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Toward Better Tasks in Sustainability Education: Search for New Approaches on Online Platforms

By Katja Andersen

Université du Luxembourg

Abstract- The O-TAPSE study deals with the question to what extent the sustainable development goals (SDGs) formulated by the UN (2015) are addressed in the latest online tasks for primary science education. The tasks of three online platforms were evaluated by four primary school teachers with regard to the occurrence of content on the SDGs. The results of the study and their analysis show a clear need for action to further implement these contents in online tasks.

Keywords: sustainability education, task development, primary science education, sustainable development goals.

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Toward Better Tasks in Sustainability Education: Search for New Approaches on Online Platforms

Katja Andersen

Abstract: The O-TAPSE study deals with the question to what extent the sustainable development goals (SDGs) formulated by the UN (2015) are addressed in the latest online tasks for primary science education. The tasks of three online platforms were evaluated by four primary school teachers with regard to the occurrence of content on the SDGs. The results of the study and their analysis show a clear need for action to further implement these contents in online tasks.

Keywords: sustainability education, task development, primary science education, sustainable development goals.

I. Introduction

Sustainability education has become an important topic in the educational sciences since the 2009 Bonn Declaration at the latest. On the subject of sustainability education, individual studies have been carried out, which deal with the representation of this topic in primary schools (cf. Andersen, 2018; Hus, 2013; Jones et al., 2012; Lloyd, A., & Gray, T. (2014). The question regarding the representation of contents to sustainable development in textbooks has been pursued by the TAPSE study using the example of Luxembourger primary school (see Andersen, 2018). Following on from the demands of the 2009 Bonn Declaration (UNESCO, 2009), the 2012 Report on the UN Decade of Education for Sustainable Development (UNESCO, 2012) and the Global Education Monitoring Report (UNESCO, 2016), the TAPSE study could show that there is still considerable unrealized potential with regards implementing environmental issues in Luxembourghian primary science textbooks and the need to anchor content on sustainability education more explicitly (Andersen, 2018). After new tasks in primary science education have recently been developed in online formats (e.g., bbb, 2020; DIPF, 2021; HKM, 2020; Maué, Schönheit & Trauth, 2019), the question arises, to what extent the new tasks stimulate the engagement with content on sustainable development. Considering that in 2015 the 2030 Agenda for Sustainable Development (UN, 2015) set new targets for the next 15 years, today, after the first third of the period, it is necessary to ask which of these targets have been anchored in the newly developed primary science tasks. The O-TAPSE study (Online Tasks in Primary Science Education) addresses this question in a multi-stage process.

II. Theoretical Framework: Theories of Sustainable Development

Understanding theories of sustainable development is the key to reflecting on the concept behind the 2030 Agenda for Sustainable Development. Enders and Remig (2016) claim that sustainable development cannot only been viewed as “the establishment of a permanent, globally practicable and future-capable mode of life and economics, but as a complex array of problems involving a wide range of social-scientific and humanistic disciplines”. Taking such a wide view of sustainable development as a starting point, the O-TAPSE study follows on from a theoretical approach that overlaps the established academic boundaries. It views the concept of development according to Todaro and Smith (2006) as a multi-faceted process, implying reduction of inequality, economic growth, eradication of absolute poverty as well as changes in social structures, attitudes, and institutions. With reference to the concept of sustainability according to Stoddart (2011), the O-TAPSE study is based on a definition that defines the equitable and efficient distribution of resources within and between generations and within the limits of a finite ecosystem. Based on a systematic literature analysis, Mensah (2019) comes to the conclusion that sustainable development is a core concept of the global development policy and agenda. According to Mensah (2019) and based on the findings of Browning and Rigolon (2019), sustainable development can be defined as a development paradigm and a concept that calls for improving living standards without endangering the earth’s ecosystems or causing environmental problems such as deforestation or water and air pollution that can lead to problems such as species extinction or climate change.

In the 2030 universal Agenda for Sustainable Development (UN, 2015), 17 Sustainable Development Goals (SDGs) and 169 targets were anchored, which aim at stimulating action over the next 15 years in areas of critical importance for humanity and the planet. This includes the five areas (a) people, (b) planet, (c) prosperity, (d) peace, and (e) partnership (UN, 2015, p. 2). The area, which is entitled people, aims to end poverty and hunger, ensuring that all people are able to fulfill their potential with equal rights and in a healthy environment. The second area focuses on protecting the...
planet from degradation, including sustainable consumption and production, sustainable management of its natural resources, and urgent action against climate change to meet the needs of present and future generations. The area prosperity aims to enable all people to lead a fulfilling life and to achieve economic, social and technological progress in harmony with nature. Peace is the fourth area of the SDGs and involves promoting peaceful and inclusive societies free from fear and violence. The final area, partnership, aims to mobilize the resources needed to implement the above mentioned objectives in the context of a global partnership for sustainable development, based on a spirit of increased global solidarity, focusing in particular on the needs of the poorest and most vulnerable and involving all countries, stakeholders and people (see for detail UN, 2015).

The O-TAPSE criteria catalogue (Fig. 1) follows on from the above mentioned five fields of action with the corresponding 17 SDGs, which are defined by the UN (2015) as follows: (1) no poverty; (2) no hunger; (3) good health and well-being; (4) quality education; (5) gender equality; (6) clean water and sanitation; (7) affordable and clean energy; (8) decent work and economic growth; (9) industry, innovation and infrastructure; (10) reduced inequalities; (11) sustainable cities and communities; (12) responsible consumption and production; (13) climate action; (14) life below water; (15) life on land; (16) peace, justice and strong institution; and (17) partnerships for the goals. For the compilation of the O-TAPSE criteria catalogue, these SDGs and the 169 associated targets build the foundation to develop higher categories and assign analysis criteria to them (see Fig. 1).

---

**Fig. 1:** O-TAPSE criteria catalogue with focus on sustainable development (developed on the basis of UN, 2015)
III. Methodology and Questions of the Study

Based on such an understanding of sustainable development and its goals, the O-TAPSE study investigates the potentials of newly developed online tasks for activating learning in the context of sustainable development. The study is divided into three research steps (Fig. 2). In Step 1, three websites for primary school learning and teaching were selected, aiming to identify websites that have uploaded new primary science tasks over the last year. As Luxembourg and Germany—both teaching in the German language at primary schools—use similar or identical textbooks and tasks, websites were chosen that are used by both countries. This is to meet the demand set out in the 2030 agenda to consider the SDGs from a global perspective (UN, 2015).

In Step 2, all tasks on the selected websites were analyzed with regard to the appearance of contents related to sustainable development. The analysis of the tasks is based on the O-TAPSE criteria catalogue to ensure that the extensive quota of 17 SDGs and 169 targets as outlined by the UN (2015) are sufficiently taken into account without overburdening the evaluators. Therefore, the criteria catalogue with six core categories (C1-C6; see Fig. 1) was developed against the background to compress the extensive 17 SDGs and 169 targets. The overarching objective of the analysis is to investigate the question, in which form the contents of sustainable development as listed in C1 to C6 become visible in tasks of the selected three online platforms. Four primary school teachers, two from Luxembourg and two from Germany, are included in the evaluation, all of whom have more than 10 years of experience in teaching science subjects. Within the group of teachers, the tasks are discussed with regard to the occurrence of criteria C1 to C6. In concrete terms, the evaluator group decides whether the sub-items defined in C1 to C6 are related to sustainability education (a) explicitly, (b) implicitly, or (c) do not address such content. In this context, the term “implicit” refers to potentials for tackling sustainable development contents, which, however, have to be activated by additional inputs from the teacher. In Step 2, it is indicated by the evaluators within the criteria catalogue which of the criteria and their sub-items occur in each task.

In Step 3, the evaluators comment on the sub-items that were identified in Step 2 as having potentials to activate sustainability education or as addressing it explicitly. The comments of the evaluators were written on the evaluation sheet next to identified sub-items. The analysis was carried out on the basis of the O-TAPSE evaluation forms completed by the evaluators. All tasks of the three online platforms were compared in terms of which contents of the SDGs were addressed from the evaluators’ point of view and whether these contents were perceived as implicitly or explicitly addressed.

Fig. 2: O-TAPSE research design

IV. Findings: The Occurrence of Contents of Sustainable Development in Online Tasks

The evaluators selected the online platforms “Lernspiele zu den Themen Mathematik, Natur, Naturwissenschaft und Technik” (learning games on the topics of mathematics, nature, science and technology; HKM, 2020), “Kostenlose Lernspiele für die Grundschule und die Sekundarstufe I und II” (free learning games for primary schools and secondary Schools I and II; DIPF, 2021) and “Materialkompass: Unterrichtsmaterialien auf dem Bildungs server Berlin-Brandenburg” (material compass: teaching materials on the education server Berlin-Brandenburg; bbb, 2020) because they perceive these platforms as always up-to-date and often use them to extract tasks for their teaching. The group discussion has shown that contents of sustainable development could be identified in individual tasks on all three platforms. The criteria individuum (C1) and resources (C3) were identified most often, although this was almost only implicitly the case. Content of other categories (access, C4; facilities, C5) was detected less frequently and categories C2 (equality) and C6 (economy) were almost not detected at all. In the vast majority of tasks from the three online portals, however, no potentials for activating sustainability education were identified. At the same time, only very isolated tasks were identified by the evaluators that explicitly address contents of sustainable development. One of these
Explicit potential for activating sustainability education was identified in the task "Unterschiedliche Energieformen" (different forms of energy; DIPF, 2021), which consists of six worksheets. Sheets 1 and 2 provide information on the various forms of energy. Seven forms of energy are presented on the basis of short descriptions. These are: "movement energy", "positional energy", "chemical energy", "radiation energy", "heat energy", "electrical energy" and "nuclear energy" (translation by author). Each form of energy is explained using examples. Sheet 3 contains six pictures showing the mentioned forms of energy (except nuclear energy); for example, a reservoir with a dam and solar cells on a roof are presented. Sheet 6 shows word cards with the terms "movement energy", "positional energy", "chemical energy", "radiation energy", "electrical energy" and "nuclear energy". The heat energy introduced on Sheet 2 is not found on the word cards. In the task, it is formulated that three matching cards are to be found, for each triple two pictures and a word card (e.g. picture of a windmill plus picture of two cyclists plus word card "movement energy").

In the framework of the group discussion, the evaluators rated this task as "not addressed" in relation to 22 of the total 25 sub-items. The evaluators rated two sub-items as having "potential to be addressed through additional input" and one sub-item they saw "explicitly addressed" (see Fig. 3). The two sub-items that were rated as implicitly addressed are distributed among the criteria C3 (resources) and C4 (access). The identified sub-item of category C3 refers to the content "combat climate change" and was commented by the evaluators with the addition "addressed by differentiating between renewable and non-renewable energy sources". This sub-item was rated by the evaluators as implicitly addressed. The two sub-items identified from the category access (C4) were, firstly, the content "ensure availability of water", commented by the evaluators with the addition "addressing hydropower and the kinetic energy of flowing water", which was rated as implicitly addressed in the task. Secondly, from the same category, the content "ensure access to affordable, reliable, sustainable and modern energy" was assessed as explicitly addressed, commented by the evaluators with the addition "differentiating between renewable and non-renewable energy sources and associated forms of useful energy". The overall overview results in the following findings related to the task "different forms of energy" (Fig. 3).

<table>
<thead>
<tr>
<th>Individuum (C1)</th>
<th>implicitly addressed</th>
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<tbody>
<tr>
<td>ensure health and well-being</td>
<td></td>
<td>combat climate change (addressed by differentiating between renewable and non-renewable energy sources)</td>
</tr>
<tr>
<td>end hunger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>promote peaceful and inclusive societies</td>
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<tr>
<th>Equality (C2)</th>
<th>implicitly addressed</th>
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<tbody>
<tr>
<td>achieve gender equality</td>
<td></td>
<td></td>
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<tr>
<td>reduce inequality within and among countries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ensure inclusive and equitable quality education</td>
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<th>Resources (C3)</th>
<th>implicitly addressed</th>
<th>explicitly addressed</th>
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<tbody>
<tr>
<td>conserve the oceans, seas and marine resources</td>
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<tr>
<td>protect terrestrial ecosystems</td>
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<tr>
<td>reserve land degradation</td>
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<tr>
<td>combat desertification</td>
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<td></td>
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<tr>
<td>ensure sustainable consumption and production patterns</td>
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<td></td>
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<tr>
<td>halt biodiversity loss</td>
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<tr>
<th>Access (C4)</th>
<th>implicitly addressed</th>
<th>explicitly addressed</th>
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<tr>
<td>achieve food security</td>
<td></td>
<td>ensure availability of water (by addressing hydropower and the kinetic energy of flowing water)</td>
</tr>
<tr>
<td>provide access to justice</td>
<td></td>
<td>ensure access to affordable, reliable, sustainable and modern energy (by differentiating between renewable and non-renewable energy)</td>
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Toward Better Tasks in Sustainability Education: Search for New Approaches on Online Platforms

V. Discussion and Conclusion

The results of the O-TAPSE study show that there is still a great potential to anchor the SDGs in online tasks for primary school students. This is confirmed by previous studies, which found a deficient implementation of tasks to sustainability education for the field of textbooks of the subject primary science education (Andersen, 2018). The results of the O-TAPSE study give cause for urgent action, since the study used the latest tasks as analytical material and yet the SDGs were not prominently addressed, especially not in the explicit sense. There is cause for concern that the SDGs are not touched at all in the context of the majority of the tasks and, in relation to the tasks in which the SDGs are reflected, almost only in an implicit sense, so that the competence of the teaching staff is needed to actually activate a reflection on the SDGs in class. This shows that the SDGs are still under-represented in primary education tasks, as they are not touched at all in the context of the majority of newly developed online tasks and almost only implicitly in the tasks in which the SDGs shine through. Thus, it requires the competence of the teacher to actually activate a reflection on the SDGs among the students. The conclusion is that the SDGs are still not sufficiently included in the development of tasks in primary science education and that this should be more taken into account in future task profiles, especially in explicit addressing, so that SDG contents are reflected by the pupils independently of the competence of the teacher.

Literature


An Overview of Artisanal Coal Mining and its Impacts on the Environment: A Case Study of Odagbo Coal Mine, North Central Nigeria


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Abstract- Mining as an activity is crucial for economic growth in most countries of the world, but issues of environmental concern are poorly managed by artisanal miners. Artisanal mining is a means of sustaining livelihood that is usually characterized by exploitation of marginal deposits, a very low degree of mechanization, low level of occupational safety and in very dangerous conditions. The objective of this study was to assess the environmental impacts of coal mining at Odagbo and suggestion of useful measures at dealing with these problems for sustainable environmental management. A literature review, field investigations and stakeholder’s consultations were used for this study. The environmental problems that were identified are incidence of acid mine drainage (AMD), deforestation, scarification of the entire landscape and decline in agricultural production.

Keywords: artisanal mining, acid mine drainage, deforestation, scarification, odagbo.

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Abstract: Mining as an activity is crucial for economic growth in most countries of the world, but issues of environmental concern are poorly managed by artisanal miners. Artisanal mining is a means of sustaing livelihood that is usually characterized by exploitation of marginal deposits, a very low degree of mechanization, low level of occupational safety and in very dangerous conditions. The objective of this study was to assess the environmental impacts of coal mining at Odagbo and suggestion of useful measures at dealing with these problems for sustainable environmental management. A literature review, field investigations and stakeholder’s consultations were used for this study. The environmental problems that were identified are incidence of acid mine drainage (AMD), deforestation, scarification of the entire landscape and decline in agricultural production. This study recommends that government should implement the mining laws that will ensure sustainable development of the artisanal mining sector in Nigeria for the overall growth of the economy and protection of the environment. Also, artisanal miners should be trained to acquire competencies in sustainable mining techniques in order to mitigate these environmental problems. Further, government should consider allocating some mining leases for artisanal mining activities. These will reduce haphazard destruction of the forest in search for productive coal deposit. Coal mining should be carried out with minimal impacts on the environment and steps should be taken to reclaim degraded land by afforestation projects and back filling of exposed land with the overburden.

Keywords: artisanal mining, acid mine drainage, deforestation, scarification, odagbo.

I. Introduction

Mining is an activity that separate useful ore from waste rocks which often impacts the local geological and ecological environment. Research has shown that about 20 million small scale and artisanal miners are in operation across 30 countries of the world (Que et al. 2018; Ericsson 2011). Proceeds from mining are used for construction of infrastructures such as roads, schools and hospitals for the human populace (UNECA 2004).

Coal was discovered in Nigeria in 1909 but exploitation, development and mining started in 1950 when Nigeria Coal Corporation (NCC) was established (MMSD 2014). Nigeria’s Federal Government effort at diversifying her economy from a mono economy of oil and gas to exploitation of her abundant solid minerals and agriculture has led to an upsurge in the mining of coal for generation of electricity and export to other countries of the world. Coal is being mined by artisanal miners on a small scale alongside with large scale mining firms such as Dangote Industries, Eta Zuma Nigeria Limited and Weco Nigeria Limited.

Odagbo coal deposit was estimated at about 100 million tones, a paltry of this amount was mined by NCC for rail project and very few tonnages were exported to foreign countries (MMSD 2014). The Odagbo coal mine was abandoned for several years until NCC entered into a production sharing agreement with Nordic Industries Limited and they succeeded in producing 2, 712 tonnes of coal from the mine in 2001 (MMSD 2014).

Till date, total amount of coal that was mined by artisanal miners are not known as they lack basic skills of keeping adequate records of production. Odagbo coal is of sub-bituminous grade which could be used for boiler fuel, production of high calorific gas, domestic heating and production of chemicals such as waxes, resins and dyes (MMSD 2014).

Nigeria’s power generating capacity is in the range of about 7000 MW which is far below the country’s demand of 30,000 MW. The power output could not sustain most industrial plants in Nigeria hence most cement producing companies in Nigeria notably, Lafarge Cement PLC, Dangote Cement PLC, Sokoto Cement PLC and Ashaka Cement Limited have developed coal- fired power plants to generate electricity for their operations. With these initiatives, artisanal miners were exploiting the abundant coal deposits at Odagbo and other adjoining communities for the supply of coal to these cement companies and export to China, Vietnam and other Asian countries. As the demand for coal to meet the energy requirements of
these cement plants increases, so also is the destruction of the entire landscape where coal are being mined from.

Artisanal mining is a poverty driven activity which is practiced by poorly educated populace with few employment alternatives (Funoh 2014). It is characterized by a very low level of occupational safety, reduced degree of mechanization (Fig. 1), low level of income and without cognizance of environmental issues from mining operations (World Bank Group 2005; Hentschel et al. 2002).

The objective of this study was to assess the impacts of artisanal coal mining on the environment within Odagbo enclave and to suggest useful strategies that will entrench sustainable environmental management practices.

II. Research Methodology

The data for this study were acquired through a thorough review of documentation from existing reports, a literature review of books, articles and laws relating to mining in Nigeria. Field visits to Odagbo coal mining sites were conducted in March 2019 for visual observation and Focus Group Discussions were organized with artisanal miners on their perceptions and views on impacts of artisanal coal mining on the environment.

III. Geology and Coal Mineralization

Odagbo is situated between latitudes 7°28′30″ N and 7°29′00″ and longitudes 7°43′30″ E and 7°44′00″ in north central Nigeria (Fig. 2). It has a landmass of about 6 km².

The area is a typical example of scarp and valley topography (Momoh et al. 2017). The soils in the area are loamy and sandy soils, they were derived from Ajali sandstones (Emmanuel 2015). The mean annual temperature is 27°C and annual precipitation is between 1,100 mm and 1,300 mm (Emmanuel 2015). The major land use of the area is farming. Inhabitants of the area and some miners are engaged in the cultivation of cassava, yams, maize, groundnuts and plantain.

The Odagbo coal deposit lies in the Lower Benue Trough, the stratigraphic succession was underlined by Albian Asu River Group (Fig.3). The Asu River Group is made up of shales, limestones and thin lenses of sandstones (Ameh, 2013). Overlying the Asu River Group is the Turonian Nkalagu Formation, which consists of black shales, limestones and siltstones. The Campanian Nkporo Formation which is predominantly marine shales rests on the Nkalagu Formation. Overlying the Nkporo formation is the Maastrichtian Mamu Formation. The Mamu Formation is often referred to as Lower coal Measures of the Anambra Sedimentary Basin of south eastern Nigeria (Obianuju 2005). The Mamu Formation is made up of shale, carbonaceous shale, sandstones and mudstones with coal at many levels in Mamu Formation (Nwajide 2013). Resting on top of the Mamu Formation is the Ajali Formation which is made up of friable sandstone (Orajaka et al. 1999).

IV. Artisanal Coal Mining Methods

Two mining methods are being used by the artisanal miners for the exploitation of Odagbo coal deposits. Open cast mining (Fig.4). This is a surface mining method of extracting coal from the seam by removing the overburden with an excavator.

Open cast mining method was adopted in areas where the overburden is thin. This method of mining changes the geological and hydrological conditions of the area. Streams are diverted from their normal courses to different routes and this diversion changes the landscape of the entire area. The overburden that was removed is used to build dams around the pits to prevent water from flowing into the mine. The mined coals are carried in sacks to suitable location before they will be loaded into trucks for transportation to designated buyers.

Another form of mining in the area is Lotto mining method (Fig. 5). It is a form of subsurface mining that involves the use of hoe, shovels and diggers to dig holes of several metres into the subsurface layer pending when the artisanal miner will strike the coal seam.

On striking the coal seam, the coal are shoveled into sacks and carried up to the surface by the miners on their head to a loading point (Fig. 6). The miners carry torch and hurricane lamps to illuminate their work places. Pumps are occasionally sent underground to get rid of groundwater in order to prevent flooding of the mining hole.

This form of mining is characterized by low productivity, lack of capital, poor technology and miners work in a very hazardous condition as there are no support pillars to protect the hole from caving in (Emel et al 2011). The mining holes are uncovered and these can form death traps to man and animals.

V. Impacts of Artisanal Coal Mining on the Environment

Physical, chemical and biological changes in the environment result from mining operations. These are scarification of the landscape, decline in agricultural production, biodiversity and ecosystem loss, deforestation, water and soil pollution (Mishra 2005).

VI. Scarification of the Entire Landscape

Miners excavate large portion of the landscape to extract coal from the seam. Waste matter (Spoils and overburden) were deposited on the edges of the open pit mines (Fig. 7). The spoils and overburden were
transported downstream and these could have adverse effects on the aquatic habitat because of increased sedimentation and turbidity of the river within the area. These pits measured up to 50 x 20 m and about 100 m deep. Some of the open pit mines that were abandoned are now filled with water. The abandoned mine pits are death traps to cattle, sheep and goats in the area. Research has shown that these ponds were enriched in Pb, As, Hg and U (Momoh et al. 2017).

VII. Decline in Agricultural Production

Most farmers whose farmlands were close to the mines have abandoned agricultural activities because the artisanal miners have taken over quite a large chunk of their arable farmland. Those farmers that are still in the business, acid mine drainage from the mines drains onto their farms, resulting in deterioration of soil quality which significantly reduced agricultural produce from such farmlands (Fig. 8). Goats, cattle’s and sheep’s that normally graze on these lands were malnourished because the grasses which they feed on are very scanty in the area.

Inadequate land for farming activities has significantly reduced the quality of agricultural produce from the area.

VIII. Deforestation and Biodiversity Loss

Odagbo is a densely forested area, but around the mines, no single tree was found in the entire area. Miners deliberately cut down the forest to have a very large mining area. The artisanal coal mining also gave room to logging business in the area. Most of the trees that were cut down by the miners are transported to major cities and sold in timber markets. The open cast mining and cutting of trees in the area has exposed the area to landslides and soil erosion. These environmental problems have led to the collapse of the trees within the vicinity of the mines. Several species of grass and herbs were noticed in areas that are very far from the mining fields. However, biodiversity in the mining area were found to be very low or completely absent.

IX. Diversion and Surface Water Pollution

Rivers that run through the mining fields were diverted from their original courses to pave way for mining. Mine tailings and mine spoils were deposited on the fringes of these rivers and leachates from these tailings drain into these rivers. Huge quantities of over burden were left on the banks of these rivers. These overburden were transported down the river courses and these leads to sedimentation of the rivers, this could adversely affect the aquatic habitat in the area. Also, acid mine drainage was observed to have drained from the mining pits into the river channel. This will decrease the pH load of the rivers and it will affect human life as most of the villagers that lives downstream the river courses use this river for their domestic activities.

X. Strategies for Sustainable Mining

Mining is sustainable when it is conducted in a manner that it balances economic, environmental and social considerations (Lawrence 2005) in view of this, a concerted effort should be made by all stakeholders in the allocation of mineable lands, regularization and training of artisanal miners in order to make artisanal mining a tool for sustainable development.

Sections 90 and 91 of the Nigerian Minerals and Mining Act, 2007 clearly spelt out that extension services and training should be provided by Directorate of Mines to artisanal miners in Nigeria. The government should enforce and implement these regulations by training artisanal miners in the management of wastes and disposal of tailings from mining activities. Also, the newly established Solid Minerals Development Fund should assist the artisanal miners to acquire improved tools and equipment for coal mining and protection of the environment.

Donor agencies and International Organizations such as World Bank, Department for International Development (DFID), United Nations Industrial Development Organization (UNIDO) and United States Agency for International Development (USAID) should assist in the area of technological transfer and proffers solution to sustainable development in small scale mining sector of Nigeria’s economy.

Artisanal miners should as a matter of policy immediately embark on reclamation of pits after mining is completed, so that mined out pits do not serve as death traps for livestock and breeding grounds for mosquitoes in the area.

Academic institutions in Nigeria should improve miner’s livelihood by teaching sustainable mining techniques to mitigate the adverse impacts of coal mining on the environment. Also, they should be able to design appropriate technology in the mining of coal and finding solutions to the problems of achieving sustainable coal mining in Nigeria.

XI. Conclusion

Coal mining has significantly impacted the environment, the observed impacts in this community are deforestation of the landscape, decline in agricultural production, scarification of the landscape and incidence of acid mine drainage. These impacts could be reduced by applications of appropriate mining techniques. Accumulation of large mine spoils and overburden can be avoided by returning these wastes to the excavation when mining ceases. An eco-park project could be embarked upon by the locals and artisanal miners alongside with coal mining by planting economic
trees such as palm trees and fruit bearing trees in the area. The newly established Artisanal Mining Directorate of the Ministry of Mines and Steel Development should teach Artisanal Miners sustainable mining techniques, this will mitigate the adverse impacts of mining on the environment and they should give them technical assistance by carrying prospection and allocation of specific areas for artisanal mining activities for the overall sustainable development of abundant coal deposits in Nigeria.

*Fig. 1:* An Artisanal Miner using a digger to excavate a Coal Seam
AN OVERVIEW OF ARTISANAL COAL MINING AND ITS IMPACTS ON THE ENVIRONMENT: A CASE STUDY OF ODAGBO COAL MINE, NORTH CENTRAL NIGERIA

Fig. 2: Location Map of the Study Area
Fig. 3: Stratigraphic Section of Odagbo Coal Mine
Fig. 4: An Abandoned Open Cast Mine filled with acid mine drainage
Fig. 5: A Lotto Mining Pit at Odagbo Coal Mine
Fig. 6: Artisanal Miner carrying Coal from a Lotto Pit
Fig. 7: Acid Mine Drainage seeping onto Agricultural Land
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Consequências Do Adensamento De Edificações sobre A Falésia: Um Estudo Sobre A Descontinuidade Erosiva Da Praia De Carapibus -Pb, Brasil

By Joao Vitaliano

Abstract- The objective of this research was to study the geomorphological changes occurring in the cliff of Carapibus Beach, Conde - Paraiba municipality and the non - observation to the regulations established by the Environmental Legislation was the objective of this research. For the data search we used the Google and Google Scholar sites to obtain scientific articles and other information modalities. The cliffs, as well as the Restinga vegetation are considered fragile environments and, in addition to the natural fragility, they present a high sensitivity caused by the various activities developed in this environment, such as urbanization in forbidden areas added to tourism. The images obtained from homes and hotels partially destroyed by the action of the bad weather on the cliffs of Carapibus beach characterize the non-compliance of the builders with the Environmental Legislation. As it will be difficult to recover the landscape without altering the constitution of the cliff with the necessary vegetation, it is prohibited to construct in virgin areas and to promote the retreat of the invaded areas so that they are not taken by surprise with a large slip.

Keywords: cliffs, restinga vegetation, geomorphological alterations, carapibus.

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Consequências Do Adensamento De Edificações sobre a Falésia: Um Estudo Sobre a Descontinuidade Erosiva Da Praia De Carapibus -Pb, Brasil

João Vitaliano

Resumo - Objetivou-se nesta pesquisa estudar as alterações geomorfológicas ocorridas na falésia da Praia de Carapibus, município do Conde – Paraíba e a não observação aos regulamentos estabelecidos pela Legislação Ambiental constitui-se o objetivo desta pesquisa. Para a pesquisa de dados foram utilizados os sites Google e Google Scholar para obtenção de artigos científicos e outras modalidades de informação. As falésias, assim como, a vegetação de Restinga é considerada ambiente frágil e, além da fragilidade natural apresenta uma alta sensibilidade provocada pelas diversas atividades desenvolvidas nesse ambiente, tais como, a urbanização em áreas proibidas somada ao turismo. As imagens obtidas de residências e hotéis parcialmente destruídas pela ação das intempéries nas falésias da praia de Carapibus caracterizam a não obediência dos construtores à Legislação Ambiental. Como será difícil recompor a paisagem sem alterar a constituição da falésia com a vegetação, necessário se faz a proibição de construções em áreas virgens e promover o recuo das áreas invadidas para que não sejam colhidos de surpresa com um deslizamento de grande porte.

Palavras-chave: falésias, vegetação de restinga, alterações geomorfológicas, carapibus.

Abstract - The objective of this research was to study the geomorphological changes occurring in the cliff of Carapibus Beach, Conde - Paraíba municipality and the non-observation to the regulations established by the Environmental Legislation was the objective of this research. For the data search we used the Google and Google Scholar sites to obtain scientific articles and other information modalities. The cliffs, as well as the Restinga vegetation are considered fragile environments and, in addition to the natural fragility, they present a high sensitivity caused by the various activities developed in this environment, such as urbanization in forbidden areas and other tourism. The images obtained from homes and hotels partially destroyed by the action of the bad weather on the cliffs of Carapibus beach characterize the non-compliance of the builders with the Environmental Legislation. As it will be difficult to recover the landscape without altering the constitution of the cliff with the necessary vegetation, it is prohibited to construct in virgin areas and to promote the retreat of the invaded areas so that they are not taken by surprise with a large slip.

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I. INTRODUÇÃO

As planícies costeiras do litoral brasileiro se estendem entre o oceano e as colinas onde a floresta tropical atlântica está localizada. Elas têm origem quaternária e consistem em depósitos e dunas arenosas marinhos (Duarte et al., 2005).

A Zona Costeira (ZC) é uma zona extremamente dinâmica Scudelari y Freitas (p.40, 2005); Marone et al. (2012) e se caracterizar por ser uma região de transição ecológica que desempenha um papel importante no desenvolvimento e reprodução de várias espécies, além das trocas genéticas que ocorrem entre os ecossistemas terrestres e marinhos registrando expressivas sobreposição territorial com os biomas da Amazônia e Mata Atlântica, bem como, em menor escala, com a Caatinga, o Cerrado e os Pampas representando, desta forma, um complexo de ecossistemas contíguos formando ambientes de alta complexidade ecológica.

A costa brasileira constitui um espaço extremamente diversificado devido à variedade de suas características ambientais e às atividades socioeconômicas ali desenvolvidas. Caracterizada como uma zona de usos múltiplos agregou ao longo do tempo, atividades econômicas muito diversificadas, que originou graves conflitos de uso do solo. A diversidade dos ambientes naturais e dos tipos de uso do espaço costeiro constitui uma complexidade que exigem ações efetivas de planejamento e regulação desta ocupação (ASMUS, 2004).

A zona costeira brasileira se estende da foz do rio Oiapoque (04º52’45”N) à fozdo rio Chuí (33º45’10”S) com faixa terrestre apresentando largura variável se estende por 10.800 quilômetros ao longo da costa e abrange 17 Estados brasileiros dos quais treze possuem suas capitais no litoral, em cuja região metropolitana vive milhões de pessoas, um indicador do alto nível de pressão antrópica a que seus recursos naturais estão submetidos (MMA, 2010).

A vegetação da zona costeira é composta por uma flora que habita a região sob a influência, direta ou indireta do mar. Situada ao longo da costa atlântica a
zona do litoral de Pernambuco não é uniforme em toda sua extensão possuindo largura variável podendo ir de poucos metros até alguns quilômetros. Sua vegetação, entretanto, apresenta características próprias inconfundíveis, sendo apontada como uma autêntica zona (LIMA, 2007). Estudar as alterações geomorfológicas ocorridas na falésia da praia de Carapibus, município do Conde – Paraíba e a não observação aos regulamentos estabelecidos pela Legislação Ambiental constituiu-se o objetivo desta pesquisa.

A Zona Costeira é uma região de contrastes, pois são encontradas nessa região, áreas onde coincidem intensa urbanização, atividades portuária e industrial relevante, e exploração turística em larga escala, metrópoles e centros regionais litorâneos. Por outro lado, esses espaços são permeados por área de baixa densidade de ocupação e ocorrência de ecossistemas de grande significado ambiental, mas que vem sendo objeto de acelerado processo de ocupação como o turismo, o lazer e a segunda residência (Asmus, 2004). Nestas situações, o elemento comum é a diversidade dos problemas, a fragilidade dos ambientes e a complexidade de sua gestão, com uma demanda enorme por capacitação e mobilização dos diversos atores envolvidos pressupondo intervenções integradas das políticas públicas nacionais incidentes nessa região (Asmus, 2004).

A Zona Costeira apresenta grandes variações na sua formação geológica e, devido a essa diferenciação como habitat, ela abriga muitas variedades de vegetais e animais. Em seu contorno localizam-se regiões com certa aridez, restingas, bancos de areia e lagunas, manguezais, matas paludosas e planícies arenosas (Dantas et al. 2010). Estabeleceram-se, na faixa litorânea, os primeiros núcleos de colonização, a partir da qual, se iniciaram os conflitos da atividade antropológica com o meio ambiente, os quais, no decorrer dos séculos, se traduziram em diferentes tipos de ocupação desordenada do espaço e em atividades produtivas danosas à qualidade ambiental (Dantas et al. 2010).

Meirelles et al., (2005) sistematizou as informações sobre processos costeiros e geomorfologia litorânea de caráter regional e local para identificar e classificar as formas, os materiais e os agentes da dinâmica costeira.

a) Permissão, licença e autorização de uso costeiro

O principal marco regulatório do uso dos ambientes costeiros é o licenciamento ambiental

Licenciamento Ambiental é o procedimento administrativo pelo qual o órgão ambiental competente licencia a localização, instalação, ampliação e a operação de empreendimentos e atividades utilizadoras de recursos ambientais, consideradas efetiva ou potencialmente poluidoras ou daquelas que, sob qualquer forma, possam causar degradação ambiental considerando as disposições legais, regulamentares e as normas técnicas aplicáveis ao caso (FIRJAN, 2004). O licenciamento ambiental é composto por três licenças que poderão ser expedidas isolada ou sucessivamente, de acordo com a natureza, características e fase do empreendimento ou atividade. São elas: Licença Prévia (LP), Licença de Instalação (LI), Licença de Operação (LO). No contexto da intensa dinâmica de ocupação da zona costeira, o licenciamento como instrumento de gestão tem atuado tanto como corretivo quanto preventivo. O licenciamento tem um caráter preventivo quando antes da implantação das atividades é realizada uma avaliação da localização e dos potenciais impactos buscando-se adequar os projetos executivos às condicionantes do meio ambiente, ou mesmo, não viabilizando a implantação do empreendimento (FIRJAN, 2004).

b) Morfologia do ambiente praiá

As praias compreendem sistemas dinâmicos, nos quais, elementos naturais, tais como, mar, vento e areia estão em constante interação, resultando em processos hidrodinâmicos e deposicionais complexos que ocorrem entre a zona de arrebentação das ondas e a região de pós-praia. A dinâmica costeira, que determina a construção geomorfológica da linha da costa, é aprincípio responsável pelo desenvolvimento das praias arenosas e pelos processos de erosão e deposição que as mantêm em constante alteração (CUNHA, 1997).

A morfologia dos perfis praias em uma determinada região pode ser alterada(devido ao potencial energético das ondas, uma vez que essa energia é liberada nas zonas costeiras (ARAÚJO, 2008).

Na consideração de Santos (2007), areião litorânea, como região de interface entre os ecossistemas terrestres e marinhos é responsável por ampla gama de funções ecológicas, tais como a prevenção de inundações, da intrusão salina e da erosão costeira, a proteção contra tempestades, a reciclagem de nutrientes e de substâncias poluidoras, a provisão direta ou indireta de habitats e de recursos para uma variedade de espécies exploradas.

c) Vegetação das praias

As formações herbáceas ocorrem principalmente nas faixas de praia e áreas ante dunas, em locais que eventualmente podem ser atingidos pelas marés mais altas, ou então em depressões alagáveis. Nas zonas de praia, dunas frontais e dunas mais próximas ao mar predominam espécies herbáceas e, principalmente, as gramineas que são consideradas fixadoras de dunas (SILVA, 2009).

Nas Formações Pioneiras com Influência Marinha, que foram genericamente denominadas de restinga que compõe a região costeira do Brasil, Assis (2011) descreve os tipos arbóreo, arbustivo e herbáceo de vegetação procurando contemplar as principais variações fisionômicas observadas desde as praias até os pontos mais interiores da planicie costeira. A pressão antrópica, no sentido de ocupação e urbanização da zona costeira já suprimiram muitas áreas representativas desta formação em vários pontos no litoral brasileiro (Moura et al., 2012).

d) Perfil topográfico da praia

Segundo Almeida (2012), uma maior erosão acontece em virtude da proximidade da praia aos bancos de areia e falésias, velocidade e direção dos ventos dominantes, quantidade de chuva nos períodos sazonais, a geomorfologia do litoral e a disponibilidade e fornecimento de sedimentos (Hesp, 2002).

Quando ocorre uma abertura nas zonas mais altas de elevações de areia, assim como em falésias, o fluxo do vento é intenso chegando a promover uma maior abertura pelo carreamento dos sedimentos para áreas adjacentes (Anderson, 2006). Bernardes y Costa (2011) registraram principalmente a importância relativa dos gradientes edáficos e topográficos como fatores ambientais que afetam a composição das estruturas físicas em geral.

e) Restinga

Restinga é um ecossistema costeiro coberto por vegetação herbácea-arbustiva localizada em um terreno arenoso, salino que pode ser composta por dunas e planícies arenosas (Rampinelli, 2011); (Sá, 2002). Este Bioma recobre cerca de 79% da costa brasileira (Carvalho et al. 2001).

A flora das restingas apresenta algumas espécies endêmicas, mas a maioria das suas plantas pode ser encontrada em outros ecossistemas (Sacramento et al. 2007). Nas praias que sofreram intensa ação antrópica a vegetação ficou restrita às plantas deporte rasteiro nas quais há o predominio das gramineas (SILVA, 2009). Apesar de estar distribuída ao longo do litoral brasileiro representa uma das áreas mais...
degradadas pela ação antrópica nos últimos cinco séculos (ROCHA, et al. 2007).

A Restinga na Legislação Ambiental Brasileira pela Resolução CONAMA nº303/2002 considera restinga, um depósito arenoso paralelo à linha da costa de forma geralmente alongada, produzido por processos sedimentação onde se encontram diferentes comunidades vegetais que recebem influência marinha, também consideradas comunidade edáficas por dependerem mais da natureza do que do clima. A cobertura vegetal nas restingas ocorre em mosaic e encontra-se em praias, cordões arenosos, dunas e depressões apresentando, de acordo com o estágio de sucessão, estrato herbáceo, arbustivo e arbóreo sendo este último mais interiorizado (MMA, 2002).

Datando do período Quaternário, as restingas possuem origem sedimentar recente, porém, as espécies daifa e da flora, que nelas vivem possuem mecanismos para suportar os fatores dominantes, tais como, a salinidade, afogamento de fortes ventos, pouca água, temperatura alta e instabilidade do solo (ALMEIDA, 2012).

O processo de formação das restingas, segundo Carvalho et al. (2012) se iniciou no quaternário a partir do recuo do mar e, ainda hoje permanecem sob um processo dinâmico de formação e modificação. A vegetação convive com salinidade elevada, exposição ao sol, ventos (Silva et al. 2009).

f) Impacto ambiental

As restingas com sua vegetação, matas ciliares, lagos, dunas e planícies de maré foram incorporadas às áreas de preservação permanente (APP) pelo Código Florestal (Lei 4.771/65-Brasil/1965), com o objetivo de evitar a sua descaracterização através da ação antrópica por apresentarem importante função ecológica na natureza, principalmente por manterem a integridade das áreas de menor fragilidade (Santos, 2007). A alta diversidade indica a necessidade de se proteger o maior número de situações ambientais possíveis (Sztutman y Rodrigues, 2002). Estas áreas abrigam conjuntos de espécies arbóreas diferenciadas por nichos altamente evoluídos (Denslow, 1987). A restinga fixadora de dunas e dafíneas foi uma das áreas mais comprometidas, muitas vezes, com a anuência de órgãos ambientais que autorizam a construção de residências, hotéis, e áreas de lazer sobre elas. O governo brasileiro também tem dado especial atenção ao uso sustentável dos recursos costeiros visando o ordenamento da ocupação dos espaços litorâneos e, para isto criou o Plano nacional de Gerenciamento Costeiro (PNGC) implementando um processo marcado pela experimentação e pelo aprimoramento constante (Santos, 2007). O comprometimento da cobertura vegetal litorânea, como é o caso da formação vegetal de restinga, uma das áreas que vem sendo descaracterizada para atender à demanda proveniente de uma ocupação que visa obter lucros, em desconto com a legislação ambiental é devido à insuficiência da atuação dos órgãos ambientais, somada à crise social e econômica, e à ausência de uma política ambiental efetiva que acabam comprometendo o Bioma (Santos, 2001). Enquanto a recuperação ambiental do cordão de dunas já é uma prática frequente, as áreas de falésias ainda não receberam a atenção devida. Diversos trabalhos de recuperação têm sido realizados sendo, desta forma, possível recuperar áreas comprometidas, desde que sejam retiradas as forças e ações que impedem sua recuperação (Rampinelli, 2011). O estudo dinâmico da regeneração natural de áreas de restinga perturbadas em suas diferentes comunidades é uma interessante estratégia para entender os processos e por quanto tempo atuam num ambiente tão complexo (Sá, 2002). A urbanização leva uma perda de biomassa acima do solo promovendo variação entre as paisagens (Nascimento et al. 2002); (Alves et al. 2010). Fachelli y Pickett (1991) asseveraram que a produção de lixo pode produzir variações importantes no ambiente.

A Resolução do Conselho Nacional do Meio Ambiente (CONAMA) em seu artigo 1º de 23/01/1986 define Impacto Ambiental como:

Qualquer alteração das propriedades físicas, químicas e biológicas do meio ambiente, causada por qualquer forma de matéria ou energia resultante das atividades humanas que, direta ou indiretamente, afetam a saúde, a segurança; as atividades sociais econômicas; a biota; as condições estéticas e sanitárias do meio ambiente; a qualidade dos recursos ambientais.

A urbanização das áreas costeiras ocorre para fins de lazer e o estabelecimento de moradias temporárias, condomínios de elevado padrão ou prédios, em geral ocupando, também, áreas de restinga. Para Ackerly (2003) é importante a triagem ecológica na montagem da comunidade, migração e monitoramento de habitat para não desfigurar a paisagem. As mais importantes consequências dessa ocupação referem-se à eliminação da vegetação natural (Malhi et al. 1999), ao estímulo dos processos erosivos, às mudanças no ambiente. Drenagem por cortes e aterros, que exigem material de empréstimo obitado a partir de escavação de morros situados na planicie litorânea, à geração de resíduo, à geração de esgoto doméstico, em geral sem o tratamento adequado, e problemas de drenagem pelo afloramento do lençol freático nas áreas planas do litoral, além do aumento na poluição por recursos naturais (Montovani, 2000). O desenvolvimento urbano descontrolado e a explicação de poluição não são apropriados para esses ecossistemas costeiros sendo a principal ameaça à costa tropical brasileira (Leão y Dorninzez, 2000).

Na tentativa de conter a degradação de restinga e das falésias, o Código Florestal Brasileiro...
através da Lei 4.771, de 15 de setembro de 1965, enquadra as mesmas como Área de Preservação Permanente - APP, não podendo a mesma ser devastada, conforme seu art.2º, alínea “f”. A Resolução Conama 303, de 20 de março de 2002, que dispõe sobre parâmetros, definições e limites de APP estabelecendo que se constitua Área de Preservação Permanente a área situada nas regiões das falésias e restingas: em faixa mínima de 300m medidos a partir da linha de preamar máxima; ou em qualquer localização ou extensão, quando recoberta por vegetação com função fixadora de dessas áreas.

g) Falésias

A definição de falésia utilizada por Ab’Sáber (2005) corresponde a um paredão abrupto originado pela erosão marinha na frente de pontas ou promontórios costeiros. Cristofoletti (1980, p.133) define falésia como um ressalto não coberto pela vegetação, com declividades muito acentuadas e de alturas variadas, localizado na linha da costa de contato entre a terra e o mar. O recuo da falésia em direção ao continente amplia a superfície erodida pelas ondas formando os chamados terraços de abrasão.

As falésias no Brasil ocorrem principalmente nas regiões Nordeste e Sudeste, onde se alternam com praias, dunas, mangues, recifes, baías e restingas conferindo singularidade à paisagem litorânea (Assad, 2010).

São considerados ambientes frágeis e, além da fragilidade natural as falésias apresentam uma alta sensibilidade provocada pelas diversas atividades desenvolvidas nesse ambiente, como: turismo moradia, indústrias e espaços comerciais (Muehe y Nicolodi, 2008).


Um dos sérios problemas relacionados à expansão do turismo local é a ocupação da borda das falésias, que aliada à erosão costeira vem ocasionando diversos problemas, tanto aos proprietários dos terrenos, quanto ao poder público e à natureza (Freitas Neto et al. 2005, p.2067-8).

Devido à sua porosidade, falésias do tipo semiconsolidadas, podem armazenar temporariamente água de chuva ou de escoamento superficial e, posteriormente abrir fissuras em sua escarpa formando bicas na parte ingreme de sua morfologia, que podem ser comprometidas pela ocupação urbana. Árvores mortas facilitam o escoamento da água de chuva promovendo ao longo do tempo queda de barreiras com grande volume de sedimentos (Pinheiro, 2003).

II. Metodologia

Utilizou-se como motor de busca, a ferramenta Google e Google Scholar para a obtenção de dados dos artigos da biblioteca on-line Scielo, dissertações, teses, blogs, entre outras para fundamentar este trabalho. Foram obtidas imagens de campo pelo autor e imagem do Google Earth, para registrar a invasão urbana na área da falésias de Carapibus, de hotéis, pousadas e residências, além de comparar com a praia vizinha Tabatinga que não permite urbanização nas falésias em virtude do terreno altamente acidentado.

a) Caracterização da área de estudo

A costa está submetida a ações naturais, tais como: ação das ondas, chuvas intensas, salinidade, ventos, declividades acentuadas, que provocam constantes modificações físicas na região, tornando-a uma zona com alto nível de instabilidade geomorfológica. Esse fator é cada vez mais agravado com a ocupação territorial desenfreada, devido à expansão imobiliária que atrai empreendimentos e grandes fluxos de pessoas para uma região que não suporta esses empreendimentos. No município do Conde, situado no litoral sul da Paraíba são observadas essas projeções de ocupação urbana sobre as falésias, principalmente, na praia de Carapibus.

Pousadas, hotéis e condomínios de veraneio são alguns dos empreendimentos mais presentes na ocupação das falésias. O litoral sul da Paraíba é constituído de uma faixa geológica caracterizada por deposição de sedimentos em barreiras que é descrita como sendo uma cobertura sedimentar de arenitos continentais médios e grossos, além de arenitos conglomeráticos sobre depósitos de arenitos carbonácticos (Barbosa et al. 2003). Desta forma, o ambiente em que a população promove assentamento pode ter sua dinâmica natural alterada devido a situações de riscos geotécnicos que podem surgir, por isso o enfoque está direcionado ao perigo que essas situações oferecem (Rosseti et al. 2009).

b) Descrição da Área de Pesquisa

A praia de Carapibus está situada no município do Conde pertencente à zona metropolitana de João Pessoa, no litoral sul da Paraíba – Brasil, e apresenta grande contingente populacional na zona litorânea, principalmente, nas proximidades das falésias. O município tem, aproximadamente, 24.000 habitantes (CPRM, 2005). As falésias que estão presentes em
quase todas as praias do município variam de 12m a 50m de altura. A parte superior ou topodas falésias correspondem a um limar para a unidade fisiográfica de tabuleiros costeiros que se estendem por todo município (CPRM, 2005). A praia de Carapibus possui uma faixa de areia de praia muito reduzida entre as águas do mar e a base das falésias. Várias casas e algumas pousadas, casas e hotéis se encontram comprometidos pela queda do solo localizada à beira da falésia que vão soffrendo as consequências do intemperismo na estrutura da mesma que vai apresentando movimento gradativo de massa ocasionando a queda de parte das edificações (CPRM, 2005).

### III. Resultados E Discussão

A Figura 2 apresenta imagem de uma das primeiras residências nas proximidades do local onde foi inaugurado o hotel Brisas de Carapibus localizado na área superior da falésia, com 31 apartamentos pertencendo ao grupo inglês J L Group. A seta mostra parte das instalações construídas à beira da falésia. Infelizmente, a fonte deste dado não apresentou a data da foto. Nessa época, a praia tinha sedimentos positivos e os veículos podiam transitar à vontade.

![Figura 2: Registro da Primeira Construção na Falésia de Carapibus](http://blog.tribunadonorte.com.br)

A Figura 3 mostra dois prédios apontados pela seta à esquerda, em um dos quais fiquei hospedado com minha família, apresentando altura de quatro andares construídos sobre a falésia da praia de Carapibus distando da areia da praia, aproximadamente, uns 70 metros. Observou-se que outras pousadas apontadas pela seta do meio, além de casas de veraneio foram construídas nas proximidades não observando a distância estabelecida pelos órgãos fiscalizadores. A seta da direita mostra a parte da Falésia que cedeu nos últimos anos levando com ela, parte das casas construídas.
Observa-se na Figura 4 a tentativa de impedir o choque das ondas com a base das falésias de Carapibus, na qual, pequenas muretas de contenção foram construídas em alguns pontos considerados críticos. Algumas árvores não pertencentes à flora da restinga e que faziam parte do jardim das residências cederam e deslizaram junto com os sedimentos até a praia. A construção dos muros de contenção impediu a passagem dos veículos que faziam esse percurso, constantemente, com os turistas.

Figura 4: Muros de Contenção para Impedir o Choque das Ondas
Observa-se na imagem da Figura 5 o desgaste da falésia cuja abertura provocada pelas chuvas destruiu completamente as escadas de acesso desta residência à praia. Parte do muro com a vegetação, principalmente, os coqueiros cederam totalmente. O desgaste pelas chuvas foi tão intenso que é possível divisar, a partir da indicação da seta, o bloco compacto de sedimentos que sobrou da estrutura da falésia antes existente nesse local.

Figura 5: Desgaste da Falésia com Destruição do Muro e Escadaria

A Figura 6 apresenta a situação crítica que a urbanização em um terreno de falésia sofre a cada ano em que as chuvas estão mais presentes, independentemente, se a estação é chuvosa ou não. A seta número um mostra uma casa na iminência de cair após o bloco de sedimentos ter arriado completamente deixando sua base, totalmente, exposta. A seta número dois mostra o material deslizado contendo partes da estrutura que estava ligada ao muro. A seta de número três evidencia o bloco de sedimentos mais antigo que suportou o desgaste permanecendo a oito metros de distância da barreira que arriou com a ação das chuvas. A seta de número quatro mostra o piso da calçada sobre a qual foram construídas as estruturas. As demais estruturas deste terreno distam da beira desta falésia, não mais que dez metros.
A Figura 7 apresenta a destruição da falésia através de uma falha escavada pelas chuvas, ao longo do tempo, na qual foi construída uma escadaria de acesso à praia para os moradores. A abertura ocorreu devido ao forte escoamento da água promovendo o escorregamento.

Fonte: João Vitaliano – Julho/2018

Figura 7: Queda do Muro e Destruição Completa de Escadaria

A Figura 8 apresenta larga destruição dos muros e parte da casa localizada à beira da falésia. As chuvas são apontadas pelos moradores da área com a principal responsável pela aceleração do desgaste desta região.

Fonte: João Vitaliano – Julho/2018

Figura 6: Evidências do Desgaste das Estruturas na Área Superior da Falésia
A Figura 9 evidencia algumas estruturas na iminência de cair por completo. Observa-se que as ondas na preamar, salvo na maré de sizígia, não atingem a base da falésia.

As Figuras 10 e 11 evidenciam outras estruturas atingidas pelas últimas chuvas que deixaram todos os moradores desta área da praia de Carapibus, totalmente sem acesso à beira mar após destruição da escadaria. Nesta área houve uma queda no turismo porque as pousadas e hotéis construídos neste perímetro foram seriamente comprometidas.
Observa-se na Figura 12 e 13 o início do processo de desgaste na estrutura da falésia. O terreno não compactado vai cedendo ao intemperismo desgastando a estrutura.

As figuras 14 e 15 evidenciam os riscos de construções de grande porte sobre a superfície de estruturas frágeis como as falésias. Muito dinheiro é investido nestas obras sem um exame minucioso dos riscos que o ambiente oferece. Observam-se na Figura 14 blocos compactos de sedimentos que arriaram sob a ação das chuvas deste ano. Na Figura 15, uma imagem da urbanização sem projeto invadindo o topo das falésias na praia de Carapibus.
A Figura 16 mostra a queda de um enorme bloco que fazia parte da falésia com sua vegetação de restinga expondo as estruturas ao risco de desabamento. A Figura 17 mostra a imagem obtida da cobertura do prédio exibido na imagem da Figura 2.

A Figura 18 mostra a imagem da praia de Carapibus em dezembro de 2019, área na qual, grande parte da vegetação localizada à beira da Falésia foi projetada na praia, por conta das chuvas ocorridas entre os meses de maio e junho.
Figura 18: Projeção da Vegetação na Área Superior da Falésia

A Figura 19 Com a queda em bloco de grandes áreas da Falésia com vegetação na parte inferior da Figura 19, a estrutura das construções vão se apresentando gradativamente. Nesse caso, o terreno argiloso cedeu, em virtude da infiltração da água das chuvas, através das raízes de árvores de médio e longo porte.

Figura 19: Comprometimento das Estruturas na Área Superior da Falésia

Observa-se na Figura 20 uma quantidade enorme de blocos que cederam após as chuvas de maio e junho/2019, além dos sedimentos que ficaram negativos impedindo o trânsito de veículos e pessoas na maré alta.
IV. Considerações Finais

Alguns pontos importantes observados neste estudo estão de acordo com o pensamento dos autores citados em relação à fragilidade das falésias, projeto de urbanização guardando uma distância regular da praia estabelecida pelos órgãos competentes, preservação destes ambientes como Áreas de Preservação Permanente, proteção à vegetação de restinga protetora do solo e maior conscientização dos habitantes em não adquirir residência em ambientes costeiros sem um prévio estudo das interações entre o solo e o clima de uma determinada região, além dos riscos prováveis que caracterizam a dinâmica dos sistemas em estudo. É importante conhecer a interação, as alterações e as respostas que ocorrerão nos ambientes costeiros em relação ao balanço sedimentar quando atingido pelas intempéries, principalmente a linha da costa que absorve o impacto da salinidade, dos ventos, tempestades, chuvas. Os graves problemas que as residências localizadas na praia de Carapibus enfrentam na atualidade, se devem à urbanização sem a elaboração de um Plano Diretor, através do qual fosse possível a implantação de uma política ambiental dentro dos padrões de sustentabilidade. Foi possível observar a transição entre os anos de 2018/2019 com relação ao aumento do volume pluviométrico que ocorre em diversas partes do globo alterando a paisagem ambiental primitiva.

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Assessment of Households’ Food Security and Hunger Level among Communities in ILE-IFE, Nigeria

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Abstract- This study assessed households’ food security level among different communities in Ile-Ife. To achieve this, ten different communities with varying demography including educational and economic backgrounds were identified within the study area. Field Survey method was used in which survey of market prices of food stuff, diet and nutrition, social well-being, food accessibility and affordability as well as price fluctuation and variation in household’s social backgrounds were the considered parameter. The results revealed that food insecurity is still high among the selected communities in Ile-Ife whereby 41% of the households cannot guarantee their households food for a month, while some have one or more household members skipped a meal in a day for lack of food whenever there is food shortage. Food insecure households have their households’ head as mostly artisans and were more likely to have no educational background. However, households with the high income earning heads are more food secured compared to households with a low income head. Poverty, poor economic activity, low agricultural productivity, lack of access to basic services like health facilities and food markets all play significant role on food security.

Keywords: households, food security, hunger level and food budget.

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Assessment of Households’ Food Security and Hunger Level among Communities in ILE-IFE, Nigeria

Dada Victoria Tobi

Abstract: This study assessed households’ food security level among different communities in Ile-Ife. To achieve this, ten different communities with varying demography including educational and economic backgrounds were identified within the study area. Field Survey method was used in which survey of market prices of food stuff, diet and nutrition, social well-being, food accessibility and affordability as well as price fluctuation and variation in household’s social backgrounds were the considered parameter. The results revealed that food insecurity is still high among the selected communities in Ile-Ife whereby 41% of the households cannot guarantee their households food for a month, while some have one or more household members skipped a meal in a day for lack of food whenever there is food shortage. Food insecure households have their households’ head as mostly artisans and were more likely to have no educational background. However, households with the high income earning heads are more food secured compared to households with a low income head. Poverty, poor economic activity, low agricultural productivity, lack of access to basic services like health facilities and food markets all play significant role on food security.

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I. Introduction

The world at large has long been concerned about food security and the eradication of hunger especially of the vulnerable groups. This led to setting aside 16th and 17th of October every year as the international days for food security and eradication of poverty respectively (EBS, 2009) and its inclusion in the Millennium Development Goals (MDGs) in 2015. Despite this, about 925 million people are still suffering from the menace of food insecurity across the globe in which 235 million food insecure people are from sub-Saharan Africa (FAO, 2010).

One of the more frequently applied indices of the level of development is the status of food security and that of its antithesis, hunger. Commonly, food security is being defined as ‘access by all people at all times to enough food for an active, healthy life’ (World Food Programme, 1991). This signifies that the ultimate goal of food security is for individual to be able to acquire food needed at all times and to be able to utilize the food to meet the body’s needs. The definition of food security is based on three important pillars, viz; food availability, access and utilization. However, the concept of food security has shifted from the mere equation of food production to access, availability, stability and utilization because a country can actually produce more, with its citizens having access to less in such a way that it exists in Nigeria (Yusuf, 2008).

In Nigeria, food security has declined in the 1980s due to rapid population growth, economic stagnation, and civil strife (IITA, 2004). The decline is more severe as population growth is on the increase while food production is on the decline in Nigeria (FAO, 2003). During the decade of the 1990s, the food gap in Nigeria is expected to be more than quadruple to 5million tons of grain equivalent, an amount far beyond either the ability of Nigeria as a nation to import or developed countries to supply through food aid (FAO, 2003). This had imparted on the food security level of the country.

However, Food insecurity today has a devastating impact on families and on the countries in which they live. Where the food insecure make up a substantial portion on the total population, as they do in some parts of Africa, the impact can overwhelm a country’s development opportunities (UNDP, 2009). Food insecure people are, by definition, unable to lead, they drain the social service budgets of the poorest developing countries and they lack the simple physical energy needed to contribute fully to their own livelihood. According to Chen and Kates (1996), the easiest way to observe food security is to examine its absence, which is the persistence of hunger and its many guises, food is not secured, nor poverty eradicated by the mere declarations of days. Food insecurity can be minimised. The policy options for reducing food insecurity are seen as depending on whether the case is chronic or transitory. Measures to address chronic food insecurity would include, increasing the food supply, focusing on the development assistance or income transfers for the poor and helping the poor to obtain knowledge about nutrition and health practises. Transitory food insecurity could be ameliorated by stabilizing supplies, prices and assisting vulnerable groups with emergency employment programmes, income transfers or food.

The effect of climate change on food production, absence of food security and associated...
coping strategies are increasingly being studied in Africa (EBS, 2009). There has, however, been very little emphasis on the roles that demographic status (such as; occupation, income, family size and educational status) play in mitigating extreme poverty and food insecurity. There is also limited information about how the various inter-relationships between individuals and households affect their food security status. This could be via the roles these play in facilitating household ability to produce food or generate income.

Furthermore, very little is known about how the shifts in family structure within many African countries towards a more western model have affected the agricultural production possibilities and food security status of families across the continent. Social and demographic status plays an instrumental role in the daily lives of all humans, particularly in developing countries where these relationships bridge the gaps caused by numerous market and institutional failures. However, studies on demographic status and household welfare or poverty in Nigeria are very few, and are mostly limited to one state or one region (Yusuf, 2008). Little or no empirical work investigating the links between demographic status and food security exist. Generally, literature has comprehensively documented studies on crop production, importation and food security in Nigeria. However, the food security at the Ile-Ife community level and the role that economic status plays is yet to be assessed, hence this study.

a) The objectives of this study are to:
- Assess households’ food security and hunger levels among different communities with varying educational and economic backgrounds in Ile-Ife and its environ; and
- Examine the impacts of varying demography on the household food security level among the selected communities in Ile-Ife.

II. Research Methodology

Ile-Ife lies within latitudes 7°28’N - 7°45’N and longitudes 4°30’E - 4°35’E. It has an elevation of about 375m above the sea level (Ajala and Olayiwola, 2013). The town has two Local Government Areas; namely Ife Central and Ife East Local Government. It has a total population of 355,818 people (NPC, 2006). The area has two climatic seasons of dry and wet. During the wet season, the mean daily temperature can be as low as 23°C while it may be as high as 30°C during the dry season. The area experiences double rainfall maxima characterized by two high rainfall peaks in June and September with a short dry season and longer dry season falling between and after each peak. The mean annual rainfall is about 1500 mm (Ifabiyi, 2008). The climate supports tropical rainforest vegetation.

Figure 1: Map of Ile-Ife in Osun State, Nigeria
In this study, the sample population was drawn from Ile-Ife and its environs to capture Low Income-high population density areas, Medium Income-medium population density areas and High Income-low population density areas. The use of the classification model adopted from Okunmadewa et al. (2007) to study the interplay of migration and urban expansion on health and environment in Lagos metropolis. The three types of settlements drawn from the study area include Parakin which represents High Income-Low Population density area, Ibadan Road as the Medium Income-medium population density area and Ilare as the Low Income-high population density area.

The sampling technique used for this study is a multi-stage sampling technique. Firstly, the use of the classification criterion adopted from Okuneye et al. (2007) in which metropolis was classified as described above. A sum of 450 randomly selected respondents was drawn from the two Local Government Areas (LGAs) in Ile-Ife. In each LGA, the street listings of the 2006 National Census were used to draw a random list of five streets followed by a systematic random sampling in other to select 10 houses (first house was selected by the use of random numbers, subsequently, every fourth house was then selected) per street from which a household was then selected. The socio-economic, economic, household food consumption and risk structure investigations were then carried out in Ile-Ife and its environs. These include: Parakin, Ibadan Road, Ilare, Mokuro, Ibadan Road, Aba-Iya-Gani, Boosa, Eleweeran, O.A.U senior staff Quarters and Eku-Isebo communities. The study made use of both primary and secondary data. The primary data were generated through an extensive fieldwork survey of market prices of food stuffs. Information on prices of food items, food security levels with respect to demographic backgrounds were obtained from the use of modified United States Department of Agriculture (USDA, 2012) Food and Hunger Investigation Module (FHIM) structured questionnaire (Appendix I shows the modified question in italics). Key informants included community heads, landlords, tenants, and household heads. The National Population figures of 2006 were used as a guide in administering the structured questionnaire using 1% of the population per community and simple random sampling technique (So as to be fair in choosing the sampled population). Allotting equal copies of questionnaire to the selected communities is impossible due to the differences in the total population of each community. However, more than a questionnaire was administered in a house that is occupied by more than a household. In all, a total number of 455 copies of questionnaire were administered within the three communities in this study all of these 450 copies were completely filled by the respondents. The test instrument (questionnaire) was first validated using a few numbers of dummy respondents before it was finally administered. This helped to re-structure some of the items in the questionnaire for better understanding and suggested the need for the interpretation of the questionnaire to the respondents in his or her native language and to ensure the filling of the questionnaire based on the answers given by the respondents.

The data collected were collated and analyzed using inferential (Chi-square, t-test and Analysis of Variance- ANOVA) and descriptive (Tables, Percentages, Frequencies, Mean) statistical techniques to describe the socio-economic characteristics of the households.
revealed that Ilare (11,685 people; 55.335% of the total population) is the most populous community in the study areas. This was probably due to as a result of the division of the town into three main categories which are; the core (the zone during the pre-colonial period), the intermediate and periphery. In the core, this is where the palace is located and this is usually where the first settlers did settle in and then there comes the expansion of the town. Community like Parakin belonged to the category of the periphery which means it came to being as a result of the expansion and modernization and it is regarded as the community of

### Table 1: Distribution of Respondents by Socio-Economic Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aba-Iya-Gani</td>
<td>42</td>
<td>9.33</td>
</tr>
<tr>
<td>Boosa</td>
<td>32</td>
<td>7.11</td>
</tr>
<tr>
<td>Eleweran</td>
<td>20</td>
<td>4.44</td>
</tr>
<tr>
<td>Ibadan road</td>
<td>40</td>
<td>8.88</td>
</tr>
<tr>
<td>Ilare</td>
<td>116</td>
<td>25.77</td>
</tr>
<tr>
<td>Eku-isobo and Iraye</td>
<td>39</td>
<td>8.66</td>
</tr>
<tr>
<td>Mokuro</td>
<td>75</td>
<td>16.66</td>
</tr>
<tr>
<td>Parakin</td>
<td>44</td>
<td>9.77</td>
</tr>
<tr>
<td>OAU Senior Staff Quarters</td>
<td>40</td>
<td>8.88</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>450</td>
<td>100</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>193</td>
<td>42.80</td>
</tr>
<tr>
<td>Female</td>
<td>257</td>
<td>57.20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>450</td>
<td>100</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
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<td></td>
</tr>
<tr>
<td>Single</td>
<td>46</td>
<td>10.20</td>
</tr>
<tr>
<td>Married</td>
<td>333</td>
<td>74.10</td>
</tr>
<tr>
<td>Divorced</td>
<td>42</td>
<td>9.30</td>
</tr>
<tr>
<td>Widow/widower</td>
<td>29</td>
<td>6.40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>450</td>
<td>100</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-30 years</td>
<td>83</td>
<td>18.40</td>
</tr>
<tr>
<td>31-40 years</td>
<td>186</td>
<td>41.30</td>
</tr>
<tr>
<td>41-50 years</td>
<td>141</td>
<td>31.30</td>
</tr>
<tr>
<td>51 and above</td>
<td>40</td>
<td>9.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>450</td>
<td>100</td>
</tr>
<tr>
<td><strong>Size of Household</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than or = 4</td>
<td>241</td>
<td>53.60</td>
</tr>
<tr>
<td>Greater than 4</td>
<td>209</td>
<td>46.40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>450</td>
<td>100</td>
</tr>
</tbody>
</table>

*Source: Author's Fieldwork, 2019*
the rich in Ile-Ife. This is in line with (Badiora and Afon, 2013) division of the town to the three categories. Also, Parakin is the residential area for the high income earners.

There were more female respondents (57.20%) than the male (Table 1). This was probably due to the fact that as at the time of this survey the females were the ones at home because they were the ones who usually take care of the household. Secondly, since women are the ones in-charge of household cooking and supplies, the questions were best answered by the females. Households’ size of greater than 4 was recorded most in Ilare (44.08%). The average household size in this study is ranged between 2 and maximum 10. The mean household size in the overall communities was about 4 members per household. This shows that the substantial proportion of the households had household sizes lesser than the mean household size. The household size has a great implication on food security. A large or small household is expected to consume more or less food as the case may be. However, a large household could pose a threat to food security especially in a household with many children and elderly people (Agboola, 2005 and Oluyole et al., 2016).

![Figure 2: Educational level of Household Heads](image)

In this study, results showed that Ibadan road (12.24%) had the highest number of household heads with no level of education while Parakin is the only community with the least percentage of respondents with Primary/Secondary education and the highest percentage of respondents with ND/HND/B.Sc. or equivalent (Fig.1). This is so because Parakin is being referred to as the community of the rich. All of these show the varying educational levels of the household heads across the selected communities and could even influence their occupations. A low fraction of farmers were recorded in some communities. However, not all communities engage in farming and this could be owed to the fact that nowadays people have neglected farming; everyone wants a white collar job. Only few communities in this study have their residents who are into farming. This could be as a result of the influence of the educational institution, the presence of the Teaching hospital, and the existence of the zonal offices of the government ministries who have gainfully employed the dwellers of Ile-Ife into one or the other capacity to function.
Table 2: Monthly Income Status of the Respondents in the Selected Communities

<table>
<thead>
<tr>
<th>Percentages</th>
<th>0-10</th>
<th>11-20</th>
<th>21-40</th>
<th>41-70</th>
<th>71-100</th>
<th>101-400</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parakin</td>
<td>7.14</td>
<td>9.52</td>
<td>30.95</td>
<td>30.95</td>
<td>47.62</td>
<td>4.76</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Mokuro</td>
<td>4.00</td>
<td>21.33</td>
<td>20.00</td>
<td>33.33</td>
<td>16.00</td>
<td>5.33</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Ilare</td>
<td>3.70</td>
<td>30.56</td>
<td>38.89</td>
<td>19.44</td>
<td>7.41</td>
<td>0.0</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Ibadan Road</td>
<td>23.91</td>
<td>28.26</td>
<td>15.22</td>
<td>19.57</td>
<td>10.87</td>
<td>2.17</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Eleweeran</td>
<td>8.70</td>
<td>39.13</td>
<td>39.13</td>
<td>8.70</td>
<td>4.35</td>
<td>0.0</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Eku-Isobo</td>
<td>54.55</td>
<td>45.45</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Iraye</td>
<td>31.03</td>
<td>48.28</td>
<td>6.90</td>
<td>3.45</td>
<td>10.34</td>
<td>0.0</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Boosa</td>
<td>6.45</td>
<td>87.10</td>
<td>6.45</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Aba-Iya-Gani</td>
<td>7.50</td>
<td>52.50</td>
<td>17.50</td>
<td>22.50</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>OAU Senior</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>9.76</td>
<td>56.10</td>
<td>19.51</td>
<td>14.63</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Author’s Fieldwork, 2019

Households’ heads with the income range of ₦11,000 - ₦20,000 (i.e low income) had the highest percentage in this study across the selected communities while in Parakin had households’ heads with a monthly income of between ₦41,000 - ₦70,000, ₦71,000 - ₦100,000 (i.e the middle income earners) and as expected, people earning above ₦100,000 (high income earners) were also from Parakin (Table 2). Hence, a household in which the household head has a low income might be faced with the problem of food insecurity arising from unavailability or limited resources as depicted by the analysis of this study. Since, one can only live within his/her income.

Table 3: Prices of Selected Food Items in Ile-Ife Over 10 Years (2009-2019)

<table>
<thead>
<tr>
<th>Food Items</th>
<th>Unit</th>
<th>2009</th>
<th>2011</th>
<th>2013</th>
<th>2015</th>
<th>2017</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>50kg</td>
<td>₦4,500</td>
<td>₦5,200</td>
<td>₦7,200</td>
<td>₦7,500</td>
<td>₦10,000</td>
<td>₦12,000</td>
</tr>
<tr>
<td>Rice</td>
<td>50 Kg</td>
<td>₦9,200</td>
<td>₦8,300</td>
<td>₦9,500</td>
<td>₦10,000</td>
<td>₦11,500</td>
<td>₦21,500</td>
</tr>
<tr>
<td>Yam</td>
<td>50kg</td>
<td>₦2,500</td>
<td>₦2,750</td>
<td>₦5,000</td>
<td>₦5,000</td>
<td>₦6,000</td>
<td>₦7,000</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>50kg</td>
<td>₦2,000</td>
<td>₦2,500</td>
<td>₦2,750</td>
<td>₦3,000</td>
<td>₦3,500</td>
<td>₦5,500</td>
</tr>
<tr>
<td>G. Oil</td>
<td>25 litres</td>
<td>₦7,800</td>
<td>₦8,000</td>
<td>₦8,200</td>
<td>₦8,500</td>
<td>₦10,800</td>
<td>₦12,800</td>
</tr>
<tr>
<td>Beans</td>
<td>50kg</td>
<td>₦8,000</td>
<td>₦8,200</td>
<td>₦8,500</td>
<td>₦8,600</td>
<td>₦9,000</td>
<td>₦10,000</td>
</tr>
<tr>
<td>Palm Oil</td>
<td>25 litres</td>
<td>₦7,900</td>
<td>₦8,200</td>
<td>₦8,200</td>
<td>₦8,500</td>
<td>₦10,700</td>
<td>₦11,700</td>
</tr>
<tr>
<td>Garri</td>
<td>50kg</td>
<td>₦3,800</td>
<td>₦2,400</td>
<td>₦2,600</td>
<td>₦2,800</td>
<td>₦4,800</td>
<td>₦5,800</td>
</tr>
<tr>
<td>Beef</td>
<td>50 kg</td>
<td>₦12,000</td>
<td>₦15,000</td>
<td>₦12,000</td>
<td>₦15,000</td>
<td>₦18,000</td>
<td>₦20,000</td>
</tr>
<tr>
<td>Fish</td>
<td>50 kg</td>
<td>₦12,500</td>
<td>₦13,800</td>
<td>₦14,000</td>
<td>₦15,000</td>
<td>₦16,000</td>
<td>₦18,000</td>
</tr>
<tr>
<td>Sugar</td>
<td>50 Kg</td>
<td>₦6,650</td>
<td>₦8,150</td>
<td>₦8,250</td>
<td>₦7,500</td>
<td>₦8,000</td>
<td>₦9,000</td>
</tr>
<tr>
<td>Yamflour</td>
<td>50kg</td>
<td>₦10,700</td>
<td>₦12,000</td>
<td>₦12,300</td>
<td>₦18,000</td>
<td>₦25,000</td>
<td>₦28,000</td>
</tr>
</tbody>
</table>

Source: Osun State Ministry of Commerce and Industries and Authors’ Market Survey between 7th to 14th of October, 2019
The prices of food items had been on the increase over the years. For example, rice which is an everyday food has its price fluctuating around ₦20,000 per 50kg and the cheapest item is cocoyam which goes for ₦5500 per 50kg as at the time of this survey in month of October, 2019 (See the Appendix). The rate of change in food items was on the increase. For example, rice increased with ₦10000 in the last two years and which made unaffordable for households but yet it has to be purchased at the household level (Fig.2). However, beans are the only food item that has the lowest rate of change. Although food items such as cocoyam and yam and garri and maize, groundnut oil and palm oil are readily available in Ile-Ife and its environs while food items such as rice, beans, yam flour, fishes and beef were brought to Ile-Ife from other places within Nigeria could be part of the reasons for not answering the affordability of the food items. All of these could be an indication of price fluctuations which then affects the food security level.

**Figure 3:** Rate of change in Prices of Rice in 2009-2019

\[ y = 2031.4x + 4573.3 \]
Fifty-nine percent of the respondents can guarantee food for their households for a month and this belongs to the class of the civil servants. Result showed that 2.9% of the households do eat enough of what they want frequently. All of these could be accounted for as a result lack of money; price instability of food items also the scarcity of food items at some season of the year. Most importantly, the income and the occupational status of the household heads do play a major role on budget and available food to the household.

Table 4: Households’ Food Security and Hunger Levels across the Selected Communities

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of food situation at home in the last 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>we do eat enough of what we want</td>
<td>193</td>
<td>42.9</td>
</tr>
<tr>
<td>we do eat enough but not always what we want</td>
<td>200</td>
<td>44.4</td>
</tr>
<tr>
<td>we sometimes do not eat enough</td>
<td>46</td>
<td>10.2</td>
</tr>
<tr>
<td>we frequently do not eat enough</td>
<td>11</td>
<td>2.5</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
<td>100.0</td>
</tr>
<tr>
<td>Duration of guaranteeing family food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A day</td>
<td>32</td>
<td>7.1</td>
</tr>
<tr>
<td>A week</td>
<td>105</td>
<td>23.3</td>
</tr>
<tr>
<td>A month</td>
<td>268</td>
<td>59.6</td>
</tr>
<tr>
<td>Six month</td>
<td>31</td>
<td>6.9</td>
</tr>
<tr>
<td>A year or more</td>
<td>14</td>
<td>3.1</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
<td>100.0</td>
</tr>
<tr>
<td>Reason for not eating enough at home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No enough money to purchase food</td>
<td>210</td>
<td>46.6</td>
</tr>
<tr>
<td>Price of food items is too much</td>
<td>129</td>
<td>28.6</td>
</tr>
<tr>
<td>It is difficult to access the market</td>
<td>102</td>
<td>22.7</td>
</tr>
<tr>
<td>Others</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
<td>100</td>
</tr>
<tr>
<td>Ever worried in the last 12 months because food at home could run out before more can be purchased</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almost every month</td>
<td>140</td>
<td>31.1</td>
</tr>
<tr>
<td>Some months</td>
<td>83</td>
<td>18.5</td>
</tr>
<tr>
<td>Only one or two months</td>
<td>95</td>
<td>21.1</td>
</tr>
<tr>
<td>Did not happen</td>
<td>132</td>
<td>29.3</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
<td>100.0</td>
</tr>
<tr>
<td>Time in the last 12 months when bought food was inadequate and no money to buy more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almost every month</td>
<td>90</td>
<td>20.0</td>
</tr>
<tr>
<td>Some months</td>
<td>129</td>
<td>28.7</td>
</tr>
<tr>
<td>Only one or two months</td>
<td>91</td>
<td>20.2</td>
</tr>
<tr>
<td>Did not happen</td>
<td>140</td>
<td>31.1</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
<td>100.0</td>
</tr>
</tbody>
</table>
### Table 5: Frequency and Percentages of the Distribution of Residents’ Responses on Food Budget Based on Demography

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Monthly Food Budget(₦)</th>
<th>Below 10,000</th>
<th>10,000-20,000</th>
<th>20,001-40,000</th>
<th>Above 40,000</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artisans</td>
<td></td>
<td>83(82.83)</td>
<td>13(13.13)</td>
<td>3(3.03)</td>
<td>1(1.01)</td>
<td>100(100.0)</td>
</tr>
<tr>
<td>Civil servant</td>
<td></td>
<td>46(26.67)</td>
<td>78(44.85)</td>
<td>31(17.58)</td>
<td>25(10.91)</td>
<td>180(100.0)</td>
</tr>
<tr>
<td>Trader</td>
<td></td>
<td>79(71.96)</td>
<td>26(22.43)</td>
<td>4(3.74)</td>
<td>3(1.87)</td>
<td>112(100.0)</td>
</tr>
<tr>
<td>Farmer</td>
<td></td>
<td>29(86.96)</td>
<td>1(4.35)</td>
<td>2(8.70)</td>
<td>0(0.0)</td>
<td>32(100.0)</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>19(58.33)</td>
<td>2(16.67)</td>
<td>3(16.67)</td>
<td>2(8.33)</td>
<td>26(100.0)</td>
</tr>
</tbody>
</table>

χ² (12) = 115.09  p-value = < 0.05

### Household size

<table>
<thead>
<tr>
<th>Household size</th>
<th>Monthly Food Budget(₦)</th>
<th>Below 10,000</th>
<th>10,000-20,000</th>
<th>20,001-40,000</th>
<th>Above 40,000</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 and below</td>
<td></td>
<td>130(53.90)</td>
<td>71(29.46)</td>
<td>27(11.20)</td>
<td>13(5.39)</td>
<td>241(100.0)</td>
</tr>
<tr>
<td>Greater than 4</td>
<td></td>
<td>106(50.71)</td>
<td>80(38.27)</td>
<td>17(8.13)</td>
<td>6(2.87)</td>
<td>209(100.0)</td>
</tr>
</tbody>
</table>

χ² (3) = 1.8867  p-value = < 0.05

### Educational status

<table>
<thead>
<tr>
<th>Educational status</th>
<th>Monthly Food Budget(₦)</th>
<th>Below 10,000</th>
<th>10,000-20,000</th>
<th>20,001-40,000</th>
<th>Above 40,000</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td>51(87.27)</td>
<td>9(12.73)</td>
<td>0(0.00)</td>
<td>0(0.00)</td>
<td>60(100.0)</td>
</tr>
<tr>
<td>Primary/Secondary</td>
<td></td>
<td>134(79.87)</td>
<td>30(16.98)</td>
<td>5(3.14)</td>
<td>0(0.00)</td>
<td>169(100.0)</td>
</tr>
<tr>
<td>ND/HND/B.Sc or Equivalent</td>
<td></td>
<td>65(36.69)</td>
<td>81(46.75)</td>
<td>23(12.43)</td>
<td>8(4.14)</td>
<td>177(100.0)</td>
</tr>
<tr>
<td>P.GD/M.Sc/M.Phil/Ph.D</td>
<td></td>
<td>1(2.27)</td>
<td>11(25.0)</td>
<td>17(38.64)</td>
<td>15(34.09)</td>
<td>44(100.0)</td>
</tr>
</tbody>
</table>

χ² (9) = 224.0708  p-value = < 0.05

### Monthly Income

<table>
<thead>
<tr>
<th>Monthly Income</th>
<th>Monthly Food Budget(₦)</th>
<th>Below 10,000</th>
<th>10,000-20,000</th>
<th>20,001-40,000</th>
<th>Above 40,000</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>₦0-₦10 000</td>
<td></td>
<td>37(91.89)</td>
<td>5(8.11)</td>
<td>0(0.00)</td>
<td>0(0.00)</td>
<td>42(100.0)</td>
</tr>
<tr>
<td>₦11 000-₦20 000</td>
<td></td>
<td>122(90.08)</td>
<td>14(8.40)</td>
<td>1(0.76)</td>
<td>1(0.76)</td>
<td>138(100.0)</td>
</tr>
<tr>
<td>₦21 000-₦40 000</td>
<td></td>
<td>54(62.96)</td>
<td>32(34.57)</td>
<td>2(2.47)</td>
<td>0(0.00)</td>
<td>88(100.0)</td>
</tr>
<tr>
<td>₦41 000-₦70 000</td>
<td></td>
<td>27(29.63)</td>
<td>52(60.49)</td>
<td>7(8.64)</td>
<td>1(1.23)</td>
<td>87(100.0)</td>
</tr>
<tr>
<td>₦71 000-₦100 000</td>
<td></td>
<td>3(4.35)</td>
<td>31(44.93)</td>
<td>27(37.68)</td>
<td>9(13.04)</td>
<td>70(100.0)</td>
</tr>
<tr>
<td>₦201 000-₦400 000</td>
<td></td>
<td>0(0.00)</td>
<td>4(20.0)</td>
<td>8(46.67)</td>
<td>6(33.33)</td>
<td>17(100.0)</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>0(0.00)</td>
<td>0(0.00)</td>
<td>0(0.00)</td>
<td>8(100.0)</td>
<td>8(100.0)</td>
</tr>
</tbody>
</table>

χ² (18) = 391.0823  p-value = < 0.05
In assessing the differences in average monthly budget on food in relation to selected socio demographic and economic variables, tests of differences in average of such expenses were conducted to assess the impact of the demographic variable on the household food security level. For example, a Chi-Square test established a significant relationship between occupation and monthly food budget. Occupation which is a determinant of the monthly income and food budget among the following categories; for example the artisans whose budget were below ₦10,000 were predominant (83%), 45% of the civil servants who used to budget between ₦10,000-₦20,000 which was the highest proportion in the category with a Chi square value of 113.09 and p-value < 0.05. This showed the association between monthly income budget, households’ head occupation, household size, educational status and monthly food budget. With respect to household size (in terms of family size) and monthly food budget, household size below 4 had (53%) budget below ₦10,000 on food monthly while households with the budget of ₦10,000-₦20,000 on a monthly basis had 29% (Table 5). Meanwhile about half (50%) of households with household size greater than 4 budgeted below ₦10,000, followed by those whose budget was between ₦10,000-₦20,000. With a Chi square value of 1.8867 and p-value of 0.001, the results showed that there was no significant relationship between household size and monthly food budget irrespective of the household sizes. Meanwhile, a significant relationship was established between the educational status of the household head and monthly food budget (at $\chi^2 = 224.0708$ and p-value < 0.05), for example about 87% households’ head with no educational background budgeted ₦4,085 with a standard deviation of ₦6,964 on food on a monthly basis and this was peculiar to the artisans. On the other hand 8 out of 10 of household heads with low educational background budgeted below ₦10,000 on food. As a departure from the foregoing, highest proportion of households budgeting between ₦10,000-₦20,000 existed among household heads with ND/HND/B.Sc. or equivalent, and the trend was followed by those with monthly food budget of below ₦10,000 with about 37%. While the household heads with higher educational background budgeted most on food monthly (Table 4), 38% of this category budgeted between ₦20,001-₦40,000 on food, 34% budgeted above ₦40,000. A Chi square value of 224.0708 and p-value of 0.001 shows that there was a significant relationship between educational status and monthly food budget.

At $\chi^2 = 391.0823$ and p-value = < 0.05 there was a significant relationship between monthly income and monthly food budget. For example about 92% respondents who earn less than ₦10,000 monthly earmarked less than ₦10,000 for food on a monthly basis while 90% were recorded among the households’ heads earning between ₦11,000-₦20,000 monthly. It could be inferred that the higher the income, the higher the amount budgeted on food monthly. For instance, households’ head earning between ₦201,000-₦400,000, about 47 percent budget between ₦20,001-₦40,000 on food monthly. The trend continued with the households earmarking above ₦40,000 for monthly food budget with 33% with a Chi square value of
391,0823 and p-value = < 0.05, which implies that the monthly income of the households’ head plays a vital role in the monthly budget on food which implies that no household food budget will exceed its income (Table 4.13). Furthermore, occupation and monthly income plays a major role on household food security, for instance where respondents earns between ₦11,000 - ₦20,000 budget an average of ₦7,542 with a standard deviation of ₦5,367 on food, respondents who earns between ₦201,000 - ₦400,000 budget an average of ₦40,133 and standard deviation of ₦21,287. An F-value of 132.04 and p-value of 0.001 shows that the difference observed in average monthly budget across levels of monthly income on food is significant (Table 3).

There is no significant difference in monthly budget on food across household size at t-value = -1.5074 and a p-value of < 0.05. For instance, in household size of 4 and below, average monthly budget on food was ₦14,808 and a total of ₦13,284 will be needed on food to be food secured, while those with size greater than 4 spend average of ₦16,932 and a total of ₦17,153 will be needed to be food secured. Studies have shown that food available to larger families per head are usually lower than that available to smaller families that is per food capita. Food intake decreases with an increase in family size. This is in conformity with Adio (2000), Oluyole et al., 2016 whereas this could not be measured in this study since the outcome of this study shows that the household sizes do not affect the budget on food by the family.

Results of this study demonstrated that food insecurity is still high among the selected communities in Ile-Ife. 41% of the households cannot guarantee their household food for a month, while some have one or more household members skipped a meal in a day for lack of food whenever there is food shortage. In all, 20% of the households have their children benefitting from the food assistance by the State Government for the children of primary school ages (Government schools) during the school hours and this has been a succor to the households. In other to enhance household food security level, food wastage has to be curbed only 56% made use of fridge in preserving their food remain for later consumption although these were being used among households of these two communities Parakin and Ibadan Road. Through this one could say that a larger percentage of the sampled population knows the adverse effect of food wastage on food security level which is hunger and starvation. Nonetheless, 8% respondents had experienced food crisis in their community and this was recorded during Ile-Modakeke crisis which lasted for years.

Focusing on households sizes and monthly food budget, at t-value = -1.5074 and a p-value of < 0.05, no relationship was found between household size and households’ food security. This suggests that focusing on household size alone may not provide an accurate assessment of the varying demographic characteristics of different households and food security.

However, Seventeen percent of the respondents suggested the need for government intervention, while 14% suggested that farmers are to be supported through loans, people should be more involved in farming and that government should encourage large scale farming through mechanization while 10% and 11% hopes that improving storage facility and planting more crops would help in a way to ensuring food security. Other suggestions include subsidizing food items and preventing adverse climatic impacts. This is an indication that the government still has a frontline role to play in the area of agriculture which is the only key to food security.

IV. Conclusion and Recommendations

a) Conclusion

This study has shown that households sizes below or equals 4 had the highest representation in this study. There is a variation in the educational background of households’ heads across the selected Communities. For instance communities such as Parakin and OAU Senior Staff Quarters had the highest number of households’ heads with higher educational Status. In terms of occupation, artisans had the highest representation in this study but with an exemption of communities such as Parakin and OAU Senior Staff Quarters which were dominated with civil servants. Across the selected communities, household heads with the income range of ₦11,000- ₦20,000 had the highest percentage except Parakin and OAU Senior Staff Quarters with higher income. While a larger population in this study budgeted less than ₦10,000 on food on a monthly basis. From the results in chapter four, it can be inferred that the higher the income, the higher the monthly food budget. Also, the higher the educational status, the higher the monthly income which shows there is a significant relationship between the Educational Status and the monthly income. Forty-one percent of the households do not eat enough food due to the following reasons; the stagnating growth in food production, increasing population, poverty, climate change, high food prices, ongoing neglect in agricultural practices, absence of market within the communities and lack of sufficient income. Food security of many household was further deteriorated due to lack of awareness on food utilization and preservation.

Food insecure households have their households’ head as mostly artisans and were more likely to have no educational background whose heads were with low income and low budget on household food. To overcome this problem of food insecurity, the empirical results suggest that it is necessary to put in
place policies that will encourage qualitative education and job creation with good remuneration.

The household with the high income earning heads are more food secure compared to households with a low income head. Poverty, poor economic activity, low agricultural productivity, lack of access to basic services like health facilities and food markets all play significant role on food security. Thus, the varying demography (such as educational and economic variables) plays a significant role on households' food security level.

b) Recommendations

Economic growth is urgently required to combat poverty, which is a key underlying factor to the hunger problem among the communities. Economic growth, preferably through increased investments in a much neglected agricultural sector, is however not enough, and there is an urgent need for the Government to address the food insecurity situation. In the current situation, food security major thrust has to be given to production of food grains, fisheries and livestock products through sustainable use of resources. Investing in agriculture has several benefits and as a great contribution to the economic growth, agriculture has to be transformed from traditionally subsistent to a vibrant commercial and competitive one. Potentiality for agricultural development should be tapped with vibrant commercial and competitive one. New challenges, FAO Rome. www.fao.org/5/c-f4631e.pdf, accessed on 7th of November, 2016.


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Consequências Das Construções Na Zona De Pós-Praia: Um Estudo Sobre A Erosão Na Praia Da Caponga – Ce, Brasil

By Joao Vitaliano

Abstract- The urbanization of the coastal zone is an occurrence globally. The lack of proper planning to edge protection limits resulted in irregular occupation along virtually the entire praial arch with buildings positioned near the active beach profile. The human intervention on coastal processes through urbanization has occurred in several beaches of the Brazilian coast, leaving the building vulnerable buildings within the dynamic response range of beach to storms and high tides tending to resume the sea of built area. The aim of this research was to study the phenomenon of coastal erosion Caponga - CE beach and the consequences of high tides.

Keywords: coastal zone, caponga, erosion.

GJSFR-H Classification: FOR Code: 960503

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Consequências Das Construções Na Zona De Pós-Praia: Um Estudo Sobre A Erosão Na Praia Da Caponga – CE, Brasil

João Vitaliano


Palavras-chave: zona costeira, caponga, erosão.

Abstract- The urbanization of the coastal zone is an occurrence globally. The lack of proper planning to edge protection limits resulted in irregular occupation along virtually the entire praiial arch with buildings positioned near the active beach profile. The human intervention on coastal processes through urbanization has occurred in several beaches of the Brazilian coast, leaving the building vulnerable buildings within the dynamic response range of beach to storms and high tides tending to resume the sea of built area. The aim of this research was to study the phenomenon of coastal erosion Caponga - CE beach and the consequences of high tides.

Keywords: coastal zone, caponga, erosion.

I. Introdução

A elevação do nível médio global do mar relaciona-se com a variabilidade climatológica natural da Terra, principalmente devido à expansão térmica do oceano, causado pelo aumento do volume de água induzido pelo aumento da temperatura atmosférica. A diminuição da quantidade de sedimentos em determinadas áreas pode ser explicada pelas muitas atividades humanas em zonas ribeirinhas ou no interior, das quais se destacam as barragens, as dragagens e a extração de inertes.

Mendes (2008) considera que a destruição das estruturas naturais deve-se à degradação antropogênica das formas costeiras naturais resultantes induzidas pela sua ocupação com construções. Ainda, segundo o mesmo autor, as obras pesadas de engenharia criam desequilíbrios locais, causando perturbações nos trechos costeiros em que são inseridas: as estruturas transversais – esporões interrompem o trânsito litoral de areias e provocam acumulação de areia de um lado do esporão e déficit de outro; as estruturas longitudinais têm como principal consequência a inibição das trocas entre as dunas e as praias.

Segundo o Ministério do Meio Ambiente (2008), entre as atividades econômicas que são consideradas mais perigosas quando se trata de uso da área que corresponde à praia está a proliferação de frentes edificadas. A ação antrópica ameaça a capacidade que as zonas costeiras têm de se adaptarem aos efeitos gerados pelas alterações climáticas, nomeadamente as marés meteorológicas e o aumento da frequência e intensidade dos eventos de tempestade.

Ainda, segundo o mesmo autor, a intervenção antrópica nos processos costeiros seguido da urbanização da orla é apontada como a causa principal da erosão em diversas praias do litoral brasileiro, principalmente, porque a construção de edificações fica vulnerável dentro da faixa de resposta dinâmica da praia às tempestades e às marés altas tendendo à retomada pelo mar da área construída.


Entre os indicadores de erosão costeira estão a pós-praia muito estreita ou inexistente devido à inundação pelas preamaras de sizigia e a destruição das dunas com a vegetação de restinga nas praias urbanizadas ou não. A ação das marés tem um papel importante na morfodinâmica e hidrodinâmica costeira, principalmente no sentido de ampliar a zona de atuação das ondas gerando correntes em estuários e em águas rasas sendo importante para o transporte de sedimentos (Souza et al, 2003).

Moraes (1980) observou o comportamento das marés na bacia do Porto de Mucuripe e determinou a amplitude máxima de 2,7m para o equinócio de março no ano de 1976 e 3,3m para máximas de sizigia no ano de 1980.

Maia (1998) utilizando 14 registros analógicos mensais do marégrafo instalado no Porto do Mucuripe verificou que durante o período de maio a junho de 1996, a amplitude máxima da maré foi de 3,23 m, na maré de sizigia do mês de dezembro de 1995. Ainda,
segundo o mesmo autor, no núcleo urbano da praia da Caponga verificou-se certa frequência da direção de 50º na arrebentação sendo este ângulo o resultado da difração das ondas quando se chocam com os arrecifes existentes no local resultando em um percentual maior de ataque frontal nesse trecho da praia.

II. METODOLOGIA

Para a presente pesquisa foi empregado o método de obtenção de imagens obtidas por sensoriamento remoto de posição suborbital e de solo para comparação do estado erosivo observado na praia da Caponga – CE. Foram feitas imagens usando o método baseado no conceito do perfil de equilíbrio que traduz a forma da praia para um determinado estado de agitação constante e, para uma determinada granulometria da areia. Segundo Moraes, (1980) a análise do estado morfodinâmico de uma determinada área consiste na comparação do perfil atual com o perfil observado anteriormente permitindo concluir se o trecho se encontra em erosão ou em acreção. As imagens de solo foram obtidas durante as primeiras semanas do mês de janeiro de 2013 e janeiro de 2014, momento no qual, as marés de sizigia proporcionaram amplitudes de 2.8 a 3.0 alcançando locais não registrados anteriormente.

III. RESULTADOS E DISCUSSÃO

As imagens das Figuras 1, 2, 3 e 4 revelam como é grande a dinâmica dos sedimentos na praia da Caponga provocada, principalmente, pelas marés altas registradas no ano de 2013. Morais, (1980) assevera que a ação das ondas nesse local é amenizada pela formação de arrecifes que promovem grande difração, mas, mesmo assim, observa-se a raspagem dos sedimentos bastante acentuada. É importante ressaltar que esta área de restaurantes foi construída dentro da pós-praia como pode ser observado na imagem suborbital obtida pelo Google Earth.

Figura 1: Sedimento Positivo/Escada

Foto: João Vitaliano. Jan/2013
Figura 3: Sedimento Positivo/2013
Foto: João Vitaliano. Jan/2013

Figura 2: Sedimento Negativo/Escada

Foto: João Vitaliano. Jan/2014
Figura 4: Sedimento Negativo/2014
Foto: João Vitaliano. Jan/2014

No início da segunda semana de janeiro de 2013 ocorreram marés altas que começaram a raspar com grande velocidade, os sedimentos que se acumularam em frente aos restaurantes, como pode ser observado na Figura 5. Nos primeiros dias de janeiro de 2014 registramos a ação da maré de sizigia com ondas que invadiram as casas e atingiram a segunda quadra momento registrado por nós em vídeo e colocado no youtube.

Figura 5: Sedimento Negativo/2014
Observa-se na Figura 7 que o volume de sedimentos acumulados em frente aos restaurantes impedia a aproximação das marés com amplitude abaixo de 2.3. Na Figura 8 pode-se ter uma ideia do comprometimento destas casas construídas na área que deveria corresponder à praia. O alcance das marés de 3.0 evidencia não só a retirada dos sedimentos deste local, mas, também, o erro cometido pela urbanização sem um prévio estudo das relações existentes entre o mar e o continente.

Souza, (1980) aponta como uma das causas principais da erosão costeira, a construção de casas e prédios na área que corresponde ao ambiente praial. O que se observou nas edificações das Figuras 09, 10, 11, 12, 13 e 14 é que as casas foram construídas na zona considerada como pós-praia, área que deveria ser formada por dunas e cobertura vegetal para receberem o primeiro impacto das ondas nas marés altas que têm sido responsáveis pela desfiguração de diversas praias do litoral brasileiro.
Observa-se na Figura 15 o fenômeno descrito por Morais, (1980) sobre as obras de engenharia, no caso, os espigões que aprisionaram grande quantidade de sedimentos impedindo o longo alcance das ondas, porém, transferiram a força das mesmas para a região a sotamar causando grande impacto nas casas, como pode ser observado na Figura 13 localizada a aproximadamente, 200 metros após a última estrutura. Na Figura 16 pode-se observar os sedimentos encobrindo totalmente o enrocamento que no ano de 2013 estava totalmente exposto para proteção das casas e da rua parcialmente destruídas.
A Figura 17 encerra o quadro de imagens que reflete a atual realidade da praia da Caponga, localizada no município de Cascavel-CE. A imagem foi obtida a 150 metros de distância da última casa construída dentro da área da praia. Observa-se a presença de dunas com pouca vegetação e, mesmo assim, fora do alcance das marés altas que ocorreram no mês de janeiro e se repetiram ao longo do ano 2014. A única construção que observamos nesta área está por trás do monte de areia à direita da imagem, local não atingido pelas marés altas.

Figura 17: Ausência Total de Erosão Costeira na Zona Norte da Caponga

![Figura 17](image17.jpg)

Foto: João Vitaliano. Jan/2014

Observa-se na imagem obtida de área suborbital o conjunto de edificações que mais tem sofrido com as marés de sizígia dos últimos anos na praia da Caponga. A imagem mostra que as residências foram construídas na beira da praia ficando expostas nos últimos anos em virtude das alterações das marés, principalmente, com relação à altura das ondas. Após a construção dos espigões que beneficiou a área localizada mais ao sul, margem esquerda da foto, a energia das ondas foi desviada para os locais apontados pelas setas causando grande destruição, quando casas de grande porte cederam completamente ficando totalmente inutilizadas.

Figura 18: Construkções na Zona de Pós-praia

![Figura 18](image18.jpg)

Foto: Google Earth. Nov/2012

A seta localizada ao centro da Figura 19 mostra a distância de 70 metros das casas para a beira da praia, construídas em uma área protegida por arrecifes, local, no qual, não ocorre erosão, mesmo nas marés de 3.0 observadas nos últimos anos. A seta da direita aponta para a área dos restaurantes e casas vizinhas que tiveram os sedimentos visíveis na foto totalmente raspados no ano de 2013. Esse local apontado pela seta indica as casas mostradas nas Figuras de número 1 a 8.
Com base nas imagens apresentadas nesta pesquisa concluiu-se que não foi o avanço do mar sobre o continente o responsável pela destruição das casas, mas, a invasão das construções nas áreas de pós-praia pertencentes ao mar. Pela foto obtida por sensoriamento remoto é possível visualizar a falta de planejamento urbano pela prefeitura da cidade que permitiu sequências de invasões e construções em zonas consideradas proibidas, no caso em estudo, a zona de pós-praia, não guardando os 150 metros de distância permitidos por lei. Pedras são colocadas para conter as ondas que atingem as casas mais expostas, porém, sabe-se que não é o suficiente para impedir a ação do mar na base das mesmas que vai se comprometendo a cada ano que passa. Como não sabemos o que a natureza poderá trazer nas próximas décadas é importante que os proprietários dessas residências construam suas casas em áreas mais afastadas evitando, desta forma, ocorrências como foram mostradas na Figura 13 cuja casa foi destruída pela ação das ondas.

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We accept the manuscript submissions in any standard (generic) format.

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

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2. Authors must accept the privacy policy, terms, and conditions of Global Journals.
3. Ensure corresponding author’s email address and postal address are accurate and reachable.
4. Manuscript to be submitted must include keywords, an abstract, a paper title, co-author(s’) names and details (email address, name, phone number, and institution), figures and illustrations in vector format including appropriate captions, tables, including titles and footnotes, a conclusion, results, acknowledgments and references.
5. Authors should submit paper in a ZIP archive if any supplementary files are required along with the paper.
6. Proper permissions must be acquired for the use of any copyrighted material.
7. Manuscript submitted must not have been submitted or published elsewhere and all authors must be aware of the submission.

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- Diagrams
- Graphs
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2. Drafting the paper and revising it critically regarding important academic content.
3. Final approval of the version of the paper to be published.

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Acknowledgments

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Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.
Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27” x 11’’, left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word “Abstract” in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper’s subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.
It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

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**Title**

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

**Author details**

The full postal address of any related author(s) must be specified.

**Abstract**

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

**Keywords**

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

**Numerical Methods**

Numerical methods used should be transparent and, where appropriate, supported by references.

**Abbreviations**

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

**Formulas and equations**

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

**Tables, Figures, and Figure Legends**

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.
Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

**Preparation of Electronic Figures for Publication**

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

**Tips for Writing a Good Quality Science Frontier Research Paper**

Techniques for writing a good quality Science Frontier Research paper:

1. **Choosing the topic:** In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. **Think like evaluators:** If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. **Ask your guides:** If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can’t clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. **Use of computer is recommended:** As you are doing research in the field of science frontier then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. **Use the internet for help:** An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.
6. **Bookmarks are useful:** When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. **Revise what you wrote:** When you write anything, always read it, summarize it, and then finalize it.

8. **Make every effort:** Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. **Produce good diagrams of your own:** Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. **Use proper verb tense:** Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. **Pick a good study spot:** Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. **Know what you know:** Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. **Use good grammar:** Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

   Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. **Arrangement of information:** Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. **Never start at the last minute:** Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. **Multitasking in research is not good:** Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. **Never copy others’ work:** Never copy others’ work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. **Go to seminars:** Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. **Refresh your mind after intervals:** Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.
20. **Think technically:** Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. **Adding unnecessary information:** Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn’t be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. **Report concluded results:** Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. **Upon conclusion:** Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

### Informal Guidelines of Research Paper Writing

**Key points to remember:**

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

**Final points:**

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

**The introduction:** This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

**The discussion section:**

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

**General style:**

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

**To make a paper clear:** Adhere to recommended page limits.
Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don’t address the reviewer directly. Don’t use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract:

This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.
The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.
Results:
The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:
- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:
- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:
As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:
If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:
The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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