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The proposed Eko Atlantic City project, Victoria Island, Lagos: Preliminary impact assessment of land reclamation on the aquatic lives and climate change

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Abstract

The effects of climate change in the face of land reclamation among other anthropogenic activities are of great concern to aquatic genetic resources and biodiversity. This study was designed to assess the preliminary impact of the proposed Eko Atlantic City (EAC) project on the aquatic lives and/or biodiversity, and the level of development and challenges that have implications on climate change in Victoria Island and its environs in Lagos State, Nigeria. The selected areas such as Lamgbasa, Badore, Ajah and Victoria Island were evaluated using the snowball sampling approach, whereby 111 respondents were assessed. Results showed that land reclamation and construction activities had impacted on the aquatic lives and the primitive fishing occupation (5.5%). Respondents (44.4%) agreed that the on-going EAC had contributed to the development of Lagos State, however, negative impacts of climate change such as ocean surge, sea level rise, flooding among others were high but with low level of adaptive capacity agreement (41.7%). Furthermore, analysis showed varying degrees in the extent of severity of problems encountered from climate change effects such as rainfall, flooding, temperature, health issues among others. The study revealed that these communities were susceptible or vulnerable to the impacts of climate change such as coastal erosion, flooding, storm/ocean surge, sea level rise etc and importantly loss of non-renewable aquatic genetic resources. The government is hereby advised to have sound policies for adaptation and mitigation strategies to protect these non-renewable genetic resources and effect of climate change activities.

Keywords: Eko Atlantic City; land reclamation; climate change; genetic resources; biodiversity

Le projet proposé Eko Atlantic City, Victoria Island, Lagos: Évaluation préliminaire de l'impact de la remise en état des terres sur la vie aquatique et le changement climatique

Résumé

Les effets du changement climatique face à la mise en valeur des terres, entre autres activités anthropiques, sont très préoccupants pour les ressources génétiques aquatiques et la biodiversité. Cette étude a été conçue pour évaluer l'impact préliminaire du projet proposé Eko Atlantic City (EAC) sur la vie aquatique et / ou la biodiversité, ainsi que le niveau de développement et les défis qui ont des implications sur le changement climatique dans l'île Victoria et ses environs dans l'État de Lagos, Nigeria. Les zones sélectionnées telles que Lamgbasa, Badore, Ajah et Victoria Island ont été évaluées à l'aide de la méthode d'échantillonnage en boule de neige, qui a permis d'évaluer 111 répondants. Les résultats ont montré que la remise en état des terres et les activités de construction avaient eu un impact

sur la vie aquatique et l'occupation de la pêche primitive (5,5%). Les répondants (44,4%) ont convenu que l'EAC en cours avait contribué au développement de l'État de Lagos, cependant, les impacts négatifs du changement climatique tels que la montée des océans, l'élévation du niveau de la mer, les inondations, entre autres, étaient élevés mais avec un faible niveau d'accord de capacité d'adaptation (41,7%). En outre, l'analyse a montré des degrés divers dans l'étendue de la gravité des problèmes liés aux effets du changement climatique tels que les précipitations, les inondations, la température, les problèmes de santé, entre autres. L'étude a révélé que ces communautés étaient sensibles ou vulnérables aux impacts du changement climatique tels que l'érosion côtière, les inondations, les tempêtes / ondes océaniques, l'élévation du niveau de la mer, etc. et surtout la perte de ressources génétiques aquatiques non renouvelables. Il est conseillé au gouvernement de se doter de politiques solides pour les stratégies d'adaptation et d'atténuation afin de protéger ces ressources génétiques non renouvelables et les effets des activités liées aux changements climatiques.

Mots clés: Eko Atlantic City; La remise en état des terres; Changement climatique; Ressources génétiques; Biodiversité

Introduction

Lagos had been known by its native Yoruba name 'Eko' and well known for her aquatic organisms farming island wherein situated between a lagoon and the Atlantic Ocean (Filani, 2012; Olokesusi, 2011). Lagos state is located at the Western part of the coastline. The state accounts for 90% of the country's trade as it holds the major air and seaport; it generates revenue of up to $80.6bn accounting for up to 36% of national GDP and 62% of national non-oil GDP (African Business, 2010; Lagos State, 2010). The location of several multi-national companies, banks, and institution headquarters makes it one of the most globally connected cities in Africa. Eko Atlantic City (EAC) is a proposed, planned and well-structured dream city of Lagos state, Nigeria. It is being constructed on land reclaimed from the Atlantic Ocean. It is located in the Bar beach situated at Victoria Island in Lagos, Nigeria. It is hoped that the heightened level of population in the city will be regulate by the construction of EAC which will help drive populations from the centre of the city into areas like the new development (Adebayo, 2014). The new city is expected to be home to around 250,000 new residents and will provide employment for up to 150,000 workers (Awofeso, 2010; Eko Atlantic City, 2012; African Business, 2013). Land reclamation or land-fill is the process of creating new land from oceans, riverbeds, or lake beds (Mostafa, 2012). The land reclaimed is known as reclamation ground or land fill (Lambi, 2001; Mostafa, 2012). It comprises dredging large amounts of sea sand transported over considerable distances to create new land for infrastructure or industrial purposes (Zeballos and Yamaguchi, 2011; Mostafa, 2012). The sand is used for all kinds of projects like land reclamations, the construction of artificial islands and coastline stabilization (Ashraf *et al.,* 2010). It is also an excavation activity usually carried out under water in shallow areas of fresh water for the purpose of gathering bottom sediments and disposing them at a different location. Importantly, this, land reclamation, among other anthropogenic activities has implications on the normal natural climate (Olaniyi, 2014). Fisheries and **aquaculture**

play a very indispensable role, either directly or indirectly, in sustaining world population at large ranging from its various level of production to significant contribution to livelihoods and employment, fish utilization and trade, supply and consumption. Millions of people are directly and indirectly engaged, part time or full time, in its production either in capture from the wild or in aquaculture or mariculture. The objective of the study was to evaluate the preliminary impact of the proposed EAC project on the aquatic life or biodiversity, and the level of development and challenges on the environment that have implications on climate change.

Materials and methods

Scope of study, data collection and analysis

The study covered areas such as Lamgbasa, Badore, Ajah and Victoria Island and the studied populations were the residents of these places. Data collection was via questionnaire administration of closed ended type with single and multiple responses that are administered by a snowball approach. Data collected were subjected to descriptive statistics (such as mean, frequency and percentage) and regression analysis using Statistical Package for the Social Sciences (SPSS).

Results

Distribution of occupation

The distribution of occupation is presented in Table 1. The highest occupation was business (35.2%) followed by civil servant (23.1%). The lowest occupations were both the public servant and teacher (1.1%). Importantly, those engaged in fishing is 5.5%. This showed that most respondents were business men or women.

Table 1: Distribution of occupation

Characteristics	Frequency	Percentage (%)
Civil servant	21	23.1
Business	32	35.2
Contractor	12	13.2
Fishing	5	5.5
Technician	2	2.2
Student	6	6.6
Driver	5	5.5
Surveyor	3	3.3
Software developer	3	3.3
Public servant	1	1.1
Teacher	1	1.1
Total	91	100.0

Level of development and challenges of the ongoing project

Table 2 shows the level of development and challenges of the on-going EAC project. Importantly, with respect to ocean surges leading to negative impacts such as destruction of buildings and properties among others, 47.4% and 36.1% respondents respectively agree and strongly agree to this. About 3.1% respondents

strongly disagree; 13.4% respondents disagree. To corroborate this, the data on low level of negative impact of ocean/sea level rise revealed 43.2% respondents being on disagree, 11.6% strongly disagree while 32.6% and 12.6% respondents respectively agree and strongly agree to this. Further corroboration reveals the effect of flooding been a major threat by causing havoc, 2% and 46% respondents respectively strongly agree and agree; while 2% and 9% respondents respectively strongly disagree and disagree with this.

In addition, 48.5% respondents strongly agree that there is there is poor and inadequate road infrastructure, 33.3% respondents agreed with this point of view while 3 (3.0%) respondents strongly disagree and 15.2% respondents disagree. Seven respondents with 7.1% strongly disagree that EAC project has contributed to the development of Lagos State; 15.2% respondents disagree while 44.4% agree and 33.3% strongly agree with this opinion. About 33.3% respondents strongly disagree that the project has led to the reduction in traffic, 34.3% disagree whereas 20.2% agrees and 12.1% respondents strongly agree with. On the construction activities, 27.6% respondents strongly agree, that the operating machines cause noise pollution; 36.7% agree while 7.1% and 28.6% respondents respectively strongly disagree and disagree on this. Essentially, for the adaptive capacity, 28.1% respondents strongly agree that there is low level of adaptive capacity; 41.7% respondents agree while 2.1% respondents strongly disagree and 28.1% respondents disagree on this.

Extent of severity of problems encountered

Table 3 shows the result on the problems encountered. Some respondents experience severe extent of problems being encountered while others do not. For example, 66.6% of the respondents do not experience severe windstorm while 33.3% do not experience this problem, while the extent of flooding is seen to be very severe as indicated by 69% of the respondents, 31.1% of the respondents experience no severe flooding. About 48.5% of the respondents were faced with severe waste disposal while 43.4% of the respondents did not.

Table 2: Level of development and challenges of the ongoing project

Characteristics	Strongly disagree (%)	Disagree (%)	Agree (%)	Strongly agree (%)
Ocean surges has led to negative impacts such as destruction of building, other properties among others	3 (3.1)	13 (13.4)	46 (47.4)	35 (36.1)
There is low level of negative impact of ocean/sea level rise	11 (11.6)	41 (43.2)	31 (32.6)	12 (12.6)
Flooding has been a major threat that destroys the road network among others	2 (2.0)	9 (9.0)	46 (46.0)	43 (43.0)
There is poor and inadequate road infrastructure	3 (3.0)	15 (15.2)	33 (33.3)	48 (48.5)
Eko Atlantic City Project has contributed to the development of Lagos state	7 (7.1)	15 (15.2)	44 (44.4)	33 (33.3)
There is reduction in traffic	33 (33.3)	34 (34.3)	20 (20.2)	12 (12.1)
There is noise pollution emanating from operating machines	7 (7.1)	28 (28.6)	36 (36.7)	27 (27.6)
There is low level of adaptive capacity	2 (2.1)	27 (28.1)	40 (41.7)	27 (28.1)

****Figures outside the bracket are the frequencies while the ones inside the bracket are the percentage**

Table 3: Extent of severity of problems encountered

Characteristics	Mean	F-value	Severe (%)	Not severe (%)
Extent of severity of rainfall	2.4462	1.834	30 (46.2)	35 (53.8)
Extent of severity of flooding	2.2931	23.805 0.606	40 (69.0)	18 (31.1)
Extent of severity of high temperature	2.5636	1.368	24 (43.7)	31 (56.4)
Extent of severity of cold temperature	2.6304	0.154	20 (43.4)	26 (56.6)
Extent of severity of salinity of borehole/well water	2.2955	0.185	28 (63.7)	16 (36.4)
Extent of severity of Windstorm	2.9259	6.221	9 (33.3)	18 (66.6)
Extent of severity of waste disposal	2.5957	3.953	23 (48.9)	24 (51.1)
Extent of severity of incidence of malaria	2.2830	0.578	30 (56.6)	23 (43.4)
Extent of severity of incidence of disease and pest	2.6939	7.557	18 (36.7)	31 (63.2)

****Figures outside the bracket are the frequencies while the ones inside the bracket are the percentage**

Discussion

The negative environmental impacts of land reclamation activities on marine environment include: destruction of the coastal plants and phytoplankton, which serve as food for the aquatic organisms, and plays an important role in gas regulation service through photosynthesis; permanently loss of the marine habitats where land is reclaimed from the sea especially the mangroves and coral reefs, which provide erosion control service as coastal defence against storm surges and biodiversity maintenance service as important habitats for fish (Borges *et al.,* 2002, OSPAR Commission, 2008; Wang *et al*., 2010). Moreover, since marine sand is usually used in large scale for land reclamation, the impacts of sand extraction effects include: great disturbance because of noise, both below and above water, and the use of equipment frighten off aquatic lives and the destruction of the seabed lives, hence biodiversity loss that may never be regained or recovered. Each species requires specific habitat for survival, however the complete removal or the destruction of the aquatic ecosystem, resulting in the reduction/loss of such species (Borges *et al.,* 2002, Ashraf *et al.,* 2011). Definitely flooding, ocean surge, marine habitats destruction among other effects that are implications from the land reclamation will not spare the aquatic lives and /or biodiversity. Great loss of non-renewable aquatic resources is imminent. The coastal waters which support fish populations that constitute a significant source of protein, sustain ecosystem stability through conservation of

biodiversity, mitigation of climate change through carbon sequestration, act as sinks for byproducts of industrial or agricultural production, and provide recreational and aesthetic benefits are now threatened. The land reclamation has caused significant damage to coastal ecosystems and the services they provide. Essentially the effect of change in climate is imminent due to the high level of pollution from fuel consumption by equipment used for construction being released into the atmosphere that affects air quality (Mostafa, 2012). Climate change which is the change in the normal natural climate resulting from both importunate direct or indirect anthropogenic activities and natural processes in the composition of atmosphere (Olaniyi, 2014); has been called for by these human activities. The data revealed severe effect of land reclamation on local ground water (Guo and Jiao, 2007). The wash-water discharge, storm runoff, and dredging activities from improper sand and gravel operations can increase the turbidity of streams. This ultimately may alter the water temperature and dissolved oxygen (Borges *et al.,* 2002, Ashraf *et al.,* 2011); and the aquatic lives are destroyed. The dredging induces suspensions that affect the water quality and local biota (Dubois and Towle, 1985, Wang and Chen, 2009). Owing to reclamations, water table will rise and saltwater-freshwater interface changes causing disequilibrium; thereby fisheries/fishing and aquaculture is greatly affected. Of course, land reclamation has beneficial role on the society such as the development of megacity and/or urbanization, creation of employment opportunities, and extended land capacity (Andriansen, 2009; Filani, 2011; Zeballos and Yamaguchi, 2011; Mostafa, 2012, Ajibade *et al*., 2014; Omenai and Ayodele, 2014). However, the effect is insurmountable especially on biological lives, agriculture, biodiversity and importantly the non-renewable genetic resources.

Conclusion

The study showed impact of the on-going land reclamation and construction activities being pronounced on these coastal or riverine locations where rapid urbanization is occurring alongside economies that are dependent on climate-sensitive resources. The implication is that these communities are much susceptible or vulnerable to the impacts of climate change such as coastal erosion, flooding, storm/ocean surge, sea level rise etc and importantly loss of non-renewable aquatic genetic resources. The government is hereby advised on sound policies for adaptation and mitigation strategies to protect these non-renewable genetic resources and effect of climate change activities.

References

Adebayo, A. K. 2014. Emerging 'New cities' in Africa and socio-spatial inequality: A case study of the Eko Atlantic City project in Lagos, Nigeria.

African Business. 2012. Lagos: Africa's emerging powerhouse. *African Business*, 387:2-3.

Ajibade, I., Armah, F. A., Kuuire, V., Luginaah, I. and McBean, G. 2014. Self-Reported Experiences of Climate Change in Nigeria: The Role of Personal and Socio-Environmental Factors. *Climate*. 3: 16-41.

Andriansen, H. K. 2009. Land Reclamation in Egypt: A Study of Life in the New Lands. *Geoforum*. 40: 664-674.

Ashraf, M. A., Maah M. J., Yusoff I., Wajid, A. and Mahmood, K. 2011. Sand mining effects, causes and concerns: A case study from Bestari Jaya, Selangor, Peninsular Malaysia. *Academic Journals,* ISSN 1992-2248.

Awosika, F., French, T., Nicholls, R. and Ibe, E. 1992. Impacts of sea level rise on Nigeria. *In: Proceedings of the 1992 IPCC Symposium: The Rising Challenge of the Sea, Margarita, Venezuela,* 14–19.

Borges, P., Andrade, C. and Freitas, M. C. 2002. Dune, Bluff and Beach erosion due to exhaustive sand Mining the case of Santa Barbara Beach, São Miguel (Azores, Portugal). *J. Coastal Res (ICS 2002 Proceedings) Special Issue,* 36(1): 89-95.

DuBois, R. and Towle, E. 1985. Coral harvesting and sand mining management practices. *Coastal resources management: development case studies,* 3:203-289.

Eko Atlantic City 2012. *http://www.ekoatlantic.com/developing/.*[Online] Available at: [Accessed on 9 November 2013].

Filani, M. O. 2011. The Changing Face of Lagos: From Vision to Reform and Transformation. *Cities Alliance/Cities without Slums*. 1-45.

Filani, M. O. 2012. *A City in Transition: Vision, Reform, and Growth in Lagos, Nigeria.,* Ibadan: Cities Alliance.

Guo, H. and Jiao, J. J. 2007. Impact of Coastal Land Reclamation on Ground Water Level and the Sea Water Interface. *Groundwater*. 45: 362-367.

Lagos State Government. 2014. *Household Survey 2013,* Lagos: Lagos Bureau of Statistics.

Lambi, C. M. 2001. Environmental Issues: Problem and Prospects. *Bamenda, Cameroon: Unique Printers*. 152.

Mostafa, Y. E. S. 2012. Environmental impacts of dredging and land reclamation at Abu Qir Bay, Egypt. *Ain Shams Engineering Journal,* 3:1–15.

Olaniyi, W. A. 2014. Climate Change and Biotechnology: Toolkit for Food Fish Security. In: Vulnerability of Fisheries, Agriculture, and Water to Climate Change: Toward Sustainable Adaptation Strategies, Behnassi M, Shelat K, Hayashi K (eds). Springer, Netherlands. pp 243-258.

Olokesusi, F. 2011. *Lagos: The Challenges and Opportunities of an Emergent African Megacity,* Lagos.

Omenai, J. and Ayodele, D. 2014. The Vulnerability of Eti-Osa and Ibeju-Lekki Coastal Communities in Lagos State Nigeria to Climate Change Hazards. *Research on Humanities and Social Sciences*. 4(27): 132-142.

Zeballos, E. and Yamaguchi, K. 2011. *Impacts of Land Reclamation on the Landscape of Lake Biwa, Japan. Procedia Social and Behavioral Sciences. 19: 683-692.*

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