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Accounting for the Environmental Impacts of Cement Production on Host Communities: A Case Study of Ewekoro, Nigeria

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Abstract- The contribution of manufacturing sector of the Nigerian economy cannot be ignored and cement production occupies a notable position in this sector. The cement industry of the manufacturing sector contributes to the growth of the economy through its sales and distribution chain, job creation, monetary circulation and lots more. However, the production process has both economic and environmental impacts on host communities as raw materials are continuously drawn-up to keep production functioning and toxic waste material are released back into the natural environment. This paper examines the environmental and economic impact of cement production of Lafarge WAPCO on local inhabitants of Ewekoro Local Government Area, Nigeria using descriptive survey design and data collected with the aid of a close ended questionnaire and scheduled interview with households. The questionnaire was administered on a total of 150 respondents. Data was analysed using the Chi Square statistic at 5% significance level.. Findings indicate that cement production is a major factor influencing the environment and economics of people of Ewekoro Local Government Area in Nigeria with impacts on farms (75%), marine life (52%), roofs on houses (91%), water(77%) and air quality(68%). The association between cement production and environmental impacts is quite strong as shown through Chi Square results as $p<0,05$ for each variable. It is recommended that hygienic treatment of all waste before release into the environment is imperative. The federal, state and local governments as well as her agencies saddled with environmental management and maintenance especially NESREA should ensure total compliance to policies regulating the disposal of waste by manufacturing companies while sanctions should be meted on violators. Suitable tax regimes should be imposed on such production to cater for remediation and interventions.

Keywords: environmental impacts, cement production, pollution, toxic waste, economic effect.

I. Introduction

a) Background to the Study

There is increasing interest in environmental protection at all levels and across climes such that environmental regulations and methodologies for enforcement, in most countries, are becoming rapidly outdated. This poses a challenge to accounting which has grappled for methods of measuring and disclosing environmental activities of man through its traditional role of recording and reporting financial information as well as managing environmental performance. So, accounting can perform an important role in relation to environmental issues. The inclusion of environmental dimension in the traditional accounting system at all levels (company, sector, government and nation-wide) will result in adjustment to economic indicators. This will enable different users of financial statements, at all levels, to take sound decisions that support sustainable development. Sustainable development demands responsible behaviour in relation to natural resources and the environment in general (Owolabi, 2007; Olatunji, 2012).

The establishment of the cement production plant at Ewekoro has both beneficial and adverse effects for the environment and its inhabitants. The environmental impacts can be described as adverse while the economic impacts are beneficial. These impacts could include pressure on local housing, market and increase in community conflict and crime, degradation of ecosystems and elimination of traditional means of livelihood. However, the creation of supporting social infrastructure such as schools, hospitals and so on may transform a previously remote area and investment in transport facilities may improve accessibility to other centers of economic activities, further enhancing its prospect for development. Cement is the most common and widely used building material in the world and its by-product concentrate is the second most consumed substance universally after water. Unlike in areas where close substitutes like brick are used in the construction industry, cement constitutes over 95 percent inputs of basic infrastructural developments in Nigeria.

The air pollution encountered in cement production has however been a source of major concern in the sustainability of rural livelihoods especially with regard to food crop production. Studies in Tanzania revealed that symptoms of heavy metal poisoning such as sensory disturbance, hyporeflexia, tremor, gingivitis, metallic taste, neuroasthenia and night blindness are common (Harada, Nakachi, Cheu, Hamada, Ono, Tsuda, Yanagida, Kizuki and Ohno,

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1999). In the last five years, studies on environmental impact of limestone mining and processing in Sagamu (Sagamu, Ogun State, Nigeria) have revealed a declining kola nut output from the plantations within a few kilometers radius of the cement factory (Adekoya, 2003; Aigbedion, 2005). It is therefore, with the background of the economic and environmental issues faced by residents of Ewekoro that this study sets out to account for environmental and economic consequences of cement production pollution in the society, specifically to inhabitants of Ewekoro Local Government Area of Ogun state.

b) Statement of the Problem

Manufacturing companies, whether private or government owned, engage in production activities for the purpose of making profit. This however, possesses a great deal of threat to the environment and human economic survival. Governments in recent times from the national to the local level have evolved ways of combating the effects of industrial pollution. This has the governments to set up bodies and programmes to reduce the effects of industrial pollution on the society. The quest for industrial growth has led to increased number of industries and hence increases of industrial pollution. Makoju (2010) wrote that Nigeria with its population of over 150 million people presents a huge - market for any good product, cement inclusive. Nigeria is abundantly endowed with the basic input into cement manufacturing with the exception of gypsum which only occurs in thin-vein layer (Mojekwu, Idowu and Sode, 2013). Lafarge WAPCO Cement Plc, whose establishment in Ewekoro Local Government Area has created lots of problems to the inhabitants since 1957 when lots of cement dust had been emitted into the environment there by affecting the host communities. The attention of this research here is to account for the impact of these pollutants on the environment and economy of host communities in Ewekoro Local Government Area of Ogun State.

c) Research Questions

The following research questions guided the study:

i. To what extent does cement production affect farm produce in Ewekoro Local Government Area?
ii. What is the nature of impact that cement production has on water sources and quality in the study area?
iii. What are the economic implications of cement production on the livelihoods of local community in Ewekoro Local Government Area of Ogun State?

d) Objectives of the Study

The main objective of this study is to account for the impact of cement production activities on the environment and economy of inhabitants of Ewekoro Local Government Area. The specific objectives are:

i. To examine the effect of cement dust pollution on farm produce in Ewekoro Local Government of Ogun State;
ii. To assess the impacts of cement dust pollution on water sources and water quality; and,
iii. To investigate the economic implications of cement production on the livelihoods of Ewekoro Local Government Area of Ogun State.

II. Review of Related Literature

Jacob (2014), defines industrial pollution as the contamination of a substance from its pure state. GESAMP (1972), describes pollution as the introduction of substances liable to cause hazard to human health, to living resources and ecological system, damage to structures, or amenity; or interference with legitimate use of environment. Hence from the afore stated, industrial pollution can be said to be that in which substances like carbon monoxide, light, heat, noise and steam, gaseous and other solid substances agents are released from the activity of the industry or industries that contaminate or pollutes an environment. Since the beginning of the industrial revolution, pollution of the biosphere with toxic metals has accelerated dramatically. Increasing industrialization and population develops the standard of living, which results in highly contaminated atmosphere due to the release of waste from these industries (Tiwari, Tiwari and Pande, 2008).

Industrialization plays an important role in polluting the environment and causes severe degradation in pedosphere, hydrosphere and atmosphere. Water used in industries create waste that has potential hazard for our environment because of the introduction of various contaminants such as heavy metals into soil and water resources (Azumi and Bichi, 2010). The release of pollutants differ from industry to industry. The waste from the pulp industry mainly contain carbohydrates, textile industry contain dyes , plating industry contain nickel and leather tanning wastes contain mainly chromium, zinc, copper, sulphides, carbonates, sodium and many other toxic organic compounds and inorganic compounds (Nouri, Khorasani, Lorestani, Karami, Hassani and Yousefi, 2009).

The residents of Ewekoro Local Government Area are local traders and basically farmers, their farming and petty trading as well as other economic activities suffer the great fate from the Lafarge WAPCO cement plant production activities. Umoh and Mosimabale (2002) are of the view that the earth is an ecosystem of natural habitats which provides basic resources for the growth of man. However, it has been confronted with the threats of contamination more from man than from natural disasters the world over. Umoh's view confirms why and how factories and other

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destructive technological inventions pollute the air, contaminates food and the environment (Jacob, 2014).

One major result of industrial pollution is the migration of people from the areas where these industries are located to distant lands. This has led to overcrowding and unhygienic conditions as it is seen in major cities in Nigeria (Ajene, 2007). Additionally, the issue of industrial pollution has affected the social life of the people in diverse ways, one of such is the contamination of water as a result of industrial waste, streams and rivers are contaminated which affects the swimming activities of the communities thereby impending on their social life (Effiong, 1980). The consequences of industrial pollution affects man's social activities in divers ways which thwarts man's development and social achievements, this is because of industrialization really contributed adversely to the present problems of environmental pollution which exercise deleterious effects on our physical development, health and survival.

The steady progress in the field of science and technology has contributed adversely to the present problems of environmental pollution which has serious effects on the social and economic activities of the people. The influx of automobiles and indiscriminate location of industries are constantly contaminating the air, water and land faster with their smokes, fumes, noise and other wastes than nature and our effort to clean and probably handle them. Pollution has even become a great problem in most Nigeria towns and cities because our modern way of life produces vast quantities of waste matter. When the accumulation of such waste cannot be dissipated, pollution is definitely the result. These waste cause pollution because they affect the health of individuals, animals and plants which in turn adversely alters the balance of nature (Glasson, Therivel and Chadwick, 1994). Berry (1984) affirms that, pollution apart from endangering the health of man and other living things also constitute an economic waste of natural resources and even retard purposeful developments. The overall productivity of crop plant is reduced by the most forms of air pollution and when combined with other environmental stresses, such as low winter temperatures or prolonged droughts, pollution causes plant to decline and die.

Olatunji (2013a), opined that effective resource management can be enhanced when the true cost of production with its consequent value to society is known. Environmental accounting serves as an effective tool for costing production in real terms while disclosing the hidden elements involved in generating the income. After all, it is what we count that we value and what we value is what we treasure. He further described environmental accounting as "an integrated approach, which examines the interrelationship between accounting, the environment and management information, decision – making and accountability. It is an extension of the scope of conventional accounting to include practical environmental and economic implications of the concepts of corporate sustainability"(EPA. 1995; Schatlegger and Burrit. 2000, Olatunji, 2013). Association of Chartered Certified Accountants, (2001) observes that it is inconceivable to consider environmental accounting without thinking of sustainability of enterprise or nations, and this serves as the dividing line between environmental accounting and conventional cost and financial accounting (UNDSD/DESA,2001;Stede and Powell, 2001).

Steele and Powell (2001) in Olatunji (2013b) recognized that environmental costs may be difficult to measure and thus recommended that in assessing external costs of existing environmental burdens, use monetary values based on how people have reacted to changes in environmental quality, which have already taken place. They further suggested that future organization status should be assessed in terms of its potential impact in monetary terms.

III. Methodology

The methodology adopted for this study is basically a descriptive research wherein answers are sought for some research questions and the outcome interpreted to highlight policy implications.

a) Study Area

The study area is Ewekoro Local Government Area of Ogun state where Lafarge WAPCO cement factory is located. Its headquarters are in the town of Itori at 6°56′N 3°13′E/6.933°N 3.2167°E. It has an area of 594 km^2 and a population of 55,156 at the 2006 census. The Local Government is bounded by Yewa South Local Government in the west, Ifo Local Government in the south, Abeokuta North in the north and Obafemi Owode in the east. The composite division that makes up the local government area are; Itori, Owowo, Mosan, Abalabi, Wasimi, Papalanto, Arigbajo, Obada, Yobo and Elere Onigbendu.

b) Source of Data, Data Collection and Sampling Techniques

Data for this study was sourced through primary sources by the use of questionnaire. The questionnaire was designed following the 5-point Likert scale. Respondents were required to provide their socio economic details, as well as make choices on a five point scale in respect of environmental impacts perceived. One hundred and fifty (150) respondents were selected from the immediate environment of the factory using cluster sampling, in line with Bailey (1994) who recommended a minimum sample size of one hundred (100) respondents being sufficient for most researches. It is also in line with Roscoe Rule of Thumb that states that a sample size between thirty (30) and

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five hundred (500) is sufficient (Robin, 2012). This sampling procedure is most suitable for this kind of study where the location is quite large, and the settlements are scattered. The cluster sampling affords every member of the population an opportunity of being selected for the study.

c) Methods of Data Analysis

Descriptive statistics was employed to present the socioeconomic data of the respondents using frequency tables and percentages. The impacts of pollution on farm produce, water sources and the general economic wellbeing of the inhabitants were explored. Data collected was analysed presented using simple percentages and inferences were made using the Chi-Square (χ^2) statistic.

IV. Results and Discussion

a) Socioeconomic Characteristics of Respondents

The socioeconomic variable considered relevant to the study were age, gender, education and occupation. These are presented in table 1.

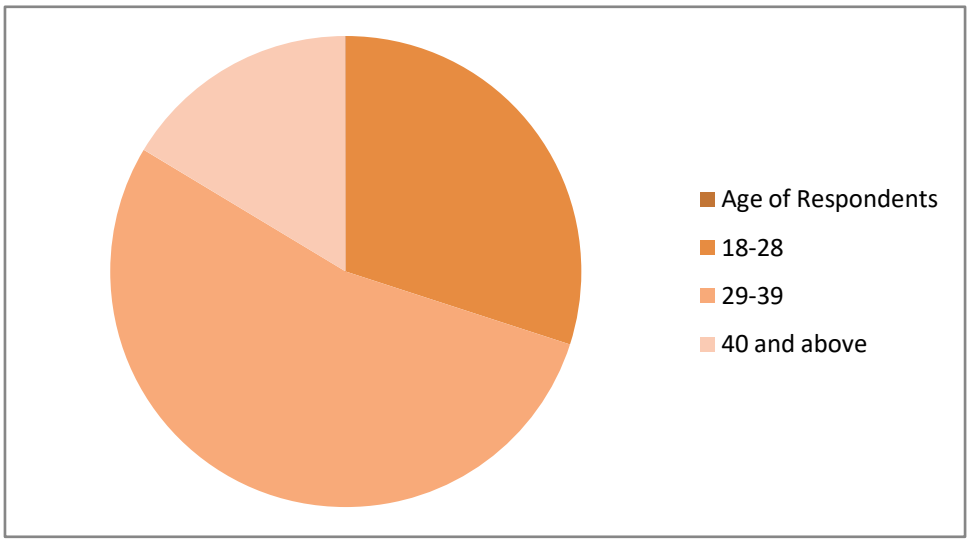
Table 1: Frequency and Percentage Distribution of Respondents by their Socioeconomic Characteristics (X=110)

Socio-Economic Characteristics	Frequency	Percentage	Cumulative%
Age of Respondents			
18-28	33	30	30
29-39	59	54	84
40 and above	18	16	100
Gender of Respondents			
Male	68	62	62
Female	42	38	100
Respondents Levels of Education			
No Formal Education	21	19	19
Primary Education Completed	17	15	34
Secondary Education Completed	48	44	78
Tertiary Education Completed	24	22	100
Respondents' Occupation			
Farming	57	50	50
Trading	29	26	76
Paid Employment	24	24	100

Source: Research Survey, (2016)

i. *Age Distribution of Respondents*

The Age distribution in the study area was depicted in table 1, which classified respondents into three categories beginning from 18 years. Children below 18 years of age were excluded as they are considered too young to participate. The categorization gave 84% as falling between 18 and 40 years old. These represent the active population while those from the age of 40 years and above were 16% as shown in figure 1.



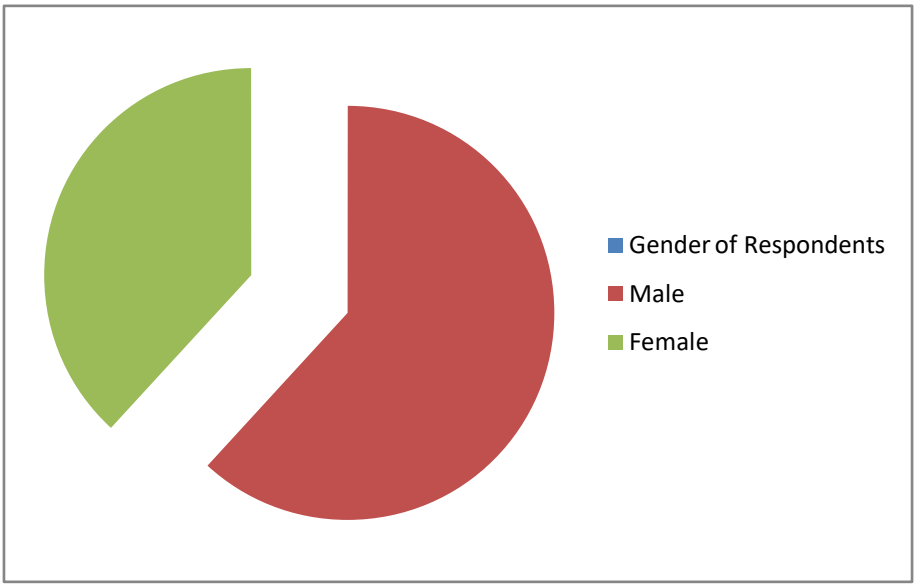
Source: Field Survey, 2017

Figure 1: Age Distribution

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ii. *Gender of Respondents*

Respondents comprised of 62% male and 38% female. More male respondents were available and willing to participate in the survey than female (as show in figure 2) The significance of gender in the survey participation reflected in the assessment of water economic related variables.

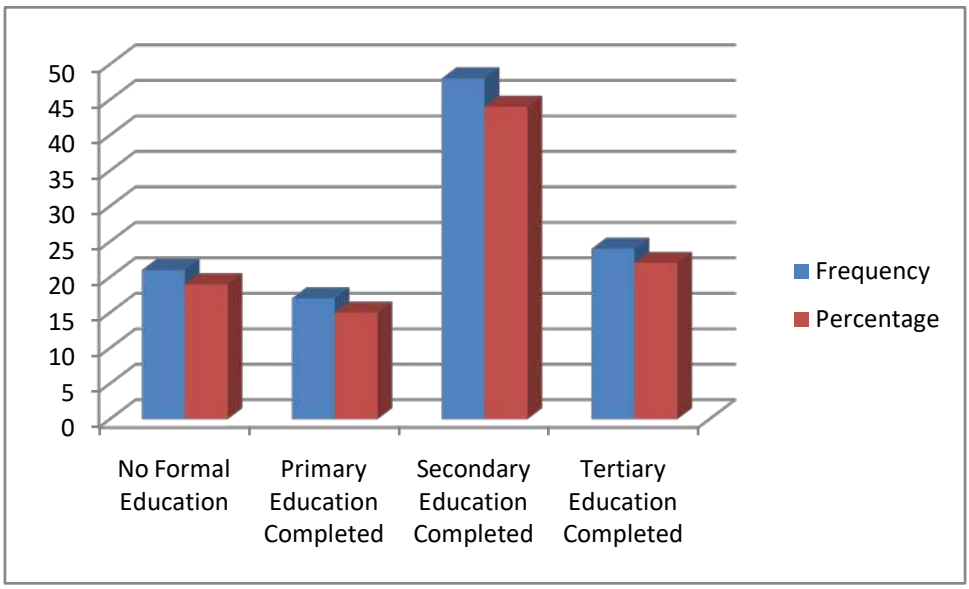


Source: Field Survey, 2017.

Figure 2: Gender of Respondents

b) Educational Qualification of Respondents

The levels of Education of household members were ascertained from the field. It was established that those that have completed their Secondary Education are the modal class of respondents with 44%, which is closely followed by those who have completed Tertiary level of education represented 22%, then those who without Formal Education is represented with 19% and lastly by those of primary education with 15%. The study shows that most of the respondents attended secondary education, as a greater number of them had one qualification or the other as shown in figure 3. The study further shows a low level of education among the people of Ewekoro Local Government Area, hence there is difficulty in adequately assessing the economic consequences of industrial pollution in the area of study.



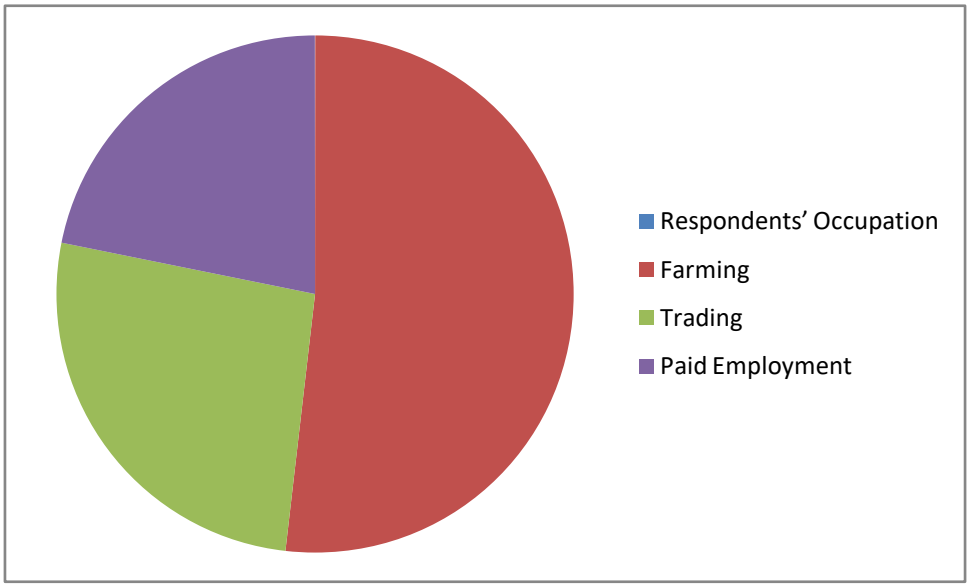
Source: Field Survey, 2017.

Figure 3: Educational Qualification of Respondents

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c) *Occupation of Respondents*

The table shows the occupational distribution of the respondents indicating that farming activities is the dominant occupation of inhabitants of Ewekoro Local Government Area with a population of 57 representing above 50% of the total respondents. Trading is next with 26% while paid employment (private and government) is 24% as shown in figure 4. This implies that, majority of the population are people who engage in farming and agriculture on full time basis. Their knowledge about industrial pollution is vital, since the pollution from the cement industry may actually affect their farming activities in the area.



Source: Field Survey, 2017.

Figure 4: Occupation of Respondents

d) *Respondents Perception on the Effect of Cement Production on the Environment*

From table 2, the respondents perception of the effects of cement production on the environment was as follows: 83 respondents (75%) observed poor crop yield in their various farms as a result of cement manufacture. This situation has brought untold hardship to them in terms of income from Agriculture which used to be the mainstay of the entire Ewekoro Local Government Area. Also pollution of waterways as a result of cement production activities which has led to the destruction of most of the marine bionetwork; with 57 (50%) respondents showing knowledge of this activity. Again 100 respondents representing about 91% of the total respondents responded that cement production in the community has led to continuous rusting of their roofing sheet, while 75 respondents representing 68% showed that the air is being polluted leading to acid rain. 85 respondents (77%) attribute water pollution to cement production in their environment.

Table 2: Perception of the Effect of Cement Production on the Environment

Perceived Effects	Agree	%	Disagree	%	Undecided	%	Total	%
Destruction of farm	83	75	24	22	3	3	110	100
Endanger marine life	57	52	43	39	10	9	110	100
Rust of Roofing Sheets	100	91	4	4	6	5	110	100
Air Pollution	75	68	32	29	3	3	110	100
Water Pollution	85	77	21	19	4	4	110	100

Source: Research Survey, (2016)

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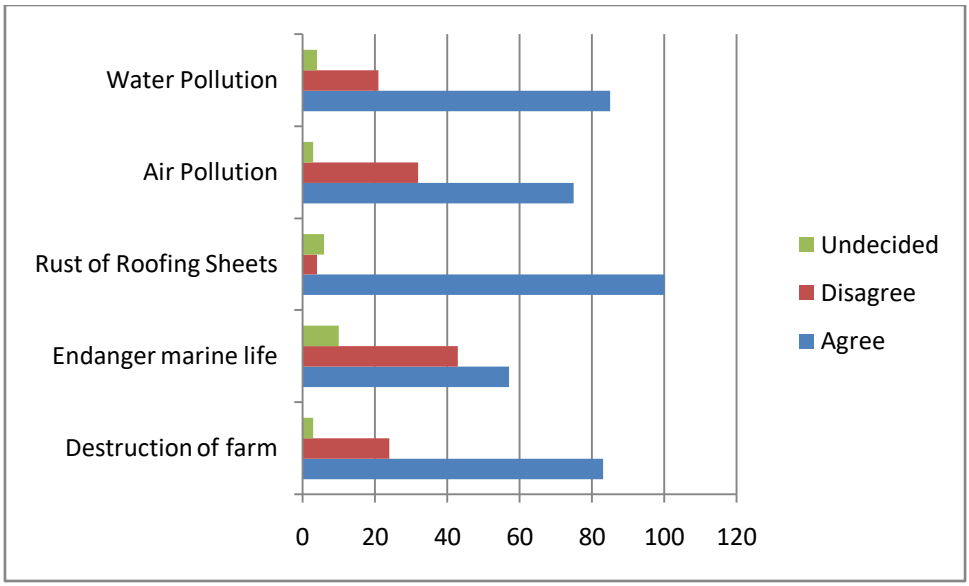


Figure 5: Perception of the Effect of Cement Production on the Environment

e) Analysis of Data on Environmental Impacts of Cement Production on the Community

Data on the environmental impacts of cement production on the environment in Ewekoro with respect to the four key variables were analysed using Chi-Square (χ^2) statistics. The results show that all four variables identified as impacts were significant at 5% level of significance.

i. The Chi Square computed was 93.839 for the relationship between cement production and damage to farms with a p-value < 0.05. This implies that there is significant relationship between the cement production pollutions and the poor yield on farms.
ii. The computed χ^2 for the impact of cement production and pollution on marine life destruction is given as 31.764 with a p-value < 0.05 implying that there is significant relationship between cement production and destruction of marine life.
iii. The computed χ^2 for the impact of cement production on rusty rooftops gave 164.1, the p-value is < 0.05. this implies an overwhelming consensus of respondents that there is significant relationship between cement production on the rusty rooftops.
iv. When air pollution is considered, the χ^2 computed for this impact was 71.582, with a p-value < 0.05 showing strong relationship between cement production and contaminated air.
v. Water pollution was examined. The computed χ^2 for this impact was 93.836, having a p-value < 0.05, implying that there is significant relationship between cement production and water pollution.

Table 3: Chi Square

	farm	Marine	roof	Air	water
Chi-Square	93.836[a]	31.764[a]	1.641E2[a]	71.582[a]	93.836[a]
Df	2	2	2	2	2
Asymp. Sig.	.000	.000	.000	.000	.000

a. *0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 36.7.*

f) Discussion of Findings

Diverse statistics on the impacts of cement production on the local communities were shown in terms of degradation of farmlands, marine life, roof tops, air and water pollutions. Opinions of respondents show that these externalities are significantly associated to the production of cement. Various authorities have written on the roles of externality in measuring productive outcomes. Prominent among them is Kuznet who wrote inverted-U hypothesis in which he related the concern for welfare to poverty levels. This in itself describes the attitude of producer in relation to social welfare which has in turn been responsible for agitations of all sorts across the world.

Umoh and Mosimabale (2002) are of the view that the earth has been confronted with the threats of contamination more from man than from natural disasters the world over. Their view confirms that

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factories and other destructive technological inventions pollute the air, contaminates food and the environment (Jacob, 2014). The production of cement in Ewekoro Local Government Area of Ogun State, Nigeria has demonstrated this concept of externality clearly as can be seen in the strong association that degradation bears to cement production (Tiwari, Tiwari and Pande, 2008; Azumi and Bichi, 2010; Nouri, Khorasani, Lorestani, Karami, Hassani and Yousefi, 2009).

Olatunji (2013a), described environmental accounting as "an integrated approach, which examines the interrelationship between accounting, the environment and management information, decision–making and accountability. It is an extension of the scope of conventional accounting to include practical environmental and economic implications of the concepts of corporate sustainability "(EPA. 1995; Schatlegger and Burrit. 2000, Olatunji, 2013). Thus, the study by assessing the opinions of respondents drawn from the study area has been able to establish that there iss need to assign costs to the environmental degradation occasioned by industrial production. Association of Chartered Certified Accountants ACCA (2001), observes that it is inconceivable to consider environmental accounting without thinking of sustainability of enterprise or nations, and this serves as the dividing line between environmental accounting and conventional cost and financial accounting (UNDSD/DESA, 2001; Stede and Powell, 2001; Olatunji, 2013b). Accounting for the environmental costs of cement production may be difficult to measure and thus need to identify existing environmental burdens through surveys similar to what has been done in this study.

V. Conclusion and Recommendations

From this study, a number of conclusions have been reached: Cement production in Ewekoro have been ongoing since late 1960. For much of this period industrial pollution from activities of cement production plants have been a major factor affecting the environment and economic development of the inhabitants of the Local Government Area. The main objective of the study is to investigate the environmental and economic effect of industrial pollution on the host Communities. This study revealed that industrial pollution impact negatively on the lives of the people of Ewekoro, as this goes a long way in distorting their natural environment and economic development. Therefore, it is imperative that the National Environmental Standards Regulating and Enforcement Agency (NESREA) should ensure strict compliance to the policies regulating the disposal of industrial waste and that penalty be imposed on violators. Furthermore, the hygienic treatment of all disposable chemicals of all forms must be made a matter of necessity. There should be taxes imposed to deter toxicity. Remediation efforts should include toxic magneting devices fixed to the dust or fume exhaust pipe to reduce release of dust to the air and, scholarships made to indigenes of the community to enable them get educated enough to gain employments in such organizations in order for them to take care of themselves. Loans and agricultural inputs should be provided to farmers to boost their agricultural productivity.

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