THE EFFECT OF INDUSTRIAL WASTE ON THE ENVIRONMENT A CASE STUDY OF ANGLU JOS INDUSTRIAL AREA.

By

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BEING A PROJECT SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY FEDERAL UNIVERSITY OF TECHNOLOGY MIFOR THE AWARD OF POST GRADUATE DIPLOMA ENVIRONMENTAL MANAGEMENT.
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CERTIFICATION

This is to certify that this project has been undertaken by Murtala Musa Nuhu under the supervision of Professor D. O. Adefolalu of the Department of Geography Federal University of Technology Minna Niger State.

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DECLARATION

I, Murtala Musa Nuhu do hereby declare that I undertake this research topic in my project as an academic exercise which I carried out myself without the involvement of another person, apart from the guide and assistance of the industry's personnel, residents of the study environment and my Supervisor and Co-ordinator.

DEDICATION

I dedicated this project to Alhaji Ibrahim Lawal Nuhu, my brother and to my uncle Alhaji Maikudi Muhammad Tafida.

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ABSTRACT

This research attempts to find the effects of industrial waste on Anglo Jos area of Jos south local government. The field investigation shows that industries are located close to the residential areas of Anglo Jos and generate enormous amount of different kind of waste (pollution), which are continuously being deposited within the neighborhood, including near by gutters and drainage channels. These obviously cause serious environmental problems such as land, air, and water pollution.

However it is clear from the field investigation that the residents in this area are not aware of their contribution to environmental waste pollution through their method of disposing their household waste. Smaller percentage of the people sampled admitted that they contribute to pollution in the area, while the greater percentage did not. This implies that majority of the population in the area are not aware of the extent of their contribution to environmental pollution through their activities. It was observed that waste generated by the industries are in form of liquid, solid and gaseous. It was discovered that most of the pollution in this area are as a result of gaseous and liquid effluents discharged into the environment by the industries. More importantly to make positive recommendation for the residents and industries, sanitation habit should be encouraged and provision of effective waste disposal system to the residents to avoid indiscriminate dumping of waste. Industries should be encouraged to have a waste treatment plant so as to reduce the toxic content of their waste being discharged into their environment.

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NTRODUCTION

The effect of industrial waste on environment is increasing rapidly as more and e industries are springing around the urban centers. These activities of industries are part of development processes. But these developments have tremendous ironmental implications, which if left unchecked can result in pollution and degradation he environment and its resources.

It is observed wastes generated by industries are in different forms i.e. solid, liquid gaseous. When they are exposed and released to the atmosphere, they pollute the ironment. It is important that we learn from the mistakes of the developed countries h that we protect the environment in our quest for development. With the recent areness of various environmental hazards that occurred in different part of the world, need for environmental protection against pollution cannot be over emphasized. Prior he 1970s industrial activities and urbanization where not pronounced in Nigeria, most ts of the country could have passed safety standards as regards to pollution effects but n the advent of oil boom in 1973-1978 there has been a dramatic increase in industrial vities that led to waste generation (Olafun, 2001). Presently, there are increase cases health hazards associated with environmental pollution in the industrial areas. These hetic situations thus raised questions on whether environmental pollutions are the price have to pay for industrialization. The issue of rapid growth and environmental pollution came more and more agitating when it is realized that pollution affects the vital essities of life, air and water (Mabogunje 1988)

These problems of health hazards caused by industrial activities are perhaps more hetic in Jos South along Anglo Jos area, where major industries of the state are ncentrated. In view of the various environmental problem associated with ustrialization, the federal environmental protection agency (FEPA) was established by degree No 58 of 30th Dec, 1988, charging the agency with general responsibility to mulate guide lines for environmental quality and atmospheric protection etc, and

nforcing regulation and laws (FEPA 1990) like most other developing countries Nigeria s for a long time embraced the concept of rapid industrial growth as the key for an erall economic development. So it is obvious that industrialization holds a very important e in terms of national productivity. These various industries are set up with diverse icipated goals, aimed at the development of the nations economy. These industries in eration are supplied with different raw materials that are the basis of their production, se raw materials are derived from both local and foreign source, they include dyes, tton, chemicals (that are more of then not toxic in nature) for example sodium hydroxide aOH), Sodium hydrogen sulphate ($NaHSO_4$) Sodium bicarbonate ($Na_2 CO_3$) and host of ners, after the utilization of those materials in the production process there is bound to be me waste which are referred to technically as "industrial waste" thus , this study is about e assessment of the effects of industrial waste on the environment.

STATEMENT OF RESEARCH PROBLEM

Industrialization is often seen as fundamental economic development and growth of y nation. This could be seen in the setting up of industries in most part of the country rticularly in state capitals such as Jos metropolis (oladipo, 1990). However the activities these industries have led to the generation of waste, which are hazardous to the vironment. Also growing cases of health hazards are caused mainly by industrial waste en release into the environment and this is of serious concern. The industrial area along, glo Jos such as Breweries, coca cola bottling company, Nasco detergent company and sco carpet company produces effluent which include dyes, acid, phenol cyanide, cium sulphide, and other forms of biological oxy-demanding-compounds which often llute water bodies meant for human consumption. More importantly there has been nstant out cry of environmental pollution arising from industrial waste as they affect ter bodies but also land, atmosphere and other living components within the vironment. Therefore government, non-governmental organisations, industries, public d individual efforts towards solving environmental problems is worthy of appreciation. wever, while the awareness campaign of environmental protection is on the high level llution effects are not well taken care of.

This work is therefore to examine the present level of environmental pollution posed by e industrial waste and to further educate the stakeholders on the need to maintain a high ality and sustainable environment in Anglo Jos industrial area.

AIM AND OBJECTIVES OF THE RESEARCH

The aim of this work is to examine the effect of industrial waste on the environment the industrial area along Anglo Jos, this can be achieved through the following jectives: -

i. To identify type of industries and their effluent in the area.
ii. To examine the effects of industrial waste on the Anglo Jos industrial area.
iii. To analyses the level of compliance by industries with the plateau environmental protection agency (PEPA) guide lines, and
iv. In view of the above to recommends possible solutions to industrial waste management.

3 SCOPES AND LIMITATIONS

This research is limited mainly with the environmental pollution in the industrial area glo Jos. This research limit itself to how industries in the Anglo Jos area affect its sidence and their effort to minimal the pollution problem.

4 JUSTIFICATION OF STUDY

The choice of Jos South L. G A were the study area is located is based on number reasons. Jos south serves as a focal point in terms of concentration of industries. Hence rious activities such as economic, industrial and social tend be more profound in this ea. Consequently upon these activities, waste generated particularly industrial are zardous to human health and other living components within the environment. This dy therefore hoped to bring awareness to people on the need to protect their vironment from industrial pollution. Similarly it is also hoped that research of this nature l help to add to the existing body of knowledge on the subject matter especially for veloping countries.

STUDY AREA

.1 LOCATION

The Jos plateau lies between 8^0 30' and 10^0 00' north and longitudes 8^0 30' and 10^0 east Nigeria. It is located at the extreme north of the Jos plateau massif in Nigeria at an vation of about 1,200 meters about sea level. Durman and Gyus (1979) established this a to be approximately 104kilomaters from the north to south and 80 kilometers from the t to west covering an area of about 8,500 square kilometers. The boundaries of the Jos teau are marked by step escarpment with descend of 600 Meters to the surrounding ins below. To the south of Plateau are Benue low lands extending southwards the plain River Benue.

The Jos Plateau is located at the geographical centre of Nigeria, about 1000 meter North east of Lagos, 400 kilometers south of Kano and 600 kilometers south east koto.

As a unique topographical area, a scarp 375 to 500 meters above the high plains of usa Land bound the Jos plateau, generally 1,000 meters above sea level. Accordingly, s latitude is bound to affect the climate and vegetation of the area in relation to geology.

5.2 CLIMATE

The high latitude of the Jos plateau has given rise to a unique climate conditions, ol temperatures in comparison with areas on same latitude. It experiences lower mperatures than most places in Nigeria, except Ibadan in Oyo and Mambilla in damawa state. It has a daily temperature of about 22^0C. Rainfall is high with about 1,500 m received during the year, 90% of this fall during the seven month from April to October e beginning of the season is marked by frequent thunderstorms of high intensity with a op in temperatures to about 200^0 c (69^0f) in August. Durman and Gyus, 1979.

During the dry season, the climate is dominated by the east trade winds (tropical ntinental) or the harmattan, the is a cool dry dusty wind which blows across west Africa om the Sahara desert, carrying along with it many small particles of fine sand and dust. uring the harmatan season, (December – January) temperatures often drops to below 5^0 c for example, in January, temperature dropped to about 8^0 c. The month of March and pril are the hottest months of the year as temperature raises, average daily temperature

y reach as 31^0c in April, the inter-tropical discontinuity (ITD) moves northwards and the nate is dominated by southwest wind (tropical maritime).

Apart from the general pattern of rainfall, the local wind system influences the local fall pattern, for example, the movement of cold air from the Shere hills to the ounding valleys affect the formation of cloud and results some times in the sectional fall experienced in Jos and Bukuru.

The varying temperature and rainfall has important implications for certain crop tivation and animal rearing. The climate favour cattle because it discourage the Tsetse s and the same area has attracted many temperate crops which are mostly grown along eams and mine ponds in the dry season.

5.3 SOIL AND VEGETATION

The soil of the Jos plateau, which is predominated by the volcanic lava flow, are ry rich in fertility and form the areas in which Irish potatoes is most wide spread (Kuru d Vom). On the second side is a soil derived from the more wide spread younger granite tcrop that are immature and less fertile ground of Jos Jarawa and Sho, while a latantic clayey soil has a low fertility grado which can only support tuber yam plants such as wild ms, coca yam and legume like groundnut found in some part of Bukuru and Gindiri, also ains such as millet, guinea corn, rizga and ridi has been widely cultivated before the vent of tin mining industry.

In a detail classification of Nigeria vegetation, Buchanan and Pugh (1960) have assified the vegetation, of the Jos plateau as a distinct type of it's own which lies on a nsitional zone between the south guinea savanna and the Northern guinea. This zone s woodland vegetation and it's climax vegetation. Though location in the northern vanna, the Jos plateau enjoys the woodland vegetation characteristics of the southern inea savanna, as a result of a high latitude and rainfall regimes. This thick vegetation ver was in existence at the beginning of the 20^{th} century.

Buchanan and Pugh (1969) also noted that the savanna woodland vegetation of the s plateau has suffered severe degradation by man with the result that today woodland is nfined to the steep most of the high plateau, which is less access able and consist of en grassy plains. These are heavily cultivated and gazed, and the only woody

getation surviving consist of "occasionally scattered trees" on rock out crops and casional patches of copies shrubs".

The rich vegetation cover high precipitation and variegated soil types supported an cultural economy of rich varieties of crops and wide range of livestock.

Deforestation is often attributed to the 20th century tin mining, although this process actually occurred on the plateau since before mining but minimal due to the fuel wood sumed on the plateau today is from the adjacent northern edge of the Plateau.

.4 POPULATION AND SOCIAL BACKGROUND

The population of Jos is evenly distributed but the largest concentration is Jos tropolis area, administration and industries are the strong "pull" factor that have led to h concentration of population, seeing that the are high chances of gainful employment cause Jos is an urban area with social amenities and good infrastructures.

The Jos plateau consist of a multiple tribes with the Jarawa, Afizere, Anaguta, kuba, Berom irigwe, Buji, Jal, being the most dominant. Also found is a reasonable mber of Hausas and Fulani. The area was long inhabited and besides was a political uge from neighboring empires of Borno, Jukun and Wamba.

5.5 TOPOGRAPHY

Generally the Jos plateau has a relatively flat terrain, often deeply incised by inciple Rivers, which drain the plateau in a radiance pattern. It drained mostly to rivers nue, Niger and Lake Chad, and also River Kaduna, which end in river Niger choeneich et. al 1993).

The main character of the surface relief of the plateau results from the resistant nes of younger and older granite, which constitute the plateau. The terrain is highly riable ranging from steep sided granitic hills to flat or undulating areas of either newer salt or sediment overlying granite (Macleod) et. al 1971).

5.6 GEOMORPHOLOGY

The Jos plateau is probably one of the striking morphological features in Nigeria. It an erosion relic since the unaffiliated younger granites are more resistant to erosion than

underlying crystalline Basement complex in the southwest and the southeast; the teau terminates in a perspicuous escarpment over 750m. In other places the more istant younger granite hills rise above the general level of the plateau.

The existence of the deep weathering profiles implies weathering under a favorable of environmental conditions including.

Readily weatherable rocks

Tropical humid climate, with seasonal incident rainfall of alternating wet and dry riods.

) Low relief surface, which minimizes removal of the weathered mantle.

) Fairly long periods during which the above conditions remains stable.

Other processes of weathering on the Jos plateau include block and granular integration, exfoliation and basal sapping.

5.7 GEOLOGY

There are bee man rock types that exist on the plateau the basement complex cks including older granites and metamorphic rocks (gneisses and magmatites); the unger granite from which tin be (cassiterite) originated and the older and newer basalts. ne granites, and to a lesser extent the basalt, are quarried for construction purpose. The unger granite consisting of heavily fractured rocks holes considerable amount of water. choenich 1986). The Plateau rocks yielded a varied landscape comprising an undulating ain of heavily weathered older granites and metamorphic rocks into which the younger anites and Basalt intruded. The intrusion became either granite hill with inselbergs and ectaculartors or basalt lava flows associated with volcalnic cores, the features which ntributed to the seenic beauty and tourist potential of the plateau (Adepetu, 1986). Rock eathering on the plateau has produce various other useful products including kaolinite, ricrust (laterite) and quartz sand. It also realized the tine over and colombite, which comes deposited in alluvium along river channels, as did some precious stones such as methyst, emeraid and topaz. This deposition has encouraged mining.

.8 DRAINAGE

A dense network of streams, which constitute headwaters of the major rivers ining Nigeria, drains being the hydrographic centre of Nigeria the Jos plateau. The chments area of these streams characterized by their small sizes, rugged topography, n run off, and low infiltration capacity. Because of its gently undulating nature, most of streams have relatively wide plains where they have their highest flow in August and ir lowest flows in March, the period of the highest flow or flood usually recede leaving hind the deposits of eroded materials like silt of varying extent. Many of streams are rennial, especially when they originate in areas of younger granite or in salt. The evailing joint and fracture systems and change directions usually, strongly control these ers frequently and abruptly. Waterfalls often mark the edge of the plateau when these eams descend the steep escarpment.

5.9 DEVELOPMENTAL GROWTH

A lot of changes have taken place on the Jos plateau during the 20th century. These anges include the growth and decline of large scale tin mining, urbanization and the evelopment of a modern economy the expansion and intensification and continue eforestation with some afforestration as observe by Philips Howard (1993).

5.10 URBAN GROWTH

The advert of commercial tin mining at the beginning of the 20th century resulted in e creation of towns and establishment of a modern economy (industrialization) on the os plateau. The Anaguta settlement was the main town on the plateau; it was the eadquarters of the Nigerian tin field until 1910 when the headquarters was moved to ukuru. As Tin Mining continued to grow so did the number and sizes of mining ettlements. The decline in tin mining was replaced as the economic base of the Jos lateau and the functions of Jos continued to expand with proliferation of institutions and ndustrial areas.

11 URBAN INFRASTRUCTURE

The essential component of urban infrastructure necessary for the location of stries includes the provision of water, electricity supply and the presence of an efficient sport network.

As regard to transport and communication Jos is well connected with air, road and network. Further more the climate condition of Jos has created a good conducive osphere for the industries.

.12 INDUSTRIAL STATUS OF JOS

Aimed at harnessing the numerous potentials of the manufacturing sector and to lize the advantage occurring to the private sector in the area of economic activity the vernment has initiated an open door policies for investors, in this regain, effort are refore directed towards promotion and expansion of the intermediate and capital goods ustries, during the last few years, one could see that there had been steady increase in number of enterprise established by both the indigenous and foreign businessmen. me of these industries are joint ventures between Federal government foreign firms and vate individuals notably among such industries include Nasco group of company, Jos el rolling company, Jos international breweries, Coca cola bottling company etc.

CHAPTER TWO

LITERATURE REVIEW

The issue of industrial waste on our environment is not a new problem as man has n much concerned with the process of maintaining and effectively managing his ironment since earliest time it has been observed that accumulation of waste from such rces as domestic, agricultural, commercial and industrial activities around site cidedly cause some people to search for new site, this contribute to the spatial position of mankind (Gilberson1967).

In determining settlement site and location factors like plain land, rich agricultural l, drinkable water, and safety are considered, the next thing to consider in contemporary e is how waste generated could be disposed off, so as not to constitute nuisance to the vironment. This is exemplified by settlement morphology in modern cities. Thus, the oblem of environmental pollution is perceived to have been associated with man tivities over time (Olafun 2001).

Scholars have written extensively on environmental pollution and problem of waste position in Nigeria and the world at large. The environment as essential resources for man survival makes us to believe that for man to survive freely and comfortably more an a few generations, we must examine man environmental relationship.

Ademototi (1980) submitted that industrial waste is large in number and wide in agnitude. These waste ranges from solvent, cyanide, heavy metals, organic acid of eaching agents, dyes, ammonium compounds which are known as toxic. He highlighted at global scale environmental pollution by industries waste have becomes a threat not ly to the environment but also to the plant and animal life. According to him the 1950 se of "minimata" diseases were reported in Japan, these contamination were brain sanity leading to death eventually. A similar case was noticed in Iraq and Nigeria when a mber of people ate bread made from wheat which had been treated with alkali mercury fungicide (royal commission report, 1971, 1974) further more he explained that in geria attempt to attain economic development led to embark industrialization due to the untry's endowment with natural resources these industries as observed produces rious waste which are discharge into the environment and have tremendous harmful

ect on the environment, plant and animal life. For example most cities like Lagos and no are feeling the in fact of pollution from industrial waste.

Mabogunje (1955) similarly observe that industries production process generate rmous amount of waste, which are discharge into air water bodies and land. He cribe the practice in Nigeria were residential estate exist close by industrial estates, this nvironmental unwise and fraught with great hazard to health, because accidental ses of toxic air pollution post serious health risk to inhabitant of such neighborhood.

Goldstein (1978) in his contribution stated that the modification and even struction of natural ecosystem through human intervention can be demonstrated easily d more convincingly by a mere catalogue of mans activities. He sought to bring to light e fact that for most time, man is responsible for the destruction of his own environment ough such activities as industrialization, construction, automobile exhaustion, ergrazing, mining and bush burning. These practices have very harmful effect on the vironment by causing pollution, erosion, and leaching of minerals, which would be neficial for agriculture.

> "Environmental protection is the system of procedures which limits the impairment of the quality of water for human use and of the land that sustains them". (Hill, 1980)

It become clear from this statement that though natural in origin, water and land can e contaminated through the introduction of pollutants. He worked at the experiment ation of the united state public health services and it was focused manly on sewage eatment and subsequent steam pollution because improper treatment of sewage is a rect reason for stream pollution and it is imperative to understand the root cause of llution in a bid to control it.

Stembridge (1977) in his work 'industrial development and degradation" stated all e relationship between industrial development and related activities giving rise to erosion ainly in the eastern part of Nigeria, mostly gully erosion which can be attributed to mining coal around Enugu area. Rainwater sometimes washes away the minerals into running ausing pollution. This problem is also a threat in mining areas.

Industrialization is the great culprit responsible for most of our environmental llution problems. But industrialization development in it self is not the problem, rather the

oblem of disposal of waste generated from industrial activities "about 4000 miles of reams were not swim able, fishable, or drinkable owing to non points pollution which se from some industries that do not border that waste are properly treated" (sell, 1991). s was the result of a study-conducted in Montana. Another problem is the direct poising water bodies and acid rain, a product of gaseous released into the atmosphere from mbustion in industries and automobiles in that vicinity.

Solomon, (1982) made an attempt and examines the different ways in which the sidents of urban Zaria perceive their environmental and the image they form of the town d to find out if there is any correlation between this and social economic status of the sident. It was paved that most residents, do not see pollution as hazard. Probably due to norance and carelessness. "A large percentage of the populace thinks that pollution is tural and does not affect living condition any way". Adeleye(1995).

M. C. Gowon (1975) in this paper presented at a conference of rural environmental ngineering stated that pollution (waste) abatement would be very expensive particularly nen done in conformity to standard hence, an attitude of "prevention is better than cure". nould be adopted so that the resources can be geared towards other development issues e education, housing, and medical care. He proceeds further to say that water bodies ould be contaminated a wide array of pollutant including chlorinated hydrocarbon esticides, phenol, like substances, nitrogen, phosphorus ammonium. The soil is not pared from the deterioration also as there is accumulation of chemical which are not levant to plant growth and in some cases had been formed to be toxic to plants.

In his attempt to demonstrate how pathetic the situation was Maler (1976) cautioned at " where do we stand if the object of our supposed economic progress turn against us s weapon of distraction". This he was implying that care should be taken to make sure at, as industrial development progresses, should give consideration to waste anagement and proper disposal.

Leh, (1974) held that the term water pollution has different meaning in one sense it ay imply a discharge of untreated waste, while in another, It include an introduction of esticides and agricultural waste in to rivers or streams.

Generally pollution encompasses all these and more, he went in to a careful nalysis of pollution as caused by trace metals like Arsenic Boron, Copper, Barium, Zinc,

dmium, Lead, and Iron. These metals find utilization in fertilizer plant, paper mills and arty plants, unfortunately the waste when discharge could cause a lot of water pollution l even air pollution leading to a lot of death and causing diseases, for example "The imata disease" scourge in Japan.

Pollution from industries involves the production of bad instead of good (Atkins and ve, 1977). This was there definition of the concept as documented in their work llution control cost in industry". A study on environmental pollution in the United gdom revealed that most of the pollutant especially of water is generated by industries o apparently do not see the problem or pretend not to.

Bamidele (1987) observed that sanitation problem in urban areas is a true reflection nature of land pollution. He divided sanitation problems into two namely solid waste llection and disposal secondly sewage collection and disposal problems. He pointed out t almost all method of solid waste creates environmental problems because much of se waste end up littering by roadside, floating in rivers, gutters and collecting in ugly mps. It is important to point out at this stage that whatever the cost of combating llution; we must make an attempt of curbing it.

Ejabeifo,(1985) said that "A school of thought hold the view that the myriads of vironmental problems confronting us in the country is the inevitable price we must pay our quest for rapid technological advancement". But this same school of thought lieved and fact insist that regardless of whatever constraints exist we can still make our vironment a safer place to live in.

A lot of literature is forth coming in environmental pollution since it has b become a bal issue, but the problem now is that people do not perceive it as a serious case and nce this lack of awareness can be major deterrents to motivation efforts. This study erefore, thought bringing out some environment problems posed by industrial waste in nformity to some of the literature reviewed, also seeks to find possible solution steps to lvage the environment from the shackles of industrial waste mismanagement.

CHAPTER THREE

METHODOLOGY

A reconnaissance survey of the industrial area Anglo Jos, first to be under taken, this is aimed at identifying the sampling procedure and methods best suited for this study.

The primary information (data) is to be obtained using 2 set of questionnaire design to source various information relevant to the study. The secondary information is to be obtained from other relevant books and past dissertations. The method of questionnaire in collecting information for research as identified by Ndagi (1984) is in two phases; one for the people within the study area and the other for the industrial personnel. The questions are set in closed and open-ended type to allow comments from the people and the industrial officials.

) SOURCES OF DATA

In the primary source of data, about 60 set of questionnaire were design to be ministered to obtain information. However 50 of these questionnaires were to be ministered so as to obtained information from the resident within the study area. The cond set of the questionnaires. i.e. 10 set were to be distributed to the industries in ndom form.

The secondary source of data is to be obtained from published materials like xtbooks, Journals, seminar papers, etc. with the hope of gaining more insight into the fect of industrial waste.

1 SAMPLING METHOD

The study area along Anglo Jos is to be classified into streets i.e. 5 major streets ase on the arrangement of the settlement. The systematic random sampling method is to e used in distributing the questionnaires to the resident of each street. On each street 10 uestionnaire are to be distributed thus of each street 10 people were to be sample.

TYPES OF DATA COLLECTED

Descriptive method is used to analyse the data obtained from the study area. Most the data that will be obtained will be tabulated and expressed in percentages and erages. This is because percentage according to Keylinger (1973) is to reduce the erent set to a number to a common base. He went on to argue "any set of frequency be transformed to percentages in order to facilitate statistical manipulation and rpretation". Since percentages are to compare and contrast groups of object on equal se.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

This chapter is devoted to the analysis of the data and certain phenomena relating environmental effects, industrial waste as collected and observed from the field. These ludes type of industrial products and wastes, methods of waste disposal, contribution to ironmental waste (pollution), nature of industrial waste disposed, effects of industrial ste in the environment, types of industries and their effluent, level of industrial mpliance with PEPA guidelines, and finally, efforts at solving the problems of industrial ste.

TYPES OF INDUSTRIES AND THEIR EFFLUENTS

Industrial effluents are the discharged waste matter from industries. For this study, lustrial effluent have been categorized into five based on their sources of discharged. ese industries include Nasco carpet, Jos International Breweries, Jos Steel Rolling mpany, Palmera Chalk industry, Zabtex industry. The effluent consist of chemicals such cyanide lead, mercury, chromium etc. table 4.1 shows the major industries and their luents.

Table 4.1.1 **TYPES OF INDUSTRIES AND THEIR EFFLUENTS.**

	INDUSTRIES	EFFLUENTS.
1.	Nasco Carpet	Lead, mercury, detergent, chlorine (bleach) colours, (dyes) phenol zinc.
2.	Jos International Breweries	Biochemical's oxygen demand (BOD) suspend solids, hydrogen sulplide (H_25), Ammonium (NH_3) methane (CH_4) hydrogen concentrated and chemical oxygen demand (COD).
3.	Jos Steel Rolling Company	Zinc, cyanide, nitrate, cadmium, chromium etc.
4.	Palmera Chalk industry	Sulphide dioxide (SO_4) carbon monoxide (co) hydrogen suphide ($H_2SO_{4)}$ Nitric acid (HN_O) Ammonia (NH_3) Hydrogen fluoride (HF) etc
5.	PLASTIC	Oil and grease (O.G) chromium (cr) suspended solids (ss) hydrogen concentration (PH), biochemical oxygen demand (BOD) etc.

Source – field work 2004

These are the major industries in the industrial area Anglo Jos generating different kinds of effluent into the environment, which are hazardous to the environment and human health. This happens especially when the effluent exceed the acceptable limit as guided by PEPA. The chemical substance that may likely exceed the limit in the industrial area depends on the production capacity of these industries in the area.

4.2. EFFECT OF INDUSTRIAL WASTE ON THE ENVIRONMENT.

It is obvious that waste generated by the industrial activities have harmful effects on the environment and health of the people of Anglo Jos where they are living and even beyond, this has been shown in table 4.2.1.

TABLE 4.2.1 **EFFECT OF INDUSTRIAL WASTE**

EFFECT OF INDUSTRIAL WASTE	PERCENTAGE
POSITIVE RESPONSE	80%
NEGETIVE RESPONSE	20%
TOTAL	100%

SOURCE FIELD SURVEY 2004

From table 2.3 It can be seen that about 80% of the people within the study area are aware of the harmful effects of waste in their health and the environment, while about 20% of the people were not aware of the effect of industrial waste on the environment and their health.

4.3 NATURE OF INDUSTRIAL WASTE DISPOSED.

Generally wastes generated by the industries are in different forms, (Solid, Liquid, Gaseous) in whatever form, they constitute pollution to the Anglo Jos and environs. This is further shown in table 4.3.1

TABLE 4.3.1 **TYPES AND PROPORTION OF INDUSTRIAL WASTE GENERATED**

TYPES OF WASTE	PERCENTAGE
1. SOLID	49.9%
2. LIQUID	40.2%
3. GASEOUS	16.8%
TOTAL	100%

SOURCE FIELD WORK 2004

The result in table 4.3.1 shows that virtually all forms of waste generated by the industries could be seen. The greatest percentage of the responses indicated that solid waste (48.9%) are discharged followed by Liquid (40.2%) and gaseous form (10.8%). By implication it showed that, large proportion of liquid, solid and gaseous waste are released by these industries into the environment and some are even accompanied with unpleasant

odour. Indeed this is true as drainage channels within the anglo jos and environs often contain effluents from these industries. This finally empty into rivers thus polluting them there are also cases of heaps of solid waste covering large areas.

4.4. NATURE OF INDUSTRIAL PRODUCT USED BY RESIDENTS

Table 4.4.1 shows some of the industrials product used by the residents of Anglo Jos. This is to enable us identify the various waste resulting from these products. Among the population of 50 sampled the result obtained are displayed on table 4.4.1

Table 4.4.1 **TYPES OF INDUSTRIAL PRODUCT USED BY RESIDENTS**

	PRODUCTS	PERCENTAGE
1	Chemicals	15.7%
2	Furniture	16.4%
3	Plastic	21.4%
4	Cosmetic (i.e. Nasco soap & Pomade)	25 %
5	Fabrics	21.4%
	TOTAL	100%

Sources of field survey 2004

The table 4.4.1 shows that all the residents of Anglo Jos make use of the industrial products in one way or the other. Most of the industries products are categorized and the greatest percentage of people (25%) sampled indicated the use of cosmetic materials. This is obvious as the investigation revealed that Nasco Group of company dominates the industries. About 21.4% of the people sampled indicated the use of fabric and plastics respectively. Other product use by residents is chemicals 15.7% and furniture 16.4%. These products after used are capable of polluting the environment.

4.5. HOUSE HOLD WASTE DISPOSAL METHOD

These examine the various methods employed by the people of Anglo Jos to dispose their household wastes. The responses are shown in the table 4.5.1.

Table 4.5.1 HOUSE HOLD WASTE DISPOSAL POINT

DISPOSAL SITES	PERCENTAGE
1. River channel	6%
2. Gutter	14%
3. Public dumping site	20%
4. Dust bin	60%
TOTAL	100%

SOURCE FIELD SURVEY 2004

As shown in the table 2.3.3 the commonest method of collection of waste disposal is the dustbin, which are mostly placed in their houses. About (60%) of the household surveyed revealed that they gather their waste into household dustbins. About (20%) of the population indicated the use of public dumping sites, other forms of waste disposed as revealed by the people includes gutters (14%) and river channel (6%). Therefore this indicated that majority of the people prefer to dump their household waste in the dustbin.

4.6. WASTE DISPOSAL BY INDUSTRIES

Wastes generated by industries in this area are disposed to the environment through various means or methods. Table 4.6.1 shows the various methods adopted by the industries to dispose their waste.

Table 4.6.1 **INDUSTRIAL WASTE DISPOSAL POINTS**

DISPOSAL POINT	PERCENTAGE
1. River channel	50%
2. Land	30%
3. Gutters	14%
4. Others	6%
TOTAL	100%

SOURCE FIELD SURVEY 2004

The different method of waste disposal by the industries as revealed by the sample respondents in the table 2.3.4 shows about 50% indicated river channels as the commonest points of waste disposal. This mostly gets into many rivers through tributaries. About (30%) of the respondents indicated that it is disposed on Land and (14%) to nearly gutters. This indicates the way through which water is being polluted by the industries. This is serious situation as 60% of the industries wastes are deliberately disposed directly on the environment (Land and River channel)

4.7. CAUSES AND EFFECTS OF INDUSTRIAL WASTE

The basis of pollution threat to environmental quality lies largely with organization and rapid industrialization in the Anglo Jos area, obviously these two components have a direct bearing on the quality of waste (pollutions) generated. For instance it is common to find a lot of solid waste within neighbor hood and industrial areas despite the unrelenting efforts of the Jos metropolitan development board (J.M.D.B). These waste take the form of bottle cork, Plastics, metal scrap, fabric wastes, depreciated packaging and other components of industrial products, just to mention a few. This is either discharged within the immediate surrounding of the industries or dispersed in places within residential areas. More importantly a serious threat to the environmental quality is that posed by industrial liquid waste. These liquid wastes often assail the residents in Anglo Jos due to poor drainage system within the neighborhood. Many of the effluent are toxic as they contain DDT, mercury cadmium, sulpheric acid, which pollutes water bodies and even aquatic life. Some of the dyes, which are in use in many industries, are believed to be carcinogenic (Adeleye 1995). Unfortunately these toxic effluents are daily discharge into rivers through its tributaries, which form a major source of water for consumption for people around the river. Industries generate gaseous effluent like sulphor dioxide (SO_2) carbon monoxide (CO), Hydrogen Sulphade (H_2S), Nitric acid (HNO_3) ammonia (NH_3), Hydrogen Floride (HF) etc. (Adeleye 1995) especially chemical fertilizer manufacturing industries. These gaseous are easily dispersed in the environment as air pollutant and the impact may be felt kilometers away from their source of generation.

It is therefore clear from the foregoing that environmental quality is being seriously threatened in Jos metropolitan region, particularly in the industrial area of Anglo Jos. The

population is at risk due to the large quantities of both domestic waste generated daily and the future trend of pollution in this region is as a result of urbanization.

4.8. PERCIEVING THE SERIOUSNESS OF INDUSTRIAL WASTE POLLUTION

An attempt is made in this section to find out how the residents in Anglo Jos perceive the seriousness of the effect of industrial waste pollution, in this regard a survey of 50 population was conducted. Table 4.8.1. shows the result obtained.

Table 4.8.1. **PERCEPTION ON THE SERIOUSNESS OF INDUSTRIAL WASTE POLLUTION**

1.	Less	30%
2	serious	40%
3	very serious	10%
4	Don't know	20%
	TOTAL	100%

Source field investigation 2004

Table 4.8.1 shows that about (40%) of the people sampled perceived the industrial waste as having serious effect on their health and the environment. About (30%) admitted that it has less serious effect on their health about (20%) where not sure of whether it has effect or not, while about (10%) of the people considered the waste to have a very serious effect. This indicated that about half of the people living in the area believed that industrial waste has serious problem on their environment, despite the fact that not all the respondants have formal education. Researchers on environmental waste are often interested in finding out the role played by individuals in determining their attitude and behaviour towards the perceived environment in this like manner this work is divided to similar research.

4.8.2. REACTION TO INDUSTRIAL WASTE

	REACTION	PERCENTAGE
1	Consulting Doctor/ Clinic	40%
2	Complaining to industries	30%
3	Move away	16%
4	Others	14%
	TOTAL	100%

Source field investigation 2004

The table 4.8.2 revealed that about (40%) indicated that they normally consult doctor when ever they are affected by the effect of waste moreover about (30%) shows that the conveyed their complains to the nearby authority that generate such harmful waste. About (16%) indicate they move away from the source of the pollution (waste) while the remaining (14%) shows form of reactions. This implies that majority of the victims prefers personal treatment rather than collectively fighting the industries that generate the pollutions through legal means. Another element of seriousness of this phenomenon is the percentage (16%) that moves away from either the industries site or the effluent. This shows a great point for concern and should seriously be noted.

4.9 INDUSTRIAL COMPLIANCE TO PROTECTION GUIDELINES.

The plateau environmental protection agency guideline reveals that industries must have waste treatment plant it was found that for all the industrial around Anglo Jos only one or two that has waste treatment plant. This shows a low level of compliance, despite the fact that most industries claimed that they pay environmental stress fee to PEPA to take case of any damage done by the industrial discharges to the environment. This environmental stress fee is rather an administrative strategy than mitigating measure to environmental pollution problems resulting from industrial activities.

4.10 SOLUTION TO INDUSTRIAL WASTE.

Having realized the threat posed by waste generated by the industries to the residents of Anglo Jos industrial area. One at this Juncture is interested in knowing the efforts made by these residents to solve industrial waste problems. This is explained in table 4.10.1

TABLE: 4.10.1 **EFFORTS TOWARDS SOLVING INDUSTRIAL WASTE PROBLEMS**

TYPE OF EFFORT	PERCENTAGE
1. Personal	60%
2. In group	30%
3. Others	10%
Total	100%

Source – field investigation 2004.

Table 4.10.1 Shows clearly the various efforts employed to alleviate the industrial waste problems by the people of Anglo Jos thus, of all the people sampled, (60%) indicated that personnel efforts is their main concern, while (30%) of the people indicated that they take joint action among the community, while (10%) indicated other actions such as appealing to industries.

4.11 SANITATION COMPAIGN PROGRAMME TOWARDS SOLVING INDUSTRIAL WASTE PROBLEM.

When a resistance is broken it is difficult to regain back it's strength, the environment has already been modified due to industrial activities as such it has been tempered as a natural environment. But measures can be adopted to reduce the impact of these industrial wastes and ensuring a sustainable development in the environment can do this. As such a question was raised on whether the environmental sanitation programme help to reduce the problem in the area and the result is shown in table 4.11.1

TABLE 4.11.1 RESPONSE ON WHETHER THE ENVIRONMENTAL SANITATION HELPED TO REDUCED THE PROBLEM OF INDUTRIAL WASTE.

RESPONSE	PERCENTAGE
1. Positive response	60%
2. Negative response	40%
Total	100%

Source field investigation 2004

Table 4.11.1 Shows that about (60%) of the people sampled admitted that the environmental sanitation campaign programme has helped in reducing the industrial waste problem in the area, where as the remaining (40%) of the sampled people indicated that the campaign programme is not effective as such it does in any way helped in reducing or caving the problem.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS.

5.1 **SUMMARY**

This research attempted to find out the present level of pollution in Anglo Jos industrial area and its resulting effect on the people. A lot of things have been discovered that could be of interest to environmental planners and policy maker.

The research has revealed that industries in Plateau state are concentrated in Jos south with the highest concentration in Anglo Jos; it is obvious the industries in this region do generate different kinds of waste often released into the environment. These waste are toxic and do constitute hazard to man and the environment. This could be in form of liquid effluents like dyes acids, cadmium, phenol e.t.c. Mainly from factories and other related industries. These effluents often affect the residents of Anglo Jos. Subsequently some of these liquid discharges find their ways into rivers. The waste could also appear in form of solid waste such as depreciated industrial materials, broken bottles, metal scraps etc. these forms waste within the Anglo Jos.

The research also revealed the type of industries within the area each with it own kind of effluent that is being discharge into the environment (and how it is effecting the resident) and its related effect to the health and the environment in general. More also the research portrays the level of compliance of industries with Kaduna environmental protection agency (PEPA) guidelines with the aim towards having a reliable and safe environment. In view of the above recommendation have been suggested which if properly implemented and executed in the correct manner would help towards ensuring a sustainable development of the environment.

5.2 CONCLUSION

Industrialization is often seen as fundamental economic development and growth of any nation. This could be seen in the setting up of industries in most part of the country particularly in state capital such as Jos Metropolis (Oladipo 1990). However, the activities of these industries have led to the generation of waste which are hazardous to

the environment and also growing cases of health hazards are caused mainly by industrial waste often release into the environment, and this is of serious concern. More importantly there has been constant out cry of environment pollution arising from industrial waste as they affects, not only, water bodies but also land, atmosphere and other living components within the environment. Therefore, government, non-governmental organisation, industries, public, and individual efforts toward solving environmental problems, is worthy of appreciation.

It is therefore the aim of this work to examine the effect of industrial waste on the environment in the industrial area of Anglo Jos. This can be achieved through the following objectives: -

1. To identify types of industries and their effluents in the area
2. To examine the effects of industrial waste on the Anglo Jos industrial area.
3. To analyse the level of compliance by industries with the Plateau environmental protection agency (PEPA) guidelines. And
4. In view of the above to recommend possible solutions to industrial waste management in the area.

While the methodology that is use in this research involves the use of both primary and econdary sources of data. While the final result of the research shows that different kind f industries are located at the Anglo Jos industrial area, each with various effluents or ischarge, which has effect to the environment of Anglo Jos and also health of the esidence.

3 RECOMMENDATIONS

- High technology (waste recycling plant) should be employed by the government and by industries to convert various wastes into useable form, (from waste to Wealth) e.g. vertical integration.
- Sanitation habits should be encouraged, and provision of effective waste disposal system such as incinerators and the public should avoid indiscriminate dumping of waste.

. The federal government should promulgate new national environmental policies and plans action to ensure that each industry has a waste treatment plant so as to reduce the toxic content discharged into bodies.

. Members of the public should be given mass environmental education on the ill effects of unhygienic and polluted environment. The mass media, voluntary organisation, individual could also help much in achieving this task of enlightenment.

. Government should set up environmental specialists, experts and public relation practitioners to monitor cases of environmental abuse and devise ways of tackling them.

. The government agencies on environmental protection such as federal environmental protection agency (FEPA) and federal task force should be vested with more authority in order to effectively implements the policies and guidelines on environmental pollution especially on waste treatment by industries.

. Annual awards for excellence for industries with good environmental management and punishment for those industries defying the industrial regulations should be introduced.

. Institution in higher learning and professional bodies in the countries have to focus more on environmental through establishment of courses on environmental safety and protection.

. The drainage system in the areas should be improved through joint effort of governments, industries and community.

0. There is the need for governmental to embark on comprehensive orientation programme aimed at educating the public and industries on the need to sustain a high quality environment.

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DEPARTMENT OF GEOGRAPHY FEDERAL UNIVERSITY OF TECHNOLOGY MINNA PROJECT, RESEARCH.

TOPIC:- EFFECT OF INDUSTRIAL WASTE ON THE ENVIRONMENT. A CASE STUDY OF ANGLO JOS AREA OF PLATEAU STATE.

BY

MUSA MURTALA NUHU

INDIVIDUAL RESEARCH QUESTIONNAIRE

The purpose of this questionnaire is to collect information necessary for this study. Information given in this regard shall be treated with outmost confidence. Therefore your sincere response to all questions would be highly appreciation.

A PERSONAL DATA

TICK [ ] AS APPROPRIATED

1. Sex: a male [ ] b. Female [ ]

2. Marital Status a Married [ ] b. Single [ ]

4. Age .....

5. Educational Status .....

6. Place of Residence:.....

7. For how long have you been in this area:.....

8. How close is your residence to the nearest industry here (In Metres) .....

B SPECIFIC INFORMATION.

9. Do you use any industrial product? Yes [ ] No [ ]

If yes list them a .....b.....c.....d..... .....

20. Has the environment sanitation campaign programme helped to reduce the problems in your area? Yes [ ] No [ ]

21. What do you think should be done to alleviate the problem of industrial waste in Anglo Jos area?.....

APPENDIX B

DEPARTMENT OF GEOGRAPHY,

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

A PROJECT RESEARCH

TOPIC:- EFFECT OF INDUSTRIAL WASTE ON THE ENVIRONMENT. A CASE STUDY OF ANGLO JOS, PLATUEAU STATE.

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INDUSTRIAL RESEARCH QUESTIONNAIRE

The purpose of this questionnaire is to collect information necessary for this study. Information given in this regard shall be treated with outmost confidence. Therefore your sincere response to all questions would be highly appreciated.

Thanks for your cooperation

TICK [ ] AS APPROPRIATE.

1. Name of industry .....
2. Location.....
3. Type of industry, a light [ ] b. Heavy [ ]
4. How close is this industry to the residential area (in metres).....
5. Why have you chosen this site?.....

PART B

6. What type of product does your industry produce?

a. Consumables b. Non consumables c. Biodegradable d. non biodegradable 7. What types of material are normally use for in production?

a. dyes b. chemicals that are toxic in nature c. metallic substances

d. other forms of oxy demanding compounds e. non toxic substances

8. What type of industrial waste do you generate?

a. Solid [ ] b. Gaseous [ ] c. Liquid [ ] d. smelling [ ] e. All [ ]

9. How do you dispose these waste products?.....

10. What problem do you face in meting their (FEPA) requirement?.....

.....

11. Where do you dispose your waste?

a. River ☐ b. Industrial Backyard ☐ c. Gutter ☐ d. others specify ☐

12. Do you treat you waste before disposal?

Yes ☐ NO ☐ If yes how do you treat them? .....

13. What problem is your industry facing as regard to waste treatment before disposal?

a. Financial problem ☐ b. lack of proper planning of settlement ☐

c. Inadequate Disposal facility in the industry ☐ d. other reasons specify

.....

15. Has the public ever brought any complains with regard to the form of waste generated by your industry?

Yes ☐ No ☐

Is your industry to blame? Yes ☐ No ☐

If yes how do you respond? .....

16. If yes what have you been offering as compensation to the Resident in the area?

.....

17. What solution do you have for industrial waste management in this area?.....

18. Did PEPA agents ever visit you or write to you because of your inability to meet their guidelines?.....

If yes how often and why?.....