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Effects of River Erosion on Houses: A Case Study of Asa River Catchment in Ilorin, Kwara State, Nigeria

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Abstract: This research is an assessment of the effects of river bank erosion on houses in Ilorin, Kwara State, Nigeria. Data were generated through direct field exercises. Such data were on the competence and capability of a river, physical characteristics of soil in the local environment, distances between the houses and river banks and the distances between the houses. These data were subjected to statistical methods of analyses. The following results were therefore, observed: the bulk of the soil in the local environment is loose in disposition and thus susceptible to the forces of erosion, the force of river's competence and capability considerably explains the qualities of the river's evorsion process, houses are randomly distributed but with most of them appearing linearly along the water course, distances between houses and rivers banks are short and thus most of the houses are often embarrassed by floods and people often lost both their lives and properties when the river is in floods. This study further suggests environmental education on flood management and the evaluation of a policy of resettlement scheme for flood prone areas.

Key words: Houses, River Erosion, Asa river, Ilorin, Kwara state, Nigeria

INTRODUCTION

River erosion is a fundamental geomorphic event and as a matter of fact, it is one of the three interrelated geologic activities of rivers (Strahler and Strahler, 1977; Cooke and Doornkamp, 1974) among others. However, erosion may be one of the river bed erosion, channel-bank erosion and channel-bed deposition are geomorphic activities that are limited within the river valley geometry and thus of lesser consequence on man and other man-made artifacts. However, the channel-bank erosion in its efforts to widen the river bank through lateral erosion process, the river gradually encroaches into the area occupance of man.

The efforts of a river undergoing a channel bank erosion depends among other things the factors of competence and capability of the river. Also, the nature of materials being used as tools and the structure and composition of soil in the local environment (Faniran and Jeje, 1983).

Interestingly, many cities of the world have been experiencing house construction explosions. This explosion is contingent upon the population upsurge experienced in these cities. Thus, people have been tempted to erect their structures wherever they can lay claim to a parcel of land. In most cases, it is observed that in the course of house constructions for instance, people have often encroached on the river valleys and have not given enough allowance to the incidence of river flooding. Victims of this act, therefore, suffer a number of losses from the river when in a flood. For example, Olaniran (1983) observed three flood incidents in the decade 1971-1980 in Ilorin and these were in 1973, 1976 and 1979. These extreme climatic events left untold sufferings and destructions in Ilorin. Some of the destructions limited to the built up areas indicated in Table 1 and Fig. 1.

Recently, flooding problems are confined to areas about the main stream's channels within the built up area.

Given the Cataclysmic nature of this extreme climatic event therefore, it is exceedingly difficult to canvass for myopism about this situation. This study therefore, stressed the need to fully understand the mechanics of river erosion in the hope of specifying the appropriate distance required before locating a house on river valleys and the effects of disregarding this measure too.

Study area: The experimental basin used in this study is the Asa catchment which divides the city into two parts. This basin lies between latitudes $8^0 36^I$ and $8^0 24^I$N and between longitudes $4^0 36^I$ and $4^0 10^I$E (Oyegun, 1987) (Fig. 1). The area occupied by the basin is about 731 km^2. Also, the basin stream frequency is about 0.66 channel for every km^2 and the drainage density is 0.956. Close to the mouth of Asa river are two dams, Agba and Asa constructed in 1952 and 1978, respectively. The population of Ilorin in 1991 is about 572, 128 and

Table 1: Problems of flooding in Ilorin

Periods	Consequences	Relieve Measures
1973	One person was drown	-----
19th Oct. 1976	24 houses were almost submerged under flood waters by the 3rd day and 56 other houses were evacuated for the same reason as the water reaches window heights, vegetables, sugarcane farms were washed away, many roads in the city rendered impassable as erosion created deep pot holes.	State govt. donated #10,000.00. Ministry of agric. Donated two boats to evacuate the properties of the victims.
30th August, 1979	One house and two cars were submerged. Residents of submerged houses took shelter on the river banks.	-----

Sources: (Olaniran, 1983)

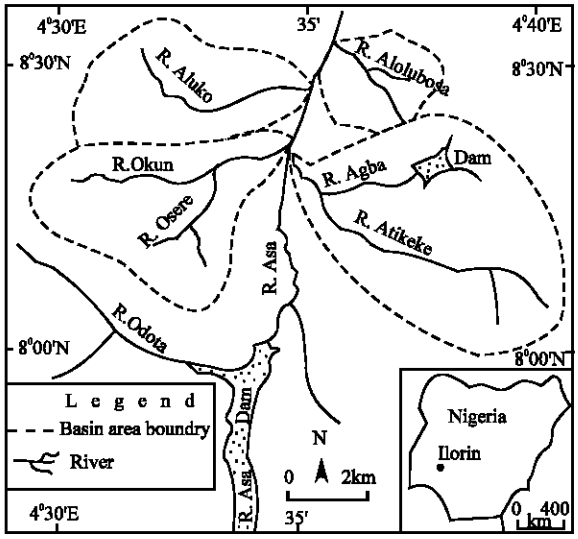

Fig. 1: Ilorin, showing the four drainage basins as the study area

occupying an area of about 100 km^2. This in essence means that there is serious pressure on land for a number of uses and the desire to locate houses in the town centers (Oyegun, 1987; Jimoh, 1994, 1997). This possibly explains why currently in Ilorin some dwelling are cited on the banks of river Asa. These categories of people took this decision in absolute ignorance of the extreme climatic event. However, they suffer greatly when the river is in flood (Enendu, 1982).

MATERIALS AND METHODS

This research is based on data from direct field work investigations. Such data were the river competence, capability, the soil characteristics in the local environment, effects of flooding problems and the methods of management.

River competence and capability were estimated using the following equivalents: In this regard, river competence was estimated using the formula, Comp. = Vb^6. Where; Comp. Is the river competence, Vb^6 is the bed velocity raised to the power of 6. On the other hand, capability of river was estimated from the formula, Cap. = Vb^3. Where, Cap. is the capability of the rivers and Vb^3 being the bed velocity raised to the power of three. Further, soil samples were taken randomly from river banks for particle size analysis. This effort in conjunction with the rivers competence and capability assisted a great deal in explaining the rate of river erosion advancement towards its banks. Further, distances between the houses on each flank of the river were measured to highlight the degree of clustering or dispersion of houses about the river channel. In addition, linear distances between each house to the river channel were estimated for each of the houses on both flanks of the river channel in the hope of specifying appropriate distances before locating houses.

Finally, questionnaire were randomly administered on 98 respondents about the problems of floods, adequacy of their sites of location, expected problems and solutions.

RESULTS AND DISCUSSION

The relevances of erosion forces on human dwelling have been traced to two main factors. These factors are the mechanisms of river erosion and the modes of house locations.

The mechanisms of river erosion: The soil materials on river banks have indicated some interesting features about the textural characteristics of soil in the catchment basin. For example, when such soil samples were sieved in the laboratory using 2.00, 1.70 and 1.18 mm grades of sievers simultaneously.

It has become possible to state the category of materials that have been eroded. For example, a total of 97.4 gms on average has been analysed from the river valley slope. Of this amount, 12.2 g belongs to the 2.00 mm siever grade while, 24.8 and 60.4 g belong to siever is of fine sand grains. However, both the coarse and medium sand grains exist.

Generally, the sand materials are loose in disposition and thus yield readily to the forces of erosion (Jimoh, 1997). Further, the capability and competence of the river to erode this type of soil have been estimated to be 4.8 and 6.3 cm sec^{-1}, respectively. Given this type of situation, the processes of evorsion easily erode the river valley slopes towards human settlements that locate along the river valley.

Location of houses: There are many houses that have been located within the Asa river valley. The locations of houses tend to form a linear arrangement along the course of the river. However, a chi-square value of 1.49 indicates that the pattern of house distributions is random within the river geometry. This behaviour may be connected to the desire to easily access fishing activities or farming on the flood plain of the river.

An average distance of 10.8 m exists between the Asa river and the houses. However, the closest house(s) to Asa river is about 5.8 m, while, the farthest of the houses stood at a distance of 17.3 m away from the Asa river.

Generally, about 78% of the sampled houses complained bitterly of constant harassment from the flood (when Asa river is in a flood). In most cases, complaints about Asa river flood boarders on the loss of peoples lives and properties such as houses and farmlands. However, about 22 % of the residents within the Asa river valley complained lightly about the discomforts of the Asa river.

This therefore, means that, locating houses far away from the Asa river valley can considerably minimize the incidence of flood problems.

Other responses to this extreme climatic event are for the government to undertake an environmental education with emphasis on human response to flooding hazards. As a matter of fact, about 92% of the respondents subscribed to this measure on flood adjustment mechanisms. While, the remaining 18% believed in relocating their houses elsewhere, but with government's financial assistance.

CONCLUSION

River erosion operates imperceptibly and thus attracts little attention from man at its incipient stage. However, the effects of river erosion eventually constitute a focus of attention based on its destructions on man's lives and properties. There is therefore, the need to adopt a preventive approach before its activities translate into heavy consequences on man and his properties.

The measures suggested however include environmental education with emphasis on flood management. Also, is the need for the government to encourage a resettlement scheme to assist both the victims of floods and those people whose abodes are prone to flood problems.

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