

# Analysis of the Socio-Economic and Environmental Effects of Population Resettlement: The Case of the Langu de Barbarie Disaster Victims Resettled in Diougop as Part of the Saint-Louis Emergency Recovery and Resilience Project (Senegal)

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## Abstract

Between 2017 and 2018, violent swells hit the commune of Saint-Louis, causing significant damage in coastal neighbourhoods such as Guet Ndar, Goxu Mbacc and Ndar Toute. Faced with this situation, the authorities identified the populations exposed to coastal risks along a corridor 20 metres wide and 3.5 kilometres long. To respond to the emergency and strengthen the resilience of the people living there, the Senegalese government set up the Saint-Louis Emergency Recovery and Resilience Project, the flagship action of which is the permanent rehousing of the people affected by the Langu de Barbarie in Diougop. These people traditionally lived by the sea, practising activities such as fishing, fish processing and seafood trade. The study presented here sets out to assess the socio-economic and environmental effects of this relocation. Using a mixed methodology, a number of significant results were highlighted. Firstly, the relocation did not disrupt working habits: 89% of those relocated to Diougop are still involved in fishing, despite the distance from the sea and the associated transport costs. What's more, these people, who used to live in precarious areas characterised by disorganised urbanisation, now have decent housing and access to basic services. 84% of the households surveyed said that their living conditions had improved.

## Keywords

Saint-Louis, Langu de Barbarie, Population Relocation, Business Conversion

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## 1. Introduction

According to the Intergovernmental Panel on Climate Change, one billion people could be living in coastal areas at risk by 2050 [1].

In Senegal, the retreat of the coastline due to coastal erosion and the advance of the sea is averaging 0.5 m per year, according to the Department of the Environment and Classified Establishments [2].

In Saint-Louis, the northern part of the Langue de Barbarie, which includes the districts of Ndar, Guet Ndar and Goxu Mbacc, is directly threatened by coastal erosion and marine submersion. In this part of the city, this phenomenon has increased with the opening of the breach, the aim of which was to combat the floods of 2003 by draining rainwater into the sea during periods of high water. Today, the extension of the breach, combined with the consequences of climate change, such as rising sea levels, is causing numerous disturbances, affecting both the natural environment (degradation of biodiversity) and human communities (destruction of housing). The national integrated coastal management strategy has been implemented to protect Senegal's coastal zones, which make a major contribution to the country's economy (fishing, tourism, maritime transport, etc.). This strategy involves projects to mitigate and adapt to the effects of climate change. The aim of these projects is to protect populations exposed to climate hazards and to build resilience in highly vulnerable coastal areas. Mild methods (construction of sandbars, planting of filaos, regeneration of mangroves, etc.) to restore and preserve biodiversity were sometimes recommended as solutions. However, given the extent of erosion exacerbated by climate change, hard methods (construction of dykes, breakwaters, etc.) were unavoidable options for protecting certain coastal areas.

In the city of Saint-Louis, a gradual strategic retreat of the populations of the Langue de Barbie exposed to the risks had been recommended by the Egis/World Bank study since 2013. The village of Doun Baba Dièye has lost around 200 m in width as the sea has advanced. In 2014, the village was abandoned, because it had been swallowed up by the waters.

Between 2017 and 2018, strong storms and swells affected populations and socio-economic activities in the Langue de Barbarie. These high levels of vulnerability require immediate intervention to protect the population from the effects of frequent swells and violent storms and to resettle them in a safe area [3]. Accordingly, the State of Senegal and the International Development Association (IDA) signed a financing agreement for the implementation of the Saint-Louis Emergency Recovery and Resilience Project (SERRP), at a total cost of thirty-five (35) million dollars for a period of five (05) years (2018-2023) [4]. The SERRP came into force in September 2018 with the technical and financial support of the World Bank.

The objective of the SERRP is to reduce the vulnerability to coastal risks of populations settled on the Langue de Barbarie and to strengthen urban and coastal resilience planning in the city of Saint-Louis [3]. The challenges and strategies for resettling populations within the framework of this project merit particular anal-

ysis, taking into account the response it is attempting to provide in the face of the harmful effects of climate change in this coastal zone. The SERRP has also contributed to strengthening urban resilience planning in Saint-Louis, which was designated a UNESCO World Heritage Site in 2000 and remains highly vulnerable to climate change, according to the climate resilience plan for the Saint-Louis urban area drawn up as part of the implementation of the SERRP [5].

For an effective and sustainable response, the authorities have opted for “hard” solutions, which consist of reclassifying the 20-metre strip of right-of-way 3.5 kilometres long located in the Langue de Barbarie. In 2019, a resettlement action plan has been drawn up to relocate people and activities located on this 20-metre strip. The affected populations were relocated to Camp Gazeille, Khar Yalla and host families, then to the temporary relocation site before being permanently relocated to Diougop.

It is of major importance to study the relocation of populations, mainly made up of fishermen, from the Langue de Barbarie<sup>1</sup> to a site on the mainland. Such a transfer is bound to have repercussions, both socially and economically, and on the environment of the new host site. In this context, it seems appropriate to analyse the socio-economic and environmental effects of relocating the disaster victims to the final relocation site of Diougop.

The commune of Gandon is located in the north-west of Senegal in the Saint-Louis region. It is part of the arrondissement of Rao in the department of Saint-Louis. Geographically, Gandon is bounded to the east by the commune of Fass Ngom, to the west by those of Ndiébène Gandiole and Saint-Louis, to the north by Diama, to the north-east by Ngnith, and to the south by the communes of Léona and Sakal. **Figure 1** shows the geographical location of Gandon.

## 2. Methodology

In the present study, the methodological work includes the following stages: documentary research; data collection; processing, analysis and interpretation of the results. For the modes of investigation, the mixed approach was adopted. This so-called mixed approach is a combination of quantitative and qualitative methods.

### 2.1. Documentary Research

As part of this study, various documents were consulted, including books, theses, dissertations, scientific articles and technical reports relating to the SERRP project. This documentary research made it possible to strengthen theoretical knowledge on the issue of population resettlement, to structure the interview guides intended for the project’s stakeholders, and to gather relevant field data.

### 2.2. Field Phase

The fieldwork phase is an essential part of this study. Its aim is to gather empirical

<sup>1</sup>The Langue de Barbarie is a strip of sandy land located between the Atlantic Ocean and the mouth of the Senegal River in the Saint-Louis region. It was a single strip of sand dozens of kilometres long, stretching from the south of the town of Saint-Louis to the mouth of the Senegal River.

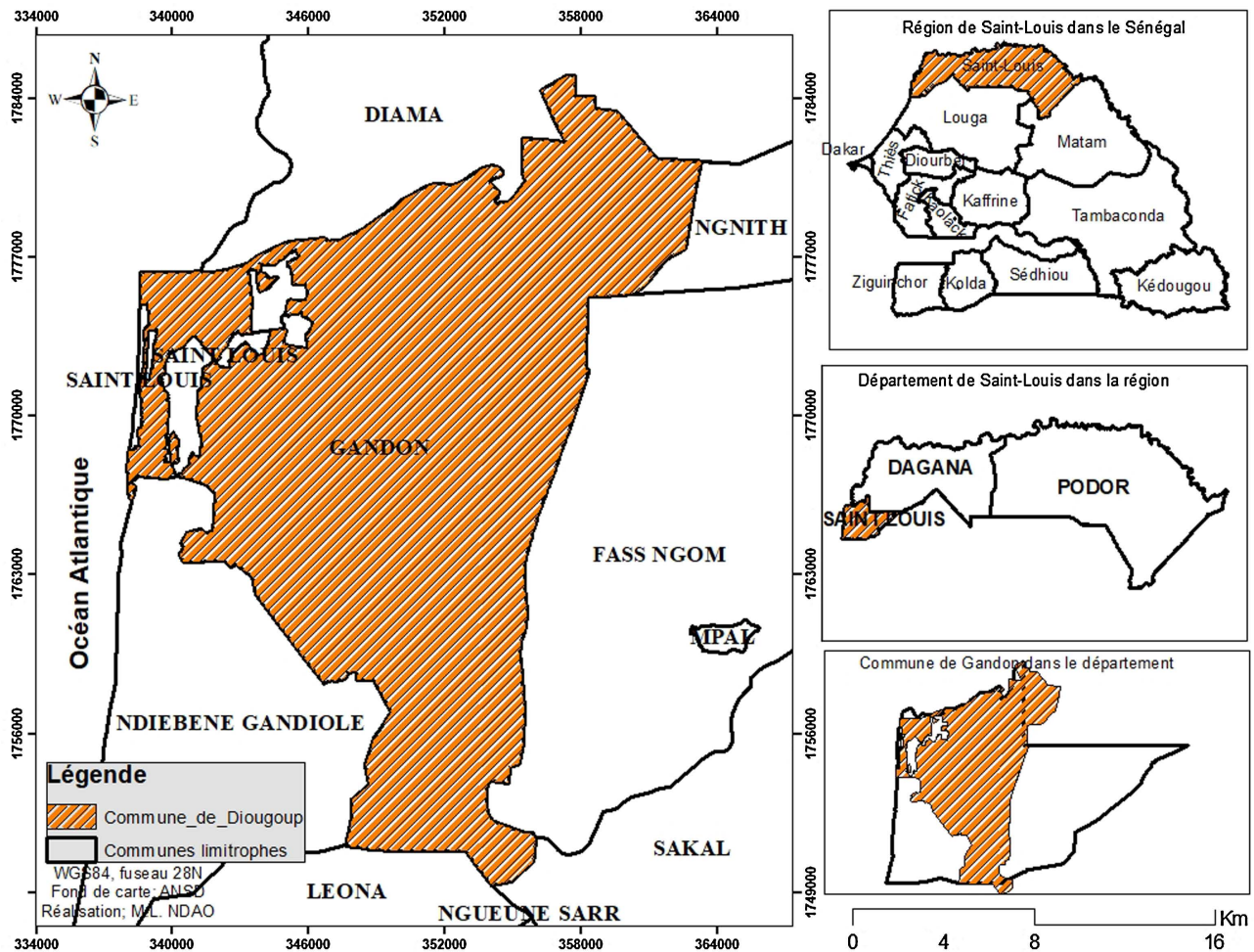


Figure 1. Location map of Gandon.

data from the stakeholders involved in order to gain a better understanding of the local dynamics associated with the resettlement of populations under the SERRP project.

### 2.2.1. Census

This study focuses on the people affected by the Barbary Tongue disaster who have been permanently rehoused in the Diougop rehousing site following the devastating effects of the swells and storms that hit this strip in 2017 and 2018. In order to gather information on this population, a census of the disaster-stricken families rehoused in the Diougop site was carried out. The census revealed 115 households rehoused in 86 concessions, with a total population of 1489.

### 2.2.2. Data Collection Tools

Data collection tools are research instruments and techniques in the human and social sciences. Once the mode of investigation has been chosen, the researcher will use these tools according to the research paradigms and objectives he or she wishes to achieve. In our study, we opted for a mixed approach, which justifies the use of quantitative research instruments such as the household questionnaire, and

qualitative research techniques such as interview guides and direct observation.

In this article, the questionnaire was indirectly administered to 115 heads of household who had been permanently relocated to the Diougop resettlement site. The questionnaire, which was designed using KoboToolbox software, was divided into four main parts, focusing on the identification of the population surveyed, their socio-economic activities and income, the improvement in their living conditions and, finally, their assessment of the rehousing. The household surveys were carried out during the day between 10 a.m. and 5 p.m., a good time to hope to meet the heads of household in the concessions.

The interview guide, which is a qualitative data collection tool, was used in this study to obtain additional information about the SERRP project and to reinforce the data collected during the household surveys.

As for direct observation, which according to [6]: “is also the only way of gaining access to certain practices: when these do not come to the awareness of the players, are too difficult to verbalise or, on the contrary, are the subject of pre-constructed discourse (...)”, it was carried out at the same time as data collection and enabled us to see the type of development (grading of networks, size of roads, size of houses), the state of the buildings (housing and social facilities) and the level of degradation of the site’s environment.

### **2.2.3. Data Processing and Analysis**

Bivariate analysis was used in this study. This so-called bivariate analysis makes it possible to examine the relationship between the dependent variable and the independent variable and to determine their relationship. This made it possible to identify cause-and-effect relationships between these two variables in order to verify or refute our research hypotheses. Data processing was carried out using software such as Microsoft world, Excel, ArcGIS, etc.

## **3. Results**

Against a backdrop of increasing vulnerability to climatic hazards, the resettlement of people affected by the devastating swells of 2017-2018 in Saint-Louis raises a number of socio-economic, environmental and urban planning issues, which this study sets out to analyze through the case of the Diougop resettlement site.

### **3.1. Effects of Resettlement on the Activities of Displaced Populations**

Loss of employment and/or restricted access to resources and means of subsistence are among the 8 fundamental risks of impoverishment that can seriously affect displaced communities [7]. In order to analyze the effects of resettlement on the activities and incomes of the people resettled in Diougop, a comparison must be made between the economic activities of the people before and after displacement, and between their incomes before and after displacement.

### 3.1.1. Businesses only Slightly Affected by Relocation

The multi-criteria analysis<sup>2</sup> carried out by the project's social and environmental safeguard experts on the three potential relocation sites revealed that the Diougop site was the best choice for relocating disaster victims and parties affected by the project [3]. Although this choice was guided by the favourable opinion of the local authorities, the availability of a PDU with land reserves, and its proximity to National Road 2, Diougop has a number of constraints, mainly linked to its distance from the Langue de Barbarie. To show the effects of displacement on the economic activities of the displaced populations, we looked at the main activity of the affected populations before and after rehousing in order to conclude whether or not there has been a change of activity.

Fishing and related activities such as fish trade and fish processing remain the main activities of households currently established in Diougop. Fishing was the main activity for 45% of those surveyed, and despite the move, it continues to be the main activity for 43% of households surveyed, with a slight drop of 2%. The same trend was observed among households whose main activity was fish trade. The number of households whose main activity was processing fish products fell from 9.5% before relocation to 6% of households surveyed after relocation, representing a 3% drop in this activity following relocation.

These cases of abandonment of the main activity in favour of other activities can be explained above all by the difficulties experienced by local people in gaining access to the beach, and therefore to fishery resources. Indeed, 87% of households surveyed still work along the beach. For women processors, the reason for giving up is the impossibility of getting to the beach every day because of the distance and the cost of travel. As a result, 6% are now involved in trade, whereas fishmongering was their activity before relocation. Others, around 1%, are employed as cleaning ladies in Diougop and the surrounding area. These data from the household survey show that, despite the relocation to the Diougop site located around 7 km from Saint-Louis, fishing and fishmongering are still the main activities of the affected populations.

### 3.1.2. Significant Reduction in Revenues due to Relocation

Although the relocation did not lead to any major retraining, it did have a profound effect on the incomes of the displaced people in Diougop. Before the relocation, 56.5% of households surveyed said they had a monthly income of between 151,000 and 200,000 FCFA, compared with only 15% after the relocation. Similarly, the proportion of households earning between 201,000 and 250,000 FCFA fell from 25% to 8%. Income in excess of 250,000 FCFA accounted for 8.6% of households before rehousing, compared with just 2.6% today. Conversely, low incomes have risen sharply. Before relocation, only 2.6% of households earned between FCFA 50,000 and FCFA 100,000 a month; after relocation, the figure has risen to 35%, with 6% living on less than FCFA 50,000 a month.

<sup>2</sup>A multi-criteria analysis in a GIS is a spatially referenced modelling based on a methodology that presents a set of solutions enabling data to be integrated and analyzed for decision-making purposes.

This general decline in income is mainly due to a number of constraints linked to the new situation: the distance from the workplace, the increase in transport time and costs, and the abandonment of small ruminant farming, which used to be an additional source of income for many households.

The data collected shows that before the relocation, 93% of respondents walked to work in less than 30 minutes. After the relocation, this time fell to around an hour for three-quarters of those surveyed. For fishmongers, it is necessary to be at the quayside from 5am to get access to the best freshly landed fish. However, this is becoming increasingly difficult, if not impossible, due to the lack of a public transport line serving the new site. They have to walk to the RN2 in the hope of finding a vehicle, often slowed down by numerous stops before reaching the Langue de Barbarie. The fishermen, for their part, used to set out to sea at around 3am before travelling, which is no longer an option today unless they spend the night with relatives or use a taxi. These logistical constraints have led to a significant increase in expenditure, adding to the financial pressure on households.

To be able to leave at the right time of the tide or access the first arrivals of fish for sale, people now have to spend between 2000 and 3000 CFA francs on taxi fares. The abandonment of small ruminant farming has also contributed to the fall in income. According to the people interviewed, the sale of animals was a source of additional income, particularly during the winter months, when fish is often in short supply. Before rehousing, 90% of households said they had enough income to meet their household needs. Today, only 55.6% feel that their resources are barely sufficient.

### **3.2. A Better Quality of Life**

One of the major challenges in a population resettlement operation is to improve the living conditions of the displaced communities so that they can return to a standard of living that is higher than or at least equal to their pre-displacement standard of living. As part of the SERRP, the strategies for improving the living conditions of displaced persons are based on the provision of decent housing, access to networks (water, electricity, sanitation, etc.), basic social services (education, health, community centres, etc.) and the development of a livelihood restoration plan.

Of the 115 households surveyed, 93% lived in houses with slate (89%) or zinc (4%) roofs. 6% of heads of household had a slab, cement or concrete terrace. Only one head of household had an upper floor before being rehoused.

At the Diougop site, all the victims received a ground floor house with a terrace. During our interview with the SERRP social expert, he stated that “the houses delivered to the people affected by the barbarian tongue at the rehousing site are valued at 20,000,000 CFA francs, including at least 5,000,000 for the land and 15,000,000 for the construction. These are quality houses with five (5) rooms, a kitchen block and a toilet block”. Title deeds will be issued at the end of the project. This will enable the beneficiaries to have a title deed and to build on higher

ground if they so wish.

From irregular neighbourhoods to a fully serviced modern housing estate, the resettlement has clearly helped to improve housing for these people.

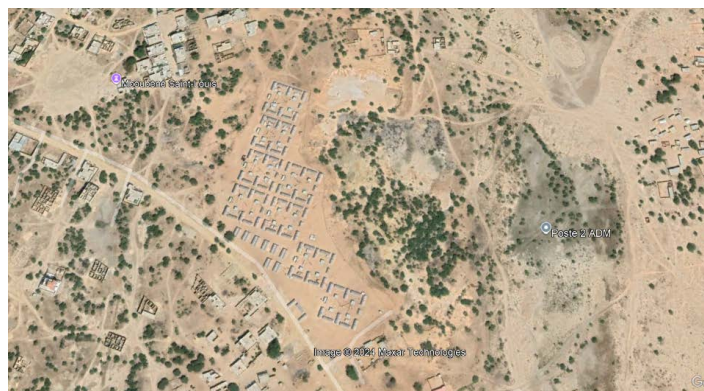
In fact, 84% of the households surveyed felt that their living environment had improved and that the living conditions they found on the Diougop site were better than those they had in their original neighbourhood.

### 3.3. Deterioration of the Site's Immediate Environment Following the Rehousing of Disaster Victims

The development and construction of roads, housing and related infrastructure, and the establishment of industrial units are often a source of environmental damage that can affect both the physical and human environment. In order to avoid or limit the negative impacts of such projects, international financial institutions and the legislation of some governments require an ESIA to be carried out before a programme or project likely to cause environmental damage is implemented. In Senegal, the execution of such projects is subject to obtaining a certificate of environmental compliance. This act may be preceded by an environmental compliance certificate, which is issued provisionally by the department responsible for the environment following validation of the ESIA or Initial Environmental Analyses (AEI).

#### 3.3.1. Fragmentation of the Natural Environment

For the construction of housing for disaster victims and people affected by the emergency recovery and resilience project in Saint-Louis, a rehousing site was set up in the commune of Gandon, at Diougop, 7 km from the city of Saint-Louis. "The development of the site will result in the clearing of certain plant species. Current vegetation on the site is sparse, with a density of less than 30 plants per hectare: *Prosopis juliflora*, *Acacia raddiana*, *Euphorbia balsanifera*, *Balanites aegyptiaca*, *Boscia senegalensis*, *Salvadora persica*, *Ipomea asarifolia*" [4]. A total of 11 ha was cleared during the general earthworks. **Photo 1** & **Photo 2** below show the land cover before and after the development work.



Source: Satellite image Maxar technologies, November 2019.

**Photo 1.** Aerial view of the Diougop site before earthworks.



Source: Airbus satellite, February 2024.

**Photo 2.** Aerial view of the Diougop after general earthworks.

A comparison of these two photos shows that the general earthworks resulted in the felling of many trees. The ESIA stated that: *“The promoter must, in conjunction with the forestry sector manager, carry out an inventory of plant species likely to be felled in order to pay forestry taxes”* [4].

In order to access the inventory, we had a meeting with the head of the water and forestry sector in Saint-Louis. Unfortunately, we did not receive any information about the inventory. He told us that: “I found the project in place because I was posted in 2022. But to this day, I haven’t found any information about either the deforestation plan or the inventory of plant species”. As far as compensatory reforestation is concerned, the sector manager explains that these activities are to be funded by ADM, but so far nothing has been done. An urban reforestation plan for the site has been proposed to the Municipal Development Agency, which has still not signed the protocol for revegetating the site and the roads leading to it. However, the environmental expert and the works manager of SVTP/GC have indicated that a compensatory reforestation plan does exist, but that it has not yet been implemented. Six years after the plant species were felled, no compensatory reforestation activity has yet been initiated, given the surface area that has been cleared. The development work required to resettle people in Diougop has therefore contributed to the loss of plant cover and resulted in the loss of plant species that have not yet been restored.

### 3.3.2. Proliferation of Illegal Dumps

Although the presence of rubbish dumps on the site had already been reported in the ESIA, the resettlement of the population has led to a significant increase in illegal rubbish dumps, particularly in the northern and south-eastern areas of the resettlement site (see **Photo 3**).

The photos show a heavy accumulation of rubbish around the rehousing site. The arrival of new residents has led to an increase in the number of rubbish dumps in the surrounding area. This situation has had repercussions on the activities of local people. Some livestock farmers in the village of Maboye have said that they have had to move their herds to avoid them ingesting plastic waste



Source: Eladia SAMB, September 2024.

**Photo 3.** Rubbish dump near the rehousing site

that is dangerous to their health.

A resident of the village of Maboye told us that: “Since the arrival of the rehoused populations, the number of illegal dumps has multiplied and the quantities of waste have increased considerably”. There is a waste collection system on the site, run by carters who collect the bags left in front of the homes, for a fee of 2,000 CFA francs per household per month. However, there are no plans to recycle or incinerate this waste. As a result, while waste collection is relatively organised within the site, it is non-existent on the outskirts, where unauthorised dumps continue to develop and spread.

#### 4. Discussion

The resettlement of those affected in Diougop has not really led to a change in activities. In fact, the study showed that the displaced populations still keep their main activities, which are fishing and related activities such as fish trade and processing of fish products. Household surveys showed that before the displacement, 96% of respondents worked in the fishing sector. Despite the relocation, fishing remains the sector of activity for 89% of respondents. This situation is more or less uncommon, as relocated populations generally change their main activity. This is the case in the department of Tivaouane, where villages overtaken by the mine are displaced and the people resettled in other localities far from their land of origin. They thus lose their main activity [8]. The new land is often of poorer quality, and economic opportunities in the new resettlement sites may be limited. We can cite the example of the village of Mbar Diop, which was relocated next to the commune of Pire Gourèye because of mining. The inhabitants are often forced to change their sector of activity. The compensation received often enables them to invest in other sectors [8].

Even if the people affected by the Saint-Louis emergency recovery and resilience project who were rehoused in Diougop did not change their activities, it is clear that the distance, the high cost of transport and the time needed to reach their

place of work led to a significant drop in their income. Indeed, 90% of the households surveyed said that their income was sufficient to cover their household needs before rehousing. Now, just over half (55.6%) said that their income was insufficient to meet their needs.

Rehousing policies are often more or less well supervised. According to CER-NEA [7], a responsible policy requires good planning and the targeting of preventive measures, as well as the allocation of sufficient resources and the mobilisation of energies among the displaced population. In Senegal, most rehousing operations have led to an improvement in the living conditions of displaced persons ([9]-[11]). In Keur Massar, as part of the urban restructuring and land regularisation of Pikine irrégulier sud [9], or the resettlement of those affected by the toll motorway in the Apex Tivaouane Peul housing estate ([10] [11]), the resettled populations have found a better living environment. In addition to the much-improved living environment, the people affected have become the rightful owners of the houses they have received, with title deeds. The majority of them were living in precarious conditions with no title or rights. Securing land tenure has been a decisive factor in enabling displaced populations to have full access to land and to be legal holders of housing plots. These results are consistent with what we found in this study, even though the people resettled in Diougop have not yet received their title deeds.

## 5. Conclusions

Resettling people is a complex operation that presents a number of risks. It very often leads to the loss of jobs and homes, as well as the impoverishment of displaced populations. Good planning of population displacement and resettlement is necessary to mitigate the negative effects of resettlement on the communities affected by displacement.

In this study, we analyzed the socio-economic and environmental effects of the resettlement of people affected by the Barbary Tongue disaster in the Diougop relocation site as part of the Saint-Louis emergency recovery and resilience project.

In order to gain a better understanding of this study, we deemed it necessary to collect both qualitative and quantitative data. We therefore carried out an exhaustive census of households that had been permanently rehoused on the Diougop site. This made it possible to obtain information on these targeted populations. The interview guides administered to the project's stakeholders made it possible to obtain information that consolidated our data in addition to the project's technical and administrative documents.

An analysis of the results shows that fishing, which was the main activity of the relocated population, continues to be so, so there has been no conversion of activities following relocation. In fact, the household surveys showed that 96% of respondents were involved in fishing before the relocation and that six years later (2019-2024), it remains the sector of activity for 89% of the relocated disaster victims in Diougop. However, these people face a number of constraints linked to

resettlement, which significantly reduce the income they earn from fishing and related activities.

The surveys showed that the rehousing contributed significantly to improving the living conditions of the people affected by the disaster on the Langue de Barbarie who were permanently rehoused in Diougop. In fact, these people have left the irregular, poorly-developed neighbourhoods, which were characterised by precarious housing that failed to comply with building standards and town-planning regulations, and have been rehoused in a modern, well-developed site that is fully serviced. 84% of the households of disaster victims rehoused in Diougop stated that the living environment they found in the rehousing site was much better than the one they had in their original neighbourhoods. The resettlement of people in Diougop also contributed to the clearing of 11 ha.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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