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Economic activities and their impacts on the ecosystem and biodiversity in Madagascar (Case of the Eastern region)

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Abstract: Extraction of wood for daily domestic use mainly for charcoal and construction are huge pressures on forests, even if restoration is carried out. Their impacts are considerably increased in the eastern region of Madagascar, due to unregulated and disproportionate economic activities mainly due to unemployment. The objective is to publicize the impacts of economic activities in the target sites. Socio-economic surveys were conducted followed by data analysis using econometric models. Questionnaires on the reasons for logging and / or forest conversion in relation to the activities of the inhabitants, the species of trees exploited in the forest restoration zone for the manufacture of charcoal, the quantity of trees felled, their diameter and the impacts on forest degradation were posed. Variances and standard deviations were calculated for the results obtained. Thus, the impacts of economic activities are significant. The use of fast-growing native species for forest restoration and the promotion of the use of efficient cook stoves or "fatana mitsitsy" were recommended.

Keywords: Economic activities, degradation, fast growing autochthonous plants, innovative thrifty stove.

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1 Introduction

An economic activity is a process which, from inputs, leads to the manufacture of a good or the provision of a service. The classification of activities divides the economic activities into categories which, by aggregation, make it possible to define the sectors of activity (Agriculture, Industry, Construction, Trade, etc.). Ecosystems are essential to life and provide us with food, building materials and energy. They guarantee the quality of the air we

breathe and the water we drink. However, the increase in demand for natural resources is leading to unprecedented environmental degradation in the world. [13]. Man is not a passive being. “Being in the world” is a “being there” whose immediate daily world is the surrounding world. He carves out an environment that he undertakes to transform into a human habitat. From all sides, it is rooted, surrounded, provoked. The first movement he makes to free himself from animosity and anonymity is to take possession of his environment. There is something irreducible in him [2]. Only 23% of land areas (not counting Antarctica) and barely 13% of maritime areas would still be preserved from human activities [26]. Man is responsible for the desertification of certain regions due to deforestation; the depletion of agricultural land due to an agriculture exclusively focused on productivity; soil and water pollution due to fertilizers and industrial waste of all kinds; air pollution linked to the emission of toxic gases... All these phenomena have a direct and immediate consequence on our lives, resulting in a reduction in biodiversity, the outbreak of certain infections or diseases, the displacement of population to survive, situations of impoverishment for others (https://www.notre-planete.info/actualites/805-homme_environnement_defi_temps). According to the same author, one must be aware that to satisfy his primary needs, Man is often ready for anything, even if this is to the detriment of the Environment in which he lives. If he has to cultivate to feed himself, he will not hesitate to clear the land, at the risk of destroying the forest. If his only source of food comes from the sea, he will not ask himself the question of the reproduction cycle of the different species of fish before going fishing. If his survival hangs by a thread, he will not hesitate to seize the opportunity of a job in a neighboring industry, even if the latter is recognized as polluting the environment and the health of local populations. Moreover, all these pressures accelerate thehe climatic risks in Madagascar. Madagascar is a country plagued by great poverty, food insecurity, strong population growth and the exploitation of its natural resources. The country faces challenges in terms of development and environment which could be intensified by climate change (rising temperatures, less and more variable rainfall, more frequent droughts, more intense cyclones and rising ocean level) [27]. The big island is a country vulnerable to climate change, while it is very rich in natural capital, given its endemic biodiversity at 90% [19], many of which are threatened with extinction due to habitat loss and fragmentation, agricultural expansion, invasive species, overfishing; climatic changes[10],[24].

Moreover, economically, about three quarters of the Malagasy population live below the national poverty line and suffer an annual loss of 9 to 10% of GDP due to environmental degradation. [19]. The business model (characterized by the production system, the ecological footprint of our lifestyles and the increase in trade) is at the origin of several of the direct factors of biodiversity degradation (IPBES, 2020). According to the same author, changes in land use, through fragmentation andhabitat destructionthey induce, constitute the most impactful pressure on biodiversity. Almost everywhere, its action has modified the ecosystems and very often, this has resulted in the destruction of certain natural environments and the degradation of the environment. [26]. In 2002, the results of the household survey, published by the National Institute of Statistics (INSTAT), in November 2003, firewood and charcoal remain the main fuels used for "households" Malagasy, even in urban areas. Thus, more than ¾ or 81% of households in the Capital use this charcoal as fuel, according to this Institute. In addition, 44% of natural forest cover was lost between 1953 and 2014[25], mainly due to slash and burn agriculture for subsistence farming and charcoal production as well as illegal removal of rosewood. If these rates continue, habitat loss will threaten the persistence of many endemic species [17].

The Atsinanana Region is the third of the former Province of Toamasina according to the geographical and administrative division of the territory of the Republic inscribed in the Constitution of the Fourth Republic of

Madagascar. This Region is very rich in natural resources, whether non-renewable, as evidenced by the abundance of mining resources such as nickel and cobalt, and renewable, as evidenced by maritime, river and forest resources, hence the popularity of the old question "Raha oviana no ho lany ny alan' Atsinanana? (literally when will the eastern forest have disappeared? ». In addition, demographically, [4]. However, the reduction and/or above all the depletion of the natural resources that make up the environment inevitably promotes its degradation. Despite this, this situation is quite logical for our country given the economic situation by speaking of the non-existence of job creation and infrastructure since people have no means of meeting their needs apart from exploitation. of mother nature, the only source of wealth creation, especially for rural dwellers. By evoking the How is it that limiting our need for natural resources is an insurance for our survival? The inhabitants are unaware that the impacts of their activities are the main causes of environmental degradation which is a burden not only for them but for humanity and the economy of the country.

In addition, research results have shown the existence of an improved oven or fatana mitsitsy whose manufacturing goal is to reduce the amount of charcoal used per household in order to preserve the environment and biodiversity. These improved ovens are sold in Toamasina (figure 1 in appendix) and have been used in some suburbs of the city of Antananarivo [21]. Also, given the incessant rise in the prices of the JIro sy RAno MAlagasy (JIRAMA) on the electrical energy consumed by household, given the exorbitant price of fossil fuels, some rural and even urban inhabitants want to use the "Fatana mitsitsy" with coal wood which corresponds to their very low standard of living. The question arises whether the inhabitants of the target sites are interested in the use of “fatana mitsitsy” which can, therefore, reduce family expenditure and achieve a fairly significant saving.

The overall objective is to make known that the environment and economic development are two inseparable elements. The specific objectives are: to demonstrate the consequences of human needs on nature and to make known their impacts on the economy and between humans.

And taking into account the problem above, this research leads us to two hypotheses: the unsustainable use of natural resources exposes humans to total danger whatever the reason and preserving the environment is preserving humanity; the degradation of the environment contributes to penalize the productivity and the incomes of the people, it is the principal source of the social conflicts

2 Context

2.1 Location

The fokontany (meaning the smallest Malagasy administrative entity) Ambodisaina (18.13648°/ 49.36043°) is located 7 km south of the National Road RN2, with an estimated area of 25 km2. It is located at an altitude of 17m [11]. It is part of the suburban commune of Toamasina in the district of Toamasina II, Atsinanana region and the Province of Toamasina. It includes 33 villages. The name Ambodisaina is literally translated "at the foot of the flag" (Communal Development Plan, 2021), a name relating to the raising of white flags as a sign of capitulation, during the attack of the French soldiers on the armies of Queen Ranavalona III, in 1895.

2.2 Climate

The climate of the Atsinanana region is of the hot and humid tropical type with high rainfall, decreasing from the east towards the interior. The trade wind, characteristic of the east coast of Madagascar, blows there permanently. The annual minimum temperature varies from 20.3°C to 20.9°C while the annual maximum temperature varies from 28°C to 28.9°C, the average annual rainfall varies from 1770 to 2780 mm between 2016-2020 (Regional Meteorological Service, Toamasina, 2021).

2.3 Relief

The Atsinanana region is characterized by an altitude of 0 to 300 m on the coast, 300 to 800 m in the eastern part with a steep cliff of 900 to 1200 m in the eastern part.[13].

2.4 Geology

The Atsinanana region has two types of geological terrain: sedimentary terrain and crystalline terrain. These are alluvial deposits, sands, sharp dunes, unsolidified sandstone bordering the coast, from Toamasina to Mahanoro. Largely of graphite type, the crystalline terrains are observed in the part of Toamasina and Vatomandry, Mahanoro, Marolambo and Antanambao Manampotsy.

2.5 Hydrology

The Atsinanana region is served by many rivers, most of which have fast currents in the middle of their course. Entering inland, there are many lakes and rivers, including the Pangalanes canal, dug by the populations under the native regime from 1896 to 1904, to facilitate the transport of men and products on 665 km, of which 247 km cross the regional territory from North to South, to the Regional capital, Toamasina (Tamatave) and its port, the 1st deep-water port of Madagascar, in the Indian Ocean (http://www .regions-francophones.org/actualite/2785/5606-la-region-atsinanana-a-madagascar.htm).

2.6 Flora

In general, the plant formations of Fokontany Ambodisaina are predominated by secondary forests or savoka, a form of degradation of the evergreen dense humid forest, characteristic of the Atsinanana region.

2.7 Wildlife

The Atsinanana region has an inestimable and even endemic rich fauna. In the evergreen humid dense forests, one can meet seven species of lemurs, 7 species of micromammals, 31 species of fish including 3 species that are seriously threatened. [13]

2.8 Human frame

The Fokontany of Ambodisaina comprises 17,041 inhabitants sheltering in 150 roofs (data available in 2020) (Commune suburbaine de Toamasina, 2021). The regional economy is based on port activities, mining, agriculture, livestock and fishing. Food, fruit and cash crops are grown on more than 24,000 ha. In addition to the manufacture of charcoal and illegal logging for the extraction of wood useful for construction, the inhabitants live at the expense of the manufacture of traditional alcohol or "betsa" and mining (figures 2 and 3 in the appendix).

3 Study methods

Three phases have been adopted as study methods. The first is the preparatory phase which consists of the search for the best possible information in addition to our theoretical knowledge in the management and economy of environmental natural resources. The bibliographic analysis in documentation centers and on the Internet was carried out. The second phase consists of socio-economic surveys for 13 days from November 26 to December 08, 2021 in the Ambodisaina fokontany, and in the suburban commune of Toamasina. A survey sheet was developed. Questionnaires were asked there, the main ones concerning the reasons for the exploitation and/or forest conversion, the species of trees exploited in the reforestation areas for the production of charcoal, the types of charcoal according to the species of origin according to their preference, the quantity of felled trees, their diameter and the consequences of forest degradation. The socio-economic surveys were carried out with respondents in the target sites: local elected officials (Mayor of the Commune, Chief Fokontany), civil servants, traders, farmers, miners, coal miners, the Vondron'Olona Ifotony or village community that manages protected forest areas, and with public establishments (municipality, Regional Meteorological Service, University of Toamasina). natural resources and sustainable conservation. The quantitative and qualitative data collected are statistically analyzed.

4 Data Analysis

Based on data on the areas of rice fields at the time of colonization, the percentages of areas of abandoned or uncultivable rice fields were calculated for 122 years, 123 years, 124 years and 125 years. The same is true for the average dropout rate, the variance and the standard deviation

4.1 Determination of percentages of areas of rice fields abandoned or uncultivable for 121 years, 122 years, 123 years, 124 years and 125 years noted: SRA or SRI and rate

We notice:
N: the total area of the rice fields of Fokontany Ambodisaina 146.4 ha at the start.
a: the respective areas from 2017 to 2021: 52 ha, 45 ha, 38 ha, 35 ha and 29 ha
Formula :
SRA: Surface of Abandoned Rice Fields or Surface of Uncultivable Rice Fields

$$SRA\ ou\ SRI = \frac{a\ x\ 100}{N} \quad [1]$$

4.2 Determination of dropout rates

We used the rate formula (i) in financial mathematics[5] assuming that Vn: acquired value (area of the previous year calculated), V0: current value (area of the year calculated) and n the periods between the years.
Basic formula:

$$Vn = V0.(1 + i) \quad [2]$$

$$i = \sqrt[n]{\frac{Vn}{Vo}} \quad [3]$$

Table 1. Summary of SRA or SRI calculation in % and annual rates.

Years	2017	2018	2019	2020	2021
n	1	1	1	1	1
SRA or SRI in %	35.51	30.73	25.95	23.90	19.80
I	7.4	17.1	4.1	9.8	Awaiting 2022 data

4.3 The variance and the standard deviation with respect to the areas 52 ha, 45 ha, 38 ha, 35 ha and 29 ha

$$Moyenne = \frac{199}{5} = 39.8 \quad [4]$$

Square deviations of each value noted In:

$$E1 = (52 - 39.8)^2 = 148.84,$$
$$E2 = (45 - 39.8)^2 = 27.04,$$
$$E3 = (38 - 39.8)^2 = 3.24,$$
$$E4 = (35 - 39.8)^2 = 23.04 \text{ et}$$
$$E5 = (29 - 39.8)^2 = 116.64 \quad [5]$$

Variance (V) is equal:

$$V = \frac{318{,}8}{5} = 63.76 \quad [6]$$

so V = 63.76

Standard deviation (E) equals square root of the variance:

$$E = \sqrt{63.76} = 7.98 \quad [7]$$

so E = 7.98

5 Results

5.1 Human needs and their consequences

Conversion of natural environments and rice fields

Concession land and rice fields at the beginning of 1896. The area of rice fields in the fokontany were shared by the settlers, whose area was 146.4 ha. According to the results of our surveys, according to the chief fokontany, this area of rice fields continues to decrease from 52 ha to 29 ha, i.e. from 19.8% to 35.51%, until today: in 2017: 52 ha, in 2018: 45 hectares; in 2019: 38 hectares; in 2020: 35 ha and in 2021: 29 ha.

According to the surveys, the forest is converted into agricultural land. Also, agricultural land and forests are converted by the inhabitants into quarry land. Because of the erosion of loose soil following forest degradation, sedimentation is felt in the lowlands, particularly in the rice fields. There is also the lack of rain due to climate change, to feed their rice field. leading on the one hand to a drying up of rice fields and swamps, an impact on the production of fish in the rice fields and marshy areas, and on the other hand leading to a reduction in agricultural yield, which cannot cover the cost during the preparation of the rice field. Thus, rice production is negligible, inducing the backfilling of rice fields by their owners for the construction of houses (which are then for rent). Part of the paddy fields once backfilled were used as spaces for drying agricultural products such as cassava. All these developments explain the decrease in the area mentioned above.

In addition, it is necessary to point out the overexploitation of natural resources, especially forestry, by a small group of 68 individuals, i.e. 0.4% of the population, who work as charcoal burners, but the impact is heavy in terms of tree felling (Table 1). Thus, the needs of man have led to the destruction of natural ecosystems, the reduction of their surface area as well as their production.

5.2 Depletion of large trees-charcoal production and its consequences

Table 2 gives the average number of trees felled in the Ambodisaina fokontany for the production of charcoal. The size of the felled trees varies from 35 to 70 cm in diameter. Also, 24 to 114,240 feet per year were felled to fill a 2m² furnace. Each charcoal burner has one or two kilns depending on the size of shaft they use. A kiln can produce 10 to 12 bags of charcoal per week, or 2,720 to 3,264 bags per month and/or 32,640 to 39,168 bags per year at a price of 11,000 Ariary to 18,000 Ariary per bag (Table III). This justifies the exhaustion of large trees. It has been mentioned that 0.4% of the inhabitants live at the expense of the manufacture of coal. The remaining 99.6% are in total suffering, especially housewives, since the collection of dead wood necessary for cooking food takes up almost an hour of the inhabitants' time, which cuts back the time devoted to work (agricultural and/or other) and therefore contributes to lower incomes, food quality and consumption.

As far as construction is concerned, 98% of the habitats are built with local materials (falafa, volo, ravinala, and wood…), these are traditional houses or huts. Due to the overexploitation of the forest, the quantity of exploitable wood (with a diameter of more than 35 cm) decreases tangibly: in the space of 4 years from 2017 to 2020, the price of wood has soared by 200 to 250 percent (round wood costs 700 ariary per piece in 2017 whereas today it costs 1700 to 2000 ariary per piece). As a result, residents have difficulty finding raw materials such as wood for their construction. In addition, in the Ambodisaina fokontany, the degradation of the environment penalizes the 90% more of the population who indirectly draw their benefit provided by the naturel resources notably the forests to the profit of some group wich directly draws their benefit speaking about the producers, sellers and collectors (of charcoal, construction wood, Toaka gasy and Betsa), mining operators etc.

Table 2. Average number of trees felled in the Ambodisaina fokontany for the production of charcoal.

Species	Tree trunk diameter (in cm)	Average number of feet felled per week	Average number of feet felled per month	Average number of feet felled per year
***Eucalyptus, Acacia mangium*and others**	45 to 70	24 to 30	6,528 to 8,160	78,336 to 97,920
Grevillea banksii	35 to 40cm	30 to 35	6,528 to 9,520	78,336 to 114,240

5.3 Preference of species used for charcoal making according to inhabitants and their respective prices

The following table gives the preferences of the inhabitants with regard to the species of trees used for the manufacture of charcoal and the prices of the bags of charcoal. These are reforestation trees and forest trees whose names have not been specified. According to this table, in Ambodisaina, the Grevillea banksii species is widely used by the charcoal burner given its abundance and much sought after by the household (40%), it is the 1st choice due to its quality of embers that are too hot, come by then eucalyptus charcoal, second choice by the inhabitants, of which 10% of the inhabitants use it (Table 3).

Table 3. Choice of trees used in charcoal making and market price.

Species names	rank of choice	Utilization Percentage (%)	Price in ariary of the 50kg bag on the market
Grevilia (Grevillea banksii)	1st choice	40	16,000 to 17,000
Kininina (Eucalyptus robusta)	2nd choice	10	16,000 to 18,000
hazo ala (unspecified)	3rd choice	14	15,000 to 16,000
Akasia (Acacia mangium)	4th choice	31	13,000 to 14,000
Others	5th choice	05	11,000 to 12,000

Table 4. Activities of the inhabitants and their situations in the face of environmental degradation in the Ambodisaina fokontany.

Denomination	Percentage (%)	Situation
Farmer	47	affected
Breeder	13	affected
Hunter and Gatherer	0.6	affected
Logger	08	affected
Producer of local drinks	0.4	affected
Official	06	Not affected
Others	24	Not affected

This table shows us that all the activities undergo the projection of the impacts of the degradation of the environment in the Fokontany of Ambodisaina except the civil servants.

It can be seen that the price of the bag of charcoal increases over time (the year). In 2006, this price increased 2.5 times more than in 1996, ie an increase of 250% in the space of ten years. To remedy this increase, households want to use the "Improved Hearth", which reduces the quantity of charcoal consumed compared to that of other types of "Fatana", for example, the "Metal Fatana", with charcoal. drink [21]. According to the same author, these people say that with this "metal Fatana", the monthly consumption of charcoal is around two bags per month, i.e. Ar 20,000 while with "Fatana mitsitsy", it is reduced to one (1) bag and a third (1/3). The third is purchased at Ar 4000 (2006), ie an expenditure of Ar 14,000 per month, which entails a reduction of 30 to 35%. Therefore, the family can, if they use this “Fatana”, save at least Ar 6,000 per month; it is still a significant saving for a modest family.

5.4 Environnemental degradation and illicit occupation : sources social conflits

According to the inhabitants in the fokontany Ambodisaina, any agricultural activity remains unprofitable due to the lack of rain or water sources for watering crops or rice fields. Forty-three percent of the total area of rice paddies existing in this fokontany remains uncultivable since 2018 until today and 23% of the total area of mountainous fields that are home to large precious stones are transformed into quarries. The existence of its free spaces attracts squatters. This situation generates two kinds of conflicts in Ambodisaina: overcrowding or population increase which leads to increasing pressure on the exploitation of resources and/or the occupation of spaces which becomes a source of social conflicts. The number of households in the Ambodisaina fokontany increases from 2,099 to 2. 459 (from 2017 to 2018) (157 squatters of colonial concession and state land, 12 former inhabitants of fokontany were mobilized for almost 6 years by their work as masons, drivers and workers of the Colas company in Toamasina in the project before but assigned to Anosy in the QMM project, 66 quarry employees, 10 plot owners, 05 traders, 04 FRAM teachers, 1 nurse and 105 students from the University of Toamasina); in 2018: 2,770 (19 land owners, 6 JIRAMA employees at the pumping station, 74 quarry employees, 57 urban exodus, 152 students from the University of Toamasina and 3 traders); in 2019: 3,129 (06 owners, 26 career employees, 10 Adventist Christians from the fokontany anjahamarina, 221 students from the University of Toamasina, 24 quarry employees and 72 urban exodus) and in 2020: 3,579 (287 students from the University of Toamasina, 161 urban exodus and 2 land owners). And with the exception of the student household, a household is home to 5 to 8 individuals on average (grandparents, nephews, nieces of the father and mother of the family as well as children). It is difficult to explain because in the courtyard she has a big house and next to the small houses to serve as dormitories for girls and boys. In the space of four years the population of the fokontany Ambodisaina increases by 340 individuals or 2% of the total population but the space continues to shrink. a household is home to 5 to 8 individuals on average (grandparents, nephews, nieces of the father and mother of the family as well as children). It is difficult to explain because in the courtyard she has a big house and next to the small houses to

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Land dispute: Today 5 to 10 land dispute complaints per week are filed at the fokontany office. And the same for the squatting in the singing of others for the career man. All this is due to the abandonment of activities, especially agricultural, linked to the environment which is deteriorating day by day. However, compared to the reasoning of the physiocrats, nature was the only source of wealth creation [22] and the theoretical foundations of the concept of human capital [23], these situations do not seem to be a danger but problems to be solved.

5.5 Use of fatana mitsitsy

In the fonkotany of Ambodisaina, fatana mitsitsy ADES and 3M have been in fashion since 2015. Its market is monopolized by Mr. RASONINA. He gets his supplies from a supplier in Antananarivo, the capital of the big island. During the interview, he shared with us the specificity of these two homes compared to that of producing locally. At the price level, ADES sells 25,000ariary per piece against 15,000ariary for 3M and 7,000 to 4,500 for local manufacturing. But the benefits are also remarkable if we refer to the consumption of coal: for ADES only 10 to 15 pieces of grevilia can cook rice until the juice is heated. And for the 3M, you have to fill in twice and see three for the other. 15 to 25 pieces of grevilia. That's why he sold out the local mitsitsy fireplace a lot compared to ADES and 3M. On average 15 to 20 fatana local against 5 to 10 for the 3M and 3 to 5 the ADES per month.
This case is not isolated but almost similar to other countries like Cameroon, especially in terms of the consequences that revolve around the degradation of the environment due to the overexploitation of biodiversity and ecosystems. Despite the specific needs that characterize each country. Since in Madagascar people exploit biodiversity (forest) for the quest for firewood and charcoal, construction and money to survive.
A recent international study reveals that hundreds of species of medicinal plants, whose naturally occurring chemical elements form the basis of more than 50% of all prescription drugs, are threatened with extinction. This situation has prompted experts to call for mobilization to "secure the future of global health care". [12].
In short, the nature of the economy of these two countries is based on the exploitation of the ecosystem and biodiversity. Despite the unsustainability of their mode of exploitation which will have a negative impact on the survival of future generations.

6 Discussion

According to Antoine Decrouy (2021), environmental degradation is the loss of the capacity of the environment to meet the social, biodiversity and environmental needs of the earth. This is serious especially in the face of the overexploitation of resources by small groups and the strong increase in the population as in the case of the fokontany Ambodisaina. The latter does not escape the phenomenon of deforestation so widespread in the Malagasy east coast. The most attested factors are linked to slash and burn cultivation practiced in most villages of the fokontany and neighboring fokontany with the exception of Ambalamanasy and Tanandava. This context is reinforced by the production of charcoal without renewing the fuel used. In 2003, 02 series of reforestation of Acacias, on an expanse of land of 6 ha, were carried out within the Ambodisaina fokontany. Another reforestation initiative of 34 ha of Acacias and Eucalyptus was also carried out by Ambatovy in 2008 in the forest of Andravinjaza and Marovato. The municipality has the ambition to make the latter with that of Analabe a pilot and protected forest area. These reforestations were carried out with a view to protecting the environment and replenishing reserves of construction wood for the future generation.
In addition, illegal logging, artisanal mining (gold, sapphire), tavy and coal mining are the main drivers of deforestation encountered in the Atsinanana Region. In 2010, 98.9% of the Atsinanana population used fuels from forest resources. The establishments of tourist infrastructures are generally reported in the central eastern part of the Region [18]. But the idea of limiting or depriving these people of their needs for natural resources considered free, essential and necessary for their survival is inhuman, because we know that the less than 10% of the

population of the fokontany Ambodisaina working in the exploitation of resources foresters (charcoal, construction wood producer and others) have no other way to meet their needs other than their own activities. And above all, more than 90% of them are illiterate and/or without a diploma. Even if they would have been hired somewhere, with a minimum hiring salary set at 200,000 ariary in Madagascar according to decree N ° 2019-927[8]; this situation indirectly induces these people into the arm of poverty in the face of the size of the household, which houses between 5 and 8 individuals. Each household lives below $2 ($1.6) per day and each individual lives below $0.33 compared to the exchange rate of 3,999.85 ariary[BCM 22]the dollar. However, if they continue to exploit these natural resources, as in the case of the coal miners, each household receives more than $5 per day and more than $1 per individual per day if the production is at least 10 bags per week of Grevilia coal sold to the price of 16,000 ariary per bag. According to a simple calculation, a charcoal burner earns three times more than a category 6 civil servant per month in Madagascar. This is thanks to the generosity of mother nature.

Compared to the case above, we can argue on the sudden increase in population or overpopulation that can boost the exploitation of these natural resources. Because of the increase in the number of charcoal burners, which requires an automatic increase in the need for natural resources, ie felled trees. It's just logic, but we can turn this overpopulation concern into a real comparative advantage. Because overpopulation is wealth if it transforms into human capital. If a charcoal maker has two children, with his monthly income he can save money to finance the training and/or education of his children so as not to become a charcoal maker himself. So compared to the 2% increase in the total population, i.e. 340 individuals in the Ambodisaina fokontany in the space of four years, it is wealth and an effective tool for conserving and managing the environment if they have been well trained and well educate, that is to say transformed into human capital, because human capital is an intangible asset that can advance or support productivity, innovation and employability (OECD, 1998). In this case, anthropogenic activities are no longer the main causes of environmental degradation but the lack of will and adequate State policy for the conservation and sustainable management of natural resources vis-à-vis human dependence on these natural resources. innovation and employability (OECD, 1998). In this case, anthropogenic activities are no longer the main causes of environmental degradation but the lack of will and adequate State policy for the conservation and sustainable management of natural resources vis-à-vis human dependence on these natural resources. innovation and employability (OECD, 1998). In this case, anthropogenic activities are no longer the main causes of environmental degradation but the lack of will and adequate State policy for the conservation and sustainable management of natural resources vis-à-vis human dependence on these natural resources.

In addition, in Madagascar, climate change will increasingly affect water resources, agriculture, terrestrial ecosystems, fisheries and human health. [27]. In the Atsinanana region, climate change is felt in the region. Rainfall varies from 1100-3700 mm per year. Most rainfall occurs from January to April, and the average annual temperature is between 23 and 26°C. What has an impact on agriculture is the case of Ambodisaina. Agricultural declines can also lead to increased deforestation as they offset reduced crop yields.

With its 285 km of coastline, the beauty of its beaches, its vegetation, its protected areas, the historic districts of cities and the cultural richness of its populations, the Atsinanana region has enormous tourist potential (http://www.regions-francophones.org/actualite/2785/5606-la-region-atsinanana-a-madagascar.htm). Tourism development is one of the solutions that should be oriented to create employment for the villagers in order to reduce anthropogenic pressures. The training of the villagers, their accompaniment to the various tourist activities (guides, crafts, ...) with the launch of tourism in the region could bring them money and improve their financial resources and the economy of the region, especially reducing the pressures anthropogenic and the degradation of biodiversity.

One of the tools that could solve the problem of deforestation for the production of charcoal is the use of an improved oven or “fatana mititsy”, which has already borne fruit in the suburbs of the capital. The use of the improved oven reduces the cooking time but above all the quantity of coal used for cooking. Cooking the rice, three times a day, takes an average of 90 minutes with the metal oven. For lunch, the household can cook other foods, the duration of which varies from 15 to 50 minutes. With the improved oven, cooking is fast (40 to 50 minutes) with charcoal, i.e. a time saving of 40 to 50 minutes [21]. In addition to all that, the use of fatana mitsitsy, especially ADES, promotes the savings plan for the household in the fonkotany of Ambodisaina because it is very resistant in terms of viability in the vicinity of 24 to 36 months if the size of pot used exceeds 40cm. So compared to the soaring price of the JIro sy RAno Malagasy and the price of the gas fireplace at the rate of 400,000 to

500,000 ariary. Finally, Ambodisaina can be taken over with the local fatana mitsitsy out of use or amortized 3 against a new one and an ADES out of use or amortized against a new locally made one.

Natural resources are legacies that have been transmitted by our ancestors from generation to generation, the exploitation of which is the only means of survival. Their mode of exploitation evolves according to time and according to the size of the population in relation to the needs in terms of quantities and qualities. Indeed, human dependence on natural resources is not a new phenomenon. It is an ancestral spirit and/or habit (dependency) transmitted from generation to generation. So ; brutalizing an individual or group to change their habit and/or dominate their mind especially as part of their survival is inhuman.

Moreover, the principle of the Economics of Ecosystems and Biodiversity (EEB), which is a global study launched by the G8 and five developing countries, centered on "the global economic benefit of biological diversity, the costs of biodiversity loss and failure to take protective measures versus effective conservation costs"[EBB 08]. In addition, EEB promotes the integration of the economic values of biodiversity and ecosystem services into the decision-making process. In concrete terms, this initiative, launched in Potsdam in May 2007, aims to draw attention to the global economic benefits of biodiversity and the cost of biodiversity loss and ecosystem degradation. It is placed under the aegis of the United Nations Environment Program (UNEP) and benefits from the financial support of the European Commission, Germany and the United Kingdom, which have recently joined Norway, the Netherlands and Sweden.

7 Recommendations

7.1 Promote the use of efficient stoves or "fatana mitsisy"

Faced with the low purchasing power of the population of the eastern region of Madagascar who cannot afford to buy induction stoves, gas stoves, etc., the promotion of the use of clay-efficient stoves is the only way to reduce the use of charcoal almost 60 percent compared to the ordinary hearth made of sheet metal, iron etc… because the capacity of the hearth sparing in clay materials is reduced by four times compared to the hearth in ferrous or ordinary materials . In addition, clay keeps the heat in the open air longer than iron. . For this reason :

The State must support the associations working in the production of these efficient stoves, namely ADES (Association for the development of solar energies) and the F3M "Fatana Matanjaka, Mitsitsy, Mateza".

The Malagasy people must value the profitable local invention in terms of stoves, the main source of destruction of the forest due to the massive demand for charcoal in daily life because each household cooks meals at least twice a day.

The recycling policy is desirable. In this case, the associations will ask users to throw the out-of-use fireplace in a bin with fokontany. This situation still requires the State's intervention.

7.2 Valuation of human capital

The population of Ambodisaina fokontany is: young, mostly university students and agricultural vocation. Therefore: the State must invest in the transformation of these young people into human capital within the framework of the management and conservation of natural resources in a sustainable manner; the state must improve and/or build agricultural infrastructure such as the dam and manarapenitra irrigation canals in the Fokontany.

With the support of the State, the fokontany Ambodisaina must again program a reforestation campaign which is considered profitable in the face of the sudden increase in the number of the population in relation to the area. People working in forestry will have to reforest the number of trees felled per day during the past month.

The Vondron'Olona Ifotony (VOI) must reinforce and provide basic military training.

The VOI must provide basic equipment for in-kind surveillance such as GPS, binoculars, uniforms, tents and flashlights etc.

7.3 Valorization of biodiversity in the world

Valued more and more throughout the world, biodiversity appears to be one of the sources of the development of new technologies and economic innovations. Its uses are very varied, in particular, in biomimetics, bio-inspiration, enhancement of bacterial biodiversity, bio-prospecting.

8 Conclusion

Economic activities in the fokontany Ambodisaina and the suburban commune of Toamasina have a negative environmental impact: given the excessive conversion of natural or non-natural ecosystems (forests, swamps, rice fields) but also the overexploitation of exhaustible resources in the production process (given the number of trees harvested per year), and the absence of accompanying measures such as reforestation, they therefore contribute to reducing natural capital.In the target sites, the impact of the latter is heavy given the scarcity of biological natural resources (water, forest, arable land, etc.), the decrease in agricultural yield and the soaring price of products from exploited natural resources. Therefore, this situation not only constitutes a danger for the well-being of the population but it could endanger the future generation. Despite the seriousness of these situations, all problems always have solutions so that there is resilience between economic activities and the conservation of biodiversity: encourage and raise awareness among inhabitants to restore reforestation forest areas with species fast-growing trees including Grevillea, Acacia mangeum (two first species of trees chosen by the inhabitants given their calorific quality), and in forest areas with fast-growing endemic species to gradually reduce erosion and restore the forest. Also, encouraging and supporting residents on the need to use the improved charcoal oven or "Fatana mitsitsy" is crucial: the use of the improved oven generates positive impacts on the socio-economic and environmentally negative. There is also the establishment of internal regulations, an exploitation of a tree induced to a reforestation of at least two feet in its place. In any case, State policy must be relevant and effective. Also, the consideration of ethics in economic activities (exploitation and preservation of natural resources, application of legislation) is imperative for both the decision-makers and the stakeholders involved.

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