

Climate Change, Land Conflicts, and Adaptive Strategies among Resettled Communities in the Manantali Dam Area in Mali

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Abstract

The construction of the Manantali dam in the early 1980s in Mali considerably altered the socio-economic and environmental landscape, displacing communities and submerging natural habitats. These displacements led to tensions over land sharing due to population growth and resource scarcity, fostering conflicts between resettled and host villages. Based on semi-structured interviews and direct observations in thirteen villages, this study examines land-related conflicts from the perspective of Cernea's Impoverishment Risk and Reconstruction (IRR) model, focusing on risks such as landlessness and social marginalisation. Forty-five in-depth interviews reveal how population density and agricultural migration exacerbate competition for arable land, while traditional and formal conflict resolution mechanisms struggle to resolve disputes effectively. This article provides new perspectives by exploring how strategies for adapting to climate change, such as agroecological practices, influence land conflicts and community resilience. It also criticises governance failures in resettlement planning and advocates participatory approaches to resource management. The findings support policy recommendations for sustainable land governance and community-led adaptation, filling gaps in existing studies on development-induced displacement.

Keywords: Host Villages; Land Conflicts; Manantali Dam; Resettlement; Impoverishment Risks; Climate Change Adaptation.

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1. Introduction

Mali's water resources hold significant potential to address the nation's electricity and food security challenges through effective management. The Manantali Dam, constructed in the early 1980s by the OMVS¹, was designed to harness the Senegal River for hydropower and irrigation in response to severe droughts in the 1970s (Wall, 2021). However, the dam's construction inundated extensive upstream areas, displacing forty-four villages, submerging sacred sites, and necessitating the resettlement of communities into thirty new villages, primarily downstream (Koenig, 2023). This resettlement process triggered significant socio-economic challenges, particularly around land-sharing, as host communities were required to accommodate displaced populations, leading to tensions over resources.

¹ Sub-regional organisation comprising Mali, Mauritania and Senegal.

While initial coexistence was supported by abundant land and low population density, rapid population growth and agricultural migration have intensified competition for arable land in the area. This study advances the discourse by analysing these conflicts through Cernea's IRR² model, which identifies risks such as landlessness, joblessness, and social disarticulation (Cernea, 1998). Unlike previous studies, this research uniquely integrates the exacerbating effects of climate change on land pressure and examines community adaptation through the use of agroecological strategies. It also critiques the transition from traditional to formal conflict resolution mechanisms, highlighting governance shortcomings and proposing participatory frameworks for sustainable resource management.

This study aims to:

- Analyse land-related conflicts in the Manantali resettlement context using the IRR model.
- Investigate the impact of climate change on land disputes and evaluate adaptive strategies.
- Assess the effectiveness of traditional and formal conflict resolution mechanisms.
- Propose policy recommendations for inclusive and sustainable resource governance.

The study focuses on the Manantali area, examining land tenure systems, agricultural practices, demographic dynamics, the impacts of climate change, and the adaptive strategies employed in response. This scope contributes to a comprehensive understanding of the challenges associated with development-induced displacement and resettlement.

Development-induced displacement, particularly from large dam projects, has profound socio-economic and environmental consequences. Cernea's IRR model provides a robust framework for analysing these impacts by identifying eight key risks: landlessness, joblessness, homelessness, marginalisation, food insecurity, access to common property, social disarticulation, and health. This study applies the IRR model to the Manantali Dam context, focusing on landlessness and social disarticulation as primary drivers of conflict.

The literature on the Manantali Dam resettlement, spanning from Koenig & Diarra (1998) to more recent works, comprehensively examines socio-economic and political dynamics but reveals significant gaps in addressing environmental stressors and adaptive strategies. Koenig & Diarra's (1998) study examined the local political dynamics and land-use strategies of resettled and host communities in the Manantali area, highlighting social tensions and competition for land resources. It acknowledged environmental changes, such as altered agricultural patterns due to the dam. However, it did not thoroughly investigate how climate-related factors, such as erratic rainfall or land degradation, exacerbate land conflicts. Similarly, Horowitz et al. (2019) documented short-term successes in land and housing provision but noted long-term challenges, including land scarcity and social disarticulation. However, their analysis lacked a focus on the role of climate variability in intensifying resource pressures.

Subsequent studies by Koenig (2023 and 2024) shifted their focus towards livelihoods, living standards, and urbanisation, emphasising socio-economic outcomes and well-being post-resettlement. While detailed in their socio-economic scope, these works paid minimal attention to environmental stressors and their interplay with land conflicts. Ficatier & Niasse (2008) provided a retrospective evaluation of the Manantali Dam's ecological and social impacts, noting changes in fisheries and agriculture alongside population growth. Nevertheless, their

² The Impoverishment Risk and Reconstruction (IRR) model, developed by Michael Cernea, is a framework for understanding and mitigating the negative social and economic impacts of forced displacement, particularly in the context of development projects such as dams.

analysis fell short of exploring how these environmental shifts drive conflicts or how communities adapt through strategies like agroecological practices. Salem-Murdock (2019) further emphasised the burdens on host communities but focused primarily on social and economic challenges, overlooking environmental factors and adaptive responses. Comparative studies, such as those by Tény et al. (2019) on the Kossou Dam in the Ivory Coast, identify similar land pressure issues but lack a theoretical framework to contextualise their findings.

The identified gaps in prior research include a limited integration of climate change impacts, an underdeveloped focus on community-driven adaptation strategies, a lack of theoretical frameworks such as Cernea's Impoverishment Risks and Reconstruction (IRR) model, and an insufficient exploration of governance transitions in conflict resolution. The current study addresses these deficiencies by examining how climate variability, such as erratic rainfall and land degradation, amplifies land pressure and fuels conflicts between resettled and host communities. It introduces a novel focus on adaptive strategies, such as organic fertilisers and farming hamlets, by analysing their potential to mitigate resource scarcity while recognising their role in sparking conflict when implemented without host consent. Applying Cernea's IRR model, the study provides a structured analysis of risks, such as landlessness and social disarticulation, offering theoretical rigour not found in prior works. Additionally, it investigates the shift from traditional to formal conflict resolution mechanisms, proposing hybrid governance models to address legitimacy crises in customary systems. The study extends previous calls for sustainable livelihoods by integrating climate adaptation and participatory governance through actionable policy recommendations, such as formalising land tenure and supporting agroecological programmes.

2. Methodology

2.1. Study Area

As a result of decentralisation, the Bamafélé sub-prefecture, which covers the area, was divided into two rural communes: Bamafélé and Diokeli. Consequently, the displaced and host villages fall geographically within these two communes. The area is located in the south of the Kayes region of Mali and is home to one of the largest hydroelectric dams, built on the river Bafing, a tributary of the river Senegal. When the dam was built in the early 1980s, its population was 10,959 (INSTAT, 1987), rising to 25,000 in 2006 (Ficatier & Niasse, 2008). It is now estimated to have more than 40,000 inhabitants (INSTAT, 2022). The area was sparsely populated before the dam was built, and its density has increased from less than five inhabitants per square kilometre (Koenig, 2023) to more than 20 inhabitants per square kilometre (Ficatier & Niasse, 2008). Over the last four decades, this acceleration in land occupation has been due to the relocation of part of the population from the upstream to the downstream section and the influx of labour on the dam construction sites. The main economic activity is agriculture.

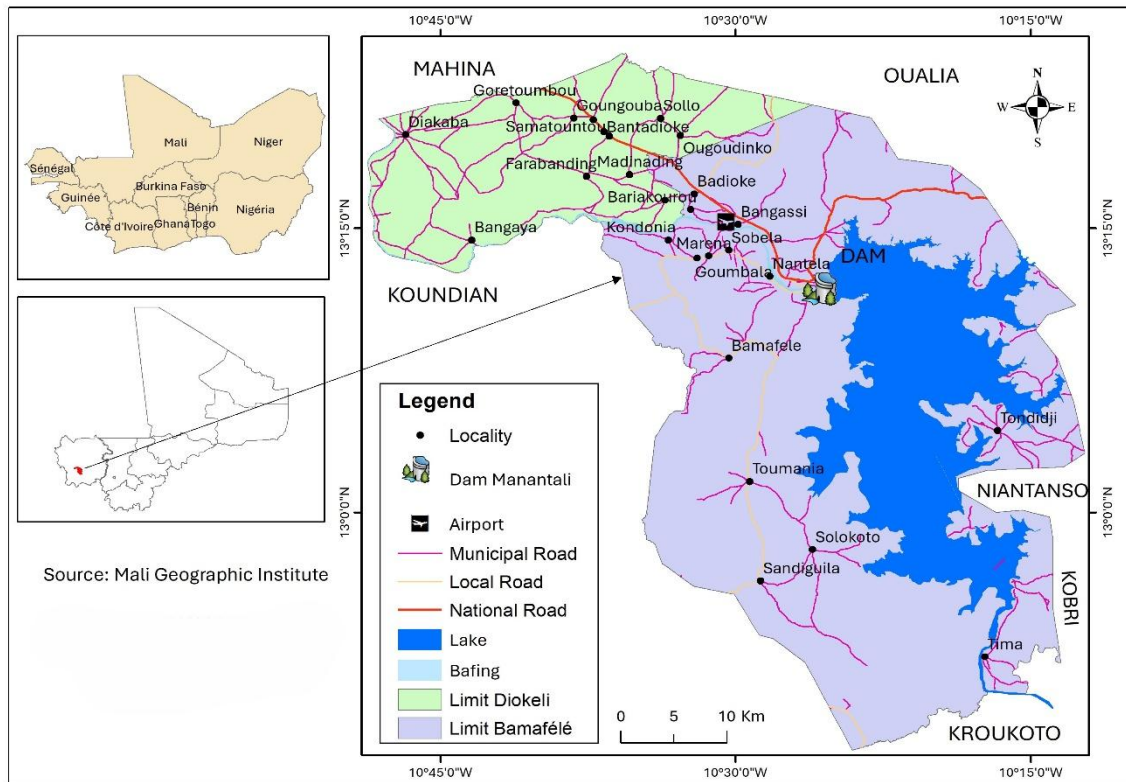


Fig. 1: Map of the Manantali Dam area, source: Mali Geographic Institute

2.2. Materials and Methods

This study employed a qualitative case study approach to examine the socio-economic and environmental dynamics of land conflicts and adaptive strategies in the Manantali Dam resettlement area. Data were collected through semi-structured interviews and direct observations in thirteen purposively selected villages, both host and resettled, within the Bamafélé and Diokeli communes. These villages were specifically chosen for their proximity to the dam, as prior research had documented recurrent land-related tensions in these areas (Ficatie & Niasse, 2008).

Forty-five in-depth interviews were conducted within these sites with key stakeholders directly involved in land and resource governance. Participants included twenty resettled villagers, sixteen members of the host community, six village chiefs, two mayors, and one sub-prefect. The sampling rationale was guided by two principles: (i) ensuring diversity of perspectives across social positions (resettled, host, and local authorities) and (ii) achieving theoretical saturation, where no new insights emerged (Blanchet & Gotman, 2015). This purposive strategy was therefore not intended for statistical representativeness but for depth of understanding and capturing variation in local experiences of resettlement and land conflict. The sample size of forty-five was deemed sufficient to capture variations among primary stakeholder groups while facilitating the in-depth inquiry essential to qualitative case study research. Data collection continued until thematic saturation was attained.

Interviews were conducted in Malinké, Bamanan, and French, then recorded, transcribed, and translated into English. Fieldwork was conducted in two phases (January–May 2023 and July 2024) to account for seasonal variations. Data were analysed using thematic and content analyses, with Cernea's IRR model serving as an analytical framework to identify risks such as landlessness and social disarticulation. Credibility was reinforced through triangulation,

reflexivity, and a detailed contextual description, prioritising transferability over broad generalisation (Téni et al., 2019).

3. Results

3.1. Land-Related Conflicts in the Resettlement Context

Natural resource management poses significant challenges in resettled villages. Similar to other rural areas, the conflicts in this case often involve land-related issues. Interactions between different groups (hosts and the displaced) regarding agricultural land are often tense.

3.1.1. Pre-Dam Land Management

The advent of the dam has led to significant changes in how farmland is managed. Land tenure issues were uncommon before the dam was constructed due to limited natural resource pressure. As was the case almost everywhere in traditional Africa, customary norms governed land management. The following extract from this interview with the Mayor of Diokéli is quite edifying about the situation that prevailed in the locality:

For new arrivals in the village, i.e., those leaving one village for another, all they had to do was take ten cola nuts to the village chief. More often than not, the stranger's host accompanied him on his approach. That is how the land was managed on the old site before the dam.

The relationships between locals and newcomers were friendly and cooperative. This was because land disputes were rare. There was little competition or greed for natural resources in the region.

In the same vein, arable land was abundant. Furthermore, the area's self-sufficiency was due to its fertile soil, abundant water supply, and limited economic opportunities, which deterred external land seekers. The population's need for land was met, and clashes over land ownership were rare. The following passage from the interview with M.S., former Mayor of the rural commune of Bamafélé, illustrated the past situation: “*Before the dam, the population had enough land, and at the time, conflicts were even rare, because we could clear a field every two years. Before, land ownership was never an issue.*” Therefore, the availability of land is a factor that contributes to stability and peace among the various players in the land and social arena. This was happening in the context of low population growth, and the area was not attracting other farmers because it lacked infrastructure and other incentives. This could explain the low land pressure. In addition, local resource people emphasise the rarity of land conflicts. The establishment of a dam has led to increased land problems due to limited availability.

These factors are directly linked to the area's natural potential and other artificial conditions (development, the advent of infrastructure, etc.). Before the dam's creation, the area was presented as a heaven of peace regarding land issues. Competition over land was not on the agenda. As D.F., a resident of Nantela, described it: “*The people of Bafing had no land problems before the dam came into being. There was enough land. It was rare to hear of any land disputes*”. Those idyllic days are over now that the dam has been built. Land disputes are rife between the various stakeholders. Natural resource governance was entrusted to the customary authorities, who played a pivotal role in regulating land use and resource allocation based on traditional practices and norms. However, the advent of the dam has transformed the locality's land and social relations.

3.1.2. The Construction of the Dam: Competition and Greed for Land (Hosts and Resettlers)

The hydroelectric dam project relocated villages, causing land sharing and competition between hosts and re-settlers. As the population increases, the demand for arable land also increases, leading to increased competition and conflict over resources. The interview with a village councillor from a resettled village, S.K., is quite edifying:

Initially, we were able to cultivate a small plot of land to feed our families, but with the demographic dynamic, we are obliged to clear other areas, and that is where the problem lies. The resettlement project has allocated us the land that belongs to our host villages, where the confusion arises. The host village does not recognise this project allocation.

Given the demographic dynamic, the displaced villages are expanding their agricultural areas, which are bound to create misunderstandings between the natives and the displaced. The dam authorities' lack of foresight and planning significantly restricted the displaced villages' ability to manage their land holdings. Another factor was the lack of consultation and negotiation with the host villages, which did not involve the displaced people to any great extent. As a result, the local people question the decisions of the dam authorities, and the displaced people are obliged to make requests to the hosts, who may or may not approve.

The local authorities' lack of experience in resettling people, combined with a lack of environmental and social impact studies, hindered the resettlement project. The dam led to social reorganisation and territorial reconfiguration, improving the area and attracting new populations for work and land-seeking. The testimony of this Manantali notable is illustrative:

The resettlement has led to a land problem; this can be explained, on the one hand, by the arrival of more than 30 villages downstream from the dam and, on the other, by the massive influx of foreigners to work on the dam site. These two factors are at the root of the land's greed.

The influx of migratory flows from various backgrounds, driven by employment and work opportunities, has exacerbated the competition for land. The disregard for these factors during the planning process has led to land saturation and misunderstandings regarding land among the different stakeholders (displaced persons, indigenous people, non-indigenous people and local elected representatives) in the socio-land arena³. Other groups, such as dam project workers, who were not previously interested, are also keen to farm the land. As the head of a family, D.D. stated: *"There's no more unused land; the whole area is occupied. Recently, a new and worrying phenomenon has appeared. The hydroelectric power station project managers are taking over the local people's land."* Added to this is the arrival of agricultural migrants heading for the locality. There are also negative effects of climate change, which contribute to the degradation of natural resources.

Faced with this scarcity of land, farmers are adopting other survival strategies. These include extending new farming areas or creating farming hamlets, as explained in this interview with the Mayor of the rural commune of Diokéli: *"Nowadays, it is a different reality; the area is overpopulated, and in my commune, there are no longer any villages that do not have a farming*

³ The notion of the arena as a place 'where heterogeneous strategic groups clash, driven by interests (material or symbolic) that are more or less compatible' [Olivier De Sardan, 1993: 13].

Jean-Pierre Chauveau defines the arena as one in which different players confront each other over a given issue, with a shared set of rules and stratagems. It can be a domestic arena, a social unit, a village arena, or an administratively defined physical unit [see Chauveau, 1994].

Socio-land arena: the place of confrontation where players negotiate over natural resources, particularly agricultural land.

hamlet because of a lack of arable land. The allocated land is insufficient and cannot sustain the current population.” The people interviewed highlighted land insufficiency to meet the growing agricultural demands. With this in mind, creating hamlets by resettled villages and foreigners appears to be an alternative.

The population is divided over the resettlement process, with host villages arguing it's disorderly and causes environmental harm, while resettled villages view it as a solution to the farmland shortage. Displaced residents face expropriation, abandonment of heritage, forced relocation, and land resource disadvantages.

3.1.3. Types of Land Transactions

Local leaders control access to natural resources, affecting resettled individuals and their land transactions. The complex interconnection of land resources has led to diverse land transactions, including loans, rentals, and sharecropping arrangements, which can have lasting impacts on future generations. The perspective of this local resident of Manantali is particularly illustrative:

On the left bank of the river, there is an irrigated area; all land transactions are carried out in this area, except sales. There are various options, including rentals, loans, sharecropping, and more. This perimeter belongs to the state, meaning there is no land sale, but all other transaction forms are practised there.

Therefore, developed land is highly sought after due to its controlled system and guaranteed agricultural yields. The first beneficiaries are seizing this opportunity to subcontract their plots. This rental is one of the challenges facing irrigated areas.

In addition, commercial land transactions have developed in relatively urbanised areas such as Manantali. This results in various speculations on land, including plots designated for housing. According to one observer, the land is sold for between 400,000 and 500,000 CFA⁴ francs in Manantali. However, loans are still the most common transaction in the villages. This can be backed up by the words of this notable B.D.: *“Land sales are rare. The land belongs to God, but people use it to make a profit, so it shouldn't be sold. The loan system exists and is very common”*. In the African conception, land is sacred, indivisible, and a source of nourishment. Their ancestors bequeathed the land to ensure their subsistence, and they were obliged to pass it on to posterity. These values guide Africans, but they are beginning to be blunted by social change and the capitalist vision that now takes precedence over all other considerations. The words of this notable person from Sobela, a host village, are quite enlightening: *“We only know about the land loan system; other types of transactions have not yet emerged in this village. The loan is made without consideration, but the owners can reclaim their plot at any time. When they take it back, the problem most often arises.”* But behind this loan lie other realities. Firstly, it establishes a relationship of allegiance and recognition on the applicant's part, especially if he or she is a foreigner. In addition to the traditional formalities (such as cola, etc.), some owners are demanding more and more money. As a result, the loan becomes a disguised commercial land transaction. This method of accessing land also contributes to the deterioration of relations: the longer it lasts, the more the lenders tend to appropriate it, and any withdrawals, for whatever reason, create frustration. Finally, the loan makes the lenders feel insecure about the land and prevents them from investing.

3.1.4. Land Relationships

⁴ CFA is the name of the currency used by the fourteen African countries that make up part of the franc zone.

Some relationships have developed around the land. Initially, the interactions between the displaced and host villages were characterised by cooperation and support. Today, however, a conflict exists between the inhabitants of the displaced villages and those of the host villages.

3.1.4.1. At the Start of the Resettlement: Relationships Around the Land

The resettlement process involves significant land and social interactions between displaced and host villages, leading to conflict based on differing perspectives on host-resettled relations.

However, most people surveyed mentioned the absence of land conflicts in the first hours of the operation. Land was not an issue. The institution of guardianship was regulated, with hosts required to offer land as a duty of subsistence and assistance, and strangers owed them recognition and allegiance. Both sides greatly resented the non-observance of these principles. As M.D., a resident of Marena, explained: *“At the start of the resettlement, there were no restrictions on land; you could clear your field wherever you wanted. As far as settling a newcomer in the village was concerned, all you had to do was offer ten kola nuts to the village chief to settle in the village”*. Other speeches are along the same lines: the Mayor of the rural commune of Bamafélé:

At the start of the resettlement, there were no difficulties; this community belongs to the same family; Bafing is a family, you cannot deny yourself land. Initially, there were no problems; the host and resettled villages had good relationships, brotherhood, sharing, and mutual aid.

As for the village chief of Soukoutali, a resettled village:

There was no land problem at the start, and the marriage links helped to consolidate our relations, especially between this village and the village of Dambélé. However, the resettlement project did not consider materialising the boundaries between the villages, and that is what lies at the root of most of the disputes these days.

This initial social cohesion can be attributed to the influence of African and Malian traditions, particularly the “*Diatiguiya*”⁵ concept, which emphasises the importance of welcoming outsiders. In the social representations of the local population, welcoming one's neighbour is a moral obligation that cannot be avoided. Especially in the case of these involuntarily displaced people, who were forced to abandon their ancestral lands in the national interest. There is also a sense of belonging to the same territory among both categories of stakeholders.

Another determining factor was the availability of land for household needs. At the time, the area was sparsely populated (less than five inhabitants per km²), and animal pressure was low due to the presence of the tsetse fly (Ficatier & Niasse, 2008). The promises of improved living conditions following the construction of this infrastructure also raised the hopes of the displaced people and their hosts. The dam's construction was anticipated to create new economic opportunities, improve living conditions, and lift the area out of poverty. It is clear from the various statements made by the interviewees that land relations were based on harmony, concord, solidarity, etc.

On the other hand, other players point out that the situation was already tense between certain host villages and those that had resettled from the start of the settlement. Some host villages were reluctant to cohabit with other populations. As one notable person from Haradala, a host village, remarked:

Our relations, from the time of resettlement to the present day, have always been conflictual because we were displaced from our ancestral land. This resettlement created nothing but desolation, and now we share our land with more than five resettled villages, so conflicts are inevitable.

⁵ Diatiguiya is hospitality, a form of charity practised by receiving and/or housing a newcomer.

Host villages viewed land sharing as an intrusion due to concerns over resource ownership and territorial boundaries. Dissatisfaction with the burden of hosting multiple displaced villages led to strained relationships and conflicts over resource allocation. Malinké villages refused to leave their cultural area, escalating tensions.

3.1.4.2. Current Land Disputes and Conflicts

Nowadays, relations between the various players in the land and social arena are marked by tensions and conflicts over land, according to the people interviewed. Several factors were cited to explain this state of affairs. Demographic growth is a major contributor to this social unrest. The area is also attracting migrants in search of land and employment opportunities, all of which adds to the pressure on resources. The words of a notable from Kéniékéniédala, a host village, speak volumes about the current situation: *“It is population growth that's at the root of the problem. Since 1986, the last villages were resettled, the population has multiplied by seven or even eight, and several generations have been born. The plots allocated are no longer sufficient.”* Demographic dynamics and land pressure cause conflict between host and resettled villages. Hosts perceive displaced people as invaders, causing social discord and misfortune, while displaced people regret their relocation, highlighting the need for discourse to legitimise their positions.

The growing population and competition for agricultural land are escalating tensions between displaced and host communities, causing social unrest and misunderstandings over land access, geographical boundaries, and social cohesion. The testimony of H.D., an octogenarian from a resettled village of Bamafélé, is particularly illustrative: *“These age-old ties are suffering at the moment. The land has become the object of conflict. Distrust has taken root within communities. Can you ask for the hand of the daughter of a neighbour with whom you were in court? I don't think that's possible”*. Conflicts between displaced communities and host villages can have profound social implications, affecting relationships, marriage ties, and social cohesion. Social reorganisation, migratory flows, and grazing areas can further exacerbate these issues. Displaced communities become strangers, deprived of natural resource governance, and conflict arises due to encroaching animals and herds, ultimately compromising peace between cultural brothers.

The deteriorating relations between host villages and displaced populations are characterised by feelings of betrayal, expropriation, and hostility, often pointing blame at the country's authorities, and highlighting the exploitation of natural resources.

3.2. Impact of Climate Change and Adaptive Strategies

The displacement of populations following the construction of the Manantali dam has led to a growing need for natural resources. This can be explained by the high concentration of the population at the new site, where both the host villages and the displaced villages live together. Faced with this situation, the population employs various strategies to meet the need for natural resources, including the creation of farming hamlets, crop rotation, use of organic manure, migration, and socio-professional retraining.

3.2.1. Host Communities' Strategies

The host villages, which were engaged in farming, livestock rearing, fishing, and gathering food, faced restrictions due to the dam, resulting in significant changes to their daily activities and social interactions, and necessitating the development of new survival strategies.

Establishing farming hamlets is one tactic the host villages frequently use. These words of this wise man are very alarming in the situation prevailing in these localities, G.D.:

We are witnessing the depletion of certain natural resources, such as honey and shea butter. As for firewood and arable land, we are forced to travel a great distance from the villages. This is also why some farmers have moved to the farming hamlets, far from the villages.

Also, in the words of M.K. of Haradala, “*The only strategy we have at the moment is to create farming hamlets, and even that is complicated. You must travel 30 or even 50 kilometres from here to create a hamlet. It is a real ordeal to produce and transport food to very remote and isolated areas.*” Farming hamlets are emerging due to overpopulation, land scarcity, and the desire for land by agricultural migrants and pastoralists. These hamlets are situated in mountainous areas, making them ideal for farming and livestock rearing. Due to limited arable land, hamlets have become crucial spaces for indigenous and displaced populations to coexist and adapt to the new environment. Organic manure is increasingly used to fertilise over-exploited areas, as it enhances soil fertility and prevents degradation, benefiting the soil. According to M.K. of Kéniékéniédala, “*We use organic fertiliser to fertilise over-exploited areas because, without organic fertiliser, it is difficult to produce good yields.*” The use of organic fertilisers is also part of an economic rationale to increase agricultural production. This is a significant issue in rural areas that rely exclusively on agricultural income. The accessibility of regional products and the prohibitive price of chemical fertilisers, which are out of reach for most people, facilitate the use of organic fertiliser.

The state, through the Integrated Rural Development Project, has created a perimeter on the left bank of the Bafing River to mitigate the negative effects of dam construction, but its poor quality and distance from villages have not generated enthusiasm among farmers. The head of the village of Sobela, M.D., said: “*In addition to the other strategies, we use the perimeter; we have small plots that allow us to grow market gardening as an off-season crop. But very few people choose this strategy because the plots are poorly developed and the water drainage system is inadequate.*” The irrigated perimeter suffers from technical problems that discourage farmers, leading some to abandon it.

The dam's construction has led to a shift in the population, primarily engaged in agriculture, to new occupations such as commerce, carpentry, masonry, and mechanics, as well as a rural exodus. The lack of consultation with beneficiaries has caused farmers to shun the area, resulting in costs and redevelopment. Young people actively participate in these new activities, preferring modern occupations to meet their needs.

3.2.2. Resettled Communities' Strategies

Resettled villages face similar challenges to those of host villages, with populations divided between two sites. The first group is downstream of a dam, while the second is upstream. They face resource scarcity, particularly in terms of land. Despite prioritising resettlement and infrastructure, these villages have implemented strategies to address resource demands. Like the populations of the host villages, the displaced also opted to create farming hamlets. From the perspective of B.D., a notable resident of Farabanding:

Generally, those who want to practice breeding are forced to settle in farming hamlets due to a lack of space for grazing. This is the only alternative; otherwise, we have no other solutions. Currently, all those who wish to practice livestock breeding and agriculture simultaneously are forced to relocate from villages to avoid conflicts. Furthermore, these producers consistently achieve good harvests.

Displaced populations face challenges in rebuilding their hamlets, with some returning to their original sites and others relocating to uninhabited areas, such as the Boya Forest. This creates environmental and socio-land tensions, as natives do not appreciate the new system and require consent for any initiative.

However, this is not often the case among the displaced. Some hamlets are created without the consent of the host villages, which deteriorates relations between hosts and displaced people. In addition to this strategy, a significant part of the population migrates. Poor rainfall, insufficient agricultural land, and other factors led to the massive departure of these populations, particularly young people, towards gold panning areas. The destinations include the gold mines in Kenieba, Kangaba, Sikasso, and other locations. As this village councillor, F.K. from Farabanding, explained:

More and more young people are migrating; it is an alternative for them, especially the gold panning areas that are their destination. [...]. Gold panning attracts an increasing number of young people; generally, the latter come to help during the lean periods. Young people abandon agriculture in favour of gold panning and migration.

Gold panning in Africa offers young people opportunities for investment and family support. Some go to large cities, while others migrate to neighbouring countries or Europe. Non-agricultural income opportunities remain popular. Overcrowding has led to overexploitation of land, forcing farmers to use chemical fertilisers. However, due to high costs, many individuals opt for alternative fertilisers.

The data show that host populations and displaced ones employ various strategies to manage their natural resource needs, including hamlets, organic fertilisers, gold panning, and migration, with strategies varying based on generation, with older persons often maintaining agricultural activities.

3.1. Effectiveness of Conflict Resolution Mechanisms

Village displacement leads to land shortages and population growth, causing conflicts and land boundary disputes. Traditional customs and statutory law are relevant, with traditional chiefdoms overseeing fair land distribution. The administration, including decentralised services, resolves disputes and ensures equitable land allocation among residents. As the sub-prefect of Bamafélé testified:

If there is a conflict, whatever its nature, most often the communities themselves always seek to find common ground; this is when they are unable to agree. Here, they are resorting to administrative authorities, such as the mayor, the prefect, and the sub-prefect, etc. We work together, and then we always manage to find a solution.

Various authorities, such as the traditional chiefdom represented by the village chief and advisors, the municipal authority, and decentralised state services, play crucial roles in mediating land conflicts. Two distinct levels are involved in managing land conflicts: the community body, responsible for local governance, and the decentralised and/or deconcentrated authorities, which oversee administrative functions. Traditional chiefdoms and decentralised services are used to manage land conflicts, leading communities to seek conflict resolution organisations, such as mediation centres and legal services. The dam's impact on social standards led to distrust and communication breakdowns between displaced and host communities. This intensified mutual distrust, exacerbating tensions and the situation.

3.1.1. Endogenous Conflict Resolution Methods

Communities are linked by centuries-old ties (kinship, intermarriage, mutual economic assistance, and various exchanges). Land management is closely connected to the

organisational system, and land, the most valuable production factor, summarises the tensions among various stakeholders in the socio-land arena (Chauveau & Jacob, 2006). The land chiefs ensure its management; the latter, as the primary leaders, are responsible for sharing the land between the different heads of families. Traditional land management rules do not confer ownership rights to non-indigenous individuals but only rights to utilise the land.

On the other hand, the concept of ownership applies entirely to the planted tree, which is admitted to the list of assets that can be bequeathed. Thus, tree planting is seen as a means of appropriating land. Traditional authorities are reluctant to practice this activity on plots lent to newcomers. According to customary law principles, the traditional body for managing land conflicts consists of the landowners and the village council institution. Their decisions apply to the entire area under their land control. Decisions are usually reached in the vestibules, and once made, they are often considered final without the option for appeal. As reported by M.D., the village chief of Sobela:

Problems related to land management are often intertwined with family issues. If a family has a problem, they should discuss it and work together to find a solution. Someone with whom you have a marriage bond and who is opposed to the management of a plot of land, do you think you will have the courage to summon them to court?

Existing links are highlighted to prevent and/or manage most land conflicts; they are factors of peace and stability. However, it must be recognised that with the changes, the massive arrival of indigenous people, and the multiplication of companies and projects linked to the dam, traditional authority is increasingly being called into question. As this village chief said: *“Land conflicts are beyond the competence of the traditional chieftaincy. The State has put us in this mess, so it is the only one that can find solutions. A village chief cannot resolve this type of problem. Endogenous methods were only valid before the advent of the dam.”* As noted by A.B., the sub-prefect of Bamafélé:

Currently, the vestibules are no longer sufficient, because the people who visit them do not even believe in them. That is the problem; the population itself sometimes criticises village chiefs. With the advent of democracy, there is no longer any respect; village chiefs are no longer held in high regard.

The traditional leadership is weakening due to the social and political changes occurring in this context. The area has experienced a significant influx of migratory flows and the displacement of individuals against their will, leading to complex social dynamics. The presence of various norms and reasoning will impact all traditional social institutions. Furthermore, the current “democratic” political environment has affected traditional societies, contributing to the decline of local authorities in this region. The use of courts to resolve conflicts has emerged. However, endogenous mechanisms are still used despite their weakening.

3.1.2. Formal Conflict Resolution Approach

Formal legal systems are increasingly recognised as valuable for conflict resolution in communities. Modern authorities enforce these systems, which become ingrained in customs. Failure to comply with native suggestions, such as preserving grazing areas and land reserves, leads to land conflicts, with local government often acting as the first mediator.

Local governments often collaborate with sub-prefects or prefects to address land conflicts, but frequently fail to address genuine concerns, resulting in contestation and short-lived solutions. As a result, the actors are turning to the courts; the Bafoulabé Court and the Kayes Appeal Court are the most frequently cited. The persistent tensions between the original and resettled villages significantly influence the decision-making process. A notable individual from Haradala M.K. expressed this sentiment directly:

I do not even want to comment on this point! We are used to enduring 3 years of lawsuits and shuttling between Bamafélé, the sub-prefecture, and Bafoulabé, the capital of the circle. From resettlement to the present, we have been involved in more than 10 lawsuits. I do not want to comment on this subject.

The complexity of legal procedures and the distance from main towns often lead to conflicting parties resigning, complicating land management and relations between the original and resettled villages.

4. Discussion

The results of this study highlight the significant socio-economic and environmental impacts of the Manantali dam's construction, particularly the intensification of land conflicts resulting from resettlement and demographic pressures in the Manantali dam area. Applying Cernea's IRR model, the analysis reveals how risks such as landlessness, social disarticulation, and marginalisation lead to tensions between host and resettled communities, which is consistent with and extends previous research on development-induced displacement.

4.1. Land-Related Conflicts and the IRR Model

The results confirm that the resettlement of forty-four villages following the construction of the Manantali dam significantly increased land pressure in the host areas, aligning with Téné et al. (2019), who document similar dynamics in the resettlement of the Kossou dam in Côte d'Ivoire, where arable land scarcity intensified due to the influx of displaced populations. Cernea's IRR model highlights that a lack of land is a significant problem, and this study shows that giving too little farmland to displaced families, along with a fast-growing population (from 10,959 in 1987 to over 40,000 by 2022; INSTAT, 1987, 2022), has caused intense competition for available farmland. This finding corroborates Cernea's (1990) observation that resettlement often leads to overpopulation and insufficient availability of resources, which undermines agricultural productivity. Similarly, Egbenta & Falana (2020) noted that the insufficient compensation in the Apo resettlement programme in Nigeria failed to address land scarcity, a pattern mirrored in the case of Manantali, where resettlement planning was not subject to sufficient consultation with host communities, thereby exacerbating conflicts over land allocation.

The study's findings also reflect Hitchcock's (2015) analysis of the Lesotho Highlands Water Project, where dam construction has depleted grazing and arable land, intensifying resource conflicts. In the Manantali context, lack of foresight in addressing the land needs of displaced and host populations, compounded by the arrival of agricultural migrants and dam workers, has led to land saturation. This ties in with Cernea's (1998) emphasis on landlessness as a driver of impoverishment, as displaced communities struggle to gain sustainable access to land, while host communities perceive their resources as encroached upon, fostering social discord.

4.1.1. Social Disarticulation and Hosts-Resettlers Dynamics

Cernea's IRR model identifies social disarticulation as a key risk, characterised by the breakdown of community cohesion and social networks. The study's results illustrate this phenomenon by the deterioration in the initial cooperative relationships between the host and resettled villages. The interviews reveal that the early days of resettlement were marked by harmony, supported by customary norms and abundant land, as noted by the mayor of Diokéli. However, population growth and resource scarcity have strained these ties, leading to mistrust and conflict over land boundaries and access to resources. These findings align with those of

Kodjo et al. (2019), who describe how land conflicts in Fengolo, Côte d'Ivoire, have exacerbated social divides due to competing claims over resources. The Manantali case further highlights how cultural differences and perceived inequalities in land allocation, such as host villages viewing displaced populations as "invaders", deepened social disarticulation, echoing Cernea's (1990) argument that host communities often face increased pressure on resources, leading to tensions.

The shift from cooperative to conflictual dynamics is also evident in the erosion of traditional governance systems. Chauveau & Jacob (2006) noted that customary land management is often undermined by modern legal frameworks, and this study found that the authority of traditional leaders, such as village chiefs, has weakened due to democratic changes and the influx of external actors. Such an evolution has led to a crisis of legitimacy, as highlighted by the sub-prefect of Bamafélé, who noted a decline in respect for traditional authorities. The use of official legal systems, such as the courts in Bafoulabé and Kayes, emphasises this issue, supporting Lombard and Rakodi's (2016) point that gaps in regulations in southern countries exacerbate land disputes, often requiring formal assistance.

4.1.2. Marginalisation and Land Transactions

The study reveals a complex network of land transactions, encompassing loans, leases, and sharecropping, that reflects the marginalisation of resettled populations, a key risk identified in Cernea's IRR model. These informal transactions, described by an inhabitant of Manantali, offer no long-term security to displaced farmers, whose access to land is precarious. This observation aligns with the findings of Lassailly-Jacob (1983) on the Kossou dam, where the absence of legal mechanisms for land acquisition rendered resettled farmers vulnerable. Mathieu's (1996) analysis of African land relations follows the same lines, emphasising that informal transactions often mask power dynamics and foster insecurity. In Manantali, the trend towards commercial transactions, such as leasing land in urbanised areas, reflects a commodification of land driven by scarcity, further marginalising displaced populations without formal land rights. This commodification exacerbates tensions, as host communities reclaim land on loan, leading to disputes and a sense of insecurity among resettled people, as the interviews showed.

4.2. Climate Change and Adaptive Strategies

A novel contribution of this study is its examination of how climate change exacerbates land pressure and shapes coping strategies, thereby filling a gap in previous Manantali studies (Koenig, 2023; Horowitz et al., 2019). Results reveal that erratic rainfall and land degradation have intensified resource scarcity, aligning with Cernea's (1998) assessment of the risk of food insecurity. Communities have responded by adopting agroecological strategies, such as organic fertilisers and agricultural hamlets, to cope with the overexploitation of the soil. This observation aligns with the findings of Vermeulen & Carrière (2001) on the Badjoué in Cameroon, where customary practices and community involvement have led to improved resource management. Similarly, Ayena et al. (2017) document the use of Benin's organic fertilisers and off-season crops to combat soil degradation. However, the Manantali study highlights a critical challenge: the creation of agricultural hamlets is often done without the consent of the host community, further fuelling conflict, as noted by a notable from Farabanding. This comment underlines Cernea's (1998) warning that poorly managed resettlement can exacerbate environmental and social risks.

4.3. Effectiveness of Conflict Resolution Mechanisms

Analysis of conflict resolution mechanisms reveals a tension between traditional and formal systems, reflecting Cernea's (1998) emphasis on rebuilding to mitigate the risks of impoverishment. Traditional mechanisms, rooted in customary norms and arbitrated by village chiefs, were initially effective because of the strength of social ties and low land pressure. However, their effectiveness has weakened as population growth and external influences have challenged their legitimacy, as the sub-prefect of Bamafélé has pointed out. The increasing use of formal legal systems, such as courts, is consistent with Duke's (2004) observation that land disputes often involve conflicting institutional frameworks. However, one notable from Haradala pointed out that the complexity and inaccessibility of legal processes often lead to unresolved disputes, perpetuating marginalisation and social disarticulation.

The findings suggest that participatory governance frameworks are necessary to address these governance failures, aligning with Cernea's (1998) call for reconstruction through inclusive policies. The lack of consultation during the Manantali resettlement, noted in interviews, mirrors Biswas' (2011) critique of large dam projects that neglect stakeholder engagement. Integrating customary and formal systems, as proposed by Chauveau & Jacob (2006), could enhance conflict resolution by leveraging local knowledge while ensuring fair legal protections.

4.4. Policy Implications

The results emphasize the need for policies addressing Cernea's (1998) risks of impoverishment through sustainable land governance and community-led adaptation. Firstly, formalising land ownership for resettled populations could mitigate landlessness and marginalisation, as informal transactions exacerbate insecurity. Secondly, integrating strategies for adapting to climate change, such as state-supported agro-ecological programmes, could alleviate land pressure and enhance food security. Thirdly, strengthening hybrid governance models that combine traditional and formal mechanisms could improve conflict resolution, ensuring inclusiveness and legitimacy. These recommendations align with Scudder's (2019) call for long-term planning to ensure sustainable livelihoods after resettlement.

In summary, the application of the IRR model in this study highlights how landlessness, social disarticulation, and marginalisation fuel land conflicts in the Manantali area, which are exacerbated by climate change and governance failures. By combining these findings with strategies to adapt and involve the community in decision-making, the study offers a way to manage resources sustainably, contributing to the broader conversation about displacement caused by development.

Conclusion

This study demonstrates that the construction of the Manantali Dam has significantly altered the socio-economic and environmental landscape of the Kayes region, contributing to ongoing land conflicts influenced by population growth, resource scarcity, and challenges in resettlement planning. Through the application of Cernea's IRR model, the findings illustrate how risks such as landlessness, social disintegration, and marginalisation have heightened tensions between host and resettled communities, particularly in the context of limited arable land and inadequate initial consultations with stakeholders (Cernea, 1998). The population increase (from 10,959 in 1987 to over 40,000 by 2022; INSTAT, 1987, 2022) and the arrival of

agricultural migrants have added pressure on available resources, fostering competition and feelings of expropriation and betrayal among displaced populations, as captured in the interview data.

The research also reveals the role of climate change in intensifying resource scarcity, with erratic rainfall and land degradation prompting adaptive strategies, such as the use of organic fertilisers and the establishment of farming hamlets. While these approaches show potential for enhancing soil fertility and agricultural output, their implementation without prior agreement from host communities has led to additional disputes, underscoring the importance of better coordination in resource management. The observed shift from traditional governance mechanisms, such as village councils, toward formal legal systems like the Bafoulabé and Kayes courts reflects evolving societal dynamics. However, the data suggest that the inaccessibility and procedural complexity of these formal systems can prolong disputes, contributing to ongoing marginalisation (Chauveau & Jacob, 2006).

Based on the study's qualitative insights from interviews and observations, potential avenues for addressing these challenges include exploring ways to formalise land tenure for resettled populations, supporting community-based agroecological initiatives to build resilience against climate variability, and considering hybrid models that blend traditional and formal mechanisms for more inclusive conflict resolution. These suggestions, aligned with Cernea's (1998) focus on reconstruction to mitigate impoverishment risks, may help promote equitable resource use and social cohesion; however, their effectiveness would require further evaluation in practice.

The findings highlight persistent issues, including climate change, agricultural migration, and land degradation, illustrating the importance of ongoing attention to these dynamics. Future research could investigate the long-term effects of climate change on land use patterns and assess participatory approaches in similar resettlement contexts. By emphasising local community involvement in decision-making, as noted by interviewees, this study offers perspectives on fostering context-specific solutions that support the needs of both host and resettled populations, contributing to the discourse on development-induced displacement in Mali and comparable settings.

Funding

The authors declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable data included in this article.

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