlights that the establishment of a robust regulatory framework, accompanied by monitoring and evaluation mechanisms, is essential to ensure the sustainability of regional cooperation efforts. The ability to manage these sectors in a coherent manner will contribute to more resilient and sustainable river management.

Figure 2. Organization of the main transportation routes in the Senegal River basin during the colonial period (circa 1930).



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Following the abolition of slavery, river transport based on the triangular trade gave way to exchanges between colonies and metropolitan powers (Giri, 1994). In 1830, Senegambia primarily exported gum arabic (72%), followed by groundnuts (peanuts) from 1880 onward. The groundnut basin, located at the heart of present-day Senegal, became the center of economic life, and Dakar—close to the groundnut production areas—captured a large share of the port traffic previously handled by the city of Saint-Louis (Figure 1).

During the colonial period in the twentieth century, the circulation of goods and people along the river intensified, agriculture expanded, and local economic life in the Senegal River Valley increasingly revolved around the commercial and military stopovers established by the French along the river (Podor, Matam, Bakel, Médine). Political stability during the colonial era enabled the construction of several railway lines. Groundnut exports were transported to the ports of Rufisque and Dakar via the Dakar–Saint-Louis line, while goods from Western Sudan transited through the Dakar–Kayes–Bamako line (Figure 1).

10. Expected Results

An in-depth analysis of the management of the Senegal River in the face of geopolitical, environmental, and economic challenges is essential to understanding the difficulties and opportunities associated with the sustainable management of this vital resource. The river, which flows through several countries such as Guinea, Mali, Mauritania, and Senegal, plays a central role in local economies, agriculture, fisheries, and the supply of drinking water. However, it faces increasing threats, including environmental degradation, overexploitation, pollution, and the impacts of climate change, all of which jeopardize its long-term viability (Smith, 2020). The transboundary management of the river also raises major geopolitical issues, influencing cooperation among riparian states and regional stability. Competition for access to water resources, dam construction, and water allocation raise questions of sovereignty and security, requiring shared governance and robust multilateral agreements (Johnson, 2011).

The expected results of this study aim to deepen understanding of the hydrological and ecological dynamics of the river. They also seek to develop integrated management strategies that take into account economic, environmental, and geopolitical interests. Identifying best practices in sustainable management is a key step toward proposing appropriate policies and strengthening transboundary cooperation among the countries concerned (Diarra, 2018). The research should also highlight the impact of human activities such as intensive agriculture, mining, and urbanization on the health of the river, in order to design effective corrective measures (Kone, 2019).

With regard to economic issues, the study should explore how effective river management can support regional development. This includes promoting irrigated agriculture, sustainable fisheries, and ecotourism, which are key sectors for local economic growth. Addressing environmental concerns is also crucial to ensuring the sustainability of resources and strengthening resilience to climate change. The recommendations resulting from this research should aim to improve governance, enhance environmental monitoring, and encourage community participation in resource management (Traoré, 2021).

The geopolitical dimension must be integrated into the development of strategies aimed at preventing water-related conflicts. Cooperation among riparian states should be strengthened through international agreements and appropriate diplomatic strategies to ensure peaceful and equitable management of the river (Faye, 2017). Regional stability largely depends on the ability of countries to collaborate in the management of water resources, while respecting the principles of sovereignty and solidarity. The establishment of effective governance mechanisms is

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therefore essential to guarantee balanced and sustainable river management (Ngom, 2022).

Finally, this study aims to provide a scientific and strategic foundation for balanced management of the Senegal River. It integrates environmental, economic, and geopolitical dimensions in order to ensure the sustainability of resources for future generations. The participation of local communities, strengthened environmental monitoring, and international cooperation are key elements in achieving these objectives. The implementation of concrete recommendations will help preserve this valuable resource in the face of current and future challenges, thereby contributing to regional stability and sustainable development (Smith, 2020).

11. Conclusion

The management of the Senegal River illustrates the tensions between national sovereignty and regional cooperation. Although the OMVS has enabled notable advances, challenges related to climate change, equity, and governance persist. Strengthened water diplomacy, supported by greater participation of local populations and a long-term sustainability-oriented vision, could make the Senegal River a cornerstone of regional integration and water security in West Africa.

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