Pakistan Journal of Social Sciences 5 (3): 235-237, 2008
ISSN: 1683-8831

Erosion and Gullying along Some Road Networks in a Third World City

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Abstract: This research has assessed the roles of erosion on road networks. Data were primarily sourced and analysed through the applications of descriptive and cross tabulations as basic methods of data analyses. Consequently, the following observations were made as follows: An average of 22 erosion sites on each road transect has been observed and each erosion site has a mean depth of about 22.3 cm. The consequences of erosion ravages on the affected parts of roads ranges from imposition of stress on road users, increased in accident rates, increase in motor servicing bills to rendering of roads impossable. Erosion on road networks can possibly be check by healing the affected road surfaces through sand fills. Generally, erosion along the high ways greatly disturbs road geometry, the consequences of which are several and hazardous on both man and the general scenic appearance of the environment. Thus, abating the problems of erosion at incipient stage before it gets into gully stage and emphasizing environmental education in schools curriculum are emphasized in this research.

Key words: Erosion, network, landsacap, gullying, environment

INTRODUCTION

Soil erosion is fundamental geomorphic event that have considerably shaped the cultural landscape (Jimoh, 1994). However, the activities of erosion are often accelerated due to the mode of interactions between man and landscapes (Jimoh, 2000). For example, man's desperate drives to harness the resources of his environment to advantage have considerably translated into a number of problems such as damages to city highways, increase in water treatment costs, damages to buildings, artifacts a, silting of resources among others (Higgins and Kassam, 1981; Lewis and Lepele, 1982; Oyegun, 1987; Sutherland and Dejong, 1990; Jimoh, 1997). In essence, man is essentially a vital geomorphological agent whose activities constitute as a major factor in the discussion of erosion vis-à-vis their consequences on the cultural landscape (Smith and Wischmere, 1962).

Interestingly, in order to foster a high level of interaction between places and people, a number of road networks that are of different grades have been constructed. Majorly, the highways on which motors ply most frequently in order to foster such interactions between places and people are gradually experiencing erosional attacks which has been contributing to unreliability of some road networks (Table 1).

Thus, studying the erosion rates, the associated problems therefore constitute the focus of investigation in this research endeavour.

Table 1: Erosional problems on some of the high ways in ilorin

Name of roads	Distance (km)	Eroded sites	Mean depth of eroded sites	Mean width of eroded sites
Emir	3.4	92	17.5	60.0
Edun	3.0	101	15.0	40.0
Amilegbe	3.4	45	19.3	80.0
Niger	3.6	160	13.0	61.5
Gambari	1.5	28	14.0	56. 8
Agbooba	3.5	80	12.5	66.3
Baboko	1.4	78	13.8	60.0
Unilorin mini campus site	1.0	87	10.0	61.3
Oko-Erin	3.0	105	7.0	40.8
Stadium	3.0	48	20.0	80.0
Reservation	6.0	70	16.0	68.0

Source: The author

Study area: Ilorin city is the study area. Also it is the capital of Kwara State. It lies on latitude 8'35E. The climate is the humid tropical type and characterized by both wet and dry season with a mean of annual temperature that ranges from 25-28.9^{oc} in addition, the annual mean rainfall is about 1150 mm exhibiting the double maximal pattern.

Interestingly, Ilorin city is located within the four urbanized drainage basins of Aluko, Agba, Alalubosa and Okun and occupying a total land area of about 43.0 km (Fig. 1) (Jimoh, 1997). Further, the city's middle belt position and relative ease of access are definite assets. It is about 300 km from Lagos, Nigeria and the coastlines and only 160 km from Ibadan African largest indigenous city.

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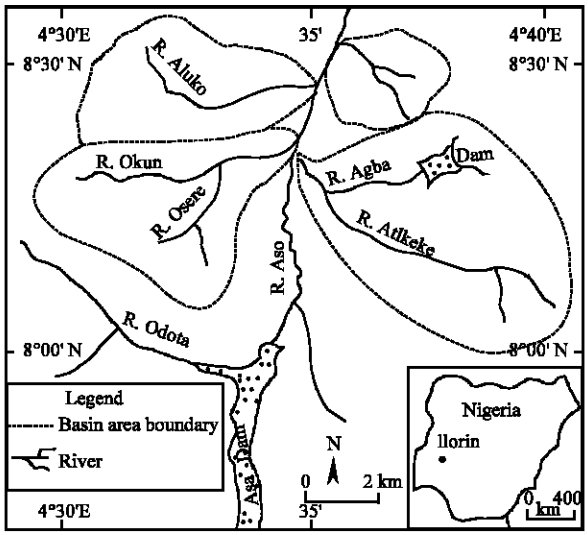

Fig. 1: Ilorin, showing the four drainage basins as the study area Source: Oyegun (1986)

Generally, the study area possessed a carefully well laid down road network, majority of which are recently being attacked by erosion incidents (Table 1) too. It is thus this development that has warranted this investigation in the hope of suggesting measures for checking this seemingly intractable problem of erosion along the highways.

MATERIALS AND METHODS

This research effort relies heavily on primary data generated during fieldwork exercises. Such data include the depth, width and distance covered by erosion problems, nature of erosion problems and the responses to the identified erosion problems in the study area.

Erosion rates at each point have been estimated using measuring tape graduated into centimeters and meters. In the course of this, the depth and width of erosion rate at each erosion sites have been estimated. Also, along each road transect, the number of erosion sites were equally counted.

Erosion problems and possible solutions to such problems have been solicited with the administration of questionnaire and the questionnaire was administered on the road users. The expected number of questionnaire administered based on the application of the equivalent of Snedecor and Cochran (1967). For detail explanation on the application of this equivalent (Jimoh, 1997).

The information generated on the research problems constitute a focus of discussion of the next section of this research endeavour.

Table 2: Erosion problems on road networks

Erosion problems	Response to erosion problems	Percentage of responses
Almost out of use high ways	12	4.33
Stressful movements	107	38.62
Increased Transport fare	102	36.82
Accident rates	56	20.22

Author's fieldwork

RESULTS AND DISCUSSION

Erosion rates along the road networks: Erosion problems manifested on road networks in the forms of potholes and at times with occasional gullies and rill erosion types (Table 1).

The road networks affected by erosion is about 60 km (road transects put together), 1,293 erosion sites i.e., an average of 22 erosion site per 1 km length of road networks on the other hand, the mean depth of erosion on the road networks was 22.3 cm while, the total mean width of the erosion amounted to 1002 cm. Thus, the problems of erosion on these roads may soon transform the affected road networks into being impassable if the current erosion rate and type does not abate.

Erosion problems along the highways: The nature of erosion problems ranges from the development of potholes to deposits of earth materials on the roads that prevents smooth driving, accelerates the loosening of bolts and thus increasing the motor servicing bills among others.

The development of potholes on the road networks stemmed up from the fact that, poor road construction materials are often used in road construction works (Table 2).

Respondents have variously expressed dissatisfactions about the problems of erosion along some of the highways in Ilorin as follows. About 4.3% of the respondents agreed that roads affected by erosion are almost out of use, 38.6% claimed that, due to the problems of erosion it has become very stressful to ply the high ways that have been affected by erosion. Finally, about 20.2% of the respondents agreed that most accident rates on the high ways are usually due to the incidents of erosion.

Generally, erosion problems on high ways are enormous and indeed have considerably threatened human lives and the general environmental quality (Oyegun, 1986).

Response to erosion problems on the high ways: Many views have been generated about the seemingly intractable problems of erosion on road networks in Ilorin city, Nigeria. Table 3 has summarized these responses to the erosion on road networks.

Table 3: Response to erosion problems on road networks

Responses to erosion problems	No of responses	Percentage of respondents
Fill with waste materials	34	37.10
Fill with earth materials	36	39.30
The state government to handle the problem	22	24.00
Total	92	100.00

Source: Author's fieldwork

From Table 3, it is obvious that about 39% of the respondents believed that erosion on the highways can be combated by filling the gullied surfaces with earth materials while, 37% of the respondents solicited for waste materials for filling the eroded spots on the highways. Finally, about 24% of the respondents believed that the state government should take over the problem for appropriate solution.

Generally, filling the eroded spots with earth materials can combat erosion on highways. This is most important, as it is crucial to preserve a high quality road networks.

Summary and planning implications: Following the analysis of the required data sets in order to accomplish the philosophy of this research effort, the following constitute as the observations of this study:

- About 60 km road networks (transects put together) have been completely ravaged by the incidence of erosion menace in the study area.
- Erosion problems along the road networks have been variously expressed to include stresses in the course of plying the roads, increment in transport fares, loosening of vehicles bolts and nuts leading to increase in servicing bills and the incidents of accident rates are equally common along the affected road networks.

CONCLUSION

The initiation of soil erosion is usually imperceptible. However, the consequences of erosion ravages are enormous especially as it assumes a gully stage. Thus, recognizing erosion at its incipient stage can be very rewarding effort at nipping the problems before it graduates into gully stage. In any case, a number of measures required to safeguard the highways against the risks of erosion menace ranges from the paving of road networks after a rigorous soil stabilization efforts have been carried out. This is crucial in other to reduce the rate of the developments of potholes usually emanating from heavy traffic pounding. Finally, environmental education with emphasis on man's interactions with road networks is encouraged.

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