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## WORLD BANK AND THE MANAGEMENT OF EROSION IN ANAMBRA STATE

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### Abstract

*Gully erosion is a serious environmental problem that has created irretrievable changes in most parts of Nasarawa state, resulting in loss of resources worth hundreds of millions of naira every year. Despite several measures at addressing this environmental catastrophe erosion is still a problem that has seemed to defy all possible solutions. This study assessed World Bank Assistance and Erosion Management in Nasarawa State from 2016-2020. The study utilized survey method with both primary and secondary sources of data used for this study. As ample of selected gully sites were carried out in five Local Government Areas representing the study area for this research work. The study finds dependency theory as most suitable tool for the analysis as it helps in understanding World Bank-supported erosion project in Nasarawa State as an agent of globalization with purely imperialist ideology, which operations cannot value free, and hence the fruits of globalization with capitalist strategies to deceive Nigeria into the trap of exploitation and domination. Findings from the study reveals that gully erosion as observed by this study has lowered the concentration of most of the physical and chemical properties of the soil in the state thus, exposing the sub soil devoid of fertility to support gainful agricultural productivity. Due to erosion, the texture of the soils at the gully sites had lost most of colloidal portion leaving a soil that were mostly sandy in nature. However, World Bank-supported erosion project in Nasarawa State has partly achieve its objectives as most NEWMAP project received relative attention across the five local governments with corruption identified as one of the major challenges militating against the World Bank-supported erosion project in Nasarawa state. The study therefore recommends among others that addressing the challenges bedeviling erosion management in Nasarawa state, there is need to create a bottom-to-top management policy that concentrates power and authority in the hands of local government areas. Also, farmers in the areas should adopt improve agricultural methods, such as minimal tillage and agro-forestry methods to reduce possible acceleration of erosion in the study areas.*

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**Keywords:** World Bank, Erosion Management, Anambra State

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### INTRODUCTION

Erosion remains the world's biggest environmental problem, threatening sustainability of both plant and animal in the world. Over 70 percent of the soil on earth is said to have displayed degradation phenomena as a result of soil erosion, salinity and desertification (Okin, 2012). Soil is the most vital of earth's natural resources. It hosts both animate and inanimate beings. Over three quarters of the world's man-made developments are on it. And its existence is the basis for the performance of most disciplines of the world.

Most earth's natural resources are directly linked to or found in the soil. Threat to soil is therefore threat to life.

Erosion is a natural land forming process that is accelerated through human activities. Land surface disturbance ranging from traffic moving over the land, to the extreme situation of deep tillage, results in disruption of the natural soil structural elements, loosening of particles, and their eventual displacement. In the absence of chaotic events such as sheets of water moving across a desert, water induced erosion is minimal under natural conditions. Erosion rates are strongly related to density and duration of vegetative cover of the soil (Francis & Thorne, 2014). With disturbance, onset of erosion is mostly a function of slope and kinds of soil; the antecedent moisture content and raindrop intensity are additional modifiers.

In the 2015 Status of the World's Soil Resources Report (FAO and ITPS, 2015), erosion was judged to be the number one threat to soil functions in five of seven regions (Africa, Asia, Latin America, Near East and North Africa, and North America); in the first four of those regions, the trend for erosion was deteriorating. Only in Europe, North America and the Southwest Pacific was the trend in erosion deemed to be improving.

In Nigeria, erosion is arguably the single most serious natural hazard, affecting nearly every part of the country, ranging from deaths, torn roads in shreds, destroyed homes, schools, farmlands, and displaced poor people. The Federal Ministry of Agriculture estimates that over 40 million tones of soils are washed away annually by erosions in Nigeria (Federal Republic of Nigeria, 2007). Global warming and climate-driven changes are certain to drive this estimate up in the coming years as some parts of the country tries to cope with a corresponding increase in annual rainfall which is already over 2000 mm. The economic consequence is unbearable (Hudec, Simpson, Akpkodje & Umenweke, 2005).

Nigeria faces severe problem of soil erosion – both sheet and gully erosion – due to both natural and human causes. Over 6000km<sup>2</sup> of land are affected by erosion and about 3400km<sup>2</sup> are highly exposed. Erosion has a devastating effect on many peoples' lives and destroys essential infrastructure for economic development and poverty alleviation. Gully erosion contributes to environmental problems and cause damage estimated at over \$100 million annually in most parts of Nigeria. This undermines economic growth and is a threat to the Federal Government of Nigeria's "developmental projects". Recent assessment of the situation confirms that the scale of the problem transcends what communities, Local Governments, States and Federal Government can address without help from development partners.

In Nasarawa State, the gully erosion crisis over the years, there have been threatening floods which has claimed lives and many communities displaced. This gully erosion was caused by the abrupt termination of a major concrete channel receiving flow from the upstream. Notable among the gully erosions in the state are; Taal Street erosion site, Ungwan Sha'au, Ungwan Doka, Gwangoro, Kilema, Lukumanu areas measured between 80ft deep and 55ft and had destroyed houses and threatening lives. However, attention will be focus on selected erosion sites, namely; Lukumanu primary school, River Amba, Rice Mills, Ungwan Nungu and Bukan Sidi all in Lafia local government area.

Consequently, Federal Government did sought and obtained the support of the World Bank to tackle the age long but worsening problem of erosion and degraded watershed in the affected States in Nigeria through an eight-year project titled "The Nigeria Erosion and Watershed Management Project (NEWMAP)" (World Bank, 2011). NEWMAP

aimed at rehabilitating degraded lands and reducing erosion and climate vulnerability in targeted areas. NEWMAP is also a multi-sectoral project, which is a State-led intervention to prevent and reverse land degradation, initially focusing on gully erosion sites that threaten infrastructure and livelihoods in Nigeria.

In July 2018, The World Bank decided to extend its Country Partnership Strategy with Nigeria until June 30, 2019. In doing so, 7 new projects worth \$2.1 billion were approved to start in Nigeria. These projects were to be carried out through multiple IDA credits; the main focus of these projects on key sectors that will lead to economic growth and stability in the upcoming years alongside the Economic Recovery and Growth Plan (ERGP).

Nigeria Erosion and Watershed Management Project (NEWMAP) was also funded with \$400 million to reduce and work against soil and gully erosion and land degradation in several states across Nigeria. NEWMAP was created by the World Bank and Federal Ministry of Environment in 2011 after President Goodluck Jonathan asked the World Bank to intervene and help with the erosion in Southeastern Nigeria and land degradation in the North. The project was initially targeted at 7 states, namely Anambra, Abia, Cross River, Edo, Enugu, Ebonyi, and Imo states (Federal Ministry of Environment, 2018). To further strengthen its operations aimed at controlling gully erosion in Nigeria, the World Bank, through its Nigeria Erosion and Watershed Project (NEWMAP) extended its services to 12 states in 2015. The states are Akwa Ibom, Bauchi, Borno, Delta, Gombe, Kano, Katsina, Kogi, Nasarawa, Plateau, Oyo and Sokoto states (FME, 2018).

As one of the beneficiaries, Nasarawa State has taken a bold step towards finding a lasting solution to the deplorable flooding challenges in the State through interventions in prioritized flood and gully erosion sites. Nasarawa state government in 2017 paid its counterpart fund of ₦500 million to the World Bank for participation in the Nigeria Erosion and Watershed Management Project. It was reported that as at October 2019, the Nasarawa State government has paid ₦561 million as counterpart fund (NEWMAP) (Business Day May, 2020). The project is aimed at correcting gully erosion, across 18 sites in five selected local government areas in the state namely; Doma, Toto, Nasarawa, Lafia and Keffi local government. Some notable among these sites are; Angwan Liman, Angwan Lukman in Lafia and behind the Emir's place Keffi among others (Daily Sun Newspaper August 15, 2017).

However, the World Bank is an international financial institution that provides loans and grants to the governments of low and middle-income countries for the purpose of pursuing capital projects. World Bank has been playing increasing role in the economies of the developing countries since the end of the World War II (Ismi, 2004).

The institutional structures of these international financial institutions were framed at an international conference in Bretton Woods, New Hampshire. The original purpose of the World Bank was to lend money to Western European governments to help them rebuild their countries after the war (Dauda, 2010).

The World Bank Group is made up of five organizations: the International Bank for Reconstruction and Development (IBRD) provides loans and development assistance to middle-income and creditworthy poor countries; International Development Association (IDA), the Bank's concessional lending arm focuses on the poorest countries to which it provides near zero interest loans. International Finance Corporation (IFC) which finances private sector investments in the developing world and provides technical assistance to governments and businesses. Multilateral Investment Guarantee Agency (MIGA) which

encourages foreign investment in developing countries by providing guarantees to foreign investors against loss caused by non-commercial risk (Anifowose & Enemu, 2000).

In recent decades, the bank's primary focus has shifted from partnering with middle-income nations on growth-related programs and trade liberalization toward global poverty alleviation. These efforts have taken place in the world's poorest countries "particularly those in Africa" and in middle-income countries, such as China and India, where many of the world's poor reside. In 2013, the Bank set a goal to end extreme poverty, experienced by people living on \$1.25 or less per day, by 2030 (Osundina, 2014). Other priorities for the Bank include reconstruction in post conflict nations and transnational issues, including public health and environmental concerns.

In the light of the foregoing, the study seeks to examine the World Bank assistance on Erosion Management in Nasarawa.

### **CONCEPTUAL FRAMEWORK**

Erosion caused by water and wind is a widespread problem in both rural and urban areas of the world. Soil erosion is normally a natural process occurring over geological timescales; but where (and when) the natural rate has been significantly increased by anthropogenic activity accelerated soil erosion becomes a process of degradation and thus an identifiable threat to soil (Le Bas, and Kozak, 2007). About 80% of the world's agricultural land suffers moderate to severe erosion, and 10% suffers slight to moderate erosion. Croplands are the most susceptible to erosion because their soil is repeatedly tilled and left without a protective cover of vegetation (Pimentel, 1995). Most studies showed soil erosion is severe in the Ethiopian Highland. FAO (1999) indicated that Nigeria is among the countries with high degrees of erosion with highest nutrient depletion rates.

#### **Erosion**

Erosion is the action of surface processes (such as water flow or wind) that removes soil, rock, or dissolved material from one location on the Earth's crust, and then transports it to another location. Erosion is distinct from weathering which involves no movement. Removal of rock or soil as clastic sediment is referred to as physical or mechanical erosion; this contrasts with chemical erosion, where soil or rock material is removed from an area by dissolution.

Onyegbule (2010) defined soil erosion as a process whereby the surface layer of the soil is detached and carried by agents of denudation and a lower in the soil is exposed leaving a topographic roughness on the resulting landscape. Gully erosion within settlements requires peculiar attention because of the threat it poses to buildings and other structures that endanger human lives. The gully in Nasarawa state has posed numerous threats to the inhabitants of the area. Here it has caused many residential buildings and worship centres to collapse, destroying road networks and other infrastructure, and degrading land for commercial and agricultural purposes.

#### **World Bank**

The World Bank is an international organization dedicated to providing financing, advice, and research to developing nations to aid their economic advancement. The bank predominantly acts as an organization that attempts to fight poverty by offering developmental assistance to middle- and low-income countries. Currently, the World Bank has two stated goals that it aims to achieve by 2030. The first is to end extreme poverty by decreasing the number of people living on less than \$1.90 a day to below 3% of the world

population. The second is to increase overall prosperity by increasing income growth in the bottom 40% of every country in the world.

The World Bank supplies qualifying governments with low-interest loans, zero-interest credits, and grants, all for the purpose of supporting the development of individual economies. Debt borrowings and cash infusions help with global education, healthcare, public administration, infrastructure, and private-sector development. The World Bank also shares information with various entities through policy advice, research and analysis, and technical assistance. It offers advice and training for both the public and private sectors.

The World Bank is one of the most powerful global financial institutions to offer leveraged loans. Despite its numerous aims and missions, the chief target of the World Bank is poverty reduction. Embraced by two main institutions like the International Development Association and the International Bank for Reconstruction and Development, the World Bank is today an internationally vital funding institution.

The World Bank was initially an inception of Bretton Woods Conference (The United Nations Monetary and Financial Conference) in July 1944, New Hampshire. It was the first from five institutions shaped, as a need of regulation of the international monetary and financial order subsequent to World War II. The conference gathered 730 delegates from each 44 joined countries, where the most potent and dominated countries subject to discussion were the United States and United Kingdom, represented respectfully by Harry Dexter White and John Maynard Keynes. Although initiated together, and both based in Washington, D.C., the World Bank and the International Monetary Fund differ from each other in the leading process. The World Bank has an American leader, whereas the International Monetary Fund is led by a European.

From 1945 to its notion until 1967, the World Bank was following a low level of lending, due to the fact that the loan transmission was regular and ordinary. Considering the specifics, the bank made its efforts to design a steadiness level of equilibrium to renovate the loans on the purpose of achieving the trust in the Bank's activity. France was chosen from the Bank president to be the first beneficiary country of the World Bank aid, while Chile and Poland's requests were rejected.

The first amount of the loan was USD 250 million and it enclosed rigorous restrains. As argued at Mason, E. (1973), after a range of observations from the World Bank regarding the fund utilization, the French government offered a very stable budget on debt repayment, although it was pointed out the need to eliminate the communism components inside the Cabinet.

Later on, the Marshall Plan in 1947 changed the flow of the World Bank aid. Many other European countries obtained financial support, and shortly after, the interest emerged in non European countries until 1968, in which the loans were intended to those projects that could help the borrower country to repay the loans mainly at infrastructure and ports construction. It was again Mason, E. (1973) criticism on the early World Bank role as ineffective to fulfill the mission, by letting the Marshall Plan becoming the only financial engine of Western Europe lending more than USD 41 billion by 1953.

From 1968 to 1980 the chief operation of the World Bank was to accomplish the fundamental needs of the developing countries. Moreover, the number of loans to borrowers was amplified, especially in infrastructure or social services sector. The former changes were due to the selected American business executive Robert McNamara allotted

by the presidency, whose intentions were in generating an innovative system that would connect the borrower country with the Bank, to facilitate the loan process. He immediately modified the Bank's policies into vital trials such as the investment in the health system, agriculture enhancement; building schools etc.<sup>3</sup> With the purpose of financing additional loans, the new president in assistance with the Bank treasurer Eugene Rotberg, managed to enhance the capital available to the Bank only by searching new external sources of capital such as those banks which have been major sources of bank funding. Unfortunately, the effect of the period of the alleviation of the poverty took a debt rise of developing countries with the annual rate of 20% from 1976 to 1980. According to Goldman, M. (2005) in its very first decades the World Bank was explicitly predestined to decline, confined also by the political pressure of the United States. The new decade brought innovative news for the World Bank. In 1980 the new president Alden W. Clausen was selected by the United States President, Jimmy Carter. Soon after, he followed a series of pioneering strategies starting from the substitution of the previous Bank team force, offering a new image of the Bank, and up to the substitution of the Chief Economist Hollis B. Chenery in 1982 by Anne Krueger, who was very famous for her disapprovals on development funding.

From 1980-1989 the loaning process was designated to the developing countries. In addition, as a part of the World Bank policy, the new structural regulation policies aspired to reform the third world economies. Thus, the new regulation established a reduction of "health, nutritional and educational levels for tens of millions of children in Asia, Latin America, and Africa"

After an extensive phase of criticisms, the World Bank shaped its activity as a reaction to several non-governmental organizations and environmental groups, which were already integrated on the lending processes of the Bank.

The World Bank missions are firmly conducted from the Millennium Development Goals (MDGs), a set of eight international goals where each United Nations country member has acceded to accomplish. The main mission of the Bank relies on the universal poverty reduction, which at the meantime is the world's most imperative increasing concern. Some of the chief issues in the center of attention are devoted to the completeness of lending activity, such as supporting the middle-income countries at certain interest rates that will replicate low gains than its own borrowings from capital markets. Furthermore, no interest loans and donations to the low income nations with minor or no admission to global credit markets are supplied by the International Development Association. Controversially, the International Bank for Reconstruction and Development is a market-based nonprofit organization loaning money for various development sectors and using the high credit rating with the aim of low interest rate on its loans. Alternatively, the IDA was financed by periodic donations selected to the institution by its wealthiest member nations.

The World Bank primary missions consist on giving support to the developing countries and assist on poverty reduction, sustain the economic growth upward to a promising investment background, build up jobs, all in the course of a relentless financial supply. Considered to be its major five features for the economic development, the World Bank comprise the governmental amplification and their certified executive's education, achievement of legal systems for the businesses, protection of private assets rights, founding of powerful supporting systems from micro credit to bigger business enterprises, helping countries to fight corruption, and finally, offers researches and programs on

consulting services, training procedures which will be especially useful to non-government organizations, academies and even governments itself. The entire above mentioned goals are determinant for an expanded economical development (Goldman, M., (2005)). The Bank's funding is acquired first and foremost from the AAA-rated bonds sold throughout the IBRD in international markets. It is this institution itself that creates earnings from its contribution actions, whereas IDA earnings are collected throughout the donor nations which refill the Bank's finances each three years and from loan refunding. In order to fulfill the missions of the MDG objectives by the year 2015, it is required to firstly complete six standards as follows: an intense growth for the developing countries, African countries and especially the tenuous ones, development of other sectors like education and health, incorporation of environment and growth programs, higher and healthier aid, advanced trade conventions, and finally a more powerful alerted support from other international institutions such as the World Bank is.

From year 1990 to 2004 there was a decline in the percentage of people living in extreme poverty. The prime impact of the Bank is extreme poverty and hunger. Thus, the World Bank utilizes its responsiveness to develop the life standards for millions of poor people and low income countries by increasing the level of its funding to USD 106 billion in 2009-2010 periods. According to statistics, the frequency of children school attendance in developing countries increased from 80% in 1991 to 88% in 2005. In addition, 57% of 72 million children of primary school age were not being educated, most of them females. (Gilbert, C. and D. Vines, (2000)). Seeing it as a problem for several countries, the World Bank also contributes in promoting the gender equality, by stimulating female's force in the labor market, as long as 60% of them are unpaid family employees. Another significant scope is child mortality declining. According to statistics, an evaluation of 10 million children died in 2005 under the age of five, where the majority of deaths came from unavoidable reasons. Still, the radical circumstances made it very hard to face the harsh problems in the region; given that more than half million women died during pregnancy or childbirth. Such causes called for deep health care involvement from the World Bank and its activities which also made it broadly available.

Another struggle of the World Bank regards the fight against AIDS, Malaria and other contagious diseases particularly in Africa, where the mortality due to HIV/AIDS have reached 1.6 million in 2007. Mortality as a result of malaria causes 300 to 500 million deaths each year, where almost 95 percent of deaths take place in Sub-Saharan Africa.<sup>8</sup> Other important activities of the World Bank comprise the biological protection and deforestation mainly in unfavorable regions; standards for air pollution and emission of the gas that reach the critical standards. The Bank also cooperates with various international associates and local ones in order to rapidly fulfill the MDGs targets. The United States is eventually the prevalent shareholder of the Bank, and the Board represents the member nations and is formed by the Executive Directors who meet twice a week to supervise the administrative issues, innovative policies, loaning decisions and mission strategies for specific countries. The Board of Directors is formed from 25 Executive Directors including the President while the Bank itself comprises 24 Vice Presidents, three Senior Vice Presidents and, two Executive Vice Presidents.

### **Causes of Erosion in Anambra State**

Erosion can be caused in a number of ways, having different mechanisms, modes and conditions of formation; some of which are directly related to the underlying geology and the severity of the surface processes operating on the surface geology and soil cover.

Ezechi and Okagbue (1989) summarized the types of gully erosion with respect to their modes and conditions of formation, and common advance mechanism. Their study indicated that the nature of the underlying bed (or geology) has a bearing on the initiation and propagation of gullies. Observations have also shown that erosion, in Nigeria, is more predominant in the sedimentary terrains and perhaps in the basement/sediment contact areas. However, in Nasarawa State, the following factors contributes immensely to increase in erosion, thus;

### **Slope of Anambra**

Slope steepness is one of the criteria for the estimation of erosivity potential. Run-off and erosion potential will increase as the slope steepness increases. The slope for the study area as weighed.

### **Rainfall**

It is well established that the amount of soil loss that is detached by a particular rain event is related to the intensity at which this rain falls. Smaller drops that dominate low intensity rainfall are less efficient in detaching soil but at high intensity, rainfall may increase the efficiency of detachment. Extant literature shows that increase in rainfall results to an increase in soil erosion in the study area. The energy of soil erosion by the rain (Salles, Poesen & Govers, 2000).

### **Soil Texture**

Soil texture was taken as one of the factors for multi-criteria analysis. The soil was weighed based on the textural class. Soil texture is important in determining aggregate stability, infiltration rate, run-off and erosion (Le Bissonnais & Singer, 1993). According to Bradford and Huang (1992), soil texture seems to be one of the most important soil variables influencing soil surface sealing and splash detachment. Although, crusts can form on soils of any texture, soils with high silt contents are more conducive to surface sealing.

### **Land Cover**

A land which has a good surface cover is characterized by low run-off while land with poor surface cover is characterized by high run-off and quick response to rainfall which is because of low surface roughness. Thus, spatial data on surface cover type was used to assess the resistance of terrain to erosion as a result of surface protection. The five LULC categories which were generated using supervised classification method were weighed where water body represents lowest erosion potential and bare-surface represents the highest.

### **Processes through which Anambra State Government Secured World Bank Funding for the Erosion in the State**

Nigeria Erosion and Watershed Management Project (NEWMAP) being a World Bank assisted project with the aim of reducing vulnerability of soils to erosion and reducing poverty among communities living within the corridors of gully eroded areas started in November 2016 when the State Government under Governor Umaru Tanko Al-Makura approved the participation of Nasarawa State in the Nigeria Erosion and Watershed Management Project through executive fiat in November 2016 following the seed fund of ₦61 million and later paid the mandatory counterpart fund of ₦500 million bringing the sum total to ₦561 million.

Moving forward, adverts were placed for various positions to constitute SPMU. Interview was conducted in 2017; no objection letters for some positions were released in



2018. In order to select sites for NEWMAP intervention, a joint State, Steering and Technical committees including State Project Management Unit (SPMU) and Community elders were involved. The selection was based on the magnitude of gully devastation, extent of the affected households and the depth and width of the gullies.

A total of 4 sites across five Local Government Areas were selected. They are Doma, Lafia, Keffi, Nasarawa and Toto.

Furthermore, contract was awarded for survey, design and costing of the targeted gully eroded areas in 2018. As things stand at present, Nasarawa NEWMAP has engaged consultants in the following Safeguard concerns; Focal Non-Governmental Organizations (FONGO), M&E Baseline Studies, Environmental and Social Management Plan (ESMP) and Resettlement Action Plan (RAP) (Nasarawa State World Bank Erosion Management Report, 2021).

### **Achievements of World Bank Supported Erosion Project**

The Ministry of Environment and Solid Minerals commissioned a Consultant (LORAJ Investment Consult Ltd) to carry out Survey, Design and Costing of the 18 gully eroded sites across Doma, Lafia, Keffi, Nasarawa and Toto local government areas. World Bank has cleared all designs for the four sites that is, Doma, Lafia, Keffi, Nasarawa and Togo gullies, duly completed in some sites and Nasarawa – NEWMAP has forwarded the designs to Federal Quality Control and Engineering Design Firms (FQCEDF).

Being blessed with rich natural resources such as assorted Solid Minerals, Rich Agricultural soils, Forest Cover and water bodies and coupled with its proximity to the Federal Capital Territory, the completion of Erosion sites in the above local governments will aid the influx of people from other states to tap the resources. In addition, with rainfall regime concentrates within few months of the years as well as transboundary, it will lead to inflow of water from the Republic of Cameroon.

Equally, Water Conservation in the area of sub-watersheds such as riparian forest, ponds and other surface water bodies will be properly managed.

### **Challenges in the Implementation of the World Bank Support Erosion Project in Anambra State**

For the proposed project, the potential negative impacts have been identified on the basis of whether they will occur during the pre-construction, construction or operation phase in the subsequent sections. This is to facilitate the implementation of the mitigation measures that are outlined in the Nigeria Erosion and Watershed Management Project (NEWMAP).

The Proposed Erosion Project Induced Development: With the proposed civil work, the hitherto gully sites will increase in intensity. The extent to which development becomes a positive or negative impact will be determined by the effectiveness of the planning framework. With an ineffective framework, the overall impact would be substantially negative.

Displacement of Landed Properties and source of livelihoods: The proposed development will lead to the displacement of land properties at the risk of gully erosion, particularly along the corridor of the proposed channel development. A resettlement action plan based on the World Bank OP 4.12 is being developed to address these issues.

Expectations of Improvement in Livelihood: The proposed project raises the hope of better infrastructure provision to the communities. It also anticipation a general improvement, with a rise in economic activities as a result of civil work activities and potential employment opportunities offered by the project activities. This perception has an adverse impact on the project as residents may develop overwhelming expectation beyond which the project can offer.

### **THEORETICAL FRAMEWORK**

The study adopted the economic structuralism and economic nationalism theories. Economic nationalism and economic structuralism was popularized in Gilpin (1987), Pettman (1986) and Balaam and Veseth (1996).

According to the proponents, economic nationalism is based on the realists positions that conflict characterize the international economic relation and that the international system is a zero-sum game where the gain of a player is automatically the loss of the other player. It is also anchored on the assumption that the states or international institutions like the World Bank economic strength to further their interest.

To actualize these motives, the proponents outlined the three economic practices or strategies namely: imperialism and neo-imperialism, economic incentives and disincentives, and protectionism and domestic economic support. Imperialism and neo-imperialism connote the direct or indirect domination of foreign lands for national economic gain which may be facilitated by establishment of colonial rules or through the activities of the transactional and multinational corporations. It was this idea that propelled Europeans outward movement to conquer the great empires and dominated so much of the world until recent decade. In the same vein, the foreign corporations operating in the satellite worlds are also in the pursuit of same objectives.

On the other hand, economic incentives entail the use of carrot approach like favourable trade policies and foreign aid to advance economic objective of a state while disincentives means the use of stick approach like sanctions and high tariffs to promote the economic interest of the advanced capitalist societies. Meanwhile, protectionism and domestic support refers to the third set of idea propagated by the economic nationalists wherein they express suspicion that economic interdependence undermines state sovereignty and weakens national economic strength. As a result, the economic nationalists would prefer that the developed societies should use trade barriers, economic subsidies and other protectionist policies to shield and further their national interest. In other to buttress their viewpoints, the economic nationalists employed the lifeboat analogy to rationalize the above outlined strategies. According to the theorists, the image depicts the world as a lifeboat that can support only few passengers. The people of the Economically Developed Countries (EDCs) are in a boat while the billions of the Less Developed Countries (LDCs) are in the sea in the peril of drowning and clamouring to get aboard (Gilpin, 1987). The theorists contended that that the life boat is incapable of saving the life of the people who are at the risk of drowning in the sea, therefore, if everyone gets in the lifeboat, it will sink. The logic behind this argument is that if the EDCs offer genuine economic assistance to the LDCs, it will jeopardize the existence of the former, hence, the need to exploit and make the LDCs perpetually dependent and appendage of the EDCs.

On the other hand, economic structuralism is based on the assumption that the conduct of the world is organized economically. Economic structuralists contend that the global system is systematically divided into the metropolitan and satellites states and that

the former works to keep the latter weak and poor in order to exploit them. Within the economic structuralism theory exist two approaches namely: the Marxist and dependency approach. While the Marxist theorists maintain that history proceed by means of a historical dialectics or clash of the opposing ideas with a resultant new order, the dependency theorists otherwise referred to as the neo-Marxists, argued that the exploitation of the LDCs by the EDCs is exercised through the imperialism and it is driven by the EDCs need for primary resources, external markets, profitable investment opportunities and low wage labour. They however maintained that the dependence of the LDCs is maintained in number of ways such as structuring the rules and practices of the international economics to benefit the North.

In applying the theory to our study, the theories is germane in understanding the dynamics and concomitant effects of the interactions and relations between the World Bank and the developing states, which Nigeria is part of. Firstly, the views expressed by the theorists of the two paradigmatic schools is very significant in appreciating the hidden rationale behind the creation of the World Bank as a mere tool of the metropolitan states in foisting and perpetuating their dominance in the international system. This dependence nay asymmetrical relationship between the two poles is maintained based on the wide held notions by the metropolitan states that any genuine developmental assistance to the satellite states will jeopardize the economic interest of the former.

Secondly, the theories helps us to understand that the technical assistance or economic carrot emanating from the International Monetary Fund has been designed to deepen the developmental crises in the developing countries so that the developed nations will continue to dictate the rule game in the international political economy. This is done through the imposition of unfavourable policies like devaluation, privatization, deregulation, liberalization of trade as yardstick for assessing loans and foreign grants. Meanwhile, the economic disincentive measure is always applied to any recalcitrant state that failed to toe the development paradigms of the economically developed states. Thirdly, it is the contention of this theoretical framework that the foreign aids of the International Financial Institutions only function to preserve and sustain the dependence and integration of Nigeria into the world capitalist system. The more Nigeria seeks for projects assistance from the World Bank, the more debts increases and no matter how much they try, they are still dependent on the West because of their incapacity to pay their debts which ultimately leads to development crisis.

## **METHODOLOGY**

This study Adopts survey method of Analysis. The study employed both primary and secondary sources of data collection. It involved methodological collection of both qualitative and quantitative data. This is with a view to providing holistic perspective in respect of the study variable.

## **CONCLUSION**

Erosion degrades soils and reduces its potential for a variety of uses including agriculture and construction. The physical and chemical properties of the soil are depleted sometimes at levels that affect the productive capacity of the soils. Nasarawa State is facing severe problem of gully erosion causing untold hardships and depression on the lives of the people. Complex interdependent mechanisms between rainfall characteristics, soil erodibility, land use, topography has reduced infiltration, which caused a higher surface runoff. This has increased deep cutting, take up valuable land, raised the cost of building

and sinking of well water. This chain of cause and effect hits most of the low income groups of the community, where the population density is highest and where the worst damages of gully erosion are found. Gully erosion as observed by this study has lowered the concentration of most of the physical and chemical properties of the soil thus, exposing the sub soil devoid of fertility to support gainful agricultural productivity. Due to erosion, the texture of the soils at the gully sites had lost most of colloidal portion leaving a soil that were mostly sandy in nature. The low concentration of macro nutrients observed for the soils at the gully sites implies that the soils were deficient in these important nutrients necessary for promoting high productivity for plants.

The World Bank Assisted Project on the Nigeria Erosion and Watershed Management Project (NEWMAP) in Nasarawa State has partly achieve its objectives in view of the evidences in the ongoing projects across the states, therefore there is need for synergy between the NEWMAP, the communities and state government in tackling erosion-related problems in the state. To this end, gully erosion especially in Nasarawa should be taken a serious environmental problem and measures should be directed towards minimising its impacts, improve the soil quality of the area and reduce the possible negative effects this may have on agricultural lands and residential areas.

## References

- Albert, A. A., Samson, A. A., Peter, O. O. & Olufunmilayo, A. O. (2015). An Assessment of the Socio Economic Impacts of Soil Erosion in South-Eastern Nigeria, Shaping the Change, XXIII FIG.
- Alexander, Earl B. (2014). *Soils in natural landscapes*. CRC Press. p. 108. ISBN 978-1-4665-9436-4.
- Allaby, Michael (2013). "Erosion". *A dictionary of geology and earth sciences* (Fourth ed.). Oxford University Press. ISBN 9780199653065.
- Amsden, A. (1989). *Asia's Next Giant: South Korea and Late Industrialization*. New York: Oxford University Press.
- Anifowose, R & Enemu, O. F. (2000). *Elements of Politics*. Lagos: Sam Iroanusi Publications.
- Apollo, M., Andreychouk, V., Bhattarai, S.S. (2018-03-24). "Short-Term Impacts of Livestock Grazing on Vegetation and Track Formation in a High Mountain Environment: A Case Study from the Himalayan Miyar Valley (India)". *Sustainability*. **10** (4): 951. doi:10.3390/su10040951. ISSN 2071-1050.
- Balba, A. Monem (1995). "Desertification: Wind erosion". *Management of Problem Soils in Arid Ecosystems*. CRC Press. p. 214. ISBN 978-0-87371-811-0.
- Beckinsale, Robert P.; Chorley, Richard J. (2003) [1991]. "Chapter Seven: American Polycyclic Geomorphology". *The History of the Study of Landforms*. Volume Three. Taylor & Francis e-Library. pp. 235–236.
- Bell, Frederic Gladstone. "Marine action and control." *Geological hazards: their assessment, avoidance, and mitigation*, Taylor & Francis, 1999, pp. 302–306.
- Bettis III, E. A., Gully Erosion of Western Iowa. The Iowa Department of Natural Resources, Iowa Geological and Water Survey, 1983.

- Blanco, Humberto; Lal, Rattan (2010). "Soil and water conservation". *Principles of Soil Conservation and Management*. Springer. p. 2. ISBN 978-90-481-8529-0.
- Blanco-Canqui, Humberto; Rattan, Lal (2008). "Soil and water conservation". *Principles of soil conservation and management*. Dordrecht: Springer. pp. 1–20. ISBN 978-1-4020-8709-7.
- Blanco-Canqui, Humberto; Rattan, Lal (2008). "Water erosion". *Principles of soil conservation and management*. Dordrecht: Springer. pp. 21–53 [29–31]. ISBN 978-1-4020-8709-7.
- Blanco-Canqui, Humberto; Rattan, Lal (2008). "Wind erosion". *Principles of soil conservation and management*. Dordrecht: Springer. pp. 54–80. ISBN 978-1-4020-8709-7.
- Boardman, John; Poesen, Jean, eds. (2007). *Soil Erosion in Europe*. Chichester: John Wiley & Sons. ISBN 978-0-470-85911-7.
- Borah, Deva K.; et al. (2008). "Watershed sediment yield". In Garcia, Marcelo H. (ed.). *Sedimentation Engineering: Processes, Measurements, Modeling, and Practice*. ASCE Publishing. p. 828. ISBN 978-0-7844-0814-8.
- Brice, J.C., *Erosion and Deposition in thin the Loess-Mantled great plain, Medicine Creek Drainage Basin, Nebraska* (Washington Dept. of the Interior Geological Survey Professional
- Britannica Library. library.eb.com. Retrieved 2017-01-31.
- Burbank, Douglas W.; Anderson, Robert S. (2011). "Tectonic and surface uplift rates". *Tectonic Geomorphology*. John Wiley & Sons. pp. 270–271. ISBN 978-1-4443-4504-9.
- Cammack, P. (2007). *Class Politics, Competitiveness and the Developmental State*. In *Papers in the Politics of Global Competitiveness*, No.4, Manchester Metropolitan University.
- Chang, D-O (2009). *Capitalist Development in Korea: Labour, Capital, and the Myth of the Developmental State*. London: Routledge.
- Chang, H-J (2002). *Kicking away the Ladder: Development Strategy in Historical Perspective*. London: Anthem Press.
- Chen, Jie (2007-01-16). "Rapid urbanization in China: A real challenge to soil protection and food security". *CATENA. Influences of rapid urbanization and industrialization on soil resource and its quality in China*. **69** (1): 1–15. doi:10.1016/j.catena.2006.04.019.
- Cheraghi, M.; Jomaa, S.; Sander, G.C.; Barry, D.A. (2016). "Hysteretic sediment fluxes in rainfall-driven soil erosion: Particle size effects" (PDF). *Water Resour. Res.* **52** (11): 8613. Bibcode:2016WRR....52.8613C. doi:10.1002/2016WR019314 (inactive 31 May 2021).
- Chibber, V. (2005). *Revisiting the Developmental State: The Myth of the "National Bourgeoisie"*. In Leo Panitch and Colin Leys (eds) *The Empire Reloaded* (Socialist Register 2005) (pp.144-165).

Congress Munich, Germany, pp. 12, 2006.

Coppola, Damon P. (2011). *Introduction to International Disaster Management*, 2nd Edition. Oxford, UK: Butterworth-Heinemann. ISBN 978-0-75-067982-4.

Cornelis, Wim S. (2006). "Hydroclimatology of wind erosion in arid and semi-arid environments". In D'Odorico, Paolo; Porporato, Amilcare (eds.). *Dryland Ecohydrology*. Springer. p. 141. ISBN 978-1-4020-4261-4.

Costard, F.; Dupeyrat, L.; Gautier, E.; Carey-Gailhardis, E. (2003). "Fluvial thermal erosion investigations along a rapidly eroding river bank: application to the Lena River (central Siberia)". *Earth Surface Processes and Landforms*. **28** (12): 1349–1359. Bibcode:2003ESPL...28.1349C. doi:10.1002/esp.592.

Dauda, S. (2010). *Essentials of International Relations*. Kaduna: Mafolayomi Press Limited.

David (2001). *Glacial Lake Missoula & its Humongous Floods*. Mountain Press. ISBN 978-0-87842-415-3.

Dewey, J.F.; Ryan, P.D.; Andersen, T.B. (1993). "Orogenic uplift and collapse, crustal thickness, fabrics and metamorphic phase changes: the role of eclogites". *Geological Society, London, Special Publications*. **76** (1): 325–343. Bibcode:1993GSLSP..76..325D. doi:10.1144/gsl.sp.1993.076.01.16. S2CID 55985869.

Dixon, John C.; Thorn, Colin E. (2005). "Chemical weathering and landscape development in mid-latitude alpine environments". *Geomorphology*. **67** (1–2): 127–145. Bibcode:2005Geomo..67..127D. doi:10.1016/j.geomorph.2004.07.009.

Dotterweich, Markus (2013-11-01). "The history of human-induced soil erosion: Geomorphic legacies, early descriptions and research, and the development of soil conservation – A global synopsis". *Geomorphology*. **201**: 1–34. Bibcode:2013Geomo.201....1D. doi: 10.1016/j.geomorph.2013.07.021.

Dreher, Axel; Sturm, Jan-Egbert; Vreeland, James Raymond (2009). "Development aid and international politics: Does membership on the UN Security Council influence World Bank decisions?". *Journal of Development Economics*. **88** (1): 1–18. doi:10.1016/j.jdeveco.2008.02.003. hdl:10419/50418.

Egholm, D. L.; Nielsen, S. B.; Pedersen, V.K.; Lesemann, J.-E. (2009). "Glacial effects limiting mountainheight". *Nature*. **460**(7257):884–887. Bibcode:2009Natur.460..884E. doi:10.1038/nature08263. PMID 19675651. S2CID 205217746.

Erosion. Encyclopædia Britannica. 2015-12-03. Archived from the original on 2015-12-21. Retrieved 2015-12-06.

Evans, P. (1992). The State as Problem and Solution: Predation, Embedded Autonomy and Adjustment. In S. Haggard and R. Kaufman (eds), *The Politics of Economic Adjustment: International Constraints, Distributive Politics, and the Stat*. Princeton: Princeton University Press.

- Evans, P. (1995). *Embedded Autonomy: States and Industrial Transformation*. NJ: Princeton University Press.
- Evans, P. B., Rueschemeyer, D., & Skocpol, T. (1985). *Bringing The State Back In*. Cambridge University Press.
- FAO & ITPS (2015). *Status of the world's soil resources – main report*. Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils. Rome. 649pp. (also available at <http://www.fao.org/3/a-i5199e.pdf>).
- Farm and Commodity Policy: Glossary. United States Department of Agriculture. Retrieved 17 July 2011.
- Federal Republic of Nigeria (2007). *Official Gazette: Legal Notice on publication of the details of the breakdown of the National and State provisional totals 2006 Census*. Government Notice Nr 21. Nr. 24. Vol. 94. Lagos, Nigeria: Federal Republic of Nigeria.
- Fine, B. (2006). *The Developmental State and the Political Economy of Development*. In K.S. Jomo and B. Fine (eds), *The New Development Economics: After the Washington Consensus* (pp. 1-20), London: Zed Books.
- Fine, B. (2011). *Locating the Developmental State and Industrial and Social Policy after the Crisis*. In *The Least Developed Countries Report 2011: The Potential Role of South-South Cooperation for Inclusive and Sustainable Development*, Background Paper No: 3,
- Food and Agriculture Organization (1965). "Types of erosion damage". *Soil Erosion by Water: Some Measures for Its Control on Cultivated Lands*. United Nations. pp. 23–25. ISBN 978-92-5-100474-6.
- Francis, C.F. & Thornes, J.B. (2014). *Runoff hydrographs from three Mediterranean vegetation cover types*. In: Thornes, J.B. (ed.) *Vegetation and Geomorphology*. Chichester Wiley, England. 363-385.
- Geddes, Ian (2015). "Lithosphere." *Higher geography for cfe: physical and human environments*, Hodder Education.
- Gjermundsen, Endre F.; Briner, Jason P.; Akçar, Naki; Foros, Jørn; Kubik, Peter W.; Salvigsen, Otto; Hormes, Anne (2015). "Minimal erosion of Arctic alpine topography during late Quaternary glaciation". *Nature Geoscience*. **8** (10): 789. Bibcode: 2015NatGe...8..789G. doi:10.1038/ngeo2524.
- Glynn, Peter W. "Bioerosion and coral-reef growth: a dynamic balance." *Life and death of coral reefs* (1997): 68-95.
- Gray, Donald H.; Sotir, Robbin B. (1996). "Surficial erosion and mass movement". *Biotechnical and Soil Bioengineering Slope Stabilization: A Practical Guide for Erosion Control*. John Wiley & Sons. p. 20. ISBN 978-0-471-04978-4.
- Gyssels, G.; Poesen, J.; Bochet, E.; Li, Y. (2005-06-01). "Impact of plant roots on the resistance of soils to erosion by water: a review". *Progress in Physical*

- Geography*. **29** (2): 189–217. doi: 10.1191/0309133305pp443ra. ISSN 0309-1333. S2CID 55243167.
- Hallet, Bernard (1981). "Glacial Abrasion and Sliding: Their Dependence on the Debris Concentration In Basal Ice". *Annals of Glaciology*. **2** (1): 23–28. Bibcode:1981AnGla...2...23H. doi:10.3189/172756481794352487. ISSN 0260-3055.
- Harbor, Jonathan M.; Hallet, Bernard; Raymond, Charles F. (1988-05-26). "A numerical model of landform development by glacial erosion". *Nature*. **333** (6171): 347–349. Bibcode:1988Natur.333..347H. doi:10.1038/333347a0. S2CID 4273817
- Harvey, A.M. "Local-Scale geomorphology – process systems and landforms." *Introducing Geomorphology: A Guide to Landforms and Processes*. Dunedin Academic Press, 2012, pp. 87–88. EBSCOhost.
- Hudec, P., Simpson, F., Akpkodje, G. & Umenweke, O. (2005). Geological society of America, *Reviews in Engineering Geology*, Volume XVI.
- International Development Association. "What is IDA?". World Bank Group. Retrieved 2019-06-13.
- Ismi, A. (2004). *Impoverishing a Continent: The World Bank and the IMF in Africa*. New York: The Halifax Initiative Coalition.
- Jones, B.M.; Hinkel, K.M.; Arp, C.D.; Eisner, W.R. (2008). "Modern Erosion Rates and Loss of Coastal Features and Sites, Beaufort Sea Coastline, Alaska". *Arctic*. **61** (4): 361–372. doi:10.14430/arctic44. hdl: 10535/5534. Archived from the original on 2013-05-17.
- Julien, Pierre Y. (2010). *Erosion and Sedimentation*. Cambridge University Press. p. 1. ISBN 978-0-521-53737-7.
- Lard, L., Paull, C., & Hobson, B. (1995). "Genesis of a submarine sinkhole without subaerial exposure". *Geology*. **23** (10): 949–951. Bibcode: 1995 Geo....23..949L. doi: 10.1130/0091-7613(1995)023<0949:GOASSW>2.3.CO;2.
- Louvat, P.; Gislason, S. R.; Allegre, C. J. (1 May 2008). "Chemical and mechanical erosion rates in Iceland as deduced from river dissolved and solid material". *American Journal of Science*. **308** (5): 679–726. Bibcode: 2008AmJS..308..679L. doi: 10.2475/05.2008.02. S2CID 130966449.
- Lupia-Palmieri, Elvidio (2004). "Erosion". In Goudie, A.S. (ed.). *Encyclopedia of Geomorphology*. p. 336.
- Mitchell, S.G. & Montgomery, D.R. "Influence of a glacial buzzsaw on the height and morphology of the Cascade Range in central Washington State". *Quat. Res.* **65**, 96–107 (2006)
- Montgomery, David R.; Huang, Michelle Y.-F.; Huang, Alice Y.-L. (2014-01-01). "Regional soil erosion in response to land use and increased typhoon frequency and intensity, Taiwan". *Quaternary Research*. **81** (1): 15–20. Bibcode:2014QuRes..81...15M. doi:



- 10.1016/j.yqres.2013.10.005. ISSN 0033-5894. S2CID 53649150. Archived from the original on 2017-02-24. Retrieved 2017-02-23.
- Montgomery, David R.; Stolar, Drew B. (1 December 2006). "Reconsidering Himalayan river anticlines". *Geomorphology*. 82(1–2): 4–15. Bibcode: 2006 Geomo..82....4M. doi:10.1016/j.geomorph.2005.08.021.
- Moreno-de las Heras, Mariano; Gallart, Francesc (2018). "The Origin of Badlands". *Badlands Dynamics in a Context of Global Change*: 27–59. doi:10.1016/B978-0-12-813054-4.00002-2. ISBN 9780128130544.
- Murck, B.W., Skinner, B.J. & Porter, S.C. (2012). *Environmental Geology*. New York.
- Nancy D. Gordon (2004). "Erosion and Scour". *Stream hydrology: an introduction for ecologists*. ISBN 978-0-470-84357-4.
- Nearing, M.A.; Norton, L.D.; Bulgakov, D.A.; Larionov, G.A.; West, L.T.; Dontsova, K.M. (1997). "Hydraulics and erosion in eroding rills". *Water Resources Research*. 33 (4): 865–876. Bibcode:1997WRR....33..865N. doi:10.1029/97wr00013.
- Nichols, Gary (2009). *Sedimentology and Stratigraphy*. John Wiley & Sons. ISBN 978-1-4051-9379-5.
- Obreschkow, D.; Dorsaz, N.; Kobel, P.; De Bosset, A.; Tinguely, M.; Field, J.; Farhat, M. (2011). "Confined Shocks inside Isolated Liquid Volumes – A New Path of Erosion?". *Physics of Fluids*. 23 (10): 101702. arXiv:1109.3175. Bibcode: 2011PhFl...23j1702O. doi:10.1063/1.3647583. S2CID 59437729.
- Okin, G.S. (2012): "Toward a Unified View of Biophysical Land Degradation Processes in Arid and Semi-arid Lands". In *Global Desertification: Do Humans Cause Deserts?* Edited by J.F. Reynolds and D.M. Stafford Smith. Dahlem University Press. Pp95-97.
- OMAFRA Staff (2003): "Soil Erosion, Causes and Effects". Ridge Town and College of Agricultural Technology, Ontario Institute of Pedology
- Onyegbule, P.E. (2010). An assessment of socio-economic impact (effects) of Angulu Nanka Gully erosion, Anambra State Southern Nigeria. *Unpublished M Sc. Thesis*, Department of Environmental Science, Nnamdi Azikiwe University Uwka – Anambra State.
- Orlov, S.Yu.; Kuznetsov, N.B.; Miller, E.D.; Soboleva, A.A.; Udoratina, O.V. (2011). "Age Constraints for the Pre-Uralide–Timanide Orogenic Event Inferred from the Study of Detrital Zircons". *Doklady Earth Sciences*. 440 (1): 1216–1221. Bibcode:2011DokES.440.1216O. doi:10.1134/s1028334x11090078. S2CID 128973374. Retrieved 22 September 2015.
- Osundina, O. E. (2014). Policy-Based External Loan and the Nigerian Economy. *Journal of Research and Development*, 2(4): 11-21.
- Pinter, N (2010). 'Coastal Terraces, Sealevel, and Active Tectonics' (educational exercise), from "Archived copy" (PDF). Archived from the original (PDF) on 2010-10-10. Retrieved 2011-04-21. [02/04/2011]

- Pitman, W. C.; Golovchenko, X. (1991). "The effect of sea level changes on the morphology of mountain belts". *Journal of Geophysical Research: Solid Earth*. 96 (B4): 6879–6891. Bibcode:1991JGR....96.6879P. doi:10.1029/91JB00250. ISSN 0148-0227.
- Poesen J.; Vandekerckhove L.; Nachtergaele J.; Oostwoud D.; Verstraeten G.; Can Wesemael B. (2002). "Gully erosion in dryland environments". In Bull, Louise J.; Kirby, M.J. (eds.). *Dryland Rivers: Hydrology and Geomorphology of Semi-Arid Channels*. John Wiley & Sons. pp. 229–262. ISBN 978-0-471-49123-1.
- Prasicek, Günther; Larsen, Isaac J.; Montgomery, David R. (2015-08-14). "Tectonic control on the persistence of glacially sculpted topography". *Nature Communications*. 6: 8028. Bibcode:2015NatCo...6.8028P. doi:10.1038/ncomms9028. ISSN 2041-1723. PMC 4557346. PMID 26271245.
- Reusser, L.; Bierman, P.; Rood, D. (2015). "Quantifying human impacts on rates of erosion and sediment transport at a landscape scale". *Geology*. 43 (2): 171–174. Bibcode:2015Geo...43..171R. doi:10.1130/g36272.1.
- Ritter, Michael E. (2006) "Geologic Work of Streams" Archived 2012-05-06 at the Wayback Machine *The Physical Environment: an Introduction to Physical Geography* University of Wisconsin, OCLC 79006225
- Sanford, Jonathan E. (2002). "World Bank: IDA Loans or IDA Grants?" *World Development*. 30 (5): 741–762. doi:10.1016/S0305-750X(02)00003-7.
- Selby, Michael John (1985). *Earth's changing surface: an introduction to geomorphology*. Oxford: Clarendon Press. ISBN 0-19-823252-7.
- Sivashanmugam, P. (2007). *Basics of Environmental Science and Engineering*. New India Publishing. pp. 43–. ISBN 978-81-89422-28-8.
- Sklar, Leonard S.; Dietrich, William E. (2004). "A mechanistic model for river incision into bedrock by saltating bed load"(PDF). *Water Resources Research*. 40 (6): W06301. Bibcode:2004WRR...40.6301S. doi:10.1029/2003WR002496. ISSN 0043-1397. Archived (PDF) from the original on 2016-10-11. Retrieved 2016-06-18.
- Styczen, M.E.; Morgan, R.P.C. (1995). "Engineering properties of vegetation". In Morgan, R.P.C.; Rickson, R. Jane (eds.). *Slope Stabilization and Erosion Control: A Bioengineering Approach*. Taylor & Francis. ISBN 978-0-419-15630-7.
- Thermal Erosion. NSIDC Glossary. National Snow and Ice Data Center. Archived from the original on 2010-12-18. Retrieved 21 December 2009.
- Thomson, Stuart N.; Brandon, Mark T.; Tomkin, Jonathan H.; Reiners, Peter W.; Vásquez, Cristián; Wilson, Nathaniel J. (2010). "Glaciation as a destructive and constructive control on mountain building". *Nature*. 467 (7313): 313–317. Bibcode:2010Natur.467.313T. doi:10.1038/nature09365. hdl:10533/144849. PMID 20844534. S2CID 20522252.
- Tomkin, J.H.; Roe, G.H. (2007). "Climate and tectonic controls on glaciated critical-taper orogens" (PDF). *Earth Planet. Sci. Lett.* 262 (3–4): 385–397. Bibcode:2007E&PSL.262..

- 385T. CiteSeerX 10.1.1.477.3927. doi:10.1016/j.epsl.2007.07.040. Archived (PDF) from the original on 2017-08-09. Retrieved 2017-10-24.
- Toy, Terrence J.; Foster, George R.; Renard, Kenneth G. (2002). *Soil erosion: processes, prediction, measurement, and control*. New York: Wiley. ISBN 978-0-471-38369-7.
- Van Beek, Rens (2008). "Hillside processes: mass wasting, slope stability, and erosion". In Norris, Joanne E.; et al. (eds.). *Slope Stability and Erosion Control: Ecotechnological Solutions*. Springer. Bibcode:2008ssec.conf.....N. ISBN 978-1-4020-6675-7.
- Wainwright, John; Brazier, Richard E. (2011). "Slope systems". In Thomas, David S.G. (ed.). *Arid Zone Geomorphology: Process, Form and Change in Drylands*. John Wiley & Sons. ISBN 978-0-470-71076-0.
- Whisenant, Steve G. (2008). "Terrestrial systems". In Perrow Michael R.; Davy, Anthony J. (eds.). *Handbook of Ecological Restoration: Principles of Restoration*. Cambridge University Press. p. 89. ISBN 978-0-521-04983-2.
- Wiggs, Giles F.S. (2011). "Geomorphological hazards in drylands". In Thomas, David S.G. (ed.). *Arid Zone Geomorphology: Process, Form and Change in Drylands*. John Wiley & Sons. p. 588. ISBN 978-0-470-71076-0.
- World Bank (2011). International Development Association Country Partnership Strategy for the Federal Republic of Nigeria (2012-2015). Abuja: African Development Bank, UK Department for International Development, United States Agency for International Development and the World Bank Group.
- World Bank (IBRD & IDA) Lending. Bank Information Center. Archived from the original on 2011-11-05. Retrieved 2012-07-01.
- Zachar, Dušan (1982). "Classification of soil erosion". *Soil Erosion*. Vol. 10. Elsevier. p. 48. ISBN 978-0-444-99725-8.
- Zeitler, P.K. et al. (2001), Erosion, Himalayan Geodynamics, and the Geomorphology of Metamorphism, *GSA Today*, 11, 4–9.
- Zheng, Xiaojing; Huang, Ning (2009). *Mechanics of Wind-Blown Sand Movements*. Berlin: Springer. pp. 7–8. Bibcode:2009mwbs.book.....Z. ISBN 978-3-540-88253-4.
- Zorn, Matija; Komac, Blaž (2013). Bobrowsky, Peter T. (ed.). Encyclopedia of Natural Hazards. Encyclopedia of Earth Sciences Series. Springer Netherlands. pp. 289–290. doi:10.1007/978-1-4020-4399-4\_121. ISBN 978-90-481-8699-0.