

Wetlands resource use, Conflict, Management and Conservation: Review of the Hadejia-Nguru Wetlands, Northeast, Nigeria

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Abstract

Globally, wetlands ecosystems perform many ecological and socio-economic functions that are beneficial to the society. Some of these include nutrient and waste absorption, ground water recharge, supporting biodiversity, and have a fundamental role in fishing, farming, and recreation. The Hadejia-Nguru Wetlands being a Ramsar site and an Important Bird Area (IBA) is significantly important for its resident and migratory waterbird species. The wetlands supply fisheries resource which is estimated to accounts for about 6% of Nigeria's inland freshwater catch with a market value of nearly US\$6 million annually, whereas agricultural outputs been estimated at US\$75 million. However, changed in the wetlands hydrology due to dam construction upstream which was aggravated by extreme drought threatens the wetlands ecosystem. Consequently, this impacts the livelihoods of the local population downstream through changes in land use, competition and conflicts over access to natural resources among the ethnic groups. Although, several institutional capacity supports from government and the NGOs were and are being in place to contain the problem of water management, the process has become a tireless effort. The wetland is also under high pressure from anthropogenic activities. Notably, uncontrolled exploitation, pollution, climate change, growing population, and biological invasions. The goal of this paper is to highlights the changes in the wetland hydrology, resource use, conflicts, management, as well as conservation based on the studies carried out for the wetland. At the same time, put forward some recommendations for effective management and conservation of the wetland ecosystem.

Keywords: Wetlands, conflicts, management, conservation

Introduction

The Ramsar convention defined wetlands as “areas of marsh, fen, peat land or water, natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters” (Ramsar, 1994). Wetlands are estimated to occupy around 8.6 million km² (6.4 %) of the earth's land surface (Mironga, 2006), and are

among the earth's most productive ecosystems (Ramsar, 1994). Wetlands provide good and services to human considered valuable, these include fisheries, wildlife, mining, energy, and recreation (Kamukala and Crafter 1993; Raymundo, 2008). Wetlands play a critical role in global climate change regulation by serving as carbon sinks. For example, the global peat lands can store between 400 and 500 gigatons (Gt) of carbon (Paul *et al.*, 2009). Wetlands play an instrumental role by serving as a transition zone of varying water regimes, and act as natural filters that can improve water quality through reducing nutrients loadings, water aquifer, thus, often called “the kidneys of the catchment”, and as “biological supermarkets” because of their rich food webs and biodiversity (Barbier *et al.*, 1997; Marwa *et al.*, 2013).

On a global scale, human have altered and destroyed wetlands either directly or indirectly because for long wetlands were thought to be “wastelands” (Barbier *et al.*, 1997). This caused several wetlands loss worldwide through conversion into human modified environments. These modifications include wetland reclamation for settlement, agriculture, deforestation, freshwater diversion and dumping sites for harmful toxic substances among others. For example, in the Hadejia-Nguru Wetlands, between the period of 1971- 1974, the giant Tiga dam were constructed upstream for water storage (storage capacity: 1492 x 10⁶ m³) and Challawa dam which was completed in 1992 for hydrological power (972 x 10⁶ m³) (Goes, 2002), with Hadejia Valley Project under construction. Consequently, reduce flooding into the Hadejia Nguru Wetlands downstream. In recent times, maximum flooding ranged from 70, 000- 90, 000 hectares, but once extended over 300, 000 hectares (Barbie *et al.*, 1997). This was also aggravated by drought and sediments generated from the dams constructed which blocked many tributaries with Kafin Hausa channel being a good example (Olofin, 1993; Chiroma *et al.*, 2005). Goes (2002) also state that the invasion of *Typha domingensis* in the wetlands emerged shortly after the altered

hydrology. These factors create conflicts among upstream and downstream users, in addition to poor water management and legislations (Chiroma *et al.*, 2005).

As a result of this projects, the socio-economic well-being of the local communities were seriously affected, these consist reduce flooding which impacts fish productivity, loss of farmlands, loss of grazing lands, fall in the level of ground water which caused many wells to dry, expansion of irrigated farming, migration, competition and conflict (Thomas and Adams, 1997; Chiroma *et al.*, 2005). For example, nomadic herdsman and farmers usually clash over land access as farmers extend irrigation farming on plains used by herdsman for grazing cattle during the dry season (Blench, 2013). In 1980s, nomadic Fulani herdsman clashed with farmers with several casualties (Hollis, 1990). Similarly, farmers are forced to lease their piece of land for some specified period of time, a situation only known to occur in the early 1980s, but now become a common practice (Blench, 2013). However, over the last two decades, government at various levels including a number of Non-governmental organizations concerns with water management and environment interfere in the water management to help contain the problems. Some of these include North East Arid Zone Development Programme (NEAZDP), DFID-JWL project, IUCN/Water and Nature Initiative (WANI), and Lake Chad Basin Commission/GEF projects (Chiroma *et al.*, 2005). Sadly, all these efforts tailored towards effective management of the water resources lack poor coordination and public participation among the various organizations (Chiroma *et al.*, 2005).

This paper discusses resource utilisation and management in the Hadejia-Nguru Wetlands ecosystem, conservation as well as threats to the wetlands. Furthermore, the paper highlights the changes in the wetland hydrology, and how it affects the socio-economic well-being of the wetlands inhabitants which obviously led to conflicts and put forward some recommendations to aid successful management and conservation of the ecosystem.

Overview of Nigeria's Wetlands and Biodiversity

Nigeria is endowed with both freshwater and inland saline wetlands which altogether cover an estimated 3% of the country's total land mass, these includes Matgadru-Kabok floodplains, Lake Chad, Adiani-Nguru floodplains, Lekki Peninsula, Sokoto-Rima basin, the Lower Ogun, Kirikasamma, Kainji Lake, Niger delta flood plains, the Ologe Lagoon, delta of the Cross River and the Lagos coastal floodplains

(Uluocha and Okeke, 2004; Olalekan *et al.*, 2014). Some mammal species found in the Nigeria's wetlands include civet, mongoose, ganet, and two species of hippopotamus; the *Choeropsis liberiensi* and the *Hippopotamus amphibious* (Olalekan *et al.*, 2014). Manatee species (*Trichechus senegalensis*) are also found in the delta and coastal wetlands (Olalekan *et al.*, 2014). Three reptiles species are found in the wetlands including the Nile monitor (*Varanus niloticus*), Nile crocodile (*Crocodylus niloticus*), Long snouted (*C. cataphractus*) and the West African dwarf crocodile (*Osteolaemus tetraspis*) (Olalekan *et al.*, 2014). The Hadejia-Nguru Wetlands shelter more than 1% of at least nine waterfowl populations found in West Africa, it is the first Ramsar site, and among 27 Important Bird Areas (IBAs) in Nigeria. For example, 70, 845 Ruff (*Philomachus pugnax*) were counted in the Hadejia-Nguru wetlands in January 1995, about 3% of those recorded in West Africa at that time (Akinsola *et al.*, 2000).

Description of the Hadejia-Nguru Wetlands and Biodiversity

The Hadejia-Nguru Wetlands is generally abbreviated as HNWs, hence in this paper will be address as HNWs. The HNWs is extensive floodplains created by the Hadejia and Jama'are rivers to form the Komodugu-Yobe River which drains into the Lake Chad. The HNWs lie on the southern edge of the Sahel savanna in northeastern Nigeria with central coordinates 10° 33.00' East 12° 39.00' North, the wetlands covered an area of about 350, 000 ha and altitude 152-305 m (Birdlife international, 2015). The climate of the wetland is characterized by two distinct seasons; wet (May-September) and dry season (October-April), rainfall is between 500- 600 mm, whereas temperature ranges from 12°C during harmattan season (cold) to about 40°C during hot season, rainfall is between 500- 600 mm, with mean minimum temperature of 12°C during the month of December to January, to a maximum of 40°C during the month of April (Ogunkoya and Dami, 2007). The ecosystem comprises permanent lakes and seasonally flooded pools connected by a network of channels. The ecosystem is an important site for biodiversity, especially migratory water birds from Palearctic regions. For example, at one time, the floodplain supports over 423,000 birds of 68 species, including significant numbers of Ferruginous Duck (*Aythya nyroca*), Spur-winged Goose (*Plectropterus gambensis*), Black-tailed Godwit (*Limosa limosa*), and Ruff (*Philomachus pugnax*) (Birdlife

international, 2010). Other wildlife species found include species of gazelle (*Gazella sp.*), duiker (*Cephalophus sp.*), jackal (*Canis sp.*) and hyena (*Crocuta crocuta*) (Ogunkoya and Dami, 2007). In total, there are about 378 bird species listed for the wetland, 103 fish species, 250 species of flowering plants and more than 136 species of aquatic flora and fauna (Oduntan *et al.*, 2010).

Three broad types of vegetation occur in HNWs. There is scrub savanna, which consist of upland farmland areas and *Acacia* woodlands. The second include the ‘tudu’ (raised areas) which are never inundated with tree species of *Acacia* spp, *Ziziphus* spp., *Balanites aegyptiaca*, *Tamarindus indica* and *Adansonia digitata*, while common grasses include *Cenchrus biflorus*, *Andropogon* spp. and *Vetiveria nigriflora*. In addition, pockets of riparian forests and woodlands, known as ‘kurmi’ comprise species of *Khaya senegalensis*, *Mitragyna inermis* and *Diospyros mespiliformis*. In some parts, the ‘kurmi’ has been replaced with orchards of mango *Mangifera*

indica and guava *Psidium guajava* (Ezealor, 2001). The third vegetation type consist the seasonally flooded marshes in which the tree *Acacia nilotica* is common while Dum palms (*Hyphaene thebaica*) grow on small raised islands (Ezealor, 2001). Aquatic grasses include *Echinochloa* and *Oryza* spp. while in drier parts *Dactyloctenium aegyptium*, *Setaria* spp. and *Cyperus* spp. occur and extensive vegetation of *Typha domingensis* along the shore of the wetlands.

Hausa, Kanuri and Fulani are the most dominant tribes in the wetlands with an estimated population of about 1.5 million, including farmers, herders and fishermen who entirely depend on the ecosystem for their livelihoods (Kaugama and Ahmed, 2014; Birdlife international, 2015). The wetlands provide essential income and nutrition benefits in the form of agriculture, grazing resources, non timber forest products, fuel wood and fishing (Ramsar, 1997). The Hadejia-Nguru Wetlands is bordered by three states of Bauchi, Jigawa and Yobe (Blench, 2013).

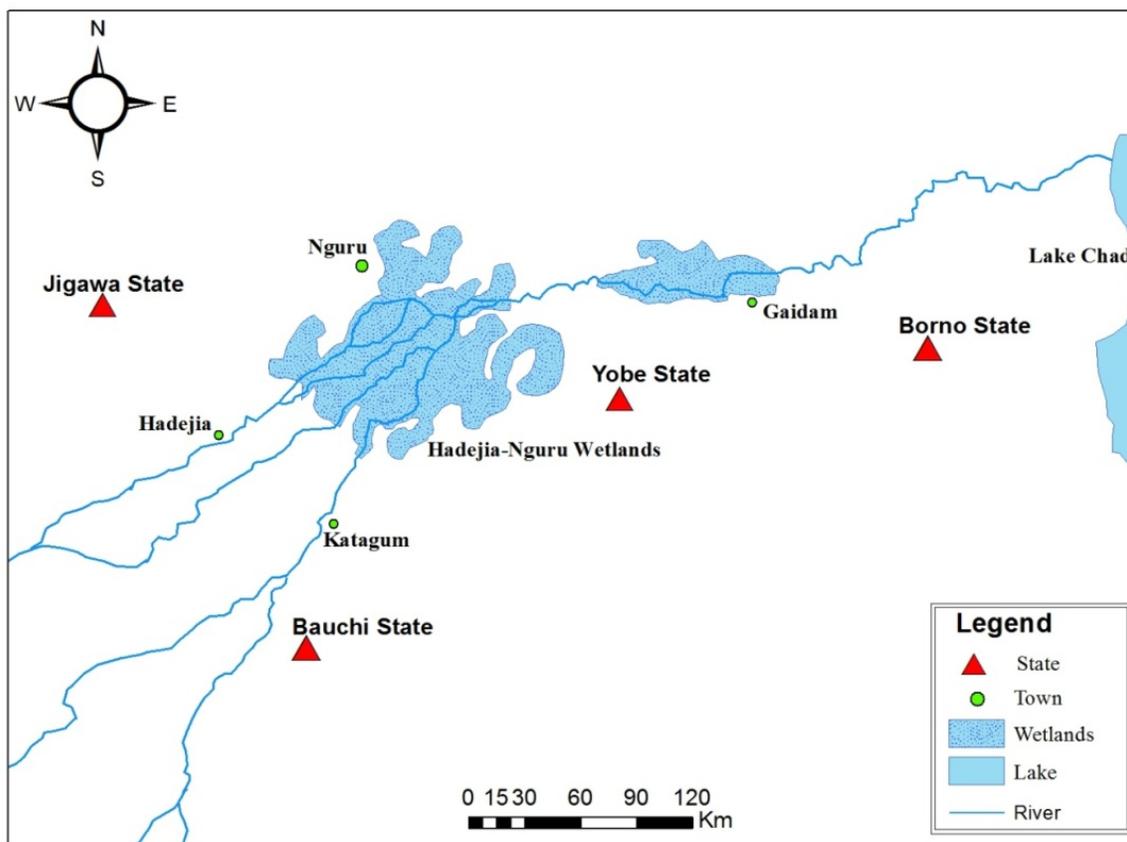


Figure. 1. Location of the HNWs
Source: (Eaton and Sarch, 1997)

Livelihood and Wetland Resources Conflict

Fishermen and farmers in the HNWs represent about 75% of the indigenous community population (Birdlife international, 2015), and the wetlands represents their entire source of livelihoods through farming and fishing activities. Farming in particular accounts for about 25%, major crops grown include rice, maize, sasmе, sorghum, wheat, millet, and some vegetables such as tomato, pepper, onions, and carrot (Ogunkoya and Dami, 2007; Kaugama and Ahmed, 2014; Birdlife international, 2015). The financial benefits of major agricultural outputs in the wetlands has been estimated at US\$ 75 million, while cattle trade annually contributes to about US\$ 5 million (Eaton and Sarch, 1997).

However, dam constructed for water storage upstream between the period of 1971- 1974 (Tiga dam), and in 1992 Challawa Gorge for hydrological power reduced flooding downstream into the HNWs which impacts many socio-economic factors (Thomas and Adams, 1997, Barbier *et al.*, 1997). For example, as echoed by Thomas and Adam (1997), farming activities are severely affected due to the local communities reliance on seasonally flooded irrigation system (*fadama* in Hausa language) after the wet season, fishermen are heavily impacted directly through reduction in fish diversity, abundance and size which is strongly correlated with the flood cycle, whereas nomadic herdsmen are distressed by the loss of pasture with an estimated cattle population of 320,000 to grazed every dry season in the wetlands (Blench, 2013; Olalekan *et al.*, 2014).

These manifold situations created conflicts among the inhabitants of the HNWs. Oduntan *et al.*, (2010) defined conflicts as “a struggle over value and claims to scarce status, power and resource in which the aims of the opponents are to neutralise, injure or eliminate their rivals”. Furthermore, testified land is one of the most important natural resources that human depend for their use in the production of goods and services and typically arise when there is clash of interest, goals and aspirations by individuals and/or groups in defined social and physical environments. According to Odada *et al.*, (2005), the main source of inter-ethnic conflicts among the HNWs inhabitants is over natural resources. Shortage of water for livestock, agricultural land forcing farmers to encroach into pasture lands which creates

conflicts. But also, migration and competition between resource users in the wetlands created hatred. For example, nomadic herdsmen and flood-plain farmers usually fought over land access as farmers extend irrigation cropping during the dry season on plains used by herdsmen for grazing cattle (Thomas and Adams, 1997). In the 1980s nomadic Fulani herdsmen and agriculturalists clashed with several fatalities (Hollis, 1990). Farmers encroaching onto the river bank also degrade habitats for waterbirds necessary for breeding and feeding such as *Dendrocygna viduata* and *Circonia circonia*.

In addition, land use in HNWs changed following altered hydrology which forced many farmers to lease their piece of land; this was only known to occur three decades ago, but now became a major issue among the wetlands inhabitants. Farmers usually lease their plot of lands directly or indirectly through an agent called locally as “*Dillali*” (Blench, 2013). Increased demand of water for agricultural irrigation also led to channelization and diversion along the wetlands channels which increased pressure on the wetlands. According to Kaugama and Ahmed (2014), these changes forces many farmers and fishermen to trespass over protected areas to exploits natural resources such as wild animals in order to cater for the families. Whereas pastoralists invade protected areas to graze their cattle conflicting protected area guards. Changes in the hydrology also increased flooding patterns as in the locality of Adiani, while Gwaiyo village experienced a decreased (Eaton and Sarch, 1997). Moreover, over growing population and expanding market demand for horticultural products such as hot peppers created competition in many parts of the wetlands (Blench, 2013). On the other hand, many fishermen exclaim about the invasive Cattail (*Typha domingensis*) reduce fish catch by forming dense biomass which clogs water ways not only that but invasive *Quelea quelea* birds (*Quelea quelea*) also impacts agricultural production causing extensive economic loss (Blench, 2013). Others complain over lack of financial support from the government such as subsidized government fertilizer is inadequate and politically stimulated (Kaugama and Ahmed, 2014).

However, Oduntan *et al.*, (2010) argued conflicts that are properly addressed can be opportunities for problems to be identified and solved with progress achieved in order to meet human needs and interests. As reported by Blench (2013), conflicts in the HNWs

are categorized into three; society-internal (farmer versus farmer), inter-society (farmer versus herder), and individuals and communities versus regulatory authorities such as fuel wood traders versus protected area authorities. Moreover, conflicts among the HNWs inhabitants are best resolved by the traditional authorities such as village elders, ward heads, village heads and district heads as most farmers and

pastoralists do not want to involved police in order to avoid financial constraints, whereas army have less to do with conflicts resolution but in case of any civil insecurity local governments communities used to involved them to contain matters. Thus, village heads play a fundamental role in conflicts resolutions and prevention among the HNWs communities (Blench, 2013).

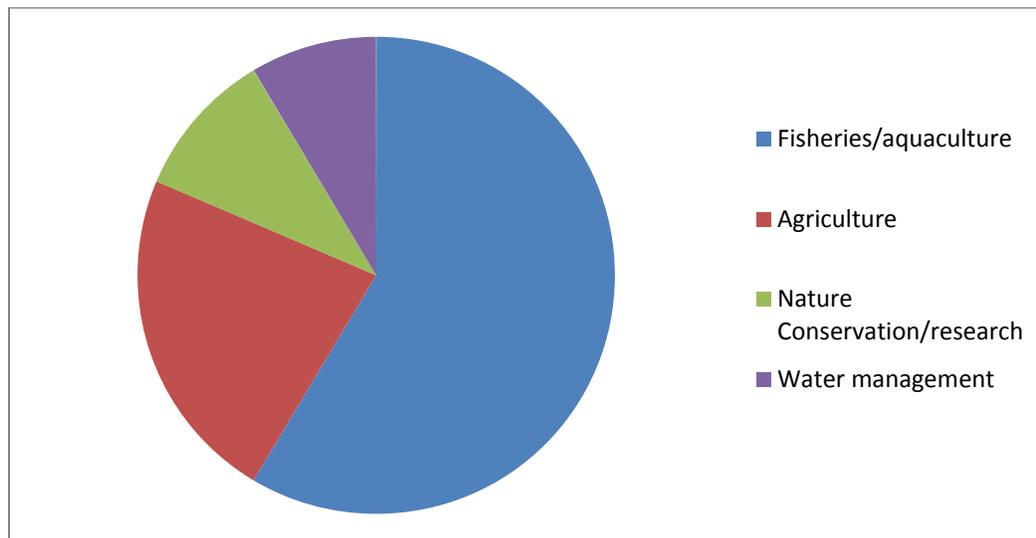


Figure. 2. Land use in the HNWs (Birdlife international, 2015)

Utilisation and Management of HNWs

Fisheries and aquaculture activities account for 50% in the wetlands representing the main source and livelihoods of the indigenous communities and is carried out throughout the year (Birdlife international, 2015). Blench (2013), reported that some nineteen species are the regularly caught in the wetlands, but according to previous reports some forty-four species were found and this signifies a decline in the fish diversity. The HNWs contribute to about 6% of inland fish catch in Nigeria with a market value of nearly US\$ 6 million per annum (Eaton and Sarch, 1997). However, fishermen have reported that catches are reducing significantly due to flooding which reduced the wetland by 17 percent (Lemly *et al.*, 2000), while invasive *Typha domingensis* are reported to reduce fish catch and prevent fishermen from having access to other parts of the wetlands.

The HNWs supports at least 250 species of flowering plants, over 136 types of aquatic flora and fauna, more than 103 fish species and 378 species of birds (Oduntan *et al.*, 2010). Several forests within the wetlands provide a wide range of natural resources

including timber and non-timber products such as honey, fruits, fodder, and fibres (Thomas and Adams, 1997). For example, the Doum palm (*Hyphaene thebaica*) is a major source of high economic income, generating more to individuals than earnings derived from the agricultural activities (Blench, 2013). Honey production by the local communities also serves as a means of economic exchange (Olalekan *et al.*, 2014). Wild animals include species of gazelle (*Gazella sp.*), Duiker (*Cephalophus sp.*), Jackal (*Canis sp.*) and hyena (*Crocuta crocuta*). The wetlands harbour waterbirds species of global conservation such as Black-Crowned Crane (*Balaerica pavonina*), other species common to the wetland include Grey heron (*Ardea cinrea*), Spotted redshank (*Tringa erythropus*), and pelicans (Ogunkoya and Dami, 2007).

In 1987, the Hadejia-Nguru Wetlands Conservation Projects (HNWCP) was founded by the International Union for the Conservation of Nature (IUCN) under the Phases II and III management project which lasted between 1992- 2000 in collaboration with other international non-governmental organizations; notably BirdLife International, World Wide Fund for Nature (WWF), the Royal Society for the Protection

of Birds (RSPB), United Nations Development Programme (UNDP), and nationally with the Nigerian Conservation Foundation (NCF) (Akinsola *et al.*, 2000; Kaugama and Ahmed, 2014). Other National and local administrators include the Ministry of the Federal Government, the River Basin Development Authorities (RBDAs), the State governments, Local government, Sasakawa 2000, JEWEL Project, National NGOs such as the Miyetti Allah organisation representing Fulbe pastoralists, Al-Hayah representing the Shuwa and Koyam pastoralists, trade associations and other smaller groups within the wetlands (Blench, 2013). Although, the IUCN is the custodian of the HNWs, the Hadejia-Nguru Wetlands Conservation Project (HNWCP) was locally established by the IUCN with the main objective; “to promote sustainable use of the wetlands resources to the benefit of both local communities and waterbird populations”, this gradually led into the goal “to maintain the natural resources and functions of the wetlands” (Akinsola *et al.*, 2000), this have the following objectives (i) to maintain both the economic and ecological functions of the wetlands, (ii) promote public awareness and education, (iii) monitoring, decision making, and cooperation, (iii) developing appropriate technologies with local farmers to enhance sustainable utilization of wetland resources, and (iv) improving management of protected areas and providing guidelines for the wise utilization of natural resources (Odada *et al.* 2005; Akinsola *et al.*, 2000). However, climatic changes and altered hydrology in the wetland created multifaceted agreement between member states and other non-governmental organizations to have interests in the management and conflicts resolution in the management of water resources (Eaton and Sarch, 1997; Olalekan *et al.*, 2014). For example, there are two River Basin Development Authorities within the basin, one for upstream and one for downstream (Goes, 2002).

In 1996, World Bank aided Agricultural Development Projects (ADPs) conducted in the HNWs basin enabled flooded wetlands (fadama) farming through the creation of fadama Users Association (FUA) with 25 fadama farmers

comprising about of 276 associations registered in the Yobe basin (Odada *et al.*, 2005). The project enabled members to secure and recover loans and other services change, but also training of members in activities such as agronomic, bookkeeping, pump repairs and maintenance (Odada *et al.*, 2005). The advocacy by the IUCN in the Komadugu- Yobe basin guided towards stakeholder coordination, public participation, and management of conflicts in the upstream- downstream users as well as public awareness (Odada *et al.*, 2005). Moreover, in late 2003, focusing on water governance in the entire Komadugu- Yobe basin, the IUCN Water and Nature Initiative (WANI) which is a global program were implemented in partnership with NCF and the Federal Ministry of Water Resources (FMWR) with an objective to assist the FMWR to develop and implement an integrated water resources management for the entire Komadugu- Yobe basin (Chiroma *et al.*, 2005; Odada *et al.*, 2005). Similarly, DFID-JEWELL’S livelihood Project is working in the basin which is supported by the United Kingdom’s DFID aim to contribute to puberty alleviation through improved management and utilisation of the common property natural resources in the wetlands. In July, 2003 initiation of the project were completed (Odada *et al.*, 2005).

Furthermore, a UNEP/GEF Wings Over Wetlands (WOW) was implemented from 2007-2010 which was funded by Birdlife International in collaboration with NCF and Birdlife Nigeria aimed to conserved migratory routes along the Africa- Eurasia Flyway through wetlands restoration (Birdlife international, 2010). During the execution of this project, tools were provided to fishermen and farmers who cleared wetlands habitats taken over by *Typha domingensis*. This led to significant portion of the wetlands habitats to be restored. Consequently this led to an increased of birds abundance from 46, 055 birds of 37 species wintering in 2008 to 129, 186 of 65 species in 2009, but also increased the size and abundance of fish catch which improved the livelihood of the local communities (Birdlife international, 2010).



Figure. 3. *Typha* clearance (Birdlife international, 2010)

Presently, the Living on the Edge Project LOTE funded by the Dutch Nationale Postcode Loterij is under implementation with a plan to improve the livelihoods and habitats for migratory birds across four West African countries; Burkina Faso, Mauritania, Nigeria, and Senegal. At the moment, the

Table 1. Protected areas in the HNWs

There are five protected areas within the HNWs, these include;

Protected areas	Designation	Area (ha)
Adiani	Forest Reserve	132
Baturiya Wetlands	Game Reserve	29, 700
Chad Basin	National Park	230, 000
Nguru Lake and Marma	Ramsar site	58, 100

However, many studies report poor policy implementation and enforcement within the protected areas. For instance, Ogunkoya and Dami, 2007; Olalekan *et al.*, (2014) point out that the local communities continue to invade parts of the protected areas for settlements, farming, cattle grazing and fishing, as well as exploitation of the natural resources within the protected areas without governmental measures to halt or monitor the forests resources, some of these resource include firewood, Doum palm, fish, and many waterfowls being illegally hunted for live trade such as ibises, storks, jacanas, and spur-wing geese, while many people engage in egg collection during the breeding season (Odada *et al.*, 2005; Ogunkoya and Dami, 2007; Blench, 2013).

At the same time, the forest guards complained about the lack of vehicles and firearms being the major hindrance for monitoring, a factor which attracted many outsiders to exploit the forests for firewood trades to urban areas such as Kano (Eaton and Sarch,

NCF have already started implementing the project in the HNWs (NCF, 2015).

Wetland Resources Conservation

1997). These factors hinder the resources conservation in the wetland which in the long run may deplete the natural resources.

Furthermore, conservation of the wetlands is among the main objectives of the Convention on Biological Diversity (CBD) which aimed to conserve biological diversity and its components of which Nigeria is a signatory.

Threats to Hadejia-Nguru Wetlands Biodiversity

In HNWs, like elsewhere, the wetlands are primarily targets for exploitation of natural resources, uncontrolled hunting, population, pollution from domestic waste and potash exploration, sedimentation resulting from deforestation, desertification, eutrophication resulting from agricultural runoff, channelization for irrigational farming, progressive industrialization, compaction of soil by pastoralists and their animals which further degrade the wetlands habitats as well as climate change and drought (Akinsola *et al.*, 2000; Ogunkoya

and Dami, 2007; Abubakar and Abubakar, 2013). For example, Olofin (1993) pointed out that drying out of the wetlands wiped out cranes which were common in the wetlands and some Palearctic waders, this situation pave way for arid species such as *Entomodestes leucotis*.

Furthermore, report assessment by Birdlife international (2008) ranked the status of the wetland in terms of pressure as “very high”, in addition to out-dated management plan which is not comprehensive. Poor administration, coordination and participation among member states even more threatened the wetlands (Olalekan *et al.*, 2014). These situations present a great danger to the wetland ecosystem, biodiversity and the community livelihood at large. Thus, the need to tackle the issues before it is too late become crucial.

Conclusion

The Hadejia-Nguru Wetlands perform many ecological and socio-economic functions. The wetland is significantly important for its flora and fauna, particularly the Palearctic and Afrotropical migrant waterbirds. The wetlands provide essential benefits to the local communities in terms of fishing and farming which is fundamental to socio-economic well-being for the local people. There are five nature reserves within the HNWs which signify its ecological and cultural importance with other several areas potential for conservation concerns that need legal action. However, changed in the wetlands hydrology, drought, as well as uncontrolled exploitation of natural resources in recent years is threatening the wetland ecological integrity. Therefore, without doubt it turns out to be crucial to set new priorities in the wetland management and conservation, at the same time managed the ones already established.

Recommendations

The following recommendations are made to aid successful management and conservation of the Hadejia-Nguru Wetlands;

- (i) Massive public awareness to educate the local communities to understand the benefits of sustainable use for effective management and conservation

- (ii) There should be more commitments, cooperation, information sharing, and coordination among the member states to work sufficiently together in the wetlands management
- (iii) More efforts should be tailored towards poverty reduction, human and financial resources, continuous funding to realize the objectives of the HNWCP
- (iv) Detail research should be done to identify any beneficial use of invasive *Typha domingensis* as used elsewhere in the world in making weaving materials like basket, mats, canoe sails, twine, food, and as clothing for cloaks, robes, and hats (Joanna *et al.* 2007) as Blench (2013) reported that no economic use of *Typha domingensis* has yet been discovered by the local communities in the HNWs. Similarly, measures to deal with invasive Quelea bird (*Quelea quelea*) in order to reduce loss of agricultural produce in the wetlands
- (v) There is also need to increase collaboration between government, NGOs and academic institutions to improve capacity in scientific researches, as point out by Akinsola *et al.* (2000) that one of the major challenges in birds’ conservation is lack of experts in monitoring and survey
- (vi) There is also need to integrate policy makers to review the policy framework in order to set new conservation strategies for the wetlands. This will help to quantify resource utilisation for sustainability and equitability
- (vii) The authors also recognized the need to boost ecotourism in the wetlands to support local communities as well as the wetlands ecosystem

The aforementioned conditions will help to maintain the wetlands aesthetic value, spiritual/religious, educational/scientific, cultural heritage values, and sense of the wetlands recognized nationally and internationally as Ramsar site of International importance.

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