

Full Length Research Paper

Framework for assessing the level of stakeholders' involvement and governance in mangrove management: Case of selected local communities in the south west coastal Atlantic Region, Cameroon

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Mangrove forest management is becoming increasingly difficult due to increasing pressure from burgeoning mangrove fuel wood dependent coastal population justifying the urgent need for a multi-dimensional participatory approach that brings together all stakeholders into a broad management and governance framework. This paper investigates, analyzes and puts stakeholders' participation within the framework for mangrove ecosystem management in local communities of Bimbia-Mabeta areas, a prominent mangrove deforestation hotspot in Cameroon. Results from data collected from a survey of three chosen communities and analyzed using relevant statistical tools showed the level of involvement and intervention in the management process of two categories of stakeholders: direct stakeholders (primary) being exploiters and indirect stakeholders (secondary - providing service control, law and enforcement; and tertiary - mainly ecological service beneficiaries). Their respective incomes per annum derived from mangrove resource exploitation activities ranged from 500.000 to 750.000 fcfa (\$1000 - 1500) per person for direct exploiters; and indirect (municipal services) 180.000 to 1.800 000fcfa (\$360 to 3600) and 360000 to 1.080 000 fcfa (\$720-2160) for government services. A matrix and map was constituted to categorize and appreciate stakeholders in terms of their roles, responsibilities, interests, influence for mangrove restoration and level of impact of mangrove degradation on their livelihoods. Perspectives for elaboration of appropriate management and stakeholders' engagement plans for more efficient governance to enhance sustainable management of mangroves through integrated, multidisciplinary and ecosystem approaches are further discussed.

Key words: Mangrove ecosystem management, stakeholders' involvement, stakeholder's matrix, stakeholder's map, stakeholders' engagement plan, good governance, Cameroon.

INTRODUCTION

Mangroves are salt tolerant woody halophytes that fringes most tropical and subtropical coastal environments worldwide (Alongi, 2002). They are classified among the

most carbon-rich ecosystems in the world (Lefebvre and Poulin, 2000; Feka and Manzano, 2008). They are the world's most productive ecosystems having a high

primary production, high rates of recycling and provide a high supply of nutrient source that supports many complex food chains (Lefebvre and Poulin, 2000; Feka and Manzano, 2008). They play critical roles in livelihood sustenance and ecological securities of rural economies especially communities inhabiting coastal zones with substantial mangrove stands (Alongi, 2009; Ajonina et al., 2014). This is through functions such as high biodiversity reservoir, fisheries production, timber production, shoreline protection, pollution abatement and high carbon sequestration rates superior to adjacent inland tropical forests. The mangrove ecosystem contributes towards stabilizing and mitigating the effects of climate change (Alongi, 2009; Ajonina et al., 2014). Mangroves are heavily used traditionally and commercially worldwide by local communities as a source of fuelwood and charcoal for cooking and heating, wood for construction of houses, huts, fences, bridges as well as timber for furniture and many other products (Kathiresan and Bingham, 2001; Alongi, 2002). In spite of their critical roles, mangroves have been considerably undervalued in the past (Primefact, 2008), negatively perceived as hostile, smelling, muddy, “wastelands” as well as breeding grounds for mosquitoes encouraging the clearing, degradation or otherwise loss of many mangrove forests (Primefact, 2008; Forkam et al., 2019). This has also contributed to very little public and scientific attention paid to mangrove compared to the colourful coral reefs or tropical rain forests (Dittmar et al., 2006). Approximately one fifth of the world’s mangrove ecosystems are thought to have been lost since 1980 due to diverse pressures from multiple local stakeholders for livelihood sustenance (Hanneke et al., 2012). The destruction of the mangrove ecosystem is not a recent issue and is positively related to human population density (Alongi, 2002).

Today, despite increasing awareness regarding the value and importance of mangroves, the destruction and degradation at alarming rates of mangrove forest one of the most threatened tropical ecosystem continues to take place in many parts of the world for a variety of economic as-well-as political motives (Polidoro et al., 2010 in Ndongmo, 2019) leading to the decline in the surface area of the world’s mangroves (Konoyima and Johnson, 2019). According to Konoyima and Johnson (2019), the distribution of mangroves has decreased globally, with some 2,260 nationally designated and 285 internationally recognized sites worldwide containing about 41% of the world’s remaining mangroves. Valiela et al. (2001) found that for all continents, present-day mangrove forest area is substantially smaller than the original area, with a world average loss of 35% since 1980s translating into an overall areal loss rate of 2.1% per year. During same

period, Macintosh and Ashton (2002) also found that in some areas, mangroves are protected by law but the lack of enforcement coupled with economic incentives to reclaim land has resulted in deliberate destruction and consequent decline in the surface area of the world’s mangrove by about 50% and regionally with Asia and Africa losing 61 and 55% respectively. Thomas et al. (2017) elucidated that the high carbon content of mangroves, coupled with their financial value in terms of the ecosystems services that they support, makes them an important asset for carbon trading initiatives through the REDD+ climate change adaptation mechanism. This thus forms the basis and justifications for various interventions aimed at the sustainable utilization, conservation and restoration of the mangrove forest in the face of heavy deforestation threats of human origin.

Africa which displays richness and diversity of cultures and peoples, geographical features and biodiversity hard to find elsewhere, hosts about 19% of the world’s mangroves, of which about 20,410 km (12% of the world’s mangroves and 59% of African mangroves) are located in West-Central Africa (Feka and Ajonina, 2011; Kauffman and Bhomia, 2017). This complexity in Africa has created great diversity in resource use and management by rural people (Barrow et al., 2002).

Cameroon is among the few countries in the world blessed with mangroves which cover over 30% of the country’s more than 590 km of coast stretching from the border with Nigeria contiguous with the mangroves of the Niger Delta in the north, to Equatorial Guinea in the south being the second largest coast in Central Africa after the coast of Gabon (Folack and Gabche, 2007). The mangrove coverage of more than 230 000 ha puts the country as the largest in Central Africa and the sixth largest in Africa (Ajonina et al., 2008; MINEPDED-RCM, 2017) with several stakeholders involved in mangrove resource management (FAO, 2018). These actors include at the international level NGOs; at the national level public administration with the involvement of several ministries comprising in particular: Ministry of Forestry and Wildlife “MINFOF”, Ministry of Environment, Nature Protection and Sustainable Development “MINEPDED”, Ministry of Fishery and Animal Husbandry “MINEPIA”, Ministry of Economy, Planning and Regional Development “MINEPAT”, Ministry of Agriculture and Rural Development “MINADER”, Ministry of Transport “MINTRANS”, Ministry of Mines, Industry and Technological Development “MINMIDT”, Ministry of Energy and Water Resources “MINEE” and Ministry of Scientific Research and Innovation “MINRESI”); at the local level local communities, councils and local authorities; non-governmental organizations; and the

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private sector. It must be noted that the exploitation of mangrove poses serious threats to the rich mangrove biodiversity, the environment and human well-being. At the coastline of Cameroon, around the Bimbia-Mabeta neighborhood, mangrove forests are not seen as a fundamental economic and ecological resource to be treasured; as such diverse livelihood activities have led to over-exploitation, degradation and even loss in some areas (Forkam et al., 2019). As there exist an important link between livelihood and environmental security which has been ignored in the past by mangrove stakeholders (as stakeholders focused mainly on the benefits derived from the mangrove ecosystem, neglecting their roles, rights and responsibilities to protect the mangrove), it is therefore imperative to identify and characterize the stakeholders as well as assessing their level of involvement to promote good governance in the management of the Bimbia-Mabeta mangrove.

The most effective way to examine local stakeholders' involvement in mangrove forest management, is essentially to identify them, have an understanding of their stakes, power relations, their interests and the ways in which the different stakeholders are able to compete for the power to control the mangrove resources. This will enable us understand their level of involvement (influence and/or impacts) in mangrove forest management. This is very important especially as the mangrove resource is the principal source of income for the local population of the Bimbia-Mabeta area. Hence it is very clear that man is at the center of mangrove degradation. Thus, the involvement of all stakeholders in mangrove management is therefore very important firstly, because according to Mukherjee et al. (2014), the number of people living within 10km of significant mangrove areas might have risen to 120 million by 2015, and that the bulk of this population resides in developing countries in Asia and West and Central Africa and largely dependent on mangrove resources for daily sustenance and livelihood. Secondly, the fact that mangrove is seen as open access resource available to the public (Buck, 1998). Kustanti et al. (2014) talks of common pool resources (CPR) as it brings together both direct *interest* and indirect or *power* enforcing stakeholders for success and cooperation.

According to Bourne (2005) and Jing et al. (2011), stakeholders are individuals, groups or institutions that can be negatively or positively affected by a proposed project or that can affect the outcome of the project (persons impacted by the project). On the other hand, Ramsar Convention (2007) defined stakeholder as any individual, group or community living within the influence of a site and who are equally said to be dependent on the site for their livelihood. An important critical element in any management approach is the involvement of all stakeholders, which include among others: local communities, non-indigenes, indigenous peoples, as well as various affected economic sectors at all stages of the process.

Good governance has been defined according to UN

System Task Team on the Post 2015 and Keping (2017) in relation to the desired outcome to human development from a democratic view as a collaborative management mechanism processes and institutions, through which citizens, group, stakeholders show their interests, exercise their legal rights, attain their obligations and mediate their differences. This also pertains to institutions of governance, including public administration and public services connected, in particular, with the sound management of resources, delivery of and equitable access to public services, responsiveness to the views of citizens and their participation in decisions that concern them. Governance identifies the blurring of boundaries between stakeholder groups (government, NGOs, public sector, local communities etc.) and responsibilities for tackling social and economic issues; the power dependence involved in relationships between institutions involved in collective action; emphasizes the importance of autonomous self-governing networks of actors and shared responsibilities in public management; and recognizes the capacity to get things done without relying on the power of the Government to command or use its authority.

This study is aimed at elaborating a framework for identification, categorization, characterization and mapping of stakeholders involved in the management of the local mangrove resources. The study assesses their roles, rights, responsibilities, interests, level of impact on the degradation of mangrove resources, level of influence on mangrove restoration as well as their levels of income earned from their different incomes generating activities. The study equally elaborates a plan for stakeholders' participation so called stakeholder engagement plan (SEP) for effective governance towards sustainable management of mangrove forests in the Bimbia-Mabeta area in south western Cameroon. This piece of work could inform all mangrove stakeholders and other natural resource managers that the mangrove ecosystem is like a natural paradise that can get lost one day. It also highlights the growing reality that, unless humanity embraces the awesome responsibility of using, preserving and protecting the mangrove ecosystem, it will indeed disappear.

METHODOLOGY

Development of the conceptual framework for identification and categorization of stakeholders within the Bimbia-Mabeta mangrove communities in Cameroon

Several approaches have been used in the classification and categorization of stakeholders in the management of natural resources on planet earth. These different approaches or school of thoughts focus either on the importance, interests, benefits, relevance, needs, rights, and other natural advantages. Some classification approaches and school of thoughts will now be examined. Concerning interest, Krott (2005) observed rivalry between different interest groups attempting to utilize the benefits gained from mangrove as a common pool resource. This rivalry

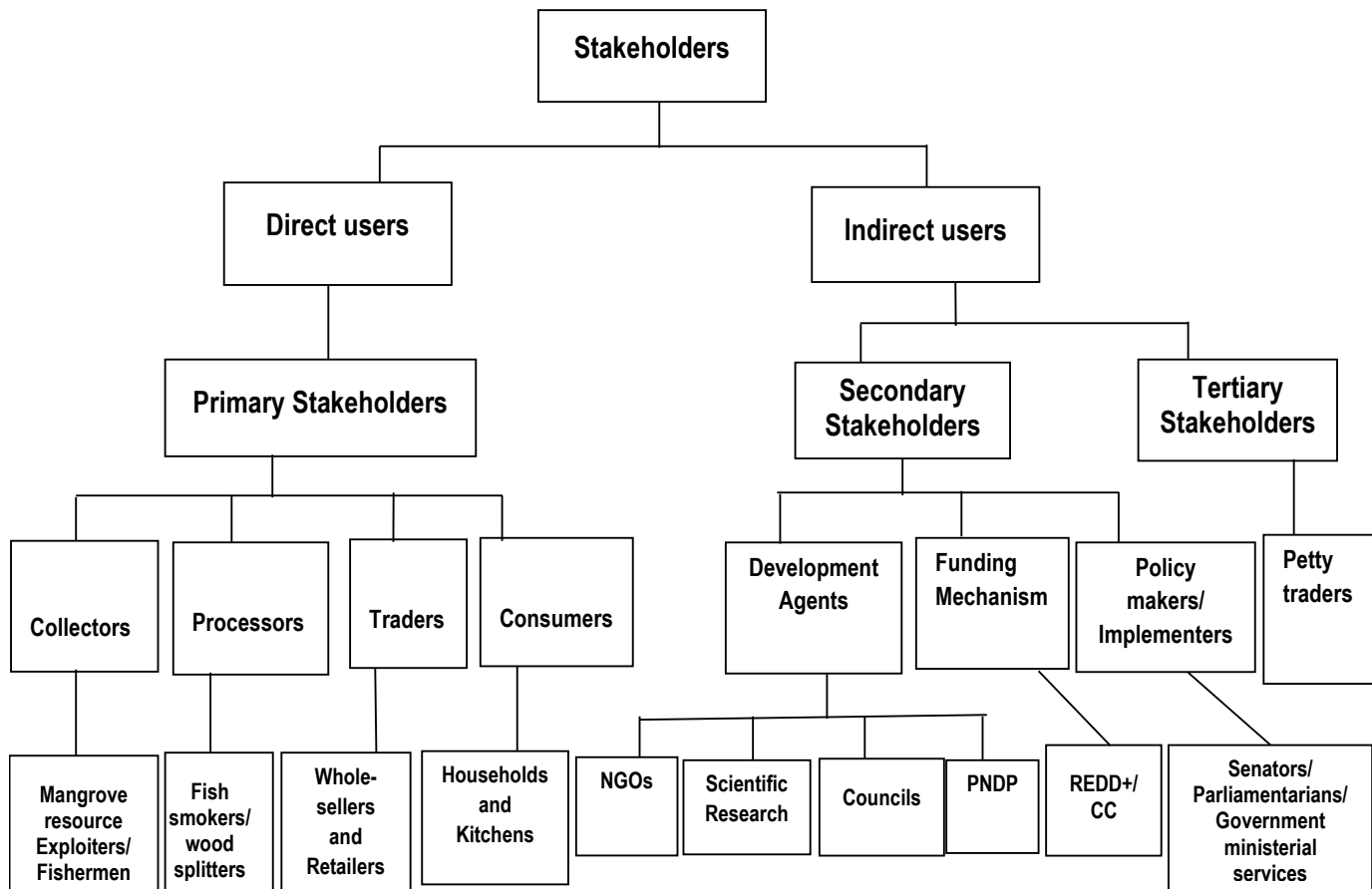


Figure 1. Conceptual frame work constructed from: MacArthur (1997), Claridge (1997), Barrow et al. (2002), Krott (2005), Samoura et al. (2007), Eba’a Atyi et al. (2013), Kustanti et al. (2014) and FAO (2016).

which he observed between local stakeholders (interest) and political players (power) form the basis of his classification. Kustanti et al. (2014) on the other hand, inspired by the works of Krott (2005) decided to further work on “actors, interest, and conflicts in the sustainable management of mangrove forest”, and found that there exist two categories of mangrove stakeholders: *direct* and *indirect users*. According to them, the direct users are those directly exploiting the mangrove forest while the indirect users are those who are not in direct contact with the mangrove forest and are not directly exploiting the mangrove forest. Eba’a Atyi et al. (2013) and FAO (2016) found the works of Krott (2005) and Kustanti et al. (2014) to be relevant and decided to add more value to their work by further classifying fuelwood/wood fuel stakeholders into direct and indirect stakeholders. In their classification, the indirect stakeholders were grouped into government and traditional authorities while the direct stakeholders were categorized into collectors/producers, transporters, traders, consumers. Reviewing a paper entitled “stakeholder Roles and Stakeholder analysis in Project Planning” that focuses on stakeholders’ interest, MacArthur (1997), identified three categories of stakeholders which he grouped them into *primary*, *secondary* and *external stakeholders*. Furthermore, Claridge (1997) made allusion to the direct and indirect impacts of stakeholders on mangroves and synchronize their “interests and needs” to come out with the following classification: Local direct users’ communities, Local indirect users Communities, Remote direct Users Communities, Government Agencies, Supporters of Mangrove Users Communities and

Research and Academic Institutions. And the last and most fascinating is the approach that grouped mangrove actors in five categories according to their *needs* and *interests*. Samoura et al. (2007) categorized them as Social actors (village association and village committee), Economic actors (economic groups and entrepreneurs), Political actors (local elected authorities and prefectures), Research groups (technical government services, research institutes, NGOs and project organisations) and Environmental services (tourists services, international institutions, NGOs, environmental departments).

The conceptualisation of our framework was therefore based on the above school of thoughts which we articulated the identification and categorization of mangrove stakeholders around two subdivisions that is the direct and the indirect stakeholders (Figure 1). The direct stakeholders’ also known as primary stakeholders are those who are in direct contact with the mangrove forest and/or resources. That is those who are involved in the direct and indirect consumption of mangrove resources (livelihood sustenance). While the indirect stakeholders on the other hand are categorised into secondary and tertiary stakeholders that is those who are involved in promoting conservation, sustainable utilisation and restoration efforts through policy making and/or policy implementation, sensitisation, education/capacity building, participatory development programs, funding of developing projects and programs (secondary stakeholders) geared towards mitigating the impacts of the direct stakeholders as well as those enjoying the benefits of environmental services like climate regulation (tertiary stakeholders). From the

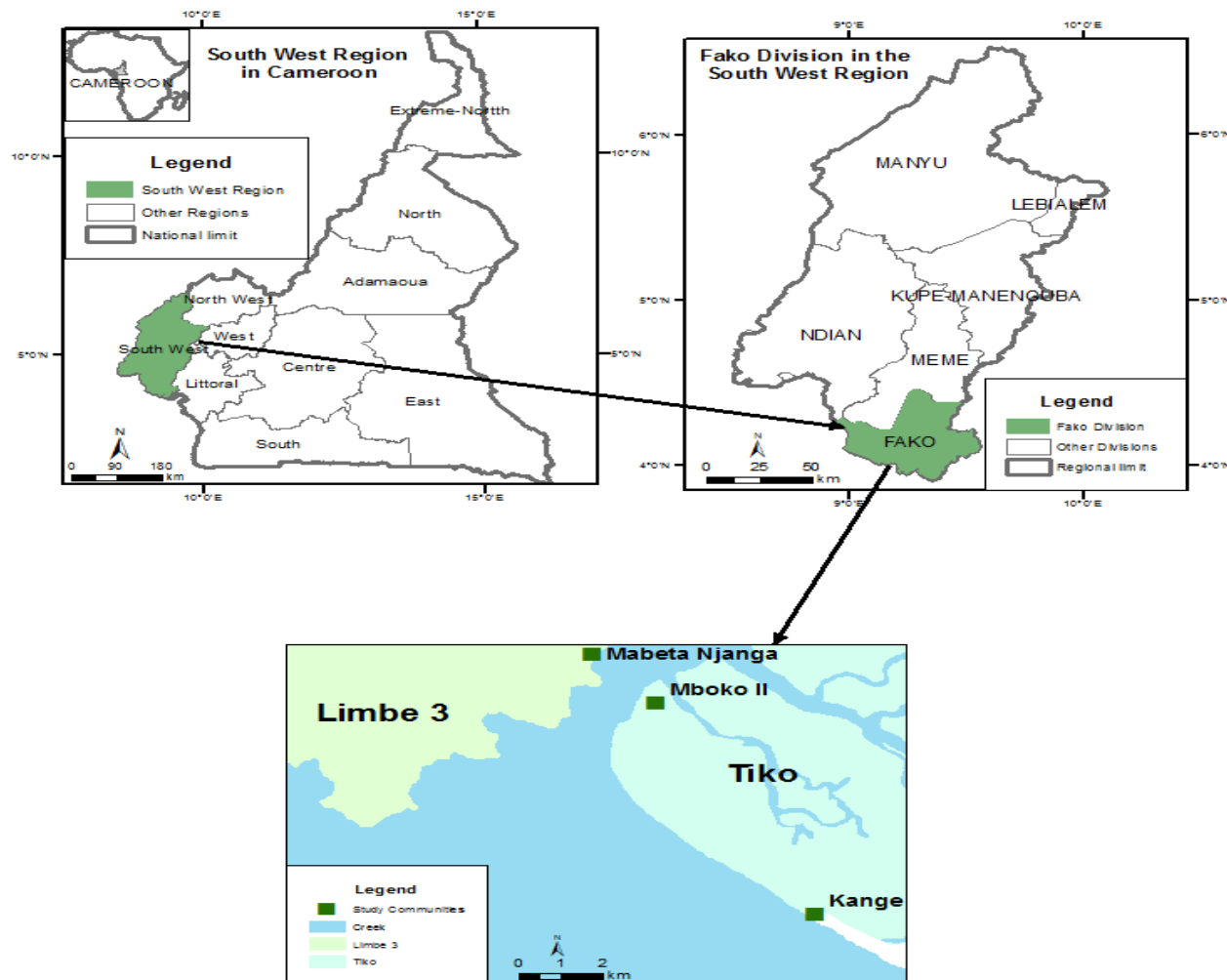


Figure 2. Land use Map of Limbe III Council.

block diagram, the direct stakeholders include among others: exploiters/collectors, transformers/ processors, transporters, traders and final consumers. While the secondary stakeholders on the other hand include: the Development agents which are the NGOs, Scientific research, Councils, and National Community Driven Development Program (PNDP); Funding mechanism as REDD+ climate change; Policy makers/implementers are the Senators and Parliamentarians, as well as government ministerial services and traditional authorities (indirect - secondary stakeholders). The petty traders are the indirect - tertiary stakeholders.

Description of study site

The South West Region of Cameroon is located between 9° 00' E to 16°00' E and 2°00' N to 7° 00' N and is bordered to the South by the Atlantic Ocean, to the West by the Federal Republic of Nigeria, to the North by the North West Region and to the East by the Littoral Region. The region has a surface area of 25 410 km² and a population of about 1,384289 estimated in 2010 (Agendia, 2010). This Region has 6 divisions with FakO being our division of interest since it is where the Bimbiamabeta communities of the Limbe III municipality are located. The Limbe III municipality is located in the

East coast of the Limbe town and is found within the Mount Cameroon region. It has an estimated surface area of 212 km². The three communities chosen for the study are Mabeta-Njanga, Mboko II and Kange. The location map of the study areas that is the Limbe III council area derived from the map of the South-West Region and the sample sites can be seen in Figure 2.

Socio-economic surveys

The study was carried out on the local population of three communities living adjacent to mangroves at the Bimbiamabeta area that exploit and use mangroves. Both purposive and random sampling techniques were used during the surveys. The study communities were randomly selected from nine fishing camps situated adjacent to mangroves zone at the Bimbiamabeta area divided into three strata (3 fishing communities per stratum). The stratification was done as follows: stratum 1: (Dikolo, Mabeta-Njanga, Ijaw-Mabeta), Stratum 2: (Mboko I, Mboko II, Mboma I) and stratum 3: (Mboma II, Anglophone Kange, Francophone Kange). This study area was purposively chosen because the area is an epicenter of mangrove exploitation for livelihood sustenance in Cameroon.

During this survey, 120 questionnaires were administered to the local population concerned directly or indirectly with mangrove exploitation within the three chosen communities. Before the administration of the questionnaire within these chosen communities, the local population and the development agents, policy makers and policy implementers (secondary stakeholders) as part of the targeted population because we consider the secondary stakeholders as Pro-Conservationists. That is those concerned with the putting in place of sustainable management strategies and mechanisms that will enhance conservation of the mangrove ecosystem. They were served with both structured and unstructured questionnaires to get from them the role they have played in promoting the conservation, sustainable utilization and restoration of the Bimbia-Mabeta mangrove ecosystem.

The three communities for consideration randomly selected from the nine fishing communities that are found within the Bimbia-Mabeta mangrove area were Mabeta-Njanga (3° 59' 57" N, 9° 17' 39" E) Mboko II (3° 58' 72" N, 9° 18' 06" E) and British Kange (3° 54' 63" N, 9° 20' 85" E).

Data collection procedure and analysis

Data collection was conducted using both qualitative and quantitative methods. The qualitative approach includes key informant interviews, focus group discussions. While the quantitative approach on the other hand was done using questionnaires (with open and close ended questions). The interviews for the qualitative approach were addressed exclusively to the indirect stakeholders notably: key traditional leaders, municipal and government service personnel within the study area with the aim of strengthening in-depth discussions and interactions geared towards investigating their role, rights, responsibilities, level of impact on mangrove degradation, level of influence on mangrove restoration as well as their annual income earning level. The quantitative approach on the other hand was carried out using questionnaires targeting the direct stakeholders notably the different households to whom 100 questionnaires were randomly administered to them using the simple random sampling technique. The random sampling selection procedure was facilitated by the information provided by the traditional leaders and councils authorities on the available number of houses in each community from where at least 30% of the population size was predetermined for assessment from physical visit and selection of houses facilitated by the linear settlement pattern. The relationship between a house and household was defined in this case as people irrespective of families, sleeping under one roof or living in the same house (Ekobo, 1995). In each household the questionnaires were administered to the head of the house to obtain information on their role, rights, responsibilities, annual income, level of impact on mangrove degradation and level of influence on mangrove restoration. Both surveys were conducted during the months of March and April 2016. Household surveys were heavily facilitated thanks to the intervention of field extension workers of the government services in charge of fisheries, forestry and wildlife.

Data analysis

Data collected was subjected to mainly descriptive statistical analyses (frequency tables, bar-charts, pie-charts, etc.) using the EXCEL statistical software package. Inferences were used to analyze the annual income earning levels of both direct users of mangrove resources and indirect users via fiscality (taxes) and notably contingency analysis using SPSS 17.0. Matrices and maps were constituted to categorize and appreciate the stakeholders in terms of their roles, responsibilities, interests, influence (for mangrove restoration) and the level of impact on mangrove degradation as well as the level of conflicts between different users.

RESULTS AND DISCUSSION

Identification and categorization of stakeholders within the Bimbia-Mabeta mangrove communities drawn from the conceptual frame work

Fitted into Table 1 are the various actors on the field in the conceptual framework already presented in Figure 1. As already indicated, stakeholders encountered were of two types depending on their level of influence in mangrove management (level of influence in conservation, sustainable utilization, restoration, and degradation). The direct stakeholders being *primary stakeholders* while the indirect stakeholders categorized into *secondary* and *tertiary stakeholders*. The *primary stakeholders* being both indigenes and non-indigenes of the local population and are characterized by collectors (fishermen and, mangrove exploiters), Traders (wholesalers and retailers) mainly Buyam-Sellam of fuel wood and fish respectively (mostly women) found streaming the mangrove areas for mangrove wood and caught fish (smoked fish or fresh fish in ice boxes), the transporters (hired engine propelled boats riders or hand pulled canoes and truck pushers), Processors (fish smokers, fuel wood splitters, paddle carvers and carpenters were seen) and Consumers (over 100 households). For the *secondary stakeholders*, the "Development Agents" encountered were NGOs such as Cameroon Wildlife Conservation Society (CWCS, 2015), Consortium Partners with Forests and Wetlands Consulting (FWC), Bimbia Bonadikombo Natural Resource Management Council (BBNRM), People Earth Wise (PEW) and Cameroon Mangrove Network (CMN); Research and Academic institutions were namely University of Buea, Limbe Nautical Fisheries Institute (LINAFLI) and Institute for Research in Agriculture and Development (IRAD); the Councils were mainly Tiko and Limbe III councils; and National Community Driven Development Program (PNDDP). The "Policy Implementers" were identified as (Ministerial services of Forestry and wildlife "MINFOP", Environment, Nature Protection and Sustainable Development "MINEPDED", Fisheries, Livestock and Animal Husbandry "MINEPIA", Agriculture and Rural Development "MINADER", Tourism "MINTOUR" and Territorial Administration "MINATD"), while the Funding mechanism was mainly Reducing Emissions from Deforestation and Forest Degradation (REDD+). Though not in direct contact with the mangroves, that is not using mangroves directly, but concerned with putting in place sustainable management strategies for the conservation of the mangrove ecosystem and resources. In the tertiary stakeholders' category, another group of indirect interest stakeholders living at the proximity of the mangrove forest not equally exploiting mangrove directly but enjoying the indirect ecological benefit (positive externalities or green house benefits) were mostly petty traders such as shopkeepers (provision shops, coffee and tea shops).

Table 1. Matrix of categorization of stakeholders within the Bimbia-Mabeta mangrove communities from field observations.

Category	Description	Field observation
Direct users		
(i) Primary stakeholders		
Collectors	Mangrove resources exploiters, fishermen	Some 92 Mangrove resource exploiters with over 97 fishermen
Processors	Fish smokers, wood splitters	At least 66 fish smokers, 3paddle carvers and several wood splitters, and carpenters
Traders	Wholesalers, retailers	Mainly Buyam-sellam of fresh and smoked fish, as well as those trading with mangrove wood and fuel wood
Consumers	Households, kitchen	At least 350 households and kitchens from data obtained from the councils.
Indirect users		
(ii) Secondary stakeholders		
Development agents	NGOs, scientific research, Councils, National development programmes	<p>NGOs: Cameroon Wildlife Conservation society (CWCS), Consortium Partners with Forest and Wetlands Consulting (FWC), Bimbia-Bonadikombo Natural Resource Management Council (BBNRM), People Earth Wise (PEW), Cameroon Mangrove Network (CMN);</p> <p>Scientific Research: Several Research students and Interns from University of Buea, Limbe Nautical Fisheries Institutes (LINAFI), University of Dschang and Douala hosted by the Divisional and Sub divisional delegations of ministerial services and IRAD ;</p> <p>Councils: Tiko and Limbe III councils (2);</p> <p>National Development programmes: Participatory National Driven Development Programme (PNDP), (1)</p>
Funding mechanism	REDD+/climate change	Reduction Of Tiko-Limbe III Mangrove Deforestation And Degradation Through Integrated Sustainable Mangrove And Associated Coastal Forest Management supervised by PNDP
Policies makers/implementers	Senators, Parliamentarians , government ministerial services	<p>Ministerial services: Ministry of Forestry and Wildlife (MINFOF), Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED), Ministry of Fisheries, Livestock and Animal Husbandry (MINEPIA), Ministry of Tourism (MINTOUR), Ministry of Agriculture and Rural Development (MINADER), Ministry of Territorial Administration and Decentralization (MINATD)</p>
(iii) Tertiary stakeholders		
Petty traders	Shop keepers	Several Provision shops and coffee/ tea shops

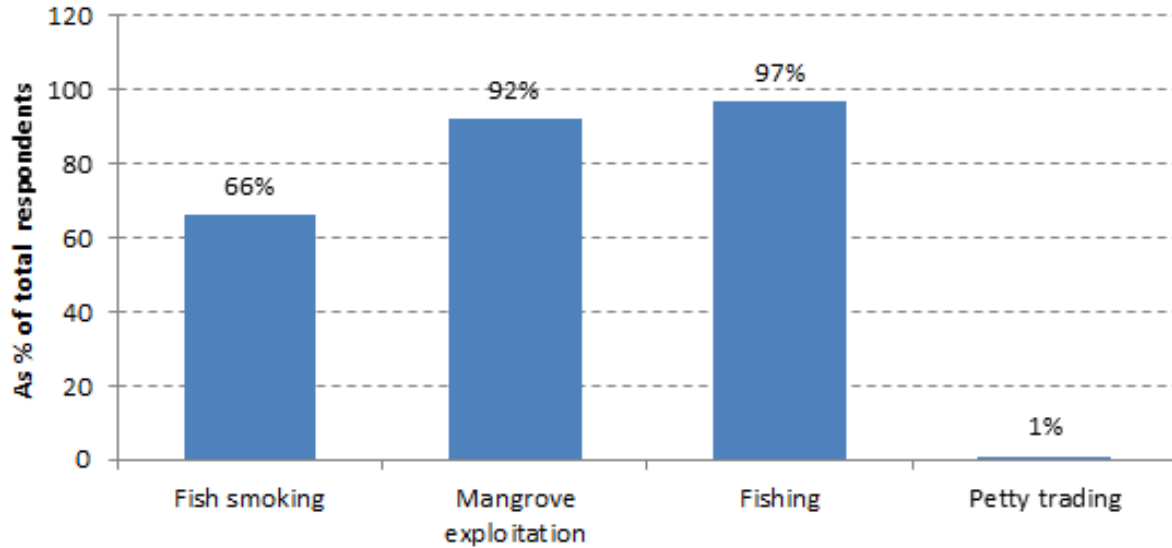


Figure 3. Activities of local direct stakeholders of the Bimbia-Mabeta mangrove area, Cameroon.

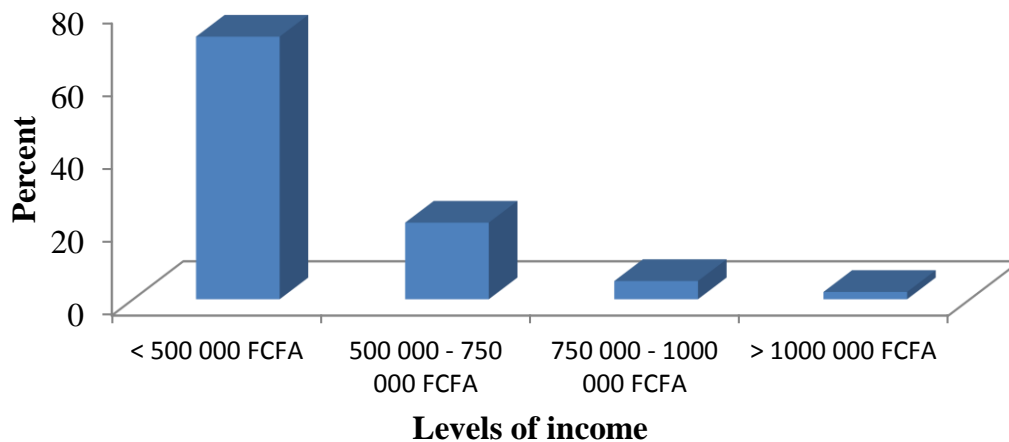


Figure 4. Annual income earning levels of the local direct primary stakeholders.

of direct stakeholders and their activities within the Bimbia-Mabeta mangrove area

The major activities actively carried out by some local stakeholders in the study area are presented in Figure 3. The majority of the respondents (97%) were involved in fishing followed by 92% in mangrove exploitation, 66% of the respondents involved in fish smoking while only 1% of the respondents were involved in petty trading and they obtained indirect benefits from the mangrove.

Annual income levels of various stakeholders

The annual income earning of the local direct primary stakeholders can be seen on Figure 4: Some 72% of the

respondents revealed that their annual income earned stood at less than 500.000fcfa (less than \$1000), 21% earned annual incomes ranging between 500.000-750.000fcfa (between \$1000-1500) while just about 5 and 2% of respondents earned annual incomes ranging between 750.000-1.000.000fcfa (between \$1500-2000) and greater than 1.000.000fcfa (greater than \$2000) respectively. The annual income earning level of the local stakeholders observed ranged from less than 500.000 to greater than 1.000.000fcfa with no noticeable influence on the conservation of the mangrove because the three activities (fishing, fish smoking and mangroves exploitation) were major activities that contributed towards mangrove degradation.

The annual earnings of the secondary indirect stakeholders especially the councils (development

Table 2. Income /revenue collected by the state (source: field surveys).

Department	Local Service in charge	Category of tax	Purpose	Unit price (Fcfa/\$)	Frequency of collection	Amount per year (FCFA/\$)
Ministry of Livestock, Fisheries and Animal Husbandry (MINEPIA)	Divisional delegation of livestock, fisheries and animal husbandry	Boat Registration/ownership tax	Fish production	5000 (9)	Annually	5000 (9)
		Fishing authorization tax	To carryout fishing activity	5000 (9)	Annually	5000 (9)
		Kitchen ownership authorization	To carryout fish smoking	5000 (9)	Annually	5000 (9)
		Sanitation tax	Sanitary inspection for crayfish	200Fcfa (0.4)	Daily	72000 (120)
		Sanitation tax	Sanitary inspection for fish	500 (1.0)	Weekly	24000 (40)
Ministry of Forestry and Wildlife(MINFOF)	Forestry Chief of post	Authorization tax (way-bill)	Transportation and fuel trade	1000 (2)/ Pickup truck	Daily	Unknown
Decentralized Territorial Collectivities	Council	Fuel wood depot tax	Land occupation for fuel wood parking	1000 (2)	Monthly	12000 (20)
		Kitchen tax	Fish smoking	1000 (2)	Monthly	12000 (20)

agents) and the different decentralized government services (MINFOF, MINEPIA, MINTOUR, MINADER etc.) (policy implementers) though difficult to obtain from most of them due to corrupt practices, were however reliably revealed from local informants through different categories of taxes they pay to municipal and government authorities especially the Forestry Chief of post, divisional delegation of Fisheries and animal husbandry and the councils. The taxes which were daily, monthly or annual collections ranged between 1000-3000Fcfa (\$2-5) per day for the forestry service, 500-5000Fcfa (\$1-9) per year for the fishery service and 500Fcfa (\$1) daily not regular to 1000fcfa monthly (\$2) on regular basis by the council service. Details of what is required by law in terms of taxes/revenue are summarized in Table 2.

Stakeholders mapping

Categorization and mapping of stakeholders in

terms of their roles, rights, responsibilities, interests, level of impact on mangrove degradation and their level of influence on decisions for mangrove restoration are presented in Figure 5 and Table 3. It can be deduced that NGOs, Scientific research, academic institutions, have high influence on decision for mangrove restoration but less impacted by mangrove degradation. They are otherwise known as the “promoters”. They are closely followed by parliamentarians, Senators, MINEFI, PNDP, Councils, MINEPED MINFOF, MINEPIA, MINTOUR and REDD+ with high influence or power on decision for mangrove restoration yet are highly impacted by the degradation of the resource and are said to be the “Defenders”. The associations of fishermen, fish smokers, mangrove exploiters and fresh/smoked fish buyam-sellam with low capacity to influence mangrove restoration but highly impacted by mangrove degradation are termed “vulnerable group” While the petty traders and shopkeepers having correspondingly low influence and low

impact, are the “apathetic” of the four categories of stakeholders. Presented in Table 3 is a matrix synthesis of stakeholders, their roles, right, responsibility, interests, level of impact by mangrove degradation and their level of influence on mangrove restoration in accordance with the stakeholders’ categorization model shown in Figure 1.

DISCUSSION

This study presents evidence supporting previous claims by Townsley (1998) and Reed (2008) that the first steps in almost every intervention and governance affecting the use of natural resources is the identification of individuals as well as groups holding some kind of “stake” or interest in that resource. Even though the several approaches used in the classification and categorization of stakeholders involved in the management of natural resources on planet earth focuses either on the importance, interests, benefits, relevance,

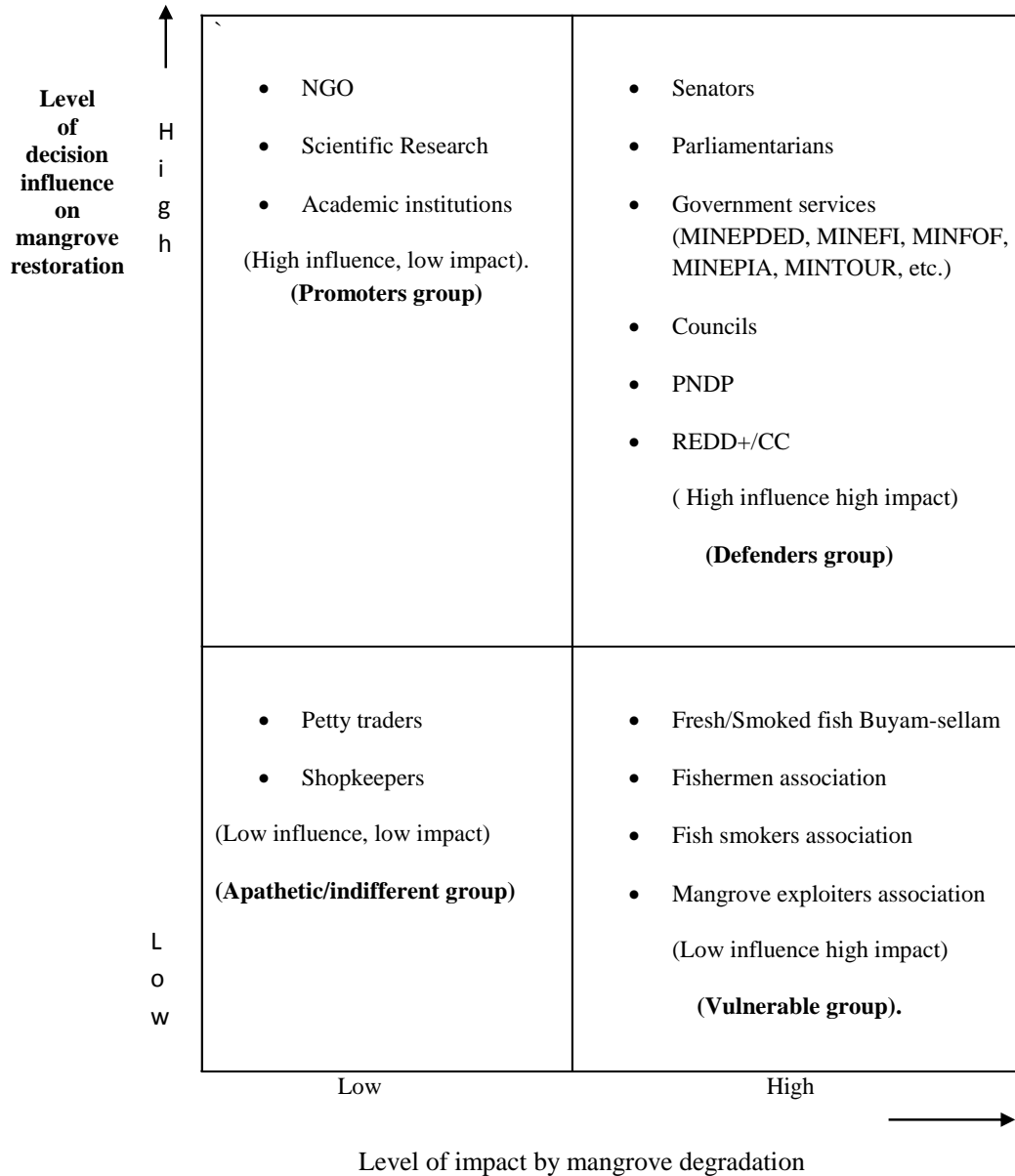


Figure 5. Mapping level of influence on mangrove restoration (Y-axis) and the level of impact by mangrove degradation (X-axis) by the various stakeholders in the Bimbia-Mabeta mangroves, SW Cameroon.

needs, rights, and other natural advantages, the likes of Krott (2005) classification was based on the rivalry he observed between different interest groups attempting to utilize the benefits gained from mangrove as a common pool resource (a rivalry observed between local stakeholders (interest) and political players or powers). Two main types of stakeholders are involved in the management of the mangrove with varying annual income earning levels. Judged from their level of influence on conservation, sustainable utilization, restoration, and degradation, they are grouped into direct or *primary stakeholders* and indirect stakeholders,

categorized into *secondary* and *tertiary stakeholders*. The direct (primary) stakeholders are collectors (fishermen, wood exploiters), traders (wholesalers, retailers), processors (fish smokers, wood splitters) and consumer (households), while the indirect stakeholders are Development agents, Policy makers (secondary) and Petty traders (tertiary). This result is in line with works of Claridge (1997) and Kustanti et al. (2014) on “actors, interest, and conflicts in the sustainable management of mangrove forest”, in which they found that two categories of mangrove stakeholders: *direct* and *indirect users*, as well as Eba’a Atyi et al. (2013) and FAO (2016), who also

Table 3. Synthesis matrix for stakeholders' roles, rights, responsibilities, interests, level of impact by mangrove degradation and their level of influence on mangrove restoration.

Stakeholders Category	Definition (local representative)	Role	Right	Responsibility	Revenue/benefits	Level of impact by mangrove degradation	Level of influence on mangrove restoration
Primary stakeholders							
1-Fishermen	Fishermen Association	Carryout fishing around mangroves	Their fishing activities around mangroves should be legal	Fishing should be sustainable	Revenue from fishing activities	High	Low
2-Fish smokers	Fish smokers Association	Fish smoking	Carryout fish smoking trade	Ensure continuous supply of smoked fish	Revenue from the sales of smoked fish	High	Low
3-Mangrove exploiters	Mangrove exploiters Association	To exploit mangroveresources	Exploitation of mangrove resources should be legal	Ensure sustainable exploitation	Revenue from exploitation of mangroves resources	High	Low
Secondary stakeholders							
1- Development agents	Non-Governmental Organisation	Support conservation efforts through integrating local community participation	Propose conservation strategies, Sustainable utilisation and restoration measures.	Organise Education, training and sensitisation workshops on the importance of mangroves and its resources	Tax exoneration, information, visibility	Low	High
	Scientific Research	Carryout research on different aspects of mangroves	Report research findingsand propose new conservation techniques and measures	Introduce new conservation measures and techniques	Information and visibility	Low	High
	Councils	Receive reveune from mangrove users	Stop illegal activities in the mangrove forest	Carryout rehabilitation and restoration project onmangrove forest	Tax and Potential carbon revenue	Low	High
	National Community Driven Development program (PNDP)	Charged with facilitating local councils in the process of development through facilitation for the elaboration of a councils development plan	To offer crucial technical and financial resources for councils	Supervised the councils initiate, implement and follow up their development through the elaboration and implementation of their communal development plan.	Tax and potential carbon revenue	Low	High

Table 3. Cont'd

	REDD+	Reduce greenhouse gas emissions and increase removal by limiting deforestation and forest degradation.	Collaborate with developing countries to reduce deforestation and forest degradation	Provide developing countries with financial incentives to take actions geared towards climate change mitigation.	Forest restored, forest carbon stocks conserved and greenhouse emissions reduced	Low	High
	REDD+						
3-Policy makers	Parliamentarians	Adopt laws and regulations governing the protection of mangrove and fragile zones	To know the state of mangrove from the ministries concern	Ensure the protection of mangroves and fragile zones	Information	Low	High
	Senators	Adopt laws and regulations governing the protection of mangrove and fragile zones	To know the state of mangrove from the ministries concern	Ensures the protection of mangroves and fragile zones	Information	Low	High
	Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED)	Enure laws and regulations governing mangroves are enacted and enforced	Control or stop all mangrove activities which aren't conservation oriented	Monitor all activities carried out within mangrove forests and fragile zones	Potential carbon revenue	Low	High
	Ministry of forestry and wildlife (MINFOF)	Enure laws and regulations governing mangroves are enacted and enforced	Stop illegal exploitation of mangrove wood and wildlife	Monitor exploitation activities carried out within mangrove forest	Tax	Low	High
	Ministry of Fishery, Livestock and Animal Husbandry (MINEPIA)	Ensure that laws and regulations governing fisheries production are enacted and enforced	Stop illegal and unsustainable fisheries practices in and around mangrove areas	Monitor all activities linked to fisheries production in and around mangrove areas	Tax	Low	High
4-Policy implementers	Ministry of Agriculture and Rural Development	Ensure that laws and regulations governing agricultural activities are enacted and enforced	Prohibits unsustainable agricultural activities around mangrove (eg animal rearing) and promote sustainable practices (eg apiculture)	Monitor all activities linked to agriculture around mangrove areas	Information	Low	High
	Ministry of tourism (MINTOUR)	Ensure that laws and regulations governing tourists activities are respected	Discourage unsustainable touristic activities, promote sustainable tourism (eg birdwatch and boating round mangrove	Monitor all touristic activities organised in and around mangroves	Income from tourism	Low	High
Tertiary stakeholders							
	Shopkeepers	Non	Non	Non	Non	Low	Low
1-Petty traders	Smoked fish "buyam-sellam"	Buy and sell smoked fish	Carryout smoked fish trade	Just buying and selling of smoked fish	Revenue from selling of smoked fish.	High	Low

revealed that, the direct users are those directly exploiting (collectors) alongside the intermediaries (transporters, traders, processors consumers) while the indirect users are those who are not in direct contact with the forest, that is the (traditional and official) authorities.

The results of this work is in line with previous studies conducted in several parts of west and Central Africa, Asia and South America like the works of Ajonina and Usongo (2001), Feka et al. (2009) and Feka and Ajonina (2011) in which they all found fish smokers, fishermen mangrove wood exploiters, sand extractors and agriculturists as direct users of mangrove resources. A claim which was further supported by Feka and Manzano (2008) and Hanneke et al. (2012) as their works were able to produce additional evidence to prove that fishermen, fish smokers and mangrove wood exploiters are direct users. They found that there exist a positive correlation between fishing, fish smoking and mangrove wood exploiters which influence the conservation of the mangrove ecosystem.

On the point of view of stakeholders roles, rights, responsibilities, benefits, level of influence on mangrove restoration as well as level of impacts of mangrove degradation, the study produces evidence that the roles, rights, responsibilities and benefits as well as level of influence on mangrove restoration and level of impacts of mangrove degradation vary from one stakeholder to another which is in accordance with the importance, needs and interest of mangrove resource to them. As seen on Figure 5 and Table 3, the study shows that direct and the tertiary indirect stakeholders (buyam-sellam of smoked fish) sustained high impact from mangrove degradation and low influence on mangrove restoration, while the indirect (secondary) stakeholders have high influence in mangrove restoration and with low impacts from mangrove degradation. This is in conformity with the works of MacArthur (1997); Barrow et al., (2002) and Samoura et al. (2007) that categorized them as; *Social actors* (village association and village committee), *Economic actors* (economic groups and entrepreneurs), *Political actors* (local elected authorities and prefectures), *Research groups* (technical government services, research institutes, NGOs and project organisations) and *Environmental services* (tourists services, international institutions, NGOs, environmental departments).

CONCLUSION AND RECOMMENDATIONS

Thousands of people rely on the ecosystem services provides by mangroves at the Bimbia-Mabeta area for poverty alleviation and livelihood sustenance but have not yet identified that the best management method to ensure its sustainability is the involvement of stakeholders in the management process. Owing to the level of the impacts of degradation on the Bimbia-Mabeta mangrove with underlying causes deeply rooted in the complex

socio-cultural, economic and political contexts, identification of the different types of mangrove stakeholders in the area, their role in re-establishing ecological functions, their rights, responsibilities and benefits cannot be over emphasized. Since the world is becoming more integrated, and being the most important concept in modern society that strongly emerges in the field of natural resource management because of the complexity of the systems involved. This implies that in enhancing conservation of the mangrove ecosystem requires a more efficient and sustainable management strategy that will mitigate the negative impacts to obtain a significant positive impact in rehabilitating and restoring the mangrove resources. Much still needs to be done as far as this ecosystem is concerned to address the prevailing human threats at the Bimbia-Mabeta mangrove zone whose management is heavily hinged on multi-dimensional stakeholders' approach that brings together stakeholders from various sectors involved in mangrove management. This can only be done through research, sensitization (with more emphasis on public awareness raising and education legislative), capacity building, the introduction of new legislation and new governing bodies with clearer administrative roles on environmental issues, as well as the institution of a stronger conservation status for the Bimbia-Mabeta mangrove area so that it can gain its outstanding value. We are left spellbound by the works of World Bank, ISME, CENTER Aarhus (2003); Hanneke et al. (2012), who both highlighted the essential ingredients for the governance from effective involvement of all stakeholders as a critically important element in the management process where coordination and clear distribution of responsibilities among the different stakeholders necessary to ensure successful and sustainable management of mangrove, are achievable by establishing "*management plans*" with "*stakeholders engagement plans*" for all mangrove areas without which implementation of any management system involving different stakeholders can be ineffective. For this to be achieved, the following recommendations are proposed:

(i) *Need for appropriate separate legislation for mangroves.* Adherence to appropriate laws and good institutions is the basis of good governance. Legislation on environment and natural resources is still general and let alone not specific to mangroves. Mangroves by the nature are also hiding grounds of all sorts of criminals since it is no man's land. There is therefore need for appropriate separate legislation for mangroves to curb corruption, 'ill' intentions of some stakeholders and governments' agencies to rob off the livelihood of rural stakeholders while failing to make alternative sources of livelihood for them.

(ii) *Incorporation of multidisciplinary approach to management process:* In order for mangroves to be managed effectively, Hanneke et al. (2012) found that critical framework or enabling conditions must be

established which include a clear and accepted understanding of ownership and use rights and a solid legal infrastructure that supports and incorporates mangrove management strategies into a wider planning and policy framework. They noted that such frameworks will involve all relevant agencies and stakeholders and extend across all adjacent zones and communities. The sustainable management of the Bimbia-Mabeta mangroves ecosystem needs be integrated into a broader spatial framework of coastal zone management which incorporates the multidisciplinary (holistic), participatory and integrated stakeholders' approaches in the management process. It is a participatory system whereby planning, management and implementation of conservation, sustainable multiple utilization and restoration of the mangroves ecosystem can be achieved through stakeholders dialogue, negotiations, consensus and compromise due to divergent views or interests.

(iii) *Building organizational and functional capacity of fishers and other mangrove exploiters*: They equally need to organize the fishermen or other mangrove exploiters into co-operative or associations or socio-professional groups that provides a conducive environment, common participatory and synergistic framework to facilitate the co-management of the adjacent mangroves forest and also for sustainable resource use innovations to operate.

(iv) *Carryout community-based tree planting schemes for mangrove restoration*: The government and civil society organizations need to be stimulus to carry out a campaign mobilizing other stakeholders groups on planting (afforestation) and replanting (reforestation) of mangroves trees (mangroves restoration) at severely degraded sites with the effective involvement and participation of stakeholders. Their level of involvement will be commensurate with their different stakes in the resource.

(v) *Creation of effective partnerships to support participatory mangrove management*: Successful and sustainable mangrove management will depend upon the creation of effective partnerships and promoting participatory activities between the different users and beneficiaries in the chain of delivery of mangrove ecosystem services. The financial support through the REDD+/climate change mechanism towards conservation efforts to developing countries should be reinforced to encourage local communities having mangrove stands to sustainably manage and protect their mangrove forest geared towards preventing global climate change.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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