Abstract

Wetlands possess abundant valuable environmental resources which hold possible opportunities for rapid and sustainable development of the eco-communities. This paper seeks to highlight multifunctional benefits derived from consumptive and non-consumptive wetland resources in Ibéno, Akwa Ibom State with a view to mitigating under-utilization and unsustainable exploitation for effective management in the area. Field reconnaissance survey identified 8 sampled communities which were purposively selected in which 400 copies of structured questionnaires were distributed to generate database for the study. It was hypothesized that tapping into the multi-utilization potentials of consumptive and non consumptive wetland resources will not contribute to local livelihood and socio-economic development of the region. The chi-square analysis at 0.05 level of significance confirmed 45.23 greater than 2.13. This affirmed the multi-utilization potentials of consumptive and non consumptive wetland resources livelihood opportunities by way of job creation, source of food, source of protein, provision of building materials for constructions, provision of medicinal and pharmaceutical material of plant and animal origin among others. The result showed that the spheres of socio-economic development in Ibéno are not only dependent on crude-oil exploitation but also on the sustainable utilization of other wetland resources in the area. The underutilization is caused by the interplay of natural factors like the swampy nature of the environment, coastal topography lying towards the sea shore with waterlogged and wave action; and anthropogenic forces. Therefore, it was recommended that wetland resources require sustainable exploitation and management for the protection of diverse resources for continuous utilization by all.

Introduction

Wetland is a unique ecosystem perceived by many countries all over the world for utilization. The awareness of the utilization potentials of wetland resources draws researchers from multi–disciplines in humid and sub-humid environment. The knowledge of utilization potentials varies among continents [1]. Diversities of ideas about wetlands influence the definition variations from place to place. According to Olalekan, Abimbola, Saheed and Damilole [2], wetlands are terrestrial or semi-territorial ecosystem, characterized with low drainage quality, slow waters or seldom standing water body filled with soil. They are referred to as boundary ecosystem because of their occurrence in nature at water body interface [3]. Wetlands are wet grounds rather than standing water (Ukpong, 2007). Wetlands are life enhancing systems of the environment which consist of direct and indirect components [2]. Wetlands have diverse functions and values which significantly recognizes the uniqueness of the environment [4]. Wetlands are very important and valuable components of the ecosystem and they serve as habitat for man and animal, source of food, shelter and other ecosystem services. They are known to be the world’s most productive ecosystems with multifunctional benefits. The resources of wetlands are both consumptive and non consumptive. Some researchers classify them into direct benefits and indirect benefits. Some of the wetland functions that human benefit from include nutrient cycling, sediment and pollution retention, flood mitigation and ground water recharge which are non-consumptive benefits. Outside these, wetlands are sources of wildlife, fish, wood and several non–timber products that are widely used by neighbouring populations. Most importantly, wetland soils can have great
agricultural potential when properly used (Olalekan, et al. 2004). Wetlands are unique productive environments with biological supermarkets of extensive food webs and rich biodiversity which support hydrological and chemical cycles [5].

Wetlands form an important primary ecosystem in the world and are often called “in series of life”, they provide habitat for thousands of species of both aquatic and terrestrial plants and animals (USEPA, 2001). Although wetlands are best known for being homes to water lilies, turtles, frogs, snakes, alligators and crocodiles, they provide important habitats for water fowls, fish and mammal (USEPA, 2002). These complex biological ecosystems and environs also provide a range of socio– economical, biological, hydrological and recreational benefits that are recognized by the society for multidimensional utilities (Abua, 2007).

The World Conservation Union (2002) estimates that wetland ecosystems provide an estimated 33 Trillion US and per year to societies, of which an estimated 26% comes from fresh water ecosystems. Wetland also performs recreational function. They are great ports for fishing, canoeing, hiking, and bird–watching, and they make wonderful outdoor classrooms for people of all ages irrespective of classs. Due to the varied functions performed by wetlands, they are a resource valued by fishermen, hunters, boaters, downstream properly owners, public water supply, flood control authorities, and recreationalists (Heimlich, 1998). Wetland also provides various multiple ecosystem services such as water treatment and purification and serve as buffers zone, provide important resource for humans and animals (verones, fister and hellweig 2013). Its functions also includes recharge of the hydrology of ground water, sediment protection and trapping, flood and erosion control, treatment and recycling of waste water, and provision of breeding and rearing ground for natural habitats, animals and aquaculture resources.

They are also useful for farming especially for cultivation of rice and fish. The peat lands which are a type of wetlands are also good for production of fuels. They are also used for sports and recreational purpose, for amusements, boating festivals, fishing and sailing events [4]. Africa is endowed with abundant wetland resources. About 169 of her coverage for wetlands is shared with estimates of about 5,600,000km², which contains wetland soils namely histosols, gleysoils, fluviksoils, and some of the flooded soils. In Nigeria, the resources attributed to the wetlands are highly valuable and they contain fish, reptile, species mammal species, amphibian species, bird’s species and different floristic species (Olalekan, et al. 2004). Examples of the wetlands in Nigeria are: Matagrud–kabok floodplains, lake Chad, Komdug, Adiami–Nghuru flood plains, Haisdeija and kiriskasama, Yobe, Kainji Lake, Batunya, Nigeria Delta flood plains, Adiami–Nghuru flood plains, Cross River Delta and Lagos Coastal flood plains (Zacheaus 2012).

In Akwa Ibom State, a vast number of species harbours in the wetland. For instance, Avicennia spp are found on the meander slip–off in the mangrove ecosystem where intense deposition of mane and clastic sediments have build up as a bar extending into channel even up to Kwa Iboe creek [6]. Wetlands offer both consumptive and non–consumptive utilization potentials in the region. The encompassing and the attraction possibilities to wetland resources give a lot of concern on the biodiversity of wetlands and other resources in the area. Wetland resources increase the economy of coastal communities. According to Ukpong (2007), wetlands are commonly known as swamp in Akwa Ibom State and are sources of considerable importance and sustainer of coastal communities with consumptive and non–consumptive resources. The traditional functions by the people like the Stubbs creek wetland covers hunting, fishing, lumbering, wine making, boat building, farming and sources of human labour (Ekanem and Michael 2010).

Although wetlands functions are well known in Ibeno community, underutilization and unsustainable exploitation are prevalent. Expansion in technological development in area of oil exploration and exploitation have with it certain forms of environmental degradation. (Ukpong, 2009, David Allen, 2010). Wetlands are degrading of floral species, through drainage for cultivation, overgrazing and cutting down of trees for building and construction purposes (Otu, 2015).

According to USEPA (2001), hydrologic alteration, pollution, grazing by domestic plants, introduction of non–native plants that compete with natures, removal of vegetation for peat mining and urbanization are common human activities that cause wetlands degradation. Natural threats include erosion, subsidence, sea level rise, drought, hurricanes and storms with remarkable wetland loss and degradation [7].

However, in recent times anthropogenic factors and natural threats have exposed the environment to risk and the resources are vulnerable to series of degradation. The destructive tendencies exhibited is obvious because the people of the area leave a wide variety of wetland resource untapped and concentrate on few which is not protected and can cause more of damage to the resource base. The question is What resources have been perceived to be of great important? What are their uses to local likelihood and socioeconomic development? What practices pose damage to resource utilization, what are the causes of the setbacks? What management strategies can mitigate the problems?

**Literature review**

**Review of wetland resources multifunctional benefits**: The study of wetland resources benefits has gain momentum over the years as a result of perception of unique functions across the globe. In addition, wetlands provide a range of goods and services and possess a variety of attributes of value to society [8]. Wetlands are composed of a number of physical, biological and chemical components such as soils, water, plant and animal species and nutrients. Wetlands throughout the tropics provide important goods and services to local communities. They are considered to be important ecosystems, which contribute considerably to the national economy and rural livelihoods [9]. These is increasing evidence that the economic returns from natural or sustainably used wetland habitats exceed those that are degraded or continue largely unabated [10]. In the
of the activities in wetland, people graze animals due to the rich content of wetland flora.

**Genetic component resources:** Wetlands are an important genetic bank where many biotic resources which were once collected in the wild are now obtained from cultivated plants and domesticated animals e.g., wild fruits. Usually, many important crops cannot maintain commercial status without the genetic support of their wild relatives.

**Medicar and pharmaceutical potentials:** Wetland plants contribute to the maintenance of people’s health in many ways by treating various sicknesses and also provide income from herbal medicines sold by traditional healers.

**Ornamental resources potentials:** Wetlands provide resources which are used for fashion and clothing (notably animal skins and feathers), handicrafts (e.g., wood and stones ceremonies). Wild plants and animals are also collected and traded as pets or for decoration (e.g. ornamental plants) in private households or to supplement the collections of gardens and artistic parks.

**Hunting:** In a similar manner to fisheries, wetland vegetation provides the ideal conditions to support hunting of both flora species and wild game.

### Non consumptive wetland resources potentials

Moran (1994) estimated the current non-consumptive value of protected areas of wetland in Kenya by foreign visitors at some & 450 million per year. This estimate is additional to current financial returns from tourism and makes no allowance for other direct and indirect benefits and potential returns consumptive uses. A valuation study of the coral reefs of the Phi Islands, Thailand (Seenprachawong, 2001) showed the travel expenses, (as an indicator of the value of a trip) to be B, 21 million baht (US$205 million) per year. In addition, visitor’s willingness to pay to increase biodiversity at Phi was estimated to be 287 Baht (about US$7) per visit.

**Regulation of atmospheric functions:** Wetlands are significant carbon sinks with peat lands and forested wetlands accounting for a greater percentage of the soil carbon pool generation. Conversion of wetlands to agriculture inevitably results in the release of large quantities of carbon-dioxide (CO₂). Wetland plays the role of global climate modifier. The services provided by this function relate to the maintenance of a favourable climate, both at local and international scales, which in turn are important for human health, crop productivity, recreation and even cultural activities (Raburus Oyongo and Obiero 2005).

**Groundwater recharge and discharge potentials:** Wetlands deliver a wide array of hydrological services viz: promoting groundwater recharge, regulating river discharge, excess ground-water movement into the underground aquifer, or underground water movement upward, and stabilizing ground and underground water supplies potential. Water is usually purified during these processes.

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River process regulation functions: By storing water and slowing water movement, wetlands buffer surrounding areas from the worst effects of storms and floods. This service is of value to the poor, who lack the financial or other means to protect themselves against the impact of storms through reinforced buildings or protected food production systems, or to recover from storms quickly (FAO 2001).

Cycling and water quality improvements functions: Sediments and nutrients are deposited in and around wetlands, preventing the siltation of downstream waterways. In addition, high levels of nitrogen and phosphorous from agricultural runoff are removed by wetlands, preventing the eutrophication of streams and rivers and the contamination of groundwater supplies. Mangroves also act as buffers and catch excess sediment that will otherwise flow into the ocean, thereby protecting vital coral reefs and sea grass beds from damaging siltation. Newcome, Provins, Johns, Ghazoul, Burgese and Turner (2005).

Erosion control potentials: Wetland vegetation control erosion by reducing wave and current energy and by binding and stabilizing the soil. The mangrove system in particular has important indirect use value through its environmental function of controlling erosion and sedimentation, which protects agricultural production in relevant regions. In a study of the mangrove wetlands of Bintuni Bay, Irian Jaya, Indonesia, the benefits of erosion control were estimated to be around US$950 per household [17], based on the value of the local agricultural production that this function provides.

Traditional/Cultural knowledge and traditions: Cultural heritage includes the physical structures and artefacts of the past, traditional water and land – use management practices, and the religious significance of wetlands and their wildlife. While there are few studies of non-use values associated with wetlands, Barbier et al (1996) suggest that donations made through campaign by European and North American environmental grounds to raise funds to support tropical wetlands conservation hint at the magnitudes involved. For example, several years ago the UK’s Royal society for the protection of Birds (RSPB) collected £500,000 from a one-off membership mailing campaign to help save the Hadejia–Nguru wetlands of Northern Nigeria in West Africa [18].

Spiritual and historic information: These areas are used baptism either by immersion of by using water from the wetlands, appeasing evil spirits, cleaning, as shrines, and a source of historical lineage among others.

Aesthetic value of wetlands: Wetland ecosystems have an important value as a place where people come for rest, relaxation, refreshment and recreation in natural areas/eco-tourism will most likely continue to increase in the future. Eco-tourism as an important niche market in tourism industry has embrace environmental conservation, maintenance of biodiversity, a satisfying experience for the visitors, nature study and sustainable community development. The wide diversity of vegetation, bird species, fish and other wildlife found within wetlands add to the diversity and beauty of the ecosystem [18].

Scientific and educational information bank: Wetland provides almost unlimited scientific and educational opportunities for nature studies, environmental education and functions as laboratory for scientific research (eg. Ibeno beach excursion and field trip by the Department of Geography and Natural Resources Management, University of Uyo in 2010–2015), enabling successful writing and publications of environmental issues in local and international journal. Government agencies and students from different institutions of learning visit the wetland region to learn more about community based wetland conservation. The wetland zone serve as important areas for monitoring environmental changes such as floods, climate change and other environmental scenario [19–22].

Biodiversity and nursery habitats: Wetland acts as a source of biodiversity by hosting a high diversity of fish species, wildlife and plants. The wetlands play a vital role as habitats in the sustenance of wetland fisheries as it accommodates wetland livelihood activities [19–22].

Method of study

Study area: Ibeno is located on latitude 04°32’27” North of the equator and longitude 008°00’12” east of the Greenwich meridian. It lies within the tropics and the area is influenced by warm humid air mass from the Atlantic Ocean and slightly continental air mass from the Sahara desert. The two seasons in the region are: rainy and dry seasons influenced by these air masses. There is a longer rainy season than dry because of the coastal location. The area is a wetland region belonging to the mangrove and fresh water swamp forest of Nigeria covering a larger area in Ibeno. The coastal geomorphic zone is a strand coastal area with beach ridge complex geological property and is highly influenced by oceanographic parameters. Ibeno is heavily endowed with petroleum resources that made it the hotspot for oil exploration and exploitation with Exxon Mobil Unlimited as the major oil player. The population of Ibeno is 78,380 people with 44311 males and 34069 females based on 2006 population figure (NPC, 2006). The people engage mainly in fishing, farming and trading.

Data sets and sources

The data for the research was obtained from field reconnaissance survey complimented with distribution of 400 copies of structured questionnaire to 8 sampled communities in the area. Focused group discussion with stakeholders, farmers, hunters, fishermen, sand miners generated additional data that enabled analysis to be carried out.

Results and discussion

The above data for sex reveals that 50.5% are male while 49.5 are females; for marital status 39.25% are married , 26% are single while 9.5% and 25.25% are divorce and widowed respectively; for age, 22.25% fall between 26–30, 29% between 31–35, 28% between 21–25, 5.75% between 36 and above and 14.75% between 15–20; for educational level, 30.75% have 0-3 years basic, 21% primary education; 29.75% secondary, 21.75% informal and 17.75% tertiary; for occupation, 20% are sand miners, 27.25% are fishermen, 27% are farmers, 8.25% are traders, 7.75% civil servant and students 9.75% Tables 1–3.

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The table above shows that 95% of one respondents perceived the availability of wetland resources in Ibéno, while 5% accounted for non-perception.

**Consumptive wetland resources in Ibéno L.G.A Tables 4-7.**

**Testing the hypothesis**

$H_0$: Tapping into multi-utilization potentials of consumptive and non-consumptive resources of wetlands will not contribute to livelihood and socio-economic development of Ibéno.

$H_1$: Tapping into multi-utilization potentials of consumptive and non-consumptive resources of wetlands will contribute to livelihood and socio-economic development of Ibéno.
Table 1: Socio-economic characteristics of respondents.

| S/N | Characteristics | Frequency | Percentage (%) |
|-----|-----------------|-----------|----------------|
| 1.  | Sex             |           |                |
|     | Male            | 202       | 50.5           |
|     | Female          | 198       | 49.5           |
|     | Total           | 400       | 100            |
| 2.  | Marital status  |           |                |
|     | Married         | 157       | 39.25          |
|     | Single          | 104       | 26             |
|     | Divorce         | 38        | 9.5            |
|     | Widowed         | 101       | 25.25          |
|     | Total           | 400       | 100            |
| 3.  | Age             |           |                |
|     | 15-20           | 59        | 14.75          |
|     | 21-25           | 112       | 28             |
|     | 26-30           | 89        | 22.25          |
|     | 31-35           | 117       | 29.25          |
|     | 36 and above    | 23        | 5.75           |
|     | Total           | 400       | 100            |
| 4.  | Educational level|         |                |
|     | Informal        | 87        | 21.75          |
|     | Primary         | 123       | 30.75          |
|     | Secondary       | 119       | 29.75          |
|     | Tertiary        | 71        | 17.75          |
|     | Total           | 400       | 100            |
| 5.  | Occupation      |           |                |
|     | Civil servant   | 31        | 7.75           |

Source: Field survey, 2015

Table 2: Sampled communities in Ibeno.

| Sampled Communities in Ibeno | No. of Questionnaires Distributed |
|------------------------------|----------------------------------|
| • Ukpenekeang                | 50                               |
| • Mikanpanak                 | 50                               |
| • Ntafe                      | 50                               |
| • Iwochang                   | 50                               |
| • Opolum                     | 50                               |
| • Itak Afaha                  | 50                               |
| • Itak Idim Ekpe              | 50                               |
| • Usu-Idim                   | 50                               |
| Total                        | 400                              |

Table 3: Perception of availability of wetland resources in Ibeno.

| Responses        | Frequency | Percentage |
|------------------|-----------|------------|
| Yes              | 380       | 95%        |
| No               | 20        | 5%         |
| Total            | 400       | 100%       |

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**Table 4: Floristic resource in Ibeno communities.**

| S/N | Botanical name   | Common name | Functions                                                                 |
|-----|------------------|-------------|---------------------------------------------------------------------------|
| 1   | Laringa gaboness | Bush mango  | Edible fruit with vitamin content.                                        |
| 2   | Dacroydes xedulis| Native pear | Used to treat skin disease.                                               |
| 3   | Pentaclethra macrophy sia | Oil bean tree | Edible fruit eaten as fruit, oil and fat content.                         |
| 4   | Colantitida      | Kola        | Stimulant.                                                                |
| 5   | Chrysophyllum album | Star apple | Edible with vitamin content, for arts craft.                              |
| 6   | Raphia hookie    | Raffia tree | Wine.                                                                     |
| 7   | Rothmania hispida| Black dye   | Body colouring.                                                           |
| 8   | Raphia vinifera  | Raphia palm | Roofing and map weaving.                                                  |
| 9   | Eremospatha macropspat | Rattan cane | Chair.                                                                    |
| 10  | Carica papaya    | Pawpaw      | Fruit consumed malaria relief.                                            |
| 11  | Cumbopogum spp. | Lemon grass | Tea and also malaria relief.                                              |
| 12  | Psidium Jujara   | Cravua      | Cures malaria.                                                            |
| 13  | Gnetum Africanum | Affang      | Consumed as vegetable plant, for cooking.                                 |
| 14  | Elaeis guimensis | Oil palm    | Cooking oil mat making peam wine.                                         |
| 15  | Nypa frutican   | Nypa palm   | Roof makings, mat weaving, beverage and wine.                             |
| 16  | Telfaria occidentails | Fluted | Pumpkin. Vegetables, purgative and blood tonic.                          |
| 17  | Veronia amygdalina | Bitter leaf | Cures stomach ache, for cooking.                                          |
| 18  | Talinum triangulare | Water leaf | Treat internal heat meases.                                               |
| 19  | Solanum incanum | Garden egg  | Treats leprosy.                                                          |
| 20  | Dennettia tripetala | Pepper fruit | Eaten and used as spicy on food.                                          |
| 21  | Psidium Jujara   | Melon       | Treat fungal disease gonorrgea.                                           |
| 22  | Psidium Jujara   | Okra        | Treats catarrh, fever,                                                   |
| 23  | Psidium Jujara   | Coconut     | Edible ripe fruits, cures malaria used as sweet fresh drink.             |

**Table 5: Faunistic species.**

| S/N | Botanical name            | Common name | Functions                       |
|-----|---------------------------|-------------|---------------------------------|
| 1   | Protomoschoerus porous   | Bush pig    | Meat consumed                   |
| 2   | Cricetomyagambianus       | Giant rat   | Meat consumed                   |
| 3   | Cichlid                   | Tilapia     | Fish, oil produced meat consumed |
| 4   | Claras                    | Mudfish     | Fish oil, meat consumed         |
| 5   | Phasiquida                | Bush fowl   | Meat consumed                   |
| 6   | Thrynomys                 | Cane rat    | Meat consumed                   |
| 7   | Achaechantina marginata   | Giant snail | Meat consumed and shell for production of vim                              |
| 8   | Itefix pormarina          | Small snail | Same                            |
| 9   | Periwinkle                | For food and meat, source of protein and shell used for building construction and vim |
| 10  | Crustacean spp.           | Cray fish, lobster, prawn | Soup condiment                  |

**Table 6: Consumptive and non-consumptive wetland resource multifunctional benefits.**

| S/N | Wetland resources | Benefits derived | Frequency | Percentage |
|-----|-------------------|------------------|-----------|------------|
| 1   | Consumptive       | Fish             | 70        | 17.5%      |
|     |                    | Production, wild game, fruits and grains | 50        | 12.5%      |
|     |                    | Consumption, grazing lands | 40        | 10%        |
|     |                    | Water for domestic, industrial and agricultural use | 10        | 3.25%      |
|     |                    | Logs production, fuel wood, organic matter, peat, leaves, fodder and litter | 10        | 3.25%      |
|     |                    | Extraction of bio-fuels, Genes for resistance to pathogens and ornamentals | 30        | 7.5%       |
|     |                    | Herbal drugs and pharmaceuticals, Resources raw materials for industries | 40        | 10%        |
| 2   | Non consumptive    | Use of nature for religious/spiritual purpose | 10        | 3.25%      |
|     |                    | Tourism, sports and beach functions. | 30        | 7.5%       |
|     |                    | For scientific research and information education. | 20        | 5%         |
|     |                    | Use of nature as motive in books, film, painting, folklore, national symbols, advert etc. | 10        | 3.25%      |
|     |                    | Soil formation and good agric soils, organic matter accumulation, nutrient cycling, and processing of nutrients, habitat. | 10        | 3.25%      |
|     |                    | Climate regulation, water purification, erosion control | 60        | 15%        |
|     |                    | Sand mining for construction, building, oil drilling and income generation | 400       | 100        |

**Table 7: Utilization level of consumptive and non-consumptive wetland resources.**

|                | Consumptive resources | Non consumptive | Total |
|----------------|-----------------------|-----------------|-------|
| High           | 98                    | 79              | 177   |
| Medium         | 90                    | 58              | 148   |
| Low            | 43                    | 32              | 75    |
| Total          | 231                   | 169             | 400   |

**Chi-square test is used to test where \( \chi^2 = (O-E)^2 / E \).**

\( \chi^2 = 45.23 \)

**Table value = 2.13**

since the table value of 2.13 < 45.23, therefore the null hypothesis is rejected and the hypothesis one is accepted. This means that tapping into the multi-utilization potentials of consumptive and non-consumptive resources of wetlands will contribute to livelihood and socioeconomic development of Ibeno.
Conclusion and recommendations

The multi-utilization potentials of consumptive and non-consumptive wetland resources in Ibeno have been examined. From the findings, both natural and anthropogenic factors viz: swampy nature of the environment 30%, coastal topography 33.25%, water logging 19.25%, wave action, 17%, and anthropogenic 52%, non-perception of wetland multifunctional benefits 38% and institutional challenge 10%, interact to cause under-utilization. Also, deforestation, overgrazing, bush burning, sand-mining, coastal erosion and over exploitation of some resources enhance degradation of wetland. The challenge of inventory to account for endangered species, poor coordination, under-utilization, low planning, government unconcerned attitude and lack of environmental monitoring mechanism are technical problems to wetland sustainability. Therefore, environmental monitoring team should be set up, impact assessment carried out; more attention should be paid to wetland multifunctional enlightenment programmes. Wetland vitality and conservation should be ensured while integrated management approach be applied with good network provision to enhance sustainable exploitation and management for diverse resources protection and utilization for present and future generations.

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