

DETERMINING THE LATENT VALUE OF BORIKIRI MANGROVE FOREST IN RIVERS STATE

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ABSTRACT

Mangroves which are considered an important natural resources occupy coastal and estuarine areas in many tropical places like Rivers state, provides goods and services for both direct use and indirect use. Borikiri mangrove forests therefore are no doubt a source of livelihood for the surrounding communities. However, Borikiri mangrove forests are fast becoming ecological martyrs - victims of public empathy and indifference. The clearing , destruction and reclamation of the mangrove forests in the area as a result of anthropogenic activities has become so common in recent times. This study was therefore initiated to determine the latent value of the mangrove forest being indiscriminately destroyed and reclaimed in Borikiri. Thus, the value of what is being destroyed in the Borikiri mangrove forest. In carrying out the study, the researcher used primary sources of data collection in gathering data, which includes the use of questionnaire. The researcher also conducted interviews randomly with community leaders and some selected mangrove users. In addition to this, field visits and personal observations were made by the researcher which also formed part of the data used for the study. The study revealed that the estimated monthly value per hectare of Borikiri mangrove forest is N3,929,875.00, and an estimated annual value of N53,071,500 Per hectare, This is despite the fact that those direct and indirect uses of the mangrove forest (e.g charcoal, firewood, sea food, materials for construction, tourism and recreational potentials, coastline protection etc.) that have contributed significantly and are primary to community livelihood have been highly depleted thus, reducing the value of mangrove forest in the area. The study therefore concluded that Borikiri mangrove forests are better conserved and protected than destroyed and reclaimed. It recommended that there is need to always carry out an analysis of costs and benefits of development projects proposed in mangrove areas. Also policy makers and planners should begin a campaign and enlightenment of the local people on the dangers and consequences of over exploitation and encourage them to strengthen their traditional resource management practice.

KEYWORDS: Latent Value, Valuation, Mangrove Forest

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INTRODUCTION

Mangrove forests which are an important environmental/natural resource, makes part of the total wealth of a state, region or nation. However, they are usually ignored in the national, state or regional accounts system, because many of its services are not traded in the open market and their values are not captured using the conventional approaches to valuation.

Mangrove forests were historically considered waste of valuable land that could be improved by providing drainages and

putting them to other uses (Mitsch and Gosselink, 1986), are today widely recognized for providing valuable ecological services (Woodward and Wui, 2001) and many other services that have been seen as being of immense importance for survival of human and other living creatures.

Generally, mangroves are an assemblage of trees and shrubs that develop between tidal one in saline coastal region. There are two types of plant communities that make up the mangrove species in Nigeria. These plant communities are; True mangroves and mangrove associates. True mangroves are trees and shrubs which are indigenous and are found mainly in the amphibious mangrove ecosystem. Example of the true mangrove include *Rhizophora racemosa*, white mangrove etc, while mangrove associates are trees, grass and ferns, which are more terrestrial but form a part of the mangrove ecosystem. Example of mangrove associates includes *Nypa fruitican* etc. Most of the mangrove associates are found in the transition zone of the ecosystem and so, do not have one or more features of true mangrove.

Mangrove ecosystems are unique, highly productive areas, and important from social, economic and biological points of view (Spalding, Kainuma & Collins, 2010). Mangrove forests provide possibly the most direct and essential connection between life in the ocean and life on the land. Mangrove ecosystems are very valuable source of timber and income for local communities, and perform valuable protective functions; absorbing the energy from waves and wind as well as regulates the estuarine coastal water quality through sedimentation and nutrient uptake (Gasana & Borobia, 2004). Mangroves have traditionally been widely used and exploited in the past in many countries where they exist. Knowledge of their current and past condition and uses is essential for forest managers, policy and decision makers (FAO, 1997)

A Section of Borikiri Mangrove Forest



Source: Field Survey, (2017)

Figure 1.

LITERATURE REVIEW

The term “Mangrove” describes both the ecosystem and the plant families that have developed specialized adaptation to live in the tidal environment (FAO, 2007). Mangrove forests are situated in topical and sub-tropical regions around the world (Alongi, 2002). Tropical regions are dominant in terms of spatial distribution of mangroves which covers up to 75% of tropical and sub-tropical shorelines (Alongi, 2002; FAO, 2007; Spalding et al, 2010). They grow in high salinity, high temperature, sedimentation and muddy lands. Mangroves are known as one of the richest biodiversity ecosystem with about 70% known mangrove species which are tolerant to salt and brackish waters (Myint, 2008).

The mangrove forest involves plants, animals and microbial organisms. The plant component involves trees, shrubs, palm or ground ferns, generally exceeding one half meter in high which normally grows above mean sea level in the intertidal zone of the marine environments, or estuarine margins (Duke, 1992). Nigerian Mangrove forests have low plant species diversity, greatly influenced by both fresh water flows from upstream and diurnal tides from the Atlantic Ocean (Ekeke, 2000). Mangrove supports a wide range of ecosystem services which includes; nutrient cycling, carbon sequestration, aquaculture, tourism and cultural services (Millennium Ecosystem Assessment, 2005; Omokhua & Ofodile, 2011) as cited in Vure, (2006). Mangrove provides important and unique ecosystem goods and services to coastal and marine environment. Thus, the mangrove provides support to commercial fisheries acting as nursery, breeding, spawning and hatching habitats for offshore fisheries (Blaber, 2007) and exporting organic matters to the marine environment providing nutrients for fauna in both the mangroves themselves and in adjacent marine and estuarine ecosystem.

According to Barbier, (2007), several studies have been carried out and documented that regions with intact mangroves were exposed to significantly lower level of devastation from natural disaster than those with degraded and converted mangroves. The species play a crucial role in stabilizing fine sediments, contributing to shoreline stabilization, erosion and flood control, groundwater refill (recharge), water purification, reservoirs of biodiversity, cultural values, recreation and climate change mitigation and adaptation (Ajuwole, 2016). Mangroves are rich source of timber, fuel wood, honey, medicinal plants and other raw materials (Barbier, 2007). Also they attract eco-tourists, fishers, hunters, hikers, and beds watchers providing a valuable realized or potential source of national income. Fish, crabs, oysters etc also produced in the ecosystem are good sources of nutrition to the people living in the area. Educationally, the forest provides opportunities for formal and informal education and training. In Nigeria, many riverine communities in the out-rich Niger Delta depends heavily on mangrove wood for domestic consumption, charcoal, poles and many construction purposes.

The economic valuation of mangrove forests, biodiversity and ecosystem services requires the pricing of their economic values, and more precisely, capturing their marginal economic value for trade-off purposes (Braat and Brink, 2008). As agreed by Ruhl (2007), "Failure to refine our understanding on their value and the consequent inability to account for those values in regulating and market settings and, more important in the public mind is unlikely to promote their conservation" in other words, coupling Cost Benefit Analysis with the valuation of biodiversity and ecosystem services would allow stakeholders of natural areas to better understand the trade-off at local, national and international levels between the benefits of legitimate (authorized) consumptive and non-consumptive use of their ecosystem services, and the associated management and opportunity costs.

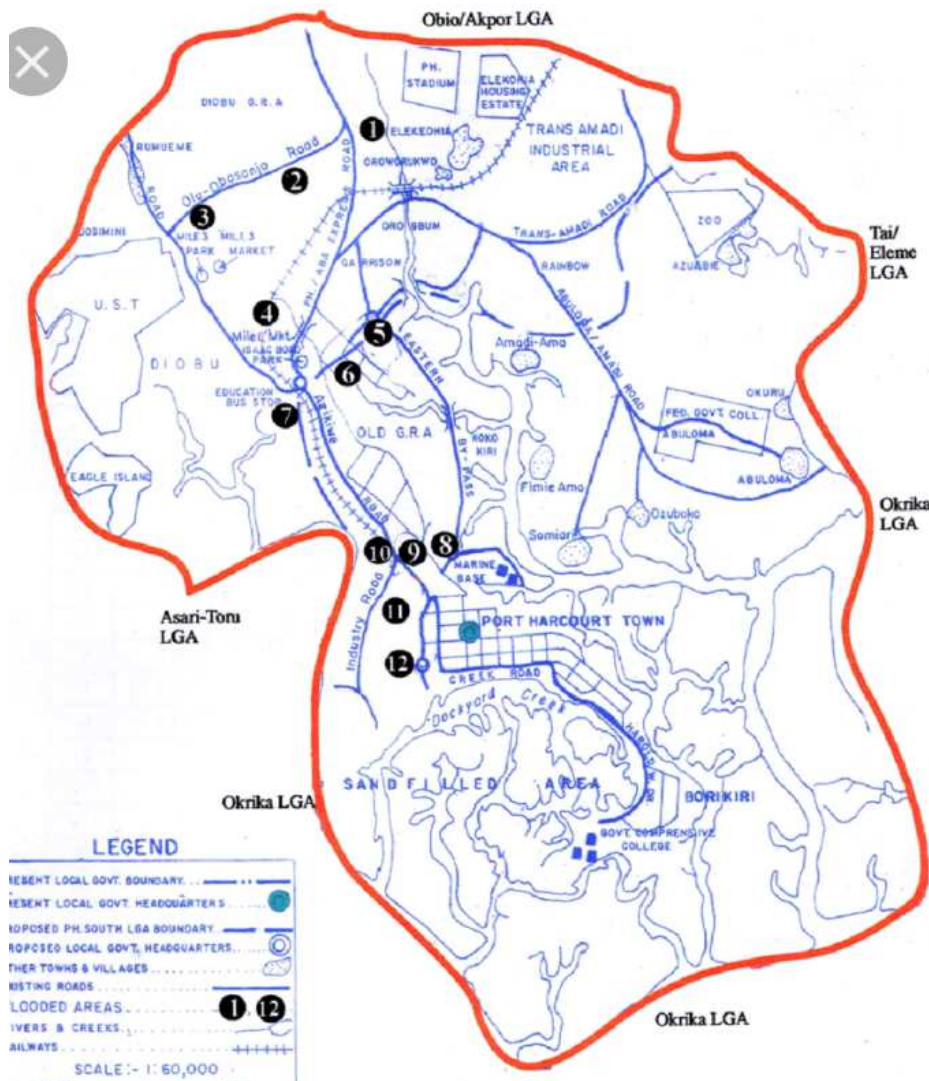
Gods time (2013) asserted that the social value of mangroves is qualitative and thus distinguishable from quantitative economic value in which money is the natural common measurement unit. He went further to state that it is for this very reason that social value of mangroves is often not captured for policy and decision making. He concluded that decision to convert mangrove vegetation in the Niger Delta to alternative uses should be based on the consideration of the value of mangroves. This includes consideration for the economic as well as the social value of mangroves.

The Total Economic Value of a mangrove forest is derived from the values associated with the services generally acceptable measure of human welfare, including recreational and educational opportunities, aesthetics, spiritual enrichment, and market based goods and services. The services provided by mangrove forests include beneficial outcomes associated with biodiversity support, carbon

The Study Area

Borikiri is a neighbourhood of the city of Port Harcourt situated just south of old GRA in Port Harcourt, Rivers State, Nigeria. It lies at latitude 4.7490W and longitude 7.0350E. The neighborhood is bounded by Ahoda street to the North, Okrika Island to the East (across Aboturu Creek), Orubiri Oil Field to the South and ship builders road to the West. Borikiri is made up of four (4) major communities which are; Olomogbogbo-Ama, Alase-Ama, Biere-Ama and Bie-Ama (not in any particular order). These major communities are further made up of pollos (units that make up the communities) that segments the areas. Olomogbogbo-Ama is made up of Nine (9) pollos, Alase-Ama community is made up of six (6) pollos, Biere-Ama comprises of seven (7) pollos while Bie-Ama comprises of eight (8) pollos. Borikiri town which is part of Port Harcourt City Local Government Area of Rivers State, Nigeria currently (May, 2017) has a population of 93,535 according to National Population Commission (NPC). The major occupation in the area is fishing, picking of sea foods, farming, and trading. The people of Borikiri speak Wakirike language. Wakirike language is a native language of Okrika people in Rivers State.

Map of Port Harcourt City Showing the Study Area



Source: Research Gate (www.google.com)

Figure 2

Materials and Methods

In collecting data for the study, both primary and secondary data were employed. While secondary data was used from literature, questionnaire was administered, face-to-face interviews, and direct observations made for the collection of primary data. In the course of this study, the following groups were interviewed accordingly; The mangrove users were interviewed on the 19th July, 2017, Polo chairman & community chairman both on the 21st July, 2017. Staff of Rivers State ministries of Agriculture and Environment both had their own turn on 27th July, 2017, while market survey on the prices of mangrove resources took place on 11th, 12th and 14th August, 2017. Typical questions asked includes but not limited to; availability of mangrove resources in the study area, types of mangrove resources collected and their uses/benefits, major sources of livelihood of the locals, other benefits of the mangrove forest to the local community apart from the resources collected, what is the present condition of the mangrove forest and its implication on the community? What is the frequency of collection of such mangrove resources and quantity collected per trip? Is there any form of restriction from the mangrove forest? Is there available market for the resource collected? What is the farm gate price for such resources collected? How would you rate the economic value of mangrove forest in the area? Etc. During the period of these interviews, questionnaires were equally distributed and retrieved. The study area was visited several times in order to achieve these. Descriptive and explanatory approaches were used in analyzing data collected. Semi-structured questionnaire were administered on the 225 purposively sampled mangrove users in the study area. This was achieved with the aid of a volunteer. Out of the questionnaire administered, One Hundred and Thirteen were retrieved and used for the analysis carried out in the study. The data collected were collated, analyzed and presented using tools such as frequency distributions and percentages tables

FINDINGS

The result of the field survey confirms the availability of mangrove resources (both direct and indirect) at the study area. The importance of the mangrove forest and its resources to the sustenance of life of the indigenous Borikiri people cannot be overemphasized. The study revealed that from the outset of the early settlement of the people of Borikiri in the present Borikiri town, the people have been depending on the mangrove forest and its resources for their survival and well being. The finding shows that there are both direct and indirect use /benefits of mangrove forest in the study area. The direct use of the mangrove forest as identified by the respondents are shown in the table below

Table 1: Identified Resources at Borikiri Mangrove Forest

S/No	English Name	Native Name (Wakirike Language)
1	Firewood	Angala
2	Fish	Inji
3	Periwinkle	Isam
4	Crabs	Epa
5	Staking sticks	Oko
6	Oysters	Mgbe
7	Prawns	Ipoli
8	Charcoal	Anyi
9	Mangrove mud (Chikokos)	Igu
10	chewing sticks	Lukwo

Source: Field Survey, (2017)

BENEFITS OF THE MANGROVE FOREST TO THE LOCAL COMMUNITY

The study found out that the mangrove forest in the area is rich in resources that are heavy income earners to the people as well as source of food. This study found out that most of the people from the study area depend mainly on the gathering and sale of these mangrove resources for their livelihood. The predominant occupation of the people as revealed by the study includes logging mangrove trees, fishing and picking of sea foods. Thus, their dependence on the mangrove resources for survival would have serious implication for the sustainability of these resources. In fact, the mangrove resources are seriously depleted in the study area. The use of mangrove trees as local fuel wood has significantly led to its depletion, just like in many other coastal areas in the Niger Delta area, where communities are still critically dependent on the ecosystem services mangrove provides. However, not minding the numerous benefits derived from them, mangrove forests are still considered wastelands with little or no value and most forests all over the region have been cleared for aquaculture, agriculture, urban infrastructure and coastal development. However, the study revealed some benefits being enjoyed from the surviving mangrove forest by the local community in the study area, as stated in the table below;

Table 2: Benefits/Uses of Resources from Borikiri Mangrove Forest

S/N	Mangrove Resources	Native (Wakirike) Name	Uses/Benefits
1	Firewood	Angala, Oko, and Atagbaka	Used for domestic cooking Used for smoking fish Used by some factories as fuel e.g for baking Source of charcoal Source of income
2	Fish	Inji	Food (source of nutrient) For income generation
3	Periwinkle	Isam	Food (source of nutrient) For income generation The shell is used for reinforcement during construction (e.g. building or road construction)
4	Crabs	Epa	Food (source of nutrient) For income generation
5	Staking sticks	Oko	Used by farmers for staking crops and vegetable e.g yam, pumpkin etc
6	Oysters	Mgbe	Food (source of nutrient) For income generation The shell is used for construction
7	Prawns	Ipoli	Food (source of nutrient) Source of income
8	Charcoal	Anyi	This is product of mangrove trees and is used for: Fuel for domestic cooking ie roasting fish, yam, plantain etc
9	Mangrove mud (Chikokos)	Igu	Used for reclamation of water-logged site for building construction or other uses
10	Chewing sticks	Lukwo	Used for mouth cleaning It is medicinal

Source: Field Survey, (2017)

Indirect Benefits/Uses of Mangrove

The data collected from the questions posed to respondents revealed some indirect benefits of the Borikiri mangrove forest as follows:

- According to respondents, it is a general belief among locals that the mangrove forest prevents all kinds of infectious diseases from invading the community. Thus, it protects them from infectious diseases. According to the respondents, such infectious diseases which are carried by air are obstructed by the mangrove trees from invading the community. The mangrove forest according to the respondents, have some aesthetic values. Thus, it beautifies the place and makes it look attractive.
- Though not harnessed, the mangrove forest also has the potential for recreational/tourist attraction.
- The mangrove trees protect the communities from effects of global warming (excess heat), and keeps the neighborhood very cool and quiet.
- The mangrove forest in addition to the benefits mentioned produces fresh air, which is enjoyed by the environs.
- Portion of the mangrove forest also serves as a burial ground for the community.

Valuation of Mangrove Resources Collected From Borikiri Mangrove Forest

Result of the study as shown in Table 3 discovered that those who engage in collection of firewood from the mangrove forest collect between 800 and 1,000 logs of firewood per month, with a unit price of N200. Thus, from the study, the total monthly income from firewood ranges from N600,000 to N800,000 per hectare. However, those who engage in fishing collect between 400 and 500 fish per month. According to result of the study, the farm-gate price per unit ranges between N300 and N500 depending on the size of the fish. The study also revealed that periwinkle collectors get as much as between 80 and 100 bags per month while the price per bag is between N2,500 and N5,000 depending also on their sizes. Between 300 and 350 bundles of crab is collected per month, with farm-gate price per bundle ranging between N1,500 and N2,000. The result revealed that between 700 and 950 bundles of staking (pinning) sticks are collected per month with a unit price of between N50 and N100 per bundle. However, between 28 and 32 bags of oysters is collected per month with a unit price range of N35,000 and N45,000.

The study also discovered that those who engage in the extraction of charcoal collect between 150 and 200 bags per month. The result also revealed that the farm-gate price per bag ranges between N1,500 and N1,800. However, between 30 and 35 baskets of prawns is collected per month per hectare of land with a farm-gate unit price of between N10,000 and N15,000. The result of the study shows that between 80 and 100 bags of periwinkle shell is gathered per month, while each bag is sold for between N400 and N500.

The study also revealed that between 600 and 900 bundles of chewing sticks are collected per month, which is sold at the range of N250 and N300 per bundle. Finally, the study discovered that between 18 and 24 plots of land are reclaimed annually with mangrove mud (chikokos). The study discovered that it takes an individual about 6 months to reclaim 1 plot of land with mangrove mud, while it takes about 2 months to reclaim same when more hands are involved. However, according to result of the study it costs between N500,000 and N 650,000 to reclaim 1 plot of land.

Table 3: The Economic Value of Identified Resources in Borikiri Mangrove Forest

S/N	Type of Mangrove Resources Collected	Quantity Collected Monthly Per Hectare	Unit	Farm – Gate Price Per Unit (₦)	Total Monthly Income Per Hectare (₦)
1	Firewood	3,000-4,000	Logs	200	600,000-800,000
2	Fish	400 – 500	Pieces	300 – 500	135,000-225,000
3	Periwinkle	80 – 100	Bags	2,500-5,000	225,000-450,000
4	Crabs	300-350	Bundles	1,500-2,000	487,500-650,000
5	Staking (Pinning) Sticks	700 - 950	Logs	50 – 100	41,250-82,500
6	Oysters	28 – 32	Bags	35,000-45,000	1,050,000-1,350,000
7	Charcoal	150-200	Bags	1,500 – 1,800	262,500-315,000
8	Prawns	30 – 35	Baskets	10,000-15,000	325,000-487,500
9	Periwinkle shell	80 – 100	Bags	400-500	36,000-45,000
10	Mangrove mud (Chikokos)	18-24 plots (per annum)	Per plot of reclaimed site	500,000-650,000 Per plot	10,500,000-13,650,000
11	Chewing sticks	600-900	Bundles	250 - 300	187,500-225,000

Source: Field Survey, (2017)

Table 4: Average Economic Value of Identified Resources in Borikiri Mangrove Forest

S/No	Types of Mangrove Resources Collected	Average Monthly Income (N)	Average Annual Income (N)
1.	Firewood	180,000.00	2,160,000.00
2.	Fish	128,000.00	1,536,000.00
3.	Periwinkle	337,500.00	4,050,000.00
4.	Crabs	412,500.00	4,950,000.00
5.	Staking sticks	90,000.00	1,080,000.00
6.	Oysters	2,362,500.00	28,350,000.00
7.	Charcoal	146,250.00	1,755,000.00
8.	Prawns	687,500.00	8,250,000.00
9.	Periwinkle shell	40,500.00	486,000.00
10	Mangrove mud (chikokos)	-	12,075,000.00
11.	Chewing sticks	206,250.00-	2,475,000.00
		N3,929,875.00	N53,071,500.00

Thus, from the field data collected and valuation carried out as shown in the table above, it has been revealed that the estimated monthly value per hectare of Borikiri mangrove forest is N3,929,875.00 and an estimated annual value of N53,071,500.00 per hectare

CONCLUSIONS

- People's survival still depends largely on the use of forest resources extracted from the mangrove forest in the study area. Households are involved in different activities that require either forest products as raw materials or that are forest-based. Such activities ranges from logging of mangrove trees, sea foods (crabs, fish, periwinkle, prawns, oysters etc) collection, fuel wood and staking sticks harvesting, mangrove mud collection, etc. Unfortunately, the mangrove forests which have been a major support of households are currently under serious threats as a result of over exploitation and conversion aggravated by indiscriminate deforestation and invasion by nypa palm.
- The mangrove forest in the study area has been subjected to mass clearing/reclamation and exploitation. Thus, the mangrove forest is not under any known form of protection and/or laws and strategies of biological resources conservation. Meaning that there is total neglect of the mangrove by relevant authorities as a result of inadequate

manpower and poor funding which has given room for steady and unrestricted deforestation, over exploitation of mangrove resources, sand filling and/or reclamation of same, and consequent loss of biodiversity and value. Results of the study clearly shows that reduced production of mangrove resources such as fishes, periwinkle, prawns, oysters, etc is attributable to over exploitation of these resources because the mangrove is generally subject to open access. It is apparent that mangrove users could observe a rapid decline in the quantity of resources they now collect.

- There is need to always carry out an analysis of costs and benefits of development projects proposed in mangrove areas. Such analysis would help to ascertain whether such proposed development project is worthwhile considering its general impact on the mangrove forest and its users. Evaluation of such impacts could also be used to establish compensation mechanism for the cost of anthropogenic impacts on those depending on these resources for their livelihood.
- Policy makers and planners should commence a vigorous campaign and enlightenment of the local people on the dangers and consequences of over exploitation and encourage them to strengthen their traditional resource management practice.

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