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CONTRAINTES ET STRATEGIES DE GESTION DURABLE DE LAMANGROVE DANS LA ZONE CÔTIERE DU BENIN

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ABSTRACT

In the coastal Zone of Benin, the mangrove develops more in the sectors exchange and Westerner that Eastern, with a dominant species *Rhizophoraracemosa*. With the latter the species *Avicenniagerminans, Conocarpus erectus* and *Laguncularia racemosa*are added which are non-existent in the Eastern sector. Indeed, the natural harmful anthropogenes activities and factors involved the regression of the surfaces of mangrove in the area of study. The aim of this research is to analyze the constraints which block the development of the mangrove in order to better define the approaches of their durable use. Collected data made with certain materials such as: the GPS, the topographic chart, the guides of observation, the guides of maintenance and the investigations socio-anthropological (semi maintenance direct, x-ray group, interview) near the population target (fishing, salicultrices, etc.) allowed the use of model SEPO (Success, Echecs, Potentialités and Obstacles). This model puts forward successes, the failures, the potentialities and the obstacles related to the management of the mangrove to the Benin one. The results show that various activities of afforestation carried out by certain institutions (ABE, DFRN, PPL, CeRPA, FAO, etc.) in load of the protection of the mangrove in the coastal Zone of Benign failed because of several constraints. To limit these last and to transform them into opportunities, an evaluation of the strategies of durable management of the mangrove makes it possible to better create an adequate framework of perennisation of the functions and services of this ecosystem.

Keywords: Constraints, strategies, durable management, mangrove, coastal zone

Introduction

The mangrove is a plant formation characteristic of intertropical littorals, in which mangroves dominate (Lebigre, 2004). Indeed, the demographic explosion as well as the climatic, hydrological, pedological and geomorphological factors influence the areas of this ecosystem in the coastal zone of Benin these last decades. Consequences include: Bank erosion, soil stripping, declining population income and environmental activities. Faced with this situation, it is important to define conservation / protection strategies that must be developed to maintain the functions of this biotope.

2. Presentation of the study area

Vol. 2, No. 05; 2017

ISSN: 2456-8643

The coastal zone as part of this research takes into account RAMSAR sites 1017 and 1018 of Benin. It is located between 6 ° 20 'and 6 ° 40' north latitude and 1 ° 40 'and 2 ° 40' east longitude (Figure 1).

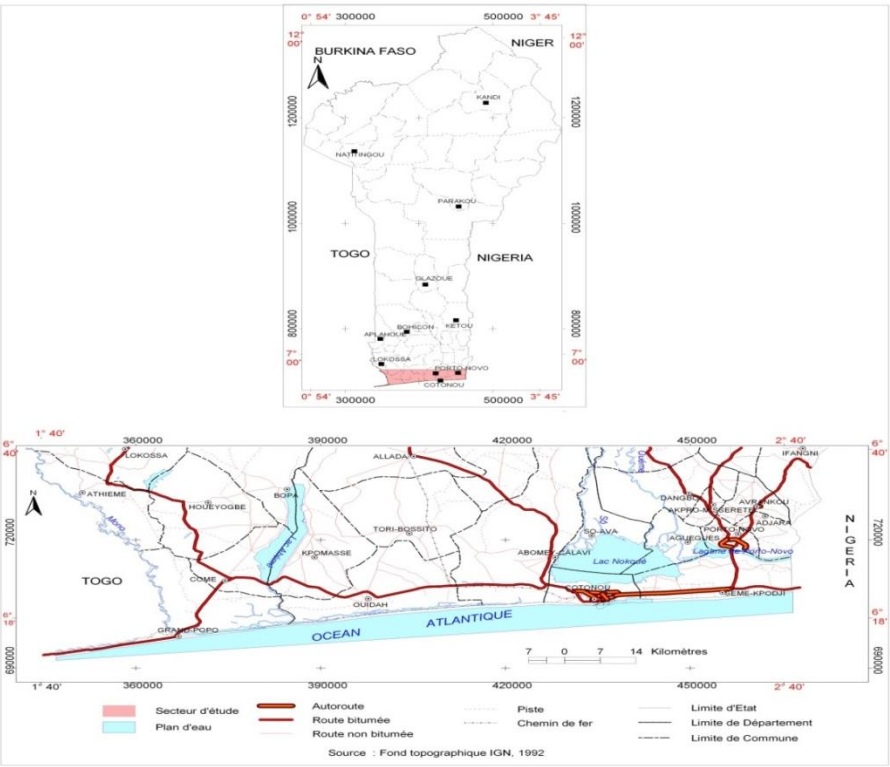

Figure 1: Situation of the coastal zone of Benin

The coastal zone is composed of a series of bodies of water on the banks of which the mangrove develops. The latter is composed of red mangrove dominating, followed by white mangrove. To these two mangroves representative of the mangrove of Benin is added the gray mangroves which are almost nonexistent in the study environment. The essential factors of their disappearance remain natural and human

3. Method of analysis

This study on the mangrove is done using certain tools, existing data collected and an appropriate method of treatment and analysis that have made it possible to propose a rational and sustainable management model of this ecosystem.

Vol. 2, No. 05; 2017

ISSN: 2456-8643

The instruments used in the field include the Global Position System (GPS) for the geographical coordinates of the localities or the mangrove is degraded / restored. The camera used for the instantaneous shooting of the architecture of different types of mangrove and related formations, current sites of preparation

salt and the forms of exploitation of this biotope, etc.

The localities are chosen according to the intensification of socio-economic activities,

regression of the mangrove, erosion, conservation / protection of the mangrove, topographic maps were used to define the investigation routes.

The observation guides were used in five communes (Porto-Novo, Abomey-Calavi, Ouidah, Kpomassè and Grand-Popo) and helped to characterize the mangrove, to identify the factors of its progression / regression in the localities investigated. These guides also made it possible to assess the effects of natural and / or anthropogenic factors that affect the development of the mangrove and finally to describe the forms of use;

- interview guides were used to interview key stakeholders (fishermen, saliculturists, local authorities, etc.) mangrove management on the importance of this ecosystem

They also made it possible to know the strategies implemented in the coastal zone of Benin for a sustainable management of this plant formation;

- the direct observation made it possible to identify the activities which have more impact on the mangrove on the one hand, on the other hand it helped to list and make a participative analysis of the strategies of management of this ecosystem by the beneficiaries .

- socio-anthropological surveys with questionnaires made it possible to apprehend the perceptions of the populations on the degradation and the measures of its reconstitution

4. Results

4.1. Natural constraints on mangrove formations

The natural constraints that hinder the development of mangroves in the study area are related to climatic, geomorphological, soil, and other factors.

According to 86% of the population, the excess of water to the floods affects the physiology of mangroves with less than 1 m. This is the case, for example, with the release of water from the Nangbèto dam (commissioned in 1987), which has hydro-sedimentological repercussions

Vol. 2, No. 05; 2017

ISSN: 2456-8643

(reduction of continental solid inputs, increase of dewatering flows of 40 m3 / s) and physicochemical effects. (including changes in salinity) thus contributing to an accentuation of eutrophication see the degradation of ecosystems demangrove. This phenomenon has also been one of the sources of the limitation of the growth and thezonation of the white mangrove, of the abandoned socioeconomic activities (fishing and salt-growing) in certain localities installed around the channel Ahô according to 60% of the population surveyed.

.In addition, the period of water withdrawal causes the drying of marshes and the very high salinity in the Beninese coastline. In this case, only the Avicenniaresist species has a salinity greater than 50 or even 60 ‰ (Faye, 2002, Camara et al., 2008) in contrast to Rhizophora stands that support less high levels of the substrate (Faye, 2007). Thus, areas once occupied by red mangrove are also rapidly colonized by paspalum meadows, thus creating a symbiosis and a certain competitiveness between herbaceous and ligneous species.

Natural factors include the invasive species Eichorniacrassipes and Pistiastratiotes, Nympheaceae and Cyperaceae, which today inhabit the banks of water bodies and therefore disrupt the spread of lamangrove (Bamisso, 2006).

4.2. Vulnerability of mangrove formations to climate change

In the study area, the rise in sea level, the variation in temperature and rainfall, would cause a disruption in the structure and composition of the mangrove.

The adverse effects of climate change on mangrove are reflected in the gradual disappearance of plant species and associated biodiversity. According to Smith and Duke (1987), the decrease in rainfall would lead to a reduction in biodiversity and mangrove productivity and an increase in salt marshes. However, common mangrove areas such as Grand-Popo, and a part Ouidah will be the most affected. But according to the IPCC (2002), the impacts of sea level rise on coastal ecosystems (mangroves / coastal wetlands / seagrass, etc.) will vary by region and by erosion processes by the sea. sea and deposits of terrestrial origin.

Climate change will reduce the resilience of mangrove formations, biodiversity, and socio-economic activities in coastal areas.

Benign.

4.3. Negative effects of socio-economic activities on mangrove formations

The production of salt that uses huge amounts of mangrove will be an important factor in the study area. According to Toffi (1990), ignigenic salt alone requires about 30000 m3 of wood per

Vol. 2, No. 05; 2017

ISSN: 2456-8643

year. In areas where the mangrove is very degraded, the saliculturists buy the mangrove woods from densely populated places such as: GbétoKouvenafid, Avlo, Zogbedji, Djegbadji, Togbin will be the most affected.

Nowadays, selling prices have increased compared to the past. Thus, wood of 0.20 cm in diameter sold in heaps between 100 and 300 F in the past is sold costs between 500 and 1000 FCFA and between 4000 and 4500 FCFA for 50 large woods of size about 1.50 m. Also, the price of the contents of a dugout loaded with mangrove wood that was 5000 and 7500 FCFA and this according to the capacity of the canoe is nowadays reached 8500 or 9000 FCFA. To this end, irrational and uncontrolled logging of mangrove woodland not only causes the loss of its functions but also the degradation of its ecological services and may compromise carbon deposition capacity in the mangrove biomass of Benin.

The constitution of the park requires the use of mangrove branches constitutes a brake to the development of lamangrove. In addition, the arrangement of the traps (xa) through water bodies retain the propagules and block their dissemination

Photos1: Xa in the Aho channel and acadja made of mangrove branches in Djègbamè
Shooting: Bamisso R. September, 2014

Tourism activities are the source of non-biodegradable waste (non-biodegradable packaging, bottles and plastic bags, etc.) that end up in ecosystems.of mangrove.

The same is true of market gardening in the background of the mangrove with the use of pesticides and fertilizers that destroy ecological habitats including lamangrove.Bhattacharyaet al. (2003), the mangrove sediments, rich in clay particles, are traps for pesticides and especially organochlorines.

4.4. Institutional and financial constraints to mangrove development

The disappearance of beliefs and rites and the weakness of the involvement of people's habits and customs in the management of the mangrove are today an essential factor in the reduction of mangrove areas in Benin. Nevertheless, some solicitations of the fetish Zangbaitoident still to preserve in general lamangrove.

Vol. 2, No. 05; 2017

ISSN: 2456-8643

From another angle, most institutions (EBA, local councils, local authorities, FAO, UNEP,

etc.) which were involved in the management and reforestation of the mangrove are no longer active once the projects have been completed for lack of financial, technical and human resources for

the sustainability of their actions. According to 70% of the population, the institutional constraints are more related to the inadequate management policy due to the lack of an active environmental policy and the non application of the texts relating to mangrove bans.

Moreover, the inexistence or insufficiency of funds intended specifically for the management of

the mangrove is one of the main factors of degradation of this plant formation.

To limit these constraints, an evaluation of mangrove sustainable management strategies makes it possible to better create an adequate framework for sustaining the functions and services of this ecosystem.

5. Mangrove management strategies in Benin

5.1. Endogenous strategies for protecting mangrove formations

In the localities of the study area, several actions are carried out for the reconstitution of mangrove formations and their safeguarding for sustainable ecological and socio-economic exploitation.

Thus, we observe voluntary transplanting of propagules by the saliculturists on the degraded banks. They are now developing agroforestry practices around the mangrove.

Saliculturists obtain their supplies of firewood from the mangrove woods by purchase. These are: caïlcédrat (Khayasenegalensis), neem (Azadirachtaindica) or eucalyptus (Eucalyptus camadulensis) wood, mostly from lowlands. The prices of these woods are between 500 and 800 FCFA for wood having at least 0.20 cm in diameter and between 1200 and 2000 FCFA for 25 medium size wood of about 1m. To this must also be added the use of coconut shells, branches or old trunks of coconut (Coco nucifera) and palm (Elaeis guineensis) and whose prices vary depending on the quantity. This gradual substitution of fuel is linked to the sensitization made to the population, to the awareness of the decline of fish resources whose main habit is the mangrove.

Vol. 2, No. 05; 2017

ISSN: 2456-8643

In schools bordering the mangrove, learning and basic notions about mangrove are given to learners through the GLOBE project. In some localities, such as along the Aho channel, people practice rational and controlled mangrove cutting to limit total degradation.

The context of the boom in the provision of microloans has enabled women nurses to develop income-generating activities (sale of foodstuffs, production of cassava flour, etc.) in order to limit pressure on the mangrove and on the land.

5.2. Strategies for sustainable mangrove management in Benin

The sustainable management of mangrove formations in Benin requires reinforcing the strategies currently being implemented. To this end, it will be necessary to involve traditional religion in the management and preservation of ecosystems for the conservation of biodiversity in general.

Also, by referring to the trophic chain of the study area, Rhizophora agroforestry (Weinstock, 1994) is more suitable for raising swimming crabs and oysters that often attach to rhizophores. On the other hand, the cultivation of land crabs under the mangrove can be done in agroforestry in Avicennia. One of the tracks of this strategy is Benin's contribution to the implementation of the green fund for climate, participation in the carbon market through a better mangrove management in Benin.

5.2.1. Green Climate Fund / Carbon Market Implementation Initiatives

The mangrove is an important sink of carbon (Howe et al., 2008, Degue-Nambona, 2007), it is necessary to think of developing projects of its trapping by this ecosystem. The figure 2 a and b shows a proposal of development of the mangrove forest of Togbin in Adounko and around Vodountô as part of the project of community management of marine and coastal biodiversity. The mangrove areas to be reconstituted thus appear as assets for a homogeneous coverage of these plant formations in Benin. This will promote a large quantity of carbon to be sequestered and will allow the mitigation of greenhouse gases.

Vol. 2, No. 05; 2017

ISSN: 2456-8643

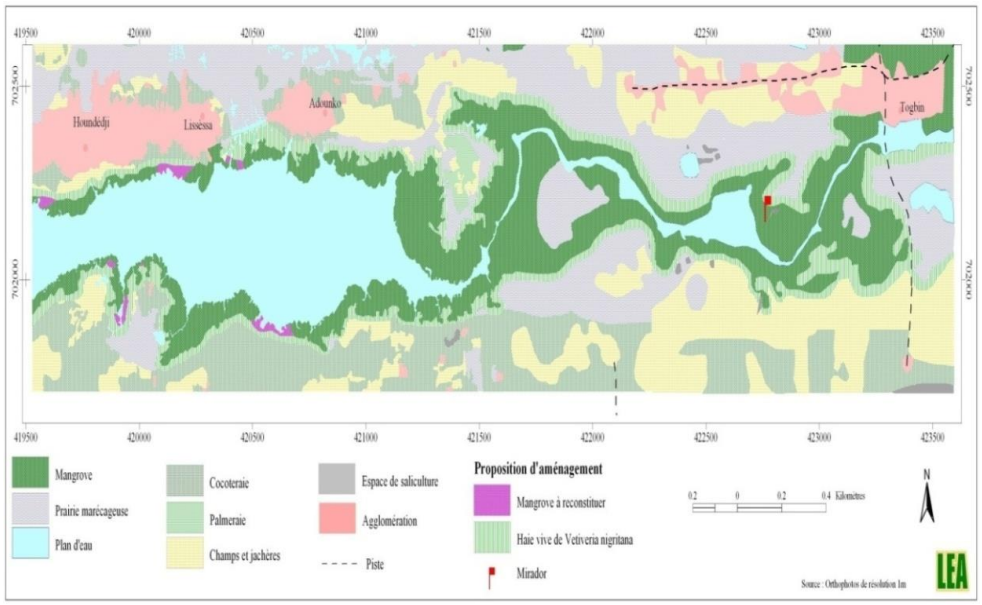

Figure 2: Mangrove Management Plan for Togbin-Adounko Sectors Source: Sinsin et al., 2011

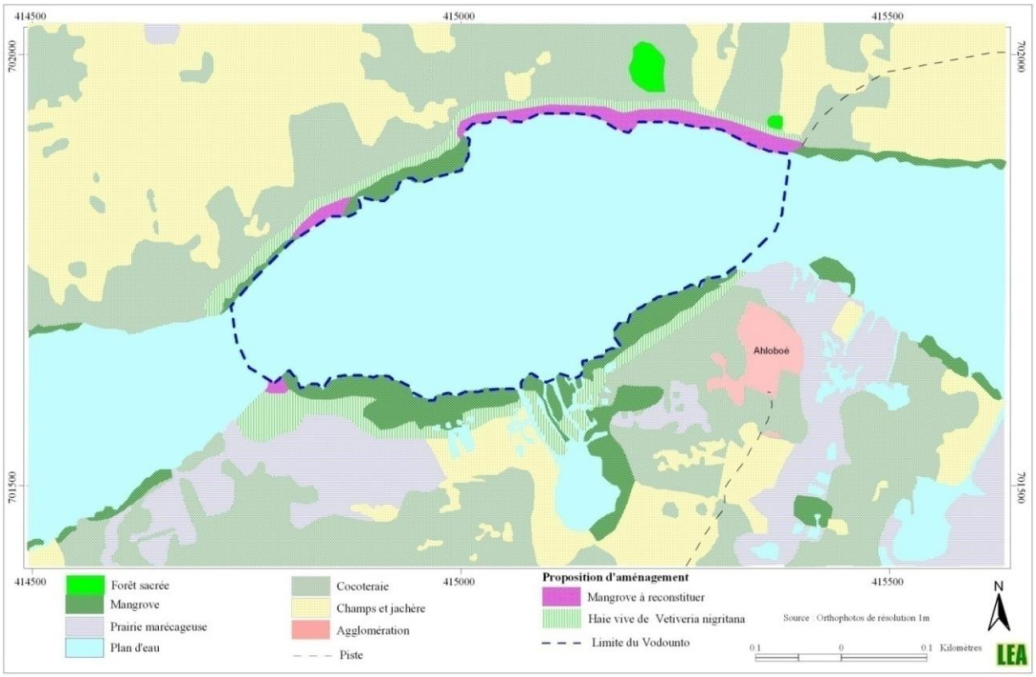

Figure 2: Vodountô Mangrove Development Plan (b) Source: Sinsin et al., 2011

Vol. 2, No. 05; 2017

ISSN: 2456-8643

But in order to make the contribution of Benin mangrove to the fight against

climate change, it will be necessary above all:

- organize annual workshops at the local or national level to sensitize all actors involved in mangrove management on processes related to carbon issues and this coastal ecosystem;

- to clearly delineate and in a participatory approach the nursery and reforestation areas of the carbon-well mangrove in Benin;

- achieve synergy between international institutions and local actors working on mangrove ecosystems.

Indeed, the participatory approach to the conservation and sustainable management of the mangrove will consist of strengthening environmental awareness in the different local languages (Xweda, Xwla, Fon, Mina, Tofin, etc. Also, international structures such as ISME , ITTO, FAO, IUCN, UNESCO and UNEP-WCMC, which work to protect fragile environments such as mangrove in developing countries, can support projects / programs (planting, reforestation and mangrove protection, production solar salt in Benin).

But the vote of a mangrove charter is an asset for the sustainability of the conservation / protection projects of this biotope in a contribution to adaptation efforts to climate change. This is the case for example in Senegal with the project "Plant your tree" (http://www.polecarto.fr/livelihoods-fundnetwork/). Similarly in Congo (Brazzaville), mangrove protection projects have been designed to strengthen the synergy between the conventions on climate change, biodiversity, Ramsar and desertification (Itoua and Dubois, 2010). In Benin, in addition to the political considerations surrounding it, the 10 million people 10 million trees project could also be aligned with this vision.

5.2.2. Opportunity for application in Benin of the principles of the Code of Conduct for the Sustainable Management of Mangrove

The principles of the code of conduct for the sustainable mangrove management, instituted by ISME and cenTER in 2005, are 15. But, the most relevant to take into account by the various institutions in charge of mangrove management in Benin, for example, among others are principles 1, 3 to 6, 8, 10 and 13 to 15.

These principles are as follows:

Principle 1 - Objectives of mangrove ecosystem management

Vol. 2, No. 05; 2017

ISSN: 2456-8643

Principle 3 - Political and Legal Frameworks

Principle 6 - Socio-economic considerations

Principle 8 - Capacity Building

Principle 10 - Fisheries

Principle 13 - Tourism, Recreation and Education

Principle 14 - Mangrove Products and Responsible Trade

Principle 15 - Research and Dissemination of Information on Mangroves

The majority of these principles applied in some particularly in Africa to Ghana, Senegal, Mozambique, etc. allowed the reconstruction of the mangrove.

Benin can draw inspiration for the sustainable exploitation of mangrove biological resources.

6. Model of optimization of mangrove functions and services in Benin

Figure 3 shows the analysis of the current state of mangrove formations, their services and functions and management modes, through the Success - Failures - Potentialities - Obstacles (SEPO) model.

This tool made it possible to highlight human, institutional, legislative, technical, natural and other factors. which condition the management of mangrove ecosystems in Benin.

Vol. 2, No. 05; 2017

ISSN: 2456-8643

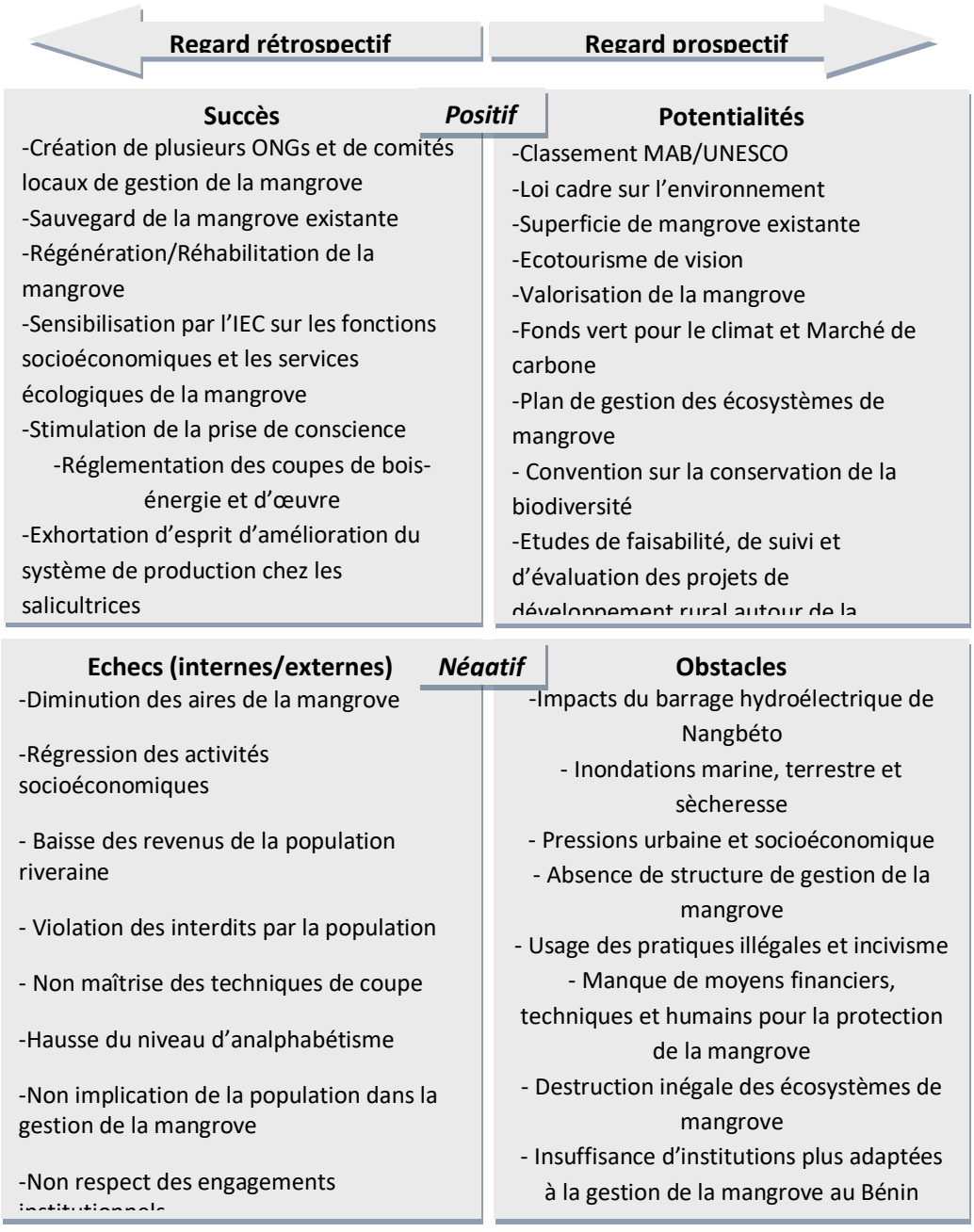

Figure 3: SEPO analysis model of mangrove management in Benin

Vol. 2, No. 05; 2017

ISSN: 2456-8643

In a vision of sustainability of its mangrove functions and services in Benin, it is important to follow an appropriate approach as proposed in Figure 4. Indeed, this proposed approach could allow on the one hand to reconstitute the mangrove formations of and to make their socio-economic functions and ecological services profitable. To do this, everything depends on the level of involvement of all the actors involved in mangrove management.

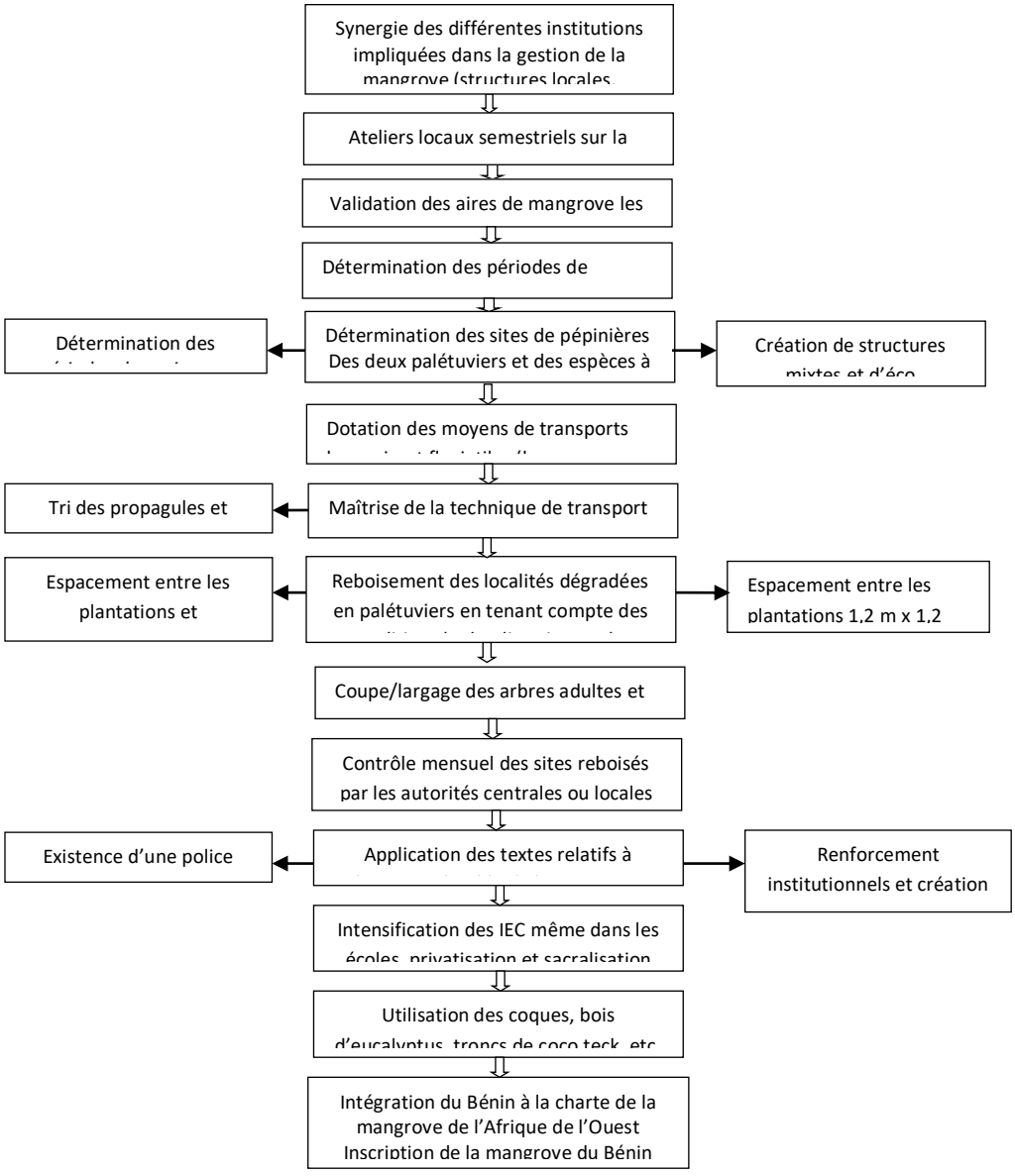

Figure 4: Proposed approach to sustainable mangrove management in Benin

Vol. 2, No. 05; 2017

ISSN: 2456-8643

Conclusion

The dynamics of mangrove formations are in Benin under the natural constraints (hydroclimatic, hydromorphological, hydrosedimentary, etc.) and human (extension of agglomerations, unsuitable socio-economic systems, weak institutional and legislative framework, low financial investments, etc.) .

The state of degradation of the mangrove formations has led the populations to a revision of the modes of exploitation of this ecosystem through the introduction of a traditional legislation of conservation, timid attempts of reforestation, rationalization of the cuts and substitution of the wood of mangrove, etc. But the opportunities offered by the international context through the Green Climate Fund, the carbon market, could lead to a sustainable mangrove management approach based on a reorientation of its economic functions and ecological services (wells). carbon and carbon credit sales).

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Vol. 2, No. 05; 2017

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