DANGERS OF GREENHOUSE GAS EMISSIONS TO AGRICULTURAL PRODUCTS AND AQUATIC LIFE, EKET AND ITS ENVIRONS

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ABSTRACT

The study investigated dangers of greenhouse gas emissions on agricultural products and aquatic life, Eket and its environs. The population of this study comprised of data from the Ministry of Environment Uyo and Ministry of Health in Eket. The study adopted descriptive and explanatory design. Data obtained from respondents was analysed using the descriptive techniques which included the use of means, range, standard deviations and graphs. The inferential statistical methods used include trend analysis, analysis of variance (ANOVA) and Pearson's Product Moment Correlation Analysis. It was concluded that that there is significant relationship between greenhouse gas emissions and agricultural products in Eket and its environs. There is significant relationship between greenhouse gas emission and aquatic life in Eket and its environs. It was therefore recommended that there is the need to examine the effect of greenhouse gas emissions on the water resources, soil and agricultural productivity and socio-economic life of the people with regards to their various occupations.

KEY WORDS: greenhouse gas emissions, agricultural products, aquatic life, Eket

INTRODUCTION

The International Energy Agency (IEA) (2005) and Smith (2002) have reported that, apart from water vapour which has a residence time of days, most green house gases take several years to leave the atmosphere. Furthermore, the emission of hydrocarbons or its combustion into the atmosphere is one of the typical and global forms of anthropogenic sources of greenhouse gases. Gas flaring which is the process of burning-off of surplus combustible vapours from oil wells, either as a means of disposal or safety measure to relieve well pressure, is said to be an important source of anthropogenic greenhouse gas emission (Macalister, 2004). Experts believe this is the biggest source of emission from offshore oil and gas installation, and the flares contain a cocktail of toxins that pollute the atmosphere (Intergovernmental Panel on Climate Change, 2004).

The United Nations Development Programme (UNDP)/World Bank Report (2004) pointed out that more gas is flared in Nigeria than anywhere else in the world, and this flaring has contributed to 75% greenhouse gas than all other sources in Sub-Saharan Africa combined. Bianchi (2005) supports this position by saying that close to 2.5 billion cubic feet of gas is flared in Nigeria every day, amounting to about 70 million tons of carbon dioxide emitted per day. According to World Health Organization (WHO)/ Environmental Literacy Council (ELC) (2006)

report on Nigeria's environmental impact assessment 2000 –2005, indicators show that the worsening greenhouse gas record is partly due to increased flaring of gas in Nigeria. Exxon-mobil, whose operational terminal is located along Eket – Ibeno axis of Akwa Ibom State, produced 94.4 million tons of gas as at 2003, while BP produced 83.3 million tons of gas as at 2004 (WHO / ELC. 2006). Thus, the high concentration of these kinds of gases in the atmosphere enhances the greenhouse effect (World Encyclopedia, 1982). International Energy Agency (2004) has also observed that naturally, carbon dioxide accounts for about 55 per cent of the change in the intensity of the earth's greenhouse effect. The contributions of other gases are 25 per cent for chlorofluorocarbons, 15 per cent for methane, and 5 per cent for nitrous oxide. Ozone's contribution to the enhancement of greenhouse effect is still yet to be determined. This research work examines the levels of greenhouse gas emissions in Eket and how they affect the health of the people.

Statement of the Problem

Environmental scientists have observed that heated waves cause hotter days which facilitate ozone formation and ozone is an extremely reactive gas that essentially attacks lung tissue by reacting chemically with it. From model predictions, increased frequency of gusty thunderstorms is likely to be experienced in the South-South zone of Nigeria, and where they are already experienced, may become more intensified. Sea level rise is also predicted to cause widespread flooding and degradation of the coastal settlements within this region, leading to loss of life and property, economic hardships, devastation of infrastructures, large-scale migration and its consequent refugee problem.

It is sad to note that after 45 years of oil exploration and exploitation in the Niger Delta region of Nigeria, and having witnessed the tremendous wealth that the nation has made out of the oil sector, the Niger Delta is suffering from terrible environmental degradation. Of recent, such confrontations have been hijacked by criminal elements in the society (popularly called militants) who vent all kinds of atrocities through such dastardly acts as mob raids and rampage, hostage taking, killing of innocent people, and the willful destruction of properties. These incidents have led to closure of many companies and oil wells resulting in loss of revenue to both the oil companies and the government. Youth unemployment, especially among graduates is high due to these conflicts and loss of revenue.

Naturally, with a gas deposit of over 177 trillion cubic feet (Punch Newspaper, 05/06/2008), Nigeria should undisputedly be among the top five gas exporting countries of the world. Unfortunately, and despite the billions of dollars earned from the sales of crude oil in the last 40 years, the country still finds it hard to put in place facilities that could harness the vast natural gas resources for commercial purposes or take stringent steps to offer subsidies that can cushion the effects of these environmental degradation resulting from gas flaring. Whereas other gas/oil endowed nations of the world are yearly reaping billions of dollars from the sales of gas.

Aim and objectives of study

The aim of this study was to examine the trend in greenhouse gas emissions and its effect on the health of the people of Eket and its environs. The specific objectives were:

1. To examine the effect of greenhouse gas emissions on agricultural products in Eket and its environs.

2. To investigate the effect of greenhouse gas emission on aquatic life in Eket and its environs.

Literature Review

Types of Greenhouse Gases

According to the Intergovernmental Panel on Climate Change –IPCC (2007), carbon dioxide, methane, nitrous oxide and three groups of fluorinated gases (sulfur- hexafluoride, Hydro-fluorocarbons, and per-fluorocarbon) are the major types of greenhouse gases, and they form the subject of the Kyoto Protocol, which came into force in 2005.

Kiehl and Trenberth (1997) outlined the following as types of greenhouse gases according to their importance in climate change:

1. Carbon dioxide (CO_2): Absorbs infrared radiation, hence affect the stratospheric O_3

2. Methane (CH_4): Absorbs infrared radiation; affect tropospheric O_3 and OH, affects Stratospheric O_3 and H_2O: produce CO_2

3. Nitrous Oxide (N_2O): Absorbs infrared radiation; affects stratospheric O_3

4. Ozone (O_3): Absorbs ultraviolet and infrared radiation

5. Carbon monoxide (CO): Affects stratospheric O_3 and OH cycle: produce CO_2

6. Sulfur dioxide (SO_2): Forms aerosols, which scatter solar radiation

7. Hydrofluorocarbon (HFC): Absorbs infrared radiation; affects stratospheric O_3

8. Chorofluorocarbon (CFCs): Absorbs infrared radiation; affects stratospheric O_3

9. Perfluorocarbons (PFCs): Absorbs infrared radiation and scatters solar radiation.

10. Water vapour (H_2O): Absorbs infrared radiation and affect tropospheric O_3: produces CO_2

Similarly, the World Book Encyclopedia (1982) lists the most abundant greenhouse gases on earth in order of its relative abundance:

- Water vapour
- Carbon dioxide
- Methane
- Nitrous oxide
- Ozone
- Chlorofluorocarbons.

Wittwer (1998) says the only recognized greenhouse gases are water vapour, carbon dioxide, methane, Nitrons oxide, Ozone and other man-made greenhouse gases which include hydrofluorocarbons (HFCs), perflorocarbon (PFCs) sulfur hexafluoride (SF6) and chlorofluorocarbons (CFCs). According to the United States Environmental Protection Agency(USEPA, 2004), the following are recognized as greenhouse gases according to their major sources

1. Water vapour - Natural
2. Carbon dioxide - Natural/Anthropogenic
3. Methane - Natural
4. Ozone - Natural
5. Nitrous oxide - Natural
6. Sulfur-hexafluoride - Anthropogenic

7.	Perfluorocabon	-	Anthropogenic
8.	Hydrofluorocarbon	-	Anthropogenic
9.	Chlorofluorocarbon	-	Anthropogenic
10.	Sulfur Dioxide	-	Natural
11.	Carbon monoxide	-	Anthropogenic

Greenhouse Gas Emissions and Agricultural Products

Global change will definitely introduce changes in agricultural ecosystem that will affect photosynthesis and plant productivity. However, the effect on crops will be different for regions depending on pre-existing climatic conditions and the adaptation potential of locally cultivated species. Meteorological data and predictive models of climate change indicate that, high temperature and lack of rain fall during summer are most important factors determining productivity of tree crops, whereas extreme rainfall and wet conditions determine the productivity of some food crops (Chartzoulakis and Psarras, 2004).

Similarly, Wake (2005) added that, increased temperature would tend to increase crop water demand. Many crops, in the case of drought (particularly grain and silage crops) are not irrigated; therefore, what climate change due to greenhouse gas emission brings in terms of summer rainfall will be critical. In the case of heavy rainfall, the trend is made worse as fields will be flooded, creating problems for yield improvement, more soil compaction, and possible crop losses due to lack of oxygen for roots and disease problem associated with wet conditions (Wake, 2005).

Boru, et al (2003) have observed that root flooding is damaging to the growth of crop plants such as soyabean, while field flooding often results in leaf chlorosis, defoliation, cessation of growth and plant death. These effects have been widely attributed solely to a lack of oxygen in the root- zone. However an additional damaging factor may be CO_2, which attains levels of 30 percent of total dissolved gases. Accordingly, the effects of root zone CO_2 on oxygen deficient soybean plants were investigated in hydroponics culture. The result showed that lack of oxygen and enhanced CO_2 affect the leaf greenness of soybean, and the plant becomes severely chlorotic and stunted, and eventually results in plant death.

Further review shows that developing countries, including Nigeria, are likely to lose as a whole in terms of food production or agricultural production due to incessant greenhouse gas emission (Walter, 2007). For example in Nigeria, especially the Niger Delta region, it is projected to experience significant losses, with quite large areas of current crop land losing significant productivity due to climate change occasioned by greenhouse gas emission. Between 2-3 ^{0}C warming, the risk of damage begins to increase significantly.

Overall, Walter (2007) observed that it is expected that warming will have effect on the rainfall patterns in all parts of the world. Many crops ranging from food crops to cash crops will be affected and can no longer be planted in certain regions (e.g. coffee, groundnut, cassava, and so on). This is as a result of extreme climate conditions. The change in climate affects these

crops by changing growth rate, seed production, as well as, flowering and fruiting in the case of mango, cashew, and so on (Joyce et. al, 2001). Greenhouse gas emissions also causes altered and unpredictable weather patterns, which increase crop vulnerability to pest, disease and withering.

Greenhouse Gas Emissions and Aquatic Lives.

Climate change caused by an enhanced greenhouse gas emission affects the natural environment. Experts say increased Greenhouse gas emission for aquatic habitat will affect habitat availability, water quality and change in the seasonal temperature cues of which some native fishes rely on to begin migration or spawning (Crozier, 2002; Goho, 2004; and Wolfe, 1994). Rain fall patterns also affect marine habitat and fish production/breeding. That is, the patterns are naturally variable, as in where, when and for how long rain falls affect the fish habitat. This results in sea level rise. Studies show that heavy rain fall resulting from climate change affect beaches with erosion, and lead to loss of key habitat for fish breeding, storm surge flooding and intrusion of saltwater into the fresh water aquifers that the fish rely on for their survival and reproduction (Gate and Victoria, 1990).

Eroding beaches threaten marine life, causes declining fish population, and red tides are the after effects of greenhouse gases emission, and this jeopardizes our economy; of course global warming is contributing to these problems. More severe storms have ripple effects on these marine lives (Crozier, 2002). Evidence indicates that hurricanes are becoming more intense due to the rising ocean temperatures caused by global warming. Researchers predict that an increase of I^0C could eliminate the younger fishes and all male breeding population of loggerhead turtles (Reilly, 2002). Further, it is found that the gender of turtles and fishes are determined by temperature; thus cooler temperatures form males while warmer temperatures form females.

Rising ocean temperatures also cause coral bleaching – the expulsion of algae that gives coral color- causing it to turn pale or white. Research suggests that a 39inch rise in sea level would cause beaches to erode from approximately 300 to 3,000 feet along the coast (Walter, 2007). Findings has it that sea level rise will affect critical fisheries habitat. In a 2006 study by World Bank in Florida, it was found that with only a 15 inch sea level rise, nearly 50 percent of salt marshes and 84 percent of tidal flats in key coastal areas would be inundated and lost, further threatening population of many species of fishes including bone fish, flounder, grouper, red snapper, pompano, red-fish, snook, spotted sea trout and tarpon. With relatively rapid changes in temperature and water flow, the cues that fish respond to may not coincide with an abundance of food. Fishes may respond to these climatic changes and move to more favourable habitats provided that such habitats exist and there are aquatic corridors that connect them (Reilly, 2002).

However, long-term changes that affect two key factors – ocean temperature and nutrient availability, will have a significant influence on marine biodiversity. It is reported that warmer water prompts fishes to migrate to cobbler water that resembles their normal habitat or get extinct (World Wildlife Fund, 2004).

Method

Research design

The research designs adopted for this study are descriptive and explanatory design. The object of descriptive research is to portray an accurate profile of persons, events or situation. This design serves as the forerunner to the explanatory approach, involving the establishment of causal relationships between variables.

Study area

The study area is Eket Local Government Area of Akwa Ibom State, Nigeria. Eket is located approximately between Longitudes 7^{o} 30´ and 7^{o} 55´ East of the Greenwich meridian and Latitudes 4^{o} 43´ and 4^{o} 55´N of the Equator.

Sources of data

Data for this work were obtained from both primary and secondary sources. The primary sources included field and laboratory experiments using such equipments as the sensitive gas chromatograph Mass spectrometer named MEDUSA. Secondary sources of data were obtained from the Ministry of Environment Uyo and Ministry of Health in Eket.

Method of data collection

The systematic random sampling technique was used to select three sampling stations northward at 10 km apart from QIT into the hinterland for greenhouse gas emission tests. This was to enable the researcher to determine the variation of greenhouse gases across different locations in the study area with respect to the probable source (Qua Iboe Terminal). The primary motivation for obtaining atmospheric data from top of towers was to fill existing measurement gaps in geographic location and on spatial scales. This took care of vertical distribution of gases in the air, which is affected by the weather and depends on topography of a particular area.

Method of Data Analysis

The data obtained were analysed using descriptive analysis to answer the research questions and Pearson Product Moment Correlation Coefficient to test the hypotheses. Test of significance was done at 0.05 alpha level. The result was considered significant if the calculated value was either equal to or greater than the critical value, but non-significant if less.

Hypotheses Testing

Hypothesis One

The null hypothesis states that there is no significant relationship between greenhouse gas emissions and agricultural products in Eket and its environs. In order to test the hypothesis, two variables were identified as follows:-

1. Greenhouse gas emissions as the independent variable

2. Agricultural products in Eket and its environs as the dependent variable

Pearson Product Moment Correlation analysis was then used to analyze the data in order to determine the relationship between the two variables (see table 1)

TABLE 1

Pearson Product Moment Correlation Analysis of the relationship between greenhouse gas emissions and agricultural products in Eket and its environs.

Variable	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum xy$	r
Greenhouse gas emissions (x)	3401	58275		
			54888	0.95*
Agricultural products in Eket and its environs (y)	3203	51837		

***Significant at 0.05 level; df =198; N =200; critical r–value = 0.139**

Table 1 presents the obtained r-value as (0.95). This value was tested for significance by comparing it with the critical r-value (0.139) at *0.05* levels with 198 degree of freedom. The obtained r-value (0.95) was greater than the critical r-value (0.139). Hence, the result was significant. The result therefore means that there is significant relationship between greenhouse gas emissions and agricultural products in Eket and its environs.

Hypothesis Two

The null hypothesis states that there is no significant relationship between greenhouse gas emission and aquatic life in Eket and its environs. In order to test the hypothesis, two variables were identified as follows:-

1. Greenhouse gas emission as the independent variable

2. Aquatic life in Eket and its environs as the dependent variable

Pearson Product Moment Correlation analysis was then used to analyze the data in order to determine the relationship between the two variables (see table 2)

TABLE 2

Pearson Product Moment Correlation Analysis of the relationship between greenhouse gas emissions and aquatic life in Eket and its environs.

Variable	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum xy$	r
Greenhouse gas emissions (x)	3071	47505		
			49558	0.86*
Aquatic life in Eket and its environs (y)	3203	51837		

***Significant at 0.05 level; df =198; N =200; critical r–value = 0.139**

Table 1 presents the obtained r-value as (0.86). This value was tested for significance by comparing it with the critical r-value (0.139) at *0.05* levels with 198 degree of freedom. The obtained r-value (0.86) was greater than the critical r-value (0.139). Hence, the result was significant. The result therefore means that there is significant relationship between greenhouse gas emission and aquatic life in Eket and its environs

Discussion of Findings

The result of the data analysis in table 1 was significant due to the fact that the calculated R-value 0.95 was greater than the critical R-value of 0.139 at 0.05 level with 198 degree of freedom. The result implies that there is significant relationship between greenhouse gas emissions and agricultural products in Eket and its environs. The result therefore was in agreement with the research findings of Wake (2005) who asserted that increased temperature would tend to increase crop water demand, he further highlighted that many crops, in the case of drought (particularly grain and silage crops) are not irrigated; therefore, what climate change due to greenhouse gas emission brings in terms of summer rainfall will be critical. The significance of the result caused the null hypotheses to be rejected while the alternative one was accepted.

The result of the data analysis in table 2 was significant due to the fact that the calculated R-value 0.86 was greater than the critical R-value of 0.139 at 0.05 level with 198 degree of freedom. The result implies that there is significant relationship between greenhouse gas emission and aquatic life in Eket and its environs. The result therefore was in agreement with the research findings of Crozier, (2002) who asserted that more severe storms have ripple effects on

these marine lives. The significance of the result caused the null hypotheses to be rejected while the alternative one was accepted.

Conclusion

From the findings of the study, it was concluded that there is significant relationship between greenhouse gas emissions and agricultural products in Eket and its environs. There is significant relationship between greenhouse gas emission and aquatic life in Eket and its environs.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. There is the need to examine the effect of greenhouse gas emissions on the water resources, soil and agricultural productivity and socio-economic life of the people with regards to their various occupations.
2. As a way of curbing increased gas flaring, government should as a matter of policy encourage gas re-injection strategy by all oil companies.
3. That the government should enact or activate environmental laws that guide against illegal or unrestrained air pollution in Niger Delta region and other parts of the country. Defaulters should be prosecuted accordingly.

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