

Suggestions for the Conservation and Rehabilitation of Nigeria's Mangrove Ecosystem

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Received date: Dec 30, 2015; Accepted date: Jan 22, 2016; Published date: Jan 30, 2016

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Abstract

Nigeria has an estimated mangrove area of 10,515 Km², which forms about 5.8% of world total mangrove area, and the largest in Africa. Nigeria also ranks fourth among the eight countries where large mangrove reserves still exist, behind Indonesia, Brazil and Australia. With the exception of Nigeria, these countries with very large areas of mangroves have significant number of mangrove protected areas while still promoting mangrove afforestation and reforestation projects. Nigeria, on the contrary, has no gazetted mangrove-protected areas, neither are there mangrove restoration projects at present. Global forests including mangroves are depleting at an alarming rate. Climate change and its impacts are evident in our country. It is common knowledge that mangrove ecosystem offers great resilience to climate change impacts. It is also common knowledge that coastal regions are most vulnerable to climate change effects. Therefore, policy and legislation are urgently needed for the conservation and restoration of Nigeria's mangrove ecosystem, which not only supports rural livelihoods but also provides protection from climate change-related hazards, especially of ocean origin. Such policies and legislations will establish implementation strategies including inventory of the mangrove resources, developing the framework for a "National Mangrove Park", instituting mangrove restoration programmes with requisite monitoring and evaluation mechanisms, and promoting community awareness. Community-based approach has been adjudged the most successful in natural resources conservation globally, and is therefore recommended for this proposal.

Keywords: Mangrove; Ecosystem; Restoration; Conservation; Climate change; Nigeria

Introduction

Mangroves are known to occupy the tropical and subtropical belts of the world. The mangrove ecosystem is both dynamic and fragile. In many countries of the tropics, coastal livelihoods are supported through utilization of the resources provided by this unique ecosystem. This ecosystem has the highest biological diversity compared to any part of the sea. It is estimated to contribute about 25% of global biological productions [1]. Azariah and Govindasamy [2] reported that more than 2145 species of plants and animals have been identified in this ecosystem on worldwide basis. The mangrove ecosystem is also known to support most of the world's [3]. It provides excellent pedagogic and research resources. Above all, the role of mangroves (one of the so-called blue carbon ecosystems) in climate change mitigation in terms of carbon sequestration is significant [4-6]. Also, the role of mangroves in coastline protection against sea-level rise and storm surges is unique [7,8]. However, since the end of World War II, new technologies and methodologies have been introduced to achieve greater financial returns from mangrove areas, providing quick gains at the cost of permanent wealth [9]. Hence, mangroves are being over-exploited for various industrial, domestic and medicinal uses. The immediate outcome of mangrove habitat destruction and/or modification is the decline of biodiversity. Unfortunately, the rate of destruction is still ahead of conversation and management for long-term sustained production. Protection of mangroves means protection of biodiversity, and sustained provision of the various socioeconomic needs and services, but any loss of biodiversity is an irrevocable loss.

The present paper aims at providing workable suggestions for protection and rehabilitation of Nigeria's mangrove ecosystem as a panacea to climate change impacts. The opinion of this paper is that conservation efforts are positive climate change adaptation measures, especially, for livelihoods supported by this ecosystem, as well as coastal resilience, and the sustainability of the ecosystem [10].

Why protection and rehabilitation of Nigeria's mangroves?

We observed that the mangrove resources of Nigeria as a whole are undergoing a subtle decline. This is not a strange development, because any natural resource whose exploitation is unregulated is unlikely to be sustainable in the long run. Nigeria's mangrove area on map (courtesy of World Mangrove Atlas) is 11,134 km², but it is estimated that about 10,515 km² still remains [11,12]. This implies a loss of about 5.6% of the total mangrove area. However, our survey of the fishing settlements in the Niger Delta area revealed a rapid increase in coastal population occasioned by the rise in number of fishing settlements in the last few decades. Sixty-eight settlements, with sizes ranging from 20 m² for small temporary huts to about 150-200 20 m² for settlement of a permanent nature, have so far been recorded within the Cross River estuary [13]. Each new settlement represents an equivalent areal loss of mangrove forest in the first instance. Additional losses definitely result from continuous exploitation by local residents for fuelwood, housing, embankment, gear and paddle construction. Worst areas of mangrove degradation are reported in parts of Rivers State [14], Bayelsa and Delta States. In these areas, the culprits are crude oil exploration and exploitation activities. In fact, recent global estimates by Giri et al. [15] using Landsat satellite imagery put Nigeria's mangroves at a little above 7,000 km². This supports our fears of continuous decline of Nigeria's

mangroves and strengthens our call for its conservation both by legislation and rehabilitation.

Protection of our remaining mangrove, and restoration of destroyed or degraded areas through afforestation and reforestation is essential. Nigeria ranks fourth among eight countries of the world with large mangrove areas, behind Indonesia, Brazil and Australia. These countries have significant number of protected areas, while still engaging in mangrove afforestation and reforestation projects. For instance, Australia has 180 protected mangrove areas, while Indonesia and Brazil have 64 and 63 respectively. Mangrove rehabilitation projects are currently going on in most countries like Indonesia, Brazil, Australia, Philippines, Bangladesh, Pakistan, Vietnam, Malaysia, India and Venezuela. In Africa, countries like Ghana, Kenya, Tanzania, Mozambique, Seychelles, and Sierra Leone are engaged in aggressive mangrove rehabilitation. But Nigeria has no gazetted mangrove-protected areas, nor is there any rehabilitation programme at present, in spite of the immense benefits of such ventures. So far, conservation efforts by government have concentrated on terrestrial ecosystems only. A good number of National Parks are functionally in existence across the country.

What do we stand to gain when we protect and rehabilitate our mangrove ecosystem?

Numerous benefits! The health of the mangroves means wealth for the nation and its people. We can summarize the benefits under two broad groups: Protection brings ecosystem preservation, and restoration brings sustainable utilization and protection of coastal areas. The degree of the threat posed by global climate change/global warming is uncertain. Rehabilitation of mangrove ecosystem is one management strategy with a dual "win-win" benefit [16]. Apart from being a precautionary approach, it would improve the livelihood of local and immediate users of the resources; increase productivity (e.g. fisheries); increase tourism revenues; sustain mangrove forestry; enhance sea defences and provide security from natural hazards; and save cost for the construction and maintenance of sea dikes. As climate change challenge continues to increase, communities in the Niger Delta region, as well as those along the entire coastline of Nigeria, are in danger of various natural disasters frequently reported in Indonesia, Philippines, Thailand, East coast of the United States and other coastal states. Mangroves have the potentials to shield the coastal communities from the severe impacts of these hazards [7].

Protection and restoration approaches

The Nigerian Government should take the initiative. It should prepare a legislative base for mangrove-protected areas by passing Mangrove Parks and Reserve Act as a first step towards mangrove management, conservation and rehabilitation. Financial support for conservation and rehabilitation should be provided.

An integrated biotic inventory: This should take the form of ecological surveys using aerial photography validated by ground checks. Modern technologies such as remote sensing and GIS may also be employed. Such surveys should establish the present status of our mangrove by (a) mapping and characterization of the mangrove plant communities; (b) estimating the total areal losses, the rate of its loss and the amount of mangrove available; (c) identifying areas that are relatively pristine or with less human influence where reserves could be sited; (d) documenting the biological diversity by species, genera and families; (e) identifying any endangered species; (f) identifying areas

for urgent or remote rehabilitation attention and (g) identifying areas of high fishery or timber production, spawning and nursery grounds (ecologically sensitive).

Enlightenment campaigns for the local communities: Protection and rehabilitation of coastal resources should be a shared responsibility between the government and local residents, with the scientists/biologists somewhere in the middle [17-19]. In mounting an enlightenment campaign, the local communities should be made to realize (a) the resource management needs/problems; (b) their dependence on coastal resources for livelihood; (c) the pressure/demand for more resource use (e.g. population growth); (d) the possibility for participatory and collaborative resource management. Quarto [20] reported cases of successful community involvement in mangrove management in the Philippines, Thailand and Vietnam. Such enlightenment and education would encourage their much needed and valuable cooperation and participation.

Providing alternative sources of energy and income/livelihood for coastal communities. This would reduce the pressure on mangrove resources.

Establishing mangrove nurseries or seedlings production areas where viviparous seedlings or propagules collected from parent plants are grown for transplanting. Collection of seedlings and care of the nurseries could be part of the contributions of the communities, especially women and children to the project.

Mangrove communities should be incorporated and accorded prominent roles in the UN REDD+ pilot project for Nigeria.

Encourage cooperation and coordination among scientists and institutions responsible for or interested in coastal resources management.

Sources of mangrove seedlings for afforestation and reforestation

Shortage of viviparous seedling supply has been identified as a major constraint for the restoration of the mangrove ecosystems. Three sources could be explored at present for Nigeria.

Natural sources: This entails collecting mature and ripe viviparous seedlings from mother plants and planting same in nurseries prior to transplanting. However, demands for viviparous seedlings, especially in restoration programmes, have not been met by natural supplies.

The "cut-piece method": This method involves cutting a viviparous seedling into a number of pieces before planting. Each surviving cut piece grows into a full mangrove plant. This method was first suggested by some Thai foresters, and has been used extensively and successfully too, in mangrove rehabilitation project throughout the world. de-Silva and Amarasinghe [21] used cut-pieces of the propagule for propagation of *Rhizophora apiculata*, *Ceriops tagal* and *Bruguiera sexangula*. Ohnishi and Komiyama [22] used the method for *Kandelia candel*, while Komiyama et al. [23] was successful with *Rhizophora apiculata* and *R. mucronata*. Ohnishi and Komiyama [22] and Komiyama et al. [23] reported that the cut-pieces grew better than intact seedlings.

Use of vegetative parts: This involves the use of shoot cuttings from parent plants. The method was successful with *Laguncularia racemosa*

[21,24]. They outlined the major advantages of this method as quicker establishment and reproduction of cuttings, as well as the possibility to plant them in flooded areas, where establishment of propagules and survival of seedlings of *L. racemosa* is very difficult to achieve.

Conclusion

In conclusion, we emphasize that the protection and rehabilitation of Nigeria's mangroves are indispensable given the obvious present and future ecological, socio-economic, socio-cultural and scientific benefits, and requires an urgent attention. So far, no concrete attempts have been made to prevent further deterioration (e.g. creation of Mangrove Parks), and no programme for the restoration of our mangrove ecosystems. It is our desire to make this clarion call on the Nigerian Government, national and international NGOs, as well as other stakeholders. We have known the problem, let us move from knowledge to action!

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