ENVIRONMENTAL IMPACT ASSESSMENT OF DRAINAGE SYSTEM ON DOWNSTREAM LOCATION IN MINNA.

A CASE STUDY OF TUNGA RIVER, NIGER STATE

BY

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PGD/GEO/2000/2001/155

A PROJECT REPORT SUBMITTED TO THE DEPATMENT OF GEOGRAPHY , FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA NIGER STATE.

IN PATIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE POST GRADUATE DIPLOMA (PGD) IN ENVIRONMENTAL MANAGEMENT TECHNOLOGY.

FEBRUARY, 2002.

DECLARATION

I hereby declare that this project titled " Environmental impact Assessment of the Tunga, Minna. Drainage system on the downstream location" is my own work and have not been submitted at any University or Institution. All published and unpublished works of other authors have been duly acknowledge.

.... 20th-3-2002..............................

YISA JOSHUA DATE

DEDICATION

This project write up is dedicated to God who made and control all this for his love and mercy.And to my wife Mrs Rhoda .N. Yisa and especially my Parents Mr Jeremaih Yisa Adama and Mrs Deborah Yisa for their parental care and encouragement.

ACKNOWLEDGEMENT

The thesis should have not come to a successful end without my Project Supervisor DR .A.S. Abubakar for his helpful supervision and encouragement on this project . To all my lecturers especially the members of staff of geography department,the Head of Department Dr. M.T. Usman Prof. J.M. Baba, Prof. D.O. Adefolalu, Dr G.N. Nsofor, Dr P.S. Akinyeye, Mrs A.E. Odafen and Dr (Miss) A.A. Akhimamhe. I say a very big THANK you for your contribution and sacrifice to giving an education.

This Project could not have been written without the finalized support of my wife Mrs Rhoda N. Yisa and my Parents Mr Jeremiah Y. Adama and Mrs Deborah J.A Yisa. And my Brothers and Sisters, friends. Joseph Yisa, David Tsado , Daniel S. Yisa, Dorath Yisa, (friends) Polycarp M. Dauda, Samuel Ojorgu.

I will not forget to appreciate my gratitude to my brothers Elijah Ama Yisa, and Smauel Gana, Amos .B. Yisa especially my Uncle Mr Johna .A. Yisa for their encouragement and support given to me. During my studies also to my friends in N.Y.S.C Minna for their contribution and encouragement.

Lastly but not the least , my sincere gratitude goes to my family members for their encouragement and moral support family members for the contribution and moral support making this Post Graduate Diploma programme a clean come true. Finally I thank the Almighty God for his steadfast love in seeing me through and who has been faithful even when I am not faithful to Him.

ABSTRACT

No construction project on the earth can be possible without changing the patterns of sequence of the ecosystem around the state Terrestrial Photographs were used both of dry and wet season during the field observation to give first hand information of the study area. The discharge velocity were calculated for the streamflow. The need to study the river channel and other related natural activities features associated with them such as flooding, degradation and erosion in the downstream location are not supposed to given a second though because this will assist in the monitoring of such river channel direct methods were employed to measure the speed of the running channel during the field surveys.

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CHAPTER ONE

1.0 INTRODUCTION

1.2 BACKGROUND

The water observed after rainfall flows down the sloppy ground areas in to a nearby stream. It is then carried into one of the major Nigerian Rivers, which finally empties into one of the West African lakes or into the ground and becomes underground water and may find its ways through a spring and into a river or ocean (Dunne, 1943). This is the way the entire land point of the earth surface are drained. In Nigeria Rivers are fed by flood and springs and this depends on amount of rainfall. A flood is regarded as any relatively high water level or discharge above an arbitrarily selected flood level or flood discharge.

The volume of the rivers vary with the quantity of the supply of rainwater annually. In the Wet season, they increase in volume while in the dry season their volume decreases exposing pebbles and bares rocks on their beds and some may be dry up completely especially in Northern Nigeria. Under this condition, navigation on the rivers is obviously impossible because boats cannot said comfortable on fast flowing and shallow rivers. Because of high temperature and humidity, the rock weather easily and flood water then seeps into the weather materials down into the rivers that is why the rivers become turbid but relatively clean and almost sparkling in the dry season.

Some rivers receive more flood and more tributaries and they flood faster more powerful than others. Many of these cut may "behead" in a weaker rivers and some of these rivers flow smoothly because the surface rocks over which they flow are uniform.

Their course are interrupted by gorges, rapid and water falls (Iioeje, 1980). Economically some of the rivers offer possible production of hydro electric power and irrigation purposes in dry area of the region. Also they provide basic water for domestic and industrial uses and as well as a source of freshwater fish used for food and as a trading commodity.

These rivers form the nuclei for the integrated development activities of the Rivers Basin development authorities in Nigeria. Hydrologically, the natural run-off of the easrth's water such as a stream and rivers from an area or origin under the influence of gravity is referred to as "Drainage".

Also it can be said to be a system of watercourse. Drainage is the area of land that drains water, sediment and dissolved material to a common outlet at some point along a stream channel. The team is synonymons with watershed in American usage with catchment in most of the countries.

1.2 AIM AND OBJECTIVES

The aim of this study is to assess the environmental impact of Tunga, .Minna drainage system on the downstream location.

The specific objective includes:

(a) Analysis of stream velocity at the drainage and down stream Location.

(b) Analysis of stream bank erosion at the down stream Location.

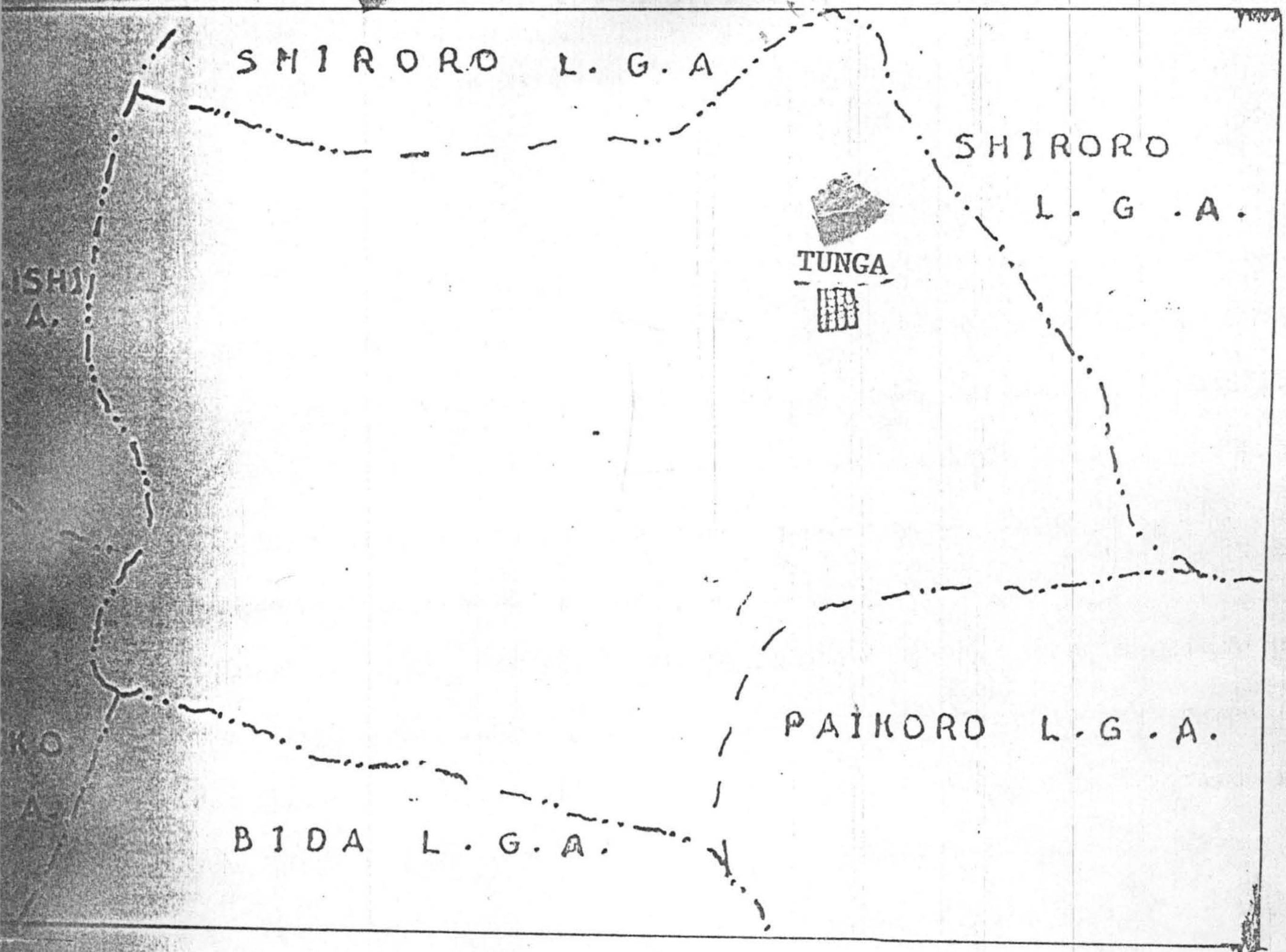
(c) Analysis of bed erosion at the down stream location.

(d) Assessment Human activities at the downstream Location.

1.3 GEOGRAPHICAL DESCRIPTION OF THE STUDY AREA

The study area is Tunga drainage system downstream location of Tunga Minna, which is located in Tunga, Chanchaga Local Government Area of Niger State. Niger State is located between Latitude 4°.00 and Latitude 7°.00 with Longitude 8°.00-11°.30 Niger State lies within

MAP OF CHANCHAGA LOCAL GOVT SHOWING THE STUDY AREA



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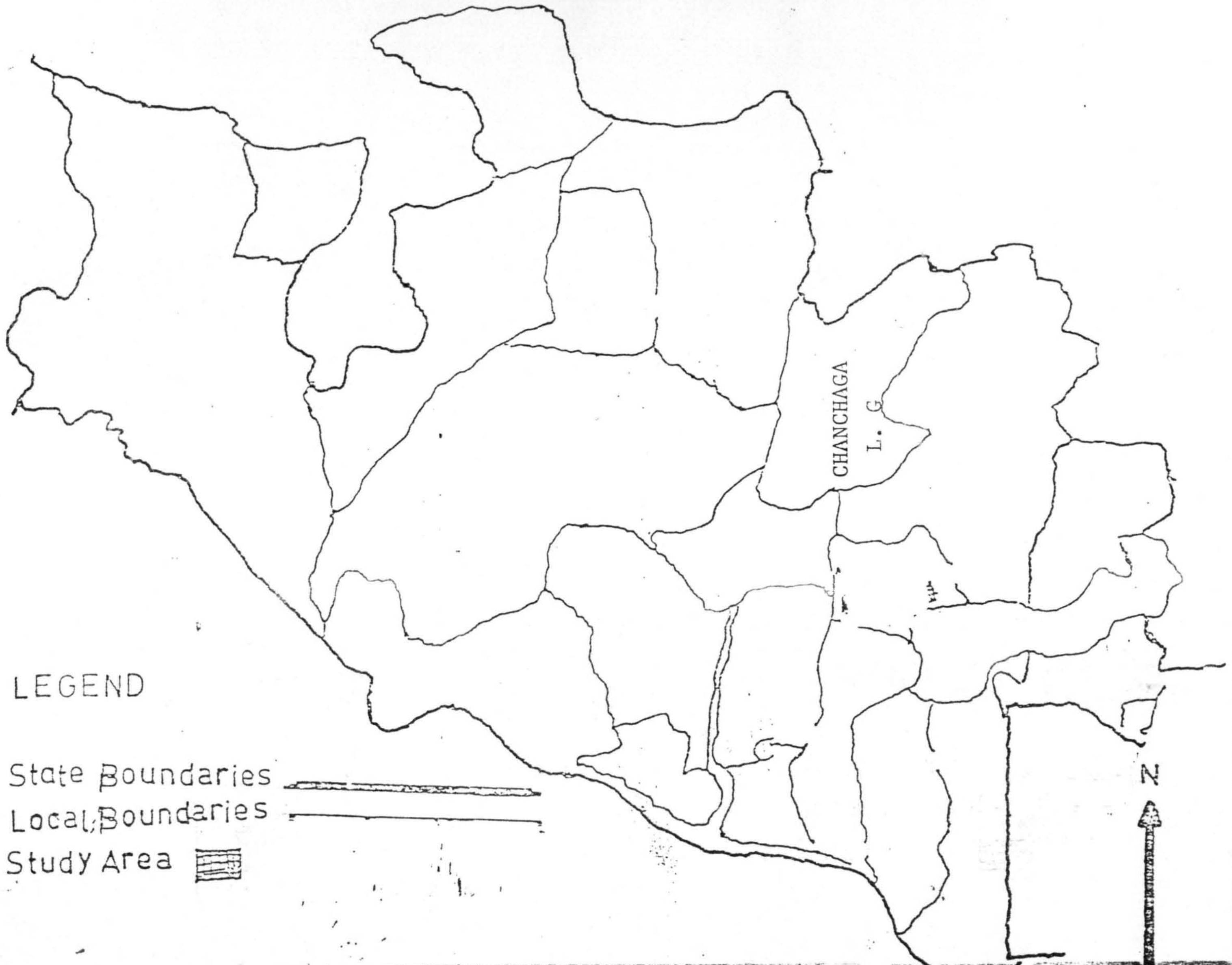
LEGEND

Local Govt Boundaries........

Study Area-------------------

MAP OF NIGER STATE SHOWING THE STUDY AREA



the middle belt of Nigeria.Chanchaga Local Government area is located on latitude 9°.30-10°.00 and Longitude 6°.00-6°.30 respectively.

1.3.1 HYDROLOGY

The suitable water includes river Malendo, river Eku, river Kaduna, river Chanchaga, Gurara, Dinga and Arunze system.They all draw into river Niger at different points. Many of these river systems are perennial but there are at present very scantly. The measurement of the amount of water flowing in the streams and rivers in general. The volume of water in the river is controlled by the season and climatic condition in the different parts of the state particularly the length of raining season ground water. The amount in water or rain water that infiltrates into the ground will depend on the topography, vegetation cover and human activities like bulding and construction of roads as well as cultivation each of these will tend to increase or decrease the amount of water that goes into the ground once water seeps into the ground. The subsequent complex rocks exist in Niger State vary in their composition and texture and therefore the degree varying depths and are covered by loose. sediment and soils. The rocks also contained opening or fracture through which water seeps into the ground. The amount of fractures also varies with the rock type.

1.3.2 CLIMATE

The annual rainfall amount has been estimated to be between 1.120mm to 1.30mm (Adefolaalu, 1991). Long hours of sunshine combine with radioactive power across the study area resulting in high power across the entire area. The planning implications of these features relate to water storage (deficits) during the period when discharge exceed recharge (i.e October through may).

The study area is in the cold/cool to cool/warm zone with cooler sector in the north half of the study area.

1.3.3 VEGETATION

The vegetation type of the watershed is mainly the Guinea savannah. There are marked differences, which occur at close intervals both the floristic composition and the open character of the vegetation, which is often caused by variation in soil types to pography, ground water situation and human interference. The vegetation is composed of mountain forest of and grasses. The grasses are between 1.5 to 3.5m high. The trees are short bold, broad leaf trees of up to 16.5m in height Riparian and gallery forest predominate along the river valleys. Most of the plants in other area shrubs with seattered trees most especially. Parkia clappertoniana and occasionally atzellia africana.

1.3.4 SOILS

The soil type is primarily the result of the interaction between climate, flora and fauna parent materials and geomorphic factors over varying period of time.

Soils are developed from the Precambrian basement complex rocks comprising granites, schist, gneiss and amphiboles. The soil belong to the Minna Association which occur on undulating rolling dissected plain developed on undifferentiated basement complex consisting mainly of granitic rocks gnesis and achist. The surface soils are usually loamy sand to sandy loam .Most of these soils are gravely except the soils formed on colloidal materials. The sub soil texture in sadly clay, loam to loam.

1.3.5 JUSTIFICATION

The construction of drainage system in any area may pose some environmental problems downstream. These problems if ignored would generate a serious disaster both on the ecology and land scape. In stream flow and in some vegetative change, which represents one justification for providing planners, geographers and policies makers with some basic knowledge of geomorphology and earth's sacrificial processes.

1.4 SCOPE AND LIMITATION

The study area covers Tunga Minna drainage system and the downstream location. This study focuses on the effect of the drainage system with particular references to the downstream location. Some environmental effects to be considered for the purpose of this study, which include vegetal cover assessment, stream velocity and bank erosion. Field observation was carried out in the study area to give first hand information on what is happening in the downstream location of the drainage system. A four cardinal with the study area to achieve the objective of this study.

CHAPTER TWO

1.0 LITERATURE REVIEW

2.1 GENERAL OVERVIEW

No construction project on the earth can be possible without changing the patterns of sequence of the ecosystem around the site. So in this case, the effect of the drainage system on the micro environment down stream location not minding its small scale is considered.

So over the years geomorphologies and hydrologists have devoted time effort through various methods and techniques to the study of drainage system and their evolution. Hydrology involves the movement of water r the land surface, but also include a variety of geomorphic, geochemical and biologic processes that depend upon the storage and movement of water. The reasons for such studies then were mainly two.

Firstly, there was the obvious point that drainage system is a major feature of the physical landscape and it does much in determining the essential character of the land scape.

Secondly, evolutionary studies of drainage system may afford valuable information about the denudation history of the area if is useful attempt as reconstruction of the unitial form of a river system in order to have evidence of the nature and mode of Origin of the land surface. Even major geological events such as marine transgressions of present day land masses may be unferred as such from a study of drainage evolution surface deposites left by the Sea.

Environmental impact of the drainage system downstream location in Tunga, Minna which shown that the attention of the channel cascade system has triggered of a sequence of interrelated morphological and ecological changes in channel and in the low terrace, increasing the mean depth of gully mouth at the downstream Location of the drainage so we can clearly say Tunga, Minna drainage system has not received adequate attention on environmental impact studies.

2.2 STREAM INITIATION

It is difficult to know what initial surfaces were like, but they are usually assumed to be uirregularly hollowed sso that stream developed leading to the hollows, which become ponds or lakes and than over spilled into hollows lower down. The two segment of the stream so initated would have had different origins. The first would required enough concentration of run-off for a rill to develop. The second is merely the overflow of a mass of water, which a stream starts from (sparks, 1972). Overland flow occurs when the precipitation is so great that not all of it can infiltrate into the soil. The infiltration capacity if the soil is governed by its permeability which is a function of its depth, its distribution of particles sizes, any cracking that may be present in it, any prior saturation or wetting which still affect it as suggested by Horton (1945). In his model of overland flow. It is likely vegetated area and far less capable of vegetation. The dominance of through flow helps to understand a number of strong regulating mechanism on peak flood discharge.

Overland flow occurring rapidly simultaneously through small drainage system will cause high peak discharge and high erosile potential in streams. The presence of through flow mean that the rill and gully network required for the drainage of humid temperature ereas is less dense than that required for the drainage of semi-arid areas in spite of their lower rainfall.

2.3 STREAM VELOCITY

Geomorphologically it is insignificant in streams being confirmed to the boundary layer at the bed and banks it is not possible for this type of flow to support suspended load. Turbulent flow is much less regular and consist of series of chaotic secondary eddies superimposed on the main flow. The threshold flow takes place varies with the viscosity. It increases with increasing viscosity, but as temperature reduce viscosity, it is lowered by increasing temperature. Two stages of turbulent flow may be recognized the first is stream flow, which is the normal occurance in stream. The second is shooting flow such as is found in rapids it involves very high velocity and erosive potential. As the turbulence itself is responsible for setting particles into motion, the energy required to over function cannot strictly be separated from energy used in transporting materials, but in a rather artificial way it can be said that energy not transport of material. The amount is very small, as it has been estimated that 96-97.5 percent is used in over coming friction.

Two quality of a stream must be carefully distinguished in this connection its competence and its capacity competence is measure by the weight of the largest fragment and varies with the velocity in any given stream it is usually said to vary with the sixth power of the velocity. The capacity of the stream is measured by the total weight of material transported and varies with caliber of the load. According to mackin (1945) it varies approximately with the third power of the velocity if a fair proportion of all gram sizes is available with a high power if the material is coarse. The principle probably does not apply to the finest materials as when a stream exceeds a certain specific gravity through the introduction of very fine material it is subject to totally different land of flow (Birot, 1952). A stream may be called fully loaded with respect to a given caliber of load, which it is arrying all the material of that Caliber that it is able to move.

2.4 BED AND BANK EROSION

Stream induce some what different problems, erosion lakes, ponds, where the stream has an excess of energy does not always result in erosion, just as it does not always result in transport. If the country rock is unconsolidated or weakly Cemented, erosion may not differ greatly from transport as individual particles may be lift up by the turbulence near the bed of a stream. If the rock is susceptible to chemical erosion, the process goes on whatever the velocity of the stream but hard resistant rocks represent a difficult problem. If the stream is carrying a large bed load of coarse ground, it is easily appreciated that a load, by impact with the rock, may loosen fragment. From it but many stream Carrying mainly.

Load in suspension and solution do not appear capable of eroding the underlying rock except by solution. Even with a powerful stream transporting a large bed load a lot of preliminary works by other factors is probably necessary before the stream succeed in eroding rock fragments most rock have planes of weakness, joint, bedding cleavage or schistosity and the action of chemical weathering may well effect a general loosening of the fragments before the stream is able to dislodge them through impacts between the bed load and the rock. If they sufficiently loosened, a stream of clear water may be able to dislodge framents through the action of turbulence. The effect of which may be erosion upstream may be largely occupied with deposition downstream. There are probably two main reasons for his. The first is to be found in the normal decrease in gradient downstream, which results in a decrease of energy and hence loss of competence. The second is the result of the form of the vally, upstream, the channel of a river may well be bounded by comparatively steep hillside slopes, so that even a large flood discharge can be accommodated in a chemical of reasonably efficient Characteristics in the lower reaches for a river however, a flood plain usually occurs, in the middle of which is the actual river channels. The channels are usually not large enough to accommodate flood discharged and water sheds on to the adjacent flood plain.

As a wide sheet of shallow water, usually with a low velocity, it has a most inefficient form of cross-section and consequently there is considerable increase in the amount of energy transformed in overcoming friction channel due from downstream is a reduction in both competence and capacity which leads to deposition.

A stream carrying capacity for suspected materials such as organic sediment and particulate organic increase with increased velocity and turbulence. Since sediment absorbs anions and cations, the concentration of many charged particles are directly related to the ability of the stream to maintain sediment in suspension.

Organism living in stream have adapted to turbulent flow most biota restrict their activities to the shave (Litoral) and bottom (benthic) zones of the stream for example, benthic algae attach themselves to the channel bottom to avoid being washed downstream. Small invertebrate animals called Zooplanton live among the rocks and debris of the channel in areas where the velocity of the stream is reduced. On the other hand, any forms of free floating algae have adapted to turbulent flow areas by taking advantage of shallow, well lighted swirls for exposure to light as well as spatial dispersion (Linsley, 1975).

The probable importance of discharge in affecting the width of the meander belt had been noted before in statistics relating the width of the stream to the width of the meander belt, factors other than discharge affect the width of the stream but general speaking the wider the, the greater the discharge. The observation of Bates (1939) and probably the most comprehensive in this from the concave bank to the covex one is supplemented by a return flow in the other direction at the surface.

(a) Direction of current of greatest velocity in a meander.

(b) Helicuidal flow in a meander

The motion is not absolutely at right angles to the current but must possess a down stream component varying with the velocity of the stream. The result is a helicuidal or corkscrew motion, which should teened to shift material from the concave bank to the convex bank, thus assisting in erosion on the outside of bends.

In small stream in the laboratory material can be observed moving across the river the from one bank to another, but whether this is due to helicoida motion is not certain. According, to maths (1914) however, such flow takes places in distorted models and in channels, which are very deep in relation to their width, but has not been observed in any part of the Mississippi system which he has, studies. The energy possessed by any stream varies with the gradient of the stream surface and with the volume of the stream, but not all this energy is available for the erosion and transport of material from the bed and the bank (sparks, 1972). Part of the energy is transformed into heat in overcoming friction between the river and the sides and bottom of the channels or in other world. Friction between stream and the wetted perimeter.

The amount of energy lost in this way will depends partly on the roughness of the bed and banks, partly on the straightness of the stream, as bends increase. The friction with the banks and partly on the nature of the cross-sectioned area of the channel. The efficiency of the cross-section form of the channel is often measured by a quality known as the hydraulic radius, which is defined as the ration between the cross-sectioned area and the length of the wetted perimeter. The higher the ration the more efficient the stream and the small the loss of energy due to external friction. The idea form of the channel for the efficient discharge of water is one, which is semi-circular in cross-section, but very few channels have this ideal shape. Although stream very considerable, there is atendency for the cross-section is one in which the breath is twice the depth. The least efficient is one in which the depth is very small and breadth very great.

CHAPTER THREE

2.0 DATA AND COMPUTATIONAL TECHNIQUE/METHOD

The method used in the study are discussed below the result obtained is based on the method of analysis describe below.

3.1 DESCRIPTION OF DATA SET

The discharge data for Tunga River was estimated at three different points of the river channel and the average was computed .

The terrestrial photographs were taken with for wet and dry season month the photographs showed different human activity along the channel the vegetation and the channel character. Gauge height at three different location was also estimated and the average was computed

3.1.1 GAUGE HEIGHT

Whereas cross-section measurement will yield the current water level measurement are needed over a period of time in order to fully describe the hydrological environment. The water level in reference to some arbitrary datum is generally referred to the stage.

Periodic measurement of stage in stream is converted to stream flow values with use of a stage discharge relationship.

3.1.2 DISCHARGE STREAM FLOW

Discharge stream flow can be define as the product of cross-sectional area of flowing water and is velocity. The discharge measurement was done through direct measurement of discharge. That is passing through a cross-section per unit time. In the S.1 unit system which is expressed in unit of cubric metres per second.

Discharge is then calculated as

Discharge= Cross-section area x velocity

$$Q = VA$$

Where Q= discharge

V= area velocity

A= Cross-sectional area of the water

M°

This procedure is given by united state Geological Survey, USGS(Corbett, 1962) and World meteorlogical Organisation WMO (1980) Velocity measurement may be made by observing the rate of travel of a float or dye which is given by the simple equation as

$$\text{Velocity} = \frac{\text{Distance}}{\text{Time}}$$

3.1.3 RECOGNISSANCE SURVEY

Recognissance Survey was embark upon to give first hand information about the study area that is the downstream location of Tunga, Minna drainage system. The Survey was base on the aim and objective of this research work. The field observation was conducted both during the dry and wet season period. During the recognisces survey photographs were taken both of dry and wet season was also survey which brought about erosion activities along the downstream Location of the river Tunga also with change in vegetal cover down stream location.

CHAPTER FOUR

4.0 ANALYSIS AND RESULTS

4.1 Analysis of stream velocity at the drainage and downstream Location

The drainage systems of Tunga, Minna has been channelised, concretized and also protected at the bank along it construction. The channel had also been narrowed to accommodate floor events the bends of the channel upstream had been systematically restructured and cut to reduce deposit along the stream. There is difference between the structures of the stream. The downstream has meandering so much to indicate the activities of stream flow. It is indicated to a middle course stream that moves slowly more especially at the beginning of the dry season through erosion doesn't take place within the channel of the Minna, deposition is not also allowed because of flood flow of the stream during the rainy session.

Since the floodplain channel bed is smooth and straighter particles from the up stream are transported down stream to the deposited. This is aided by the meandering nature of the down stream where alluvial deposit is evident. At the downstream without concrete walls/bank both erosion, transportation and deposition take place more than the channel that upstream saddled with only the role of transportation, risen Tunga, Minna stream had been channelised the river course has not changed over since, but the river course down stream has been changing with flood regimes the bank slowly continuously due to the human and water activities.

4.2 ANALYSIS OF STREAM BANK EROSION AT THE DOWN STREAM LOCATION

The stream flow has been regulated and thus was the actions of the running water. The stream Tunga, Minna has been graded to eliminate erosion and deposition, while the down stream suffers the consequences of the increased deposition and erosion in the channel that is hampered by low discharge are velocity, corrosion activation and channel vegetation. The colonization of the stream by vegetation is a clear indicator of depositional activities going on long the stream.

Though the up stream was channelized and protected, the ecological imbalance created by the concretization has not been considered in the downstream , because of the shift in human activities from the upstream to downstream, the ecology of the area has also been distorted. The presence on the stream downward has been increased. Because the stream had been narrowed at Tunga, Minna drainage system its flow had been increased to carry most particles downstream. The edge at where the concretized channel meets eroded as a mark in shift of the stream activities. It has also been depend by erosion while the edge is collapsing cascading

4.3 ANALYSIS OF BED/BANK EROSION AT THE DOWNSTREAM LOCATION

Since the protection of the banks as a result of channelisation, no activity is taking place upstream. No farming, fishing, well digging and refuse dumping is taking place here. The downstream became a heaven for the little communities depending on the stream both up and downstream.

The banks upstream are marked by sanctified concretic walls to ritness any erosion. While the down stream is fairly a lot of termina erosion during the rainy season and deposition at both rainy and dry season. Scanty vegetation marks the edges of the stream downward.

The banks upstream are marked by sanctified concrete walls to ritness any erosion. While the down stream is fairly a lot of termina erosion during the rainy season and deposition at both rainy and dry season. Scanty vegetation marks the edges of the stream down .The banks are heavily cultivated during and after the rain seasons. This leads to erosion of the banks and the vicinity. During the raining season the population pressure is more on this land than when it is farmers partake in irrigation farming. The plain is favourably cultivated too during the dry season. The vegetation by the stream are very scanty that rills are evident at most of the banks of the stream. The source of the stream flows from the surface flow can easily be marked from the rill they form. The ecology of the banks are greatly disturbed annually and are replaced by human activities must of the fauna and flora along the banks are perpetually changing with seasons and human activities downstream. The activities of cattle rearing along the bank and also drinking from the stream are also helping in erosion of the banks. When cows and goats move around the hanging banks to collapse into the river in the process of tempering down for water is indicating cattle's grazing by the river and it banks.

4.4 ASSESSMENT HUMAN ACTIVITIES AT THE DOWNSTREAM LOCATION

Because of the regulation, concretizing and protection of the river upstream. Human activities in both the channel and bank are highly made impossible. The channel and the banks cannot be used for any farming activities. Sand excavation, fishing and shallow well digging. These activities have shifted down stream and had created a lot of pressure on both the bank and the flood plains down stream location.

In the rainy season, farming is not possible along the stream but at the banks when the dry season set in farmers scramble to cultivate. Here they plant their until when rainy season comes again. This is the reason why some colonizing vegetations are also seasonal or annual.

The deposit at he downstream has also led to excavation or evacuation of gravel sand from the river for building activities . This is mostly done during the dry season when the tippers can drive into the river channel and at the edges during rainy seasons.

Since the downstream is not protected most of the people living by the stream, as a result of populations explosive created by the University empty their refuse into these stream to wait for the rainy season flow to transport them. In the period of water scarcity, shallow wells are also dug along the course of the river. Most of these activities are concentrated here because the upstream could not be used for the same thing.

More fishing activities also take place along the stream by adventurous little boys. This will take place upstream because the fauna and flora of the upstream were not only mutilated but also destroyed.

4.5 THE FOUR CARDINAL POINT APPROACH TO VEGETAL COVER SURVEY

This was an approach and opted in the assessment of the vegetal cover of the study area. The four Cardinal approach involved the selection of points within the study area and subsequent division of such points into four Cardinal point each Cardinal points was survey serially and the contents were classified in terms of the constilnent of the vegetal cover and area of bare ground. The result was tabulated for analysis.

Total number of ten sampling survey were carried out. Each of the 10 point was taken as sampling point view all the environment as a complete circle. It is divided into four cardinal points . Each sector was assumed to be composed of five types of vegetation namely shrubs, grassland, bare land, trees and farmland.

3.1.4 ANALYSIS OF STREAM FLOW

The velocity of the river channel was taken at three different point A, B, C with distance of 10m each.

Point A we have 7, 6, 7 and 8x= 7.2secs

Point B we have 5, 4,5, 5, 5, 5 and 4,x=4.9secs

Point C we have 11, 10, 9, 11 and 12,x=10.6sec

Velocity= Distance / Time

For point A = 10m / 7.2 = 13m/sec

For point B = 10m / 4.95= 0.49m/sec

Total mean = 27m/sec velocity about a point cross-section area of the river channel.

LENGTH

A	B	C	
mm=4.7m	mm=6.0	mm=14.6m	= 25.3m dry
Max=12.0m	max=27	max=26.6m	=65.7

BREADTH

Min=0.25m	mm=0.8m	min=1.10m=1.41m dry	
Max=0.20m	max=1.4m	max=2.3	=3.9m wet

DISCHARGE FOR DRY SEASON

Min=dry season= =(LxB)x velocity

=8.43x1.41

=11.8863x2.7

=32.09m3/3

DISCHARGE FOR WET SEASON

Max=wet season= (LxB)x velocity

=85.41x2.7

=230.607m3/3

Between the dry and wet season there is a differences of 198.517m3/3 which show that along the wet season there is a high discharge which make the activities impossible in the channel because of high flow. Also due to the high discharge, the down stram location may liable to flood. And wash away from land and widening the channel as a result of degradation of the soil which cause erosion in the downstream location.

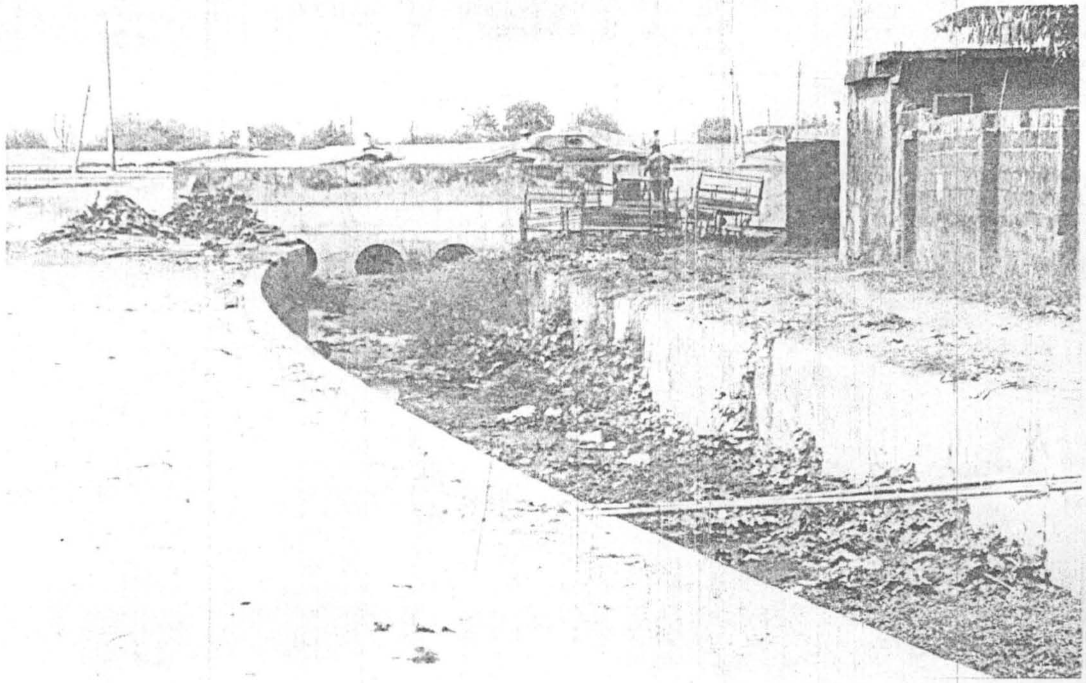


Plate1: The drainage channel that cuts across the Tunga market, Minna, concretized and also protected at the bank during its construction

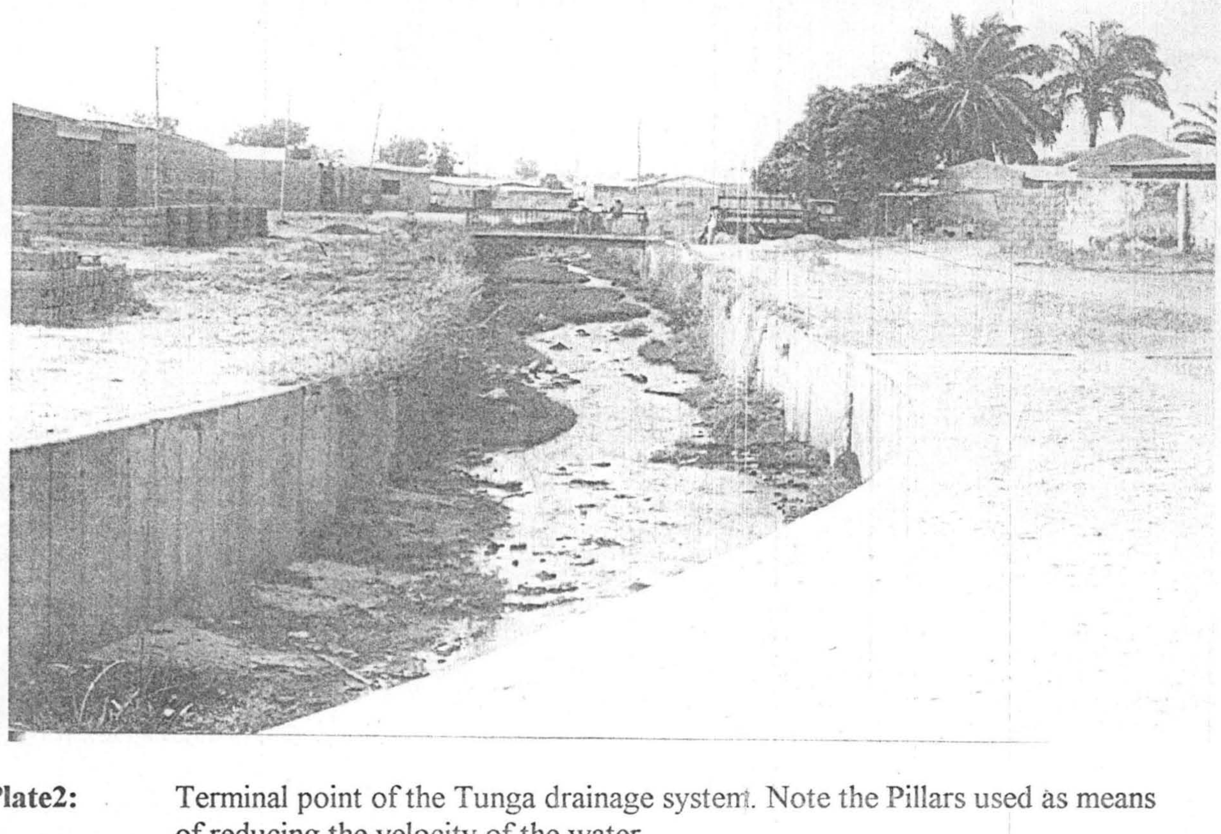


Plate2: Terminal point of the Tunga drainage system. Note the Pillars used as means of reducing the velocity of the water

Plate3: Downstream location showing areas liable to bank erosion

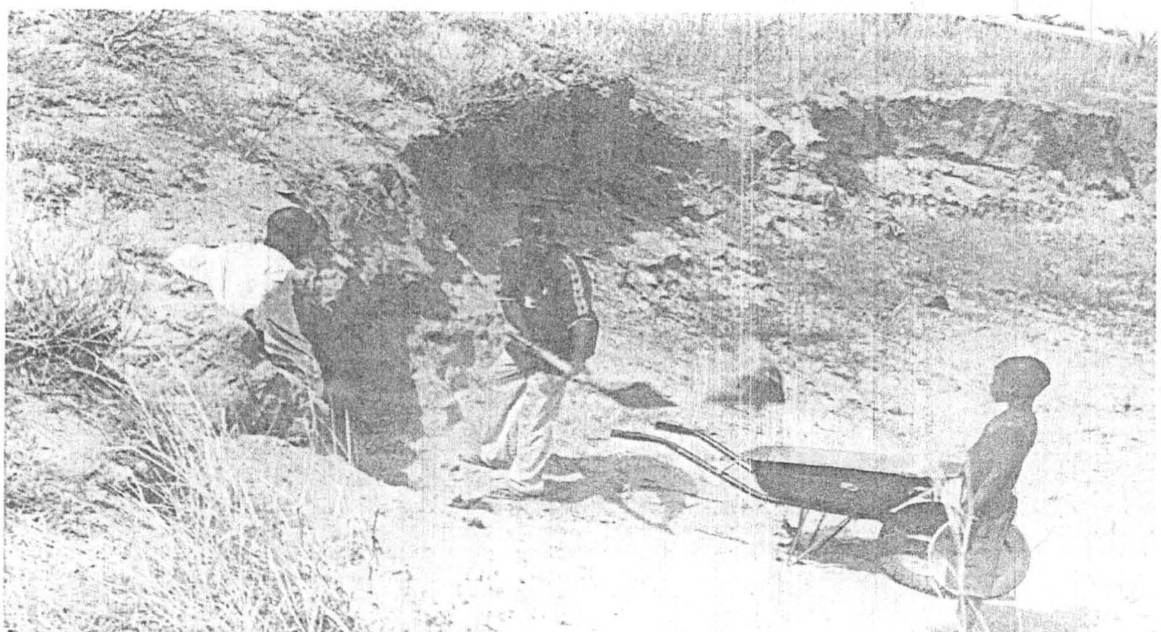


Plate4: Downstream location showing human activity excavation of sand used in the block industry during the rainy season

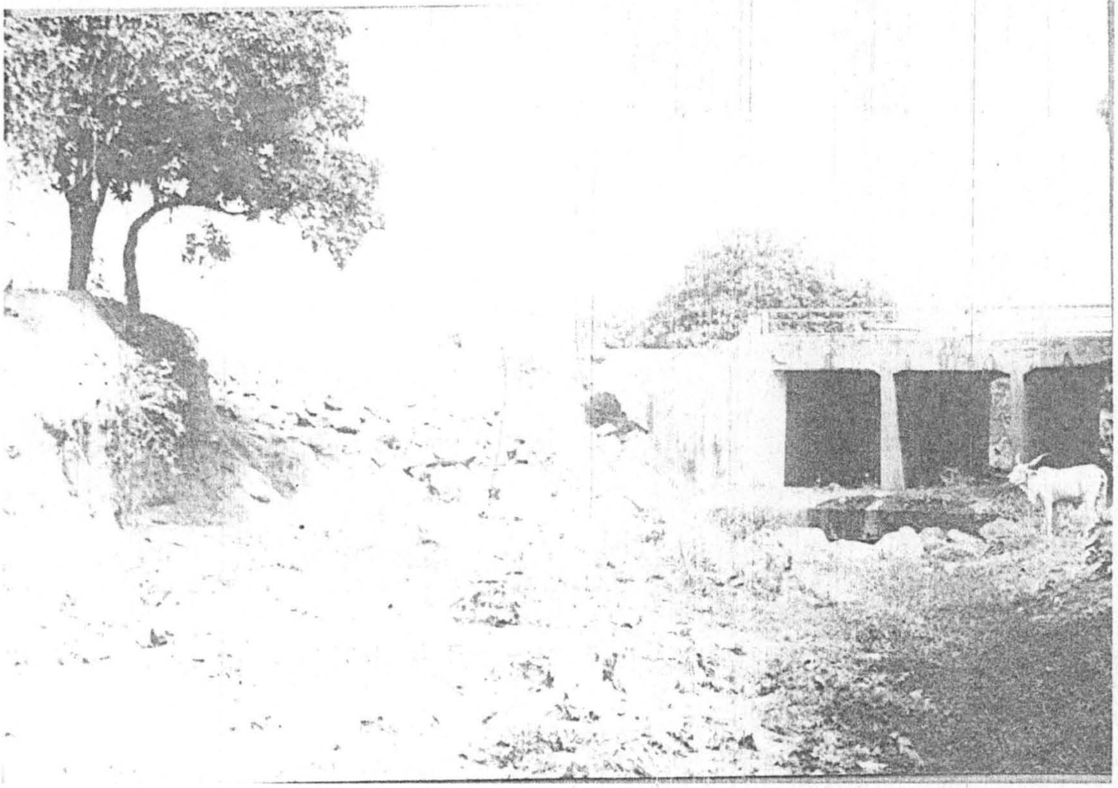


Plate 5: Downstream location showing no discharge of water during the dry season

Plate 6: Downstream location showing meandering in the channel of the river alluvial deposit

CHAPTER FIVE

5.1 SUMMARY

It was discovered that drainage construction has led to so many impact downstream location of the drainage system. The result of the analysis carried out in the previous chapter could be summarized as it was categorized into four substitute.

The upstream was channelised and concretized to carter for both particles coming in and going out. It was graded to avoid deposit and erosion .These erosional and depositional activities are transferred downstream. The regulation upstream is affecting the downstream by regulation of flow that has lead to meandering.

Land pressure that was supposed to be shared by both Tunga, Minna drainage system and the downstream are all transferred to the down stream, thereby creating a lot of pressure on the land and creating more erosion problems. The banks of the downstream have also experience land pressure and different cultivations that is also leading increased erosion and land degradation.

5.2 CONCLUSION

It is obvious from research to see the impact of the channelisation of the Tunga drainage system on the down stream. The downstream is facing great problems of pressure, that is leading to erosion and deposition that is marking the stream a bit shallow and also the river course daily it could be concluded that most of the stream flow activities, human activities and stream morphologies are concentrated at downstream as a result of their shift from the up-stream.

5.3 RECOMMENDATION

Following the result of the research one would want to make the following recommendations.

1. That the downstream should be protected against human activities Endangering the course of the river and ecological species.

2. That refuse dumping along the river should be discouraged against the Occurrence of flood which could be felt much downstream than upstream.

3. That the rate of deposit and erosion of the area be study, while intensive studied is carried out on the change of the river course.

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APPENDIX 1

FOUR CARDINAL POINT APPROACH

4	1
3	2

The observer stands and imagines himself to be in a circle and assesses the vegetation, the vegetation cover associated in section 4.5.

The mean of the ten sample points was calculated and tabulated as follows.

Sectors	1	2	3	4	Mean
Vegetation					
Shrubs	60	56	29.3	33.4	44.65
Grasses	3.3	3.3	8.3	1.67	4.14
Bare land	1.67	3.3	8.3	8.3	4.14
Trees	13.3	29	12.3	25	19.9
Farm land	21.7	8.3	8.3	38.3	27.5

The result was calculated as given below

Vegetation	percentage
Shrubs	44.65%
Grassland	4. 14%
Bare land	4. 14%
Trees	19. 9%
Farmland	27. 5%