TITLE PAGE

SOME ENVIRONMENTAL IMPACTS OF THE ASHAKA CEMENT INDUSTRY IN GOMBE STATE

PGD Project In Environmental Management

By

Hamidu Galadima
(PGD/GEO/2001/2002/246)

Dept of Geography

School Of Science And Science Education.

FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA

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CERTIFICATION

I **HAMIDU GALADIMA** hereby state, that this project is my original work under supervision of Dr. **A. S. ABUBAKAR** of the department of Geography FUT Minna. It was read and approved as one of the requirements for the award of Post Graduated Diploma in Environmental Management in the Dept of Geography, School of Science and Science Education FUT Minna.

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Project Supervisor

Date: 17/09/2003

.....
Head of Department

Date:.....

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Finally, I Also wish thank my wife **Mrs. Maryam** and my children for their moral, and prayerful support given to me, their patience endurance and prayers throughout the period of the study.

DEDICATION

This project is dedicated to my beloved mother, and my late daughter Njami whose devine attributes and intellectual gifts remain fresh in my memory.

ABSTRACT

The activities of Ashaka cement have impacted both positively and negatively on the life of the lost community. The cement factory discharge its effluent directly into streams which are tributaries to river Gongola which happen to be the source of drinking water to the host communities and also its air emissions into the air which settles on the neighboring communities.

Results obtained from analysis, interviews and questionnaire administered have shown that diseases and sicknesses which are associated with water are rampant and these are: body pains eye and skin irritation, stooling, vomiting and ashma etc.

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1.0 INTRODUCTION.

1.1 OVERVIEW

Humanity is now being forced to investigate the environmental consequences of its development actions on a local, national and global scale (Kiely 1999). In the short time span within the industrial revolution, the face of this our beautiful planet earth has been changed in many areas, sadly in some, irreversibly. This change were called progress, but now our generations who are the beneficiaries of fast progress are also the inheritors of past environmental mistakes. The gains of the past will be retained and future progress will be attained, not based on the narrow forces of economics or engineering but on sustainable development. Somewhat an overused phrase, sustainable development is defined as "the ability to meet the needs of the present without compromising the ability of the future generations to meet their own needs". The latter calls for a balanced use of resources. The evolution of the age of sustainable development will require radical changes for many professional disciples as they are now known, but most particularly for engineering. Engineering now requires an ecological appreciation and responsibilities to a public, well educated in environmental conservation.

The engineering profession must include environmental protection in its brief if it is to retain public credibility. No longer can engineers design and construct projects without assessing their environmental impact on the environment. The onus' duty of care' now legislates for the developer or producer to be accountable for materials waste or otherwise, from cradle to grave'. Engineers are now being called upon regularly and publicly to

depend their proposals, sometimes losing, because of inadequate sensitivity of their proposal to impact on humans, flora and fauna.

The cement industry which happens to be one of the babies of engineers in their industrial drive, is having a serious impact on the environment and its component.

The Oxford Advance learners Dictionary define cement as a prey powder made by burning clay and lime that sets hard when it is mixed with water. Cement and lime products are essential components of the human environment that supports modern lifestyle we enjoy today. Cement hold together much of our infrastructure from roads to houses, dams to water treatment systems, and schools to hospitals. etc.

Cement also known as limestone occurs naturally in the ground; they are roasted in lime kilns and cements plants to make plaster and cement.

1.2 STATEMENT OF PROBLEMS:

Ashaka cement works a cement production company, have been producing cement for the past 24 years, the company's activities have been affecting the environment both on land, air and water and the major sufferers or targeted species are the inhabitants of the area i.e. the surrounding villages and the company's work force, especially the exposed plant workers who lack adequate safety protection. Problems that are being encountered in this area among the populance are health related problems, which are common to all and almost all the year round. Such illness are cough, catarrh, skin & eye itching and rashes, stomach pain, vomiting, fever etc.

The most disturbing one is the recent one which occurs early this year 2003 during early onset of raining season i.e. between the months of May and June, when the inhabitants of Ashaka town and its surrounding villages were strucked by a water related diseases epidemic which was characterized by

vomiting, skin rashes, swollen of body parts, which resulted into sudden death, and hospitalization of hundreds of people both old and young Adults and Children.

1.3 AIM AND OBJECTIVES.

This research work is aimed at assessing the post environmental impact of Ashaka cement industry on the environment, with much emphasis on its impact on the water and air quality of the area the impact of the industry on the life of the inhabitants of the town and the surrounding villages. Important areas or parameters investigated are the water source and quality of the villages. The health related diseases being experience by the communities due to the activities of the industry. The socio-economic benefits derived due to the company's existence in the area.

The objectives include the following to

1. Highlight the Negative impact of the industry especially in relation to the health problems being encountered.
2. Sensitize the communities of the dangers of using their source of water for domestic consumption
3. Make the government both Federal and State take drastic action against the company, and to provide drinking water to this communities.

1.4 JUSTIFICATION:

There are constant complain and cry from the inhabitant of Ashaka town and its surrounding villages about abnormal sicknesses and diseases that have been affecting the people of which they attributed it to the activities of the cement industry. Most of these complains are on their source of water and

the air they breath, which is always dusty, of recent between the month of May – June the people or communities were strucked by an epidemics which they attributed to their source of water which is being polluted by the company's effluents streams which is being discharge directly into the communities source of water called river gongola.

1.5 SCOPE AND LIMITATION

The scope of this research covers the source of drinking water of the communities which is called river gongola, the effluent drainage stream of the company, the plant workers and the inhabitants of Ashaka town and its surrounding villages. Questionnaires were administered to the factory workers and the host communities, while water samples from river Gongola, the company's effluent discharge stream and the only single existing borehole in the villages were taken and analyzed. The results were then compared with WHO standards on water drinking water.

5.1 LIMITATION:-

This study is limited to Ashaka cement factory, the host community and their source of drinking water

1.6 STUDY AREA:

1.6.1 Physiology:- Ashaka is found in the Sudan savannah area, in this area rainfall is between 65cm and 100cm. With less rainfall, there are fewer and shorter trees than in guinea savannah. Gallery forest do exist along river courses where the soil is moist enough to support trees.

The typical tress are acacia, date palm, silk cotton or kapok tress. All these have adapted having long roots or narrow leaves. The baobab tree, which is more common here than in the guinea savannah stores water in its trunk and drains from it during dry season. However there roots remain dormant until the next rains, during the wet season, every where is green again. The dry season is associated with the harmatten period which is dry and dusty.

1.6.2 CLIMATE

1.6.3 Relief:- the areas surface features is of the lowland type, just similar to the Borno plains, made up of the sedimentary rocks and limestone and gypsum found in abundance.

1.6.4 Temperature:- Generally temperature are low in the months of Novem ber to February. With an average temperature of about 20^0c while temperature are high in the months of April and May with an average of 32^0c while the months of March, June, October temperature are between = $26 - 28^0$c.

1.6.5 WIND:

The area is characterised by the two seasons which is being influenced by the movement of the two most important air masses, the first being the tropical maritime air – mass. It is moist and moves across the country from the Atlantic ocean in a South-westerly direction its

passage over the country brings along rains. Which affects this same area though raining season is short in this area of the sudan savannah compared to the Guinea Savannah and forest swamps. The second is the dry tropical continental air-mass, it originates in the sahara desert and moves from the north easterly direction across the country. It is dry and its passage is associated with the harmatten. The dry air-mass is more dominant in this Sudan savannah area. During the dry seasons the winds are characterized by durst derils which normally moves in a circular motion carrying light materials and dust. During the onset of rains the winds are very strong at times, sweeping the ground of loosed soil particles leaving a strong top soil cover thereby accelerating soil erosion by wind.

1.7.0 LAND USE:

1.7.1 Farming:- the most predominant occupation of the people of Ashaka is farming, their cropping season normally is between June an October due to the short period of rainfall most of the crops plated are those whose life span is short, crops that are commonly grown are, millet, sorghun, cotton, maize, groundnut, beans and cassava of the dry land type. During the dry season small scale farming is practice along the river Gongola banks and other wet streams and most of the crops grown or cultivated are vegetables such as onions, tomatoes, and other green leafs. Garden egg is also planted together with pepper.

1.7.2 Poultry:-poultry farming is done on a small scale by most of the people area, large scale poultry farming is practice by only the few that are well to do, this always practiced so that its maturity time will

concide with festive periods such as the Eld. El Fir, and other sallah periods.

1.7.3 Grazing:- No part of the Sudan savannah that grazing is not common although they always migrate to the sardauna plateau areas of Adamawa and down southern part of the country in search of food for the animals. Animals are seen mostly during harvest period that is between the month of November to January when they feed on available grain cornstalks before leaving to, areas such as lake-chad basin area or Adamawa and down south for food and water.

Grazing in this area of the Sudan savannah have been recognized by authorities such as Local governments and States, this is because there are cattle routes that were designated for use by nomads during raining seasons to enable free movement of animals. The effect of grazing as an environmental hazard is so prominent also in these areas, because of the frequent cattle movement, coupled with lack of enough vegetation cover soil erosion has become so glaring. Desertification has also been accelerated due to cutting down of tress for animals feed and use as fire wood by man. Bush burning for land clearing and other reasons have also become a yearly affair. Grazing animals tend to select species they prefer and leave the tougher, less tastly plants. When native plants are removed from the ground, weedy invaders move in, gradually, the nutritional value of the available forage declines. As overgrazing progresses, hungry animals strip the ground bare and their hooves pulverize the soil hastening erosion.

The process of denudating and degrading once fertile land imitates a desert producing cycle that feeds on itself and is called desertification with nothing to hold back surface run off, rain drains

off quickly before it can soak into the soil to nourish plant or replenish grand water, springs and wells dry up. Trees and bushes not killed by browsing animals or humans scavenging for fire wood or fodder for their animals die from drought.

When the earth is denudated, the micro climate near the ground becomes inhospitable to seed germination. The dry barren surface reflects more of the suns heat, changing wind patterns, driving away moisture laden clouds and leading to further desication.

1.8.0 POPULATION AND HISTORY:

Ashaka is a town in funakaye local government in Gombe State. The history of former north eastern state indicates that the early settlers of the town came from former Kanen Borno empire, it was as a result of wars, this dates back to the year between 1703 and 1705.

According to waziri and Galadima of Ashaka. The tribes that were found in the area the terawa and Bolawa who happens to be the first settlers and origins of the town, there are other settlers who came to settle because of the presence of the cement factory looking for greener fastures such as the hausa people and some Fulani migrate as well on Yoruba & igbo. The present & ruler ship of the town is under the Terawa people. The population of the town is estimated to be about (6,000) people of the villages are predominantly Muslims constituting about 95% of the population.

CHAPTER 2

2.0 LITERATURE REVIEW:

2.1 History of Cement and Concrete

2.1.1 Overview:- concrete in its broader sense i.e. as a material made by man through the use of a binder in the mass of which other materials are being added and bonded together to form a new solid materials, has a bachground of 7000 years.

What is today considered to be the oldest concrete date back 7000 Bc and is located in south galilee, Yiffah El, in Isreal. It was discovered in 1985 when a bulldozer was opening a street and forms a kind of floor. It is made of a mixture of lime with stones. Lime when combined with water and sand forms a slime mortar which coming into contact with the carbon dioxide of the atmosphere becomes more stiff and renders a solid compound. If this mortar is mixed with stones, it bonds – stick together the stones and forms a type of concrete.

Another old concrete finding exist in the shores of Danube in Lepenski Viv in Yugoslavia and dates back to 5600 BC. It constitutes the ground of a pre-historical hut.

2.1.2 THE FIRST HISTORICAL STEPS: -

In the big pyramid in Giza, Egypt (2500 BC) the cobble stones which were used are connected to each other through a certain types of mortar from lime or gypsum. In the same country, in ancient Thebes, there is a fresco which depicts the preparations works for a lime mortar and the construction works

with this material this mastery of Building seems to have been transported to ancient Greece as well, where various mixture of lime were used for construction and for coating bricks made out of clay and dried out in the Sun (500 BC, Krissos and Attalos Places)

All mortars consisting of lime and water in order to set and hadden, need to remain on the air (aerated mortars) so that the chemical reactions of lime with the carbon dioxide of the atmosphere takes places. Ancient Greeks were probably the first to use hydraulic mortars in other words, mortars which when mixed with water can set and harden both in the air and inside water. Therefore its is self evident that mortars and concrete produced with hydraulic mortars have much higher durability against adverse environmental impacts. Such hydraulic mortars were being used by ancient Greeks and the main ones are.

i. a blend of lime and volcanic soil from the island of Thira or Nisiros in Greece or from Dikearchia (Pozouli) the Greek colony in Italy, close to Napoh this blend has the ability to set and to harden within water (hydraulic mortar) and is not dissolved by water like lime mortars. Taking this into considerations the blend of lime and volcanic soil is very relevant to cement and could be considered as a forerunner of contemporary cement. (today, Portland cement with the addition of Pozzolana is being produced and widely used, the so called Pozzolanic Portland cement).

ii. Crumbed tiles or bricks with lime mainly in sea construction (Dilos Rodos Villa of Helenistic period).

iii. Various other materials like ashes (Kortis in Arkadia Prefecture) iron waste (Athens market) lead oxide laviro.

Worth mentioning is the written text which describes the preparations of this ancient cement and belongs to vitruvius in 13 BC. In the text direction are given to architects for the preparations of a mortar which sets both in the air and in water.

It is well known that Romans used to add improve its properties. These materials can be considered as forerunners of the chemical addictives used today for instances they used blood the action of which is similar to the one air entraining agents. (materials which import air into concrete aiming to improve its resistance to frost action and to increase its workability). Of interest is the addition of horse hair during mixing process, forerunner materials of the plastic and steel fibers used today (fiber reinforced concrete).

The first fundamental step for the creation of cement in form it is used today could be attributed to the English engineer John Smeaton in the middle of 1700's AD. To this engineer was assigned the construction of a lighthouse close to Plymouth, which had previously been made out of wood and had been destroyed twice, initially from fire and then storm. It became evident that the lighthouse should be constructed with stones but the small distance from the sea and the delay of setting and hardening of the lime mortars did not allow a safe construction. Smeaton started investigating the various materials and came to the conclusion that the lime mortars with lime which has been produced from the burning of limestone containing clay (Silica and Alumina) could set both in the air as well as more importantly in water. This observation is considered to be the first essential step for the production of cement in the form in which it is produced today. Similar development of that period refer to France and one attributed to Vicat and Lesage. There also exist other invention s

with respective patient diplomas, like the Roman cenat of Parish Priest James Parker. The most systematic preparation of cements is attributed to the English engineer Joseph Aspdin who gave to the material (and obtained a patient diploma) the name which is also used today Portland cement. This name was given because the colour of hardened cement was very similar to the colour of rocks in Portland. Today (in the installation of British cement industry) one of the stone kilns which were used by William, Aspdin's Son, to produce cement is still preserved.

Since then, cement production spread through out the world and continuously evolved so as to reach the contemporary development stage.

Today more than 1.5 Billion tons of cement are annually produced worldwide, and the concrete which is produced from the concrete exceeds 10 b. tons making cement and concrete one of the most important structural materials of our era. This is an accomplishment following a number of significant development having taken place with in the last 80 – 100 years.

2.1.3 GLOBAL PERSPECTIVE

It is estimated that more than 1.5. billion tons of cement is produced annually in the world, this include Europe, America, Asia, Russia, Arabia and Africa.

In Japan the Mitsubishi materials corporation which is involved in metal extraction have established itself as one of the leading cement producers of Japan.

Portland cement which first started in England has assume a worldwide leadership in the world when it comes to cement production.

Lafarge another world giant in cement production has bought over the blue circle of London shares has established herself recently as a challenge to Portland cement Lafarge have been aquring shares especially in most of African cement company's in the world example of Banburi cement of Kenya which is one of the largest cement plants in Africa and of recent Ashaka cement.

Heidelberg cement has been actively involved in cement production in Asia

Turkey and Africa. In Africa alone Heidelberg cement operates five cement plants, nine griding facilities and two import terminals with the exception of Tanzania all locations are in ten West Africa countries south of Sahara i.e. Angola, Benin, Congo Gabon, Ghana Liberia, Niger, Nigeria, Sierra Leon and Togo.

In 1989 most European cement companies came under an umbrella body called CEMBUREAU, that is the association of cement industry in northern, Western, and Southern Europe to was with the aim of consolidating their gains, and with a qumick of concern to the Environment and sustainable development, they use instrument in articulating a commitment and formulating a document titled the European cement industry Approach to the environment, it covers the technical as well as the political aspects of the industry attitude to its impact on the environment with statements on 10 specific areas. Sulfur Dioxide, Nitrogen Oxide, Carbon Dioxide, heavy metals and hydrocarbons. This has created an approach to solving cement pollution in Europe and it has became the first step in the world.

2.2 EFFECTS OF CEMENT INDUSTRIES IN THE ENVIRONMENT

Cement companies operations in the environment affects all the components of the environment such as land water and air or atmosphere as well humans. Operations such as quarrying and cement manufacture, convert a resource in the ground into sustainable improvements in the areas in which they operate and where their products are used. Environmental effects associated with the production of cement and lime include local effects from cement dust noise, waste, traffic and access to natural resources. More wide reaching effects include producing carbon dioxide as part of the manufacturing process generation of waste and disposal as well as acceleration of climate change.

2.2.1 The environmental effects is in the form of land use and raw materials extraction.

In cement manufacture about 1.6 tones of dry raw materials are required to manufacture one tonne of Clinker the bulk of these raw materials is extracted from mines usually located as close as possible to the cement plants to reduce transport cost and other problems during the processes of extraction of raw materials, land is rendered valueless as more land meant for agricultural purposes are converted to mine pits, creating gullies, at times dislodging settlers who have to go to other places to convert virgin lands to residential purpose leading to the cutting down of trees aggravating the process of deforestation. In most cement quarries nowadays the use of blasting process is a daily affair causing fly rock phenomenon, noise, dust and vibrations. Vibrations from blasting usually caused weaker lines of the crust to collapse, weakening nearby culverts, bridges and shaking foundations of buildings etc.

2.2.2 SOILS: -

Dust deposition on soils due to dust that arises in quarry site may have detrimental effects on soil as this may contain certain elemental particles both metallic and non metallic which may reduced the soil fertility. This particles may also affect vegetation growth and germination. Capping of tailing ponds may also occur thereby affect ponds aeration ability.

2.2.3 FLORA

Flora will be affected in many ways including changes in surface water which supports vegetation of water plants such as lilies, when surface water is affected fauna which depends on such surface water for existence will face extinction changes in underground water may also occur due to deep excavation and blasting while extracting raw materials. Durst deposition will affect photosynthesis this then threaten the vegetative cover of the land as well as the fauna which depends on this vegetation for survival phytotoxic metals and reagents effects on flora also do occur in such areas. Crop yields and pasture for man and animals in quarry sites became diminished or even non existent. While new habitats may spring up after decommissioning.

2.2.4 FAUNA:-

The aquatic community is being affected by the activity of cement company's at quarry sites due to water pollution during extraction and excavation process as the water source of these fauna is polluted diseases and epidemics will occur; water Eutrophication may also occur in some areas i.e. increase in nutrients, elevated temperature, depletion of oxygen, increase in algal growth and reduction in level and variety of fish and animals.

Aquatic habitats are threaten by water control measures, and post closure measures. Agricultural stock became affected by durst especially metallic durst, vibration due to blasting.

2.3. υ WATER (Surface and Underground)

Extraction of raw materials for cement factories from quarry sites have effect on water quality especially surface and underground water.

2.3.1 EFFECTS ON SURFACE WATER: -

At quarry sites where cement raw materials are extracted, the surface water is seriously affected with changes in water character. (temperature, dissolve gases etc) due to dewatering related surface discharge. Contamination also arises due to in – mine discharged to surface. Which eventually and into body of surface water, also contamination by processes water is possible. Run off from stockpiles, spoil heaps, tailings and setting ponds, site structure made of mine rocks do end up into surface water bodies causing pollution. Another source of contamination is from accidental spills, reagents, fuels, ores and process water etc.

2.3.2 EFFECTS ON GROUNDWATER:-

Underground water quality is affected in cement quarries mainly due to contamination from reaction with mine workings, backfill, oxidized in-mine mineralogy, spills, and sewage all this find their way into the underground water thereby coursing contamination. The movements of contaminated mine waters after mine closure is another sources of pollution also wide spread covering of water levels, due to dewatering happens to be another source of concern.

2..4 ATMOSPHEREIC EFFECTS:-

According to GERARD KIELY in his book title Environmental Engineering 1996. he described air pollution as an atmospheric condition in which substances exist at higher concentration higher than normal background or ambient levels is said to be polluted if it has measurable effects on humans, animals, flora or materials example of Acid rain on buildings. For instance the London Smog of 1952 which was the worst Smog to afflict London and perhaps the worst air pollution episode in world history, in this Smog more than 4000 were injured on a single terrible weekend, this demonstrate the atmospheric effect of pollution of the cement industry to its inhabitants. A visit to any cement industry in Africa and Nigeria for example the Ashaka cement, you will see a thick dusty emission which spews from chimneys of the factory going as high as more than 200 metres high above the chimneys and traveling for more than 5000 meters (5km) before its thickness is reduced and then disappears. The above describe how cement industries have been polluting our good natural atmosphere. See fig. 1

2.4.1 AIR POLLUTION AT CEMENT MINE:-

Air quality from mine vents consist of fumes from blasting and engines such as excavators which produce large quantity of cement raw materials durst into the atmosphere. Durst also emanates from transportation, handling, and stock piles, in addition also dust from beaches of tailings and setting ponds also contribute to the pollution of the atmosphere, during transportation of raw materials from quarry site to quarry grinding station a lot of cement raw

materials dust is produced. At the quarry grinding station a lot of durst is also produced and spews into the atmosphere.

2.4.2 EMISSIONS TO AIR: -

They key emission from the cement manufacturing process are emission to air of oxide of nitrogen (Nox) sulfur dioxide (So_2) carbon dioxide co_2 etc and particulates.

Oxides of Nitrogen:- Although oxides of Nitrogen are been produced by a range of industries as well as by motor vehicles, Nox can combine with volatile organic compounds to produce ozone and photochemical smog. In cement industry, Nox are produced as a direct result of the high temperature flame in the cement klin. In Australia the cement industry is using alternative fuels in cement manufacture in order to reduce Nox emissions. Nitiric oxide is a colourless, odorless gas, while Nitrogen dioxide is a red – brown gas with a pungent chocking odour. Although other oxides of Nitrogen exist such as No_3, N_2o, N_2o_5, only No and No_2 are dominants. No are emitted into atmosphere in greater quantities than No_2 (the reverse of Co and Co_2)

Once in the atmosphere same No is converted to No_2 by the process of Photolysis (ultraviolet sunlight energy) and does not involved a reaction with 0_2.

Many of the serious effects of Nox pollution result from the formation of photochemical oxidants which are harmful components of photochemical smog.

3.4.3. SULFUR DIOXIDE:

Sulfur dioxide (So_2) from cement manufacturing originates from both cement raw materials and fuel. However calcium compounds bind most of the sulfur into the Klinker. Thus the condition within the cement kiln essentially 'scrub out' the majority of potential $S0_2$ emissions from cement manufacture, this is applied to cement factories in Europe and Australian facilities but is not practical in Africa and Nigeria.

Oxides of sulfur in the atmosphere undergoes reaction and produce sulphuric acid.

2.4.4 PARTICULATE MATTER (Dust Emission):

Particulate emission from cement manufacturing arise from a range of activities, including raw materials extraction and handling, Kiln processes, cement grinding and handling. Particulate matter ranges in size from as small as 10^6 mm to as large as 1mm. Because of their very small in size, they remain in the atmosphere for periods and can travel great distances. They will on their own or on agglomeration with water droplets, settles to the earths surface. Particulate water is undesirable as it impede, lungs efficiency in humans and animals and this may leads to ashma in people. Particulate matter also interferes with plant growth when deposited on their leaves, it impedes photosynthesis by shielding sunlight from plant and it interferes with the balance of co2 between the plant and the atmosphere.

2.4.5. GREEN HOUSE & CLIMATE CHANGE

The potential for climate change as a result of increased atmospheric levels of green house gases is an issue concerning governments and communities around the world. International negotiations on the UN framework

convention on climate change began in 1988. and many government have ratified the convention, committing to limiting the growth of green house gas emissions, such countries as Australia and some European countries are signatories and also the cement industries of such countries entered into agreement with their home government in limiting emissions from cement manufacturing. The cement manufacturing industry has been a culprit on green house emissions. As with many other industries, green house gases are produced directly from the burning of fossil fuels and directly from the generation of electricity used. In addition the cement production process itself releases carbonioxide when the calcium carbonate in limestone is converted to calcium oxide during the production of Clinker in the kiln. As this chemical reaction is an essential step in the production process, cement manufacture emits relatively greater volumes of green house gases than other industrial, processes, this then leads to much concentration of green house gases in the atmosphere causing climate change which result into unpredictable consequences and some such as melting of ice at the poles leading to flooding etc.

2.4.6. INDUSTRIAL EFFILUENT DISCHARGES.

Cement industries uses fossil fuels and other hydrocarbons in their manufacturing processes as a source of energy, this include AGO Automatic Gas Oil, LPFO Low Power Fuel Oil popularly called Black lubricants also known as engine Oil, as well as other chemical substances also gypsum is an other raw material of great importance to the industry, All these listed above are being discharged as effluents from manufacturing plants of cements into their immediate environment;

Most of these effluents have the following listed below as some of the few materials that are found in their effluents and its associated effect in the environment

WASTE	NEGATIVE EFFECT
Soluble organics	Delete DO
Suspended Solids	Deplete DO & releases undesirable gases
Trace Organics	Affect taste, odour, & toxicity
Colour & turbidity	Affect Aesthetics value are toxic.
Heavy metals	Are Toxic
Nutrients (N & P)	Causes Erotroplication
Refractory Substances resistant to Biodegredation	Toxic to aquatic life affects health
Oil & floating Substances	Affect health
Volatile Substance	H_2s and other Voc course air pollution
Human Waste	Cause diseases, epidemic, carries pathogenic micro organisms

2.4.7 NOISE & VIBRATIONS

Transportation of raw materials from sites to factory courses noise, raw materials (limestone) extraction by use of heavy equipment and machinery also contribute to high level of noise. The most frequent freighteing noise is caused by Blasting at quarry sites. This activities i.e. the use of heavy machinery and blasting causes vibrations as well.

2.4.8 LANDSCAPE:

The extraction of raw materials from quarries do have visual impacts of over ground structures such as trees, damage to termite colonies etc. changes also do occur in landuse as more agricultural land is converted to mining sites, people shift to other lands, and clear more land forest for cultivation leading to deforestation and desertification.

Poor rehabilitation of mining sites leads to the creation of gullies by erosion and water pollution with much negative impacts on farming activities, fishing Ponds, are destroyed,

Tourism and residential places are affected due to conversion of such places to mining sites,

Amenity value is rendered valueless, cultural heritage especially places of worship and museums may be destroyed during extraction of raw materials.

2.4.9 EFFECTS ON HUMAN BEINGS:

Cement industry have a lot of impact on human beings starting from the extraction of (limestone) raw materials from quarry site to the factory for processing, it is during the process of extraction and factory production that most of there impacts become manifest through the emissions of oxides of Nitrogen, sulfur and particulates matter etc.

Most of these emissions affect human health in many more ways. First and foremost these emissions affects the health of workers through their inhalation as the dust settle in the lungs it produces some chain reaction, by depriving the lungs of O_2 supply and it may manifest as cough, catarrh, and

leading to ashma in patients Also these emissions causes skin irritations and skin peeling

Effluent discharge from cement kilns, contains organic and inorganic substances which pollute water sources and if such water sources are being patronize by human beings it may lead to breakout of diseases and epidemics. As in the case of cement companies of Britain i.e. (Rugby cement, Blue Circle and castle cement). In 1997 when they are made to account for their pollutions of public water supplies and air quality "as reported by the friends of the earth campaigns" people suffered from the polluting effects of the cement industry while the official watchdog appears to have been toothless and idle, the environment Agency has acted more like an industry poodle than a tough public guardian, An independent investigation into the control of the big polluting industries is desperately needed. Meanwhile the cements companies should be told to stop burning toxic wastes"

The Friends of Earth called for a full scale investigation into the incident.

Cement durst and emissions affect agricultural yields especially cotton in Ashaka. These emissions prevent cotton fruit from ripening and bursting, and even if it does its being darkened by emissions from the cement industry.

In some crops photosynthesis does not take place as it is suppose to be because of blocking of the stomats by cement durst. Effluents from cement plants when discharged into rivers or lakes it affects the fish population and leads to fish eaten by man it leads to biological accumulation magnification polluted waste when consumed by man leas to stomach pain, diahorrhea and vomiting sometimes death as in the case of Ashaka cement in June 2003

2.5 Employment:- Cement manufacturing plants create unemployment in some cases while in some it creates employment, like the case of Ashaka cements where the people main occupation is farming, their farmland were converted to quarry sites, while the communities lacked education than to gain employment with the industry.

Chapter 3

3.0 DATA AND COMPUTATIONAL TECHNIQUES

3.1 DATA

Data collected for the purpose of this research was gathered through site visits and observation from which the use of questionnaires was administered to the communities and also water samples were taken and analysed in the laboratory.

During the survey within the research domain the following areas were observed.

i. The quarry site, where raw materials (limestone) is extracted.
ii. The Factory.
iii. The communities living within 5km Of company's perimeters
iv. The communities sources of water
v. The communities Farmlands
vi. The factory's effluent upstream to its final discharge point.

3.1.0 USE OF QUESTIONAIRES

Questionnaires was designed (see appendix……) and used during the research and this was administered to the following target groups

a. The factory workers
b. The factory's Senior workers
c. The host communities
d. The Communities leaders including their Chiefs.

3.2 EXPERIMENTAL ANALYSIS ON WATER SAMPLE

Analysis is the process that leads to the determination of the amount of a substance or chemical in a sample. The process of determining the identity

of the sample is called qualitative analysis, while the process that deals with the determination of the amount of substance in a sample is called qualitative analysis.

The experiment that was carried out to qualify and quantify the sample are explained below:

3.3.0 SAMPLING METHODS: AND ANALYSIS

There are two types of scientific sampling methods and this are:

a. Grab sampling and

b. Composite sampling.

As for the purpose of this research the method adopted is the grab sampling method with same special attention and precaution paid to taking samples from surface to little depth so as to get a true representative of the sample.

The water sample was collected using a clean container washed with detergents and rinsed properly with water and allowed to dry the containers were then taken to the sites where a sample of the water was used to rinse the container twice before taking the actual sample for analysis. The containers was then cocked and sealed with as cellotape to prevent air entering into it the sample was then taken for analysis. The sample collected from river gongola is upstream before the point of its meeting with the effluents stream

3.3.0 WATER ANALYSIS, RESULITS AND RESULITS DISCUSSION

3.3.1 DETERMINATION OF PH:

Definition the PH of water sample at some selected sites were obtained.

If the PH value is less than 7, then the solution is acidic but if greater than 7, is alkaline.

APPARATUS:- PH meter, beaker, and magnetic stirrer

REAGENTS:- Buffer solution, water sample

PROCEDURE:- the PH meter was standized at PH close to that of the sample and was checked against a buffer. A 100 ml beaker was Rinsed properly with a distilled water and then the sample of about a magnetic stirrer was dropped inside it this sample was taken to the PH meter and switch on. The tip of the electrode was removed from the buffer solution and placed in the sample and the corresponding PH of the sample was read off simultaneously when PH meter was stable the electrode was removed and place again on the buffer solution.

RESULT OF THE PH

SAMPLE A, RIVER GONGOLA – 7.95
SAMPLE B, EFFLUENT STREAM – 6.0
SAMPLE C, BOREHOLE – 7.14

WHO STANDARD 6.9 - 9.2

DISCUSSION OF RESULT.

The result obtained from the water sample analysis above are compared to (WHO) world health organization water quality standards. From the result above it can be seen that some of the parameters are within acceptable limits, while some are above the acceptance set limits. Indicating that the situation is not normal.

The PH for sample B is above the normal WHO set limits, excepts that of the borehole which falls within the acceptable limits of 7.14. also the river Gongola sample A is within the acceptable range.

The effluent stream sample B which is not within acceptable range is acidic in nature and this can affect reproduction in fish and most aquatic life, it will also disrupt food chain by killing aquatic plants, insects and invertebrate on which fish depends upon for food, Acidic alters fish body by destroying fish gills, prevents oxygen uptake by the fish, causes bone decalcification and disrupt muscle contraction. Another dangerous effluent is that acid water leaches toxic metals such as mercury and aluminum out of soil and rocks. Human health is also not spared, this may be the cause of epidemics breakout within the area.

3.3.2 DETERMINATION OF CONDUCTIVITY:- conductivity is the measure of the ability of a solution to conduct an electrical current and is proportional to the concentration of ions in the solutions. The electrical current is conducted in the solutions by the movement of ions and so the higher the number of ions (that is the greater the concentration of dissolved salts) the higher the ionic mobility and so the higher the magnitude of conductivity. Also the conductivity 'K'

$K = Y / E$

Where Y = Electric current density

K = Electric field strength.

APPARATUS:- conducto meter, magnetic stirrer, 200 ml beaker and sample.

PROCEDURE:- 100ml of the sample was introduced into a clean beaker rinsed with the sample, A magnetic stirrer was placed in it and taken to a conductometer. The tip (cell) of the conductometer was place in the sample and the conductivity was read off simultaneously.

Note: it should be noted that the tip of the conductormeter (cell) was rinsed with distilled water before and after the experiment.

RESULTS OF CONDUCTIVITY

SAMPLE A - 0.9×10^{2USM}
SAMPLE B - 2.1×10^{2USM}
SAMPLE C - 0.12×10^{2}

WHO STANDARD $2.5 \times 10^{2\ USM}$ - 2.5×10^{3USM}

Chemically pure water does not conduct electricity since the only ions present are H^T and OH^- so the conductivity of very pure water is about 0.05 NS/cm.

From the results sample C has the lowest conductivity of 0.12×10^{2USM} it falls within the acceptable limits. Sample A has a conductivity of 0.9 $\times 10^{2USM,}$, while B the effluent stream is 2.1×10^{2USM} it is also within the acceptable limits but is higher than the 2 samples ie. (A&C). this may be due to the presence of tatal solids and dissolve solids being discharged by the factory.

3.3.3 DETERMINATION OF CHEMICAL OXYGEN DEMAND (COD)

Chemical oxygen demand (COD) is the amount of oxygen required to oxidized organic matter present in the water sample.

APPARATUS:- Round bottom flank, reflux apparatus, stirrer, measuring cylinder, pippete & burette.

REAGENTS:- distilled water, 0.25N potassium trioxodichromate ($K^2cr^2O^3$) mercuric oxide (Hgo) silver trioxomitrate (VI) (AgNo3) suphnic acid, O.25N fero's ammonia nitrate phenolphthalein indicator.

PROCEDURE:- Two round bottom flasks were collected one labeled 'A' and the other Labelled 'B' To flask 'A' 50ml of water sample was added.

And flask 'B' 10ml of water sample was added. Each flask was diluted with 25ml of 0.25N of $K_2cr_2o_3$ which is in excess, 0.3g of Hgo was also added to each flask. Then 0.2g of Agno 3, which acts as a catalyst, was added each flask also. Also 75ml of concentrated sulphuric acid is added to both flasks to acidify the solution for reaction to take place. Gently it was stirred to distribute heat evenly so that the glass would not crack. The products from each flask are refluxed for one hour each (boiling chips is added because of the acid).

After reflux, the products are cooled and poured into a beaker properly rinsed with excess water the level of the products in the beaker was increased to 350ml mark with distilled water to dilute the acid 2 –3 drops of phenolptholin indicator was added to each and the titration of the ferrons ammonia nitrate fe (NH4 NO3) against the solutions was carried out and the various titer values were obtained.

The difference between the titer values of sample A (blank) and sample B is the value of the chemical oxygen demand (COD).

Calculations:

$$COD = \frac{(B - S) \times N \times 1000 \times \text{equivalent weight of oxygen}}{C}$$

Where

B = Volume of standard fe (NH4 N03)2 for blank titration

S = Volume of standard fe (NH4 N03)2 for sample titration.

N = Normality of the standard fe (NH4 N03)2

C = Volume of sample used for the test

RESULT OF CHEMICAL OXYGEN DEMAND (COD)

SAMPLE A	-	8
SAMPLE B	-	14
SAMPLE C	-	3
WHO STANDARD IS	-	1 - 5

CHEMICAL OXYGEN DEMAN (COD):- The COD of sample B the effluent stream is high and is above the acceptable limits, also the COD for sample A river Gongola is above the acceptable limits, while that of sample C is within the acceptable limits of (1 - 5) for WHO. Sample C the borehole is the best source of water.

3.3.4. DETERMINATION OF BIOCHEMICAL OXYGEN DEMAND (BOD)

Biochemical oxygen demand is used as a measure of the quantity of oxygen required Mg/L for oxidation of biodegradable organic matter present in a water sample by aerobic biochemical action.

Oxygen demand of waster waters is exerted by three classes of materials

1. Carbonaceous organic usable as a source of food by aerobic organisms
2. Oxidizable Nitrogen compounds which serve as food for specific bacterial (e.g. Nitosomoas and Nitrobacter)
3. Chemical reducing compounds e.g. fe_2 so_3 which are oxidized by dissolved oxygen.

BOD5:- This is measured by incubation of a sample in the dark for 5 days at 200c. this means oxygen consumed by bacteria during oxidation of organic matter (bio – degradation) in 5 days at 200c. this period of incubation has been considered suitable for bio-degradation of considerable amount of

organic matter in the sample. The standard methods of determination is as stated bellows.

APPARATUS:- Incubation bottles, incubators, burrette pippete, test tubes, dropper.

REAGENTS:- distll water, sample Buffer solution, magnesium sulfate, calcium chloride ferric chloride, conH2So4, mgso4 sodium thiosulphate, starch, solution indicator

PROCEDURE:- Eight incubators bottles were prepared by washing them with distilled water and then with rinsed with sample. 250 ml of distilled water was aerated for. 1 hour before adding 2ml of each of the followings solutions A, B,C, & D

Where solution A = is a buffer solution

B = is magnesium sulphate

C = is calcium chloride

D = is Ferric chloride

20mls of the sample was taken into two different incubating bottles, four incubating bottles of each sample was kept in an incubator at 250c for 5 days. While the remaining incubating bottles containing each of the sample was treated by adding 2ml of each of the solution. Con H2so4 (5:1) mgs04, it was then titrated with sodium thio sulphate to pale yellow before adding 2 drops of the starch solution indicator which makes it become black. The black colour becomes colourless. The titre value was obtained and then multiplied with the volume of the incubating bottle used and recorded.

The same procedure was followed on the remaining four bottles kept in the incubators nad the result obtained was recorded. The four samples which were not incubator are called dissolved oxygen DO.

$$DO = \frac{\text{titre value} \times 0.2 \times 1000}{}$$

Volume of bottle

While the bottle kept under 25oc in incubator is called biochemical Oxygen demand.

$$BOD = \frac{D1 - D2}{0.2.} \quad \frac{\text{(Average Volume of bottle)}}{}$$

where D1 = Dissolved oxygen before incubation

D2 = Dissolved Oxygen after incubation

0.2 = is the Volume of sample taken.

RESULT AND DISCUSSION OF BOD

SAMPLE A - 17

SAMPLE B - 21

SAMPLE C - 2

WHO STANDARD 1 - 6

BIOCHEMICAL OXYGEN DEMAND (BOD):- The BOD for both sample A and B are above the acceptable limits, But that of sample C is within the acceptable limits of WHO water quality standards so both sample A and B are not fit for human consumption and this may be the cause of certain sickness and ailment experience by the communities.

1. **HARDNESS**

SAMPLE A	-	95	
SAMPLE B	-	138	
SAMPLE C	-	42	
WHO STANDARD	**100**	**-**	**500**

3.3.6 HARDNESS:- Both sample A and C that is the village borehole and the river gongola samples hardness falls within the acceptable limits, while that of sample B the effluent stream is above the acceptable limits, this is due to the presence of carbonates compounds of calcium

& magnesium from the factories activities and lime which is principal raw material for the factory.

RESULT OF TDS

SAMPLE A - 49

SAMPLE B - 97

SAMPLE C - 22

WHO STANDARD 100 - 1000

3.3.7 TOTAL DISSOLVED SOLIDS:- (TDS) The total dissolve solids in all the 3 samples falls within acceptable limits of the WHO water quality except that of the effluent stream is higher than that of the river and the borehole.

3.3.8 DETERMINATION OF HEAVY METALS:-

(By the Atomic Absorption Spectro-Photometer) the sample was first digested in an acid by mixing 100ml of the sample with 5ml of concentrated Hcl. It was then evaporated to 10ml in a beaker by placing it on a hot plate and diluted to 10ml in a 100ml volumetric flask with distilled water.

A standard solution of the desired element under analysis was first aspirated and the observance recorded. The samples were then Aspirated and the observances were calculated from the calibration curves of observation Vs concentration (PPM) of the Standard see result

The wavelength, lamp current, band pass burner height for each element determined was recorded.

RESULTS OF HEAVY METALS

1. COPPER
   SAMPLE A - 0.76
   SAMPLE B - 1.83
   SAMPLE C - 0.32
   WHO STANDARD 0.05 - 1.5

2. **LEAD**
   SAMPLE A - 0.96
   SAMPLE B - 2.14
   SAMPLE C - 0.27
   WHO STANDARD 0.05 - 0.10

3. **MANGANESE**
   SAMPLE A - 0.88
   SAMPLE B - 1.36
   SAMPLE C - 0.18
   WHO STANDARD 0.05 - 0.5

4. **SELENIUM**
   SAMPLE A - 0.57
   SAMPLE B - 2.11
   SAMPLE C - 0.16
   WHO STANDARD

5. **IRON**
   SAMPLE A - 1.88
   SAMPLE B - 1.69
   SAMPLE C - 0.30
   WHO STANDARD - 0.10 - 1.0

6. MAGNESIUM

SAMPLE A	-	44
SAMPLE B	-	68
SAMPLE C	-	20
WHO STANDARD	-	**30 - 150**

7. CALCIUM

SAMPLE A	-	53
SAMPLE B	-	39
SAMPLE C	-	18
WHO STANDARD		**75 - 200**

The level of heavy metal concentration in sample C, that is village only functional borehole is less and within acceptable limits, metals such as copper, lead, manganese, magnesium, calcium. While the level of concentration of these metals is higher than the acceptable limits of WHO in water sample 'B' the factory's effluent stream; the level of concentration is also higher in sample 'A' river gongola but is not as high as that of sample 'B' these metals have effects on both animals and human beings, lead poisoning have a devastating effect on the intestinal track the lungs and the skin lead poisoning also causes brain damage in children and adults, it also affects borne marrow of the unborn as well as other deformities in features, its extreme consequences, may range from high blood pressure in adults to low intelligence quotient in children. When the level of lead concentration is high in blood exceeding its threshold limit of 0.5 mg/cm^3 paralysis of the limbs, anemia or death may occur.

Though copper is biologically essential, a balance between absorption and excretion has to be maintained, otherwise its excessive

retention in the body may cause diseases of the liver and central nervous system, it also causes Hepatic diseases.

Manganese: exposure to manganese may bring aching limbs, back pains, nervousness, drowsiness and lack of bladder control, it can induce pnemonia nasal congestion and nose bleeding selenium can cause depression and irritability as a neuratic effects, it accumulate fluids through out the body and is destructive to liver, In addition animal can become ill and die due to high concentration of selenium intake.

This follows food chain, Grass, plants, fruits containing considerate quantity of selenium eaten by animals in turn animals are killed and consumed by humans. The early symptoms of acute toxic effects are sore throat, fever, vomiting, irritation to eyes and nose, headache, gastro intestinal irritation, sleepiness or drowsiness, drop in blood pressure, darmatitis leading to vascular disruption.

3.4.0 ANALYSIS AND RESULT

Result (Mg/Litre)

Sample A River Gongola	**Sample B Effluent stream**	**Sample C Borehole**	**WHO Standard**	**Parameters**
0.76	1.83	0.32	0.05 – 1.5	CU
0.96	2.14	0.27	0.05 – 0.10	PB
0.88	1.36	0.18	0.05 – 0.5	Mn
0.57	2.11	0.16		Sn
1.88	1.69	0.30	0.10 – 1.00	Fe
44	68	20	30 – 150	Mg
53	39	18	75 – 200	Ca
95	138	42	100 – 500	Hardness
17	21	2	1 – 6	BOD
8	14	3	1 – 5	COD
$0.9x10^{2}$ µSM	$2.1x10^{}$ µSM	$0.12x102^{}$ µSM	$2.5x10^{2}$ – $2.5x10^{3}$	Conductivity
7.95	6.0	7.14	6.9 – 9.2	PH
49	97	22	100 - 1000	TDS

3.4.1 SIGNIFCANCE OF THE PARAMETERS DETERMINED:

PH:- The PH is used to estimate the level of acidity and alkalinity of a solution which can be employed in corrosion control. Reproduction in fish and other aquatic life is affected by acidity especially when PH drops to about 5.0 this level can also disrupt.

the food chain by killing aquatic plants, insect and invertebrates on which fish depends for food

3.4.2 CONDUCTIVITY:- To check the extend of ionized impurities in water and it depends on the quality of dissolved salt in water.

3.4.3 DISSOLVED OXYGEN:- To know the amount of oxygen that is required by the water, less dissolved oxygen affects water, this will cause anaerobic condition and it will affect suitability of water for fish and other aquatic life.

3.4.4 ALKALINITY:- This is the measure of the capacity of natural water to neutralize acid. The main contributors to alkalinity are Hc03, C03 and 0H, phosphate, silicates amona.

3.4.5 TURBIDITY:- This is due to the presence of colloidal particles arising from clay silt and organic matter during rainfall of from spills and discharge of sewage and industrial effluent or to the presence of large microganisms, Turbidity is measured by an instrument called turbidimeter.

3.4.6 BIOCHEMICAL OXYGEN DEMAND (BOD):- In the assessment of pollution and effluent this is possibility the commonest and most versatile of broad effect. It depends to some extend on the medium and condition and composition of microbial population present.

3.4.7 TOTAL DISSOLVED SOLIDS:- In drinking water or river water samples it is sometimes desirable to know the fractions of solids that are suspended and also those from farmland, municipal, urban run off oil spills etc. into surface water to cause pollution, the accumulation of heavy metals may have adverse effect on aquatic flora and fauna and may constitute a public health problem whose contaminated animals organisms are used as food.

3.5 QUESTIONAIRE METHOD:

This is the second method adopted for this research. About 400 copies of questionnaires were distributed. They were administered at the following target group.

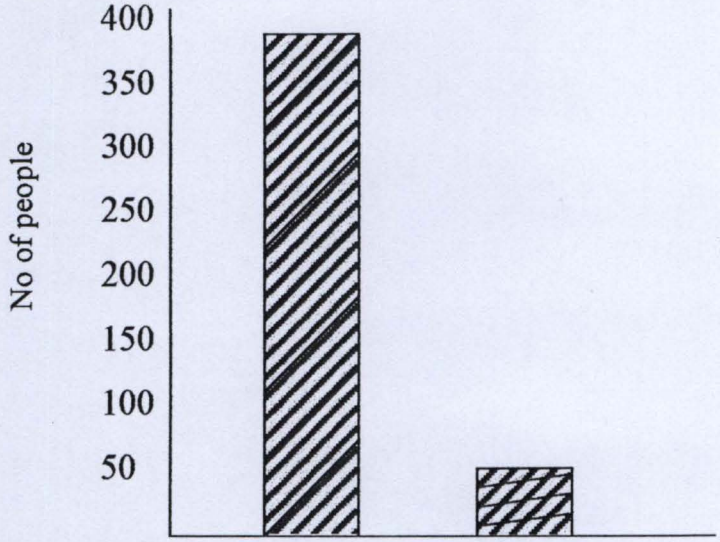
1. For the workers and the villagers and (380) three hundred and eighty copies were administered. While
2. The second type was for the cement factory supervisors and management and only 20 copies were administered among this group because of their refusal to say or write anything. The workers response was good, while that of the villagers was very encouraging. Both the adults and youths responded favourably, except women whom there was no access to them because of religion and customs.

The aims and objectives of the questionnaires is to know the answers to the following questions.

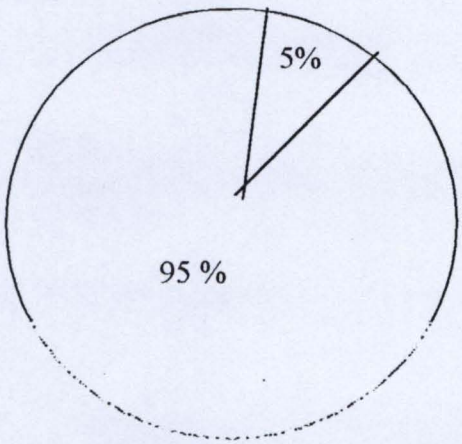
a. Is there any effect of the industry on the life of the people ?.
b. What type of diseases are common to the people as a result of the industry.
c. The type of sanitation available in the industry and homes to prevent diseases.
d. Whether any ecological disaster was witnessed in the area
   i. The type,
   ii. The time of its occurance.
   iii. The degree of severity.

3.6 RESULTS OF QUESTIONARIES METHOD

From the results of the questionnaires administered. About 395 people acknowledge that the industry have effects on their life's while 5 people did not know exactly what the effect is all about due to illiteracy.



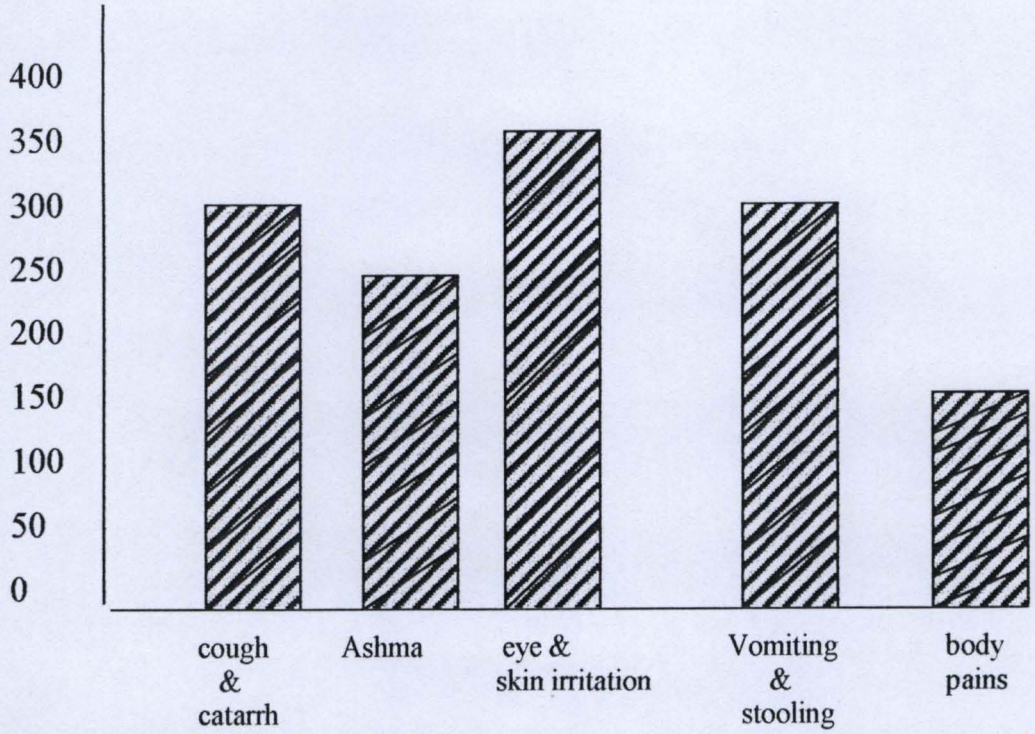
a bar chat showing response to the effect of the cement industry.



Above is a pie chart showing peoples acknowledgement to the effect of the industry in their environment.

On the type of diseases and sickness that are common due to the sickness that are common due to the presence of the industry, the response were as follows, about 300 people complain of cough and cattarh, 250 complained of

Ashma 350 for eye and skin irritations, 300 for vomiting and stooling, while 120 people complained of experiencing body pains.



a bar chart illustrating the type of diseases common to the communities due to the presence of the industry.

On the occurance of Ecological disaster almost all the respondents agree to its occurrence, leading to the death of many people while some people were hospitalized and some are still sick and weak due to the occurrence of the disaster which they described as water borne diseases, which emanated from their source of drinking water which is being polluted by the factory's effluent

The degree of severity of the disaster was described by all the respondent as being serious because of the number of people that were left dead which was estimated between 25 – 35 persons both Adult and children.

The occurance of the disaster was described to occur mostly during the onset of raining seasoning the area that between the month of may and June. This is due to the fact that at dry season the rate of flow of the factory effluent is at its lowest level, it is only characterized by accumulation of pockets of water in deep gully areas, and during raining season these accumulated pollutants were carried into the river gongola which is the community source of water.

CHAPTER 4

4.0 FINDINGS:-

During this research work the following findings were observed;

The company's factory's emissions into the atmosphere is responsible for the prevalent rate of diseases that have to do with reparatory system, such as cough, catarrh, and asthma e.t.c. within the communities surrounding the factory.

These emissions also contribute to properties damage reducing its values, properties such as clothes, vehicle, green areas and fruits, reducing the serene beauty as well as affecting roof tops of buildings.

During the dry season harmattan winds accelerates the rate of cement dust and emission dispersal to far distances contributing to the rate of temperature rise in the area contributing to global warming.

The company's factory effluent are being discharged into the river gongola indiscriminately without proper treatment before discharge: and even if these effluent are treated its does not tarry with laid down standards. Thereby affecting flora and fauna in the river.

It is also proved beyond reasonable doubt that these effluents has affected the water quality of the communities and its is responsible of the out break epidemics within the communities such as vomiting, stomach pain, headache cough, catarrh, asthma, skin itching and eyes irritations. e.t.c

The company has not provided the community with drinking water, other social amenities that are supposed to the enjoyed by the people of the area are non-existent.

4.1 RECOMMENDATIONS

In order to achieve the goals of sustainable development the cement company and the government should be fully involved in tackling environment problems due to cement productions.

4.1.0 THE ROLE, OF GOVERNMENT:-

The regulatory agency concerned with tackling pollution in the country should show more concerned by regular monitoring the environment especially water and air.

Set standards for the design, construction, installation and testing of waste water should be established in the country.
Laboratories should be established and equipped with modern facilities to act as research center for the control of water pollution in cement and other industries.

Stiffer penalties should be imposed on industries that have shown little or no concerned on government policies regarding pollution. The company management should be held responsible for its inability to control the pollution that has caused the spread of epidemics in the area. The company should be made to pay compensation to the affected communities. The polluter pay rule should be imposed.

4.1.1 THE ROLE OF THE COMPANY:-

The company should be committed to achieving a balance between economic development and the maintenance of the environment. Its goals should be in compliance with environmental laws as minimum standards, and work hard to achieve more.

The company should continue to:-

* Improve their environmental and safety performance
* Incorporate environmental and safety factors into planning decision.
* Comply with environment laws and regulations.
* Rehabilitate the environment affected by their actions and activities
* Promote environmental awareness.
* provide portable and clean drinking water to the communities.
* Provide health facilities.
* Be fully involved in promoting and planning of trees.

4.2 CONCLUSION:-

The Ashaka cement company is responsible for the health problems related to water and air within the host communities, through its air emissions and effluent discharge into the surrounding villages sources of water. If the activities of the company continue unchecked it will lead to the extinction of human race downstream within the area.

It is also evident from the results of analytical studies of heavy metal. Determination in the company's industrials effluents that some degree of environmental pollution is being caused daily through the discharge of the effluents to streams and on the river and land in immediate surroundings. This should give the government a serious concern to fix acceptable standards for disposal of waste water. It should be suggested to the industries to treat their waste by removing all these heavy metals and others pollutant before disposal. Inhabitants of the area should also be warned on the dangers of the use of the water for domestic consumption.

QUESTIONNAIRE FOR WORKERS/VILLAGERS

(1) Name of Village .....

(2) Was the Village there before the industry (Yes / No)

(3) If 'Yes' how long before the Industry.....

(4) What are the main Occupation of the people.....

.....

(5) Is there any effect of the Industry on the life of the People?.....

(6) What type of Diseases is common to the people as a result of the industry?.....

(7) What type of sanitation is available in the industry/homes to prevent diseases related to cement?

(8) How long have you settled in this area?.....

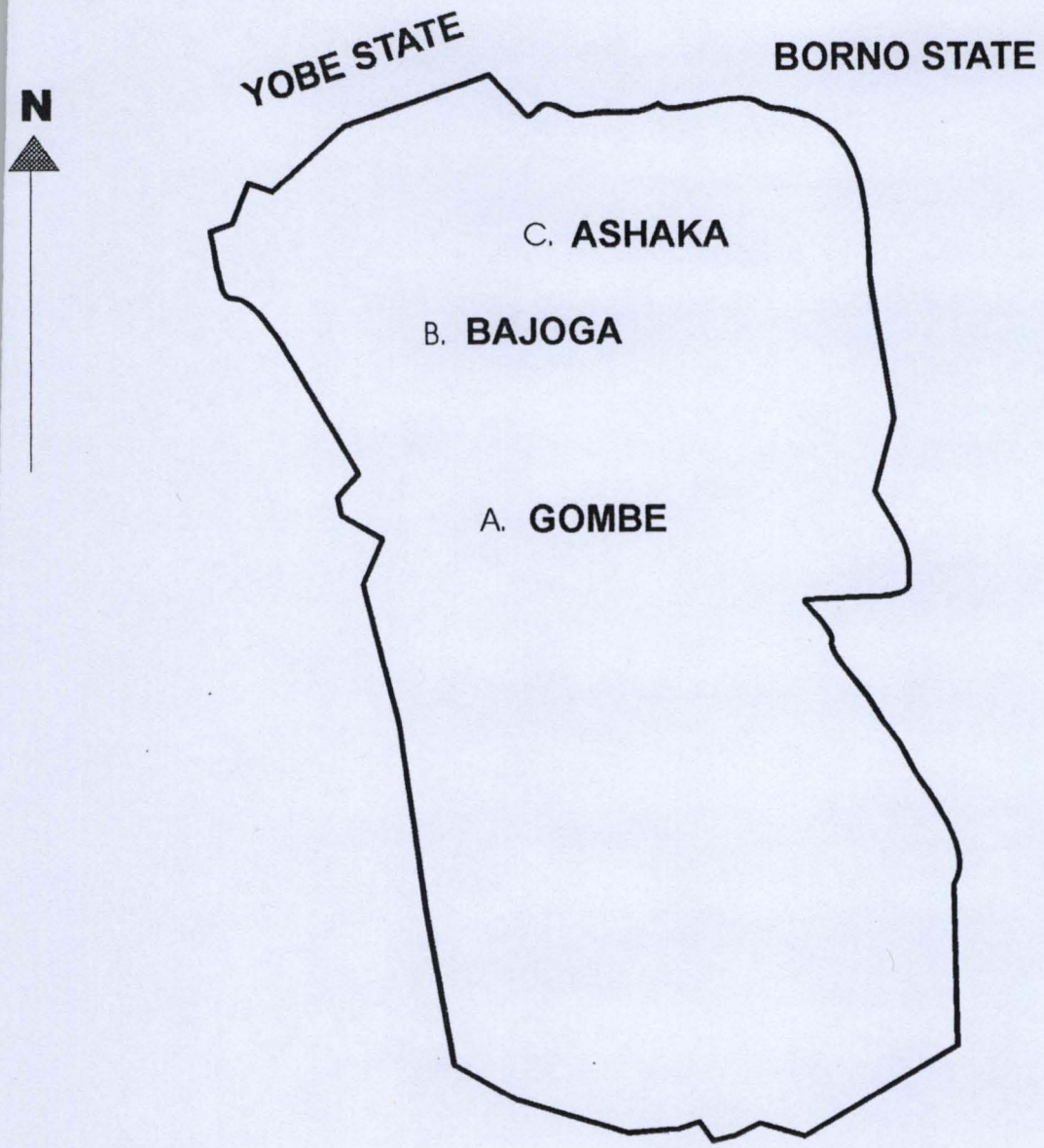
(9) Have you witness any Ecological disaster problem in this area?

b. If yes what type.....

c. And when does it occur?.....

d. What is the degree of it severity delete (serious, less serious, not serious).

GOMBE STATE MAP

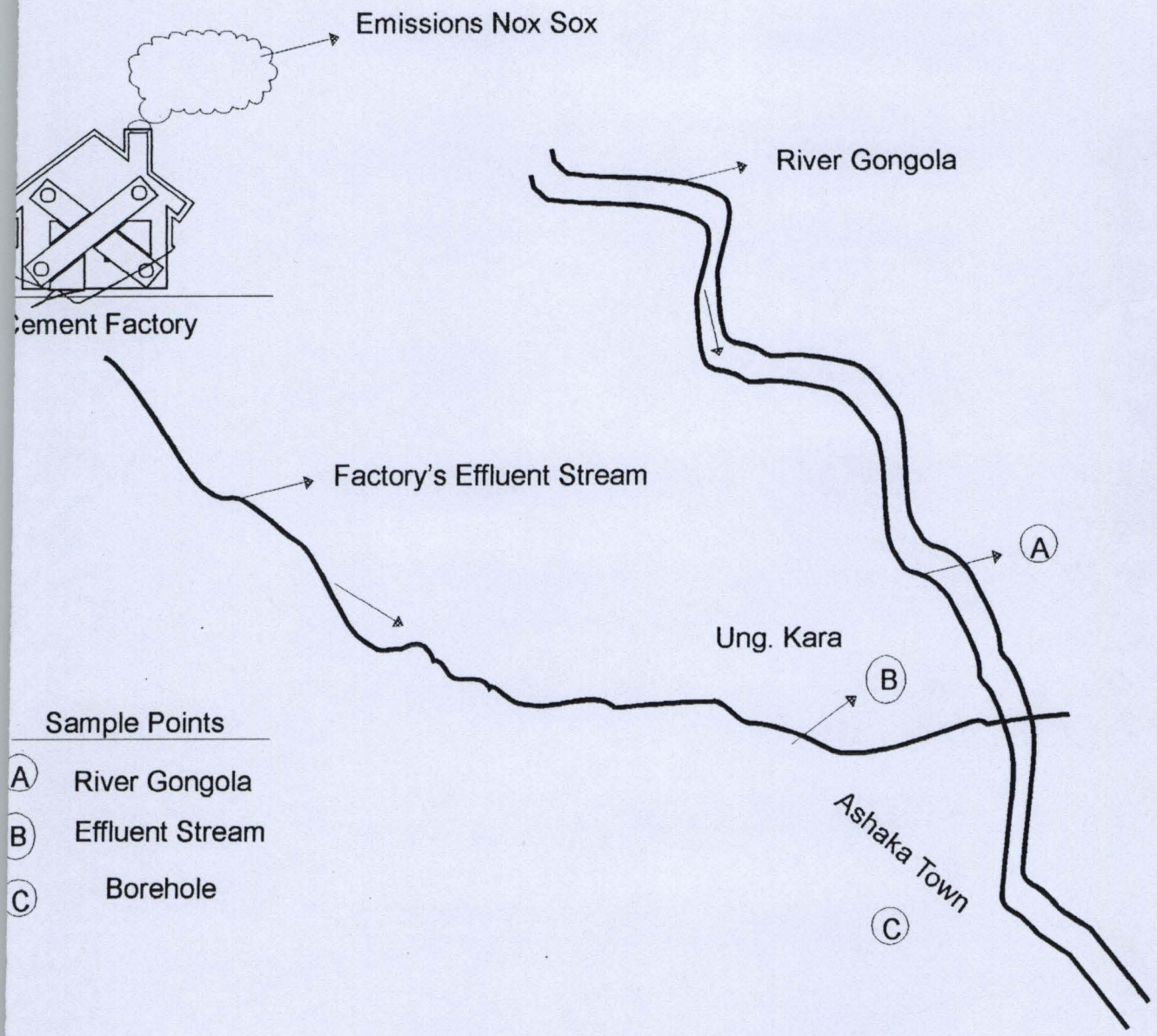


Gombe State Map Showing Ashaka Study Area.

A State Capital
B Local Government Headquarters Of Study Area
C Study Area

Fig 2

VIEW OF ASHAKA CEMENT FACTORY SHOWING AIR EMMISSIONS FROM ITS CHIMNEYS.



A schematic diagram showing study area and points where samples of water were collected.

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