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Research article

REMOTE SENSING AND GIS ASSESSMENT OF DOMESTIC FUEL ENERGY SUPPLY: A THREAT TO GLOBAL DRR CRUSADE IN SOUTH-WESTERN NIGERIA

Jaiye Jehoshaphat Dukiya[1], Banji Adeleye, AB[2]

1 Centre for Disaster Risk Management, Development Studies, Federal University of Technology, Minna, Nigeria,
Correspondence duksat2000@futminna.edu.ng

2 Department of Urban and Regional Planning, Federal University of Technology, Minna, Nigeria
banji.adeleye@futminna.edu.ng

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Abstract: Nigeria that is crown the giant of Africa is acclaimed to have one of the world's highest economic growth rates, averaging 7.4% by the World Bank report, yet her over 80 million people (42.4%) are currently living below the poverty line. Instead of eradicating poverty by the year 2030 according to the UN SDG in Nigeria, about 7 people are entering poverty every minute. The average kerosene price per litre in Nigeria is ₦284.03 and the price of cooking gas per 25kg is ₦4000. Charcoal and fuel wood therefore becomes the only alternative domestic power source. In fact, Nigeria currently ranks second to Brazil in the production of charcoal and currently exports 380,000 metric tonnes of charcoal annually. This study uses secondary data and remote sensing GIS to analyse the trends of poverty, charcoal and fuel wood production in the country and the loss of vegetal cover in the western region of the country. The result reveals that there is positive correlation between poverty, fuel wood, charcoal and loss of vegetal cover, and this implies that Disaster Risk Reduction(DRR) programmes must be intertwine with poverty reduction.

Keywords: Charcoal, DRR, GIS, Fuel wood, Land Cover, Poverty.

1. Introduction

The level of community vulnerability in Africa, and Nigeria in particular is high, while resilience that refers to the ability of people to cope with and withstand new, changing or unexpected events or situations is very low comparatively due to failed state (GTZ 2002, 2003). Poverty in its multiple dimensions has a strong influence on people's vulnerability to disaster,

and vice versa ,and because of the complex relationship between poverty and vulnerability, disasters typically worsen the poverty situation of these groups, as well as their vulnerability to future risk. It has been reported that more than 20 million people in Sub-Saharan Africa are vulnerable to one disaster or the other due to different levels of environmental degradation. The United Nations (2016) confirmed that Yemen, Somalia, South Sudan and Nigeria top the list of countries where over 20 million people facing the threat of starvation and famine are found. Nigeria in particular may be facing its largest humanitarian crisis as poverty aggravates in the land and well over 2 million persons internally displaced are confronted with extreme hunger. Separate reports from the Central Bank of Nigeria (CBN, 2017), African Development Bank (AFDB, 2017) and World Bank (WB 2017) consistently agree that most of the vulnerable to poverty are in northern Nigeria.

According to Oyedepo et al (2018) referencing Insight Nigeria, (2014), the absolute measure of poverty puts the poor in Nigeria at 99.284 million (60.9%); and the dollar per day measure puts it at 99.75 million (61.2%); while the subjective measure of poverty rating puts it at 153.08 million (93.9%). Ahiuma-Young (2016) quoting the National Bureau of Statistics (NBS), states that about 160 million Nigerians (76.19%) of the country's total population of 2100million live in poverty as global poor hits one billion mark In these cases, the poverty trap can be described as a downward spiral, ending in a hopeless situation for the affected people (Kwak and Smith. 2013).

The high unemployment and poverty push and the pull of both national and international demand for cheep domestic energy (charcoal and fuel wood) is the driver of excessive exploitation of forest resources for income generation and other traditional fuel at the expense of local community health and sustainable development. The charcoal production process have been observed to be a major cause of environmental health hazards, depletion of community based resources, and deforestation that is aggravating the current climate change and its effects (Fawehinmi and Oyerinde, 2002).This study therefore seeks to examine poverty level, charcoal production and environmental degradation as affect sustainable development and disaster risk reduction in the South-Western Nigeria.

The key objectives of the study are: to examine the level of poverty generally in Nigeria, the relationship between poverty and environmental disaster, the accessibility of alternative domestic power supply and charcoal production activities south-western part of Nigeria as it relate to DRR and sustainable development.

1.1 Review of Literature

Poor countries are much at risk of disasters and the consequences of natural hazard than the other wealthier nations of the world. Poverty erodes society's self-help capabilities in preventing extreme natural occurrences from turning into a human disaster (Eschborn, 2005). Rapid population growth and societal poverty often led to the overexploitations of natural resources that exacerbate the vulnerable of those settlements, and the poor knowledge of natural hazard identification also prevent such community from taking sufficient precautionary measures for their safety. Disaster vulnerability has everything to do with poverty and development, and vice versa (Wolfensohn and Cherpitel, 2002). Disasters triggered by natural events often raise poverty rates in the affected regions and thereby erode achieved development progress, as illustrated in Figure1.

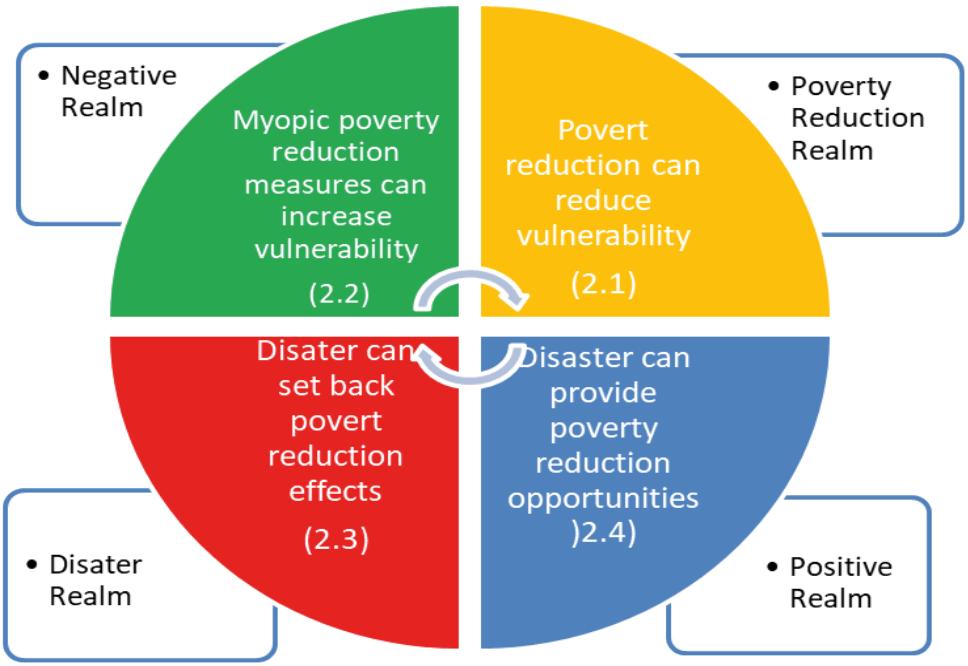

Figure 1. The relationship between poverty and vulnerability to disasters.
Source: After: UNDP 1994,, 10.

When it comes to poverty discuss statistically, over 50% of the world population (about three billion people) are living on less than $2.50 a day. Although Nigeria has one of the world's highest economic growth rates of about 7.4% according to the World Bank report (2014, 2016), over72.4% of the population (160 million Nigerians) currently live below the poverty line. From every indication including the current COVID 19 pandemic challenges, the poverty level may get worse than the global projection for 2030 or 2050 (Homi and Meagan 2021).According to the World Bank standards, living in extreme poverty mean living on less than $1.90 (₦684) per day. The first item of the 2015 UN Sustainable Development Goals is "to eradicate extreme poverty for all people everywhere by 2030". However to achieve this globally, researchers have projected that 90 people need to leave poverty line every minute to eradicate poverty totally by 2030; and for Africa, 57 people have to leave every minute; while for Nigeria, 12 people have to leave per minute (Guardian Editorial Board, 2021).Debt was an increasing problem across all income groups of African countries prior to COVID-19, and the pandemic has only exacerbated the problem. In fact, African countries had been borrowing heavily in the global financial markets in recent years. Ironically and unimaginably for Nigeria, about 7 people are entering extreme poverty every minute. Although Nigeria's poverty profile for 2021 has not yet been released, it is estimated that the number of poor people will increase to 90 million, or 45% of the population, in 2022. If the World Bank's income poverty threshold of $3.20 per day is used, Nigeria's poverty rate is 71% (Chris et al, 2021).

Poverty in Nigeria is not unconnected to the nation's population that is growing faster than its economy, and by 2050, according to the UN, Nigeria will be third most populous country in the world after India and China. In fact, the 2021 budget is to run on deficit, and to be funded by much borrowing in addition to the existing foreign national debts according to President Mohammad Buhari (Oladeinde, 2020). More so, the country's dwindling oil revenue due to the global oil market recession affected nation's GDP negatively leading to more rate of unemployment in the country. The high level of corruption has also helped in plunging millions people in the country into worse poverty as the able bodies are now engaging in criminal acts, while others are busy ravaging the forest resources within their domain

for charcoal production. Charcoal that consisting of carbon is produced by the slow process of heating wood and other substances in the absence of oxygen, called Pyrolysis. Charcoal production is best with hardwood species; therefore, the bulk of charcoal wood is harvested from primary and in some cases secondary forest (Brandley, 1991).

Charcoal, though an old source of energy is still much a source of energy for cooking in both rural and urban centres. Charcoal in addition, is now an export commodity in the world including Nigeria, with a large market in the EU, USA and Asia as prices range from $170 -$300/ton depending on the packaging. Tropical Africa accounts for 70% of the exports and the market is all year round with a slight drop between July and September, (Omoakin et al, 2015). In fact, the charcoal industry is a multibillion dollar global industry. According to Foraminifera (2013) quoting the Food and Agricultural Organization (FAO), over 40million metric tonnes of charcoal are consumed globally and approximately 2.4billion people rely on wood and charcoal for their daily fuel. According to the report, Nigeria currently ranks second to Brazil in the production of charcoal and that the western world particularly prefer Nigeria's charcoal which exports about 380,000 metric tonnes of charcoal annually; as the country is rich in tropical hardwood, which burns slower and hotter. The United Kingdom is one of the largest consumers of charcoal, though other countries around the world like Holland, France, Netherland, Germany Spain, Bulgaria and Denmark also consume the product in large quantity.

Studies like that of Olagunju (2006) revealed that a small team of 4-8 people can produce three pickup loads of charcoal in two weeks. In fact, South-Western Nigeria is leading in the business due to many factors that are not unconnected to the abundant rainforest coverage and poor access to a more profiting livelihood business. Indeed, the Charcoal Development Dealers Association of Nigeria (CDDAN) recently took a step towards smooth exportation of their products by commencing the process of certification through an international organisation (Ogunesan, 2017).

In an effort to banning the exportation of charcoal in Nigeria by the Federal Government on the premise that the Charcoal Dealers failed to adhere to its policy of cut-one-plant-two, the association reported their plan to maintain the afforestation status and even strive to meet international standards in the course of their trade Furthermore, according to Salami and Briege (2010), the CDDAN president had been working in collaboration with the Forestry Research Institute of Nigeria (FRIN) to plant 30 hectares of Eucalyptus and Teak trees at Ijio in Iwajowa Local Government Area and Otu in Itesiwaju Local Government council, in Oyo State. Also in their bid to further step up their ranking among the best exporters on the world map, they hosted a representative of one of the world's leading firm in forest management certification, Pacific Salmon Commission (PSC), to Nigeria.

2.Methodology

2.1. The Study area

The Western part of Nigeria c that was formed in 1967 consists of 6 states which are: Ogun, Oyo, Osun, Ondo, Ekit, and Lagos states, see figure 2. The area lies between longitude 2 31 and 6 00 East and latitude 6 21 and 8 37 N (Agboola, 1979) with a total land area of 77,818km2 and a projected population of 28,767,752 in 2002 (NPC, 1991). The study area is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi states; in the West by the Republic of Benin and in the South by the Gulf of Guinea. It has over 80 constituted Forest Reserves with a forest area cover of 793,266ha as stated in table1.

Table 1. South Western States and their Land Areas. Source (Frunbol&Lasos, 1998).

States	Total Land Area km2	No of Forest Reserves	Area of Forest Reserves (Ha)	No of Local Gov
Oyo	27,848	19	169,173	33
Ondo/Ekiti	20,451	37	329,288	17& 16
Ogun	16,086	16	195,790	20
Osun	9,491	11	92,242	30
Lagos	3,939	03	6,873	20

The largest Western state is Oyo State that is about 28,454 km2 in land mass. The western region of Nigeria is homogenous, mainly inhabited by the Yoruba ethnic group who are primarily agrarian but have a predilection for living in high-density urban centres. Ibadan had been the centre of administration of the old Western Region of Nigeria since the days of British colonial rule and agriculture is the main occupation of the people of the rural and suburban areas. The climate of the region is usually with small temperature range that is almost constant throughout the year. Some of the town records a maximum of 28 °C (82.4 °F) for its hottest month while its lowest temperature is 26 °C (78.8 °F). This region experiences heavy and abundant rainfall with convectional rainstorms due to the regions proximity, to the equatorial belt. The annual rainfall received is usually about 2,000mm (78.7 in) that is known for tropical rainforest climates worldwide that enhances abundant agricultural food and cash crops. There are a number of government farm settlements in places like Ipapo, Ilora, Eruwa, Ogbomosho, Iresaadu, Ijaiye, Akufo and Lalupon.

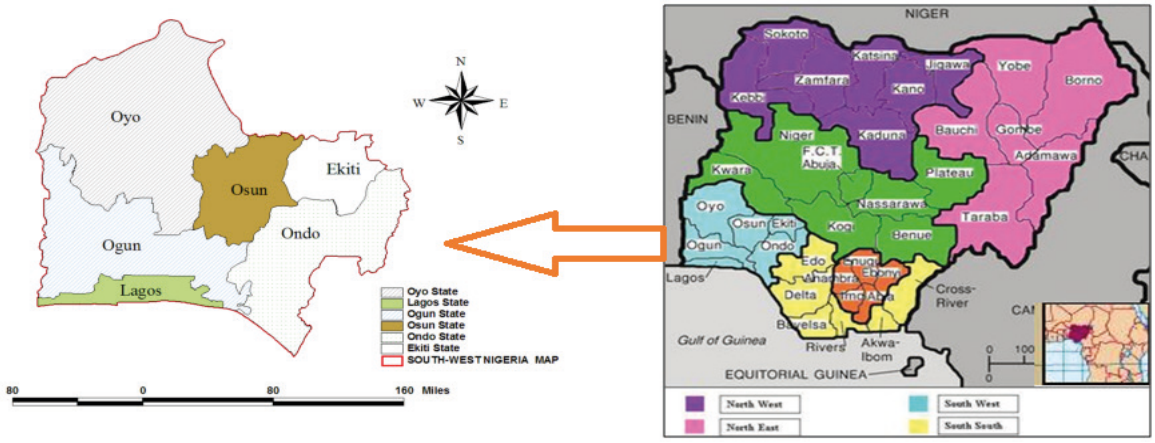

Figure 2. Location of the western states of Nigeria.
Source: Google Image.

2.2 Data sources

In assessing the impact of charcoal and fuel wood production in the country and the loss of vegetal cover in the western region of the country, the study employed the use of multi-temporal satellite images of 2000, 2005, 2010 and 2018 over the area as detailed in table 2. For the charcoal production process and species of trees, field observations was carried out in some selected villages, while oral interview was also conducted to ascertain the level of production and the associations they belong to for their marketing. Existing poverty baseline value was also used to carry out regression analysis to determine the significant influence of poverty depth on environmental degradation.

Table 2. Image properties for the years under study

Year	Path and Row	Sensor	Resolution	Date
2000	191/54	ETM^+	30m	06/02/2000
2005	191/54	ETM^+	30m	18/11/2005
2010	191/54	ETM^+	30m	18/12/2010
2018	191/54	ETM^+	30m	19/03/2018

Source: Author's compilation, 2018

On each of the images obtained, the selected Local Government Area was clipped out using the "Sub-map of raster tool" on the "operation list" of ILWIS 3.3 Academic software. Bands 4,3,2 were used to form the false colour composite for the study, and to calculate the Normalized Difference Vegetation Index (NDVI) of the area, the near infrared band (band 3) and the visible band (band 4) were used to perform this task. NDVI calculation of an area ranges from minus one (-1) to plus one (+1) with 0 representing an approximate value of no vegetation. Values closer to +1 (0.8 - 0.9) shows a significant level of vegetation or possible density of green leaves. This study uses the NDVI formula on ILWIS 3.3 Academic software (NDVI = (NIR - RED) / (NIR+ RED)).

3.Results

3.1 Charcoal Production process

In each of the production centres, harvested logs of trees are covered with grasses/leaves and thereafter, the leaves are covered with earth. The leaves/grasses serve as a lagging material between the logs of wood and the earth covering the entire setup. While covering, a small portion of the heap is left uncovered on any side of the entire setup for the introduction of fire. After lighting the opening is covered and tiny holes are created in various parts of the heap so as to enable the inflow of oxygen for combustion as revealed in figure 3 a,b,c,d. This thermal degradation of biomass results in formation of products of incomplete combustion (PIC) such as CH4, CO2 alkanes, alkenes, oxygenated compound and particulate matter.

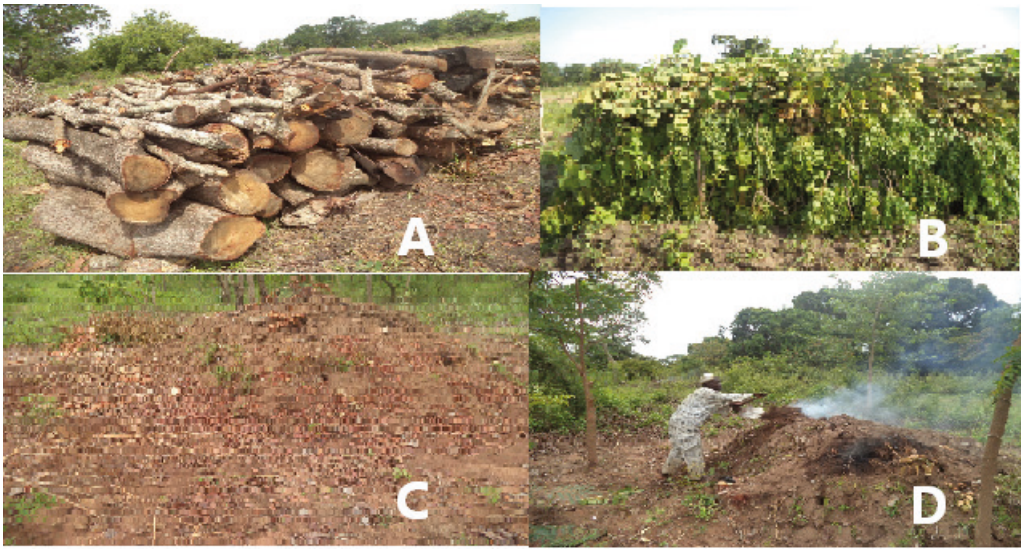

Figure 3. Local charcoal production processes in south-western Nigeria.
Source: Adapted from Omoakin et al., (2015).

Table 3 reveals the survey result of some selected villages that are dominated by the charcoal producers who are also members of the larger charcoal business association.

Table 3: Charcoal production in selected villages of south western Nigeria

S/N	Bags per week	Production	%
1	20-Jan	36	73.6
2	21 – 40	6	12.2
3	41 – 60	5	10.2
4	61 – 80	2	4
	Total	49	100

Source: Field survey

3.2. Effect of Poverty Level and Charcoal Production on Environmental Degradation

In assessing the significant influence of poverty depth on the environmental degradation, the variables that had significant co-efficient are the quantity of wood collected, knowledge of environmental conservation and size of farm land. The analysis revealed that the coefficients of the quantity of wood collected is 0.0404 with ($P<0.01$) significant, meaning that an increase in the quantity of wood collected would result to a proportionate increase in the poverty depth of the farmers by 4.04%. Going by the already established monthly absolute poverty line of $7.3 (₦2,627) for the study area, the study observed that about 42% of the farming households were poor. This agrees with previous expectation that the indiscriminate felling of trees makes the farmlands prone to degradation. This finding is in conformity with the findings of Okwi *et. al* (2006) and that of Lal and Okigbo (1990) that deforestation and fuel wood is a major source of human induced environmental degradation, accounting for nearly 15% of the total land degradation in Africa.

3.3. GIS analysis of deforestation impacts on land cover in the area between 2000 and 2018

The land cover change analysis for the year 2000, 2005, 2015 and 2018 is as shown in figure 4 and table 4 respectively which reveals that there is a decrease in secondary vegetation in 2005, with a land area of 770.46 km2 as against the 927.35km2 recorded in 2000. A decline of 31.38 km2 was recorded annually in the land area of secondary vegetation between 2000 and 2005. The decline in disturbed vegetation resulted in an increase in the land area of undisturbed vegetation with a magnitude of change of 132.67 km2 and an annual frequency of change of 26.54km2

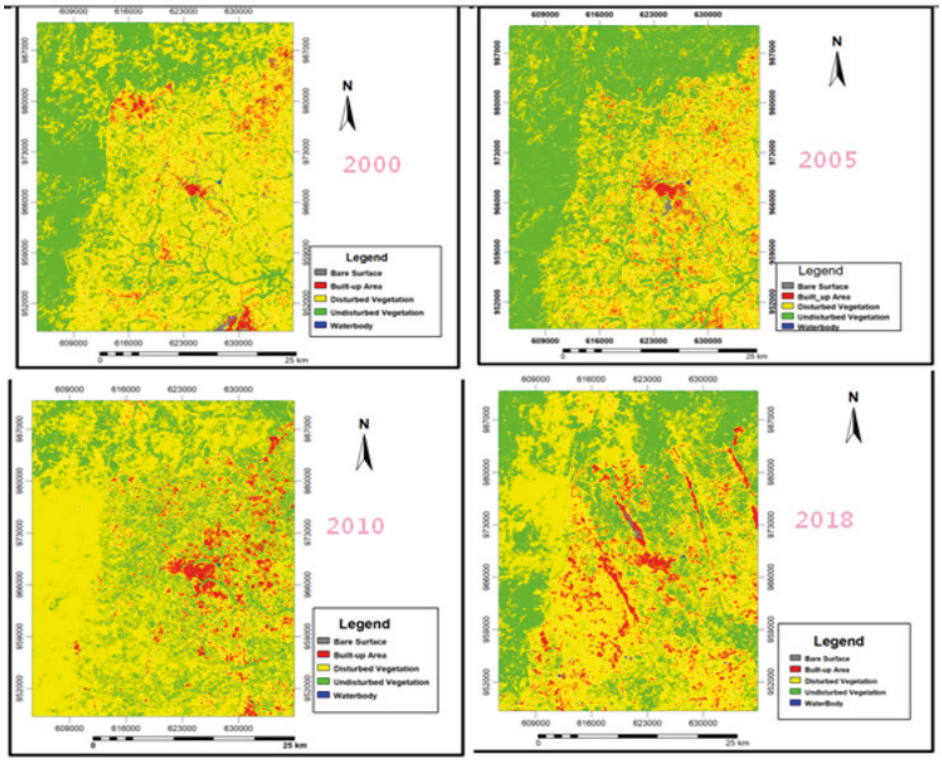

Figure 4: Land Cover of Olorunsogo in 2000, 2005, 2010, and 2018. Source: Author, 2019

Table 4: Spatial Changes in Land cover between 2000 and 2005. Source: Author, 2018.

Land cover	2000 (KM^2)	2005 (KM^2)	Magnitude of change	Frequency of Change	Percentage of Change
Built-up	65.25	91.03	28.78	5.76	44.11
Bare Surface	15.08	13.64	-1.44	-0.29	-9.55
Sec..Vegetation	927.35	770.46	-156.89	-31.38	-16.92
Pri.Vegetation	380.22	512.89	132.67	26.54	34.89
Water Body	0.38	0.26	-0.12	-0.02	- 31.57
Total	1388.28	1388.28	3.0	0.65	20.96

It can also be deduced that land reclamation is not uncommon in this area as physical developments progresses and this has resulted in a decline in the areas coverage of water bodies.

Table 5: Spatial Changes in Land cover between 2005 and 2010.Source: Author, 2018.

Land cover	2005 (KM^2)	2010 (KM^2)	Magnitude of change	Frequency of Change	Percentage of Change
Built-up areas	91.03	102.46	11.43	2.29	12.57
Bare Surface	13.64	2.78	-10.86	-2.17	-79.62
Disturbed Veg.	770.46	1042.02	271.56	35.25	35.25
Undisturbed Veg.	512.89	240.72	-272.17	-54.44	-53.07
Water Body	0.26	0.29	0.03	0.006	11.54
Total	1388.28	1388.28	-0.01	-19.06	-73.33

In table 5, a total of 271.56 km^2vegetal covers were lost between 2005 and 2010 with an annual decline of 35.25Km^2 within the period. The increase in the land area of secondary veg-

etation between 2005 and 2010 can be attributed to anthropogenic activities in the local government area which include deforestation for charcoal production, fuel wood, and lumbering for physical development. The land area of undisturbed primary vegetation also declined due to the anthropogenic activities in the area between 2005 and 2010. A total of 54.44km^2 of the primary vegetation were lost annually in the area, with a magnitude of change of -272.17km^2.

Table 6: Spatial Changes in Land cover between 2010 and 2018.

Land cover	2010 (KM^2)	2018 (KM^2)	Magnitude of change	Frequency of Change	Percentage of Change
Built-up	102.46	119.25	16.79	2.10	16.39
Bare Surface	2.78	4.10	1.32	0.17	47.48
Disturbed Veg.	1042.02	1058.83	16.81	2.10	1.61
Undisturbed Veg.	240.72	205.15	-35.57	-4.45	-14.78
Water Body	0.29	0.94	0.65	0.08	224.14
Total	1388.28	1388.28			

Source: Author, 2018.

Between 2010 and 2018 in table 6, an increase in anthropogenic activities, population growth and quest for space for physical development can be attributed to the increase in bare surface degraded lands. The bare surfaces/ degraded lands increased to 1.32km^2. A further increase was observed for secondary vegetation area; with an annual increase of 2.10km^2 between 2010 and 2018. Between 2010 and 2018, a total land area of 4.45km^2 was lost to anthropogenic activities (charcoal and fuel wood) annually in the study area. The analysis of the NDVI of the LGA was carried out for the year 2000, 2005, 2010 and 2018 is as depicted in figure 5 to further reveal the impact of deforestation in the area.

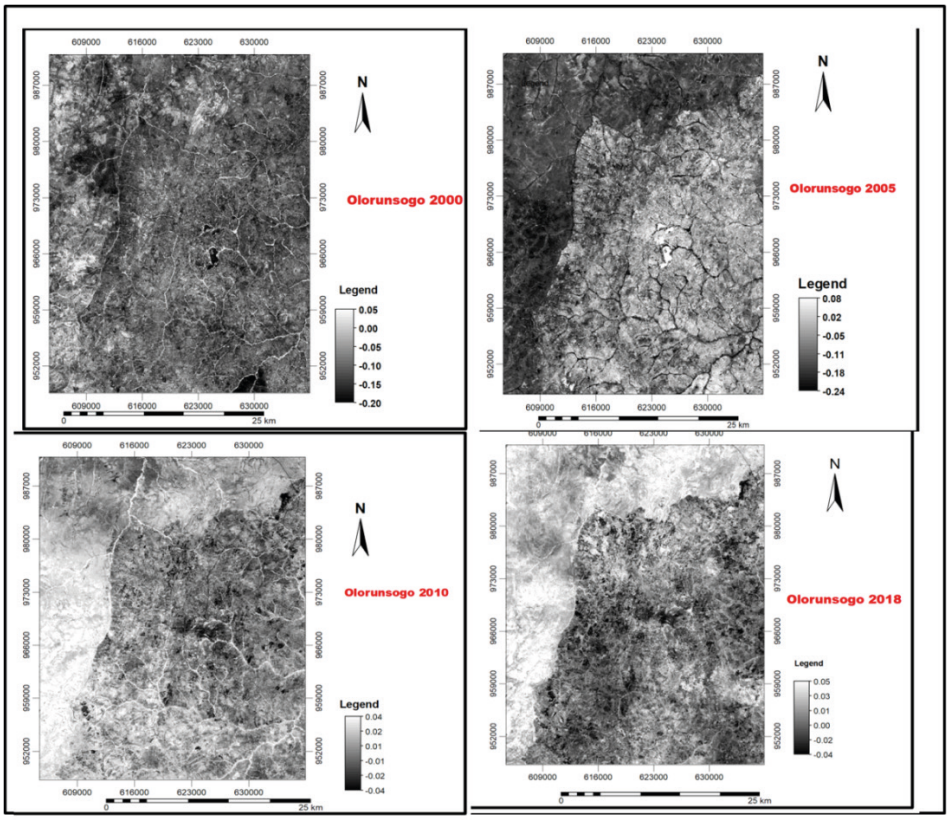

Figure 5: NDVI for Olorunsogo in 2000, 2005, 2010 and 2018. Source: Author's 2019.

In the year 2000, the NDVI result range from – 0.58 to + 0.35. The analysis revealed that the unhealthy vegetated surfaces range from - 0.58 to - 0.01, while the vegetated surfaces range from + 0.01 to + 0.35. This result shows that a substantial level of greenness was observed in the area. The 2000 image analysis also revealed that 16.61Km^2 of the area are without vegetation, but a slight change was however recorded in 2005. The value of the NDVI within this period (2005) range from - 0.44 to + 0.33, the value of the unhealthy vegetated area range from - 0.44 to - 0.01 while the value of the vegetated area range from +0.01 to +0.33. The increase in the anthropogenic activities (bush burning, deforestation for fuel wood and charcoal) also translated into the increase in the areas with no vegetation. A total of 34.68km^2 of the area are without vegetation in the year 2005. The NDVI value for the year 2010 range from - 0.13 to + 0.01, this result shows a decrease in green vegetation. The NDVI of 2010 recorded a value of - 0.13 to - 0.01 for unhealthy vegetation, while the vegetated area ranges from +0.01 to + 0.07. A drastic increase in the areas of non vegetation was recorded within this period as the non-vegetated area increased from 34.68Km^2 in 2005 to 263.53Km^2 in 2010. These results show that these LGAs are fast losing their lush vegetation due to consistent increase of anthropogenic activities. Although, the non-vegetated area declined slightly with a land area of 194.79Km^2 in 2018, the lushness is still not substantial. The analysis revealed that the vegetated area range from + 0.01 to + 0.08 while the unhealthy Vegetation range from - 0.14 to 0.01. The NDVI value of -0.14 to +0.08 was recorded in 2018.

4. Discussions

In Nigeria and sub Sahara Africa, poverty is the bane of environmental degradation and domestic energy policy formation that price kerosene and cooking gas beyond the common man affordability aggravate the demand for and sales of fuel wood in the urban centres. Poverty constrained options often induce the poor to deplete resources at rates that are incompatible with long term sustainability (Holden *et. al.,* 2004). Studies revealed that a percentage increase in the knowledge of environmental conservation has the tendency of decreasing poverty by 46% among the farmers. It has also been argued that, the high proportion of the ill informed local communities on the adoption of appropriate land management technologies and the poor coordination of extension services in the country is the major challenge (Maiangwa *et al*. 2007). Also in the work of Lacaux, et al., (1994), charcoal kiln emission ratio of CO, CH4, NMHC, and NH3 to CO2 are larger than those from savannah bush burning because CO, CH4, NMHC have much higher global warming potential than CO2. In term of migration from fuel wood and charcoal to Cooking Gas utilization in the country, Nigeria is among the most backward. Although, world's top ten countries in terms of natural gas proven reserves, over 180 trillion cubic feet ((NNPC 2015, World Energy Review 2015), world's top five exporters of liquefied natural gas (LNG) and a major supplier to the West African Gas Pipeline (WAPCo) (Pesaran, Shin, and Smith, 2001.). With the commissioning of the West Africa Gas Pipeline (WAGP) in 2011, the country is yet to fully utilize the Global Gas Flaring Reduction Partnership (GGFR). (Onolemhemhen et al, 2017). The however commenced exportation of gas to neighbouring Ghana with plans to extend delivery to Benin and Togo as well (Delano, 2014), yet the domestic gas utilization in the country is far below average. The major challenging issue is the affordability of the product where the average price for the refilling a 12.5kg cylinder for Liquefied Petroleum Gas (Cooking Gas) is about $18.25 (₦7500). Apart from petrol (PMS) for vehicles, Kerosene is the most widely used in the country for lighting and cooking in both rural and urban areas. Kerosene is often seen as poor man's fuel but ironically in the Nigeria, is the most priced atUSD0.973 EUR0.838 $0.86 (₦4000.00) per litre (National Household Kerosene Price Watch, 2018). This situation has forced millions of

Nigerians into the use of fuel wood and charcoal as substitute. This of cause is detrimental to sustainable environment.

4.1 The prospect of DRR in Nigeria

Globally, there is growing realisation that countries and communities need to place more emphasis on a holistic approach to Disaster Risk Reduction (DRR) as against DRM. DRR approaches should generally involve; risk assessment, risk reduction, early warning and disaster preparedness if and only-if the socioeconomic and environmental costs of disasters will be effectively reduced. Disaster risk can be calculated as the interaction between the probability of a hazard occurring and the vulnerability of a community to the hazard ,together with the capacity of the community to cope with and recover from a disaster The elements that formulate disaster risk for a community are expressed in the following risk equation:

$$\text{Risk} = \frac{\text{Hazard x Vulnerability}}{\text{Capacity}}$$

Risk: The probability of a disaster occurring.

Hazard: A potentially damaging physical event, phenomenon or human activity which may lead to a disaster.

Vulnerability: A set of conditions and processes (physical, social, economic and environmental) that increase the susceptibility of a community to the impact of hazards.

Capacity : A combination of all the strengths and resources available within a community that can reduce the level of risk or the effects of a disaster.

Risk perception in rural areas of Nigeria is relatively low and this is not unconnected to the poor socioeconomic characteristics of the people. The poor infrastructural facilities and low economic generating activities exacerbated the proneness of the communities to poverty related environmental hazards. Fuel wood and Charcoal production in the South-Western parts of Nigeria increases because there is a total neglect of cash crops like Cocoa, Coffee Cola-nut and rubber tree. The rural famers and the able bodies who are not gainfully employed engaged in illegal lumbering and Charcoal business as a way of self-employment as also observed in the work of Otu-Danquah, (2010).

5.Conclusion

Environmental degradation and disasters intertwine with community poverty and deprivations in all its forms. The gains of any community or national development are usually eroded by the impacts of poverty and disaster occurrences and that is the feature of most Sub Saharan countries like Nigeria where access to domestic energy supply is beyond the reach of the common populace. The need for sustainable development and its allied programmes like Green Development, Green Infrastructure, Green Financing, Clean Air Act, Resilient City, Smart City and DRR are the key issues raised in the just concluded COP26 at Glasgow. Leaders of developing countries of the world and particularly Nigeria cannot but reprioritize their environmental policy implementation with more inclusiveness in the adoption of Strategic Environmental Analysis (SEA) if SDG and COP26 goals will not be a mirage to them.

5.Recommendations

International organizations and researchers have established the fact that poverty reduction and development initiatives must be integrated into DRR for sustainable development. The primary mission of the UNDP is to assist developing countries in poverty reduction through variety of initiatives and structures. The following are some of the recommendation for this part of Nigeria and other African countries:

- There is an urgent need for strong advocacy drive for every community to embrace agro-forestry. The State Government in conjunction with the local authority should come up with simple inclusive rules and regulations governing the use of existing natural forests resources. This will ensure a systematic harvest and or felling of forest resources.
- There is the need to introduce environmental aid programme with political-will that will abate environmental degradation and accelerate economic growth. This will promote environmental-friendly development among the rural poor.
- Grassroots education and awareness raising on the potential risks inherent in deforestation and motivation for changes in collective behaviour to reduce risks;
- There should be practical understanding and taking action to mitigate socioeconomic conditions that create the vulnerability of those communities;
- Develop disaster preparedness plans that cover both emergency management and recovery from potential disaster in the region with hazard monitoring systems and early warning indicators.

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