# ENVIRONMENTAL IMPACT ASSESSMENT OF CEMENT BAGGING IN NIGERIA:

# A CASE STUDY OF DANGOTE INDUSTRIAL ACTIVITIES

BY

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**MINNA, NIGERIA**

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IN THE DEPARTMENT OF GEOGRAPHY
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## DEDICATION

This study is dedicated to my wife, Mary and my children, Utaji (Jnr) Jacob and Ene Rosemary Onyemowo for their invaluable contributions throughout the course of this study.

## ACKNOWLEDGEMENT

I wish to express my profound gratitude to my bosses, O.J. Omoloyin and Dr. N. G. Ekeh for their understanding and permission granted me to undertake this course of study. I also wish to express my gratitude to my supervisor, Dr. M. T. Usman for his invaluable contributions and guidance in ensuring timely completion of this study. My special thanks and appreciation also go to my friends, Engr Celestine C.W.G. Gomwalk and Mohammed Francis Abba for their words of encouragement and moral support that inspired me to pursue this course of study.

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## CERTIFICATION

This is to certify that this project report being submitted by **Mr. .J. A. Utaji** (PGD/GEO/2000/2001/143) to the Department of Geography, Federal University of Technology, Minna, Nigeria is considered adequate and worthy of presentation for the post-graduate project.

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**EXTERNAL EXAMINER**

**D ate**

**PROF. J. A. ABALAKA**
**DEAN, P.G. SCHOOL**

**Date**

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## ABSTRACT

The study on the Environment Impact Assessment (EIA) of Cement Bagging in Nigeria is focused on the industrial activities of Dangote Industries in Nigeria.

A site assessment visit was undertaken to both Lagos plant and Port Harcourt and had discussions with both the General Manager and the Project Manager from whom details about the design of the plant were obtained.

A literature search or review was conducted. The data about the concept of EIA as well as legislative and institutional framework were gathered.

The data collected from the reconnaissance survey were analysed and their impacts were evaluated using the Leopold and Peterson matrices.

Based on the results of the data analysis, conclusions are drawn on each of the component of the environment to ascertain the suitability, sustainability or otherwise of the cement bagging plant being built by Dangote Industries Limited.

The aims and objectives of the study as well as scope and limitations are explicitly stated.

bagging plant built in the warehouse is enclosed by a light sand crete block wall to prevent any dust escaping from the storage area into the packing area.

Other facilities installed include the conveyor belt, which is fully covered, and kept air tight with dust captures machines and mechanical screw ship unloader to transfer bulk cement from the ship to the ware house. This is designed to allow for cargo traffic and is packed at a safe place after unloading. This implies that the installation was done in such a way that its operations will not inhibit traffic movement. The conveyor takes delivery of the cement from the ship unloader and transports it to the elevator next to the packing line. The ship unloader sucks cement dust straight to the silos, from where it is transported via suction pipes to the rotor packers where the cement is bagged. If the silos are full, an automatic switch takes the cements to a recovery bay. Pay loaders carry the spill over cement from the recovery bay to the storage area.

The de-dusting points are being installed at the recovery bay to suck fugitive cement from the air and expel clean air to the atmosphere.

The bagged cement (50kg) is transported via conveyor belts to the loading bay which is designed such that trucks can conveniently drive in and out without necessarily disrupting the flow of traffic at the port.

Dust bags and Hoover vacuum cleaners are used to clean the waste cement from the ship side to the bagging plant. The wastes generated are usually contracted out for evacuation and general environmental cleaning.

In-order to protect the health of the workers, every worker on site is issued a nose mask to prevent excessive inhalation of dust, provided with tins of peak milk on weekly basis and red palm oil for use in their meals as oil is noted to be the best way of cleaning cement from the body system.

particles; Accidents and injuries from various project activities mainly on the site workers; Increased noise levels that shall impact mainly on the site workers; Destruction of large area of mangrove forest. The clogging of cement dusts on the linticels and photosynthesising organs of the vegetation which results in stunt growth and eventual destruction of the vegetation; destruction of fishing, fish breeding ground and other fisheries resources; Human exposure to cement dust causes respiratory effect and eye irritation; increased vehicular traffic within the port premises; Potential Urban Sprawl and increased turbidity arising from the wash off of the waste cement particles into the river/Lagoon by surface run-off.

Some of the detrimental or negative impacts of industrialization or urbanisation include: noise and air pollution from vehicles and plants, disruption of existing agricultural productivity and livelihood of the host communities disruption of human living patterns e.g removal of homes, displacement of people, soil erosion, sedimentation, disruption of wildlife and general ecology of the area, potential urban sprawl, blight and wasteful land use, loss of aesthetic value, and disruption of natural and historic land marks.

In attention or ignorance to such environmental consequencies can result in: creation of hazards to human life and property; Loss of opportunity to take advantage of the benefits and amenities of the environment; destruction of important resources; insufficient uses of land and ecological imbalance.

The main thrust of the EIA study is to appraise or evaluate the positive and/or negative impacts the cement bagging plant will have on its operational environment. It is therefore imperative to have environmental planning. There is now a fundamental interdependence

among (a) development processes (b) environmental factors and (c) human needs and natural resources.

## 1.5 JUSTIFICATION OF STUDY

The EIA study is being undertaken in order to appraise or evaluate the positive and/or negative impacts the cement bagging plant will have on its operational environment as well as the socio-economic and health implications of the work force and the stakeholders/host communities. The sources and characteristics of wastes products will be identified and the effects of such wastes on each component of the environment highlighted.

Some potential impacts (adverse effects) associated with cement production such as waste gases/flue gases that are capable of polluting the air, cement dust (fugitive dust); ionizing radiations, noise production in the cement bagging plant and the effect of run-off from the factory site into the River/or Lagoon; the effects of dust on vegetation and soil shall be evaluated and appraised in accordance with the provisions of the EIA Law.

Dangote Industries took bold initiative in establishing the Cement Bagging plants in Nigeria (i.e. Lagos and Port-Harcourt) which has high demand for the commodity because of the increasing pace of development to cushion the escalating price of the bagged cement which is being occasionally hightened due to high transport cost as a result of shortage of fuel supply in the country then.

The cost of purchasing cement in Nigeria became astronomically high, far and above the reach of common man. On this premise, Dangote thought it worth while and timely to intervene by embarking on importation of bulk cement by shipment to be bagged into 50kg size in Nigeria.

- To determine the physico-chemistry and biological characteristic of sediments in the project areas.
- To recommend appropriate mitigation measures for the identified potential impacts and
- To make appropriate recommendations for decision making in the planning and designing of the plant.

## 1.7 SCOPE AND LIMITATIONS

The scope of study involves:

An on-site assessment of the bagging plant to be carried out.

Determination and evaluation of the basic parameters and their associated potential impacts i.e. ambient air quality characteristics and noise level in project area as well as traffic.

Critical appraisal and evaluation of the identified significant potential impacts.

Determination of the worse scenario case of the cement bagging process. Critical assessment of the views and opinion of the host communities and stake-holders concerning the installation and operation of the cement bagging plant.

Analysis of data generated to determine their influence on the socio-economic well-being of the itinerant population as well as the settled communities.

The study is but limited tot he Environmental Impact Assessment of the Cement bagging plants built by Dangote Industries Limited at Port-Harcourt Wharf and Apapa Wharf, Lagos.

The hydrocarbon degrading bacteria count, though present, is low in the surface water bodies. The total fungal count in the surface water bodies is very high and above WHO standards. These factors present a serious health risk for consumers of fish from these sources.

Phytoplankton composition of the surface water bodies is high with abundance of species, high density and diversity. The net phytoplankton flora is dominated by members of the baccillariophyceae family as characteristics of most Nigerian surface water bodies.

The dominant crustacean zooplankton are cyclopoid copepods.

The most widely spread benthic macro-invertebrate fauna are the polychaetes, oligochaetes, crustaceans and anthropods.

The project area under study comprises the mangrove swamps as the main vegetation types in the area. The dominant and prevalent species are rhizophora racemosa, Nypa fruitican and laguncularia racemosa.

Fishing is the main occupational activity of the people within the project area. Most part of the site is flooded during the rainy season. Fishing activities are noticed to be in practice, most especially at nights. Common fishing gears used in the area include Cast nets, Gill net and Hoop net.

On the socio-economic aspect, the main occupation of the people within the study area is petty trading. The population of the area under study is largely itinerant. The heterogeneity of the area precludes a uniform culture or leadership structure.

### 1.8.2 DESCRIPTION OF THE ENVIRONMENTAL BASELINE CONDITION OF LAGOS ENVIRONMENT

The Lagos plant is located with in the northwest of the Apapa Port complex, which is at the extreme south of Lagos and at the entrance of the Lagos Lagoon and Badagry Creeks to the Atlantic Ocean. Administratively the study area falls within Apapa L. G. A. of Lagos State. This area falls within the Barrier-Lagoon Complex. The beach sediments around the project area varies from fine-grained sand to medium to coarse-grained sand and from moderately sorted to well sorted in the upland areas. The shore, which is more of an accretion coast, is dominated by extensive stretches of sandy beaches.

The Lagos factory is within the hot humid equatorial climate. The temperature, humidity and rainfall are generally high. The mean annual temperature is about 27.5°C while annual rainfall varies from 1,524 mm to 2,032mm. The mean relative humidity is about 80%. This area is affected mainly by the rain bearing South-Westerly wind that originates from the Atlantic Ocean and blow onshore with velocities 2.5ms$^{-1}$ During the wet season (June-September) wind speed exceeding 10ms$^{-1}$ in the form of thunderstorms and line squalls are more persistent while during the dry season (November- April) offshore north – easterly winds reach the area with less intensity. During January and February, dust haze, which usually concentrates in the northern area of Nigeria, May reach the coast in spells which may last between one to two weeks. During this period, low visibility and cold conditions are experienced at sea. Wind is therefore an important climatic element in any study relating to atmospheric emissions of pollutants and contaminants.

**Table 1.1 Mean Annual wind values for Lagos Area (1978-1987)**

| Year | Values ($ms^{-1}$) |
|---|---|
| 1978 | 3.7 |
| 1979 | 2.5 |
| 1980 | 5.6 |
| 1981 | 5.1 |
| 1982 | 3.1 |
| 1983 | 4.6 |
| 1984 | 4.3 |
| 1985 | 4.1 |
| 1986 | 5.1 |
| 1987 | 4.8 |

The highest amount of monthly rainfall between 381mm to 508mm occurs around the months of June and July.

Table 3.4 and Figure 3.4 show the rainfall profile for Lagos area between 1979 and 1989

**Table 1.2 Annual Rainfalls for Lagos Area between 1979 and 1989.**

| Year | Rainfall(mm) |
|---|---|
| 1979 | 1,857 |
| 1980 | 1,65 |
| 1981 | 1,365 |
| 1982 | 737 |
| 1983 | 1,191 |
| 1984 | 1,193 |
| 1985 | 995 |
| 1986 | 1,148 |
| 1987 | 1,707 |
| 1988 | 2,027 |
| 1989 | 1,413 |

Source: Nigeria Meteorological Service, Oshodi Lagos.

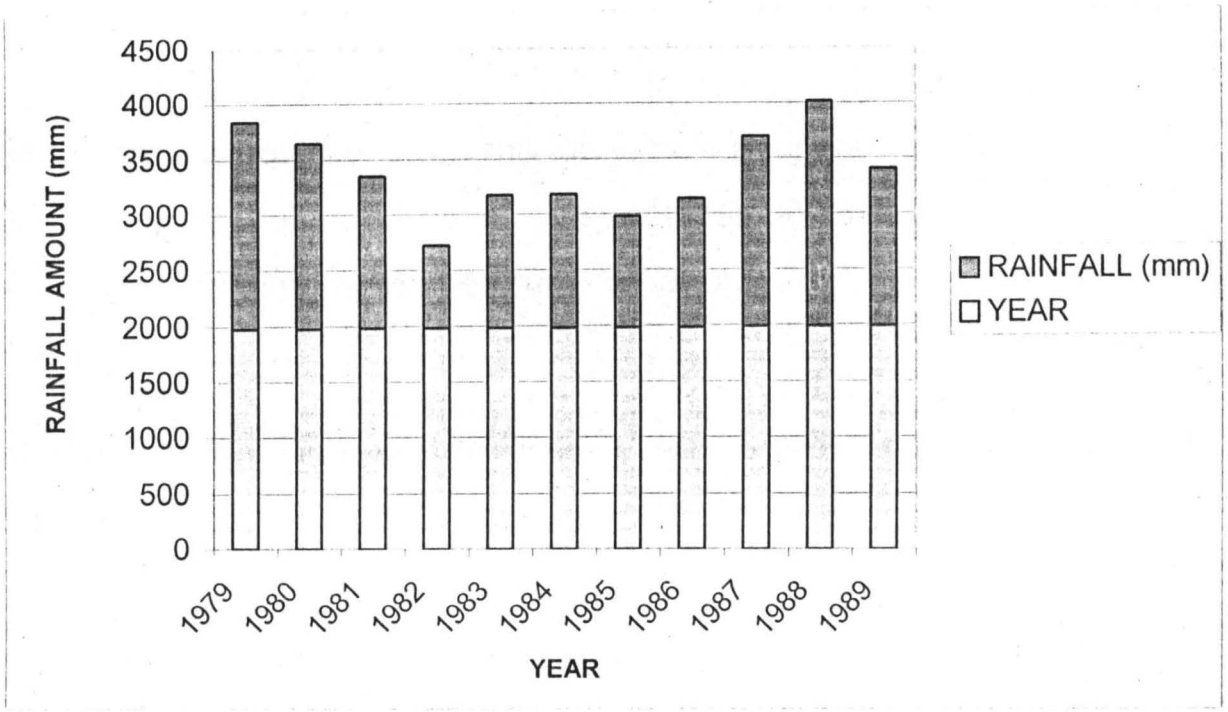


**Fig. 1.1 Showing Annual Rainfall for Lagos Area between 1979 and 1989**

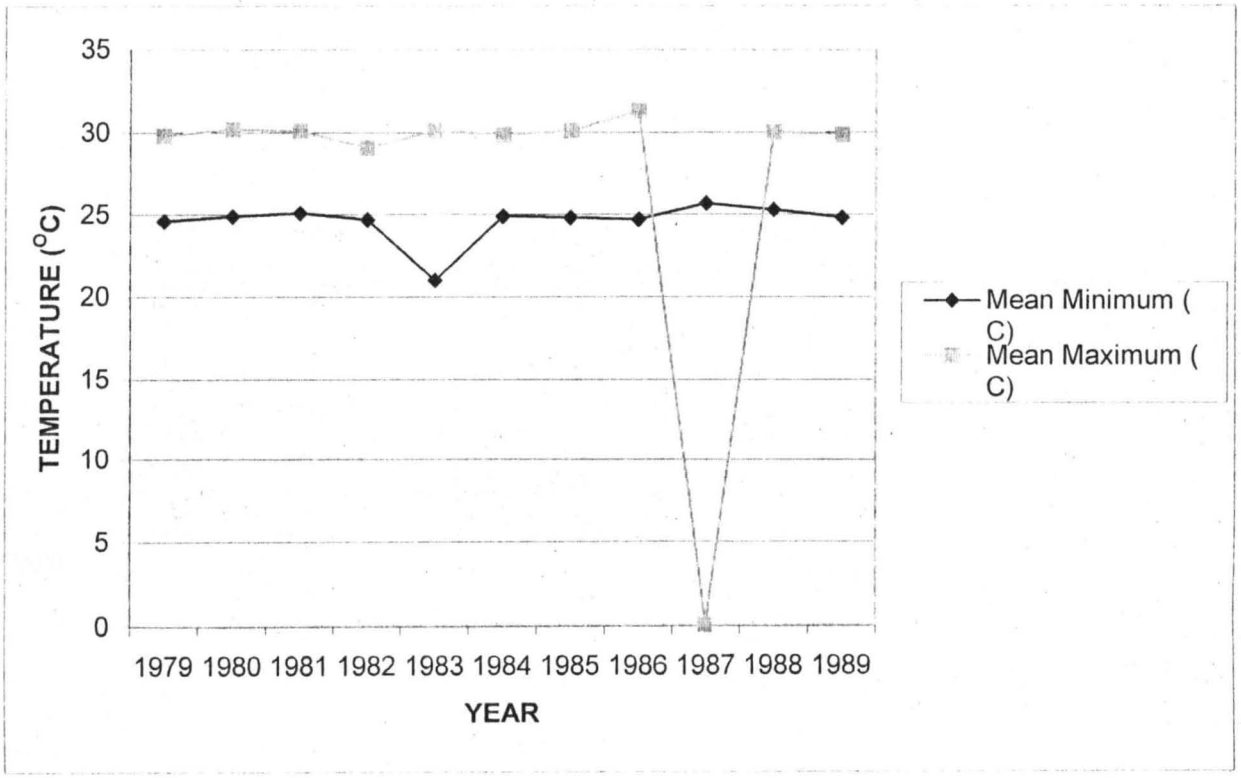


Fig. 1.2 Showing Mean Temperature Profile for Lagos Area between 1979 and 1989

into the atmosphere. With the awareness of environmental impacts of the cement, the doors are now being fitted with PV C fillers; the escape of cement dust will be minimal. There used to be loss of cement from the conveyor belt during transportation of cement from the ship. With the expansion programme, the company is able to install dust capture devices that make the conveyor completely air tight. The same devices/machine is the type that is planned to be installed in the Port-Harcourt plant to make the plant environmentally benig. The ship unloader initially designed is fixed at a point, which cause some obstructions to other port users. Now there is a new design with wheels which can be packed after the day's operation at a more convenient and safe place to avoid obstructions /traffic to other port users. These are results of the EIA process that ensure prior considerations for options and alternatives in the design and planning of a proposed action. This, in essence is an art of environmental management plan, which is being achieved after the initial experiment with the installation of the cement bagging plant at Lagos, Apapa Wharf. With the implementation of the EIA process it is anticipated that development activities of this nature will be sustainable environmentally. There will be less pollution of air and contamination of water bodies as the amount of cement dust escaping unto the atmosphere is anticipated to be less when all the necessary machineries are integrated into the planning and design stage of development activities.

## 1.9 THE STRUCTURE OF THE REPORT

The study has been presented in the following chapters:

- Chapter one presents the Introduction, Background Information about the Dangote Industries Limited, Synopsis about the Cement Bagging Plant built by Dangote Industries Limited, Statement of the problems,

# CHAPTER TWO

## 2.0 LITERATURE REVIEW

## 2.1 CONCEPT OF EIA IN NIGERIA

EIA is conceptually rooted in the theory of environmentalism, whose origin according to Coates (1923); Mikesse (1974); Herbert and Johnston (1978), dates back to the 19th century. Environmentalism has two ideological themes, both of which have led to the emergence of EIA either directly or indirectly. These two ideological of themes are eco-centricism and technocentricism (O'Riordan, 1981).

The eco-centricism ideology attempts to accommodate man as part of nature, although in its original formulation, eco-centricism precluded man from interfering with nature based on the presumption that man acted only to disrupt or destroy the natural ecosystem or natural order (Faniran, 1988).

The technocentricism ideology on the other hand, according to O'Riordan and Turner (1983), is essentially anthropocentric in origin and practice. This philosophy is hinged on the presumed ability of human beings to explore, study, understand and control the physical, biological and social processes of the bio-physical environment for the present and future benefits of man. Technocentricism has good following among economists and engineers.

However, events in the last decades have led to a partial marriage of the main tenets of the technocentric and eco-centric ideologies. Consequently, environmental management and resource conservation practices have been accepted by environmental designers, planners, engineers, geographers, economists and policy makers. It is this acceptance that has largely led to the emergence of EIA which is the progency of the tenets of environmental management.

EIA is also conceived to achieve a parsimony between man's need to exploit the natural environment for his own ends and the need to protect and sustain the intrinsic qualities of that environment. Since an important objective of EIA is to identify ways in which the negative effects of a proposal could be measured and prevented or ameliorated either by altering aspects of the development or introducing protective measures in the environment, alternative plans and their evaluation become the normative goal. Consequently, the goal of EIA is the reduction of environmental and social costs associated with a proposed action.

The core concept imbedded in the EIA process is central to comprehensive models of planning processes, since such models have given explicit recognition to the importance of considering contextual ends and unwanted impacts. One effective and holistic application of these models implies that environmental protection is to be sought at least as an end not to be sacrificed, and evaluation of environmental consequences. In the final analysis therefore, EIA studies involves an analysis of existing situation, goal setting, the generation and evaluation of impact s and alternatives, as well as decision making, (Hudson, 1979, McHarg, 1971; Hill, 1968).

Equally, the concept of EIA as a philosophy attempts to capture the totality of values relevant to decision making as affected by a development project, and stipulates appropriate measures for avoiding or minimizing the negative effects on biotic and abiotic systems. EIA also embodies the aim of maintaining and enhancing the productivity of natural resources through economic development while venting the imposition of unwanted costs on other development activities.

The concept and practice of environmental impact assessment commonly referred to by the acronym "EIA" was formally introduced to

- National Effluent Limitation, Regulations S.I.8 of 1991.
- National abatement in Industries and Facilities Generating Wastes Regulations S.I.9 (1991).
- Hazardous and Solid Wastes Management Regulations S.I. 15 of 1991.
- Federal Environmental Protection Agency (Amendment) Decree 59 of 1992.
- Guidelines for Environmental Impact Assessment.

The EIA Decree 86 of 1992 (now Act 86 of 1992) was promulgated in December, 1992. The Decree sets out the procedures and methods prior consideration of Environmental Impact Assessment on certain public and private development projects. It also gives specific powers to the Federal Ministry of Environment (FMENV) to facilitate Environmental Impact Assessment of development projects in Nigeria.

The Nigerian constitution allows states to make Legislations, Laws and edicts on the environment. The EIA Decree (now Act) No. 86 of 1992 also recommends the setting up of state environmental agencies, to participate in regulating the consequences of project development on the environment.

One important observation that can be made is that many of the Nigerian actions and activities in the area of environmental protection and management have been patterned after the USA. In other word, Nigeria seems to have taken a position on they issue by adopting the sectoral (EIA) Framework.

## 2.3 PRINCIPLES AND APPLICATION OF EIA OF MAJOR DEVELOPMENT PROJECTS IN NIGERIA

EIA is concerned basically with identifying and assessing the environmental consequences of development projects, plans, programmes and policies in an attempt to ensure that the best alternative for development is selected. While it is clear that decisions will and should be made based upon different value judgements concerning the net cost benefit assessment about environmental, economic and social impacts, it is now widely accepted that development can be planned to make best use of environmental resources and to avoid degradation.

The process of EIA forms part of the planning of such environmentally sound development. Development cannot proceed without the use of more resources, but development must be sustainable over the long term, and hence has to be in harmony with environmental requirements. Nigeria has made significant progress in the last few years in setting up new national goals in support of sustainable development, by putting in place new environmental policies and laws and in strengthening the institutional arrangements for environmental protection and resources management. Nigeria is thus one of the first African Governments to launch a 'National Policy on the Environment' (FEPA, 1991).

Nigeria has made significant progress in the last few years by applying the EIA process in most of her major development projects among which include:

- Abuja-Kaduna dualization Road Project.
- The Lower Niger River Capital Dredging Project

- Oil exploration and production, drilling and development activities n the Niger Delta region embarked upon by Shell Petroleum Development Company Limited (SPDC), The Nigerian Agip Oil Company Limited (NAOC), Mobil Oil Producing Company Unlimited, Chevron Nigeria Limited (CNL), Elf Total Fina Limited,
- The Cement Bagging Plant at Port-Harcourt by Dangote Industries Limited.
- Otuegila – Nembe Road Construction Project in Bayelsa State by Shell Petroleum Development Company of Nig. Ltd.
- Atlas Cove Single Point Mooring Facility and Pipeline Route, Lagos by NNPC to mention but just a few.

# CHAPTER THREE

## 3.0 EIA METHODOLGY

The methodologies or methods in the EIA context, according to Canter, (1986), are simply mechanisms whereby information is collected, evaluated and displayed for the purpose of decision-making.

Techniques provide some of the data, which are organized according to the logic of a particular method.

The methodology adopted for this study involves:

- An elaborate literature review to establish an extensive environmental data base for the EIA. The review was aimed at obtaining data for the two prevaling seasons in the area.
- A site visit was embarked upon to the project sites (both Lagos, Apapa wharf and Port Harcourt Wharf to ascertain some of the basic parameters within the project environment. Useful information concerning the nature of the project, the baseline conditions of the project environment as well as identification of the potential impacts on the host communities are gathered.
- According to information gathered from the Project Manager, Dangote Industries Limited, the stakeholders were consulted and their views and opinion concerning the installation and operation of the cement bagging plant and its associated and potential impacts are integrated into environmental management plan of the project.
- The ground truthing of all information generated was correlated with the literature search or review. The field work is in accordance with the FMENV/DPR and World Bank Guidelines and standards for industrial activities in Nigeria.

## 3.1 IMPACT ASSESSMENT METHODOLOGIES

The Leopold and Peterson matrices are adopted to identify, evaluate and quantify the potential impacts. In predicting impacts, the empirical 'worst case scenario "approach was applied to determine the extreme effects of potential project activities on environmental components, while consensus of opinions' was employed to determine the importance of affected environmental components. The impact evaluation results form the basis of developing the Environmental

evaluate the potential impacts of the project activities on the biophysical and socio-economic environments and health status of communities in the study areas.

The assessment has examined the project activities in details, and presents the results of the environmental baseline data, potential impact evaluation, preventive and control measures.

The air quality is influenced by the release of suspended particles within the study areas. These suspended particles are in the form of dust from construction plant machinery and cement dust. The effects of suspended particles are easily discernible from painted surfaces being soiled, metal corrosion, reduced visibility, intensive respiratory and cardiovascular diseases and increased premature mortality.

The construction machinery, vehicles and boat all constitute the main sources of noise within the study area. A peak of 78 d (B) A was obtained when a truck passed by or blared its horn. On noise pollution, noise exposure limits for Nigeria have been given by FEPA (1991), and as follows:

Noise standards including acoustic generators.

Guidelines for the control of neighborhood noise, especially with respect to construction sites, markets and meeting places.

Permissible noise levels in noise – prone industries and construction sites, and to ensure the installation of noise dampers on noisy equipment. The document sets regulations on the noise exposure limits for Nigeria as presented in table 3.2.

**Table 4.1 Noise Exposure Limits for Nigeria (FEPA, 1991)**

| Duration/Day, hour | Permissible Exposure Limit dB(A) |
|---|---|
| 8 | 90 |
| 6 | 92 |
| 4 | 95 |
| 3 | 97 |
| 2 | 100 |
| 1.5 | 102 |
| 1 | 105 |
| 0.5 | 110 |
| 0.25 or less | 115 |

Source: FEPA (1991) Guidelines and Regulations for Noise Exposure limit.

Note: The ambient noise levels for a workplace should not exceed 85dB(A).

**Table 4.2 Nigeria Ambient Air Quality Standards (FEPA, 1991)**

| Pollutants | Time of Average | Limit |
|---|---|---|
| Particulates | Daily average of hourly values 1 hour | 250ug/$m^3$ |
| Sulphur Oxides ($SO_2$) | Daily average of hourly values 1 hour | 26 – 260ug/$m^3$ |
| Non-methane Hydrocarbon | Daily average of 3 hourly values | 160ug/$m^3$ |
| Carbo n Monoxide | Daily average of hourly values 8 hourly average | 160ug/$m^3$ |
| Nitrogen Oxides ($NO_2$) | Daily average of hourly values ranged | 0.04ppm – 0.06ppm (75.0ug/$m^3$– 113ug/$m^3$ |
| Petrochemical Oxidant | Hourly values | 0/ 06 ppm. |

The finding of this study also compares the two areas, Lagos and Port-Harcourt environments and attempt to appraise the importance of EIA application to development projects in Nigeria.

Field studies to describe the existing environment of the study area are carried out as well as the assessment of the probable/associated potential environmental impacts of the cement bagging plant.

The sources and characteristics of potential impacts are identified and the effects on each component of the environment evaluated.

During the bagging process, cement dusts will be raised. The dust so produced is a mixture of limestone, calcium oxide, cement minerals and in some cases burnt cement. Apart from some quantity of calcium oxide (CaO), these dusts are harmless, though they constitute a considerable nuisance. The proper use of high performance de-dusting installations like electrostatic separators, fabric and gravel bed filters and, cyclones will enhance recovery of cement dust for re-cycling. It is hoped that cement dust concentrations of less than $25mg/m^3$ will be obtained in a cement bagging plant with the above facilities.

The plant is essentially for bagging finished cement product imported. Hence, it is envisaged that there will be no production of gases like carbon dioxide, sulphur dioxide, nitrogen dioxide and lime ($Ca_2CO_3$) which are gases usually associated with cement production. The releases of air quality parameters such as oxygen, sulphur dioxide, nitrogen dioxide, methane, carbon monoxide and hydrogen sulphide are generally low.

The study also determines the present background emission level of ionizing radiation. This will however, form the basis for radiation monitoring. It is imperative to note that the cement raw materials especially limestone and potassium do contain radiation sources. Also, mineral rocks or soils of natural environment produce some amount of

## 4.4 MITIGATION MEASURES

The following measures can be recommended for inclusion into the project planning and designs:

i) Modern equipment and techniques, such as de-dusters, airtight ship unloader and bagging mechanism shall be provided at the design stage.

ii) The bagging plant should have a containerized design to prevent cement dust from escaping to the atmosphere. In addition, there should be lining of the factory roof with filler blocks to keep it air tight. Also electrostatic de-duster should be installed to filter out any dust that manages to escape confinement.

iii) Wearing of personal gadgets such as safety goggles, safety shoes, nose/gas masks, coveralls, should be made compulsory for any one having access to the factory areas.

iv) Practical engineering control design such as attenuation using high density enclosures should be adopted for the reduction of noise levels.

v) Warning signs should be used to identify work areas where noise limit may be exceeded.

vi) Separation of operation and plants by attenuating partitions should be ensured.

vii) The suspended particulate matter should be sprayed to enhance air quality of the project environments.

viii) Ensuring regular maintenance of equipment so as to minimize smoke discharge.

ix) Promotion of health awareness through talks, meetings and posters.

x) Provision of sanitary toilets before project commences.

xi) No waste arising from operations shall be discharged into the rivers and lagoons.

xii) Ensuring proper rehabilitation of site during abandonment stage.

It is envisaged that Dangote Industries will adopt an efficient EMP to handle emergencies and loss in containment of the cement at all stages of the operation.

# CHAPTER FIVE

## 5.0 SUMMARY, CONCLUSION AND RECOMMENDATION

## 5.1 CONCLUSION

Finally, it is worth mentioning that planners are becoming increasingly aware that systematic analyses or assessment of the total environment and its processes need to be part of the overall planning process and that effort to maintain or improve environmental quality ought to be given sufficient weight in making development decisions. This is the basis of the concept of sustainable development. Actions designed to increase the productivity of the society and to meet essential needs must be reconciled with environmental factors which hitherto have earlier been neglected or not given sufficient attention.

The level of environmental use should therefore be such as to sustain or preserve the (environmental) capital. That is, economic, fiscal, trade, energy, agricultural, industrial and other development policies should be designed to bring about development that is economically, socially and ecologically sustainable through:

- Judicious use of natural resources such that the carrying and productive capacities are not over exploited.
- A better understanding of the diversity of ecosystem, and
- A monitoring of environmental impacts of development activities.

The achievement of sustainable impacts of development pre-suppose that the appropriate tool for environmental management has been adopted. Environmental Impact Assessment (EIA) is that tool embarked by Dangote Industries and indeed Nigeria for the integration of environmental concerns into project planning and implementation in her development programmes.

## 5.2 RECOMMENDATION

- Periodic monitoring of work place air quality should be conducted for air contaminants relevant to employee tasks and the plants operations.
- Ventilation, air contaminant control equipment, monitoring equipment should well maintained.
- Protective respiratory equipment must be used by employees when the levels for welding fumes, solvents and others materials present in the work place exceed local or internationally accepted standards or the following threshold limit values (TLVs):

| | |
|---|---|
| Arsenic | 0.5 ug/$m^3$ |
| Carbon monoxide | 29ug/$m^3$ |
| Copper | 1 ug/$m^3$ |
| Free silica | 5.0 mg/$m^3$ |
| Hydrogen cyanide | 11mg/$m^3$ |
| Hydrogen sulphide | 14mg/$m^3$ |
| Lead, dust and fumes as Pb | 0.15mg/$m^3$ |
| Nitrogen dioxide | 6mg/$m^3$ |
| Particulate (inert or Nuisance or Dusts) | 70mg/$m^3$ |
| Sulphur dioxide | 5mg/$m^3$ |

- Adequate health, safety and environmental policy should be established to maintain the highest standards of occupational health, safety and environmental protection at work, so as to prevent personal injury or illness, property, damage, fires security losses and environmental pollution.

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