

EVALUATION OF THE STRATEGIES OF ADAPTATION AND MITIGATION IN THE HADEJIA-NGURU WETLAND IN JIGAWA STATE

Ahmed, B. Idris, Y.A., Yahaya, A. and Ilu, K. J.
Binyaminu Usman Polytechnic, Hadejia Jigawa State

Abstract

The paper attempt to evaluate and review the role of Adaptation and mitigation as the strategies of climate change in the Hadejia-Nguru Wetland. Attempts by Government at various level, NGOs and the host communities were evaluated and found have greatly influence the eco-system and ultimately the economic well-being for the host community. Further recommendation of the strategies of adaptation and mitigation to promote the sustainability of the wetland .were suggested to further enhance the system.

*abashir22@yahoo.com

Introduction

United Nation Framework Convention on Climate Change (UNFCCC, 2011) defines climate change to mean a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere which is in addition to natural climatic variability observed over comparable time period. Also according to Dessler (2012) climate change can be a change in the statistics of weather (changes in averages and extremes of temperature and precipitation and other meteorological parameters) over a period of several decades. The concern in the climate debate is with the long term climate change. The American meteorological Society defined the term to mean “any systematic change in the long term statistics of climatic elements (such as temperature, pressure, or winds) sustained over several decades or longer. The risks associated with climate change call for a broad spectrum of policy responses and strategies at local, regional, national and global level.

The United Nations Framework Convention on Climate Change (UNFCCC) highlights two fundamental response strategies: mitigation and adaptation. While mitigation seeks to limit climate change by reducing the emissions of GHG (greenhouse gases) and by enhancing “sink” opportunities, adaptation aims to alleviate the adverse impacts through a wide-range of system-specific actions (Fusel and Klein, 2002)

Climate change mitigation could mean an action to decrease the intensity of radioactive forcing in order to reduce the potential effects of global warming. Most often, climate change mitigation scenarios involves reduction in the concentration of greenhouse gases,

either by reducing their sources or by increasing their sinks. The UN defines mitigation in the context of climate change, as a human intervention to reduce the sources or enhances the sink of greenhouse gases.

Climate change adaptation refers to the “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation” (IPCC 2001). Adaptation simply means learning to live with climate change.

Conventional approaches to understanding climate change were limited to identifying the potential long-term climate impacts on different ecosystems and economic sectors. While useful in depicting general trends and dynamic interactions between the atmosphere, biosphere, land, oceans and ice, this top-down, science-driven approach failed to address the regional and local impacts of climate change and local abilities to adapt to climate-induced changes.

Wetlands

A definition of wetlands is often difficult and depends on who is asking the question and what development or study is proposed for a particular wetland site. With applications ranging from urban real estate to the scientific nature preserve, a great many points of view may be expressed for proper definitions, classification and management techniques for wetland environments.

Many definitions of wetlands can be found in the literature. But some of the straightforward definitions describe wetlands as “comprises three aspects – water, soils and organisms, which are accepted by wetland scientist as the basis for recognizing and describing wetland environments. The three basic components being ground water, hydric soil, and specialized vegetation (Schot and Charman, 2002).

Although wetlands are often wet, a wetland might not be wet year-round. In fact, some of the most important wetlands are seasonally wet. They are transition zones where the flow of water, the cycling of nutrients, and the energy of the sun meet to produce a unique ecosystem characterized by hydrology, soil and vegetation. Wetlands are present in all climates and topographic settings around the world. Wetlands are relatively common in tropical and temperate lowlands, alpine wetlands, peat land, bogs, ponds, marshes and meadow. Others include forested wetlands, the Sahelian floodplain and desert wetlands supported by drainage from adjacent mountains, groundwater or infrequent storm runoff. Given the diversity of wetland environments many classification schemes have been proposed and utilized over the years (Coward *et al.* 1997).

Wetlands provide fundamental ecological services and are regulators of water regimes and sources of biodiversity at all levels-species, genetic and ecosystem. They constitute resources of great economic, scientific, cultural and recreational values for the host community. Above all wetlands play a vital role in climate change adaptation and mitigation, progressive encroachment on, and loss of wetlands cause serious and sometimes irreparable environmental damage to the provision of ecosystem services. Adverse effects of climate change will lead to a reduction in the services provided by wetlands. Removing the existing pressures on wetlands and improving their resilience is the most effective method of coping with the adverse effects of climate change. Conserving, maintaining, or rehabilitating wetland ecosystems can be a viable element of an overall climate change mitigation strategy.

There are a wide variety of wetland environments in West Africa. They include various kinds of floodplains (for example those of Senegal, Niger, Nigeria, and Logon – Chari system) larger inland deltas and lacustrine wetlands (notably Lake Chad and Niger inland delta in Mali). Most of them support substantial communities of people, who depend on their natural resources and ecology and hydrological patterns that maintain them. Indigenous systems of water resource management include agriculture (including flood cropping, notably of rice, flood recession cropping and various kinds of irrigation at various scales) fishing and pastoralism. In the Sahel, in particular, wetlands provide a vital element in the resources available to people not only within but well beyond their immediate boundaries. Many of these wetlands also support internationally important populations of wild species, those in the Sahel, for example, providing important links in the Palaearctic African bird migration flyway (Derek and Marie, 1997).

The Hadejia-Nguru Wetlands

In Northern Nigeria, an extensive floodplain has been formed where the Hadejia and Jama'are Rivers converge to form the Yobe River, which subsequently drains into Lake Chad. The area is referred to as wetlands and recognised by Ramsar as an international site. Ramsar is an intergovernmental treaty that was established in 1971 at the Iranian city of Ramsar that embodies the commitment of its member countries to maintain the ecological character of their wetlands of international importance and to plan for the "wise use" or sustainable use, of all the wetlands in their territories. Unlike the other global environmental conventions, Ramsar is not affiliated with the United Nations system of multilateral environmental agreement but it works very closely with other MEA'S and is a full partner among the "Biodiversity-related cluster" of treaties and agreement. The wetlands have a similar hydrological regime to other floodplains within the region, most notably the inner Niger delta and the Senegal valley.

Based on the Ramsar convention 3C criteria (Perennou 1991), the Hadejia-Nguru wetlands are of international importance for breeding and wintering waterfowl. However,

it was considered that construction of two large reservoirs upstream might result in reduced peak discharges and hence reduced flooding of wetlands, thus negatively affecting the ecosystem's integrity, including the livelihood of estimated one million people in local communities. The region's farming system is based on the natural inundation of the area, rice being planted with the rising waters, followed by range of other crops after the water has receded. The wetlands are characterized by various vegetation types. The highlands consist of *Acacia seyal* bushland and *andropogen spp*, grassland, with characteristic doum palm *Hyphaene thebaica* and Baobab *adansonia digitata* present in large numbers. Emergent species in lakes consist of *Nymphaea spp.* and floating mats of *Ceratophyllum spp* (Garba boyi and Polet, 1996).

Recognizing these issues, the Royal Society for the Protection of Birds and the World Conservation Union launched the Hadejia-Nguru Wetlands Conservation Project (HNWCP) in 1988, with the aim of maintaining the natural resources and functions of the Hadejia-Nguru wetlands. The project carries out hydrological, ecological and socioeconomic survey's as well as developing alternative sources of livelihood for the impoverished local population. Climate change has compounded wetlands shrinkages caused by upstream dams built to provide a more consistent supply of water for irrigated agriculture in responding to droughts that were affecting communities both upstream and downstream. This development did not consider downstream effects, or provision for current needs without jeopardizing mid-to long-term benefit.

As water levels have dropped and velocity of water flow in the river has decreased Typa, a native wetland plant species, has thrived and blocked water ways (with invasion increasing from 550 ha to over 200 km² in the last 5 years). Local communities reported that this phenomenon has prevented a natural flooding regime to occur. So that water was not able to reach the floodplain and pools, whilst at the same time causing flooding of productive farmlands areas upstream of the blocked channels. Aware that climate change may substantially affect the ecological character of the wetlands and their sustainable use and aware of the potential important role of the wetlands in adapting to and mitigating climate change, the Nigerian government in partner with the Ramsar Convention, the Royal Society for Protection of Birds, World Conservation Union and the Nigerian conservation Foundation- the bird life of Nigeria with the local communities aim at maintaining the natural resources and functions of the Hadejia-ngru wetlands through the Hadejia-Nguru wetlands conservation project (HNWCP).

The Nigerian Conservation Foundation- the bird life of Nigeria has empowered local communities by providing technical guidance on ecology, as well as tools and credits for food and transportation, and facilitating multi-stakeholder action groups (including dam operators and local government authorities) to counter the multi adaptation impacts of dams by restoring wetland ecosystem through clearing of Typa fields. Such approach has

put into practice one of principles of ecosystem-based approach to adaptation. This work by the communities has not only restored a more “natural” flood pattern, but has also increased household income an example of the multiplicity of benefit that ecosystem-based approach to adaptation can provide. Apart from getting bigger and more fish catches, farmers have also reclaimed most of their farmlands and grazing areas and no over flooding were experienced in the next rainy season. Building on this success, the communities have now set up their own maintenance programme that includes a substantive monitoring component to ensure continued success of the project (CBD, 2007).

Evaluation

The Ramsar Convention is helping in mitigation and adaptation of global wetlands. Its mission is “the conservation and wise use of all wetlands through local, regional, and national actions and international co-operation, as a contribution towards achieving sustainable development throughout the world”. Dating from 1971, the convention was the first global intergovernmental treaty to promote integrated management practices for wetlands, river basins, and coastal zones, recognising this as essential in ensuring water resources for future, and providing mechanisms for applying integrated landscape approaches at all scales.

Ecosystem-based approach are the use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change. This may include sustainable management; conservation and restoration of ecosystem, as part of an overall adaptation strategy that takes into account the multiple social, economic and cultural co-benefits for local communities, as demonstrated in the Hadejia- Nguru wetlands by Bird’s life international. Wise use provisions of the convention apply to all wetlands and their support systems, both those designated as wetlands of international importance (Ramsar sites) and all other wetlands. The wise use concept covers implementation responses at policy level as well as being directed towards specific wetlands. At the 2005 Conference of parties (COP) it was agreed wise needed re-defining so as to be better related to other more recent terminologies and better linked to a redefined “ecological character” definition.

In pursuing this aim the conceptual framework of the Millennium Ecosystem Assessment’s (MEA) was seen as valuable (i.e. maintaining ecosystem services for human well-being and poverty reduction). Applying MA terms and links between Ramsar “wise use” with the CBD’s ecosystem approach as each convention’s overarching approach an updated “wise use” is “wise use of wetlands in the maintenance of their ecological character within the context of sustainable development, achieved through the implementation of the ecosystem approach”. The current exchange of adaptation

experiences is poor, even when good practices are concerned. The current focus on national approaches has the followings strategic objectives of adaptations.

- (1) Improving and sharing basic scientific knowledge and decision support information. It will consist of working to strengthen the system of data collection and analysis and the broadening of research activities. And that research result are appropriately disseminated, and better taken into consideration in development policies
- (2) Promoting the ecosystem approach in managing water resources, continental and coastal wetlands, through rehabilitation and sustainable management of wetlands. Actually through their multiple functions (water storage, flood mitigation, stabilisation of soil surface conditions, water purification and carbon sequestration)
- (3) Identifying, promoting and disseminating appropriate adaptation technologies, techniques and measures with local, NGO, government and all stakeholders.

There has been many calls for institutional and policy reform through the Ramsar Conventions on wetlands and the parties to the Ramsar Convention have agreed to the wise use of all wetlands and implement national wetlands policies. A number of responses are recommended these include (a) integrated planning mechanism (e.g. IWRM, ICM). (b) Risk and vulnerability assessment. (c) Strategic and environmental impact assessment. (d) Education and awareness (e) rehabilitation of degraded ecosystem and re-establishment of the benefits they supplied (f) economic incentives and removal of perverse incentives.

In the legislative and regulatory field, Nigeria has signed and ratified several conventions, agreement and treaties on the sustainable management of wetlands and water resources in general. Among these are the Ramsar Conventions, Convention on Biological Diversity (CBD), and United Nations Convention to Combat Desertification (UNCCD). Decentralisation of legislation, which makes local governments accountable in their areas of responsibility, has promoted the establishment of local resource management tools for wetlands. The local governments are supported in this respect by national or international NGO's operating in the wetlands, e.g. Bird life International Nigeria. In the African Sahel, mitigation activities are traditionally employed as natural resource conservation measures, but they generally serve the dual purposes of reducing the emission of GHG from anthropogenic sources, and enhancing carbon "sinks". Strategies aimed at reducing GHG emission emphasizes cutbacks in the burning of fossil fuel through improved energy-efficiency and the use of clean energy sources particularly, solar. Carbon sink enhancement generally involves forestry programmes that protect the forest and encourage afforestation in marginal areas including rangelands (Adesina *et al*, 1998). Indigenous knowledge has been defined as institutionalized local knowledge that has been built upon and passed on from one generation to other by word of mouth (Osunade, 1994, Warren, 1992). It is the basis for local-level decision-making in any rural communities such that of the Hadejia-Nguru wetlands. Local farmers in the area have

been known to conserve carbon in soils through the use of zero tillage practices in cultivation, mulching and other soil management techniques (Schafer, 1989; Osunade, 1994). Natural mulches moderate soil temperatures and extremes, suppress diseases and harmful pests, and conserve soil moisture. Before the advent of chemical fertilizers, local farmers largely depended on organic farming, which also is capable of reducing GHG emissions.

Adaptation to climate change will cost money, time, effort and changes to how and why we do things. Adaptation will usually require planning and investment in new techniques, new infrastructure and new habits and lifestyles. These responses will have their advantages, or else we would not do them, but these advantages must be weighed against the costs of adaptation. The ecosystem based approach used in the Hadejia-Nguru wetlands has effectively taken care of these adaptation needs and transformation is quite imminent

Conclusion

The Hadejia-Nguru wetlands, a Ramsar site, provide essential ecosystem services including water for irrigation of export products such as peppers, as well as food staples and irrigation of land outside of the wet season for rice and wheat. The diverse nature of these services ensures flexibility in resources and income, which is vital to the ability of communities to adapt to environmental shocks like drought. The wetlands also provide water to groundwater reservoirs that supply wells and boreholes for large proportion of this Sahelian area.

Climate change has compounded wetland shrinkage caused by upstream dams built to supply water for irrigated agriculture, in response to drought that were affecting communities both upstream and downstream. These developments did not consider downstream effects, and as water levels have dropped and the velocity water flow in the rivers has decreased, Typa, a native wetland plant species has thrived and blocked the water ways. This has prevented a natural flooding regime. As part of the “wings over wetlands” project (UNEP/GEF Africa-Eurasian flyways project), birdlife partner the Nigerian conservation foundation, has empowered local communities to counter the mal-adaptation impacts of the dams by restoring wetland ecosystems through clearing the Typa.

The biodiversity benefit of the wetlands, provide wintering stop-over sites for over 68 different water birds species such as ruff *Philomachus pugnax* and spur-winged goose *Plectropterus gambensis* which were also been threaten by climate change. The ecosystem approach and landscape approach in conjunction with the wise use of wetlands by the Ramsar Convention are used as strategies for mitigation and adaptation. However, the need for integrating indigenous knowledge into formal mitigation and adaptation are strongly recommended with its ample benefits.

Recommendations

It is generally known that Africa, in general is a minor contributor of global GHG emissions. Its share of carbon emissions, which is by far the most important GHG, is only 3.2% of the world's total in 1992. Its share of methane is also small, only 7.7% of the world's total in 1991 (Davidson, 1998). Agriculture and land use sectors dominate GHG emissions in Africa, accounting for 57%, with the energy sector accounting for 32%. Two lines of actions are articulated in the literature for dealing with the adverse conditions that are expected to attend climate change. These are mitigation and adaptation strategies. Mitigation strategies are procedures or activities that help prevent or minimize the process of climate change and adaptation methods are those strategies that enable the individual or the community to cope with or adjust to the impacts of the climate in the local areas. Such strategies will include the adoption of efficient environmental resource management practices, such as the planting of early maturing crops, adoption of hardy varieties of crops and selective keeping of livestock in areas where rainfall decline such as the Hadejia-Nguru wetlands. They also include the use of technological products that enable the individual to function in the new condition. Obviously, adaptation strategies area expected to be many, and their combinations in various ways will be required in any given location such as that of Hadejia-Nguru wetlands.

Until recently, mitigation and adaptation were seen as two mutually exclusive strategies. Nevertheless, there are strong linkages between the two and it is increasingly recognized that integration of both strategies may not only provide new opportunities, but may even be a prerequisite for successfully addressing both issues. According to Klien *et al* (2003) integration connects mitigation and adaptation with natural resource management, biodiversity conservation and measures to combat desertification". Mitigation and adaptation should not be about the implementation of options. Studies have shown that local communities in the Sahel had successfully achieved some level of sustainable livelihoods by adopting continuously in their farming, livestock-keeping, and other income-earning activities (Mortimore, 2000). Therefore, any meaningful attempt at implementing or integrating mitigation and adaptation strategies to reduce the vulnerability on the ecosystem and people in the Sahel to the impacts of climate change should start by examining how the communities in the region had successfully reduced their vulnerabilities and coped with past impacts (e.g. the clearing and burning of native Typa weeds in the Hadejia-Nguru wetlands). Building on the indigenous knowledge systems of the locals offers great prospects for effective integration of mitigation and adaptation strategies that will be attractive enough to the vast majority of small-scale farmers who are expected to use them.

Developmental projects are known to have been created, funded and managed by outside resources and introduced into rural communities with the hopes and promises of impacting their lives. However, in recent decades the Hadejia-Nguru wetlands have come

under increasing pressure from drought and upstream water resource schemes. Upstream developments are affecting the hydrological regime of the wetlands either through the construction of dams which alter the timing and size of flood flows or through the diversion of surface water and abstraction of ground water for irrigation. The constructions of the dams and large-scale water resource schemes have not been directed by a single coherent basin wide plan and have failed to consider impacts on the floodplain or any subsequent loss of economic benefits that are currently provided by use of the floodplain. The net benefits forgone through floodplain losses due to recent and potential future upstream irrigation developments in the Hadejia-Jama'are river basin are highly significant, and in all scenarios exceed the net agricultural production benefits gained from these developments.

On the strength of the literature of adaptation and mitigation in the Hadejia-Nguru wetlands, integration of indigenous knowledge into formal mitigation and adaptation is recommended for the followings benefits:

- (a) Indigenous knowledge systems create a moral economy. It identifies a person within a cultural context, therefore providing decision-making processes or rules of thumb to be followed based on observed indicators or relationships within events (Adugna, 1996; Woodley, 1991). Members of communities act within these rules of thumb to maintain security and assurance, or risk isolation from their community. In an uncertain and biased world these rules of thumb provide people with a sense of community.
- (b) Indigenous knowledge is increasingly exhibiting a resemblance with scientific methods as many ideas in indigenous knowledge that were once regarded as primitive and misguided, are now seen as appropriate and sophisticated.
- (c) Indigenous knowledge systems provide mechanisms for participatory approaches. A major requirement for the sustainability of any project is that the local population must be seen as partners in the project, with joint ownership. This is best achieved when communities effectively participate in the design and implementation of such projects.
- (d) Indigenous knowledge systems share the same guiding principles with sustainable development framework with 3E concerns – economy, equity, and environment. The essence of most climate change projects is to reduce poverty and ensure sustainable development. This can be facilitated by the integration of indigenous knowledge into climate change policy.
- (e) Indigenous knowledge systems can facilitate understanding and effective communication and increase the rate of dissemination and utilization of climate change mitigation and adaptation options.

Ability to adapt depends on the state of development. Under-development limits adaptive capacity because of lack of resources to hedge against extreme but expected events. Thus enhancing adaptive capacity requires similar actions as promotion of sustainable development, including improved access to resources, improved information and education, assurance that responses are comprehensive and inclusive of the people, not just technical, and active involvement of all parties to ensure that actions are related to local needs and resources.

Mitigation strategies can be grouped into two categories: some represent mainly technological solutions; others involve changes in economic structure, societal organization, or individual behaviour. In the Hadejia-Nguru wetlands, mitigation activities are traditionally employed as natural resources conservation measures, but they generally serve the dual purposes of reducing the emission of GHG from anthropogenic sources, and enhancing carbon sink. Attempt by local authorities and NGO'S to cutbacks in the burning of fossil fuel through improved energy-efficiency, use of clean energy sources particularly solar is quite helpful.

Nigerian Birdlife NGO in partner with local authorities is providing loans to locals so as to diversify means of economic opportunities away from the stressed wetlands. The wise use of resources especially the ecosystem approach is put to best practices for sustainable development.

References

- Adams, W.M. and Kimmage, K. 1992. Wetlands agricultural production and river basin development in the Hadejia-Jama'are valley, Nigeria. *Geographical Journal* 158: 1-12.
- Adams, W.M. 1992. Indigenous use of wetlands and sustainable development in West Africa. *The Geographical Journal*, vol.159, no.2, pp. 209-218.
- Bridgewater, P. 2001. Landscape ecology and wetlands: a landscape approach to wetland conservation and wise use through the Ramsar convention. www.wetlandsinternational.org.
- Barbier, E.B., Adams, W.M., and Kimmage, K. 1993. An economic valuation of wetlands benefits in: The Hadejia-Nguru wetlands, economy and sustainable development of a shahelian floodplain wetlands wetlands. *IUCN, Gland*. Switzerland, pp. 191-209.
- Communities work together to restore lives and livelihood. www.wetlands.org. assess on line on 06/02/2012 @ 2:oopm
- IPCC 2007. Summary for policymakers in: climate change. Impacts, adaptation and vulnerability, contribution of working group11 to the forth assessment report of the intergovernmental panel on climate change, J, P. Palutikof, P.J. Vander Linden. Cambridge, UK, 7-22.

- Kitwan, A., Chang, S., and Popper, L. 2004. Wetlands and flooding (the Hadejia-Nguru wetlands. *Birdlife International*.
- Thomas, H.L. David and Adams, W.M. 1997. Space, time, and sustainability in the Hadejia-Jama'are wetlands and the Komodugu Yobe basin, Nigeria. *Birdlife International*.
- UNFCCC 2010. UNFCCC Article1, paragraph 2. Available online at (http://UNFCCC.int/essential_background/convention/background_items/2536.php). assess on 23/02/2012 at 01:55am.
- UNFCCC (United Nation Framework Convention on Climate Change) 2002. Report of the conference of parties on its seventh session, held at Marrakesh from 29/10/2001-10/11/2001.Bonn Germany. Available online at www.unfccc.int assess on 23/02/2012 at 10:30pm.