

# Eco Sensitive Beach Design: Conceptualization of Community Recreational Sandy Beach Development

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## 1 ABSTRACT

This paper explores the principles of ecological planning in conceptualizing a sustainable non-consumptive recreational beach for Eleko community. Sustainable tourism destinations are planned on ecological design concept that draws strength from bioregional concept of “place making”. Eleko Community Beach is a typical sand barrier-lagoon coastal village with a population of 850 people. It is 75 kilometres from metropolitan Lagos and fronts Atlantic Ocean on longitude 13° 50’ degrees east and latitude 4° 17’ north of the equator.

This study recognizes participatory research as a viable physical planning tool for community base recreation enterprise. Relevant primary data was obtained through a combination of three participatory research techniques including questionnaire, structured interviews and personal observation. Previous research works on coastal erosion in Nigeria, marine ecosystem and Lagos State regional master plan provides relevant secondary data

The research found out that the narrow continental shelf sand barrier –lagoon bioregion showed erosive characteristics with a high and intense wave action enhanced by the prevailing south westerly. This coastal process is recently made worse by the climate change powered ocean surge. The ecosystem is sparse coastal vegetation, holding together loose sandy soil formation along the Atlantic shoreline while Rhizophora racemose and Avicennia africana associations dominate near lagoon landscape patch. Community participatory mechanism provides “place making” inputs including activities and services the community is willing to supply; the users recreational demand.

The conceptualization took into consideration the socio religious practices that sustained the community; economic benefits accrue to the community; compatible recreational activities; and the sensitive marine ecosystem in the ‘place making’ process. Recommendations emphasize indigenous architecture for all cabins; symbolic interpretive centre; unique linkage to the artisanal fishing occupation; and conservation of native flora as ecological engineering approach to reduce ocean surge threats

## 2 INTRODUCTION

Defeo et al.(2009) enumerated ecosystem services provided by sandy shores to include sediment storage and transportation; wave dissipation and associated buffering against storms; response to sea-level rise within its geomorphological limits; breakdown of organic materials and pollutants; water filtration and purification; maintenance of biodiversity and genetic resources; nursery areas for fingerlings; nesting sites for turtles and shorebirds; prey resources for birds and terrestrial wildlife; functional links between terrestrial and marine environments in the coastal zone; and scenic vistas and recreational ground. Recreational activities on waterfronts, creeks and beaches play dominant role in the development of tourism enterprises especially domestic tourism. In his study of tourism destinations in the United States of America Houston (1996) observed that coastal recreational areas accommodate more visitors than other destinations. In the year 2000, Caribbean nations accounted for 3% of the world tourism arrivals (WTO 2001). 95% of these Island destinations are within the scenic coastal beaches. Such socio economic development stimulated the interest of Lagos State Government to set up a Tourism Development Review Committee (LSG 1985). The dual policy objectives emphasized the use of coastal tourism as a developmental strategy for the economic empowerment of littoral villages and meeting the recreational demand of the rapidly increasing metropolitan population.

The last decade of the twentieth century witnessed the emergence of sub urban coastal communities’ interest in recreational enterprises as an alternative to the dwindling fortunes from the primary artisanal fishing industry. Eleko is one of such villages. Without State Government’s facilitating program, civil society’s influence and corporate body sponsorship Eleko evolved a home grown participatory mechanism at a time when sustainable tourism paradigm is unknown in Nigeria. Sustainable tourism is a developmental strategy

that marries the needs for economic growth and protection of natural resources. It is a principle that places a high premium on environmental quality. The prime position of recreational seashore activities on sandy beaches in the metropolis is well established especially filling the wide gap created by public parks inadequacy (Adejumo 2002). Besides, sub urban beaches drive the littoral community's peasant economies. The primary goal of beach management in these villages is maximum profit with little attention given to ecological degradation especially trampling on sand dune vegetation, beach grooming and destructive dunes grading to accommodate tourism infrastructure. Shore line degradation erodes the social, economic and cultural benefits of tourism destinations. It is imperative to understand how beach ecosystems and the goods and services they provide will respond to unprecedented environmental change. Sustainable management of sandy beaches demands a framework that is conscious of natural sand replenishment, beach stability and proactive adaptive and mitigation measures to checkmate climate change driven ocean surge threatening Lagos sand barrier - lagoon bioregion. This paper examines ecological sensitive planning concept for sub urban community recreational beach along the coastline of Lagos state using Eleko community beach as case study.

### 2.1 Case Study Setting

Eleko is a typical sand barrier coastal village in Lekki peninsular with a 1991 population of 600 people. It is 75 kilometres from metropolitan Lagos and fronts Atlantic Ocean on longitude  $13^{\circ} 50'$  degrees east and latitude  $4^{\circ} 17'$  north of the equator. Littoral climatic variables prevail throughout the year with average daily maximum temperature of about  $30^{\circ} \text{C}$  and 29 mill bars of vapour pressure in the air at critical sunny dry season days. Eleko village is encumbered with challenges that other rural settlements along the 180 kilometres Lagos State Atlantic coastline endure. Pollution of lagoons, absence of fishing regulations in the various creeks and overexploitation of aquatic stocks by fish trawlers companies within the short 30 kilometres continental shelf. Unemployment and poverty enhanced the migration of the community's active labour force to metropolitan Lagos. But the completion of Lekki-Ibeju coastal road in 1988 exposed the scenic beach landscape to picnickers from the metropolis and marked the beginning of day trip recreational enterprises in the community.

## 3 ECOLOGICAL PLANNING

Beaches and natural recreational centres are planned to facilitate exchange between users and nature. Engwicht (2002) summed up such barter as exchange of ideas, emotion, knowledge, culture, material goods, friendship, and spiritual desires. These exchanges are enhanced by appropriate manipulation of sites natural capital, social values of host community and income level of potential users. When the exchanges are in continuous supply without depreciating the environmental stocks the plan has fulfilled the concept of sustainable development. WTTC et al (1997) embarked on a sustainable plan of action for tourism and recreational industries with interrelated goals of economic development, socio-cultural growth and environmental protection. Pucsko (1998) noted that ecological sustainability ensures that development is compatible with sites environmental process while economic sustainability focused on continuous benefit for all generations. Planning with socio-cultural variables make sure that the physical development do not totally disregard host community world view. The underpinning theoretical framework for sustainable design is rooted in ecological design and planning philosophy. Ecological planning originates from the fundamental objective of applying ecological principles to physical planning at both urban and regional scale. (Yip, 2008). The theory is based on the simulation of ecological process in the spatial configuration of desired recreational features.

Sustainable design and planning is an input from the field of urban ecology that recognized the fact that "nature has design principles that sustain continuity" (Register 2000). These principles are responsible for meeting the needs of every member of the system continually through biogeochemical cycles. Such regulating process is controlled by an in built design mechanism. Natural design attributes do not accommodate straight line, rigid symmetry, streamlined order; hard-line hierarchy and homogeneity (Downton 2002). Rather sustainable planning place priority on how a project fits into the contextual ecosystem. Cowan and Ryn (1996) define such design as "any form of design that minimizes environmentally destructive impact". Spatial consideration on this platform respects species diversity, minimizes resource depletion, preserves nature, maintains habitat quality and attends to all necessary preconditions for ecological health. Cowan and Ryn (1996) grouped natural processes as five major



ecological design principles ideal for landscape design at any scale. The principles are “solutions grow from place; ecological accounting inform design; design with nature; everyone is a designer; and make nature visible”. The first principle “*solutions grow from place*” is a reflection on Berg (2001) philosophy of “bioregionalism”. Bioregionalism addresses the daily relationship of man with the biosphere (Nicholls 2004). It is linked with the various land use undertaken by indigenous groups as a natural survival strategy. Bioregion transcends political boundaries. It looks at heritage, culture, norms, values and ideas that local people have developed in inhabiting a particular place. As examined by Downton (2002) bioregionalism is having “a sense of place”. This principle seeks a localized design solution. According to Salvesen (2002) ‘place making’ is about people and the activities that provide a memorable feeling in a defined landscape. Such place making is not only fitting desired activities in the landscape but also defining spatial configuration that accommodates native flora and local arts and architecture in its aesthetic finishes.

“Ecological accounting principle” highlights the importance of comprehensive site ecological variables inventory. Understanding site’s variable including soil, vegetation, hydrology and climate and interrelation between them will enhance the determination of the resources for special use. The first step in eco planning is the determination of ecological variables (i.e. environmental resources) to be investigated. This is often dictated by design goal which is the function or land use under consideration. McHarg (1971) blazed the trail of design ‘with nature’. He explained that “nature is an interacting process responsive to laws constituting a value system, offering intrinsic opportunities and limitations to human use”. This third principle and ecological accounting are interrelated. Design with nature stressed that the inventoried ecological variables be collated, digitized, mapped, analyzed, evaluated and synthesized to determine suitability and vulnerability of site for the defined goal. It is an effort to ensure that human impact is within the regenerative capacity of the site. Community participation is at the center of sustainable tourism destination planning. Cowan and Ryn (1996) fourth principle- ‘*everyone is a designer*’ – advocates the contributions of all stake holders. Sustainable developments in all its ramifications draw strength from participatory action research (PAR) framework (Ishida, 1991). According to Ishida (1999), the main trust of PAR is valuing local knowledge, transforming local knowledge into a major resource and using the knowledge to bring about transformation. PAR is a grass root developmental approach in which the people rather than the government or developmental agencies define the problem, assess the needs, agreed on the knowledge and method to solve the problem. “Everyone is a designer” desires the input of all stake holders including local people, developers, users, civil societies and governmental agencies in the final decision making.

The fifth principle to “*make nature visible*” implies showcasing ecological process physically in the realization of conceived functions and aesthetics of the proposed project. That is ecologically designed projects must conserve woodlands, stress the capacity of wetlands to enhance water quality, reserve enough floral as carbon sink, re-vegetated desolate streets to achieve human thermal comfort, accommodates urban farming for food security, bio-remediate polluted water bodies and have a strong linkage to primary community means of livelihoods. The bottom line is integrating ecological process in any physical project for the sustainable use of environmental capital. The case study at hand is a recreational beach initiated by Eleko community. With the erosion of the premier Victoria beach, the absence of integrated coastal zone management plan and the menace of ocean surge there is the apathy that the emerging community base beaches will be degraded in due course. The research explored the principles of ecological design and planning in conceptualizing a non consumptive recreational beach. Such a sustainable rural beach enterprise will improve the economic capacity of the local people and meet the recreational and domestic tourism needs of metropolitan Lagos.

### 3.1 Methodology

Participation was achieved through structured interview of community opinion to understand the historical background of the beach and community expectation. Two sets of questionnaires were administered. The first set was administered to the community to comprehend primary occupation, festivals, natural resources and linkage to beach enterprise. The second questionnaire addressed the beach activities visitors are engaged. Personal observation took an inventory of existing recreational facilities. Secondary data were obtained on previous research works on sand barrier-lagoon complex bioregion, including Coastline Erosion in Nigeria (Ibe, 1988); Lagos State Review Regional Master Plan (Ashinyanbi 2006); and Badagry Coastal Ecotourism

Master Plan (Gold 2008). The desk top study focused on coastal ecosystem and was supported by personal observation.

### 3.2 Result

Bioregional planning advocates detail comprehension of ecological system complexities as they relate to peoples way of life. This demands knowledge of gulf of Guinea coastal process. As noted by Ibe (1988) Eleko village falls within the 200 kilometres Sand Barrier –Lagoon Complex. Morphologically this bioregion is framed by interconnecting creeks lagoons that run parallel to the Atlantic shoreline. The lagoons and creeks network include Badagry creek, Port novo creek, Lagos lagoon and Lekki lagoon. With the exception of Lagos lagoon, none of the lagoons, creeks and water bodies drains directly into Atlantic Ocean. Previous studies of this Sand Barrier –Lagoon Complex showed erosive characteristics due to four inter related coastal processes (Ibe, 1988; Ashinyanbi 2006; Gold, 2008). First is the absence of exoreic rivers necessary for sedimentary deposit from upland sources. The second reason is the very active eastward long shore current. Thirdly the complex has a narrow continental shelf of about 30 kilometres wide. This shelf is indented by gullies and submarine canyons including Avon canyon on latitude 6° 10'N and longitude 3° 55'E (Ibe 1988). The narrow continental shelf empowers waves to reach the shore at higher heights and enhances the loss of near shore sediments to the gullies and canyon. Finally the intensity of wave action is high along the beaches due to the influence of the prevailing south westerly.

The waves affecting the Nigerian continental shelf are wind generated. Wave intensities on this coast are determined by the wind velocity, duration and fetch. Plunging waves are dominant in the Barrier-Lagoon coastline. Lekki Peninsular coastal zone, where Eleko beach is located, is under the influence of four overlapping currents including long shore, tidal, rip and oceanic currents (Ibe, 1988). Long shore currents are generated by south westerly wind and it induced swell waves that break obliquely on the sand-barrier coast line. An average velocity of .75m/sec long shore current impact the shore line sweeping sediments away. Generated tidal currents are in phases and cyclical. Tidal currents vary from 2.0m/sec to over 5.0m/sec. (Gold, 2008) Tidal currents are very important in the study area and contribute to sediment transportation. Effects of rip current in the area are not very strong but a combination of high tide and ocean surge occasionally generates plumbs of sediments perpendicular to the shore line. The frequency of ocean surge and the accompanying destructive flooding, especially during the equinoxes, is high in the last thirty years. These coastal processes determine the relatively narrow 60 meters wide beachscape and grain composition (Ibe 1988). The beach is made up of well-sorted medium to coarse golden sand grains with some broken shells. The beach profile shows an average of 20% gradient from the sand berm scarp northward to the beginning of the stabilizing vegetation.

The biogeographic ecosystem is comprised of sparse coastal vegetation holding together the loose sandy soil formation. Four landscape patches are recognised (Figure 1). A dominant feature is the 40 meters wide coconut plantation that linearly defines the vegetation edge of the beach. Elias guinensis and Parinari robusta medium height trees emerged from the thickets of ground covers, climbers and sedges (Gold, 2008). The second patch is about 300 meters wide. Cypress species, Euphobia hyposopipolia and Ipomea aquatica are the major sedges, climbers and ground cover respectively (Gold, 2008). The third patch is the 500 meters coastal grassland. The woody component of the vegetation included trees such as Bridelia ferrugina, Borassus aethiopum and Parinari spp. Prominent among the herbaceous annuals and grasses were Eupatorium odoratum, Paulina pinnata, Pennisetum polystachyon, Imperata cylindrica and Axonopus compressus, Panicum barmanii, Panicum maximum. Along the flood plains of the creeks and lagoon to the north is fresh mangrove vegetation. Raffia hookeri, Phoenix reclinata, Rhizophora racemose and Avicennia africana associations are the dominant trees of this near lagoon landscape patch (Ibe, 1988).



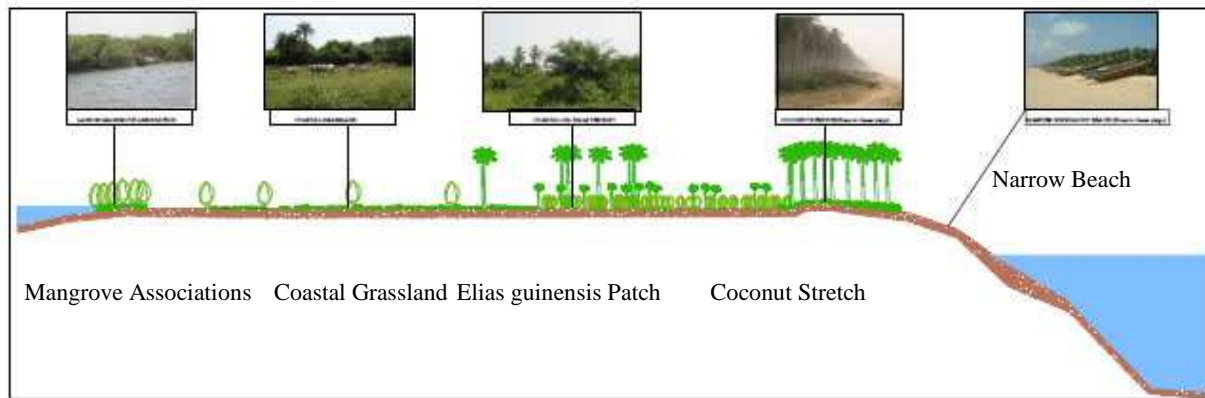


Fig. 1: Landscape Patches.

Beach users' opinion on recreational activities and willingness to be involved in community festivals were obtained from questionnaire. Figure 2 enumerates the existing recreation activities on the beach. 62.8% of the current visitors to the beach at peak festive season are involved in picnicking while 13.7%, 10.7% and 9.1% of the respondents swim, play beach volley and beach football respectively. The remaining 3.3% use the beach for a range of religious activities. The interest of the visitors on cultural activities was sampled. 83.5% of the current visitors will appreciate well packaged cultural activities while the remaining 16.3% did not show any interest.

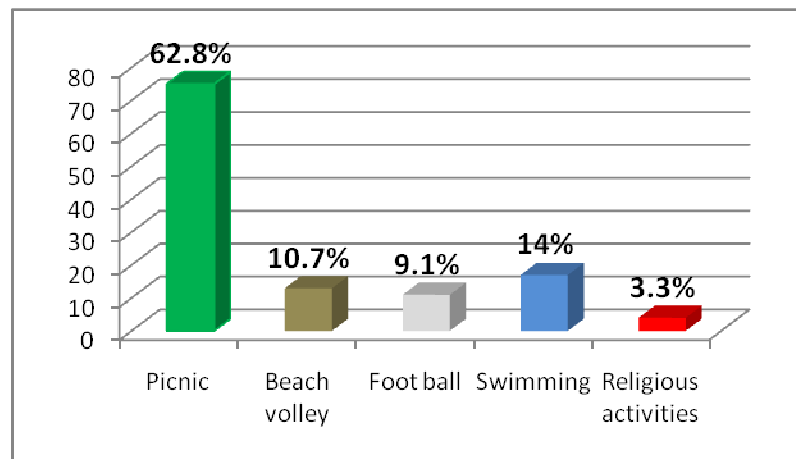


Fig. 2: Recreational Activities on the Beach

The household survey on the willingness of the community to invite visitors for the various cultural festivals in Figure 3 shows that 75% of the respondents express interest while 25% believed that most of the cultural festivals are sacred and must be kept away from visitors. In order of preference, 40% recommends 'Egungu' festival while 30% and 10% suggested 'Obaluye' and 'Oluweri' festival respectively. The remaining 5% recommends 'Alegbagba' festival. Although 95% of this community practices Islamic faith, the influence of traditional religion especially the worship of 'Oluweri', is strong. The place of Oluweri festival (festival of water goddess) must be understood from artisanal fishing as the major occupation followed by peasant coconut farming.



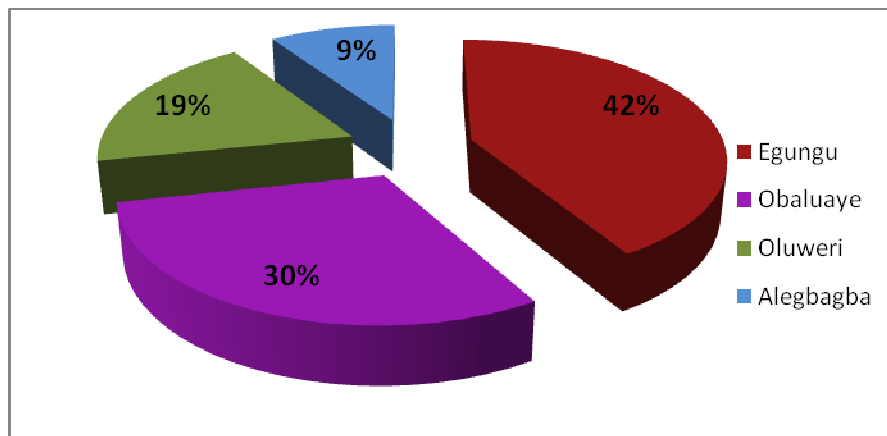


Fig. 3: Cultural Festival

Structured interviews to community opinion leaders revealed that the recreational beach tourism project was intuitively developed. There was no defined community forum to set goals and objectives. Rather, the project developed in response to internal and external socio-economic issues. Internally, selected members of the village started Eleko Seaside Club for the social needs of the community. Externally, metropolitan Lagos was in dire need of alternative planned recreational water front spaces having lost Victoria beach to coastal erosion. Eleko Seaside Club was an informal village club with a beach cabin clubhouse overlooking the ocean. The clubhouse also served as landing spot for the fisher men operating on the continental shelf. More beach cabins were built to meet the sudden rise in demand by tourists from the metropolis in search of quiet sub-urban waterfront picnic site. This additional source of income drew the attention of the entire community especially the Traditional Council. The council encouraged each household in the village to build beach cabin as proposed by Eleko Seaside Club on community land without destroying the coconut plantation.

The inventory and analysis of current recreational activities on the beach show that the domestic tourism product in Eleko community is non consumptive recreational beach tourism. It is an environmental friendly product that does not destructively convert eco resources for the use of metropolitan users. The necessary facilities for the sustainable implementation of such project are deduced from existing recreational infrastructures on the beach and the demand of the interviewed tourists. These facilities are grouped under 5 sub headings as follows:

- *Management Services*:- Beach Administrative Office, Security post, Local Government or State Government liaison offices, Life guard post, Central car park.
- *Beach Shelters*: - Group picnic cabins, Individual picnic cabins and over night Camp cabins.
- *Cabin Support Services*: - Local Restaurants/ Non alcoholic beverages stall, Fresh food stalls, Souvenir stalls, Picnic Rentals, Beach Sport Rental Stalls, Toilet facilities, Standard changing room with bathing facilities.
- *Linkage Center*: - Fishing Terminal, Seafood cold room, crafts/cottage industries.
- *Necessary Community Infrastructure*: - The following community infrastructures are necessary for the successful development and management of this recreational beach project: Portable Water source, Police post, Fire brigade post, Community Communication centre, Land fill or certified refuse dump, Community Motor Park or bus terminal, Community hall, square or park.

### 3.3 Discussion

The focal point of ecological design is integrating, protecting and enhancing ecological process in created spaces, places, built forms and site development process. Conceptualization of this beach considers site's geomorphology, ecosystem, coastal process, recreational mandate and linkage to the villager's primary means of livelihood. According to Berg (2002) "sense of place" is the focal point of bioregional planning. Achieving sense of place in this beach project demands the understanding of what the beach is to Eleko community on one hand and the users from metropolitan Lagos on the other. The community sees the beach as a natural capital for continuous socio economic empowerment through domestic tourism, artisanal fishing on the continental shelf and peasant coconut plantation. It is also a place of worship where supplication is



made to Oluweri (Water goddess). The visitors on the other hand perceive the beach as a public place that enhances spiritual, mental and physical rejuvenation. That is, it is a place to exchange fatigue from oppressive city living with the refreshing natural aquatic splendor. The ‘place making’ process is poised to symbiotically integrate the tradition, social, economic and educational needs of the local people to the recreational wants of the tourists on the marine landscape without impacting negatively on Eleko culture and the contextual Barrier - Lagoon Complex ecozone.

Community participatory mechanism provides inputs that lead to the spatial considerations for “place making”. These inputs are activities and services the community is willing to supply, the users recreational demand and the nature’s provision. From economic perspective, the community will provide beach cabin services, cabin support services and primary products cabin services. Socio-cultural events that the people are willing to provide include Egungun and Oluweri festival. The later, Oluweri festival is the religious activities preceding the annual worship of ocean goddess upon which the community’s norms and values for the sustainable use of the marine ecosystem is based. Passive recreational activities demanded by users include picnicking and cultural events. Active games recreational demands include beach volleyball, 5 aside beach football, tot lots and swimming. The tourists request for the following services namely interpretive centre, well equipped changing room facilities with standard changing rooms, telecommunication services, sports shops and rental services, grocery cabin and security conscious central parking lot. A critical step in “place making” is reconciling community’s and tourist events and services with the site’s ecology. This conceptual plan is shown as Figure 4.

Cultural festivals, social gathering spots and allied events will fit within the 40 meters gentle sandy slope between the sand berm scarp and the vegetation line. The same stretch will accommodate beach volley and beach football with removable posts. Locally made picnic cabins at the edge of the vegetation belt will benefit from the adequate noon day shade generated by the coconut palms. Support cabins including grocery stores, changing rooms, seafood linkage facility, overnight camp cabins, interpretive centre, security posts, and first aid centre may be linearly located at transition zone between the coconut belt and the scanty coastal vegetation on firmer soil composition. The current practice of parking local fishing boats powered by gasoline engines indiscriminately on the 15% slope towards the waterline need be improved upon. Such boats will be grouped. The shallow stretch of the continental shelf remains the safest swimming point.

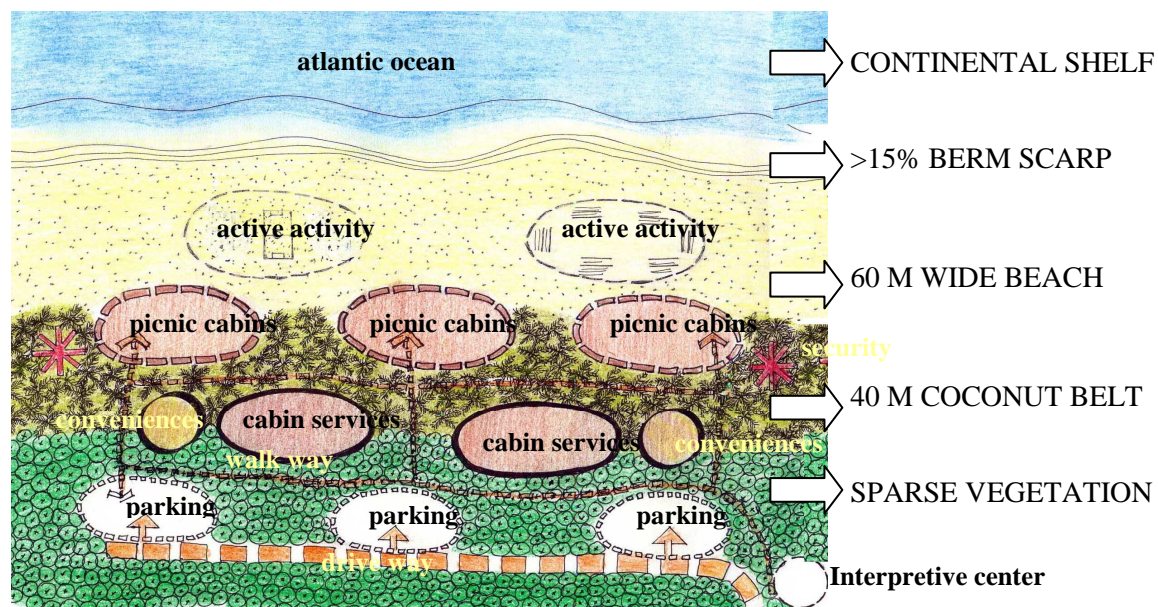


Fig. 4: Eco Sensitive Beach Concept

#### 4 CONCLUSION

Ecological design mimics nature’s process responsible for self regulation. It is a regulation that meets the needs of all members of the system. The principle of ecologically designed tourism destination requires that environmental problems be resolved within the developmental framework. The by product of the tourism destination development can then be passed to the regional community as benefits rather than environmental

liability. The geomorphology of Eleko community is representative of the large Sandy Barrier - Lagoon bioregion. This calls for the following environmental considerations:

- A spatial consideration for recreational activities must be conscious of the coastal erosive potential occasioned by the short 30 kilometres continental shelf; eastward long wave current; high wave on the shore, the prevailing trade winds, absence of exoreic streams; and erratic climate change driven sea rise..
- The location of permanent structures and active games on the loose sand berm scarp must be discouraged.
- Potential for team games including beach volley and 5-aside football is higher within the 40 meters gentle slope between the berm and the vegetation line.
- Site design process on this project must bear in mind the bioengineering capacity of the indigenous plant species. This calls for localized planting plan and maximum respect to the natural ecosystem.
- The legal setback for developmental activities along Nigeria's coastline is fixed at 150 meters from the vegetation line. The setback implies that permanent structures should not be constructed within the specified range.
- In conventional urban landscape design, manicured hedges and well mowed green lawn connotes environmental aesthetics. This is not so in nature oriented ecological design. Well kept lawn may even degrade sensitive marine ecosystem. Therefore the challenge is integrating urban dweller's perception of environmental aesthetic on a stable beach ecosystem. A design option is the introduction of compacted sandy trail as walkways through the Ipomea aquatica and Euphorbia hypositolia dominated coconut grove undergrowth.

Recommendations for place making emphasized the physical character, ownership structure, space allocation and the level to which the project accommodates people.

- The arrival point must exhibit indigenous art and architecture of Eleko people. This is better achieved through gateway design, finishing of the interpretive center and other built form on the beach.
- Pattern of introduced elements in the beach must compliment the linear shoreline golden sand beach and the bioengineering strength of the vegetation belt.
- The ownership and subsequent administration must reside with the community base organization. This will increase common trust, social and ecological management of the beach.
- Introduction of ecological images, artefacts and unique community landmarks will create a positive memory for first time visitors.
- Space creation must respond to different uses, age groups and activities. Ceremonial and active recreational spaces should meet the needs of both the spectators and participators. While tot lot responds to the demand of the children. Seating arrangement in various spaces will interest the teenagers and parents either in groups or individuals.
- Architecture of all built forms to be indigenous. Specification for construction materials should give priority to local market.
- Safety and human health must be accorded priority. The experience of the recent Asian Tsunami must bear in mind effective parking lot design, location of life guards and ocean surge early warning devices.
- Eco design respect peoples culture. Cultural impact of city pop life must be minimized through a buffer system between the planned beach and the community.

Place making creates image. Physical image promotes destination branding. A well branded community beachscape respects the contextual ecosystem with the inbuilt natural capital that creates a solid base for the social and economic empowerment of rural population.





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