LEATHER TANNING EPFLUENT AND ITS EFFECTS ON VEGETATION IN CHALLAWA INDUSTRIAL AREA, KANO, NIGERIA.

Okolo, N,V., Obidiozor, J and Danjuma,D..
Depertment of Environmental Management
Nnamdi Azikiwe University, Awka
Correspondence; email ngo_okolo@yahoo.com

ABSTRACT;

The effects of tannery effluent on the vegetation in Challawa industrial are, Kano, Nigeria was studied by assessing the chemical characteristics of the effluent, stressing more on the heavy metals like: Iron (Fe), Manganese (Mn), Copper (Co), Chromium (Cr), Lead (Pb), Cobalt (Co), Zinc (Zn), Cadmium (Cd). The result showed increase in Chromium and lead which may have led to deficiency in some nutritional content needed by vegetations, thus leading to their destruction

Keywords; Tannery, Effluent, Heavy metals, Vegetation

INTRODUCTION:

Environmental issues have become important to the scientist as it is to the politician, the business man and to the football administrator. The reason for this state of affair is not far- fetched, for it is within this twentieth century that the activities of man inhabiting the earth, has adversely affected the planet. Such activities include: the atomic bomb, nuclear plants, arsenal of mass destruction or killings, improvements in agriculture, health, food processing, the cars, jet and space travels, the plastics technology and many others accompanying stresses on our environment. The compelling need for the awareness of these problems is because environmental pollution does not respect geographical or political boundaries. Gases released in England caused defoliation in Sweden; toxic effluent discharged or released to River Niger in Mali can be harmful downstream in Nigeria. Also in recent times, there has been a global traffic of toxic wastes' (Okonkwo et al., 1999).

The development of technology is pursued with increasing intensity as a way of remedying ailing economies. In Nigeria, new industries are emerging to either

revive or reverse current unpleasant trends in the economy (Dike, 1991 and Horne, 1978). The growing intensity of industrialization inevitably imposes an increasing burden on the environment as both the source of raw materials and the depository of all effluents (Horne, 1978). The wide range of new processes, raw materials and wastes rejected in association with emergent technologies in industries expose the environment and society to increasing contamination and related hazards (Horne, 1978). There is a progressive contraction in the free space available for comfort and safe occupation. The contamination of land, water and food is progressive and imposes new and intensifying demands on the management of resources and services. The ultimate danger posed by either an unmanaged or poorly managed industrializing society is cumulative, emerging as the sum of contributions from individual type of industries. The efficient management of the environment and risks arising from pollution has as reference point the rules and regulations of the agencies of government charged with responsibilities for the same.

Industrial processes such as steel making, chrome plating, dye and pigments, leather tanning processes and wood preservation are common curses of acute environmental pollution if not properly controlled. 'Groundwater is a major source of clean water supply because; it is assumed to be free from surface pollutants compared to surface water (Voudouris et al., 2007). The movement of destructive materials into soil and rivers through disposal of wastes, discharge of effluents from industries, or release of chemicals through agricultural activities has led to increased vulnerability of ground water, soil and vegetation (Ahmed et al., 2009).

Inappropriate disposal of waste has led to serious environmental pollution in most developing countries of the world (USEPA, 1990., Allen et al., 1998 and Patterson, 1999). In Nigeria, industries generate thousands of tons of hazardous waste per day, which is discharged into Nigerian Rivers (Ajayi and Osibanjo, 1981). According to these scholars, there is a wide scale contamination of Nigeria's surface waters from industrial effluent due to increase in industrialization and urbanization.

Kano comprises of three major industrial areas namely: Chalawa Industrial Estate, Sharada Industrial Estate, and Bompai Industrial Estate. Unfortunately, the discharge of untreated industrial waste from these industries may have resulted in obvious environmental degradation of land, surface water and ground water and vegetation in the municipality. Farmers in the area use the industrial waste water for the irrigation of their farm land, especially. Effluent

from leather industries. Farm produce from the site are also reported to have lost their natural taste, especially those harvested from fadama planting, this is because of the fact that, farmers in the area use water from the river for their irrigation.

In the light of the above, this project, seeks to investigate the environmental effects of these industries on vegetation in the area the area.

STATEMENT OF PROBLEM

Kano is one of the industrial cities in Nigeria. It ranks second after Lagos. Other industrial cities in Nigeria are Onitsha, Nnewi (Japan of Africa) in Anambra State, Port Harcourt, Aba, Warri, Shagamu, Otta, Kaduna and many others. Industrialization in Kano started in carly 1960's. Immediately after the independence. Today, we have up to about five industrial areas in Kano. The major industries in the city are mainly tanneries, textiles, pharmaceuticals, food and a few other ones. These industries discharge their effluents into the environment (sometimes poorly treated and in most cases, not treated at all). The discharge of such effluent materials is sometimes indiscriminate without proper channelization to the river. Sometimes, some of these effluents find themselves on farmlands, thus affecting the soil and vegetation. Consequent upon this, both surface and ground water are also contaminated (Egwuonwu, et al., 2011). According to Ahmed et al (2009), the movements of pollutants into soil and groundwater through disposal of wastes, discharge of effluents from industries, or release of chemicals through agricultural activities have led to increased vulnerability of the environment.

STUDY AREA

The Kano urban area covers 137 sq. km and comprises six local government areas- Kano municipal, Fagge, Dala, Gwale, Tarauni and Nassarawa. The metropolitan area covers 499 sq. km and comprises eight local government areas- the six mnentioned above plus Ungogo and Kumbotso, with a population of about 2, 828,881 at the 2008 Nigerian census (Nigeria Official gazette, Wikipedia). The principal inhabitants of the city are the Hausa people, and Hausa language is widely spoken in Kano. The city is the capital of Kano emirates, and the current emir, Ado Bayero, has been on the throne since 1983 (Wikipedia encyclopedia).

Challawa Industrial Estate, Kano, northern Nigeria, is bounded latitude range of 11052.65N - 11054.29' and longitudde range of 8027.52E- 8°28.853'E at an

average elevation of about 430m above the mean sea level (Egwuonwu, et al., 2011). A gentle slope tending towards the S-W direction characterizes the study site.

All the industries located in the area discharge their effluent into Challawa River located at about 2.0 km downstream from the cluster of industries. The area, which falls between the industrial site and the river, is about 6.0 km2 (Egwuonwu et al., 2011). It mainly constitutes cultivated portions and few village settlement

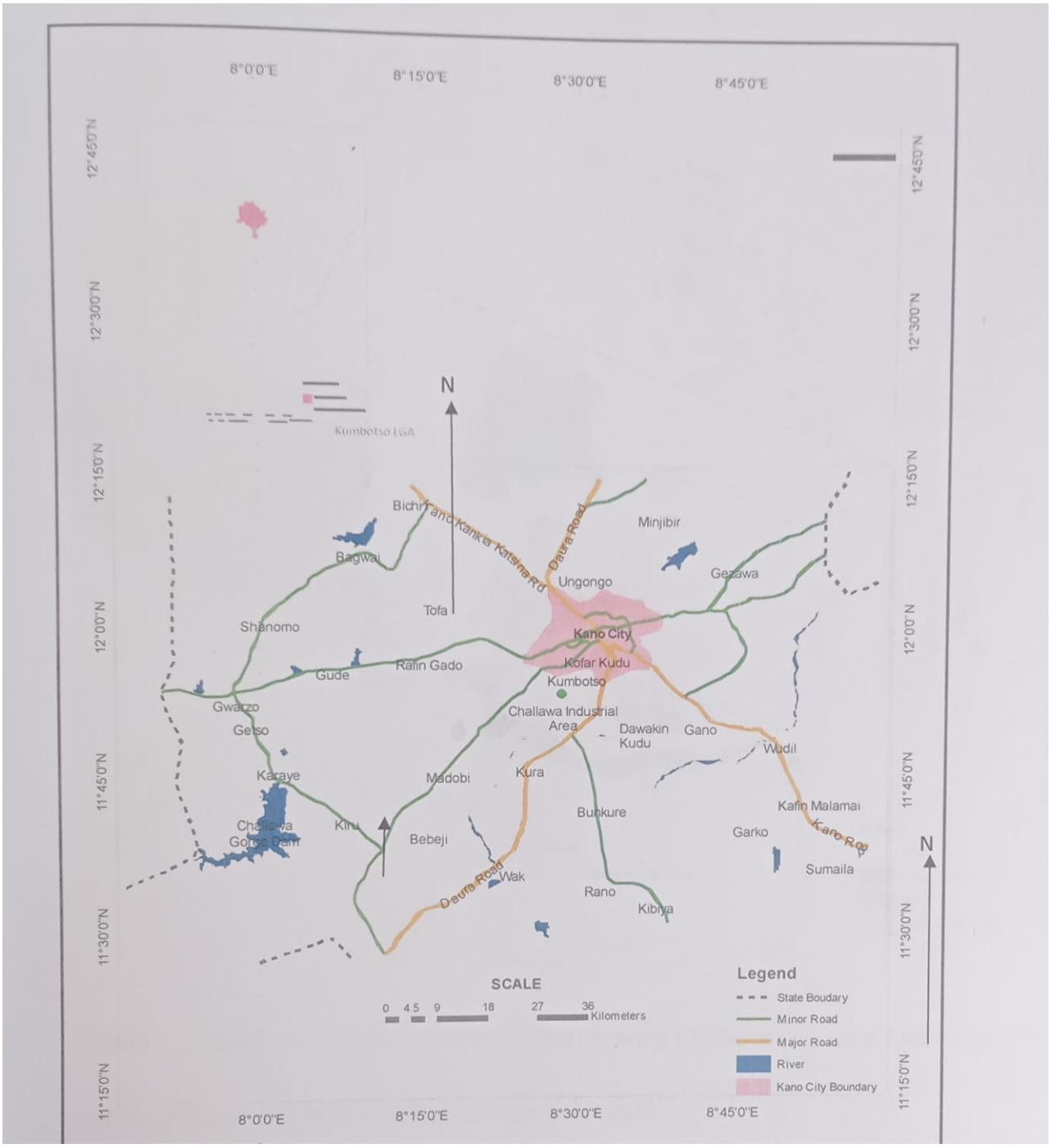
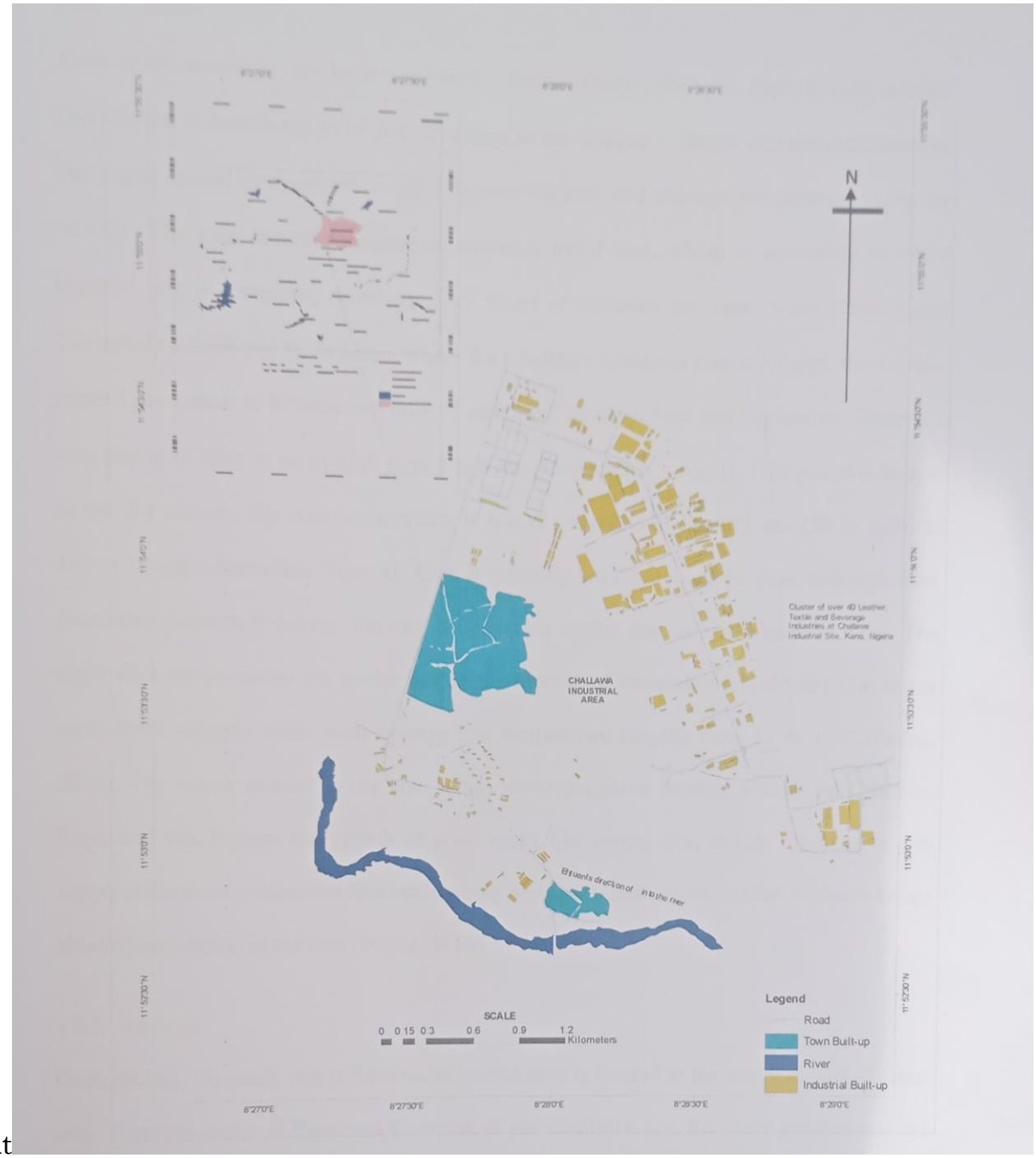


Fig. 1 : Map of Kano City and its Environs, showing Kumbotso Local Government Area where Challawa industrial area is

Source: Adapted and Modified from Google Earth 2023



sit

Fig. 2: Map of Kumbotso Local Government Area showing Challawa industrial area

Source: Adapted and Modified from Google Earth 2023

Reconnaissance Visit

This reconnaissance visit was done using camera to get the observation points, and to be acquainted with the terrain and total environment of the area. The photograph taken will be used in the physical assessment of the effects of industrial effluents on the vegetation in the area



Fig 3; Farmlands areas affected by industrial effluents

(Field trip, 2023



Fig 4; Color of the effluent and the grasses destroyed by the effluent

(Field trip, 2023)

METHODOLOGY

Effluent Sample Collection

The effluent was collected in plastic containers that have been previously washed in non-ionic detergent, rinsed with tap water and later soaked in 10% HNO_3 for 24 hours and finally rinsed with de-ionized water before usage.

At the point of sample collection, sampling bottles were rinsed about three times with the sample and then filled to the brim, making sure that air is not trapped in. The filling was done at a depth of meter below the surface of interference.

RESULTS AND DISCUSSION

Table 1.

Concentration of chemical Elements in the effluents from tannery industries (sludge) in rainy and dry seasons

Elements.	Sludge (rainy season)	Sludge (dry season). FEPA/WHO
Co	0.11	0.02
Cd	0.01	0.01
<1		
Zn.	0.01	0.01
3		
Mn	0.17	0.17
5		
Cr	0.14	1.10
Fe	0.80	0.01
20		
Pb	0.86	1.14
<1		
Cu	0.02	0.40
<1		

Source: Field work 2023

Cd- Cadmium, Zn- Zinc, Mn- Manganese, Cr- Chromium, Fe, Iron, Pb- Lead, Cu- Copper

The chemical composition of the effluent from tannery industries at the sludge sight in rainy and dry season reveal that Co ranged from 0.11mg/1 - 0.01mg/1,

Zn: 0.01 0.0lmg/1, Mn: 0.17 - 0.17mg/1, Cr: 0.14 1.10mg/1, Fe: 0.80 0.01mg/1, Pb: 0.86 1.14mg/1 and Cu: 0.02 0.4mg/1 in rainy and dry season respectively as shown in the table above

Apart from the concentration of Chromium and Lead in the dry season which were higher than the FEPA/WHO standard, other elements were within the stipulated limit of FEPA/WHO as shown above. This condition is expected due to dilution in pollution in the rainy season.

Chromium gives the river a blue coloration and destroys grasses around the river bank. Farm produce from the site are also reported to have lost their natural taste, especially those harvested from fadama planting. Interview showed that farmers in the area use river effluent - polluted river for farming during fadama planting.

Chromium is a relatively scarce metal that occurs in several states. The most toxic of these states is the chromium VI or hexavalent state. According to WHO/USEPA guideline value, the concentration value of 0.1mg/1 is acceptable in a river water (Radojevic and Bashkin 1999).

The value above 0.1mg/1 could result to condition known as Allegic dermatoid (EPA, 1999). From the result of the analysis, the concentration of chromium in effluent sample exceeded the standard limit in dry season, indicating possible contamination of water bodies, soil and vegetation, and severe chromium contamination in the area in years to come. This high concentration of chromium can also lead to formation of complexes by chromium and other metals which may not allow migration of nutrients from top soil down the horizon and so denying the vegetation of necessary nutrient needed for growth and survival.

As seen on the table above, the concentration of lead (Pb) also exceeded the WHO standard. This may lead to increase in the acidity of top soil. Lead pose a high risk if much of it enters the soil. The risk is especially high in pregnant women and young children (UMD,1997).

All soils contain lead in varying degrees depending on the geologic source. For urban gardener, lead is a concern (Murphy, (2009). Health officials, soil scientists and environmental engineers worry that the increasing popularity of gardening particularly the urban type will put more people at risk for lead poisoning if they do not protect themselves. Lead knows no socio economic boundary and can increase soil- lead level to several thousand mg/1.

FEPA-federal Environmental Protection Agency

WHO- World Health Organization

USEPA- United State Environmental Protection Agency

EFFLUENT AND ITS EFFECTS ON VEGETATION;



Fig 6;Farmlands areas affected by industrial effluents

A 

Fig 7; Colour of the effluent and the grasses destroyed by the effluent

CONCLUSIONS

This study tried to assess the effect of industrial effluents on vegetation in Challawa industrial area, Kano, Nigeria. It revealed increase in the concentration of Chromium and lead which may have led to deficiency in the nutritional content of the soil needed by vegetation in the area, the colour of the vegetation, destruction of farmlands in the area which is quite different from what was obtained in the adjacent area not polluted by effluent gave enough indictment on the effluent from the tannery industry.

REFERENCES

Ahmed, F,M., Wan Zuhari, W,Y., Mohd. R,T and Abdul, R,S (2009), Ground Water and Soil Vulnerability in the Langat Basin, Malasia, *European Journal of Scientific Research 27(4);628-635*

Ajayi, S.O., Osibanjo, O. (1981**).** Pollution Studies on Nigerian Rivers (11) Water quality of some Nigerian Rivers. *Env. Poll. Series B* 87-95.

Allen, H., Garrison,A and Luther, I,G (1988). Metals in Soil surfaces. Sleeping Beer Press, New York, Ny17

Dike, F (1991) Economic Transformation in Nigria, Accumulation and Technology, ABU Zaria

Egwuonwu, G.N., Olabode, V.O., Bukar, P.H., Okolo, V.N., Odunze, A.C. (2011). Characterisation of Top Soil and Groundwater at Leather Industrial Area, Challawa, Kano, Northern Nigeria. *Pacific Journal of Science and Technology* 12 (1): 628-631.

Environmental Protection Agency EPA (1999). Sediments quality Guidelines Developed for the National Status and Trends Programs Report No. 6/12/99. /cs/pubs.htmhttp:/www.epa.gov/waterscience

Murphy, K (2009), For Urban Gardner, Lead is a concern, For the New York Times Ny.com/2009/05/14/gardens/ 14 lead.htm

Okonkwo, E.M and Eboatu, A.N (1999**).** *Environmental Pollution and Degradation***.** New popular series (2): 79-95

Patterson, R.A. (1999). Production and Environmental Monitoring, Workshop Paper No. PEM 9 Oil and Effects of effluents.

Radojevic, M and Bashkin, N,V (1999), Practical Environmental Analysis, Royal Society of Chemistry and Thoma Graham House, Cambridge, 180-430

UMD, University of Maryland (1997). Environmental Safety, Lead fact sheet, Division of Administration and Finance, Department of Environmental Safety(301)405-3690

United Nation Environmental Protection Agency, USEPA(1990). Drinking Water Contamination

, National Primary Drinking Water Regulation.

Voudouris, K., Manos, B., Adamidoe, K., Patrikaki, O., Trikilidoe,E., Gozios, B, Arabatzis, S and Papadopoulou, O.P (2007). Development and Utilisation of Vulnerability Maps for the Monitoring and Management of Ground water Resources in the Archimed Areas.