

Assessing the socioeconomic and environmental impacts of the Souapiti hydropower dam on local communities: Empirical Insights from Bangouyah, Republic of Guinea

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Abstract

Hydroelectric infrastructure represents a strategic lever for meeting the growing energy demands of developing countries while supporting the transition to a low-carbon economy. However, the implementation of such projects often generates significant socioeconomic and environmental impacts on surrounding communities. This study assesses the socioeconomic and environmental impacts of the Souapiti Hydropower Dam on the local communities of Bangouyah in the Republic of Guinea by examining changes in living conditions, economic activities, natural resources, as well as the effectiveness of the compensation and resettlement mechanisms implemented.

The study adopts a mixed-methods approach combining quantitative surveys of 500 households, semi-structured interviews with key stakeholders, field observations, and a comprehensive review of relevant literature and project documents. Quantitative data were analyzed using SPSS, while qualitative data were subjected to thematic analysis to provide an integrated understanding of the phenomena under investigation.

The findings reveal that, despite the dam's significant contribution to increasing national electricity generation, local communities continue to face substantial challenges, including the loss of agricultural land, declining agricultural and fishing activities, degradation of certain ecosystems, and persistent difficulties in restoring livelihoods. The study also identifies shortcomings in compensation mechanisms, limited community participation in decision-making processes, and a gap between the project's sustainable development objectives and the lived experiences of affected households. These findings underscore the need for more inclusive governance of large-scale infrastructure projects.

This research makes an empirical contribution to the literature on the impacts of hydropower dams in West Africa and provides a set of policy recommendations aimed at strengthening compensation mechanisms, enhancing community participation, and promoting the socioeconomic and environmental sustainability of future hydropower projects in the Republic of Guinea.

Keywords: Hydropower Dam; Souapiti; Socioeconomic impacts; Environmental impacts; Sustainable development; Environmental governance; Compensation; Community participation; Guinea

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1. Introduction

1.1. Global Energy Transition and Hydropower Development

The global energy transition has become one of the foremost challenges facing public policy worldwide. Driven by the combined effects of population growth, industrialization, and climate imperatives, energy systems are increasingly expected to shift toward low-carbon energy sources (IPCC, 2023; IEA, 2024). According to Sovacool et al. (2021), this transition extends beyond technological substitution and entails a profound transformation of institutions, governance mechanisms, and stakeholder participation processes. In this context, hydropower remains the world's largest source of renewable electricity and plays a pivotal role in the decarbonization of electricity systems (IEA, 2024; IRENA, 2024).

Hydropower therefore occupies a strategic position within the global energy transition. It is the leading renewable source of electricity worldwide and contributes significantly to the decarbonization of energy systems by providing relatively stable, low-carbon electricity capable of meeting growing energy demand. Unlike fossil fuels, hydropower facilities generate large amounts of electricity while reducing dependence on imported fuels and strengthening national energy security.

Hydropower development directly contributes to the achievement of several Sustainable Development Goals (SDGs), particularly SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation and Infrastructure), SDG 13 (Climate Action), as well as SDGs 1 and 8, which focus on poverty reduction and inclusive economic growth. Consequently, large dams are widely regarded as strategic infrastructure capable of simultaneously supporting the energy transition, enhancing economic competitiveness, and improving people's living conditions.

However, these contributions to sustainable development largely depend on the ability of projects to minimize their negative externalities. While the macroeconomic benefits of large dams are well documented, numerous studies have also highlighted their social, economic, and environmental consequences for host communities. Involuntary population displacement, loss of agricultural land, ecosystem alteration, land-use conflicts, and difficulties in restoring livelihoods represent major challenges that may undermine the long-term sustainability of such investments. Therefore, dam evaluation should no longer be confined to energy or economic performance alone but should also encompass their impacts on local communities and socio-ecological systems.

1.2. Hydropower at the Core of Development Strategies in Africa

In Africa, the energy sector is of strategic importance due to the persistent structural deficit in access to electricity, which remains one of the major constraints to industrialization, job creation, structural economic transformation, and improved living standards. According to the International Energy Agency (IEA, 2024), nearly 600 million Africans still lack access to electricity, representing approximately 83% of the global population without access to modern energy services. This energy poverty undermines national competitiveness, discourages productive investment, and hinders progress toward the Sustainable Development Goals, particularly SDG 7 on universal access to affordable, reliable, and sustainable energy (United Nations, 2015). The African Development Bank (AfDB, 2024) considers the energy deficit one of the principal factors slowing industrial development across the continent, thereby justifying substantial investment in electricity generation and transmission infrastructure.

Within this context, hydropower is widely recognized as one of the most promising solutions for supporting Africa's energy transition. The continent possesses an estimated technically exploitable hydropower potential of nearly 350 GW, of which less than 12% has currently been developed (International Hydropower Association [IHA], 2024). The Congo, Nile, Niger, Zambezi, Volta, and Konkouré river basins provide considerable opportunities for expanding low-carbon electricity generation capable of supporting economic growth, regional energy integration, and energy security (IRENA, 2024). Kumar, Katoch, and Purohit (2022) argue that hydropower development constitutes a major instrument for reducing African countries' dependence on fossil fuels, strengthening the resilience of electricity systems, and advancing national decarbonization policies. Accordingly, several countries—including Ethiopia, Guinea, Ghana, Zambia, and the Democratic Republic of the Congo—have launched major hydropower projects with the support of development partners such as the World Bank, the African Development Bank, and the Export-Import Bank of China (World Bank, 2023; AfDB, 2024).

Nevertheless, although the macroeconomic benefits of these infrastructures are widely acknowledged, the scientific literature demonstrates that their benefits are often unevenly distributed across territories and social groups. The landmark report of the World Commission on Dams (2000) demonstrated that, while large dams contribute to increased national electricity production, they also generate substantial social and environmental costs through involuntary

resettlement, loss of agricultural land, ecosystem fragmentation, land conflicts, and the impoverishment of local communities. These findings were reinforced by Scudder (2005), who emphasized that displaced populations frequently struggle to restore their livelihoods despite compensation programs. More recently, Moran et al. (2018) and Kibler and Tullos (2013) have shown that dam impacts extend well beyond economic considerations, affecting biodiversity, ecosystem services, territorial dynamics, and natural resource governance. In Sub-Saharan Africa, Kirchherr and Charles (2016) observed that while the national benefits of hydropower are substantial, the associated social and environmental costs are disproportionately borne by local communities.

These observations indicate that the sustainability of hydropower projects cannot be assessed solely on the basis of electricity generation capacity. It also depends on the quality of governance, the effectiveness of compensation mechanisms, the degree of community participation, and the capacity to restore the livelihoods of affected populations (Cerne, 2000; Tilt, Braun & He, 2009; Ostrom, 1990). Consequently, the assessment of large dams should move beyond a purely techno-economic perspective to incorporate the social, environmental, and institutional dimensions of sustainable development, in line with the Sustainable Development Goals and the principles of environmental governance (Sachs et al., 2023; IRENA, 2024).

1.3. The Guinean Context: The Souapiti Dam as Strategic Infrastructure

The Republic of Guinea possesses one of the largest hydropower potentials in West Africa, owing to its extensive river network dominated by the Konkouré, Niger, Senegal, and Gambia river basins. In recent years, the government has implemented an ambitious policy aimed at harnessing these resources to reduce the country's electricity deficit, support industrialization, and strengthen regional electricity trade.

This strategy has resulted in the construction of several major hydropower facilities, notably the Kaléta and Souapiti dams. With an installed capacity of 450 MW, the Souapiti Hydropower Dam is currently one of the largest energy investments ever undertaken in Guinea. Its commissioning aims to secure the national electricity supply, reduce dependence on thermal power plants, support industrial development, and reinforce Guinea's position within the ECOWAS Regional Electricity Market. Accordingly, Souapiti is considered a cornerstone of the country's national energy strategy.

However, the implementation of this project has also brought profound territorial transformations. The filling of the reservoir resulted in the inundation of extensive land areas, the displacement of several rural communities, significant changes in traditional economic activities, and substantial alterations to local ecosystems. Bangouyah, located in the Kindia Region, is among the communities most directly affected by these changes. The local population depends primarily on subsistence agriculture, artisanal fishing, livestock farming, and small-scale trade, making them particularly vulnerable to project-induced transformations. Evidence indicates considerable losses of agricultural land, challenges related to resettlement, and shortcomings in compensation mechanisms within the locality.

These observations highlight the need for a comprehensive assessment of the dam's impacts, considering not only its national energy benefits but also its economic, social, environmental, and institutional consequences at the local level.

1.4. Research Gaps and Research Problem

The impacts of large hydropower dams have been widely investigated in the scientific literature. Existing studies have extensively documented their energy performance, population displacement, ecosystem changes, and resettlement mechanisms. Other research has focused on environmental justice, benefit-sharing, and community participation in infrastructure projects.

Nevertheless, several important gaps remain. First, most studies adopt sector-specific approaches by examining economic, social, or environmental dimensions separately rather than providing an integrated assessment of the interactions among these components. Second, governance mechanisms—including participation processes, compensation effectiveness, and sustainable livelihood restoration—remain insufficiently explored from a systemic perspective. Third, research focusing on West Africa remains relatively limited compared with studies conducted in Asia and Latin America, despite the rapid expansion of hydropower investments across the region.

The case of the Souapiti Hydropower Dam clearly illustrates these shortcomings. Although institutional reports and a limited number of studies have documented certain project impacts, few have provided an integrated empirical analysis of its socioeconomic, environmental, and institutional effects on the local communities of Bangouyah. This gap provides a strong justification for the present study.

Accordingly, the central research question is formulated as follows:

To what extent has the Souapiti Hydropower Dam transformed the socioeconomic, environmental, and institutional conditions of the local communities of Bangouyah, and to what extent do the compensation, resettlement, and governance mechanisms implemented contribute to achieving a sustainable development trajectory?

1.5. Scientific Contribution of the Study

This study makes three major contributions to the literature on large hydropower projects.

The first contribution is empirical. Based on field research combining quantitative data collected from 500 households with qualitative evidence obtained through interviews and direct observations, the study provides new empirical insights into the impacts of hydropower infrastructure in a context that remains underrepresented in the West African literature.

The second contribution is methodological. Unlike previous studies that emphasize a single analytical dimension, this research adopts an integrated framework encompassing economic, social, environmental, and institutional impacts. This approach provides a more comprehensive understanding of the interactions between territorial transformations, community livelihoods, and infrastructure governance mechanisms.

The third contribution is conceptual and practical. The study proposes an integrated governance framework for the sustainable management of large hydropower dams by linking compensation mechanisms, community participation, environmental governance, and benefit-sharing. This framework offers practical guidance for policymakers, project developers, and development partners seeking to improve the design, implementation, and evaluation of future hydropower projects in the Republic of Guinea and other comparable contexts.

By simultaneously addressing the challenges of energy development, social justice, and environmental sustainability, this research contributes to advancing scientific debates on the governance of strategic infrastructure in developing countries and opens new perspectives for more inclusive and resilient development planning.

2. Methodology

2.1. Presentation of the study area

The study was conducted in the locality of Bangouyah, located in the Kindia Prefecture in the Republic of Guinea. This locality is among the areas directly affected by the construction and impoundment of the Souapiti Hydropower Dam, built on the Konkouré River. The livelihoods of the local population rely primarily on subsistence agriculture, artisanal fishing, livestock farming, and small-scale trade, making households highly dependent on natural resources and particularly vulnerable to the environmental changes induced by the project.

With an installed capacity of 450 MW, the Souapiti Hydropower Dam is one of the largest energy infrastructure investments undertaken in Guinea. Its commissioning is part of the country's national strategy to strengthen energy security and promote economic development. However, the creation of the reservoir resulted in the inundation of agricultural land, the displacement of several communities, and significant alterations to local ecosystems, making Bangouyah an especially relevant case study for assessing the socioeconomic and environmental impacts of the project.

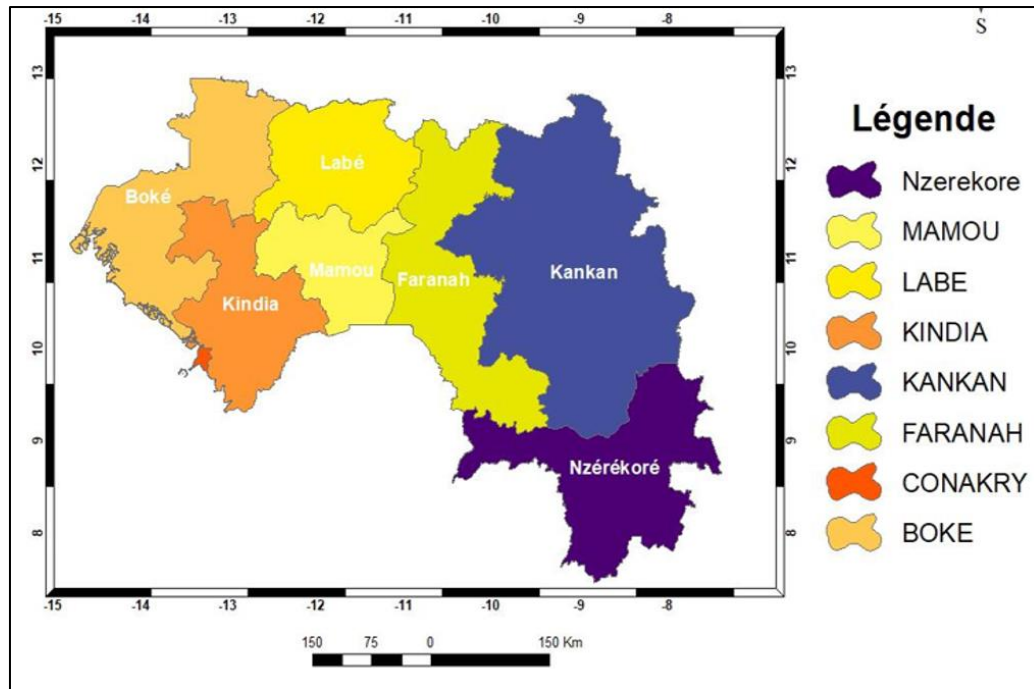


Figure 1 Location map of the study area

2.2. Target Population and Sample Size

The target population comprised households residing in the villages directly affected by the Souapiti Hydropower Dam. It also included the principal stakeholders involved in the implementation and monitoring of the project, namely local administrative authorities, project officials, community representatives, and civil society organizations.

The quantitative survey was conducted among **500 households**, selected to ensure adequate representation of the different socioeconomic groups and the affected villages.

The sample size is consistent with the methodological recommendations of **Krejcie and Morgan (1970)**, who indicate that a sample exceeding **384 observations** provides robust estimates for large populations at a **95% confidence level** with a **5% margin of error**. Furthermore, **Hair et al. (2019)** emphasize that a sample of this size is more than sufficient for conducting descriptive and multivariate statistical analyses in the social sciences.

The diversity of the respondents also enhances the representativeness of the perceptions collected and strengthens the external validity of the study findings.

2.3. Data Collection Instruments

Data were collected using four complementary instruments:

- A structured questionnaire administered to 500 households;
- Semi-structured interviews conducted with key institutional and community stakeholders;
- A direct observation checklist designed to document changes in infrastructure, agricultural land, and natural resources;
- A documentary review covering Environmental and Social Impact Assessments (ESIAs), Resettlement Action Plans (RAPs), institutional reports, and scientific publications.

The questionnaire consisted primarily of closed-ended questions using a five-point Likert scale to assess respondents' perceptions of the various impacts of the dam. The semi-structured interview guides provided an in-depth understanding of compensation mechanisms, governance arrangements, and local adaptation strategies adopted by the affected communities.

2.4. Reliability and Validity of the Research Instruments

The scientific quality of the data collection instruments is a fundamental prerequisite for ensuring the credibility of the study findings. The internal consistency of the measurement scales can be assessed using Cronbach's alpha coefficient, which is generally considered acceptable when its value exceeds 0.70 (Cronbach, 1951; Hair et al., 2019). In the final version of the article, this reliability coefficient will be calculated for the main questionnaire constructs, provided that the raw data are available.

The validity of the questionnaire was established through several complementary procedures. Content validity was ensured through an extensive review of the scientific literature and by aligning the questionnaire items with the research objectives and the theoretical constructs underpinning the study. Face validity was strengthened through expert review by specialists in the field and a pilot test conducted with a small sample of respondents. Finally, methodological triangulation, based on the integration of quantitative, qualitative, documentary, and observational data, further enhances the credibility and trustworthiness of the findings (Lincoln & Guba, 1985; Creswell & Plano Clark, 2018).

2.5. Data Analysis Techniques

The quantitative data were coded, cleaned, and analyzed using IBM SPSS Statistics software. Descriptive statistical analyses—including frequencies, percentages, means, and standard deviations—were performed to characterize the respondents and describe the main impacts of the dam. Where appropriate, association tests and comparative analyses may also be conducted to examine relationships between selected variables.

The qualitative data obtained from the interviews and field observations were analyzed using thematic analysis, following the approach proposed by Braun and Clarke (2006). This process involved coding interview transcripts, identifying recurring themes, comparing the perspectives of different stakeholder groups, and interpreting the findings in light of the study's theoretical framework.

Finally, the integration of quantitative and qualitative findings provided a comprehensive assessment of the socioeconomic, environmental, and institutional impacts of the Souapiti Hydropower Dam, in accordance with the principles of mixed-methods research. This triangulation strategy enhances the robustness of the study's conclusions and offers a more comprehensive understanding of the project's effects on local communities.

3. Results

This section presents the main findings of the survey conducted among **500 households** in the communities affected by the **Souapiti Hydropower Dam**. The results are organized around six dimensions corresponding to the study's conceptual framework: (i) respondents' profile, (ii) economic impacts, (iii) social impacts, (iv) environmental impacts, (v) compensation mechanisms, and (vi) community participation. The quantitative findings are presented in the form of summary tables and interpreted in light of field observations and the semi-structured interviews conducted with key stakeholders.

3.1. Respondents' Profile

Table 1 Socioeconomic Profile of the Respondents (n = 500)

Variable	Category	Frequency	Percentage (%)
Gender	Male	231	46
	Female	269	54,8
Main Occupation	Agriculture	274	54,8
	Fishing	226	45.2

3.1.1. Analysis

The sample consisted of 500 households, with a slight predominance of women (54,8%) compared to men (46%). This distribution reflects a relatively balanced participation of both genders in the survey and allows for the consideration of gender-specific perceptions regarding the impacts of the dam.

Regarding economic activities, 54,8% of the respondents reported agriculture as their primary occupation, while 45,2% relied mainly on fishing. This occupational structure confirms the strong dependence of local communities on natural resources and explains their vulnerability to the environmental and livelihood changes resulting from the impoundment of the Souapiti Hydropower Dam.

3.2. Economic Impacts of the Dam

Table 2 Perceived Economic Impacts of the Dam

Indicator	Yes	No	Yes (%)
Agricultural land flooded	351	122	70.0
Partial flooding	27	—	5.0

3.2.1. Analysis

The findings indicate that **70%** of households reported that their farmland or economic activity areas had been affected by flooding resulting from the impoundment of the dam, whereas **24%** stated that they had not experienced flooding, and **5%** reported partial flooding.

These results highlight the magnitude of the economic transformations brought about by the project. The loss of agricultural land has reduced the area available for cultivation and altered traditional farming systems, forcing many households to adapt their livelihood strategies. Furthermore, the interviews revealed that although the construction phase generated temporary employment opportunities, these jobs were generally insufficient to provide a sustainable offset for the loss of agricultural income.

3.3. Social Impacts

Table 3 Main Observed Social Impacts

Indicator	Yes	No	Yes (%)
Difficulties related to displacement/resettlement	451	49	90.0
Disruption of social conditions	465	35	93.0

3.3.1. Analysis

The findings reveal substantial social consequences associated with the dam project. Approximately 90% of respondents reported that the displacement and resettlement process created significant difficulties, while 93% believed that their social conditions had been profoundly affected.

The interviews conducted with displaced households highlighted the disruption of social support networks, difficulties in adapting to the new resettlement sites, and significant changes in traditional ways of life. These findings are consistent with the impoverishment risks identified by Cernea (2000), particularly those related to social marginalization and community disarticulation.

3.4. Environmental Impacts

Table 4 Main Environmental Impacts Identified

Environmental Impact	Frequency	Percentage (%)
Loss of agricultural land	404	80.0
Perceived local climate change	56	11.0
Deforestation	40	8.0
Total	500	100.0

3.4.1. Analysis

The environmental impacts were dominated by the loss of agricultural land, reported by 80% of the respondents. Perceptions of local climate change (11%) and deforestation (8%) were also noteworthy, although they were mentioned less frequently.

These findings reflect the magnitude of the ecological transformations brought about by the creation of the reservoir. The inundation of extensive agricultural areas has profoundly altered local farming systems and directly affected household food security. Field observations also revealed noticeable changes in the landscape and in several riparian ecosystems.

3.5. Assessment of Compensation Mechanisms

Table 5 Perceptions of Compensation Mechanisms

Indicator	Yes	No	Yes (%)
Satisfaction with compensation mechanisms	318	182	63.0

3.5.1. Analysis

Approximately **63%** of households reported being relatively satisfied with the compensation mechanisms implemented, whereas **36%** expressed dissatisfaction.

These findings suggest that, despite the efforts made within the resettlement program, a substantial proportion of the affected population believes that the compensation provided has been insufficient to sustainably restore lost livelihoods. The interviews further highlighted expectations regarding enhanced income-generating opportunities, improved access to community infrastructure, and stronger economic support for affected households.

3.6. Community Participation

Table 6 Community Participation in the Project Process

Indicator	Yes	No	Yes (%)
Community participation or consultation	274	226	54,8

3.6.1. Analysis

The findings indicate that 54,8% of respondents considered that they had been involved in the project's consultation mechanisms, whereas 45,2% believed that they had not participated satisfactorily in the decision-making process.

These results suggest a moderate level of community participation. The interviews revealed that although several information and consultation meetings were organized, local communities expressed a desire for more meaningful involvement in decisions related to compensation, resettlement, and the monitoring of project impacts. These findings confirm that strengthening participatory governance remains a key challenge for improving the social acceptability of large-scale hydropower projects.

3.6.2. Summary of the Main Findings

The analysis highlights the mixed impacts of the Souapiti Hydropower Dam. At the national level, the project has contributed to strengthening electricity generation capacity and supporting infrastructure development. However, at the local level, the communities of Bangouyah continue to face significant challenges, including the loss of agricultural land (80%), resettlement-related difficulties (90%), social disruption (93%), and a still limited level of community participation (54,8%).

These findings underscore that the success of a large hydropower project cannot be assessed solely on the basis of its energy performance. It also depends on the effectiveness of compensation mechanisms, the quality of participatory governance, and the project's ability to sustainably restore the livelihoods of affected communities.

4. Discussion

The findings of this study highlight the contrasting effects of the Souapiti Hydropower Dam on the local communities of Bangouyah. While the project has undoubtedly strengthened Guinea's national electricity generation capacity and supports the country's energy transition strategy, it has also generated significant socioeconomic, environmental, and institutional transformations for the directly affected populations. This section compares the study findings with previous research to assess their consistency with the international literature while highlighting the specific characteristics of the Guinean context. The discussion is organized around five dimensions: economic impacts, social impacts, environmental impacts, compensation mechanisms, and participatory governance.

4.1. Economic Impacts: Between National Development and Local Vulnerability

The findings indicate that the Souapiti Hydropower Dam represents a strategic investment for Guinea's energy security, yet its economic benefits remain unevenly distributed among stakeholders. While the infrastructure has contributed to expanding the country's electricity generation capacity and supporting economic development, a substantial proportion of surveyed households reported losing part of their agricultural land and traditional sources of livelihood.

These findings are consistent with the conclusions of the World Commission on Dams (2000), which argue that large dams generally generate substantial macroeconomic benefits while transferring a significant share of their economic costs to local communities. Similarly, Scudder (2005) emphasizes that displaced populations rarely benefit proportionately from the economic gains generated by large infrastructure projects, thereby reinforcing territorial inequalities.

The results also corroborate the analyses of Moran et al. (2018), who demonstrate that the benefits of hydropower projects are frequently assessed at the national level without fully accounting for the economic costs borne by affected communities. In the case of Souapiti, this asymmetry is particularly pronounced, as the reduction of agricultural land directly threatens the livelihoods of households whose economies depend primarily on farming and fishing.

These findings suggest that the economic performance of a hydropower dam should not be assessed solely in terms of its contribution to gross domestic product (GDP) or electricity generation but also in terms of its capacity to sustainably preserve the livelihoods of riparian communities.

4.2. Social Impacts: Confirming Cernea's Impoverishment Risks Model

The analysis reveals significant social disruptions associated with population displacement, resettlement challenges, and changes in community networks. These findings strongly support Cernea's Impoverishment Risks and Reconstruction (IRR) Model (Cernea, 1997, 2000).

Several of the eight impoverishment risks identified by Cernea are clearly evident in the Souapiti case, particularly landlessness, economic marginalization, food insecurity, and social disarticulation. These findings are also consistent with Scudder (2005), who argues that the success of resettlement programs depends less on the physical relocation of communities than on the capacity of institutions to sustainably restore affected people's living conditions.

The results further align with the work of Tilt, Braun, and He (2009), who demonstrate that large dams profoundly reshape social relationships, cultural practices, and local governance systems. In Bangouyah, the interviews revealed that the loss of ancestral lands and the reorganization of living spaces weakened community solidarity and undermined traditional resilience strategies.

Therefore, the social consequences of the Souapiti Dam extend far beyond material losses and should be understood as structural transformations affecting local livelihood systems and community organization.

4.3. Environmental Impacts: A Major Challenge for the Sustainability of Hydropower Infrastructure

The findings indicate that the loss of agricultural land is the environmental impact most frequently reported by surveyed households, followed by deforestation and perceived changes in local climatic conditions. These observations confirm the analyses of Moran et al. (2018), who argue that hydropower dams produce long-lasting changes in landscapes, hydrological dynamics, and ecosystem services.

The results are also consistent with the conclusions of the World Bank (2023), which emphasize that large hydropower projects should incorporate adaptive ecosystem management approaches to mitigate adverse effects on natural resources and local livelihoods.

From the perspective of sustainable development theory, these findings illustrate the inherent tension between the global benefits associated with the energy transition and the environmental costs borne by local communities. As emphasized by the International Energy Agency (IEA, 2024) and the International Renewable Energy Agency (IRENA, 2024), hydropower is a fundamental component of the decarbonization of energy systems; however, its contribution to the Sustainable Development Goals (SDGs) ultimately depends on the effective management of its environmental impacts.

The Souapiti case therefore demonstrates that the environmental success of a hydropower project cannot be evaluated solely on the basis of its low carbon footprint. It must also be assessed according to its ability to conserve ecosystems and protect the natural resources upon which local communities depend.

4.4. Compensation and Benefit-Sharing: Beyond Financial Compensation

The findings indicate that the compensation mechanisms implemented have mitigated some of the project's adverse consequences but remain insufficient to sustainably restore the livelihoods of the affected populations.

These observations are consistent with the recommendations of the World Commission on Dams (2000), which argues that financial compensation alone provides only a partial response to the social consequences of large dam projects. They also support the findings of Skinner, Niasse, and Haas (2009), who contend that the fundamental challenge lies in the equitable and sustainable sharing of the economic benefits generated by hydropower infrastructure.

According to Sadoff and Grey (2002), hydropower projects should enable riparian communities to benefit directly from the economic gains generated by such infrastructure through improved local infrastructure, preferential access to electricity, the creation of sustainable employment opportunities, and the financing of community development initiatives.

In the case of the Souapiti Hydropower Dam, the findings suggest that this benefit-sharing approach remains limited, which helps explain the relatively moderate levels of satisfaction reported by the affected communities.

4.5. Participatory Governance and the Social Acceptability of Large Dams

Community participation emerged as one of the principal determinants of the social acceptability of the Souapiti Hydropower Dam. The findings indicate that, although several information and consultation meetings were organized, a substantial proportion of respondents felt that they had not been adequately involved in decisions concerning compensation, resettlement, and project monitoring.

These findings support the work of Arnstein (1969), who argues that information alone does not constitute genuine participation. They are also consistent with the analyses of Reed (2008) and Ostrom (1990), which demonstrate that the effective involvement of stakeholders enhances natural resource governance and reduces conflicts associated with development projects.

The findings further align with the observations of Human Rights Watch (2022) regarding several large-scale infrastructure projects in Africa, where inadequate consultation mechanisms have frequently contributed to increased tensions between local communities and public authorities.

Within the Guinean context, these results underscore the need to strengthen participatory governance mechanisms in order to achieve better alignment between the country's national energy transition objectives and the legitimate expectations of the communities directly affected by such projects.

4.6. Summary of the Discussion

Overall, the findings of this study confirm that large hydropower dams constitute strategic infrastructure for energy and economic development while simultaneously highlighting the persistent challenges associated with their social and environmental governance. The case of the Souapiti Hydropower Dam demonstrates that national energy benefits coexist with economic, social, and environmental costs concentrated at the local level, thereby corroborating the major

conclusions of the international literature (World Commission on Dams, 2000; Cernea, 2000; Scudder, 2005; Moran et al., 2018).

However, this research makes an original contribution by providing an integrated analysis of the interactions among socioeconomic and environmental impacts, compensation mechanisms, and community participation within the Guinean context. It demonstrates that the sustainability of large hydropower projects depends less on their technical performance than on their ability to establish inclusive governance, equitable benefit-sharing, and the effective restoration of the livelihoods of affected communities. This integrated perspective offers valuable insights for improving the planning, implementation, and evaluation of future hydropower projects in West Africa.

5. Conclusion

This study assessed the socioeconomic and environmental impacts of the Souapiti Hydropower Dam on the local communities of Bangouyah, Republic of Guinea, using an integrated mixed-methods approach combining household surveys, semi-structured interviews, field observations, and documentary analysis. The findings demonstrate that, while the dam has significantly strengthened Guinea's national electricity generation capacity and contributed to the country's energy transition objectives, it has also generated substantial socioeconomic, environmental, and institutional challenges for the communities directly affected by the project.

The study reveals that the inundation of agricultural land, disruption of traditional livelihoods, social dislocation associated with resettlement, environmental degradation, and the limited effectiveness of compensation mechanisms remain major concerns among local households. Although compensation and resettlement measures have mitigated part of the project's adverse impacts, they have not fully restored the livelihoods of affected populations. Likewise, the relatively moderate level of community participation suggests that existing consultation mechanisms should be strengthened to promote more inclusive and transparent decision-making processes.

Beyond its empirical findings, this research contributes to the literature by providing an integrated assessment of the interactions among socioeconomic impacts, environmental changes, compensation mechanisms, and participatory governance in the context of a large hydropower project in West Africa. Unlike many previous studies that examine these dimensions separately, this study demonstrates that the sustainability of hydropower infrastructure depends not only on technical performance and energy production but also on equitable benefit-sharing, effective environmental governance, and the long-term restoration of community livelihoods.

From a policy perspective, the findings suggest that future hydropower projects in Guinea and other developing countries should move beyond a compensation-centered approach toward more comprehensive benefit-sharing strategies. Strengthening participatory governance, improving livelihood restoration programs, protecting ecosystem services, and ensuring continuous monitoring of social and environmental impacts are essential for enhancing the long-term sustainability and social acceptability of large-scale infrastructure projects.

This study is subject to certain limitations. The analysis focuses on a single case study and relies partly on respondents' perceptions, which may not fully capture the long-term dynamics of project impacts. Future research could adopt longitudinal designs, comparative analyses across multiple hydropower projects, and advanced econometric or spatial analytical techniques to better understand the long-term socioeconomic, environmental, and institutional consequences of hydropower development in West Africa.

Ultimately, the Souapiti case demonstrates that the success of hydropower projects should not be measured solely by the amount of electricity they generate, but also by their capacity to foster inclusive development, environmental sustainability, and equitable improvements in the well-being of the communities that bear the greatest costs of development.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Verbal informed consent was obtained from all participants prior to their participation in the study. The objectives of the research, the voluntary nature of participation, confidentiality, and the right to withdraw at any time were explained before each interview.

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