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GUIDE TO AUTHORS

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1   Format of Manuscript:

Manuscript should be typed doubled-spaced on one side of A4 paper with generous margins, at least 2.5cm. It should not exceed 15 pages, including tables and illustration. Use font 12 and Time New Roman.

- The title page abstract and reference should be typed on separate sheets. The title page should include the title of the paper, the full name(s) of the author(s), postal address, telephone and fax numbers, Email address and the institutional affiliation
- The paper proper should start on page 2, with Title, Abstract, Introduction, etc.
- The Abstract should contain objective, materials and methods, major findings and conclusion of the study.
- The work should contain abstract, introduction, methodology, results, discussion, conclusion, recommendation (if necessary).

2   Table, Illustration and Plates:

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All references cited in the text must be cited alphabetically by authors surname followed by initials under 'References'.

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CONTENTS

Deforestation and Sustainable Watershed Management in Nigeria: A Reflection

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Abstract: Environmental degradation has assumed a serious dimension in Nigeria in recent times. There is virtually no ecological zone in the country where problem of environmental degradation is not noticed, although its nature and scale may differ. Hence, formulation of policies directed at managing the environment by government at various levels is of utmost desire. However, for a meaningful progress to be made on issues of sustainable management of the environment, ecological concerns must be given due consideration by all stakeholders. This study examines causes of deforestation, roles of vegetation on watershed management and it also examines the relevance of vegetation to the ecosystem. The paper later advances a number of recommendations towards controlling rates of deforestation in Nigeria.

Keywords: Environmental degradation, deforestation, watershed, environment, policies, recommendations

Introduction

In the past decades, Nigeria has exhibited vigorous attempt at economic growth. This trend has been marred by an increase in the rate of environmental deterioration. Rapid drive for economic growth coupled with high population density and widespread poverty has given rise to excessive environmental degradation. In many parts of Nigeria air, water and land pollution values largely exceed World Health Organization safety guidelines (Egunjobi, 1983; Ogundele, 2007; Onokerhoraye, 1988). Soil erosion, deforestation and loss of biodiversity are also widely noticeable in Nigeria (Nest Profile, 1991; Ogar and Anyorah, 2003; Ijatuyi, 2005; Ibraheem, 2005).

Nigeria environment is increasingly faced with various environmental challenges This assertion is not only due to the complex environmental issues in the country, but also the complex linkages between growth, population, poverty and environment (Imevbore, 1972). This calls for the adoption of scientific methods in studying the various components of human ecology and their interaction with one another (Worthington, 1972). One of such interactions is deforestation and watershed which this study seems to examine.

Deforestation can be defined as indiscriminate destruction of forest (Iwena, 2008). It is a major catalyst of land degradation (Smith, 1996). Deforestation affects catchment water flow and qualities of water for different uses (Maidment, 1993). It causes soil erosion, sedimentation, soil infertility, desertification, shortage of food and fibre, reduction in wood and wood related products amongst others (Ayoade, 1988; Grainger, 1990; Jimoh, 1997; Ijatuyi, 2005; Yakubu and Zagga, 2006). Globally, deforestation has implication on ozone layer depletion, loss of ecosystems and loss of rare, threatened or endangered flora and fauna (Ajaero, et. al, 2009).

Deforestation is an important issue in virtually all ecological zones in Nigeria; although, the nature of this problem differ from one ecological zone to the other. Over

the last two decades, the rate of deforestation has risen considerably in the country; far exceeding the rate of regeneration (Aweto, 1991; Odunawo and Adeyemi, 1997). According UNEP (2005) report, Nigeria and Cote d'lvore have the highest annual rate of forest loss in West Africa. In the same vein, FAO (2005) reported that the percentage area of forest land in Nigeria has decreased from 19% in 1990 to less than 13% in 2005.

A country wide remote sensing exercise conducted in 1981 provide a fair picture of the actual land cover in Nigeria by vegetation types and different land uses (Table 1)

Table 1 Land use in Nigeria as determined by Side-looking Airborne Radar (SLAR)

Formation	Area (ha)	% of Total
Grassland	12,821,302	14.1
Grassland/shrub land transition	1,779,382	2.0
Shrub land/thicket	2,288,311	2.5
Wooded shrub grassland/woodland transition	23,747,306	26.1
Woodland	4,197,209	4.6
Forest	8,874,255	9.8
Farmland	35,870,552	39.5
Plantation and agricultural projects	276,500	0.3
Water, rivers; built-up areas	1,024,231	1.1
Total	**90,879,048**	**100**

Source: NEST (1991)

The pathetic state of Nigeria forest is further worsened as human pressure on vegetation has dramatically escalated since the above survey was carried out in 1991 mainly due to urbanization process, agricultural production and timber exploitation. Other practices observed to have contributed to vegetation destruction in Nigeria include intensive grazing, persistent bush burning and extension of agricultural activities into less favoured, often, environmental fragile areas (Otegbeye and Onyeanusi, 2006).

Don-Pedro (2009) further identified that large scale agricultural projects have further contributed to high rate of deforestation in Nigeria; amongst these projects are; Operation Feed the Nation (1976), Green Revolution (1979), Directorate of Foods, Road and Rural Infrastructure (1988) and National Agricultural Land Development (1992).

These projects have all encouraged large scale clearance of tropical virgin lands in all parts of Nigeria. According to FAO (1993), the remaining forest area in Nigeria will likely disappear by 2020 if the current rate of forest depletion continues unabated.

In order to reduce the rate of environmental degradation caused by deforestation in our watersheds, there is need for public education on the to discourage deforestation

Reasons for Deforestation

Previous researchers have identified some causal factors of deforestation. These factors include population pressure, demand for wood and forest products, logging and poor enforcement of forest laws and policies, illegal encroachments, development of forest land for agriculture, shifting cultivation practices and construction activities such as hydro dam-project among others (Imevbore, 1971; Hayum, 1991; Panayotou and Sungsuwan, 1994; Ogar and Anyorah, 2003; Ijatuyi, 2005; Yakubu and Zagga, 2006). Of all

these, population size and density have been identified as the strongest factor influencing environmental degradation (Allen and Barnes, 1985; Rudel, 1989, Stonich, 1989; Rao, 2006).

Indeed, researches consider the blaming of population growth as a major cause of natural resources destruction in developing economy as an over-simplification of a complex social problem (Gillis et. al, 1987; Rowstow, 1990). For example, the rate of deforestation is due to the expansion of export oriented cash crop production. This view was supported by neoclassical economic growth models. According to the model, economic growth proceeded in five universal stages as countries moved from traditional society (producing primary products) to high mass consumption (specializing in industrial goods). According to Gillis et.al. (1987), such economic growth would derive from four variables vis: the stock of capital, the size of the labour force, the stock of arable land and natural resources and increases of input productivities or efficiency. Thus, country such as Nigeria has depended on agricultural and natural resource exports, including timber and wood products to generate foreign exchange to finance its industrialization.

Researches such as Hirsch (1987) have however underscored neo-classical economic model. This according to them is because; the model has failed to recognize the impacts government policies such as those on agriculture and infrastructural developments, as a cause of deforestation. For example, government policies yearly result in clearing of large expands of land for development. Not only that, issues such as land tenure system (Turner et. al, 1989) and high poverty rates (Yakubu and Zagga, 2006) were not addressed. For example, Sada and Odermerho (1988) observed that environmental problem of rural area is that

of unregulated exploitation of agricultural, forestry and mineral resources as well as the encroachment of urban and industrial development. Thus, Okafor (1988) recommends an environmental policy which must attempt to marry the maintenance of ecological quality and progress in development – a cost benefit balance between economic growth and environmental integrity.

On relationship between poverty level and deforestation, Yakubu and Zagga, (2006) observed that in most developing countries due to high poverty level, most people depends on biomass (wood, charcoal, dung, crop residue) as their source of energy for domestic activities. Infact, virtually all rural dwellers and poor city inhabitants throughout the sub-saharan Africa now depend on wood and charcoal for cooking, smelting of iron, heating of rooms and providing light (Umaru and Wamakko, 1977).

Roles of Vegetation in Watershed Management

The role of vegetation in watershed management cannot be over-emphasized. It contributes to environmental sustainability of watershed, it modifies net input into a basin through interception and evapotranspiration; (Gregory and Walling, 1973), it influences the rate at which water and sediment are produced and transmitted through the basin system (Penman 1963; Lull, 1967). According to Gregory and Walling (1973), vegetation affects all watershed dynamics.

Vegetation and Stream flow Pattern

Vegetation significantly affects catchment stream flow pattern. This is through its biological, thermal and physical effects (Jones, 1997). It reduces catchment overland runoff through its thick litter production (Ifabiyi, 2000), through the effect of evapotranspiration resulting from

canopy interception (Dinku, et. al., 2006) and through plant stage of growth (Trimble, et. al. 1987). Interception is a product of plant vegetation canopy, it aids evapotranspiration processes. Furthermore, litter production from fallen leaves increases soil organic matter and promotes the activities of soil organisms, increase soil biological activities resulting in high infiltration rates (Atoyebi, 1995). Afforestation thus results in lower runoff (Butte, 1995); while forest clear cut increases runoff volumes (Keppeler and Ziemer, 1990) resulting in higher peak discharge due to reduction in concentration time caused by more overland flow. In addition, Calder (1990) and Hudson (1988) both reported 20% decrease in annual runoff in paired catchment experiment due to interception losses in a forest catchment study. Also, percentage increase in runoff and peak discharge were also been reported following clear forest tree cutting activity (Hewlett and Healvey, 1970; Wood et. al. 1990; Sandstorm, 1995).

Vegetation Cover, Erosion Process and Sediment Production

Each parcel of land has a tolerance range, which is a function of geology, soil, landuse amongst other factors (Jimoh, 2003). Whenever this tolerance range is exceeded, which may be caused by vegetation removal, rainfall impact falling on bare soil break down the soil aggregates and detach particles which are subsequently moved from their positions thereby resulting in soil erosion.

The effects of vegetation removal in urbanized watershed are even worst. Whenever the tolerance range of the soil is exceeded in urban areas, surges of water vastly accelerate stream bank erosion, undercutting trees and causing them to topple into the stream, which divert water against and over the banks and cause further erosion. During this process, coarse

materials and rock stones which cannot be washed away are deposited in the river channel. This causes it to clog, thus resulting in further bank erosion as a result of rise in water level. The resultant effect of this is that, such river channel gets wider and shallower and in some cases, such channel may become completely filled to the extent that the water is diverted and flood the valley floor. Thus, a formal narrow tree-lined stream may be converted into a broad wash-way drifts of sand and gravel by erosion and sediment that results from deforestation process.

Vegetation covers thus account for difference in rates of mechanical erosion over watersheds with different land use surfaces (Oyegun, 1980; 1982; Jimoh, 2003). Hence, man's careless interaction with watersheds by way of deforestation may translate easily to soil loss within the basin, the consequences of which are many and hazardous (Davison, 1980; Chaitat, 1982; Alexander, 1988).

Other Impacts of Vegetation Cover on Watersheds

Other beneficial effects of vegetation cover on watersheds are as follows:

i.   Preservation of the atmosphere:

Vegetation helps in preserving the atmosphere by making use of atmospheric carbon dioxide for photosynthesis. During this process, oxygen which is greatly needed by living things, especially, animals is released into the atmosphere as a by-product. This activity also purifies the atmosphere by making it less polluted.

ii.   Regulation of micro-climate

Vegetation helps in regulation of micro-climate by providing shade. Shading of soil by trees reduces evaporation and consequently improves transpiration – assimilation ratio (Neemann, 1982).

iii.   Source of food and herbal medicine

Vegetation serves as source of food. Consumption of fruits such as mango and leaves such as vegetables are required by man for healthy living. They are also important source of animal fodder, particularly during the dry season. Leaves, roots and barks of some trees are used in preparation of herbal medicine by man.

iv.   Habitats for living things

Vegetation serves as habitats for living things. According to Ijatuyi (2005) tropical rainforest are known to house about forty percent of the world living things. Depletion of vegetation thus spelt danger for these living things.

v.   Source of delight and wind break

Vegetation, especially those ornamental serves as source of delight by providing shade and beauty in homes, parks and gardens. They are also use as wind breaks and in checking rates of wind erosion and desert encroachment.

Reducing Deforestation in Nigeria: The way forward.

Deforestation activities may not entirely be stopped, but it can be controlled such that it will have minimal impact on a watershed. How effective a recommendation towards solving deforestation problem is, will be determined by the stage of developmental process of a nation. Thus, for effective control, a country must be in post – industrial forest use stage. At this level, forests are treated as multiple use resources where emphases are usually on recreation and forest conservation rather than resource extraction. Before reaching this developmental stage, countries will naturally deplete their forests as part of the means to fuel their national economic growth. Meanwhile, drastic measure such as a total ban may not have much impact on checking the abuse of deforestation.

However for a country like Nigeria, which is in the early postindustrial use stage, adoption of the following measures will aid in no small way towards ameliorating land degradation problems due to deforestation activities.

1.   Improvement in living standard of rural dwellers. This is because, poverty, and population growth increase rates of deforestation, particularly under condition of food and resource scarcity. Financial ability to access alternative energy sources such as oil, gas and electricity will result in drastic reduction in the level of biomass demand in Nigeria.

2.   Government and non-governmental organizations should establish hardwood plantations.

3.   Enlightenment campaign should be carried out by concerned government agencies towards educating the citizenry of the need to adequately take care of the environment. This issue can also be enshrined in the educational policy of the country.

4.   There should be adoption of indigenous technologies which will be appropriate to the people. This effort will encourage sustainable resource management.

Conclusion

A watershed represents the land area within the total catchment area of a river system. It represents the soil, water bodies and vegetation within the catchment area. A watershed thus represents the segment of earth surface set apart from adjacent segments by a less clearly defined boundary. The uses to which man put the watershed is of considerable importance. This is because; the characteristic of a watershed influences the processes operating in it. Thus activities of man such as indiscriminate deforestation activities manifest in the form of soil erosion, flooding, drought occurrences and desertification. Environmental degradation is happening at an increasing and alarming rate. It is being intensified by increasing

rural and urban poverty coupled with unwholesome activities such as bad agricultural practices, civil construction works, urbanization and increasing population pressure on land. Effective and efficient watershed management is a prerequisite for reducing natural disasters. This can only be achieved by an integrated land management methodology involving systematic management of land, water, vegetation and other physical resourceswithin a watershed. Catchment management ensures effective coordination of activities that affect the conservation, sustainable use and management of watersheds, including their soils, water and vegetation. Thus, watershed management is relevant not only for water resource development as erroneously believed in Nigeria (Faniran, 1991); but for basin planning and management (Clapp, 1965). This is what Cunniugham (1986) and Irwin (1986) referred to as Total Catchment Management (TCM) and Faniran (1991) also defined as Comprehensive River Basin Development (CRBD). This methodology of basin management is proposed in this overview.

References

Ajaero, C.K.; Akukwe, T.I. and Asuola, G.C. (2009), Climate Change: Concepts and Issues In: Ayandike, R.N.C; Madu, I.E and Ajaero, C.K. (eds.) *Conference Proceedings on Climate Change and Nigerian Environment* University of Nigeria Nzukka

Alexander, E.B. (1988), Rate of Soil Formation: Implication for Soil Loss Tolerance. *Journal of Soil Science* 145(1): 37-40

Atoyebi, J. O. (1995), Infiltration in Urbanized Basins in Ilorin, Kwara State. *Unpublished Ph.D Thesis,* Geography Dept. University of Ilorin, Ilorin 239 pp

Butte, J.M. (1995), Channel Changes Following Headwater Reaforestation: The Ganaraska River, Ontario, Canada. *Geografiska Annaler,* 77A (3): 107-118

Clapp, J.R. (1965), An Approach to the Development of a Region In: Burton, I. and Kates, R.N. (eds.) *Reading in Resource Management and Conservation* Chicargo, pp. 298-307

Cunningham, G.M. (1986), Total Catchment Management: Resource Management for the Future. *Journal of Soil Conservation* NSW, Australia 42 (1), 4-5

Don-Pedro, M. (2009), *Man and the Environmental Crisis.* Cheers Book Series, University Press, Lagos 375pp.

Faniran, A. (1991), *Water Resources Development in Nigeria*, University of Ibadan Lecture Series 95pp.

Food and Agricultural Organisation (1993), Forest Resources Assessment 1990, Tropical Country *FAO Paper 112* Rome

Grillis, M; Perkins, D. Roemer, M. and Snodgrass, D. (1982), *Economics of Development.* New York W.W. Norton & Company

Gregory, K.J. and Walling, D.E. (1993), *Drainage Basin Form and Process:*; A Geomorphological Approach. Edward Arnold, London. 456pp

Hirsch, P (1987), Deforestation and Development in Thailand. *Singapore Journal of Tropical Geography,* 8(2): 129-38

Ibraheem, D.C. (2005), The Role of Afforestation in Presenting the environment of Bauchi State, Nigeria. *International Journal of Environmental Issues* 3(2): 156-161

Ijatuyi, O.A. (2005), Tree as Forest Resources: Their Conservation Efficiency and Effectiveness in Environmental sustainability. *International Journal of Environmental Issues* 3(2): 175-183

Imevbore, A.M.A. (1972), Man and Environment: The Nigerian Situation. *Inaugural Lecture Series* 5, University of Ife, Nigeria 22pp.

Irwin, F. (1986), Catchment as a Planning Unit, *Soil Conservation Service* NSW 40, 6-10

Iwena, O.A. (2008), *Essential Geography for Senior Secondary Schools.* Tonad Publishers Ltd. 351pp.

Jimoh, H.I. (2003), Erosion Tolerance Range of Landuse Surface: Implications on Land Resources Use and Management Techniques in Ilorin, Nigeria. *Intern. J. Environ. Studies 60(5): 445-452*

Jimoh, H.I. (1997), Individual Rainfall Events and Sediment Generation on Different surfaces in Ilorin, Nigeria. *Unpublished Ph.D Thesis,* Dept. of Geography, University of Ilorin, Ilorin.

Jones, J.A.A. (1997), Global hydrology: *Processes, Resources and Environmental Management.* Longman, 399pp.

Keepplier, E.T. and Ziemer, R.R. (1990), Logging Effects on Stream flow, Water yield and Summer flow Flows at Casper Creek in Northwestern California. *Water Resources Research, 26(7):* 1669-1679.

Lull, H.W. and Sopper, W.E. (1966), Factors that Influence Stream flow in the Northeast. *Water Resources Research* 2(3): 371-379.

Maidment, D.R. (1993), *Handbook of Hydrology,* McGraw Hill Inc.

Nigerian Environmental Study/Action Team (1991), *Nigerian's Threatened Environment: A National Profile* Inec Printers Ltd. Ibadan 288pp.

Odunawo, S. and Adeyemi, M. (1997), Story of Illegal Wood Business. *The Guardian Newspaper* July 26th, 17-18pp.

Ogundele, J.A. (2007), Environmental Perception of Pollution Problems in Nigeria Cities: Case Study of Ekiti State, Nigeria. *Journal of Geography, Environment and Planning* 3(2):155-159

Okafor, F.C. (1988), Rural Development and Environment: Degradation Versus Protection. In Sada, P.O. and Odemercho, F.O. (eds.) *Environmental Issues and Management in Nigeria Development.pp*150-163.

Orgar, N.E. and Anyorah, C. (2003), Watershed Management and Forestry Development in Kano State, Nigeria. *International Journal of Environmental Issues,* 1(2): 90-96

Otegbeye, G.O. and Oyeanusi, A.E. (2006), The Impact of Deforestation on Soil Erosion and on the Economic Life of Nigerians In: Ivbijaro, M.F.A.; Akintola, F. and Okechukwu, R.U. (eds.) *Sustainable Environmental Management in Nigeria,* Mattivi Production, Ibadan 465pp.

Rao, C.S. (2006), *Environmental Pollution Control Engineering,* New Age Int. Pub. Ltd. New Delhi 424pp.

Rowstow, W. (1990), *The Stages of Economics Growth: A Non-communist Manifesto,* 3rd ed. Cambridge University Press.

Sandstorm, K. (1995), The Recent Lake Babati Flood in Semi Arid Tanzania – A Response to Changes in Landcover. *Geografiska Annaler* 77A (1-2): 35-44

Sada, P.O. and Odemerho, F.O. (1988), Environmental Management and

Development: Introduction of the Main Issues. In: Sada, P.O. and Odemerho, F.O. (eds.) *Environmental Issues and Management in Nigeria Development,* 1-8

Smith Keith (1996), *Environmental Hazards: Assessing Risk and Reducing Disaster*, Routledge, London and New York 387pp

Trimble, S.W. Weirich, F.H. and Hoag, B.L. (1987), Reforestation and the Reduction of Water Yield on the Southern Piedmont Since Circa 1940. *Water Resources Research* 23, 425-32

Tunner, B.L., Moss, R.H. and Skole, D.L. (1993), Relating Landuse and Global Land Cover Change: A Proposal for an IGBP-HDP Core Project. *Report No 24* Royal Swedish Academy of Sciences.

Tunner, B.L., Moss, R.H. and Skole, D.L. (1993), Relating Landuse and Global Land Cover Change: A Proposal for an IGBP-HDP Core Project. *Report No 24* Royal Swedish Academy of Sciences.

United Nations Environmental Programme (2005), Africa Environment Outlook 2: Our Environment Our Wealth

Worthington, F.B. (1972), Human Ecology Council Report: The Commonwealth Foundation. *Occasional Paper* Number XIV. 52pp.

Yakubu, A.A. and Zagga, A.D. (2006), Use of Fuel Wood and Health Hazards in Sokoto City, Nigeria. *International Journal of Environmental Issues,* 4(1&2): 200-205