

*Full Length Research Paper*

# **Effective solid waste management: A solution to the menace of marine litter in coastal communities of Lagos State, Nigeria**

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**Effective management of solid wastes is a goal that is yet to be achieved in many countries, even developed ones. In attempt to carry out a study on effective waste management system as a solution to the menace marine litters posed on coastal communities, three coastal areas in Lagos State Nigeria which are known for fishing, recreation, housing, and other various coastal activities were selected. Three groups of research questions were formulated based on the problem perception and impacts, actors and level of governance, and strategy and instrument; and each question was examined, and specific strategy was developed for necessary data gathering. This study was based on the observational findings and interviews conducted for various actors; and conclusion and recommendations were based on the evaluation of the research questions. While a clear cut of marine littering resulting from ineffective solid waste management was the case at Makoko and Ebute-metta, the dividend of relatively effective solid waste management system with multi-actor approach was seen clearly at Victoria Island bar beach, as this location was found to be relatively clean, thus reducing the chances of litters escaping into the marine system. Generally, the major impacts identified are aesthetics impairment, health issues, and economic downscale. Based on the studied sites, the framework for requisite actions to address the problem of marine littering in an effective and sustainable manner is documented herein.**

**Key words:** Solid waste, waste management, marine litter, Makoko, Ebute-metta, Victoria Island, multi-actor approach, pollution, coastal community.

## **INTRODUCTION**

Human health and environmental quality are undergoing continuous degradation by the increasing amount of

wastes being produced (UNCED, 1992; Osibanjo, 2001). Solid waste is a major public health and environmental

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concern in urban and coastal areas worldwide; the situations in Africa, part of Asia and Latin America in particular are severe (UNEP, 2005). The total volume of marine litter collected in 2008 beach cleanup worldwide was estimated at 3,402 tons (ICC, 2009). In Africa, increasing urbanisation, rising standards of living and rapid industrial growth have resulted in increased solid waste generation by households, commercial institutions and industrial activities. Coastal litter, also referred to as marine litter or debris, is any item that appears on beaches, or at sea as a result of anthropogenic activities causing environmental quality deterioration (Storrier and McGlashan, 2006). Littering has been attributed to, inter alia, poor solid waste management practices, lack of infrastructure, indiscriminate human activities and behaviours, and an inadequate understanding on the part of public on the potential consequences of their actions (UNEP, 2009). Marine litter is an environmental, economic, health and aesthetic problem. It threatens marine and coastal biological diversity in productive coastal areas (UNEP, 2005).

An insight into Nigeria's population data is necessary to fully understand that increasing population poses a major obstacle to effective solid waste management (Solomon, 2009). As a result of beach user behavior, urbanization, shipping, fishing and residential activities, solid wastes of anthropogenic sources have polluted virtually all the lagoons and creeks in Lagos (Ajao et al., 1996; Nubi et al., 2008). According to the Ocean Conservancy International Beach Cleanup report of 2009, shoreline and recreational activities resulting in waste materials like plastics bags, food wrappers and beverage drinks constitute nearly 88% of waste volumes collected annually in Nigeria (ICC, 2009). Litter from smoking related activities and composition involving dumping activities along the coastline, as well as medical and personal hygiene constitute the remaining 12%. Anthropogenic causes of flooding in Lagos has been attributed to ineffective waste disposal system that encourages littering which eventually leads to flooding (Folorunsho and Awosika, 2001). The resultant effect of the population growth on littering is evident, as the volume of waste generated continues to increase at a rate beyond the ability of the responsible agencies to improve on resources needed to handle the problem of solid waste management. Beside the increase in population, Nigeria suffers from lack of continuity in implementation of government policies, financial and operational constraints, inadequately formulated policies and poor attitude of citizens towards waste management. Waste collection and management is handled either by the state environmental agencies or private companies or both. Most often high and medium socio-economic class urban and coastal areas get better services than low socio-economic class areas mainly due to willingness of the former group to pay for services which are facilitated by proper planning in these areas, thereby making

monitoring and enforcement less difficult. This paper consequently provides an overview of the current state of solid waste management in the coastal areas of Lagos, Nigeria, and the causes of marine litter in these areas. It identifies key stakeholders in solid waste management (SWM) in Lagos, their perceptions and interests towards effective solid waste management system, and also makes available recommendations for improvement.

## METHODOLOGY

### Study area

Makoko, Ebute-metta and Victoria Island (Figure 1) were selected as the case studies for this research because they are located at the tributaries of Lagos lagoon, and are both known for commercial and residential activities. Makoko and Ebute-metta areas are known to accommodate the low-income class people while Victoria island accommodate the rich and middle class people. In the latter area, marine litter is not as prominent as Makoko and Ebute-metta and waste management within this area seems to be more effective. Understanding the perception of various individuals with different backgrounds in similar location will help to ascertain if effective solid waste management can be a solution to the menace of marine litter.

### Nature and source of data

Extensive literature search, interviews and personal observation and administering of questionnaire were employed. Interviews were conducted for key officials who are responsible for solid waste management, institutional organizations, research bodies, governmental authorities at central and municipal levels who are concerned with coastal litter management which includes the Lagos State Ministry of Environment, the Lagos State Environmental Protection Agency (LASEPA) and Lagos State Waste Management Authority (LAWMA), and also the coastal communities. Pre-structured interview questionnaires were used (see appendix); and these help to give precise answers to questions for better analysis. However, the interviewees were at liberty to explain and answer the questions in their own way.

### Data collection instruments

Combination of three primary data collection instruments was used for this study. These include face-to-face interviews (an open style of interviewing with a high degree of pre-structured questions, observational scheme, and search method). The use of a combined instrument ensured appropriate data collection with desired details and accuracy.

### Sample frame

The target group consisted of relevant stakeholders based on theoretical framework which underscores the need for multi-actor character in policy management, and as a result a predetermined list of institutions like governmental authorities at central and municipal levels, research bodies dealing with coastal litter and solid waste management, and also the coastal dwellers formed the sample frame. The coastal dwellers sampled were residents of Ebute-metta, Makoko (Igbeyinadun and Apollo), and Victoria Island bar beach. In Table 1, a list is presented of the organizations from

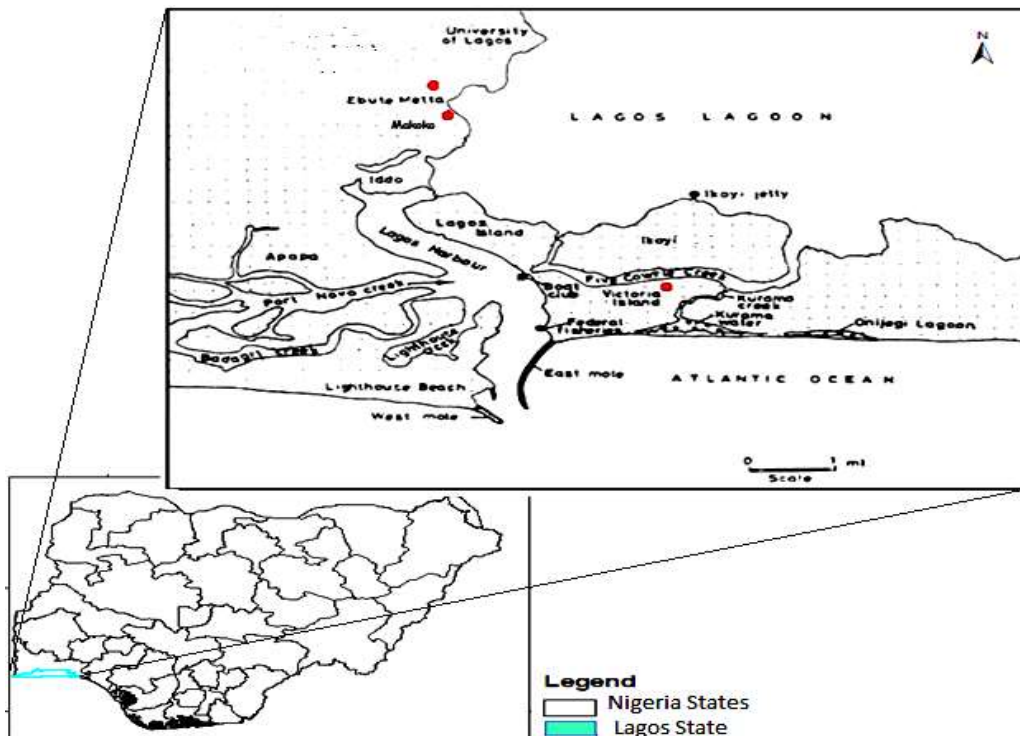


Figure 1: Map of Lagos showing the study locations (in red dots)

Table 1. Organisations/Respondents interviewed.

Name	Organization type	No. of interviewee
Federal Ministry of Environment (FMEnv.)	Government	2
Lagos state Ministry of Environment (LAMENV)	Government	2
Lagos State Waste Management Authority (LAWMA)	Government	2
Nigerian Maritime Administration and Safety Agency (NIMASA)	Government	2
Nigerian Institute of Oceanography and Marine Research (NIOMR)	Research Institute	2
Coastal dwellers in Makoko	Residents	10
Municipal authority for Makoko	Government	2
Coastal dwellers in Ebute-metta	Residents	10
Municipal authority for Ebute-metta	Government	2
Coastal dwellers in Victoria Island	Residents	10
Municipal authority for Victoria Island	Government	2

which employees were interviewed (two person per actor for the governmental organisation and ten respondents per coastal community).

## RESULTS AND DISCUSSION

### Observational report

Makoko is a large coastal area comprising many communities. Governed by Yaba local government of

Lagos State, the major occupation of the residing people is fishing (Plate 1). The communities visited were Igbeyinadun and Apollo. These two communities are the closest to the Lagos lagoon, and their choice was influenced by this proximity. At Makoko, there was no observable waste management system in place as wastes were seen dispersed all over the sites visited (Plate 1). There were no observable road networks within the communities at Makoko. The few accesses seen were bad, and have been encroached by the dispersed wastes.



**Plate 1.** Fishing activities (left) and open waste dumpsite (right) at Makoko.



**Plate 2.** Lumbering activities (left) and open waste dumpsite (right) at Ebute-metta.

Ebute-metta is a coastal area that also shares boundaries with the Lagos lagoon. This area is located beside Makoko and also governed by Yaba local government of Lagos State. Apart from the area being used as residential zone, the major commercial activity in this area is sawmilling (Plate 2). Also at Ebute-metta, there was no observable waste management system in place as wastes were seen dispersed all over the sites visited (Plate 2). Conversely, there are relatively better road networks at Ebute-metta compared with Makoko.

Bar beach in Victoria Island is a coastal zone predominantly occupied by recreational, religious, and commercial activities (Plate 3). Horseback riding, sun tanning, and picnics are part of the observed activities. There is a waste management system in place at the Victoria Island bar beach, as the whole place was found to be in a tidy state (Plate 3).

## Interview report

### *Problem perception and impacts*

Ninety percent of the respondents at Victoria Island

perceived marine littering as an environmental and economic problem, because it impairs the aesthetics of the beach thereby reducing the number of tourists visiting the beach. They are also of the opinion that other recreational and commercial activities would be adversely affected. Although from respondents and observation, the area does not have waste management or littering as a major problem, but the beaches experience littering from land based sources during public holidays when there is high inflow of people on picnic. The major impact of litters on the beaches to the businessmen on the beach is the economic impacts; when people would leave a particular beach for other beaches, making them loose customers and revenue.

Eighty percent of the respondents in Makoko and Ebute-Metta area did not strongly perceive marine littering as an environmental or health problem, they rather perceived it more as an economic problem, because it affects their fishing and dredging activities due to clogging. The respondents identified lack of awareness as the main contributory factor to the menace posed by marine littering on the community. In addition to lack of awareness, defective waste management system such as inadequate collection facilities, poor legislation, and



**Plate 3.** Recreation (left) commercial (middle), and religious (right) activities at Victoria Island bar beach.

enforcements are also contributory factors. According to the respondents, ineffective solid waste management in Makoko and Ebute-Metta makes the area filthy and unsightly; causing injuries to people, reducing revenue from fishing, and having adverse effects on the children. Secondary problems such as localised flooding are claimed to be caused by litters and waste that block the waterways and drains after heavy rainfall (see appendix).

#### Actors and level of governance

The information gathered from all residents of Victoria Island is that everybody litters. This is evident due to huge municipal waste generated on daily basis in this area. However, more of the littering is associated with children, low income earners (local inhabitant), and people on picnics who visit the beaches for recreation. The actors handling the waste generated in this area are the state government, local government, non-governmental organizations, private sectors and general public (beach users). From the respondents in Victoria Island, the key actor responsible for their waste management is LAWMA, an institution under the state government.

The information gathered from all residents of Makoko and Ebute-metta is that everybody litters because they do not have an effective waste management system in place, most of the littering is associated with artisanal-fishermen, coastal residents, and local dredgers and since the area is waterlogged with many depressions, they resorted to using their wastes as materials for landfills and landscaping. They believe it is the state government duty to make their vicinity clean by providing them an effective solid waste management system. The actors identified as key to solving the littering menace in this area are the state and local governments, non-governmental organizations, and private sectors (mainly manufacturers). According to the respondents in this area, LAWMA is the authority responsible for managing the solid waste, but they have not been effective with no

facility in place for waste collection (see appendix).

#### Strategy, instruments, and resources

According to respondents, LAWMA and other private contractors are the authority responsible for managing their solid waste. A mixture of strategies, instruments and resources were utilized to achieve the national goal of a clean and healthy environment involving proper solid waste management in Lagos. In Victoria Island, the financing mode used is the user charges, where residents pay for waste collection and disposal. The respondents felt that the waste management (collection and disposal) by LAWMA is fairly satisfactory. Rendering their quota to combat marine littering through waste management, residents participate in the Environment Sanitation Day that was inaugurated by the state government whereby last Saturday of each month is set aside for people to clean their homes and their surroundings. The monitoring of the exercise is usually undertaken by the State Environmental Sanitation Task Forces. Mobile Courts are put in place to issue appropriate sanctions to those who flout the environmental sanitation laws and regulations. Despite the fact that various actors consider litter and littering as major problems in most coastal area, it was discovered that there is no separate policy to address marine littering as a problem, but rather marine littering management is considered as an integral part of solid waste management. It was also gathered from the respondents that the resident's motivations to litter reduction is mainly to have a good and clean environment, and this has been achievable with activities such as paying someone to clean their vicinity, and providing small working tools for the hired labour. The basic caution for coastal littering within this community is "self regulation", a situation whereby fellow resident insist their neighbours clean their environs.

In Makoko and Ebute-metta, residents of these areas have not started paying for waste collection and disposal

**Table 2.** Summary of the interview report

Stakeholders	Problem perception and impacts	Actors and level of governance	Strategy and instrument
Bar-beach (Victoria Island)	(i) Environmental and economic problem (ii) Aesthetics impairment, Health issues, economic impacts	(i) Litter generation -children, low income earners (local inhabitant),picnickers (ii) Litter reduction – LAWMA	(i) Financing mode (users charge), Environmental sanitation day. (ii) No specific policy for litter
Makoko and Ebute- metta	(i) More economic than environmental and health problem (ii) Injuries to people, reduce revenue from fishing, adverse effect on children, flooding	(i) Litter generation – artisanal fishermen, coastal residents, local dredgers (ii) Litter reduction – LAWMA	(i) No financing mode (users charge), Environmental sanitation day (ii) No policy
Governmental organisation	(i) Environmental problem	(i) Litter generation – artisanal fishermen, coastal residents, picnickers (ii) Litter reduction – LAWMA	(i) Financing mode (users charge), Environmental sanitation day (ii) No specific policy for litter but for SWM

basically because there is no facility or program in place. The respondents were of the opinion that LAWMA has forgotten them, and left alone to tackle their waste problems. To combat the problems of solid waste dispersal, and prevent marine littering, residents of this area also participate in the Environment Sanitation Day, inaugurated by the state government. In spite of resident's perception towards marine littering, solid wastes are still being used to landfill, and cart pushers are paid to empty wastes collected from other areas into waterlogged and depressed zones within the community. They are not aware of any policy that addresses littering and still very myopic to dangers associated with it. Moreover, they have little knowledge on solid waste management policy. Respondent's motivation to tackle marine littering is to have a good and clean environment, increase yields on fishing, and prevent damage to ships and canoes. Also, monthly meetings of youths and elders within the community are often organised to discuss issues on development. There are no penalties for marine littering within this community, as residents are even encouraged to use their solid waste to landfill (see appendix).

In Table 2, a summary is provided on the actors and level of governance, the problem perception and impacts, and the various strategy and instrument in place.

### Collaboration among agencies

The governmental organizations perceived solid waste and marine littering as an environmental, health, social and economic issue. It was established that the main actor involved in waste management and marine litter prevention is LAWMA; and the latter also accepted this responsibility. Collaborations were identified among various stakeholders, and at various levels. Figure 2

illustrates the collaboration between various stakeholders on matters of SWM and marine litter.

The respondent for the Ministry of the Environment pointed out that there is collaboration between FMEvn and other stakeholders which resulted in the creation of the national committees for Agenda 21, Coastal erosion and integrated coastal zone management. The collaboration is largely mutual and was initiated by the Federal Government. The LAWMA respondent also indicated some level of collaboration between herself and the private sector such as the PSP (Private Sector Partnership) for waste collection, the press for constant public enlightenment, Manufacturer Association of Nigeria (MAN) to help minimize wastes from industrial sources and ensuring member's compliance to FMEvn guidelines and regulations, and NGOs to ensure effective campaign and dissemination of information. Conversely, the respondent for NIOMR pointed out that there is little or no collaboration between the institute and other stakeholders involved in marine littering. The little collaboration that exists is not with the main stakeholder that is responsible for marine littering cases in Lagos State, LAWMA. The respondent also pointed out that NIOMR only study the marine environment, and make findings available to the public. Except for the FMEvn and the Nigerian Navy that exchange information with NIOMR on marine studies, other stakeholders operate in isolation. The reason most times is as a result of contest for supremacy, particularly when there is difference in opinions, and a division is trying to encroach into other's responsibilities. Collaboration between governmental organizations is scarce, but few that exist do not involve subsidies (schemes) but are present so that each organization can achieve its mandate. Economic incentives such as stationeries, products of companies, field materials, and sometimes cash are sometimes available to some governmental organizations by private

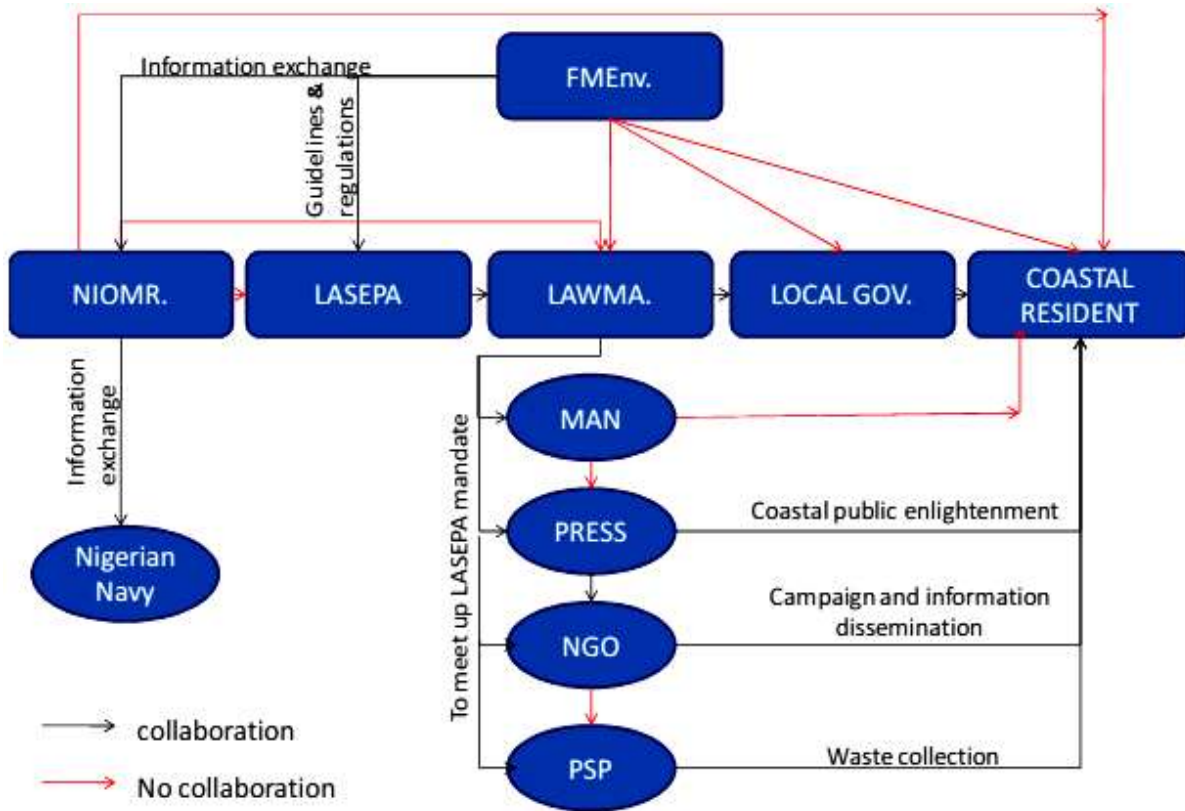


Figure 2: Collaboration between stakeholders on matters of SWM and marine litter.

sector to implement their corporate social responsibility.

The major source of marine litter in Makoko and Ebute-metta is the solid waste generated within these communities. Though the residents claimed that tidal waves do bring litters from other coastal communities or land based sources, but it was clear that greater percentage is from within the community based on the huge solid wastes that were found dispersed throughout the community. In line with the work of Folorunsho and Awosika (2001), during high tides at the study sites, there is an influx of coastal waters into the coastal communities which fill up all the depressions and landfill areas, creating a situation that could be termed as coastal flooding. The dispersed solid wastes in these communities are therefore left floating, and are transported into the middle of the lagoon during low tide, as the water movement is reversed. Fishing and dredging activities by the residents of these communities are also factors to be considered. The fishing traps of fishermen (Plate 4) trap both the fishes and the free flowing litters escaping from shores of the coastal communities and also from other sources, thereby concentrating the litters, and making the marine environment unsightly and unproductive.

Dredging activities re-suspend materials that could have natural decay in the bottom sediment; thereby turning them to nuisance, a case of marine littering.

Taking a critical look at the situation at these communities, one could easily conclude that they have been neglected, or that LAWMA, whose responsibility is to manage their waste had given up on them. Inaccessibility (bad road networks) is another problem facing these communities; and this has created a bottleneck in the activities of LAWMA in this area. The interview report revealed that collaboration among actors that are responsible for the proper management of the coastal areas in Lagos State is very weak. This is not in accordance with Bressers contextual theory on sustainable development (Bressers, 2004), Mazmanian and Kraft's epochs of environmental policy (Mazmanian and Kraft, 1999), and Bressers and Kuks's governance model (Bressers and Kuks, 2003).

Due to effective cleaning practice that is operational at the beach and the surrounding communities, the high level of cleanliness observed at the Victoria Island bar beach is expected. The activity of LAWMA that takes care of the collection and disposal of solid wastes in this area, the type of governmental establishment (FMEnv, NIOMR, Nigerian Navy) located in this area, and the calibre of people living in this area are also contributory in ensuring a high level of hygiene in this area. The Federal Ministry of Environment outstation and the Naval Base located at the Victoria Island bar beach area maintain



**Plate 4.** Makoko coastal community showing the fish traps of fishermen, and the litters hanging on them.

high profiles in keeping the environment clean. Many research works had been carried out as well by NIOMR on different aspects of marine debris, and some are still ongoing. This multi-actor approach of management at this location, albeit not collaborative (thus inconsonance with Bressers and Kuks governance model (2003) that emphasizes collaboration within actors) is instrumental to its relatively clean state. According to Isaac et al. (2005), tourist density also contributes to the small amount of solid wastes observed during weekends (Saturdays and Sundays) when the beach is put into full use (Plate 5).

## Conclusion

Within the scope of this study, effective solid waste management has been identified as a solution to the menace marine litter poses on coastal community. A clear-cut case of marine littering resulting from ineffective solid waste management was the case at Makoko and Ebute-metta. The solid wastes generated by these coastal communities escaped to the surface of the lagoon



**Plate 5.** State of the environment at Victoria Island bar beach after the weekend activities.

system during high and low tides systems. Factors responsible for marine littering observed at Makoko and Ebute-metta are:



- (1) lack of integrated coastal zone management (ICZM) or marine spatial planning (MSP);
- (2) ineffective solid waste management system;
- (3) poor road networks which prevent accessibility;
- (4) lack of awareness of the danger posed by marine littering;
- (5) the perceptions of the coastal dwellers towards marine littering.

Of the aforementioned listed causes, ineffective solid waste management is critical and requiring urgent attention.

Conversely, the dividend of relatively effective solid waste management system with multi-actor approach is seen clearly at Victoria Island bar beach. Except for weekends when the visitor's density is higher than during the week, the beach and the surrounding communities were found clean and tidy. The contributory factors are:

- (6) excellent awareness of the danger posed by marine littering;
- (7) environmentally sound solid waste management system;
- (8) the perception of the coastal dwellers towards marine littering;
- (9) relatively sound ICZM;
- (10) good road networks that allow accessibility;
- (11) a multi-actor (though not collaborative) approach of ensuring sound solid waste management within the coastal communities.

Overall, effective solid waste management is among the environmental subjects of major concern in maintaining the quality of the earth's environment and especially in achieving sustainable development. This however, must go beyond the mere safe disposal or recovery of wastes that are generated, and seek to address the root cause of the problem by attempting to change unsustainable patterns of production and consumption. This implies the application of the integrated life cycle management concept, which presents a unique opportunity to reconcile development with environmental protection. The following recommendations are key towards achieving effective and sustainable waste management system:

- (1) It is anticipated that if the government uses a participatory approach especially with the coastal dwellers, that is, the fishermen and residents, a substantial result can be achieved, which will be source-based. Also, the implementation of a review waste management policy at grassroots levels by involving NGOs, communities, business enterprises and traditional social institutions.
- (2) Collaborative multi-actor approach in tackling the problem of solid waste should be encouraged as this will prevent replication of duties and responsibilities among actors. LAWMA should collaborate more with Manufacturers Association of Nigeria (MAN) and also the General public to tack the problem of waste within the

coastal zone; this can be done by encouraging individual people and commercial sectors to get involved in litter/solid waste management business which include collection, sorting, and recycling.

(3) Perception/Awareness: Educational campaign on litter reduction strategy is highly recommended. This awareness campaign should be targeted at all actors/stakeholders by teaching them the mechanisms of controlling litter at the source, introducing alternative disposal mechanisms and also the negative effects of littering.

(4) Involvement of all actors such as representatives of MAN, FMEnv, LAWMA, research institutes, coastal residents, local governments, and PSPs in policy development and decision-making so as to encourage acceptance and ownership, thus improving policy effectiveness.

(5) Adequate monitoring, feedback to actors in waste management on the basis of monitoring data and trends, and evaluation of the effectiveness of the policy to support future planning should be embraced. Studies and surveys should be conducted to aid proper planning and optimise the use of scarce resources.

(6) Budget of sufficient financial resources to tackle waste and litter problems. This can be achieved by levying some manufacturing companies especially nylon and plastics companies, sponsorship from international/national companies, levy from individuals and companies that prohibit waste management laws. Also, the Federal Government should budget for solid waste management in the annual budget.

(7) Although LAWMA has started the involvement of public private partnership (PPP) with solid waste collection, more suchlike involvement should be encouraged in all aspect of waste management.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

## ACKNOWLEDGEMENTS

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## REFERENCES

- Ajao EA, Okoye BCO, Adekanmbi EO (1996). Environmental Pollution in the Nigerian Coastal Waters; A case study of the Lagos lagoon. Water Quality Monitoring and Environmental Status in Nigeria. FEPA Monograph 6:101-112.
- Bressers HT (2004). Implementing sustainable development: how to know what works, where, when and how. In: W. M. Lafferty (Ed.), Governance for Sustainable Development: The Challenge of

- Adapting Form to Function. Cheltenham: Edward Elgar Publishing pp. 284-318.
- Bressers HT, Kuks SMM (2003). What Does "Governance" Mean? From Conception to Elaboration. In: H Bressers and W Rosenbaum (Eds.), *Achieving Sustainable Development. The Challenge of Governance Across Social Scales*. London: Praeger pp. 65-89.
- Folorunsho R, Awosika L (2001). Flood Mitigation in Lagos, Nigeria through Wise Management of Solid Waste: a case of Ikoyi and Victoria Islands. Nigerian - Paper presented at the UNESCO-CSI workshop Maputo 19-23 November 2001.
- International Coastal Cleanup (ICC) (2009). *Ocean Conservancy - International Coastal Cleanup report, Arising Tide of Ocean Debris: What Can We Do About It*. ISBN: 978-0-615-27056-2.
- Isaac R, Ana CF, Monica W, Gilberto F (2005). Influence of socio-economic characteristics of beach users on litter generation. *Ocean & Coastal Management* 48:742-752.
- Mazmanian DA, Kraft M (1999). *Toward Sustainable Communities: Transition and Transformations in Environmental Policy*. (M&K) (eds.) Cambridge, The MIT Press.
- Nubi OA, Ajao EA, Nubi AT (2008). Pollution Assessment of the Impact of Coastal Activities on Lagos Lagoon. *Science World Journal* 3(2):83-88.
- Osibanjo O (2001). Overview of hazardous waste according to the BASEL Convention. Seminar Dissertation on "Awareness Raising on Hazardous Wastes Management". UNIDO/FAO/SBC/FMENV, Lagos, Nigeria.
- Solomon UU (2009). The state of solid waste management in Nigeria. *Waste Management* 29(10):2787-2788.
- Storrier KL, McGlashan DJ (2006). Development and Management of a coastal litter campaign: The voluntary coastal partnership approach. *Marine Policy* 30:189-196.
- United Nations Conference on Environment and Development (UNCED) (1992). *United Nations Conference on Environment & Development. Rio de Janeiro, Brazil, 3 to 14 June 1992, AGENDA 21*. <https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf> (accessed Sept 03, 2018).
- United Nations Environment Programme (UNEP) (2005). *Marine litter: an analytical overview*. <http://wedocs.unep.org/handle/20.500.11822/8348> (accessed Sept 03, 2018).
- United Nations Environment Programme (UNEP) (2009). *Marine Litter: A Global Challenge*. Nairobi: UNEP. 232 pp. <https://wedocs.unep.org/handle/20.500.11822/7787> (accessed Sept 03, 2018).

## APPENDIX

### Data collection strategies

The central question of this work is "What is the present situation in the coastal areas of study i.e. Ebute-metta, Makoko, and Victoria Island bar beach, concerning marine litters, solid waste management, and means of improvement?" Sub questions were:

#### 1. Actors and level of governance

- Who are the main stakeholders involved in solid waste management and marine litter?
- What resources do actors have to reduce litter?
- Is there any collaboration between the various actors?

Sources		Accessing
Individual people	Coastal dwellers	Face-to-face group interview
	Municipal authorities	Face-to-face individual interview
	Government informant	Face-to-face individual interview

#### 2. Problem perception

- What are the stakeholders' perceptions about solid waste management and coastal littering?
- How do coastal dwellers perceive litter as a problem and what are their motivations and activities to reduce litter?

Sources		Accessing
Individual people	Coastal dwellers	Face-to-face individual interview
Situation	SWM and marine littering situation	Observation

#### 3. Strategy and instrument

- What are the present strategies used in waste management within the coastal area and how effective are the functional element of the SWM system?
- Which authority is in-charge of managing the waste/litter in the coastal area and what is its main policy strategy?
- Which recommendations and strategy can be given to improve the current situation?

Sources		Accessing
Individual people	Coastal dwellers, Municipal authorities, government informant	face-to-face interview
Situation	SWM and marine littering situation	observation
Documents	files from ministries, municipality	content analysis
Media	web-sites, internet, newspapers	content analysis

#### 4. Impact

What are the main sources and impacts of marine litters in the coastal communities?

Sources		Accessing
Individual people	Coastal dwellers, Municipal authorities, government informant	Face-to-face interview
Situation	SWM and marine littering situation	Observation
Documents	Files from ministries, municipality	Content analysis
Media	Web-sites, internet, newspapers	Content analysis

## INTERVIEW QUESTIONS FOR GOVERNMENTAL ORGANISATION

*Information obtained shall be exclusively used for Academic and planning purposes only*

Please fill in the table below:

Sex                    Male        Female   

Location                    .....

### **Part A: Actors, level of governance and problem perception**

1.        What is your organisations role and experience on marine litter and solid waste?
2.        What is your perception about solid waste management and coastal littering?
3.        Who are the main stakeholders involved in SWM<sup>1</sup>?
4.        Who are the main stakeholders involved in marine litter generation and reduction? Is there any collaboration between the various actors?
5.        From your experience, how do you perceive marine litter? Do you consider it a problem?
6.        Is there any law governing the management of waste to reduce coastal littering?

### **Part B: Strategy, instruments, and resources**

7.        Which authority is in-charge of managing the waste/litter in the coastal area? And what is the main policy strategy?
8.        What are your motivations, activities and what resources (financial assets, skills, knowledge, and support) do you have available to handle the litter and Solid waste problem?
9.        What kind of SWM system is present in the coastal areas and how do you control waste generation?
10.      Is there a monitoring system that ensures that waste is properly collected and transported to designated disposal sites in order to discourage littering?
11.      What are the actions taking against persons who improperly dispose litters?

### **Part C: Impacts**

12.      What are the sources and types of marine litter?
13.      What are the main impacts of marine litters on the coastal communities?

### **Part D: Evaluation**

14.      What suggestions can you provide to improve waste management /coastal littering reduction?
  - More involvement of private business partners or local communities?
  - Conducting of educational activities and specific targeted campaigns?
  - Economic incentives for manufacturers and small monetary rewards for coastal dwellers?
  - Provision of more trash bins in public areas?
  - Increase penalties and fines?
15.      Which barriers do your organization/stakeholders experience with regard to a successful litter reduction and SWM?
16.      Is there any activity you do to reduce the amount of waste that is generated/ discarded?
17.      What can be done/recommendations to improve the situation of marine littering?
18.      What can be done/recommendations to improve the SWM in the coastal areas?

## INTERVIEW QUESTIONS FOR COASTAL RESIDENTS

*Information obtained shall be exclusively used for Academic and planning purposes only*

Please fill in the table below:

Sex                    Male        female   

Location                    .....

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<sup>1</sup>Solid Waste Management

**Part A: Actors, level of governance and problem perception**

1. Why do you have litter/ waste around your vicinity? What is your perception about solid waste management and coastal littering? Do you consider it a problem?
2. Who do you think are the main actors<sup>2</sup> causing marine litter?
3. Who in your opinion are the most affected by impacts of coastal littering? Fishermen, resident, others specify.....

**Part B: Strategy, instruments, and resources**

4. Who do you think/ which authority is responsible for managing your solid waste? And what is the main strategy? Taxes, penalties, collecting facilities, PSP, safe disposal, treatment, other.....
5. Is there any law governing the management of waste to reduce coastal littering?
6. Do you pay for the waste collection? If yes how effective is the waste collection and SWM within your vicinity?
7. What are the penalties for coastal littering/waste within your community (**What is your opinion about the effectiveness of the penalties**)
  - o Monetary fine
  - o Imprisonment
  - o Other *Specify*:
8. What are the main barriers you have experienced in dealing with coastal littering and with regard to a successful SWM?
9. Is there any community participation to reduce litter and waste around you? If yes what measures have you/your community taken in order to respond to littering/solid waste problem?
10. What are your motivations, activities and what resources do you have to reduce this marine litter? Resources-financial, skills, monthly sanitations, other.....

**Part C impacts**

11. What are the sources and types of marine litter?
12. What are the impacts that coastal littering has caused?
  - Ruins Aesthetics of the area
  - Injuries to people
  - Environmental threat to society
  - Lack of accessibility to facilities, beaches,
  - Threat to particular sea species
13. Do you believe that litter is causing any problems to you? If yes what happened
14. Wounds  Diseases  discomfort  economic

**Part D: Evaluation**

15. What do you consider the most pressing problem regarding MSWM<sup>3</sup> in the coastal areas and why?
  - Collection  transport  disposal  others  .....
16. What suggestions can you provide to improve waste management /coastal littering reduction?
  - More involvement of private business partners or local communities?
  - Conducting of educational activities and specific targeted campaigns?
  - Economic incentives for manufacturers and small monetary rewards for coastal dwellers?
  - Provision of more trash bins in public areas?
  - Increase penalties and fines?
  - Other

***Thank you for responding positively to this interview. Your assistance and cooperation are greatly appreciated!***

<sup>2</sup> Stakeholders: Different actors involved in litter generation.

<sup>3</sup> Municipal Solid Waste Management