

Article

# Let the Women Harvest the Mangrove. Carbon Policy, and Environmental Injustice

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**Abstract:** Carbon policy is a fascinating topic in geography and political ecology, because carbon is a new exchangeable good, which links the local to the international arenas through a complex set of instruments, norms, and institutions. In this paper, after explaining my theoretical and conceptual framework rooted in Africanist geography and currents of political ecology, I analyze the responses of local actors (knowledge, practices, logic, and strategies) to environmental policies and consider the effects of new mechanisms, upon local dynamics in Africa. I focus my attention on the impacts of mangrove reforestation policies on women, who harvest shellfish. My research, conducted over 35 years on coastal mangroves in Africa and Madagascar, provides me with examples. Through a long-term approach to the perception of mangroves and the changing modes of policies, I highlight the weight of imperialism and neo-liberalism and analyze types of environmental injustice against mangrove harvesters, particularly the women, who are the most directly concerned by the preservation of their heritage and are rarely recognized as stakeholders in environmental policies that are defined internationally and implemented at national and local levels. They are not informed (or are deliberately kept unaware) of new devices such as REDD+. They have lost their rights of access to the reforested mangrove areas. Carbon policy requires comparative and empirical research, giving voice to local actors, especially women, about their perceptions of policies and actions. The approaches in terms of political ecology must be combined with analysis of the bio-ecological and socio-cultural dynamics of the mangrove.

**Keywords:** mangrove; women; shellfish; environmental justice; grabbing

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## 1. Introduction

West African mangroves are found discontinuously from Senegal to the Niger Delta and represent about 20% of the world mangrove cover, totaling some 15,000 km<sup>2</sup> [1]. They belong to the western Atlantic bio geographical region, which counts eight species of trees [2,3]. They are internationally important (and protected for that purpose) for migratory waterfowl (designation of Ramsar sites, National Parks, and Biosphere Reserves, such as the Senegal Delta and the Saloum Delta in Senegal). Besides their important contribution to global biodiversity, they provide many ecological and socio-cultural services: they shelter against storms, absorb and disperse tidal surges associated with these events, regulate flows, and retain soils. Their roots and mud are home to over 2000 known species of fish, mollusks, including bivalves and oysters, and crustaceans, which are the basis of domestic consumption and long-distance commercial trade. The mangrove trees and leaves provide wood for construction (houses, boats, farm tools, fishing gear), firewood and charcoal (cooking, fish smoking, heating the brine to manufacture salt), feed for livestock, drinks and alcohol, traditional medicine, etc. In the Saloum Delta, shell middens served as burial places for elites, recognized as a cultural landscape by Unesco since 2011.

In spite of their importance, since 1980, the mangroves worldwide have lost 36,000 km<sup>2</sup>, that is to say 20% of their area [1,4]. According to most sources, such a decline would be equivalent to, or even worse, than what is happening in Senegal, with a decline from 2300 km<sup>2</sup> in 1990 to 1760 km<sup>2</sup> in 2008 [5]. Over 30 years, the Saloum reserve of the biosphere's mangrove has had of 40% of its area removed, which is about 750 km<sup>2</sup> [6]. In Casamance, 670 km<sup>2</sup> of the ecosystem has disappeared in the same period [7].

While the contribution of mangrove to people is well known and recognized [8,9], and while its drastic decline worldwide is undeniable, its current dynamic and the solutions recommended for its preservation are debatable.

In reference to the book *Let Them Eat Shrimp*, a violent indictment against industrial shrimp farms that grab the mangroves to the detriment of local fishers [10], this article examines the threats of mangrove reforestation, or carbon policies, towards women, who harvest shellfish along the Upper Guinean Coast, or Northern Rivers in West Africa (Figure 1: Studied areas). This area that extends from the Senegal to the Sierra Leone contains the most-inhabited (up to 150 h/km<sup>2</sup>) and best-developed (8507 km<sup>2</sup>) mangroves in West Africa [11].

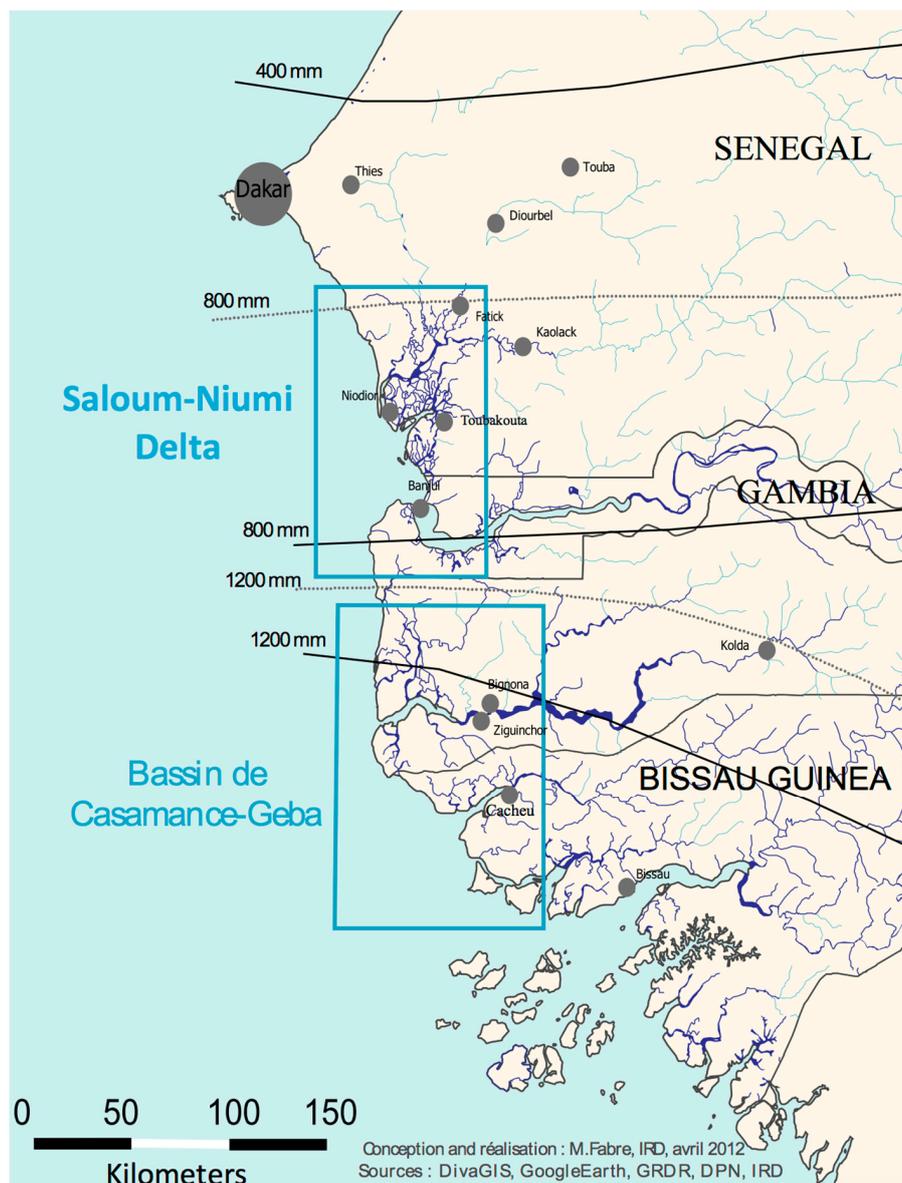


Figure 1. Studied areas: Saloum Delta and Casamance Basin, Senegal.

There are a lot of data and articles regarding past trends of mangroves, but not on the same geographical scale (the patterns described at regional scale may not always match those of local scales) and timeline. The large variation in the estimates of the mangrove cover according to the sources is linked to how mangrove cover is defined (from dense forests to open areas/swamps and tannes), and also to problems with the interpretation of remotely sensed images [12]. We have a similar challenge with current trends, to the extent that we lack recent, reliable, and adequate data. There is contradictory proof of decline versus recovery according to types of sources and knowledge (academic versus ILK) and how mangroves are perceived and managed. So, in the eyes of Northern Rivers people, a “healthy” mangrove terroir is not a dense forest, but a combination of rivers and canals, trees groves, mudflats, and tannes, and, above all, rice fields, reclaimed to the detriment of mangrove trees [13].

In the past 10 years, carbon policies, particularly in Africa, have been the subject of more and more studies, examining their efficiency as an instrument to mitigate climate change, and denouncing the risks of land/green grabbing and environmental injustice [14–18]. These critiques have led, in particular, to changes in the REDD (Reducing Emissions from Deforestation and forest Degradation) mechanism by adding “+” in order to better take into account social safeguards [19]. Most of these studies focus on terrestrial forests (among others: [20–27], respectively in Mozambique, Uganda, Kenya, Central Africa, Madagascar, and Senegal). Apart from the studies of Beymer-Farris & Bassett in the Rufiji delta, Tanzania [28,29] and Crow & Carney [30] in the Gambia, very few focus their attention on mangrove forests, and highlight gender issues in particular.

In this paper, after stressing the specificity of the study area and explaining my theoretical and conceptual framework, I explore the views of women—regarding environmental changes—and reflect on the effects of carbon policies upon them, pointing out the risk of mangrove grabbing and environmental injustice. I focus on the effects of the largest program of mangrove reforestation, called “Plant your tree”. Launched in 2006 in the Casamance estuary, and in 2008 in the Saloum Delta, it is based on a partnership between a Senegalese NGO, Oceanium and a set of public and private—the FFEM, Carbon Livelihoods Venture Fund and private companies (Danone, Yves Rocher) [9].

## 2. Material and Method

### 2.1. Study Area

Northern River mangroves are among the oldest inhabited and exploited areas, as evidenced by shell middens, dating from more than 7000 years ago [31]. These middens (shells, fish bones, rice, pottery, etc.) attest to the age of shellfish harvesting, fishing, and rice cultivation, as well as to exchange relations along the West-African coast. African rice, *Oryza glaberrima*, originally wild, became domesticated on a date that remains unknown. The early Portuguese explorers of the late 15th century testified to the construction of rice “terroirs” in the mangrove swamps. This mangrove (or wet) rice farming is very original [32]: it is a dam based cultivation (neither irrigated nor flooded), using African rice varieties and dikes and bunds to protect the fields against the intrusion of salty water, and retain the rainwater under limited rainfall conditions (1500 mm of rainfall). The rice farming structures the *terroir*, schedules the rural activities and ceremonies (rites of initiation, entry into the sacred wood and palm groves) in association with other uses of the mangrove, such as: oyster (*Crassostera gazar*) and cockle gathering (*Anadara senilis Galatea paradoxa*, *Murex hoplites*, *Murex cornutus Orbicularia orbiculat*, *Pugilina morio*, *Cymbium* spp., *Cultellus tenuis*), fisheries (*Tilapiae*, *Mugil* spp., *Ethmalosa*, *Epinephelus* spp., *Lates* spp.), salt collection, etc. This multiple use system has built a unique landscape, managed and controlled by local institutions and transmitted from one generation to another [8].

The diversity of resources and products (rice, fish, shellfish, salt, honey, etc.) and the mobilization of an important labor force, both masculine (for dike repair) and feminine (for transplanting and harvesting the paddy) have long ensured the adaptation and flexibility of the socio-ecosystem built in the mangroves, at least until the 1980s [33]. In fact, systems of use and values (socio-cultural, archaeological, patrimonial, etc.) are gradually being challenged. Diverse and entangled factors are of

an environmental and socio-political order, including rural exodus (more than demographic pressure), drought (the long succession of deficit decades since the end of the 1960s), and governmentality (lack of recognition and marginalization of traditional systems, dysfunctioning of modern systems), resulting in a decline in rice fields and, more generally, in an interrogation of the future of these systems [13].

## 2.2. Approach and Methodology

My empirical, comparative, and diachronic approach is at the crossroads of the French African rural geography (Gourou, Pélissier, Sautter) and North-American political ecology [34,35]. It is inspired by the perspectives of postcolonial studies and criticism of imperialism and neo-imperialism, Neo-Malthusianism, and dominant and normative currents [36–38]. These perspectives call for a diversification of approaches, from the geography of identities, the margins (of women) to radical geography.

My research, conducted over 35 years on mangroves in Africa, notably in Senegal (Saloum Delta and Casamance) provide me with examples (Figure 1: Studied areas). In previous publications, I show that the mangroves have been the subject of very contrasted perceptions and policies, moving from a productivist vision in the colonial era to a sanctuarist vision in the 1970s and 1980s, then a market vision, advocating the conservation of ecosystem services through mechanisms such as PES and REDD+ [8,13]. I develop a critical approach to discourses, highlighting the weight of imperialism, whether it is colonial, green or blue (as part of carbon policies, that seek coastal forests and marshes) and the consequences of neo-liberalism and neocapitalism, resulting in injustices against mangrove harvesters [9,39,40]. In this article, I continue my exploration of the drifts of environmental policies and risks induced by the globalized and dominant commodification of nature and suffered by local communities. More specifically, I analyze the impact of carbon policies on women who harvest mangroves and present their views (diagnosis, key drivers of change, relevant solutions) that contrast with that of experts who are foreign to the milieu (NGOs, scholars, decision-makers, etc.).

In Senegal, the annual and official census of fishery activities and the canoe park (around 9000 fishermen, 2115 canoes divided among 65 fishing centers) concerns only fishermen. Women are not taken into account, although they are the ones who harvest the resources of the mangrove, process fish, and control the value chain of sea products. So, in Casamance, women mainly collect oysters, fixed on the *Rhizophora* roots (*Crassostrea gazar*). In the Saloum Delta, women collect oysters (*yojos* in wolof), but mainly bivalves (*Anadara senilis*, *Murex* sp., *Cymbium* sp., respectively in wolof *pañe*, *tuffë* and *yeet*).

My surveys in these regions span over 35 years: of the 1584 oyster harvesters surveyed in 1984, in-depth inquiries were carried out among 54 women in 13 villages of Lower Casamance and the SEFCA pontoon in Ziguinchor [41]. Then, in the context of the Biodivalloc program (ANR05BDIV), between 2005 and 2009, 74 inquiries of shellfish harvesters in 15 rural communities in the Saloum delta were carried out [13,42]. More recently, between 2012 and 2016, within the framework of the LMI PATEO ([www.pateo.ird.fr](http://www.pateo.ird.fr)), I have conducted in-depth inquiries and follow-up of the activities of two Economic Interest Groupings (EIG), called respectively Ngodane and Gnassemane, in Dionewar and the Local Federation of EIG/FELOGIE of Niodior, in the Saloum islands. FELOGIE is the local federation of producers' organizations, or Economic Interest Groupings (EIG). FELAGIE is the National Federation of Economic Interest Groupings. At Niodior, FELOGIE groups 25 EIGs of 30 women each, which means more than 700 women; three-quarters of the women of Niodior joined. Inquiries were also conducted with about 20 women who are not in FELOGIE (Niodior has 7289 inhabitants, 2013 census, ANSD).

In addition to classic ethnographic primary sources (participant observation, focus groups, surveys, and in-depth inquiries), my research study is based on secondary sources of information, such as newspapers, early 15th century explorers' stories, and 19th and early 20th century colonial reports [8,11].

In the framework of this paper, I decide not to quote each woman and prefer to synthesize their discourses for two reasons: first, they are speaking in their native language (Soce, Niominka, Diola, Serer, etc.) or in French, and so, I have to translate their sentences into English, which does not sound relevant and would make the paper too long; second, I prefer to give more room to the meaning of their speech. Besides, I concentrate on giving feedback from the women interviewed during the reforestation campaigns of Oceanium (2006–2016), while taking a retrospective approach (since 1980).

### 3. Narratives of the Women, Who Are Harvesting the Mangroves

In this section, I examine the views of the women of Casamance (Diola groups) and Saloum islands (Niominka and Soce groups), who harvest oysters and bivalves. The Diola women of Casamance are primarily oyster gatherers, while the Niominka and Soce women of the Saloum give priority to the harvesting of the arches (*Anadara senilis*) on the mudflats of the delta. According to our latest inquiries in the Saloum Delta [42], shellfish work (harvesting and processing) represents the major activity of nearly 92% of the women of Saloum Delta in terms of time allotted to that activity and the main source of income for nearly 76% of those women (the sole source of income for nearly 7% of them). In Casamance, we find a similar importance of oyster work in the villages of the Casamance river estuary or Lower Casamance, notably in the islands of Blis-Karone, Boulouf, and Bandial. In the vicinity and upstream of Ziguinchor, most of the harvesters are Arame Diola or Felupe, refugees coming from Bissau-Guinea and settled in the city of Ziguinchor.

#### 3.1. A Nuanced Diagnosis about the Dynamic of the Mangroves (Harvesters' Statements)

During the dry season, from November to June, mangrove harvesters come out daily in the mangrove; at least, at the rhythm of the tides, they alternate between the outlets for harvesting the shells and their processing. They usually go to the same sites, which belong to their *terroir* and know all the meanderings of the bolons, the sandbanks, and the shallows. Therefore, they have a good understanding of environmental changes, especially since their average age is high and most of them have traveled the mangrove for more than 30 years. One can meet young girls in the mangrove, even very young children (especially in the Soce group). Most often they accompany their mothers and help them to row or carry the baskets. Nevertheless, it is an activity dedicated to married women, even often menopausal, for religious and cultural reasons.

As early as the 1980s, women's discourse was explicit about the degradation of mangroves, both the decline of forests, the erosion of muddy banks and the salinization of the bolons, and consequently the rarefaction of the oysters and arches.

The women's diagnosis of current mangrove trends is more nuanced: they find that the mangrove forest is less dense, has even disappeared in some sites, that the oysters and arches are smaller and less numerous and that it is necessary to go farther and farther to harvest them. This trend, however, is not homogeneous over the entirety of the mangrove and is not univocal. It must be qualified on both the spatial scale and the period. Women know how to spot sites that are still in good condition and those that are on the verge of exhaustion and are therefore defended. They adapt their itineraries according to the tides and seasons within the limits of their *terroir* and, if necessary, migrate outside their *terroir* to exploit sites suitable for their gathering and not exploited by the resident populations. Thus, it is common to find Diola women in the Gambia or in the Saloum islands to exploit the oysters. These migrations can last several months.

Recent scholars, who argue that the decline of the mangrove forest is neither linear nor irreversible and show the maintenance, even the recovery and the "natural" re-growth of the mangrove forests, support this diagnosis. The increase is reported at the Senegal-Gambia border of Saloum-Niumi [43,44], in Blis-Karone islands of Casamance [45,46], or also in Bissau-Guinea: also, in this country, notably around the Cacheu river, mangrove coverage increased about 23.5 % during a 20-year period from 1990 to 2010 [47]. In 2015, mangrove forests occupied 3500 km<sup>2</sup> of the territory of Guinea-Bissau, 47% more than in 1990 [48,49].

Since the 1990s, a progressive dynamic of mangroves has been taking place across the Northern Rivers, partly due to the return of rainfall [43,50,51], partly due to the abandonment of the rice fields and afforestation and conservation initiatives [39,44,49,52,53]. The key driver of changes is another debatable point.

### 3.2. Multiple Entangled Causes

The causes put forward by the harvesters are diverse and complex: if the women blame the drought of the 70s and 80s, they also point at some actors—both public and private—who have introduced new techniques and practices and have not taken into account their knowledge and customs. They refer to fishermen from northern Senegal and other African regions—Bozo and Somono from Niger, Krou from Sierra Leone and Nigeria, Fulani loggers, Guinean fish smokers, and refugee women from Bissau-Guinea, etc. They arrived in successive waves, attracted by the mangrove resources, settling in temporary camps within the mangrove, clearing and exploiting it without respecting local rules, and behaving like “predators” or free riders according to Hardin’s theory.

Bridges, roads, anti-salt dams, which prevent water from circulating (as the flushing effect of salt and the enrichment of mud by the tide), are also blamed by the women, as are programs such as the ILACO pavement project of Tobor, which, by clearing the mangrove trees and drying the soils, rendered them acidic. Inadequate and incoherent public policies have imposed their system of governance based on positive law, challenging customary rules and weakening the traditional power of the elders. The war, which has been raging for 30 years in Casamance, is also a decisive factor in the degradation of the mangrove and its governance.

Another matter of debate is the overexploitation of resources by women themselves and their harvesting practices. Several arguments can be put forward: if many women are invested in this activity, their number tends to decrease due to the difficulty of work [41,42]. Their pressure on resources is limited because of the strong constraints of the mangrove. Women are dependent on the tide and therefore have only a few hours to practice their harvesting; their other domestic tasks take up a good part of the day; agricultural activities take them during the rainy season. Harvesting depends mainly on the ability of women to access the sites (on foot or in small rowing canoes), to stay in the muddy flats, to spot the most suitable sites (with their eyes for the oysters, with their toes for the shells buried in the mud). Their tools are minimal: a spoon to dig up the shells, a knife for the oysters, and baskets for the harvest.

With regard to the harvesting of oysters, three uses of the machete are noted with varying impacts on the resource: (1) cutting the roots of the *Rhizophora*; (2) Harvest by shaking the roots of the mangroves to make the suspended oysters fall into the baskets or directly into the canoe; (3) Detripping, an operation that involves detaching the oysters, without cutting the roots, using a knife or a machete. The women do this standing on their canoe, in the mud, or plunged into the water. The oysters then fall into a basket and the contents are, in turn, poured into the canoe.

The latter technique probably takes the most time, but it is nevertheless preferred by the women who are aware of the need to preserve the resource and it is considered less painful than the cutting of green (live) roots. However, they recognized cutting the roots, but only under certain conditions: when the wood is dead, or even when the roots are very dense, they practice pruning to allow the roots to grow.

Besides, women distinguish the uses for home consumption (cooking, fish smoking, salt production, house building, and agricultural tools) from the uses for sale. Even in the latter case, women discriminate between local actors and foreign fishermen and fish processors (fuel-wood from mangroves used for smoking fish) who are much less interested in the long-term sustainability of the resource and less prone to adopt environmentally-friendly practices. Nevertheless, they accept the presence of women from Bissau-Guinea who live in Ziguinchor for two main reasons; first, because they are related to them (the country of the Diola/Felupe extends between the estuary of the Casamance River and the Rio Cacheu and was divided respectively between the French colony of Senegal and the

Portuguese colony of Bissau-Guinea, but the people belong to the same linguistic and cultural entity); second, because they do not themselves exploit sub-urban mangroves.

For mangrove harvesters, the causes, both natural and anthropogenic, constitute a complex set that needs to be understood within the more general context of rainfall irregularities and the crisis of the agrarian systems which contribute to increasing the pressure on the coastline and its resources.

### 3.3. ILK and Local Institutions of Mangrove Conservation

Reforestation of mangroves is a very ancient local practice, well known by harvesters. Since the 1980s, several programs have been implemented in the sub region, supported in particular by FAO and managed by the International Union for Conservation of Nature (IUCN) or local NGOs, such as West African Association for Marine Environment/WAAME in Saloum. The program “Plant your tree”, carried out by the NGO Oceanium, launched in 2006, varies in its magnitude. More than 1400 km<sup>2</sup> of *Rhizophora mangle* are replanted, 90% of them in Casamance; more than 300,000 villagers are mobilized. The means and methods used and the financial and legal framework contrast with previous practices [39].

The majority of mangrove harvesters are familiar with this program, which is highly publicized and embodied in the charismatic and controversial figure of Haidar El Ali, president of Oceanium, who is very popular in Casamance, but much less so in the Saloum Delta. The program’s reforestation activities have not had the expected results. Many plantations did not take. Criticisms are made toward the choice of sites (determined according to their visibility), the techniques of transplanting (too tight), and the sole species preferred (*Rhizophora mangle*). In addition, the small groves prevent the circulation of canoes for navigation and fishing. The mangrove harvesters of the Saloum islands have already been scalded by the creation of the Bambang Marine Protected Area, a measure initiated and carried out by Oceanium, which led to the closure of the Bambang bolon and to preventing them access to collect the shells. According to the women, this measure is illegitimate and damaging because uncollected shellfish rot [54].

Likewise, in the eyes of the harvesters, the mangrove is not limited to a forest. Its services, or rather its values, are not reduced to carbon sequestration. The mangrove is a complex socio-ecosystem, consisting of rivers and tidal channels, mud flats, and forests. It is the support of many resources, on which they depend for their existence (shells, but also fish, rice, salt, honey, etc.). Mangroves are their living space, their *terroir* or their heritage, inherited from ancestors, in which they identify and which they intend to preserve and defend in order to transmit it to their descendants. For a long time, mangrove harvesters have defended certain sites, have applied conservation measures (harvesting seasons, zones shared between lineages and neighborhoods, and places, sacred or not, prohibited to use), to reforest certain habitats, plant *Rhizophora* poles, experiment with new techniques, such as those inspired by JICA (Japanese cooperation) in the Saloum Delta, who are trying to make better use of their products (via the OVOP “One Village, One Product”, label also launched by JICA) [13].

In addition, all the harvesters do not have the same practices. The Diola do not cut the roots of the mangroves for practical and ecological reasons: so the green wood of the *Rhizophora* is very hard, very difficult to cut; it is therefore quicker to remove oysters from the branch or root of the mangrove and more environmentally friendly. Moreover, they have access to dead wood (issued from the mangrove or the upland clear forest) and they prefer this wood to boil the oysters or arches, and for their domestic needs.

In spite of the reform on the national domain, the harvesters still consider the mangrove as part of their *terroir*; it is collectively owned, maintained, controlled, often shared between neighboring groups, each of them corresponding to a lineage or a clan, and descending from a common ancestor. Thus, in Casamance, each district (or lineage) has its harvesting area inside the *terroir*, with its mangroves, bolons, landing stage, and processing sites. The women of each district, organized by groups, called companies, harvest the oysters and manage their area according to traditional use rights and access (Figure 2: Mangrove’s *terroir* of Niomoune, Casamance).

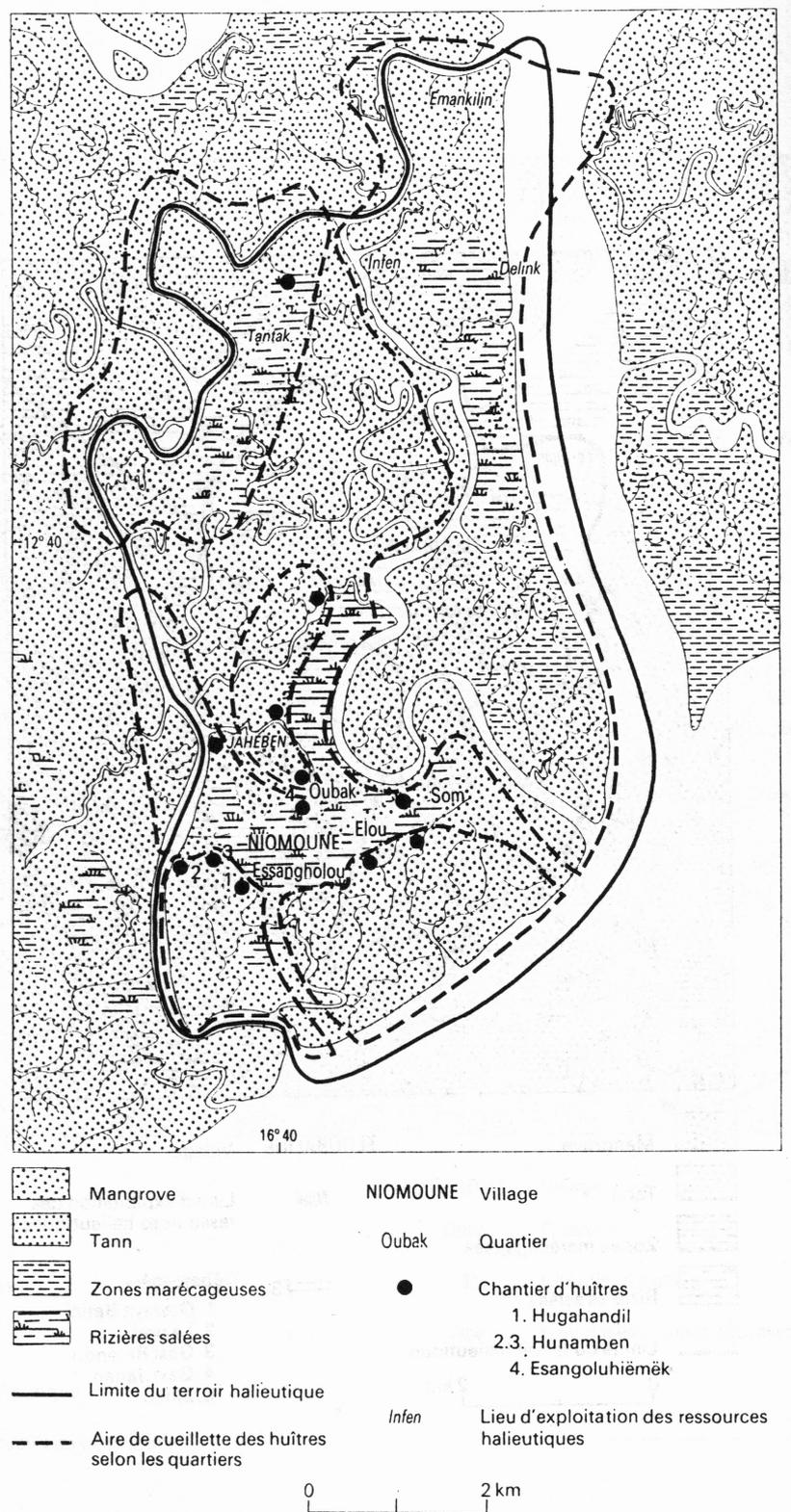


Figure 2. Mangrove's terroir of Niomoune, Casamance.

The clear recognition of the areas of harvesting and the respect of the *terroir* institutions by the local people are also noted in the Saloum Delta. Thus, in the Rural Community of Dionewar, which includes three villages (Dionewar, Falia, and Niodior), some bolons such as *Jumbass* and *Gohekor* (and thus their mangrove forests and mudflats) are jointly exploited and collectively controlled by the three villages.

Others fall under the prerogative of a single village, or even of a single district. Niodior consists of four large traditional districts: Mbilmack, Babaack, Damal, and Sindiala with a shared mudflat, called *Jandufo*, located near Niodior (Figure 3: Niodior *terroir*, Saloum Island). The women reach it on foot, even in a cart, at low tide; in addition, each district has its places for landing and shellfish processing. Similarly, in Falia, the sandbanks are clearly identified, named, and shared among the commoners, or the inhabitants of this village, according to their traditional knowledge and institutions.

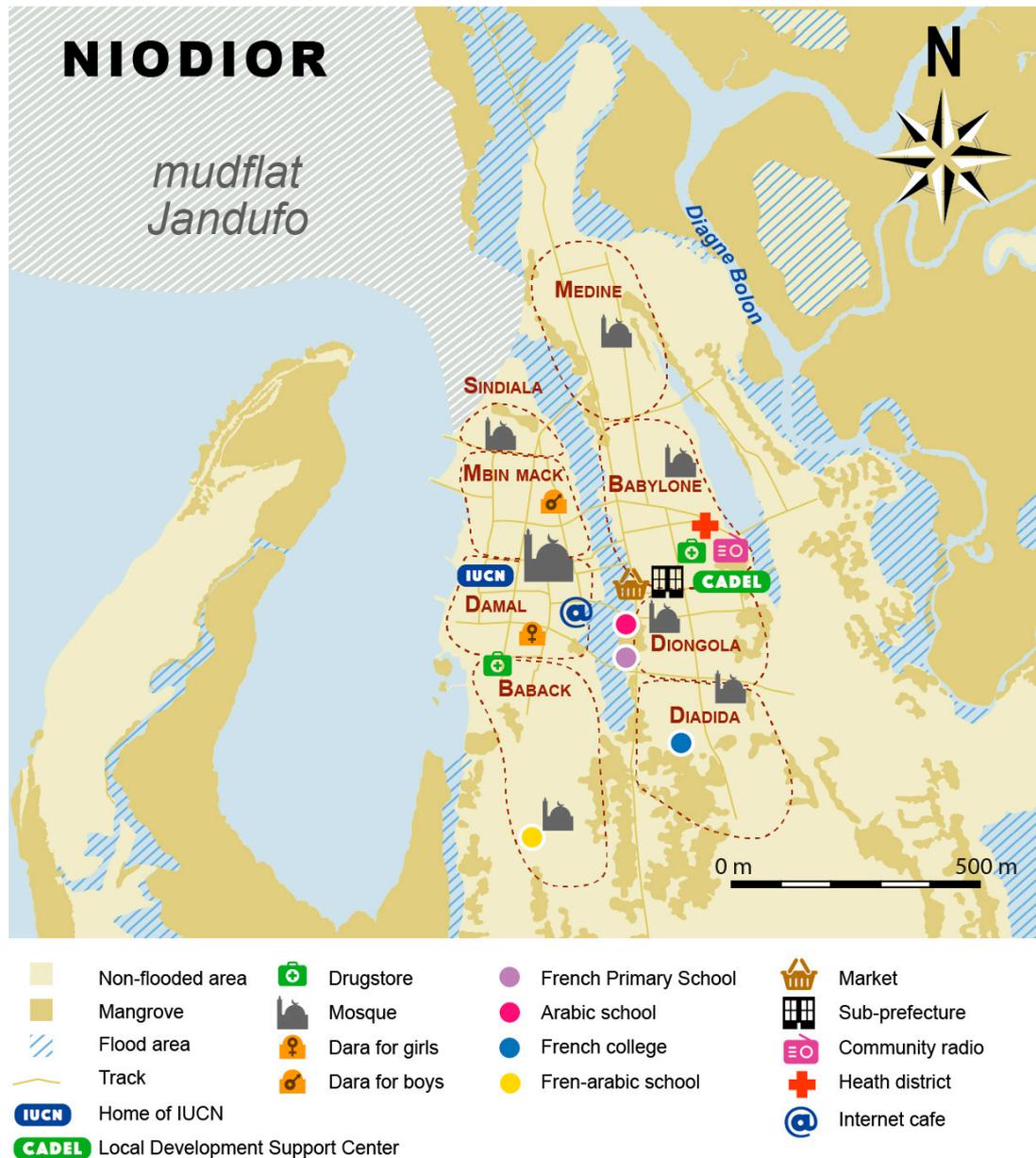


Figure 3. Niodior's *terroir*, Saloum Island.

The harvesters do not criticize reforestation itself, but the approach and its consequences, which I describe in terms of environmental injustice.

#### 4. Mangrove Policies in Africa in Question

According to many studies [1,4,6,55,56], the mangroves have been retreating dramatically. The figures are beyond question, more than 30% in 25 years. The causes are due to the overexploitation

of resources (wood and firewood, fish, and shellfish, etc.) and to anarchic practices (abusive cutting of wood used as building material, mangrove roots to collect oysters, fuel wood for open oysters and smoke fish, charcoal for cooking, overfishing, etc.). The solution lies in the protection of mangroves, the banning of these destructive practices, and the displacement of villages. The creation of most Marine Protected Areas (MPAs) is based on the same dominant discourse on the environmental crisis (the erosion of biodiversity) and the implicit assertion of the inefficiency of local institutions [54]. The first Senegalese coastal areas to be classified, in 1971, were coastal wetlands, because of their function as migratory bird habitats. The Saloum Delta National Park, created in 1976, covers the Fathala forest and islands and islets partially colonized by mangroves. In 1981, the protected area was extended to 180 km<sup>2</sup> and classified as a Unesco Biosphere Reserve, added to the list of Ramsar sites in 1984. In 2004, the Bambung MPA led to the closure of the Bambung bolon. Finally, the Saloum Delta was added to UNESCO's list of world heritage sites in 2011. This intertwining of areas with different statuses completely disregards the local people. Furthermore, the enclosure of the Bambung bolon creates many tensions between the villagers on the one side, who now live in the area and are involved in the co-management of the MPA and the professionals of the sea on the other side, who were the traditional users of this bolon, namely the Niominka fishermen of the islands and the women, who are shellfish harvesters.

Bambung MPA is a participatory but exclusive area, i.e., solely benefiting the villages along the Bambung bolon, although most of these villages are new, inhabited by diverse groups. Also, the village of Sippo includes Soce, Diola, Bambara, Wolof, many of whom are not indigenous, but assimilated, or living together [54].

In the last decade, the rise of the REDD+ mechanism to reduce greenhouse gas emissions caused by deforestation and forest degradation, and blue carbon devices [57,58], which targets mangroves (such as sea grass beds and salt marshes), have increased all over the world. Despite numerous criticisms from scientific experts on the bio ecological and socio-cultural legitimacy of reforestation and local user resistance, REDD+ and blue carbon projects are developing, revealing the gap between the progress of knowledge and influence of dominant policies and discourses. Thus, the 2015 national and international political agenda (COP 21, UNEP, Ecosystem-based Adaptation Program) puts mangroves at the forefront because of their climate change mitigation function [59]. Yet, heterodox economist scholars question the calculation of the cost of non-deforestation, and the economic rents of carbon credits [26,60]. Geographers and anthropologists point to methodological and ethical biases in field measurements [15,24] and to perverse effects in terms of environmental justice and land grabbing [28], not to mention the strong scientific uncertainty about the appropriateness of deforestation in Africa [61].

When we examine the accounts of the missionaries, explorers, and colonial agents originating from Europe, and the contemporary programs, colonial history seems to be repeating itself [8,40]: certainly the protagonists have changed and the rhetoric does not mobilize the same lexicography or the same fields of knowledge. Nevertheless, the diagnosis is biased by representations and ideologies. The causes are due to their linearity, their reductionism, linking poverty and degradation. The solutions, imposed by the "top", are univocal, homogeneous, technico-administrative. These convergences of drift, even environmental violence [36], result in both ecological and social failure of the implemented mechanisms and in environmental injustice.

These policies, often with good intentions, suffer from the same biases or drifts in approaches and logics of rationality, namely: the essentialization of local communities (supposed to be homogeneous, united, stable, and watertight), the reductionism or simplification of the complexity of the ecological and social systems, their interactions and their dynamics, faith in the technical and normative expertise of the scholars (whereas in most cases the solution is less technical than institutional) [62–64]. They adopt the same "indirect" mode of governance, thus contributing to the weakening of local institutions (deregulation of custom), the eschewing of states, and the growing influence of NGOs acting as intermediaries and environmental brokers which end up indirectly controlling men and land [48,65].

In this last section, I explore the effects of mangrove carbon policies with regards to the three dimensions of environmental justice [66–69]:

- (1) The distribution of carbon: for whom? Provided by whom, where and how? What are the benefits of this—material and immaterial, direct and indirect—and the beneficiaries? Are there compensation mechanisms, and alternatives to traditional uses?
- (2) The procedures: who are the actors at the initiative of these devices? Who participates? Who decides? In particular, what place is given to the poorest and/or most vulnerable populations? How to anticipate risks? What are the mechanisms planned to share costs and benefits?
- (3) The recognition of local people and the social and cultural values of mangroves, their knowledge and traditions, rights of use and access, their needs and their identity, territorial and patrimonial claims.

In Tanzania, Beymer-Farris & Basset [28,29] argue that the actions taken to make areas “REDD Ready” in WWF forest reserves, lead to environmental injustices insofar as the Warufiji people have lost their customary land right to the replanted forest. In our studied case, environmental violence is less drastic, but the tensions and resistances are nonetheless real. An in-depth analysis of Senegal’s environmental policies, and their inspiration, implementation, and implications at both sub-regional and local levels, goes beyond our scope. It is important, however, to highlight certain elements of this context in order to better understand the perception and behavior of the actors concerned, particularly women. The behavior of women is often judged to be irrational, whereas it is the political actions that are inconsistent or diverted to the benefit of an elite.

Building upon the Abidjan Convention, supported by NGOs (Wetlands International, IUCN, WWF, FIBA, and MAVA), a policy network has been built at a sub-regional level, called the West Africa Marine and Coastal Conservation Platform (PRCM). It covers seven countries (Mauritania, Senegal, the Gambia, Bissau-Guinea, Guinea, Sierra Leone, and Cape Verde). It is the most important example of coordinated mangrove conservation partnership. It led to the adoption of a Mangrove Charter and subsequent national action plans, promoting inclusive and long-term governance of mangroves.

In Senegal, trade-offs are delicate between international injunctions to protect biodiversity and national commitments to fight poverty, promote participatory democracy (and, in particular, implement the third phase of decentralization) and guarantee peace, especially in Casamance, a region marked by more than 30 years of civil war, in a sub region marked by political instability.

Fisheries in Senegal are one of the key sectors of the economy, one of the main sources of currency; small-scale fishery alone accounts for nearly 90% of the landings, i.e., 400,000 tons per year; it employs directly and indirectly more than 600,000 people (out of a total population of 14 million). Finally, fish (including shellfish) is the primary source of animal protein. Given the strategic importance of fishing in Senegal, the State keeps total control on it, and is trying to impose its coercive policy. This centralized and authoritarian policy has shown its limits, highlighting the inability and lack of resources of the State services to control the resource throughout the territory and the resistance of Senegalese civil society.

On the basis of the promotion of responsible and fair harvesting practices as well as on measures capable of ensuring conservation of resources and related ecosystems, the local people, with the support of NGOs and international organizations, establish their own management measures which are called local “conventions”.

Senegalese civil society is very active, but also traversed by power relationships [27]. Those are manifest at the local level between NGOs, local authorities (local representatives of the State, traditional and religious authorities, and leaders) and producers’ organizations (fishermen, or women), for example, FENAGIE and its local entities, FELOGIE. A good illustration is given through the mapping of the main institutions that govern the *terroir* of Niodior (Figure 4: Governance of the rural community of Niodior): the diversity and complexity of institutions (traditional authorities, such as Elders’ council, religious authorities with diverse Muslim brotherhoods, government representatives, local associations of producers) are sources of innovation—such as the new local conventions, hybrid

institutions issued from dialogue between local stakeholders and State in the context of the third phase of decentralization—but they also blur the decision-making process, and marginalizes the less powerful actors, such as the cadets and the women.

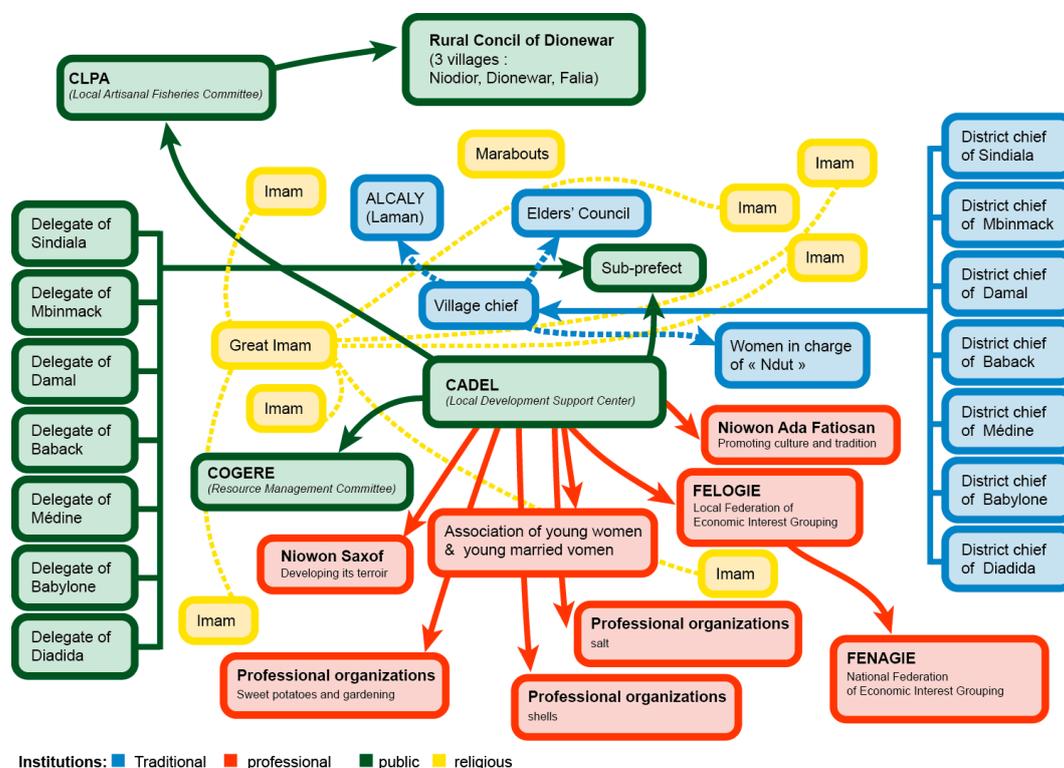


Figure 4. Governance of the Niodior community.

The above-quoted program “Plant your tree” is a good illustration of the inconsistency of carbon policies and the risks endowed by the harvesters. The firm Ernst & Young and partner [70] has validated this program as compliant with the Clean Development Mechanism, although its contributions are controversial [9,39].

In fact, in terms of redistribution, participation and recognition, Senegalese women are being harmed. Mangrove forests and mudflats are strategic locations for both women harvesting and reforestation campaigns. Thus, as part of the “Plant your tree” program, the charter signed between the external operators and the rural communities stipulates that for 30 years the replanted mangrove is controlled by the donors (i.e., Danone) and henceforth forbidden for any use. The harvesters no longer have the right to exploit the reforested areas and are disposed of their land. They barely receive appropriate compensation, direct or indirect, immediate or future, despite remuneration that varies according to the communities. They might receive a modest supply of bags of propagules, or the mere hope—promise that the densification and extension of the mangrove forest, might allow their grandchildren to have access to it in an uncertain future.

Finally, harvesters are totally unaware of the REDD+ mechanism, its supporters (reforestation of mangroves to sequester carbon) and its outcomes (private enclosure of reforested sites and prohibition of use).

The participatory approach, which is required in all research-action policies since the 1990s (from Rio in 1992 to the Millennium Ecosystem Assessment in 2005 and to the Millennium Development Goals in 2015), has contributed little to paradigm shifts [71]. Of course, in the discourse, the approach is said to be participatory. In fact, in the field, the people are at best informed, rarely consulted, nor involved in the diagnosis (ante and post interventions), nor in the interpretation, nor in the solutions to bring.

In the end, reforestation campaigns serve the interests of certain actors (private patrons and donors relayed by local and national NGOs) and the cause of biodiversity or climate change. These benefits are certainly more political than financial, as the carbon market is a decoy [60]. However, the mangrove harvesters do not benefit from it and, on the other hand, pay the heaviest costs.

Mangrove harvesters do not have a clear vision of the new status of reforested areas. The environmental injustice against them is clear: they lose their holdings of mangroves, their rights of access and use, for at least 30 years, to the benefit of private companies. The procedures are imposed on them, according to non-negotiable reforestation recommendations. Their knowledge and their close and ancient ties with the mangroves are disregarded.

The mangrove harvesters are often neglected, both in development schemes and in research and action projects, while they are very dynamic, very invested in these activities and control the whole value-chain, from extraction to distribution and consumption. They are, therefore, the most vulnerable and most affected by these public or private schemes for the restoration, conservation, and/or reconquest of mangroves.

Although women are the most directly concerned with the preservation of their heritage, they are rarely recognized as stakeholders of environmental policies, defined internationally and implemented at national and local scales. They are not informed (or deliberately kept ignorant) of new devices such as REDD+. The shifting and uncertain legal status of mangroves leads to resistance and diversions: formerly included in the *terroir*, and collectively controlled by the community, mangrove now is considered public domain; and the State can assign control of it to private operators. The superimposition of conflicting rights and standards, as in the days of colonial imperialism, contribute to mangrove grabbing at the expense of local users and to conflicts between communities.

Another example of these risks of injustice is given through the sensitization campaign launched by the IUCN: the posters denouncing the cutting of the roots of *Rhizophora* by women gathering oysters constitute an IUCN means of sensitizing people and fighting bad practices (Figure 5: poster of the IUCN). During the same period (the 2000s), the IUCN has been supporting wide-ranging research and action program entitled “Women and shellfish” aimed at improving knowledge of the sector and supporting harvesters groups with a view to sustainable resource management. The message of these two actions is not clear, and rather contradictory, even tangential. In fact, the women, targeted by NGO incentives, do not constitute a homogeneous group. They are coming from diverse places, are not involved in the same social networks or harvesters’ organizations, and are not supposed to have the same knowledge and know-how. As women say, foreigners are held responsible for the degradation of the mangroves, while the inhabitants respect their *terroir*. Nevertheless, to the extent that migrations (for sea fishing, oyster picking, palm wine harvesting, etc.) are central to the exploitation of natural resources, this argument raises the sensitive question of autochthony and the risks of identity withdrawal in a generalized context of the closing of the *terroirs*. In another article [54], I show the risks of multiplication of Indigenous and Community Conserved Areas. The local people, on behalf of NIMBY (Not In My Back Yard), reject the migratory marine fishermen outside of their *terroir*.

Thus, the poster implicitly suggests that it is the Diola women from Casamance who destroy the Saloum mangrove by cutting the roots of the mangroves to collect the oysters, whereas in their *terroir*—in Casamance—women have harvesting practices which respect the mangrove. According to the origin of the women, the programs would adopt various strategies, that are coercive for the migrants, and that offer incentives for the natives. This vision is not only simplistic and reductive, but also unfair and dangerous from an ethical point of view, opposing the local to the non-local, and systematically castigating migrants as being responsible for degradation.



Figure 5. Sensitization campaign of the IUCN.

From our inquiries with Niominka and Diola women, the mangrove harvesters “work hard”, under difficult conditions. As highlighted by Davidson [72] among Diola rice cultivators of Bissau Guinea, hard work is a cultural value in its own right, regardless of productive or reproductive outcomes. The Northern Rivers people, the Soce and the Niominka women of the Saloum as well as the Diola women of Casamance and Bissau Guinea, who harvest the mangrove, share this distinguishing cultural characteristic. So, they have mutual respect and recognition of their know-how and their ILK.

This is the reason why the Felupe refugees, coming from Bissau-Guinea, were welcomed by their relatives of Casamance; not only because they are related, but also because they share the same strong links with the mangrove, the environment, the *terroir*, and the harvesting of its resources.

The new mechanisms, REDD+ or PES, are authoritarian discourses and self-legitimation, become business for experts, NGOs, and donors. Feasibility reports obscure the local reality, the real issues, and direct diagnoses and solutions to justify external interventions and ensure the continuous flow of resources [73].

## 5. Conclusions

Mangrove harvesters, who are most directly concerned with the preservation of their *terroir* and heritage, are rarely recognized as part of environmental policies that are defined at the international level and implemented at national and local levels. They are not well informed (or deliberately kept ignorant) of new devices, such as REDD+. The changing and uncertain legal status of mangroves leads to resistances and diversions [74]. Formerly included in the *terroir*, collectively controlled by the community, mangroves are now part of the public domain and can be attributed to private operators. The over-imposition of conflicting rights and norms, as well as in the era of colonial imperialism, contribute to mangrove grabbing to the detriment of local users. Challenging the power of traditional leaders, masters of land and water, and the influx of new actors in a context of decay and lack of means by governments, contributes to free access to mangrove resources and to the exclusion or marginalization of local people. The land, traditionally in Casamance as in the Saloum, is not a commercial good, it can never be bought—not more than rice—but can be lent. These rules now suffer many exceptions, as evidenced by sales to individuals (tour operators, foreigners) in the Saloum Islands, or Cap Skirring in Casamance and the multiplication of second homes.

More and more work supported by activist groups (see for example [www.carbontradewatch.org](http://www.carbontradewatch.org): Climate justice movements) denounced the campaigns of reforestation of the mangroves.

For reforestation, the restoration of hydro-ecological conditions and the “natural” reconquest of mangroves are preferred. It is better to help nature repair itself [75,76].

Besides, the progression of the mangrove, i.e., the extension of the surfaces colonized by mangroves, does not say anything about the quality of reforestation (of their specific diversity, their height, their density, and the richness of associated biodiversity) and claims for in-depth studies in the field to assess their status.

Carbon policy is a fascinating topic in geography and political ecology because carbon is a new market good, linking the north and the south through a complex set of technologies, institutions, and discourses which links the northern and the southern countries; and linking the local to the international arenas through a complex set of instruments, norms, and institutions [77]. It requires comparative and empirical research, giving local actors—especially women—a voice on their perceptions of policies and actions. To avoid conflicts and resistances among local people, the REDD+ and blue carbon schemes that are spreading, need to pay particular attention to the three dimensions of environmental justice [67,68]. Monitoring and evaluation of projects (Safeguard Information Systems/SIS) are now increasingly required [19]. Procedures must be transparent, inclusive, participatory, at all stages of the process, from its conception to its implementation and follow-up. Approaches in terms of political ecology need to combine analyses of the bio ecological dynamics of mangroves and the impacts, both biophysical and socio-cultural, of financial and political mechanisms. It is not only a matter of explaining the changing relationships between societies and nature, of socio-environmental processes, but also of deconstructing them and developing alternatives to the dominant environmental policies. Notably, it means accompanying local initiatives for the conservation of both biological and cultural diversity, with a view to shared and sustainable governance of the deltas, a privileged approach we try to develop within the framework of our laboratory PATEO.

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