

Migration causing forest degradation in Madagascar: prevention or adaptation to the effects?

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ABSTRACT

Madagascar is the largest island in the Indian Ocean and has huge forestry potential spread over several types of ecosystem. However, these natural assets that generate flows of goods and services necessary for daily life, are subjected to intense threat of degradation due to migrants' illegal settlement. In fact, many forest areas of the Big Island are affected by this destructive occupation by individuals external to their territory, and whose negative impacts are felt consistently. This study is focused on the application of the precautionary principle, which requires the utility to take action at source in order to prevent harmful impacts on the environment. The first part of the article outlines the main migration flows which degrade forests in the country. The analysis shows that the causes of human movement vary from one zone to another. They are not only limited to purely economic considerations but also incorporate sociocultural factors. Limitations of different policy interventions in the migration field which are detrimental to forests have been highlighted in the second part. The analysis has concluded that the prevention of migration causing forest degradation remains extremely complex. Thus, adaptation to the effects seems the most realistic option for the Big Island. Recommended adaptation strategies are focused towards the forest area organization so that it really constitutes an environment contributing to economic development, hosting and helping people, especially the disadvantaged migrants in the labor force.

Keywords: Migration, forest degradation, prevention, adaptation, Madagascar.

1. Introduction

Only few studies have been made on the migration's impacts on forest resources in Madagascar, whereas lately, this phenomenon is a known and fearful underlying cause that affects forest management in several areas of the Big Island. Moving into the forest has become a strategic option for families to survive and for others to expand their economic activity. In addition, migration analyses in literature are often limited to a small spatial scale. However, these informational gaps are serious disadvantages for the public decision-making at national level. From the mechanism viewpoint, the attention of many researchers has focused in recent years on environmental migration that generally refers to the human movement caused by the resources destruction in the places of departure. In an effort to complement and extend the horizon of analysis, this article is more concerned with the effects of migrants' activities. Migrants are attracted by the abundant forest resources in host areas whatever their reasons for leaving their original environment.

The major concern of the study is to analyze the sustainable development principles applicability to migration. This is the prevention principle, which aims at implementing rules and actions to anticipate any environmental damage in case of proven risks. However, given the complexity of the migration mechanism affecting forest resources, some questions have to be asked, "Is this principle really applicable to migration, a

forest degradation factor?" In other words, this article attempts to answer the question "What is the best option between mitigating the movement by taking preventive measures and adapting to the effects by managing the migration impacts in host areas?" This article has two parts; the first one consists in characterizing the migration related to forest degradation in Madagascar. It puts an emphasis on the description of the main migration flow from a national level and their impacts on forest resources. The second part will deal with the scope and strength of sectoral public policies or other specific interventions to regulate this migration that threatens this natural capital. A strategic outlook will be released at the end of this section.

2. Methodology

Given the crucial role played by forests in a country's development, first, as an asset that generates environmental goods and services and second, as an endangered resources due to migration, the present study is to analyze and demonstrate in what way the precautionary principle contained in the sustainable development principles can be applied to the management of this human factor (migration) that causes forest degradation. The precautionary principle was defined in French law by the 1995 Loi Barnier in accordance with Article L.110 -1 of the Environmental Code as the precautionary and corrective measures for the damage to the environment, using the best techniques

available at an economically acceptable cost. This principle seeks to remove at source the environmental impact, and consequently its associated risks. The methodology is based on a qualitative approach that seems most appropriate to the investigation's objective. Regarding data collection, the information used is from more than 20 field works in different areas of Madagascar for 12 years ranging from 2000 to 2012. The collection was based mainly on interviews with resource persons combined with direct observations, and was completed by consulting the additional information provided by scientific papers and work reports. About the data processing, the analysis focuses on two study areas known as the migrants' places of departure and host area. It consists of sites located at the southernmost of the Big Island where three cases were treated, and localities northeast illustrated by two cases. Given the multiplicity of possibility, the study is limited to the main migration flows that impacts on the forests condition. To better characterize the migration, you should first determine the main stream. Then, the next step is to analyze the practices in the forests, their impacts and their origins. Once this mechanism apprehended, we must see the possibility of prevention or mitigation by analyzing the reasons for the migrants' departure in their places of origin and the sectoral public policies' strengths and limitations to regulate the trend. In the case where the preventive measures application proves to be extremely complicated, provisions to adapt to the migration impacts will be suggested.

3. Results and Discussion

3.1. Characterization of migration

This description is powered by five case studies which involve three sites in the south and two in the north of Madagascar.

From Androy Region to Boeny Region

Thanks to supports from the Domestic Energy Project (MDPE) in 2000 and the CARAMCODEC project in 2009, a charcoal burners association called MAMELONARIVO was created in the rural town of Tsaramandroso in Boeny Region. Management of forest plots included in the delineation was transferred to the Community Based Management (COBA) and the related management plan generally distinguishes two main areas: integral protection zones and char-oriented plots. The total forest extent reached 2,150 ha. Rasoanaivo (2010). In 2008, migrants with about twenty individuals have infiltrated clandestinely plots managed by COBA. To deal with this situation, the association officers have filed a complaint at the Boeny's regional forestry administration, and these illegal occupants were arrested. Afterwards, they were expelled from these places in 2009 by a raid with police. Then they were brought to the prosecutor and were subjected to imprisonment. But from 2010, offenders were released for unknown reasons and returned to the forest areas managed by the association. According to the Boeny's regional forestry administration estimation, in 2012, nearly 400 people have created villages in this forest and are still inviting distant families to join them. According to the forest-managing association's officials, in 2012, one third of the core surfaces estimated at 750 ha was damaged by the clear cutting practice. They have even observed cornfields as far as their eyes could reach in these burned areas.

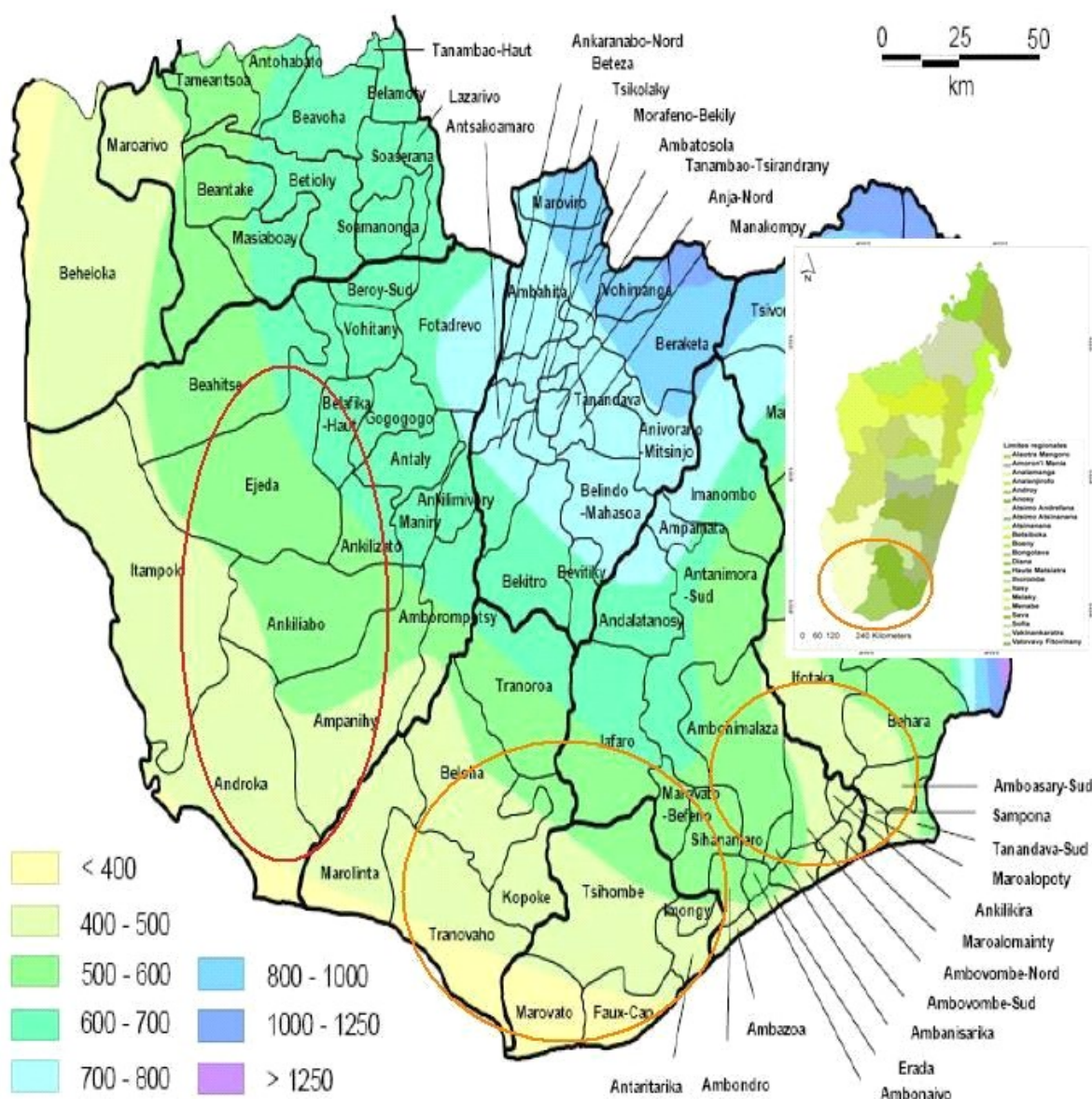
Migrants use removed trees as charring materials. The members also found that in 2012, 2 to 3 charcoal trucks per day came out of the forest with an estimated load of 350 bags of charcoal per vehicle. As for the origin of these individuals, according to COBA officials, these illegal occupants consist mainly of natives from the southernmost point of the Big Island belonging to the Antandroy ethnics.

The main migrants' areas of departure (Figure 1) are included in the driest localities of Madagascar which are affected by recurrent famines. When food shortage develops into a famine situation, thousands of people flee the region as in 1991-1992 (BIDOU et al, 2007): it is a human evaporation due to drought according to the head of the Ambovombe District cited by DECHAMPS in 1959. Added to these climatic and dietary factors are cultural reasons. Indeed, the Antandroy ethnics' primary ambition is to build up a zebu herd, increase it and return in the village with pride as an "important man". Migration is a way to accumulate wealth in order to fulfill these needs. Southerners always feel thirst for accumulating cattle in all big events of life SAMISOA (2001). A mission carried out in migrants' areas of departure has informed that in 2011, 4 truckloads of emigrants per week leaving the Beloha District. The main departure points of migrants reported by interviewees are circled in the map 1. This is Betioky, Ampanihy Beahitse, Ejeda, Faux Cap, Beloha (Figure 1).

From the Androy Region to the South West Region

Between 2000 and 2006, migration into the forest especially near Tolikisy, Ankikiky Andalakazo in the East of Andranovory on the N7, was significant compared to other previous years (RAMAMONJISOA et al, 2012). This shift is related to the conquest of forest land favorable to corn cultivation by clearing practice. Deforestation is thus a means of land appropriation for the maize cultivation. The importance of demand for corn, which represents the main diet of the peasants in the southernmost region, associated with periodic famine, largely explains this migratory dynamics. Indeed, most of the migrants come from regions of Beahitse, Betioky, Ejeda, Ampanihy and Ambovombe where shortage persists (Figure 1).

Figure 1: The main migration departure areas in the South of Madagascar, modified of (BIDOU et al, 2007).



With an individual average area of 5 ha and more than a thousand producers, the impacts on forest resources are not negligible. According to (RAZANAKA et al, 2001), the survival of forestry formation in the South West areas is more than threatened, based on a deforestation rate of 25 km²/year and stating that the area between the Onilahy and Fiherena is a reception area for migrants from the southern region (Mahafaly and Antandroy). Working in the same areas, in 2008, RAZAFY estimated the deforestation extent to about 2000 ha per year based on a diachronic analysis between 2000 and 2005. For one hectare of cleared forest, a clearer could generate a total profit of 1,683,988 Ariary (€ 842) per hectare per year. As most of the settlers came from the extreme south of the island, their temporary migration generate annually over 3.4 billion Ariary (1.7 million €) cash flows (RAMAMONJISOA et al, 2012). But the practice persistence is not only attributed to monetary incentives. Indeed, most of the migrants come from regions Beahitse,

Betioky, Ejeda, Tsihombe, Ampanihy Ambovombe which are subject to recurrent famines (Map 1). The clearing is done in order to overcome the food deficit both for migrants and their families who are victims of repetitive famine in these places of departure. In fact, the corn produced by the settlers in these study areas contributes in large quantities to supply the South with Tsihombe, Ambovombe, Antanimora. The practice of burning contributes to the production of 60 to 70 % of the total maize crop in the Toliara region as estimated by collectors (RAMAMONJISOA et al, 2012).

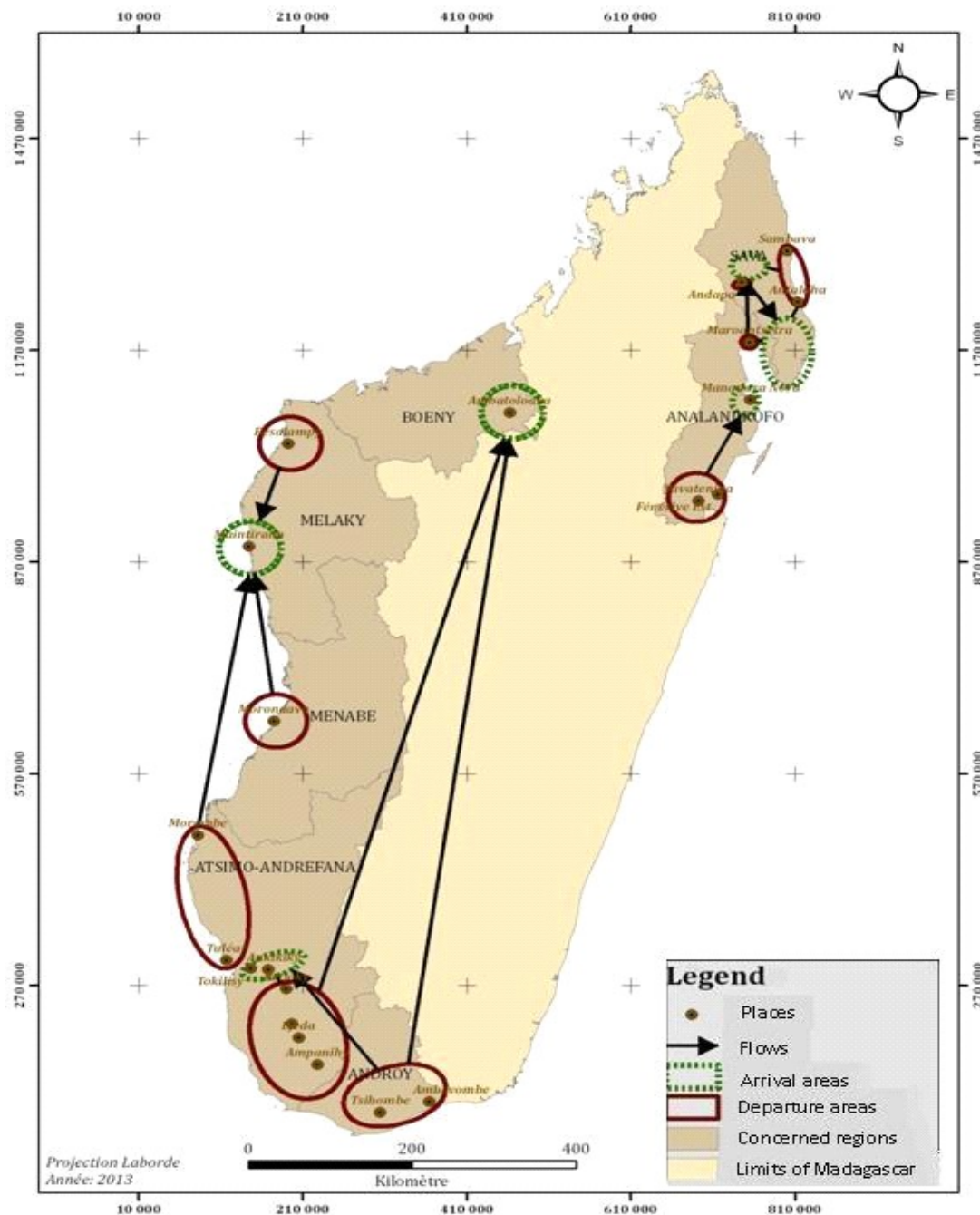
From the Southwest Region to the Melaky Region

The study developed in this section will focus on the case of a migrants' reception village called Ampasimandro included in the Maintirano District, Melaky Region in the western part of Madagascar. It is a traditional fishing village living mainly of marine and coastal resources. The majority of migrants

from this area come from Besalampy Morombe, Morondava, Toliara and (Figure 2) Rakotomanana (2012). The reasons for migration in this area are consistent with the view that

fishermen are especially attracted by the shark fishing (*Carcharhinus* sp) and sea cucumbers collection.

Figure 2: The main recent migration flows impacting forest areas in Madagascar



According to Razanakoto, in 2008, fishermen in this migrants' arrival area do not have the required knowledge for trepang collection and shark fishing. The abundance of fishery resources in the Melaky Region also explains the fishermen massive displacement. Interviews conducted in the villages in the starting zones confirmed the gradual decrease in the fishermen catch. This decline in production would come, according to them, from the large number of fishermen who frequent the usual areas, and from the new fishing gears Razanakoto (2008).

The final settlement of migrants mainly from 2000 favored the intense use of mangroves for house construction. Villagers collect mangrove wood for their daily needs. The majority (95%) of houses finds its raw materials in this ecosystem while a house consumes about 5.75 m³. To illustrate the intensity and the importance of migration dynamics in the host sites, the number of Ampasimandroy inhabitants increased from 872 to 1087 between the May 2011 and July 2011 according to the Maintirano's "Service de District de la Population et des Affaires Sociales" census (District's Population Service and Social Affairs). Thus, about

100 migrants per month arrived and settled in Ampasimandroro (Rakotomanana, 2012). Indeed, the surface losses that are estimated to 1400 ha between 2000 and 2010 could be attributed to the permanent settlement of migrants who use wood for construction. Following a cross, these mangroves destruction periods roughly coincide with the traditional fishermen's massive departure from the south of the island. According to Razanakoto, in 2008, the last ten years, fishermen began to move to other fronts that extend to Maintirano. This more or less permanent migrants' system poses a potential threat to the sustainability of host localities' mangroves. It will be exacerbated by the decline in fishing catches in these areas. According to a survey conducted in 2012 in a few Ampasimandroro villages, 76.19 % of fishermen believe that the amount of seafood has decreased for 10 years Rakotomanana (2012).

Migration within the Analanjirofo Region

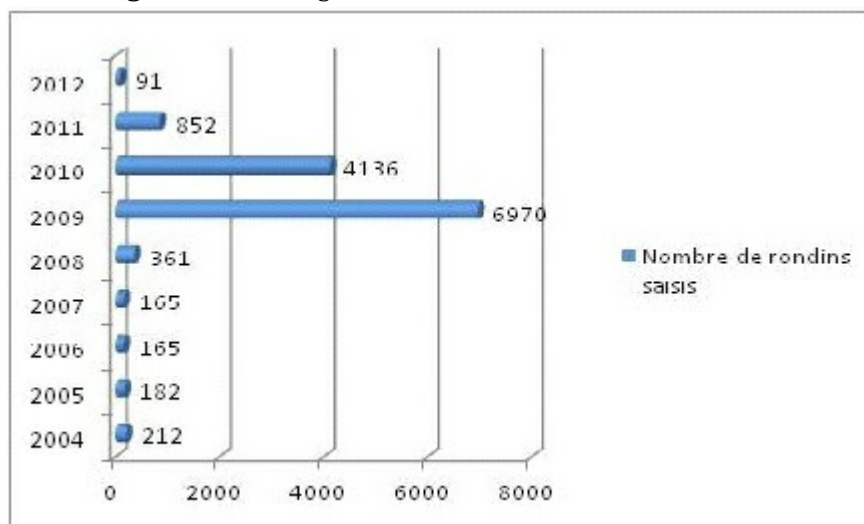
Located northeast of the Big Island, the District of Mananara is the national capital of cloves with 2000 tons average annual production. The myrtle tree's maintenance and the clove-picking require a large labor force. Now the area is sparsely populated and growers of cash crops, especially cloves in Mananara, were obliged to bring round external labor force to support these operations. This has resulted thereafter the phenomenon of mass migration at the regional level especially after 1993, when a gradual price increase of this annuity product in the international market was observed. In 2010, the economic gains were significant for each collector has received 10.3 Euros per day at a rate of 2.3 Euros per kg of cloves, which is 7762 Euros in three months of harvest. These migrants come mainly from districts of the same region as the hosting area. It

is thus an interregional migration linked to agricultural activities. With regard to deforestation, the average speed was estimated at 2.60% between 1992 and 2000. During the same periods, 761 or 370 ha of tavy plots were recorded annually in the park, located almost entirely on old clearings (BRAND et al, 2010). We were able to identify the hypothesis on the existence of a correlation between the cleared surfaces and the price of cloves. Moreover, interviews with local resources in Mananara in 2010 allowed saying this trend. In fact, the hired labor force in plantations including migrants has gradually converted to planters. The practice of clearing was a way to acquire suitable land for the medium and long term clove planting. This strategy of development was confirmed by the study of (RABEMANANJARA et al, 2012). After clearing, a series of fields are settled on new plots: rice growing is set up at first, then followed by food crops and finally cash crops, especially clove planting that permanently colonize the area. Forests in these areas are not protected from the threat of clearing with the rising prices, knowing that clove price has raised four times higher since the 2010 production year compared to previous years.

Migration within the SAVA Region

In recent years, Madagascar has been famous for its illegal rosewood logging which usually takes place within the protected areas of Masoala and Marojejy. The trend is particularly pronounced since 2009 when illegal logging has taken a considerable scale. The importance of sampling is illustrated by the number of logs seized in the Masoala National Park between 2004 and 2012 (Figure 3).

Figure 3: seized logs in the Masoala National Park in 2012



Sources: Madagascar National Park, 2012 (personal communication)

As the value chain has several operations, residents alone cannot ensure the production and disposal of products in large quantities. The round wood log transport weighing 300 kg requires at least six men because of the high density of rosewood. Based on field observations by GLOBAL WITNESS in 2009, from 70 to 100 trees were felled daily in both Marojejy and Masoala National Parks. Loggers responsible for

slaughtering, cutting and peeling and the logs' longshoremen are mostly people from outside.

The same source said the migrants are integrated in support of residents, especially in the upstream value chain. Several students from the town of Antalaha and Maroantsetra move massively in the rural areas to work in rosewood logging in

order to finance their school charges. According to the same source, most people hired by these sub-collectors come from other parts of the Region, mainly the Antalaha region. Several socio-economic parameters promote the appeal of migrants to illegal logging FAO (2012). Indeed, they have benefited from the existence of transient speculation that reports a considerable share in the household budget. The lack of youth access to land cultivation and the falling price of vanilla only amplify the situation.

3.2. Preventing or adapting to the effects

Most of the treated cases in this study demonstrate concretely the government's impotence, via the forestry administration or the local structure in the migration control that has destroyed forests. Regarding the migrants' infiltration in plots assigned to communities in the southwest of the island, residents have tried to prevent the arrival of these migrants by asking the forestry administration's support. However, local communities have also decided to practice shifting cultivation on a resource because of the external actors' physical threats and the unsatisfactory response from the forestry administration (RAMAMONJISOA et al, 2012). As regard the island's northwest region's case, in view of the regional forestry administration's impotence, members no longer know who to turn to in such cases. According to them, they have not yet found the best solutions to expel migrants. With regard to the island's north region's case, a massive involvement of migrants working for the accounts of big bosses is supposed, for illegal logging continues to this day and the state is unable to control the situation.

The government's various attempts to organize the population's migration since independence until now have not been seen successful. To cause and organize migration, the State has established favorable reception conditions with different kinds of incentives on specific areas. Yet these organized migrations have often failed because the newcomers cannot easily integrate into the local populations and are faced with problems of insecurity which is fostered by the host areas' remoteness and isolation (RALANDISON et al, 2011). A spontaneous phenomenon of migration has developed from 1975 until the 90s, most often from the East to the West of the Island. The opportunity granted by the 60-1271 Act on crop clearing and a leaders' double incentives from socialist era - "mamokara, mamokara" or "excessive production", "earth will belong to the one who values it") - in early 80s have contributed to the worsening of this phenomenon, causing migration throughout the island and leading to deforestation for everyone felt entitled to clear the forest he coveted. Human displacement in the country is also facilitated by the permanent contact between migrants and their families in the departure communities. The communication development through mobile phone took part in maintaining this connection. In general, the payment of travel expenses for new immigrants is due upon arrival because they do not have the financial means. Actually, according to the Ambovombe observatory's finding (BIDOU, et al, 2009); "poor" and "very poor" households are more affected by departure than "better-off" households. The existence of transport links connecting poor departure areas and reception areas also promotes human migration. But other parameters

such as fluctuation in annuity prices on the international market, as well as socio-political crisis favor migration.

On the basis of these observations, prevention of migration, which is among the main causes of forest degradation in Madagascar, remains extremely difficult because the phenomenon results from the combination of multiple factors: climatic, cultural, economic and social (interconnected). Moreover, the various governmental incentives for planning migration have not been successful in Madagascar. It is also known that migration is one of the few options for survival especially for poor households who do not have other alternatives. At the same time, there are many factors facilitating human movement. This allows us to deduce the prevention's limits in the migration context that harms the Madagascar's forest condition. This is why adaptation to the effects seems the most effective and realistic option. The priority adaptation measures recommended to delay the negative effects of migration on forests in Madagascar is to recognize the forest's function as land reserve and to reorganize the uses of forest areas nationwide. The basis of this strategy is to downgrade forests which are considered as potentially useful to the economy, whether for agricultural activities or for products development. In this case, it is important to build the "Ivorian economic miracle" between 1960 and the mid-80s that resulted from income coming from the forest resources exploitation, focusing particularly on the forest's agronomic potential. In this perspective, the government's participation was essential. In fact, the new administration has made the deforestation organization to establish commercial agriculture providing foreign exchange for the country (LEONARD et IBO, 1994). The State's intervention was primarily committed to establish a legal framework guaranteeing free access to forest land and infrastructure for the rapid development of these forest areas. Coffee and cocoa plantations replaced primeval forest clearing. The impacts of this decision were economically considerable as real GDP increased at a rate of 8% per year during those times. When this reform will be applied to Madagascar, it should provide multiple benefits to the country's development. On the economic front, it helps to strengthen the competitiveness of Madagascar's annuity products and subsequently to improve the actors' incomes. On the social front, it contributes indirectly to the organization of migration as the development of these planting activities will require substantial external labor force. The impacts of cloves' price boom in the region Analanjirofo is taken as an example to illustrate this argument. The quadrupling of the cloves' price from the 2010 campaign resulted in significant migration of agricultural workers to potential clove production areas including Mananara District. This price improvement has increased the consumption of goods and services and has attracted national investors and hawkers from other regions of Madagascar.

In this case, the migration took place spontaneously without the State's intervention. However, the state must currently define a space organization system to avoid conflict between the clove production and the forest management. In return to forest's downgrading, there should be compensation funds granted by deducted taxes from commercial activities

in the forest. The aim will be to preserve the forests in areas devoted exclusively to this type of management. The funds can go directly to national foundations working in this field in order to finance conservation activities. This approach which is based on a multisectoral vision integrating key sectors priorities will ensure the adaptation measures' effectiveness. There should be discussions on finding the right way to manage forest areas in each region, and especially on the balance between forest and agricultural lands. They should be well defined multisectoral supporting and sustainable measures, such as balancing forest protection and exploitation especially in rural development projects areas.

3.3. Conclusion

At first, the article has helped to bridge the knowledge gap by developing a summary on how migration is affecting the forest environment in Madagascar. Human displacement affects several ecosystem types especially mangroves, dense forests and dry forests. The logging and clearing for cash crops and foods are the migrants' main practices in forests of host sites. The reasons for migration are variable and complex as they cannot be explained only by economic considerations but also include social, cultural dimensions. Unlike the environmental migration concept that takes into account the individuals' departure as not related to the destruction of resources on residency locations, the analysis put more emphasis on human movement favored by the abundance of resources in distant host areas. It is partly due to the imbalance of resources in a country.

This study was able to conclude that it is better to adapt to the migration's effects than to prevent it. Measures based on the adaptation of the forest's use in Madagascar, leading to an optimal and ecological economic development seem to be the most appropriate solution. However, several aspects have not been mentioned in this analysis. The described human flows in this article are not exhaustive given the existence of significant secondary movements in other places. The Island's southeastern part which is recognized as an important departure place of formidable clearers is not taken into account. The temporal dimension of migration also warrants further analysis for it is still quite unclear in this study. Similarly, the dynamics of the area's use by migrants will be avenue for research.

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