AN ASSESSMENT OF HUMAN INFLUENCE ON JEMIRU STREAM IN PAIKO

BY

ADAMU TANKO PAIKO
PGD/GEO/99/2000/098

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF POST-GRADUATE DIPLOMA IN ENVIRONMENTAL MANAGEMENT, DEPARTMENT OF GEOGRAPHY, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

AUGUST, 2001

DECLARATION.

I declare that this project tilted "An Assessment of Human Influence on Jemiru stream in Paiko" is an original work done by me and has not been represented anywhere for Post-Graduate Programme in Environment Management Studies.

....

ADAMU TANKO PAIKO **DATE**

CERTIFICATION.

This is to certify that this work was carried out by Adamu Tanko Paiko PGD/GEO/99/2000/098 under the supervision of Dr. A. A. Okhimamhe and has been prepared in accordance with the regulation governing the preparation and presentation of project in the Department of Geography, Federal University of Technology, Minna, Niger State.

A Okhimamhe. ..... 02/10/01 .....

Dr. A. A. Okhimamhe — Date
SUPERVISOR

..... 27/9/2001 .....

Dr. M. T. Usman — Date
HEAD OF DEPARTMENT

....

Prof. A. A. Abalaka — Date
DEAN PG. SCHOOL

....

EXTERNAL EXAMINER — Date

DEDICATION.

To my Late Parents Malam Adamu Dada Kura Magaji and Fatimatu Gbefu Jami, my daughter Fatimatu Gbefu Isah tanko, my wife Mallama Aminatu Jummai Bello and to all Postgraduate students of Environmental Management.

ACKNOWLEDGMENT.

I must not relent to acknowledge with deep appreciation the contribution of the under mentioned either morally or financially to the success of this project. First and foremost is my project supervisor Dr. A. A. Okhimamhe, the course co-ordinator Salihu Saidu, the Head of Department Dr. M. t. Usman, all the course lecturers whose lectures have in one way or the other proved very useful to my project, my colleagues; Dajuma Tanko, Mohammed Ahmed, Ekpekurode O. Edward, Mohammed N. Saidu and Tasiu Idi who have assisted me with useful materials for my project compilation.

I shall not be sincere to concluded without acknowledging Honorable Ali S. Bello, Mohammed T. Doma, Mallam Gambo Ibrahim Lapai, Commrade Labaran Garba and Mallam Garba Adamu Paiko, who gave me all the financial assistants.

To them all, I say thank you and God bless.

ABSTRACT.

Stream/River interference have become common both at rural and urban areas with increasing number of people that are in dear need of available land for their economic activities of farming and building constructions.

People living at the source regions or along the banks of the stream/river have greatly tempered with the stream/river natural vegetation and the source regions through deforestation and dumping of refuse at the source region in the stream/rive bed resulting in the salutation of the stream/river, over growth of weeds on the bed, flooding effects and destruction of aquatic habitat.

Jemiru at Paiko is not one example from this case. A feasibility study from the source regions and along the unchanged section of the stream revealed that much vegetation have been loss to human activities, deposit of sand at the dam, disappearance of water in the dam, loss of the quality of the water down stream and much of the source regions of the stream are in a greater danger with increase in population and expansion of the town.

The implication have been analysed and the management measures suggested to those problems.

TABLE OF CONTENT.

CHAPTER FOUR.

CHPATER FIVE:

CHAPTER ONE

1.1 BACKGROUND TO THE STUDY.

Environmental problems have been with man from the time he came into existence right until contemporary times. Man have assumed proportion, forcing world leaders to converge for the purpose of devising concerted measures to ensure a safe haven for existence and living. These environmental challenges range from natural disasters such as erosion, hurricanes, desertification and earth quakes to "man - made" ones today like chemical pollution noise, urban planlessness, deforestation, etc.

These problems originated essentially from man's attitude to his environment, which he interpreted as an inanimate and inert things made for his creation and needs. The aquatic, reptilian and animal kingdom were for his basic consumption and pleasure. Thus man's perception of his environment was negative. It came to adopt his unfortunate attitude because of the harshness of the environment at the early phase of human development.

The cold, heart and animal (wild) with their ferocities were decimating men who is forced to devise ways to cope with the hostile of reality of existence, which in facing the reality, man has abused, destroyed and wasted his environmental resources. Besides, the water resource within the environment is treated by man without dignity or respect for the lives of aquatic animate species. The effects of all these is to pose

challenges and limitation to an eco-systemic world in which everything is related to the other.

The solution to these problems pervading human attitude in developing a correct relation between man and the environment, will begin by man evolving an adequate understanding of the environment as a creative vessel within which human possibilities are actualised. That is to say water resource is a dynamic, purposeful background for man to develop himself. It provides him with enabling opportunities for self-discovered, development and self mastery.

The implication of this background is that water resource should be understood as a spiritual active base that must be preserved and constructively harnessed. In sum; for man to be, for man to develop and progress, for man to come to ultimate discovery of himself and be a set actualised being, he must take into consideration the fact that his environment is animate and is not tied to his own existence.

Therefore, for man to exist, the first condition is to have a safe and organised water resource environment, immediately, man comes to this awareness, all environmental problems around him would gradually lessen. It is clear that water is a heterogeneous resource that can be found either in a liquid, solid or gaseous form, at a number of locations near or at the earth's surface. Depending on the specific location of water, the residence time may vary from few days to many thousand of years. More than 99% of the earth water is unavailable or unsuitable for beneficial human use because of its salinity or location. Thus, the amount of water for which all the people compete is much less than 1% of the total. But on a global scale, total water

abundance is not the problem, the problem is water available in the right place at the right time in the right form.

The environment can be regarded as a set of resources for human use. Humanity and the environment is an essential one entity and the human society is determined by the nature of their physical environment and somewhere, there must be physical limit to the quantity or resources that can be found, the amount of waste that could be absorbed by the environmental system, and hence there are limits to the number of human that the planet can support.

Therefore, the creation of man of his own world and his own image within the world of nature is found in antiquity. From the early recorded times, human have found that the planet did not provide an ideal habitat for them. Some part were wet, others too dry, too monotonous or too heavily forested for easy access to a livelihood. Some of these features could be changed, while others were amenable to alteration. Swamps could be drained, forest replaced by agricultural land and houses.

River basin management is also environmentally manipulative since it always involve dams, provide fisheries of a community, support domestic irrigated land and use for waste disposal. The danger associated with water are varied and ranged from grossly visible such as drowning and flooding to the more subtle and insidious such as the spreading of diseases. Each human require water in order to survive, grow and reproduce. After other resource have been used, any waste are led-off into water, land and atmosphere. As generalisation therefore, it could be said that human extract materials resource from their environment of which water is the commonest on earth

and very essential for life but has become inter-woven within human livelihoods in various ways.

Therefore, this project will survey the nature of the Jemiru stream, problems that exist and provide a resource management alternative that would likely make Jemiru stream more free and very useful to all people while avoiding the negative impacts.

1.2 STATEMENT OF PROBLEM.

Jemiru stream had supported all the domestic water need of Paiko people for the past several years, but in recent times has witnessed a drastic change in terms of its quality and quantity due to human activities on the banks of the stream and in the bed of the stream, which are mostly of land-use practices which has polluted the water and siltation of the beds due to deposition of debris, eventually resulting in over-flooding of the stream.

These problems have called for attention so as to assess the extent to which men has interfered on the stream in order to proffer a management alternatives, since urban river system is very vital for human sustenance.

1.3 AIM AND OBJECTIONS.

1.3.1 AIMS.

The basic aim of this research work is to assess and analyse the extent of human interference on a used stream of Jemiru and provide an effective measures for managing Jemiru stream.

1.3.2. OBJECTIVIES.

This research work shall:-

i) Assess the extent of land-use of the banks and source regions especially upstream of Jemiru stream.

ii) To determine to some extent the rate of deforestation at banks of the stream through field survey.

iii) From the field observation, the research work shall identify the effect of human activities on the beds and banks of the stream (Jemiru).

1.4 SCOPE AND LIMITATION OF STUDY.

Due to limited financial resource at my disposal and time constrain, this study shall be limited to cover only the source regions at Dobwa Hills and Paiko town where the stream has its watershed which are drained into the stream. And because of limited time, the study shall not go beyond Jemiru dam, where much of the impact of human interference on the stream is felt and noticed.

1.5 JUSTIFICATION.

A field trip to River Lanzu in Bida by Postgraduate Diploma Students of Federal University of Technology, Minna, revealed that, population growth has affected the land-use pattern of Bida in term of agricultural activities and construction of houses by people. These activities by man has led to much interference on the catchment areas, the banks and the beds of river Lanzu in Bida.

This project is intended to provide a basis for estimating human interference on a stream in Paiko. The study will therefore be centred on human interference on Jemiru stream and the strategies for managing the stream effectively.

1.6 DESCRIPTION OF THE STUDY AREA.

The town Paiko is located on latitude 8^0 6' and on longitude 6^0 8' having an undifferentiated basement complex of mainly guess and magnetite. The town enjoys a climate typical of the middle belt zone, with a rainy season starting from April and lasting for about 190 - 120 days. The mean annual rainfall is about 1334mm, with August and September recording the highest rains of about 300mm.

The mean monthly temperature is highest in March at about 30^0C - 32^0C and lowest in the month of August at about 24^0C - 25.3^0C. The town is situated at the foot of a hill to the south and fart to the eastern part is another hill called Dobwa hills, to the north is Kwanayi hills which is an extension of Dobwa hills and to the west is an extended plan bounded by salefu stream.

Jemiru stream occupies the lowest part of Paiko draining almost all the run-off of the town into River Chanchaga elsewhere down stream. Jemiru stream take its main source from Dobwa hills to the East and some other catchment areas scattered around the town between the two hills flowing toward the west joining River Chancahaga elsewhere down stream and finally into River Niger.

Agriculture is the major economic activity of Paiko people, where Jemiru stream used to provide for irrigational facilities to farmers, in cultivation of the town has resulted in high dependency rate on the stream, though poor drainage continue to be a serious problem in Paiko with the increasing number of people on a used stream as Jemiru. The population of Paiko has more than doubled in recent times and the town has expanded to embed the stream banks and watershed of swamping regions of the town.

But with a used stream as Jemiru, if Paiko people have had water problem in the past, it has been only a sample of the future because the population of the town has continue to increase and pressure on the stream has more than tripled which has resulted in the disappearance of the stream near the town far away from the main source regions on the hills. Despite most stream draining run-off water in Paiko are seasonal flooding which is a result of marked wet and dry season. However, generally streams in Paiko provide water for domestic uses - drinking, cooking, washing etc. Stream waters such as that of Jemiru were used for improving Agriculture in the past mostly for irrigation of crops and to water livestock. Fishes from the stream provided valuable protein to the people.

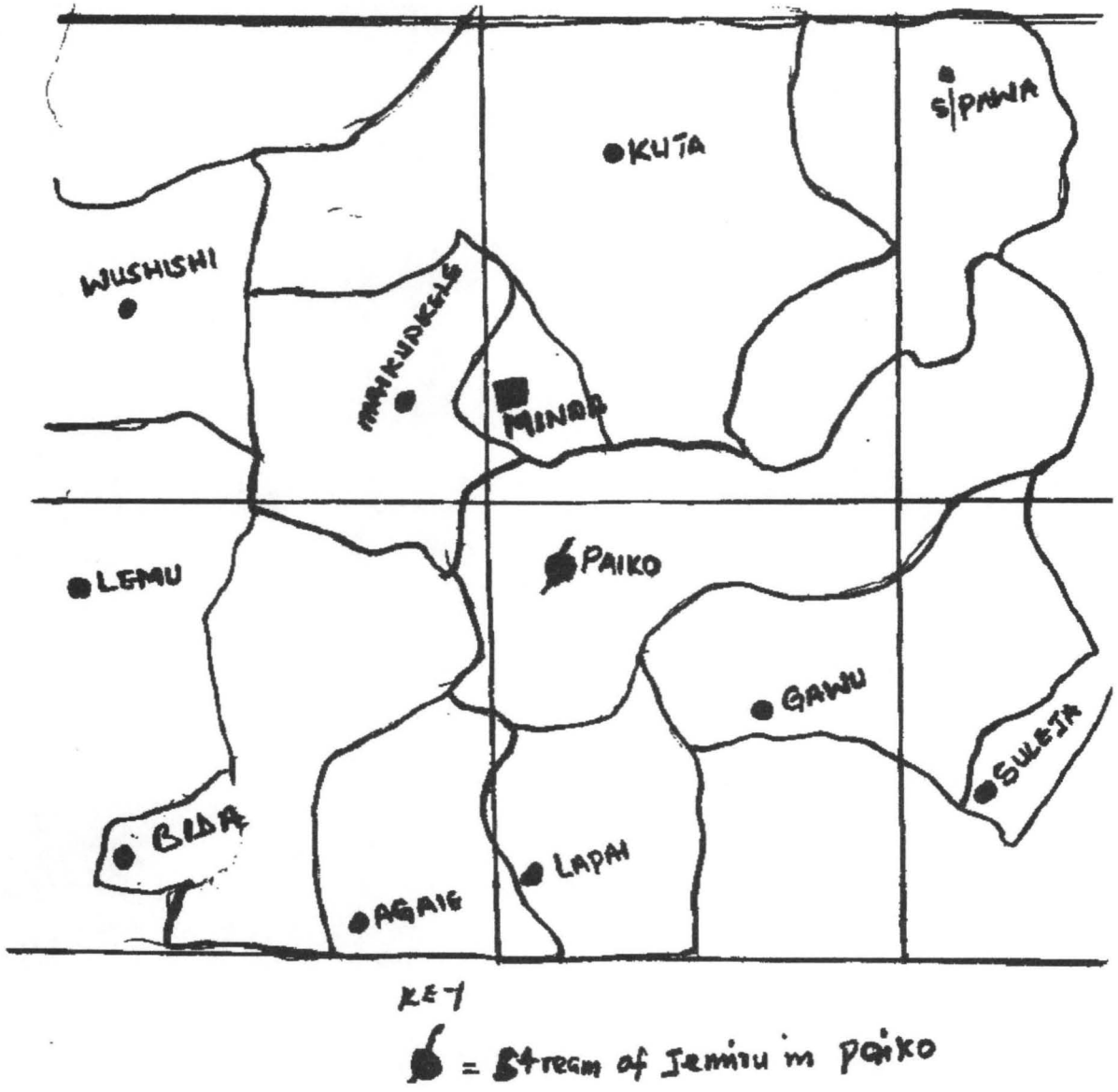

Fig. 1: Map of the study area: Paikoro Local Government Area Paiko Town

Partly produced map (Author)

CHAPTER TWO.

2.0 LITERATURE REVIEW.

Rainfall either sinks into the ground, evaporates into the atmosphere or runs-off as rivulets, brooks, stream and tributaries of rivers that flow down to sea (Akinyeye, 2000). The upland forms catchment areas of the stream/river. The crest of hill the divide or water shed. (Adeleke, 1980). Such a stream is defined as a course of running water, a rivulets, brooks or river (Moore, 1974).

The velocity of a stream is determined by the amount of load it is carrying, with the load been the main agent of erosion (Horrocks, 1964). Erosion is a process whereby the surface layer of weathered rocks is loosened and carried away by running water, wind, ice or natural agent and the lower horizon in the soil is exposed, resulting in decrease in soil fertility, diminution of cultivable land, loss of properties, disruption of communication and scarcity of water.

However, a combination afforestation, ridging, contour plugging, construction of side drains to soak-away pits and construction of concrete structure and drainage channels is usually been applied to combat erosion (Akinyeye, 2000, Umoh, 2000).

The natural function of all stream valleys is to carry the peak discharge that occur seasonally or rare interval, but human economic activities have resulted in the loss of biodiversity as a consequence of degradation from over - exploitation of soils, forest, coastal and agricultural land. Pollution of air and water, clearing of forest for

farming, drainage of the wetland etc., transform habitat and could result in complete loss of certain species (Okhimamhe, 1999).

Sediments from soil erosion is greatest in stream in areas that features gully erosion and waste load from urban areas tend to increase owing to growing population and greater per capital water usage (Abubakar, 2000). Water in the stream is made up of hydrogen and oxygen with a chemical formula H_2O (Willcock, 1982) water is almost a universal solvent, most natural as well as man-made substances area soluble in it to some extent (Linsley, 1992). The increase use of chemical fertilisers to increase farm productivity pollutes surface water when run-off carries the chemical into such surface streams (Abubakar, 2000).

Surface water in which there is significant increase in the level of turbidity after a rainfall are often identified as "flashing water" and the organic materials from man's activities often identified as synthetic organic compound (SOC's) which includes constituent such as pesticides, herbicides, degreasers, solvent etc, and over a thousand SOC's have been defected in our stream water (Iinsley, 1992).

Under the concept of riparian right the owner of the land adjacent to the stream is entitled to receive the full flow of the stream without change in quality or quantity (Usman, 200; Iinslay, 1992). The riparian owner is protected from the diversion of the water upstream from his or her property or from diversion of excess flood water towards the property. Therefore, no stream owner may materially lessen or increase the natural flow of the stream to the disadvantage of the down stream owner.

Water-shed can quite clearly be "demarcated and mapped" for a collective process of guiding and organising land-use and other resources on a water shed so that human needs are satisfied, without affecting soil and water resource (Okhimamhe, 1999). Though the scale of human tragedy caused by natural disaster is compounded by the unchecked process of urbanisation and the destruction of the environment; the impact of the disaster can be minimised through better environmental and urban planning (Toepfer, 2000).

It is also clear that certain believe encourage the protection of the environmental resources such as some forest being preserved as sacred shrines where the collection of fuel wood and other forest product is forbidden and access to some stream or other water bodies and their aquatic life is sometimes restricted, thus allowing minimum resource depletion (Abubakar, 2000). But through appropriate technology, the environment can be made better and safer such as dredging of silted portion of a river, making water flow more freely and allowing fish grow more abundantly (Abubakar, 2000).

From environmental view, the best approach to flood problem lies in a planned combination of water control structure, flood plains zoning, adequate forecasting and insurance (Umoh, 2000). The world per capital property damage from flooding is estimated to be increasing, as is vulnerability to catastrophic damage caused by exceedingly rare floods with probable recurrences of 100 - 1000 years. Urbanisation and poor land-use has effects of even greater magnitude through out the developing countries (UN, 1983).

Engineering works for irrigation and other purposes can in some places be combined with flood control, warning system, building designs, land-use plans and regulation can be integrated to reduce vulnerability to loss (UN, 1983). Flood routing which is the routing of the movement of water from rainfall to run-off may reduce flooding problems (Chow, 1981).

Grasses or vegetation in channel of a stream will result in considerable turbulence, which means, loss of energy and retardance of flow. The grasses will stabilise the body of the channel, consolidate the soil mass of the bed, and check erosion on the channel surface and the movement of soil particles along the channel bottom (Chow, 1981).

It is necessary to remove large floating and suspended debris such as logs and branches that may be present at the intake location in the stream (Linsley 1992). Relatively through channel improvement by increasing the capacity of the water channel by clearing refuse, trash and weeds from channels has low first cost, but a high maintenance cost because it may be periodically repeated. A more permanent improvement is replacing the natural channel with a larger prismatic channel on a straighter alignment. The channel, further be improved by replacing set back levee as on either sides of the main channel by suing reinforced concrete graft, or asphalt living. Non-structural measures include land treatment, flood proofing, land-use adjustment and flood insurance (Nsofor, 2000).

Afforestation does not only help to conserve forest, a vital natural resource, but also prevents unnecessary floods that comes with forest clearance, it also slow the rate

of run-off by intercepting the rain and thus help to conserve water. The concrete dam construction across a stream, a large reserviour of water can be held back and later release in any part of the year to feed numerous irrigation canals that bring water to adjacent area (Adeleke, 1980).

On a global scale, total water abundance is not the problem, the problem is water's availability in the right place at the right time in the right form, more than 99% of the earth's water is unavailable or unsuitable for beneficent human use (Daniel, 1982). The story of the restoration of lake Washington represent many important aspect of the relationship between human beings, the biosphere, and our water resources. Most important, lake Washington is a success story and shows that public concern, combined with appropriate laws, policies and regulation can improve our water resources without much human interference (Daniel, 1982).

A co-operative study of River Denube in central Europe revealed some influences which result from human activities, Denube river is about, 2900km and it is a real international river, passing through 8 countries with over 390 communities along its backs. It has a drainage area of about 817,000km^2 supporting over 70 million lives.

In course of hydro-biological study of Denube, one of the most important tasks is to estimate those influence which result from human activities. The original, natural factors:- geomorphological, hydrographical and meteorological ones-entirely determined the flow, drift speed, rate of silt deposition, light and temperature conditions and the bank side formation rivers, now the authropogenic effects and

human interference play an important part in the life of even such a large river as Denube. The construction of dykes, drainage channels, dams power station, riverside wall etc are extremes form of these interference (Kovacs, 1985).

As the world's population and human economic activities increases, the use of water will also accelerate. Today world per capital use of water is about 710 cubic metre per year, and the total human use of water is about 2600 cubic 1 cm per year. It is estimated that by the year 2000, world use of water will more than double to 6000 cubic 1 cm per year (Daniel, 1982). Today, only about 8% of the world's energy consumption by human societies is of wood (Simon 1999). Demand for wood in developing countries averages about 1.5t dry wood/cap/yr and given rise in demand from growing population and from urbanisation, the effect is obvious (Simon, 1991). A list of the main uses of water by human societies is given below which also gives example of where substitutes are provided and the percentage supply that is consumed.

TABLE 2.1:LIST OF MAIN USES OF WAER BY HUMAN SOCIETY.

USE	SUBSTITUDE	% CONSUMADED
Drinking	None	1 - 15
Other domestic	None	1 - 15
Public urban	None	1 - 15
Livestock	None	1 - 15
Irrigation	None	10 - 80
Navigation	Land transport	0 - 10
Hydro power	Other energy	0
Mining	None	1 - 5
Industry		
Cooling	Air	0 - 3
Processing	Mechanical	0 - 10
Waste disposal	Air	0
	mechanical	-
Recreation	Landuse	0
Flood loss reduction	Management	0

(Simmons, 1991)

Surface waters are in most cases subject to both industrial and human contamination and sometimes the water carried by a river contain a certain amount of suspended solids which could be removed with time (Deju, 1971). However, menace caused by erosion of surrounding villages is of concern which could be arrested by rechanneling the river courses as the case of Sakwu River in Bauchi state that will be recourse by 1 Km while the Jamaare River could be bank-blocked to avoid further erosion (Edu, 2000).

CHAPTER THREE.

3.0 DATA COLLECTION PROCEDURES.

This study made use of data of the following forms:-

i) Measurement of the distance of the stream from the main source region to where it was dammed. The width of the stream at different section were measured using measuring tape.

ii) Data were also collected from relevant literatures verbally based on some set of questions from some persons randomly selected residing close to some source regions or the bank of the stream (shown as appendix I).

iii) Photographs were acquired during survey and field work to illustrate human activities at different sections of both the catchment areas and the banks of the stream.

3.1.1 RESPONSE TO VERBAL QUESTIONS.

The questions prepared was intended to be responded to verbally by at least 60 persons, but only 48 people randomly selected responded to the questions. 20 persons who had their farm along the banks of the stream cleared the trees on the banks of the stream before cultivation, while 3 persons met the land the way they are farming it now. Five (5) respondent prefer to cut down the branches and leaves of the trees before cultivation rather than cutting down the trees.

Fifteen (15) persons met, responded to "YES" for the banks of the stream to be the only piece of land they have for cultivation of their crops, while twenty (20) of them, have other alternative elsewhere, though far away from the town as such prefer to cultivate the closer land to them. However, those of them cultivating rice where the application of fertilizer is much demanded are unaware of the damage and danger caused to the quality of water and aquatic life in the stream. Four (4) person confessed that they clear, vegetation covering water in stream in order catch fish and other reptiles in the water.

Ten households residing near some source regions and the banks of the stream denied the fact that refuse are dump into the stream by them, but rather the refuse are carried into the stream by run-off of water during raining season. But houses built along the banks in due to increase in the number of people and reduction in space for building.

Five (5) people engage in the excavation of the banks and bed of the stream claim that they do so to earn a living and since land owners do not allow them to excarvation of the free land (i.e. the streams). They excarvate the stream for moulding local blocks used in building houses. However, the horrors created they feel do not constitute threat in any way to residents of there areas.

A response from eight (8) house hold along the banks have observed that bed odours are not produced by pounds created by the horrors, instead the ponds are breeding centres for mosquitoes, they spend much on insecticide to avert the menace of mosquito bite, yet it proves abortive since they can not sit outside their rooms at night in fear of mosquito bite.

According to an elderly person in Paiko-Ba Kuso, said that Jemiru dam was constructed in the early 1960's i.e. some years after Sarki Bello has returned form England (period of independence) that the dam was constructed which served many purpose to people of Paiko, such as washing, fishing, swimming and irrigation farming. But with the deposition of sand and the breakage of the dam, there is no longer in the dam site, and the purpose for its construction is lost.

Fifteen (15) farmers testified that they lost then farm crops in 1990 to flood of the stream. Notable among them are mall Musa Kwago and Mal. Usman Mamman (Kuranji), who lost their sugar cane plantation yams to flood in that year. Shenpapi residents suffered the flooding effect though no human life was cost, but livestock lost to the flood in that year.

In General, i.e twelve (12) persons testified that the general weather condition of Paiko has changed in the past fifteen (15) years. The town seems hotter on average as compare to the late 50's and early 60's.

3.1.3 PHOTOGRAPHS:

Pictures of human activities on the stream were acquired at different section of the stream and the source regions, during dry and raining seasons as shown in plates 1 - 14.

CHAPTER FOUR

4.0 ANALYSIS OF RESULT.

Jemiru stream is measured about 3.8km from the main source region located of Dobwa hill to where the steam is dammed at the outskirts of the town in the early 1960s. the stream has a varying valley width of measurement taken at different section ranging from about 15m, 30m and some section near the town has lost its valley to human activities of different type which include land-use, deforestation, use of chemical fertilizer, refuse dumps and accelerated erosion by man.

4.1.1. LAND USE.

The activities of man on the catchment areas of Jemiru stream is the cultivation of rice an yams as the major land-use pattern. Building residential houses most especially areas around the newly constructed town hall is yet another land-use pattern of the source region and the catchment areas.

However, cultivation of the banks, stream beds and building construction of the banks and excavation of the valley edge forms yet another interference on the stream as land-use is concern.

4.1.2 DEFOERSTATION.

Deforestation for the purpose of cultivation and fuel wood is another influence of man on the stream along the banks except far away at the main source region where

little vegetal cover still give protection to the stream. It is at such area with vegetal cover at the banks of the stream that the valley of the stream still contain water.

4.1.3 USE OF CHEMICIAL.

The use of chemical fertilisers is indicated by the over-growth of weeds on the beds of the stream. This chemical fertilizer is assumed to have been used in the cultivation of rice and is washed away into the stream.

4.1.4 REFUSE DUMPS.

Dumping of refuse into the stream and in some catchment areas is posing great danger to the stream. As it was vividly survey, most of the refuse dumped in the stream or drainage pattern of the stream is carried into the stream during the rainy season. Most of the materials dump in the stream or carried into the stream has effect on the quality and quantity of water in the stream. It also has an effect on the life or aquatic habitat.

4.1.5 FISHING.

Man has accelerated the rate of evaporation of some amount of water in the stream and quality of water in the stream through their activities of fishing. Man in search of fish clears the little vegetation protecting the water in the stream or makes use of chemicals, thus affecting the quality for water in the stream.

4.1.6 ACCELERATED EROSING.

The study has revealed that the frequent cultivation of the banks of the stream has result in the movement of some portion of the soil into the stream leaving the most resisting part and gradually opening up smaller channels.

4.2 EFFECTS OF HUMAN INFLUENCE ON JEMIRU STREAM.

4.2.1 LANUSE.

Building construction and the cultivation of catchment areas as well as the banks of the stream has greatly affected the quantity of water in the stream since the spring head of some of the catchment is likely to have been damaged (blocked) due to the farming or construction activities.

4.2.2 REFUSE DUMPS.

Refuse dump at the spring head or into the stream affects either the flow of the water in the stream or affect the quality of the water in the stream. Inspite of its contamination effects, it also accelerate the rate of particles deposition in the bed of the stream. This is what has happened to the stream at the dam constructed in the 60's. Besides the polluting effects and the upward fining of sediments developing, the aquatic life in the stream has been affected with the disappearance of the stream leaving fine sediments for pure cultivation. This has forced the water in the stream to find an alternative way out of the reservoir.

4.2.3 DEFORESTATION.

The deforestation has accelerated the erosion of the banks of the stream by water thus depositing the debris and fine particles removed along the beds and finally at the dam which has been sealed up paving way for rice, vegetable and sugar cane cultivation.

The lost of the stream valley (channel) from behind the police barrack down to the dam is due to lack of vegetal cover due to intensive cultivation of this areas in addition to the siltation of the valley as a result of fine deposit of sediments and debris.

A verbal history has revealed that periodically farmers used to loose their farm product or crops to flood sweeping virtually all the crops on the farms. More so, the micro-climate of the town may not longer be moderated with the lost of water in the stream, since population concentration of the town may make the town warmer due to conjunction.

4.2.4 USE OF CHEMICALS.

The use of chemical fertilisers up stream and at the spring head for better yield of cultivation or rice and yams has greatly affected the rate of growth of grasses in the stream bed, though grasses may have the advantage of checking erosion of the stream banks; it has greatly affected or influenced the rate of deposition fine particles transported by the stream along the bed.

Also, some other chemicals use in catching fish has much greater effect on the aquatic habitat which are present scarce throughout the valley of the stream. The dam has been sealed up and all the aquatic habitat lost.

4.2.5 EXCARVATION ACTIVITIES.

The removal of some parts of the bank of the stream for mulding used in building houses has proved devastating to live. A verbal history has revealed that a life was lost during 1996 rainy season when a child was drown in one of the pond formed by harrow left by excavating activities.

Also the water collected in the harrows become a breading space for mosquitoes, it was learnt during the study that areas near these harrows face mosquito bite even during the harmattan period. Therefore with this development, it implies that people residing around this area are liable to malaria attack.

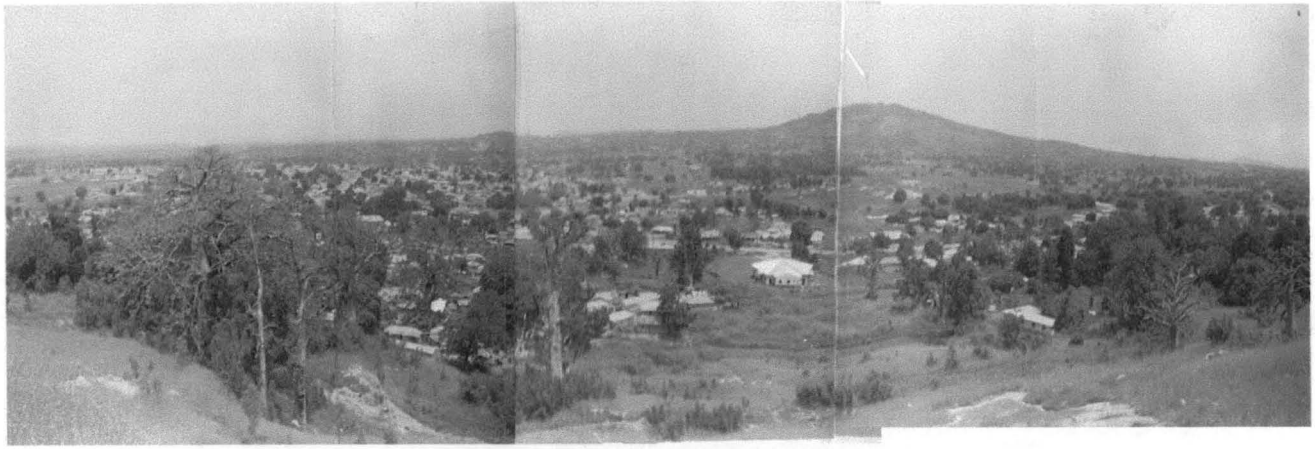

PLATE 1(a): This is the total area of the town drain into the stream

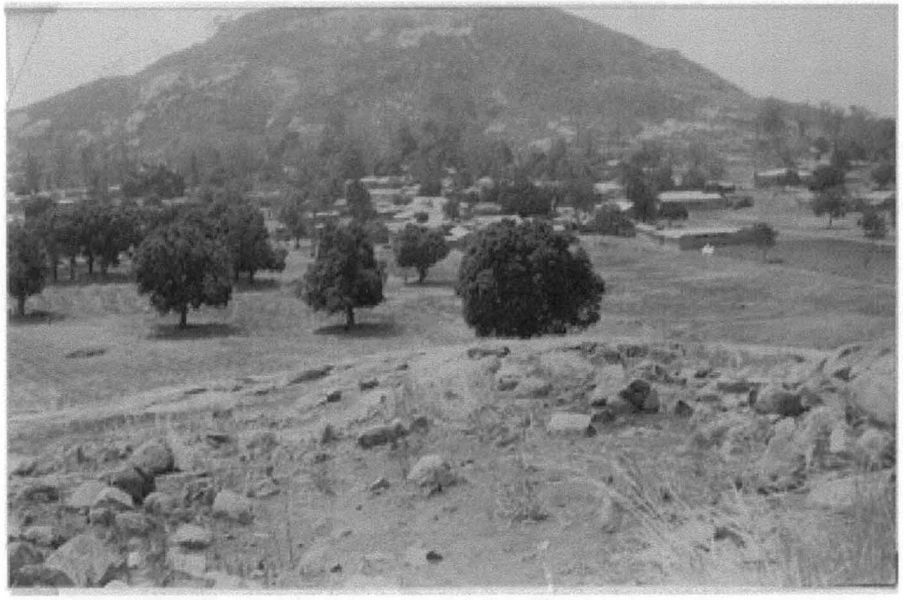

PLATE 1(b) This is a close view of one of the catchment area whose water is drain into Jemiru stream, now intensively been utilized by drawing and building.

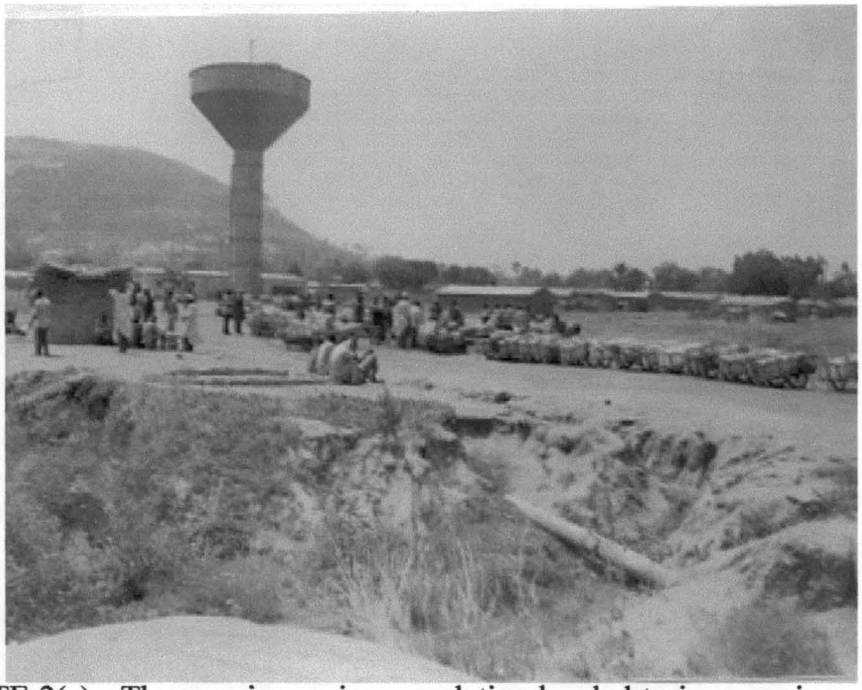

PLATE 2(a): The ever increasing population has led to increase in water demand. People waiting at water board Paiko to carry water into the town to various customer.

PLATE 2(b): One of the pond located inside the town on which people around it relay for their water need.

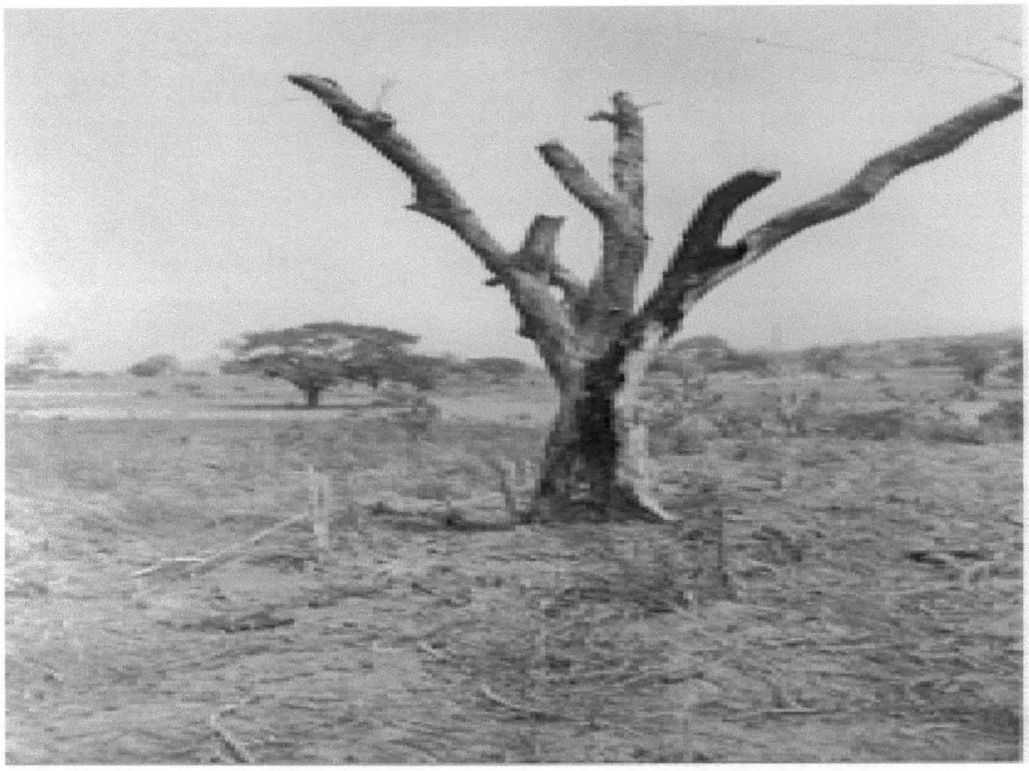

PLATE 3(a): Deforestation of some catchment of Jemiru stream for the purpose of cultivation

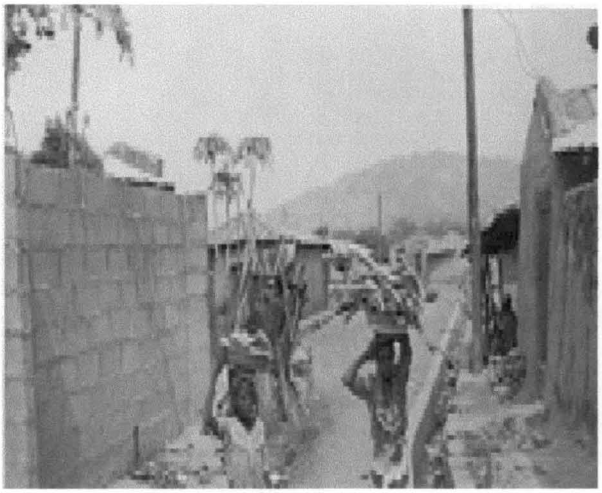

PLATE 3(bi & ii): Deforestation of vegetation for fuel wood and commercialisation of fuelwood.

PLATE 4(a): Some grasses that were protecting the water in the stream has been cleared in order to make fish catch, exposing the water to evaporation.

PLATE 4(b): This portion of the stream is still much protected interns of vegetation and its natural stream channel so still contain water through dry season

PLATE 5(a): This is on catchment been lost completely to refuse and eventually erection of a building

PLATE 5(b): A house constructed at the bank of the stream and the stream has become the ground for dump refuse

PLATE 6(a): Excavation work for mulding local blocks use in building houses

PLATE 6(b): Excavation of the the beds of the stream where pit dug has reached water table and people collects from such pit for domestic use

PLATE 7(a): The bank of the stream left to fallow despite it has been affected by erosion...

PLATE 7(b): This stream bank has been eroded beyond cultivation

PLATE 8(a): This is a river bed being intensively cultivated with rice

PLATE 8(b): Same as 8(a) but showing how the valley has completely disappeared due to set deposition as result of human influence on the banks of the stream.

PLATE 9(a): This is the front view of the dam during dry season where it has been tilled for vegetable and sugar cone cultivation..

PLATE 9(b): This is the rainy season view of the dam where deposition of fine particles has taken place, now been cultivated with rice.

PLATE 10(a): This valley at the upper part of the stream is been over-grown with grasses may due to the use of fertilizer and beginning of the deposit of fine particles

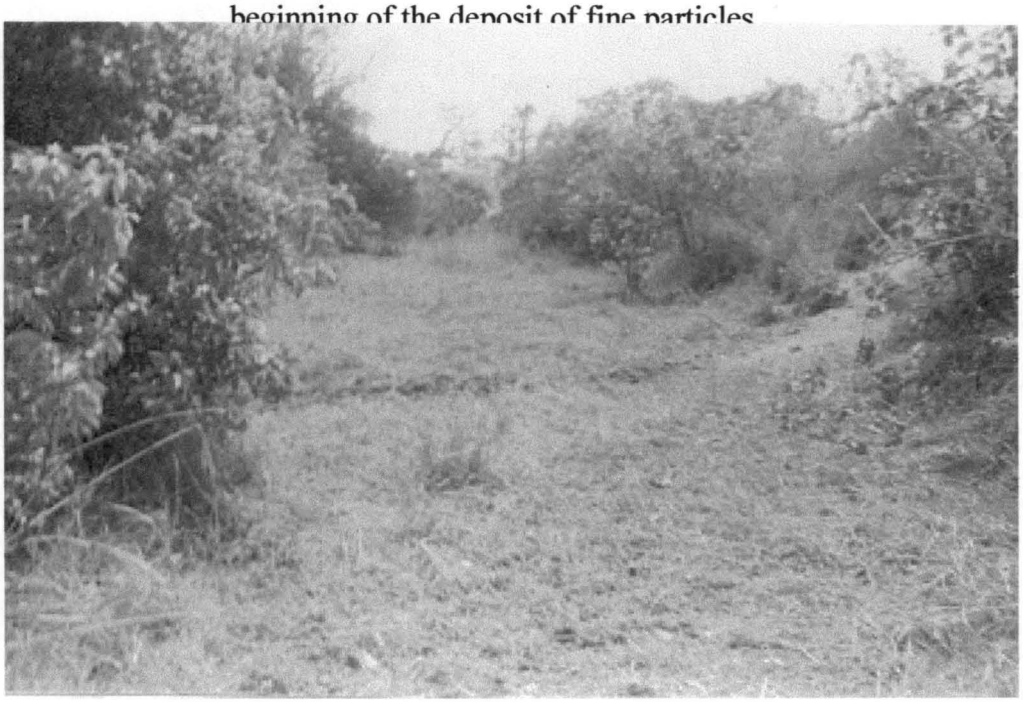

PLATE 10(b): This is the dry season views of 10(a) here fine deposited of particle is clearly noticed..

PLATE 11(a): The stream at the dam has diverted its course, where this house is very liable to the danger of flood.

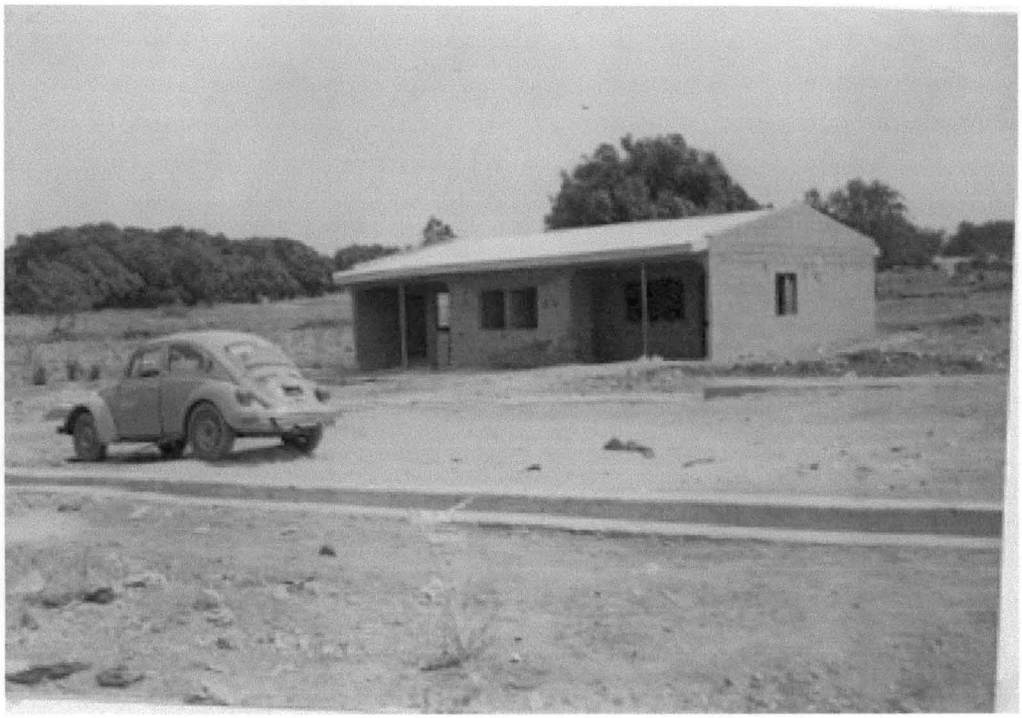

PLATE 11(b): This is a new constructed building on the bank of the stream due to increasing demand for shelter as result of the increase in population.

PLATE 13(a): The stream near the source region where the vegetation and natural channel is out of human influence.

PLATE 12(b): Bottom Little influence of man in terms of deforestation has started here.

PLATE 13(a): This is yam farm cultivated on the bank of the stream while the opposite side had been cleared and set ablaze in readiness for next season cultivation.

PLATE 13(b): This erosional activities has eroded over 20 metres length of the bank of the stream.

PLATE 14(a): Accumulation of water in a pits serving a breeding space for mosquitoes.

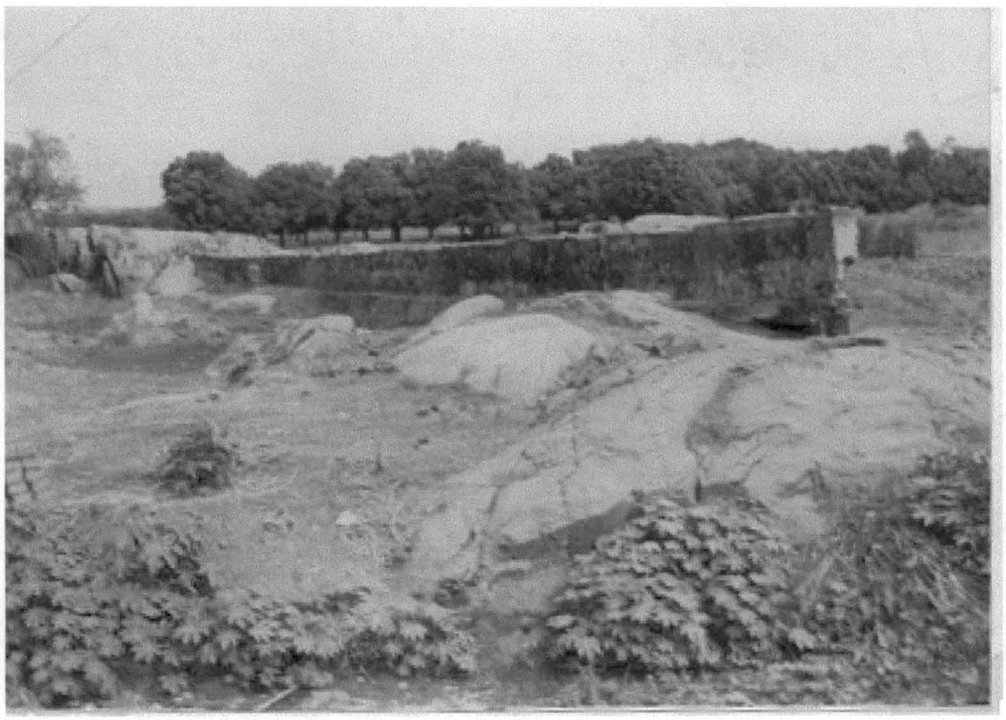

PLATE 14(b): The back view of concrete dam constructed in the 60's which has be deforested and water no longer flow over the dylce.

CHAPTER FIVE.

5.0 MEASURES TO BE TAKEN FOR THE RESTORATION OF THE JEMIRE STREAM (RECOMMENDATION).

Water serve people in may different ways. Its lack prevent us from enjoying benefit that might otherwise be available. As such with appropriate policies, laws and regulation, Jemiru stream can be improved without hindrance to other economic or atheistic factor.

However, much need to be taken into consideration in terms of the potential for multiple uses such as recreation and habitat enhancement, cost of maintenance, the risk of children around stream water ponds and the hazards associated with downstream flooding.

Therefore, the following measures are recommended to be under taken in order to enhance a sustainable livelihood on Jemire stream.

5.1.1 AFFORESTATION.

Tree should be planted along the banks of Jemiru stream which is as important as the water itself, so as to check erosional activities and to provide cover to the channel of the stream. Therefore a "settlement free zone" of about 40 metres to 50 metres be established and forested, be set aside on both sides of the banks of the steam including the attachment areas.

5.1.2 OBSTRACLE REMOVAL.

In order to smoothen channel sides and the bottom of the stream to reduce friction and speed of the stream flow, obstacles such as debris and other vegetation in the stream be removed. On the alternative, the stream should be dredged to deepen and open up the loss channel.

5.1.3 CONSTRUCTIONS.

To increase the capacity of the channel or valley of the stream and to ensure a greater flow, the banks of the stream should be increased in height by constructing dykes or levees. Also embankment should be constructed along the banks of the stream, so as to contain flood water in the channel.

Detention basin should be constructed on the bed of the stream in form of pond size to store storm water on the stream bed which will be allowed for discharge at a specified rate. In addition, the construction of on-site disposal on the banks embankment will assist in directing the storm water into the vegetal cover, shallow depression or pits from where it will percolate into the ground.

5.1.4 DEVELOPMENT PLAN.

A cluster development plan should be designed for Paiko as a means of reducing impervious areas and related facilities which is likely to achieve a zero net increase in the run-off solely through careful site planning especially where farmland is involved.

5.1.5 ENACTING LAWS.

A board be set up to be empowered to monitor and control laws governing the use of the Jemiru stream. Such board shall on periodic basis organise conversation enlightenment on the use of the stream.

The establishment of laws for minimum-flow for public use to meet in stream requirement meant towards the provision of adequate water in the stream for fish and wildlife and for recreation swimming and to provide and project aesthetics of the stream.

5.2 CONSLUSION/SUMMARY.

Paiko has witnessed a steady transformation in terms of population increase and of particular not in terms of numerous residential house spraining up over the town and close to be banks of Jemiru stream and some of its catchment areas.

These development by man has greatly affected the stream resulting in the disappearance of its channel due to siltation causes as a result of the activities of man of farming, deforestation, refuse dumps, excavation and building constructions.

However, water is the cheapest commodity in the market which serve people in many different ways, its lack prevent us from enjoying benefits that might otherwise be available, but as population grow and become concentrated in urban areas, water problem also grow and claims increasing attention, which has become even more challenging as water resources have expanded to include aquatic habitat value and the unique function of wet land and area bordering water bodies, for instance, the low

stream flow of Jemiru may not only be problem to downstream users, but also for local fish and wildlife population.

As such, for a sustainable livelihood within Paiko with the increasing rate of its population, the development of Jemiru stream to boost water resource availability becomes a necessity.

Since water is crucial and important to both living and non-living things, it is not suprising that its diversion and use by humans should often produce environmental effect. It he scale of the diversion is small, then the impact is unlikely to be great, but in the case of large dams and their impoundments and equally with management schemes for a whole river basin, wholesale changes can be effected. Since man's quest for survival and the resultant expansion of economic activities should not cause anxiety.

Tree built in our cities and towns could reduce noise and make life more liveable. The extent of reduction depend upon the degree of penetrability or density and the height of shelter-belt. The waste reduction policies covering general conversion measures, production durability measures, product design (with recycling and material intensity) and the product re-use measures be formulated.

Though the cost of building materials both imported and locally, available ones will continue to be on the increase as long as government adopts luke-warm attitude toward establishment of a solid materials base necessary for the production of building materials. Housing springing up on the banks of the stream came in order to balance demand for housing with supply at varying equilibrium.

REFERENCES.

Adejuwon J. O. (1978) - "Inaugural Lecture series 37" River Basin Management for Optional Water Yield.

Chow V. T. (1988) - Applied Hydrology.

Gordon N. D. (1992) - Stream Hydrology.

Moore W. G. (1974) - Dictionary of Geography.

Adeleke B. O. el at (1980) - Certificate Physical and Human Geography.

Gorbone E. Cherry (1993) - Cities and Plans "The shaping of urban Britain in the 19th and 20th century".

Harm J. Deblis & Peter O. Muller - geography "Regions and Concepts, fifth edition.

William M. Marsh (1991) - Land Scope Planning.

B. H. Bache & I. A. Mac Askill (1984) - Vegetation in Civil and Landscape.

United Nation (1995) - Water Development and Management.

Denis B. Willcock (1983) - Water Engineering.

Ven T. Chow (1981) - Open - Channel Hydraulics.

Ray K. Imsley, el at (1992), Water Resource and Environmental Engineering.

A. S. Abubakar (2000) - Lecture notes" on Environmental Conservation Management (Unpublished).

A. A. Okhimamhe (1999) - "Lecture Notes on "Remote Sensing Application (Unpublished).

Umoh T. Umoh (2000), "Lecture Note on" Environmental Problems (Unpublished).

G. N. Nsofor (2000), - "Lecture Note on" Environmental Audit and Economics. (Unpublished).

M. T. Usman (2000) - "Lecture Note on" Environmental Law. (Unpublished).

A. E. Odafen (Mrs) (2000) - "Lecture Note on" Dynamics of Natural Environmental. (Unpublished).

A. S. Abubakar (2000) - "Lecture Note on" Environmental Monitoring and Assessment. (Unpublished).

The Guardian; Monday Jan., 10 2000 - "The Environmental" UNEP alerts on increasing rate of disasters.

The New Nigerian; Thursday, July 20, 2000 - "Environmental" Tackling Environmental Challenges in Nigeria.

P. S. Akinyeye (2000) - Lecture Notes Fresh Water Resources.

M. Kovacs (1985) - Pollution control and conservation

New Nigeria on Sunday July 16, 2000.

APPENDIX I.

Some questionnaire were conducted verbally as follows:-

1. Before cultivating this land were there no trees, what happen to them

   a) Cleared [ ] b) Not cleared [ ] c) Not trees [ ]

2. Is the cultivation of the banks/catchment areas of this stream your only alternative?

   a) Yes [ ] b) No [ ]

3. Are you aware of the damage that the fertilisers you apply on your rice field/farm could cause to the quality of water down stream and it effect on the aquatic life.

   a) Yes [ ] b) No [ ]

4. Along the course of the stream grasses covering water in the beds are cleared exposing the water, why is this so?

   a) .....

   b) .....

   c) .....

5. Are these places the only alternative place for your refuse dumps?

   a) Yes [ ] b) No [ ]

6. Why do you have to build your house so close to the bank of this stream?

   a) .....

   b) .....

   c) .....

7. Why do you excavate the banks and beds of this stream?

   a) .....

   b) .....

   c) .....

8. Don't you thinks that the harrow created could be dangerous to people around this place especially children?

   a) It could be dangerous [ ]

   b) It could not be dangerous [ ]

9. What is the impact of those dirty waters in pounds near year house?

   a) Produces bad odour [ ] b) Breed mosquitoes [ ] c) a & b [ ]

10. With the siltation of the Jemiru dam, how do you manage to irrigate your vegetables?

    a) .....

    b) .....

    c) .....

11. When was this dam constructed and for what purpose.

    a) Year [ ] b) No [ ]

12. Since you have been farming here have you every witnessed the danger of flooding as a result of heavy down pout?

    a) Yes [ ] b) No [ ]

13. What have you observe in the past years as compare to now in times of the micro-climate created by Jemiru stream to Paiko and its disappearance in recent years?

    a) Hot [ ] b) Cold [ ] c) Moderate [ ]