GREENHOUSE GAS EMISSIONS AND THE HEALTH OF THE PEOPLE OF EKET AND ITS ENVIRONS

BY

DR. ENOBONG JAMES *FCE*
FUEL OPERATIONS, QIT, UN LOGISTICS
MOBIL PRODUCING NIGERIA UNLIMITED

ABSTRACT

The study investigated greenhouse gas emissions and the health of the people of 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 greenhouse gases vary from one location to another in the area. Greenhouse gases contributes significantly to the prevalence of respiratory tract infections, asthma, heart attack and itching. It was therefore recommended that the government should work in concert with multinational companies in the area to encourage periodic medical checks and subsidized bills on gas related sicknesses for the people of the area.

Introduction

The world has entered a period of unprecedented environmental change as evidenced in the rapid growth of natural and man-made changes in the biosphere during the final quarter of 20^{th} century (Ekpoh, 2002). One of the major causes of this is the effect of green house gas emissions. Although scientific evidence remains inconclusive on the issue of global warming, it is recognized that the potential impact of greenhouse gas emissions on society and ecosystems may prove to be significant. To address the environmental issue of greenhouse gas emissions properly, one needs to have an open and sound mind.

According to Vine, Kusher and York (2004), greenhouse gas emission is the leading process that causes the greenhouse effect, which aids in heating the earth's surface and atmosphere. Dlugochenky (1998) also opined that greenhouse effect is the consequence of certain atmospheric gases such as carbon dioxide, methane, and water vapour being emitted into the atmosphere, and are able to change the energy balance of the planet by absorbing long-wave radiation from the earth.

See (2001) believe greenhouse gases make up only 1 per cent of the earth's atmosphere, and they regulate our climate by trapping heat and holding it in a kind of warm air blanket that surrounds the planet. He observed that nitrogen (N_2) and oxygen (O_2) do not absorb infrared radiation but carbon dioxide (CO_2) methane (CH_4) and nitrous oxide (N_2O) do absorb such radiation

The Intergovernmental Panel on Climate Change (IPCC) (2007) has noted that greenhouse gas emission causes the earth to be naturally blanketed and to be kept at about 33°Celsius and warmer than it would be without these gases in the atmosphere. Over the past centuries, the earth has increased in temperature by 0.5°Celsius and many environmental experts' believe this is because of an increase in the concentration of the major greenhouse gases: carbon dioxide, methane, nitrous oxide, and fluorocarbons. Fears are that emissions of these gases at a rocket rate may result in negative consequences such as frequent and more dynamic floods, droughts, increased prevalence of insect infestation, sea level rise, lower/poor health, and decreasing economic development (Patin, 2002; International Energy Agency (IEA), 2005; Community Development Carbon Fund (CDCF), 2004). Some of these negative consequences have already manifested in Eket Local Government Area due to intense oil and gas exploration and exploitation.

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. Therefore, being the primary ingredient of smog, ozone is very harmful to the breathing mechanism. Based on these facts, there is no doubt that, given today's globalized and ever increasing energy and resource consuming society, ecosystems will not be able to respond to unprecedented weather variability, unlike in the past centuries. The consequences of this global crisis have been a catalogue of major economic and environmental disruptions, together with colossal health risks to man. The global warming phenomenon has probably affected the health of the residents, agricultural productivity, water supplies, energy and housing of the inhabitants of the affected region.

There are frequent complaints in Eket/Ibeno areas about heat rash and general discomfort, asthma, malaria and dengue fever, foul air, poor agricultural yields, declining fish catch, and upper respiratory tract infections in children and adults. In the area surface streams have become polluted, there are power outages due to frequent thunderstorms and rapid deterioration of physical structures, including zinc roofs. Medical reports also suggest that increasing number of the productive human population suffer from heart attack, a very serious situation that impact on the production and gross domestic product of the place. This study seeks to ascertain their actual effects on the health of the people of Eket Local Government Area of Akwa Ibom State of Nigeria.

Aim and objectives of study

The aim of this study is to examine greenhouse gas emissions and the health of the people of Eket and its environs. The specific objectives are:

1. To examine the variation in greenhouse gases across different locations in Eket.

2. To investigate the effect of greenhouse gases on the health of the people of Eket.

Research hypotheses

The following hypotheses were formulated for testing:

1. There is no significant variation in the concentration of greenhouse gases across different locations in Eket.

3. Greenhouse gases in the atmosphere do not have significant effect on the health of the people of Eket.

Literature Review

Sources of Greenhouse Gases

It is universally accepted that there are two major sources of greenhouse gases emission: natural and anthropogenic. But most greenhouse gases have both natural and anthropogenic sources (Clinton 1998 and Ekpoh, 2004). That is, green house gases come naturally while some are man-made, but some do have dual tendencies.

According to Patz, et al (1996) and Pearson and Palmer (2000) greenhouse gas emission in the United States comes primarily from the combustion of fossil fuels in energy use. Energy use is largely driven by economic growth with short-term fluctuation in its growth rate, created by weather patterns affecting heating and cooling needs, as well as, changes in the fuel used in electricity generation and energy related carbon dioxide emissions. This results from the combustion of petroleum, coal, and natural gas, which represent 82 per cent of total US anthropogenic greenhouse gas emission (Pearson and Palmer, 2000).

During the pre-industrial Holocene, concentrations of these gases were roughly constant. Since the industrial revolution, concentration of all the long-lived greenhouse gases has increased due to human actions (IPCC, 1994). According to Smith (1993), since about 1750, human activity has increased the concentration of carbon dioxide, methane and some other greenhouse gases. Natural sources of carbon dioxide are 20 times greater than its anthropogenic sources, but over periods longer than a few years, natural sources have closely balanced natural sinks such as weathering of continental rocks and photosynthesis of carbon compounds of plants and marine plankton (Raven, 1993). The author further advanced that as a result of the balance, the atmospheric concentration of carbon dioxide in the past remained between 260 and 280 ppm for the 10,000 years between the end of the last glacial maximum and the start of the industrial era.

Thomas (2004) and Thomas and Zelikoff (1999) have revealed some of the main sources of greenhouse gases due to human activity to include: burning of fossil fuels and deforestation which leads to higher carbon dioxide concentrations. That is land use change for instance (mainly deforestation in the tropics) accounts for up to one third of total anthropogenic CO_2 emissions.

Livestock enteric fermentation and manure management, paddy rice farming, wet land changes, pipeline losses, and covered vented landfill emissions leading to higher atmospheric methane concentrations. Many of the newer-styled, fully vented septic systems that enhance and target fermentation process are also sources of atmospheric methane. Use of chlorofluorocarbons (CFC_S) in refrigeration system, and use of CFC_S and other halons in fire suppression systems and manufacturing processes is a contributing factor. Agricultural activities, including use of

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fertilizers leads to higher nitrous oxides concentrations. Buesseler (2007) has outlined seven more sources of carbon dioxide (CO_2) from fossil fuel combustion to include:

i. Solid fuel (example coal) with 35 per cent contribution.
ii. Liquid fuels (example gasoline) with 36 per cent contribution.
iii. Gaseous fuel (example natural gas) with 20 per cent contribution.
iv. Flaring gas industrially and at wells with 1per cent contribution.
v. Cement production with 3 per cent contribution
vi. Non-fuel hydrocarbon with 1 per cent contribution
vii. The international bunkers of shipping and air transport not included in national inventories with 4 per cent contribution.

Effect of Green House Gas Emission to the Human Health

After thousands of year's stability, the chemistry of the earth's atmosphere is changing rapidly (Schlesinger, 1997). Research has revealed some of the causes of poor human and health conditions and the changes in biogeochemical cycles. The mechanics of man, like every other living thing including plants, depend largely upon air for sustainability. Therefore, greenhouse gas emission is seen as a very hazardous development for human health.

Air pollution and global warming are well recognized by scientists around the world as serious public health and environmental concern (Pavley, 2002). As atmospheric concentrations of greenhouse gases rise globally, the earth's surface temperature also increases (IPCC, 2007). The greenhouse effect has been beneficial before now as it has helped in stabilizing global temperature compatible to human life, although recent increases in the emissions of greenhouse gases have directly and indirectly increased the average earth's surface temperature, resulting in increased weather extremes including heat wave and worsening of air quality (WHO, 2007). Environmental experts 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. Therefore, being the primary ingredient of smog, air pollution is very harmful to the breathing mechanism (Arquit & Fecher, 2006).

Environmental studies and allied fields that are designed to examine the impact of increased temperature due to increased greenhouse gas emission have confirmed that globally, human health is extremely affected by these emissions because it pollutes the air for breathing and also increases in peak ozone level, which also affects human health negatively (Lancet, 1997; Beerling & Berner, 2005).

Responding to public concern "about possible health disorders related to odorous emissions" coming from an industrial park, including asthma symptoms in children, the Israelis Ministry of Health ordered, a medical study, in 2002. The purpose of the study was to determine if respiratory system diseases, upper respiratory infection, and asthma in children were related to emissions from the Negev industrial facility. The study focused on previous ecological studies, and a new study began in 2002 at 7 localities up to 20 km from the industrial park. The medical study was conducted by the School of Public Health, University of Haifa, Haifa, Israel. Results

of the study were published in a PubMed web site article dated July-September 2009. The title of the article is "Life Prevalence of Upper Respiratory Tract Diseases and Asthma among children residing in rural areas near a regional Industrial Park: Cross-Sectional Study." The School of Public Health medical study results showed that increased "life prevalence" of upper respiratory tract chronic diseases and asthma symptoms increased in "proximal localities" when associated with odour complaints. The closer proximal distance to the emissions showed increasing respiratory diseases and asthma. The medical study concluded that there was an increase "...of chronic respiratory morbidity among children" associated with the industrial emissions. The study recommended a need for environmental protection measures, and monitoring of air pollution.

Increasing amount of greenhouse gases in the atmosphere that results in global warming could lead to new health concerns. A statement released from the Inter-governmental Panel on Climate Change (IPCC) stated thus: "Climate Change is likely to have wide-raging and mostly adverse impacts on human health, with significant loss of life". As temperatures increase towards the poles, insects and other pests will equally migrate towards poles. These insects and pests could be allowed to migrate up to 550 km or 550 miles. Some insects carry diseases such as malaria and dengue fever. Thus, an increase in these insects and pests closer to the poles could result in an increase in these diseases.

Patin (1993) reports that emission of hydrocarbon gases also pollute the water used by humans. He revealed that these gases are absorbed into the water and when drank, the gases rapidly penetrates the human system and disturbs the main functional system (respiration, nervous system, blood circulation and enzyme actions). Evidence of these disturbances includes a number of respiratory-related symptoms like heart attack, cancer of the lungs, and collapse of the central Nervous System.

Cairns (1992) noted that the most common greenhouse gas that is predominantly noticed in water, apart from carbon dioxide, is methane. He added that methane intoxicates the waters and that medical toxicology distinguishes between three main types of intoxication by methane. Light intoxication which results in severe contractive effects in the central nervous and cardiovascular systems; medium-increases Leukocytes in the peripheral blood; Heavy-results in severe disturbances of the Cerebrum, heart tissues, alimentary canals.

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.

Procedure for data analysis and testing of hypothesis

The data were treated to a wide range of descriptive and inferential statistics. The descriptive techniques 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.

Data Analysis and Results

Variation in greenhouse gases across different locations in Eket

The data from the three (3) sampling locations as described in section 3 are presented in tables 1– 4.

Table 1 shows the carbon dioxide concentration across the atmosphere of Eket and its environs in 2009. Data on methane concentration is presented in table 2, Table 3 presents the data on nitrous oxide while data on ozone concentration in the atmosphere is in table 4.

From the result of descriptive analyses of the data (Table 5), carbon dioxide concentration varies between 19.58 and 116.20ppm in station A, 19.32 and 89.70ppm in station B and 17.88 and 80.72ppm in station C. The mean concentration of CO_2 in station A is 43.30ppm with a standard deviation of 24.65. In station B, the mean concentration of CO_2 is 31.45ppm with a standard deviation of 15.36. Station C has a mean concentration of CO_2 to be 26.84ppm with a standard deviation of 12.37. The diagrammatical illustration of the variation in the mean concentration of carbon dioxide is shown in figure 1.

Table 1

Carbon dioxide concentration across Eket and environs

Sampling locations		
A - Esit Urua (ppm)	B- Afaha Uquo (ppm)	C- Ikot Obiota (ppm)
116.20	89.70	80.72
80.03	51.20	36.05
80.00	48.50	30.62
78.33	38.10	30.45
55.02	32.25	26.46
56.55	34.70	33.70
55.78	33.08	27.42
57.30	46.05	25.68
41.12	28.37	27.41
35.00	27.05	23.12
40.00	28.50	23.81
31.33	24.78	22.94
35.88	27.90	23.94
33.22	25.00	22.36
28.78	21.12	22.01
26.01	25.35	20.04
23.10	20.22	17.88
24.55	21.30	20.96
22.78	21.45	20.54
30.56	26.88	25.69
23.59	21.00	22.73
22.05	21.22	19.97
22.53	21.81	20.94
19.58	19.32	18.73

Source: Author's fieldwork, 2009

Table 2

Methane concentrations across Eket and environs

Sampling locations		
A - Esit Urua (ppm)	B- Afaha Uquo (ppm)	C- Ikot Obiota (ppm)
20.05	12.09	8.66
13.88	12.08	11.78
13.92	12.54	12.30
12.40	11.54	11.25
12.58	11.68	11.44
13.00	11.98	11.74

10.82	10.25	11.06
15.45	14.80	13.61
10.78	10.11	10.73
12.11	12.10	12.00
11.20	10.56	10.37
10.50	9.09	8.97
11.56	10.55	10.02
11.80	10.82	10.52
11.72	10.74	6.61
11.11	9.67	7.27
11.01	9.58	8.99
10.91	9.50	8.66
12.59	11.50	11.61
12.22	11.41	10.03
10.52	10.22	6.29
10.90	9.25	8.41
9.88	9.17	7.47
10.39	9.08	8.07

Source: Author's fieldwork, 2009

Table 3

Nitrous oxide concentrations across Eket and environs

Sampling locations		
A - Esit Urua (ppm)	B- Afaha Uquo (ppm)	C- Ikot Obiota (ppm)
7.10	6.43	4.92
6.79	6.22	5.35
6.26	5.68	4.89
5.89	5.32	3.58
6.32	5.74	4.26
5.12	4.54	4.11
5.88	5.31	4.62
5.03	4.45	3.78
3.98	3.42	3.31
5.03	4.45	3.78
8.67	8.09	7.72
4.55	3.97	3.21
4.67	4.09	2.97
4.43	3.86	3.44
4.39	3.82	3.52
5.45	4.87	4.47
5.34	2.56	1.79
5.85	2.87	1.48
6.87	3.89	0.46

5.85	2.87	1.48
6.65	3.10	2.49
5.85	2.87	1.48
5.34	2.36	1.99
4.32	2.42	1.93

Source: Author's fieldwork, 2009

Table 4

Ozone concentrations across Eket and environs

Sampling locations		
A - Esit Urua (ppm)	B- Afaha Uquo (ppm)	C- Ikot Obiota (ppm)
1.39	1.22	1.98
2.92	1.74	1.46
2.10	1.01	0.97
1.90	1.69	1.51
2.22	1.44	0.93
1.37	1.22	0.98
1.27	1.09	1.21
1.42	1.30	0.85
1.50	1.34	0.22
1.66	1.55	0.36
1.22	1.11	0.22
1.45	0.96	0.65
1.41	0.92	0.73
1.37	0.88	0.82
1.32	0.83	0.90
1.28	0.79	0.48
1.24	0.75	0.05
1.20	0.71	0.13
1.17	0.67	0.22
2.22	1.42	0.44
0.92	0.88	0.24
0.88	0.75	0.41
0.99	0.64	0.41
0.52	0.51	0.50

Source: Author's fieldwork, 200

Table 5

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum

Carbon dioxide	Station A	24	43.3037	24.64837	5.03133	19.58	116.20
	Station B	24	31.4512	15.36313	3.13598	19.32	89.70
	Station C	24	26.8404	12.37323	2.52568	17.88	80.72
	Total	72	33.8651	19.27764	2.27189	17.88	116.20
Methane	Station A	24	12.1375	2.13569	.43595	9.88	20.05
	Station B	24	10.8462	1.38598	.28291	9.08	14.80
	Station C	24	9.8858	1.93315	.39460	6.29	13.61
	Total	72	10.9565	2.04292	.24076	6.29	20.05
Nitrous oxide	Station A	24	5.6512	1.08645	.22177	3.98	8.67
	Station B	24	4.3000	1.45173	.29633	2.36	8.09
	Station C	24	3.3763	1.59751	.32609	.46	7.72
	Total	72	4.4425	1.66639	.19639	.46	8.67
Ozone	Station A	24	1.4562	.51222	.10456	.52	2.92
	Station B	24	1.0583	.34565	.07056	.51	1.74
	Station C	24	.6933	.48979	.09998	.05	1.98
	Total	72	1.0693	.54758	.06453	.05	2.92

Descriptive statistics of concentration of greenhouse gases across different locations

Effect of greenhouse gases on health

Correlation analysis

Table 6 shows number of cases of diseases and sicknesses that are related to greenhouse gas emissions between 2004 and 2009. These diseases and sicknesses include respiratory tract infections, asthma, heart attack and itching. The correlation coefficients are generally high having values that range between 0.785 and 0.951. All correlation coefficients are positive. This implies that as greenhouse gas emission increases, respiratory tract infections, asthma, heart attack and itching also increase.

Table 6
Cases of diseases and sicknesses related to greenhouse gases

S/N	Year	Respiratory	Asthma	Heart attack	Itching

		tract infection			
1	2004	49.00	54.00	27.00	42.00
2	2005	51.00	62.00	38.00	60.00
3	2006	66.00	65.00	44.00	73.00
4	2007	98.00	79.00	65.00	82.00
5	2008	120.00	83.00	75.00	87.00
6	2009	123.00	98.00	77.00	96.00

Source: Ministry of Health in Eket

Discussion of findings

Variation in greenhouse gases across different locations

The result of the analysis for this hypothesis revealed that there is a significant variation in the concentration of greenhouse gases across the different locations in Eket and environs, and as such the environment is likely going to be affected differently. This finding collaborates with Khalil et al., (1993) atmospheric monitoring facility in Cape Meares, Oregon, by the Oregon Graduate Institute of Science and Technology. Analysis of ambient air collected 12 to 72 times a day was carried out by means of an automated sampling and measurement system, using the method of gas chromatography and flame ionization detection. According to the paper, the data show higher levels of methane than would have been expected.

Effect of greenhouse gases on people's health

The result of this hypothesis revealed that greenhouse gases in the atmosphere do have significant effect on the health of the people of Eket. The above findings is in line with the opinion of Arquit and Fecher (2006) who are of the view 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. Therefore, being the primary ingredient of smog, air pollution is very harmful to the breathing mechanism. The findings also support the studies of Lancet, (1997) and Beerling and Berner (2005) that globally, human health is extremely affected by greenhouse emissions because it pollutes the air for breathing and also increases in peak ozone level, which also affects human health negatively. The study has confirmed the result of the research conducted by Israelis Ministry of Health in 2009 which discovered that the closer proximal distance to the emissions showed increasing respiratory diseases and asthma.

Conclusion

In conclusion, the study revealed that greenhouse gases vary from one location to another in the area. The data analysis reveals a decrease in the mean concentration of greenhouse gases from the location in close proximity to the Qua Iboe terminal (QIT) to those further away. Also, greenhouse gases contributes significantly to the prevalence of respiratory tract infections, asthma, heart attack and itching. Hence, concentrations of greenhouse gases affect health in the area.

Recommendation

The following were recommended:

1. As a way of curbing increased gas flaring, government should as a matter of policy encourage gas re-injection strategy by all oil companies.

2. The government should work in concert with multinational companies in the area to encourage periodic medical checks and subsidized bills on gas related sicknesses for the people of the area.
3. 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.

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