

Impact of Environmental Degradation on Livelihoods in the Coastal Areas of South West, Nigeria

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Abstract

Various forms of environmental degradation in the coastal areas have affected the livelihoods of coastal inhabitants. The aim of this study is to examine the impact of environmental degradation on livelihoods in the coastal areas of southwest Nigeria putting into consideration the various ecological zones in which the surveyed communities within the study area are located. Primary and secondary data were collected, and then descriptive, inferential as well as cartographic analysis was used in interpreting the data. Result shows that flooding is the main environmental problem that affects the livelihoods of inhabitants in the three ecological zones. There is a spatial variation in the impact of environmental degradation on the livelihoods of people over space ($p < 0.05$). However, environmental degradation has no impact on livelihood on the coastal inhabitants within the mangrove ecological zone ($p > 0.05$). The study concludes that the downturns in livelihoods arise from the degradation of the environment.

Keywords: Environmental degradation; Impact; Livelihood; Coastal areas; Nigeria

Introduction

Environmental degradation would remain an important global issue for the 21st century because of its adverse impact on agronomic productivity, food security and quality of life [1]. Getachew and Demele [2] hold the most pressing environmental problems in the least developed countries are prevalent in rural areas, where the bulk of the populations live and whose livelihood depends on agriculture and related activities. Izibili [3] stated that no doubt, damage to the environment is no respecter of frontiers, and damage done to one generation has the consequence of affecting the future generation. Based on this and many salient issues within the context of environmental degradation, Reynolds Stafford-Smith and Lambin [4] stated that a major environmental challenge of the 21st century is environmental degradation; it adversely affects the sustainable relationship between ecosystems and the livelihoods of people worldwide. Environmental degradation is not a new thing; it has been happening all over the world for centuries. The problem is that it is now occurring at a much faster rate, therefore not leaving enough time for the environment to recover and regenerate [5].

The biggest threat to the coastal resources in Nigeria therefore, is poverty, through land base activities [6]; as the resources remain their main cheap sources of food and income. In Nigeria, as at 1997 there were 5,081 plants species, out of which 0.40% are threatened and 8.5% endangered; 22,090 animal species (20,000 being insects), 0.14% of which are threatened and 0.22% endangered and 1,498 species of microorganism. Given their biological, biochemical, medicinal, sociological, and economic as well as aesthetics value, humankind must ensure that these resources are adequately protected as essential component of the natural restoration process in the coastal environment [7]. The current pace of environmental change in Nigeria prompted partly by degradation continues at an alarming proportion [8].

A considerable number of studies have dealt with coastal livelihoods and coping strategies [9-14]. However, perception of the impact of environmental degradation on coastal livelihoods has received little or no attention. This study is designed to fill this gap. The aim of this study is to analyse perception of the impacts of environmental degradation on livelihoods in the coastal areas of south west, Nigeria, and to achieve this aim, the study examined pattern of most perceived severe impact

of environmental degradation on major livelihood, the impact of most severe environmental degradation on subsidiary livelihood and major livelihoods and most severe environmental problems affecting the study area.

Materials and Methods

Two sources of data were used in this study. These are primary and secondary sources. Questionnaire survey and Focus Group Discussions (FGD) were used as the main instruments for primary data collection, while secondary data were collected from various NPC 2006. Fifty-six (56) settlements were sampled from west to east along the coastline and between zero and ten kilometres away from the coast putting at the same time into consideration the ecological zones. The numbers of coastal settlements were acquired from 2015 satellite imagery produced by Google Earth and confirmed from existing maps of the study area and the names of the settlements were extracted from existing maps of the study area. The coastal boundary shown on the imagery was digitized and over-laid with the existing administrative maps of the concerned states and as well as the ecological map of the coastal area with the aid of ArcGIS. In addition, the population data of all the localities of each states within the study area was collected from the National Population Commission office of the respective states. The sample frame for this study is 150,062 [15]. Yamane [16] sampling formula was used to calculate the sample size of seven hundred and eighty-two (1,782). Table 1 indicates the selected communities across the study area, their population size and the number of questionnaires allocated in each settlement.

The focus group discussions were carried out among representative youths and the elderly ones in all the sampled community. Information

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S/N	Settlement	Population	Population in % of total	Sampled population size
	Abalala	1,189	0.8	14
	Aboto	5,017	3.3	59
	Ago Iba	2,112	1.4	25
	Agonu	290	0.2	4
	Ajido	3,357	2.2	39
	Akarakumo	575	0.4	7
	Aradagun	399	0.3	5
	Araromi	5,505	3.7	66
	Araromi Obu	592	0.4	7
	Araromi Oke	565	0.4	7
	Ayetoro	4,994	3.3	59
	Badagry	23,959	16.0	286
	Badore	501	0.3	5
	Ebaa	2,942	2.0	36
	Ebute Lekki	230	0.2	4
	Egan	279	0.2	4
	Etikan	1,474	1.0	18
	Ganyingbo	153	0.1	2
	Gbabijo	4,168	2.8	50
	Ibasa	376	0.3	5
	Iberekò	11,564	7.7	138
	Ibese	2,069	1.4	25
	Idiogba	5,544	3.7	66
	Igbede	3,621	2.4	43
	Igbogbele	712	0.5	9
	Igbokoda	4,918	3.3	59
	Ijo Odo	2,862	1.9	34
	Ikare	591	0.4	7
	Ilasa	1,808	1.2	21
	Ilepete	13,561	9.0	161
	Ipare	1,507	1.0	18
	Isagira	693	0.5	9
	Isekun	317	0.2	4
	Ito Omu	148	0.1	2
	Itoga	430	0.3	5
	Iyafin Isalu	503	0.3	5
	Iyagbe	781	0.5	9
	Kesumetta	322	0.2	4
	Kweme	717	0.5	9
	Ladeba	242	0.2	4
	Makun	1,658	1.1	20
	Obe Nla	4,918	3.3	59
	Ode-Mahin	5,429	3.6	64
	Okun Ibese	962	0.6	11
	Oloja	1,029	0.7	13
	Olokata	1,254	0.8	14
	Olopo	686	0.5	9
	Olotu/Eruna	1,400	0.9	16
	Olute	6,861	4.6	82
	Panko	131	0.1	2
	Ropoji	302	0.2	4
	Topo	3,750	2.5	45
	Toga	3,738	2.5	45
	Ugbonla	4,893	3.3	59
	Wasere	355	0.2	4
	Yaye	1,109	0.7	13
	Total	150,062	100.0	1789

Source: Settlement: Satellite Imagery Produced by Google Earth (2015)
 Population (NPC, 2006)
 Sample size calculated by the Author (2018)

Table 1: Population size from each sampled settlement.

provided by the elders were essentially to get a historic background of environmental degradation in each settlement, while the youth who are directly involved in the economic activities of the coastal areas provided information on how environmental degradation affects their livelihoods. A digital tape recorder and a camera were used to capture the verbal and visual expressions of participants, which, along with the notes taken during the discussion, helped to transcribe the interviews. In addition, pictures of some environmental problems were also taken. Both descriptive (frequencies, percentages and charts) and inferential statistics (chi square tests) were used to analyse the data at $p \leq 0.5$ significance level.

Study area

The study area (south western coastal area of Nigeria) stretches from Nigeria/Benin Republic border and terminates at the Ondo-Edo border (part of Niger-Delta Region). It lies approximately between latitude 6°10' to 6°50'N and longitude 2°45' to 6°09'E. The study area cuts across three states (Lagos, Ogun and Ondo states) of the eight coastal states of Nigeria. It is about 324 km long, which is 33.6% of the nation's coastline of 963km [17]. This is presented in Table 2. The south west area of Nigeria has a coastline of about 324km (Lagos 171km, Ogun 69km and Ondo 84km), a large area of inshore waters, and a vast inland system comprising natural and man-made lakes, rivers, creeks, lagoons and wetlands all of which support a good variety of fisheries. Thus, artisanal fisheries occupy a very significant position in the economy providing employment for over 200,000 people and supplying about 70% of the total local production of about 100,000 metric tons [18]. It influences the quality of lives of various groups through supplying 58% of per capita animal protein intake and engagement in fishing and allied occupations as primary or secondary source of income [19] (Figure 1).

Results and Discussion

Pattern of impact of most perceived severe environmental degradation on major livelihood

The spatial pattern of environmental degradation shows that flooding is the most prominent environmental degradation problem that cuts across the settlements (Table 3). Flooding as an environmental problem was reported as most severe by about 63% of the respondents and 68% of the communities during focus group discussions. Nevertheless, the effect of flooding cannot be over emphasized as it affects livelihoods. For those communities whose major livelihood is fishing such as Ibese, they disclosed that daily rise in tides does not affect their daily activities. Nonetheless, seasonal high tides accompanied by heavy down pour most of the time displaces them away from their fishing sites. In the words of Ibese community discussants:

Flooding disrupts our livelihood activities. When the flooding is the

normal daily inflow of water caused by rise in tides, the impact is not felt as much as when it is a flash flood caused by heavy rainfall. During flash floods, all activities will be paralyzed. Even our main fishing activity will be suspended because when the rain is heavy, it can easily carry people away, though water don't carry our people because we are all "fish", that is 90% of us living here can swim (28/10/2016).

Communities like Ijo Odo also considered the effect of flooding on fishing from another perspective. The discussants said most of the fish in their water cannot survive saline water. Flooding in the community causes saline water inundation in small lakes and ponds that are breeding ground for varieties of fishes and other aquatic fauna, which serves as means of livelihood to majority of the inhabitants, and when this happens, most of the fishes cannot survive. Such cases are entirely opposite in Egan community. Though they consider flooding as the most severe environmental problem that affects the community, and fishing their major livelihood in the community, they still feel flood occurrence is an advantage to them as it brings in various species of fish to their own waterside. In the words of Egan community discussants:

Flooding is a blessing to us because increase in water level brings about plenty catch of fish. During flooding, we get big fish, and some other rare species of aquatic animals. We sell those things and it brings us good money (24/10/2016)

Although the impact of flooding is an advantage on Egan fishing community, the adverse effect across most of the settlements still outweighs the advantage thereof. Some of the adverse effects include washing away of fishing nets that has previously been set inside water, destruction of fishing gears and boats, washing away of both adult and juvenile fishes, salinization which makes fishes that that survive saline water die off, threat to the fishermen as stormy waves can carry them, among others. Impact of flooding on farming among the settlements also differs from one settlement to another. To those engaged in animal rearing in communities such as Araromi Oke, Igbede, flooding when too severe carry away livestock such as poultry, goats and sheep. In addition, to crop farmers, flooding reduces the eventual yield they get from the farmland. It also leaches the soil thereby making it deficient in nutrients. In the words of Igbede community discussants:

Flood carries away our crops, animals, poultry and even our properties if care is not taken. The flooding makes our crops rot. Therefore, we will not be able to harvest them. If also spoil the soil by washing away all the nutrients and fertilizers, we have applied earlier. The other issue is that you see some nutrients that are washed away ends up in the river in form of chemicals and kill the aquatic animals. Therefore, getting potable water to drink and cook from the river then becomes a major challenge (27/10/2016).

Selling of farm produce also becomes a major challenge when flooding

State	Length of coastline in km	% of total coastline
Lagos	171	17.76
Ogun	69	7.17
Ondo	84	8.72
Delta	117	12.15
Bayelsa	186	19.31
Rivers	111	11.53
Akwalbom	96	9.97
Cross rivers	129	13.40
Total	963	100

Source: Falade (2010).

Table 2: Coastlines of Nigeria by states.

Settlements	Major livelihood of each settlement	Perceived most severe environmental degradation	Impact
Abealala, Aboto, Ago Iba, Agonu, , Araromi, , Ebaa, Ganyingbo, Egan, Gbabijo, Ibese, Idiogba, Igbokoda, Ijo Odo, Ito Omu, Itoga, Ode- Mahin, Oloja, Olopo, Olotu/Erana, Panko, Ugbonla, Wasere, Yaye	Fishing	Flooding	For those that fish, they get less or no catch whenever the creek is flooded. Wash fishes away from the water. Flooding is an advantage for Egan
Araromi Oke, Igbede, Igbogbele, Isagira, Kweme, Ladeba,	Farming		The flood affects the farmers especially when it enters the farmlands and carries the crops away
Aradagun, Badagry Town, Ibereko, Iyafinlsalu, Ropoji, Toga, Topo,	Trading		Shops and trading spots are usually filled up with water when rain falls.
Ibasa	Water transportation		Getting out of livelihood especially when the sea waves are high and dangerous
Ajido, Akarakumo, Araromi Obu, Badore, Ebute Lekki, Ilasa, Isekun, Kesumetta, Makun, Okun Ibese, Olute	Fishing	Water hyacinth invasion	-It covers the creek and destroys the aquatic animals because it does not allow sufficient oxygen to reach the aquatic animals. -Affects fishing by blocking nets from catching fish. Nets catch hyacinths instead of fish. -It spoils fishing boats by destroying the propellers. -It makes the water smelly after the hyacinths must have decayed and sank
Ikaare	Trading		-It makes the boat journey to the market where sales take place slow. The boat drivers keep dodging it so that it will not affect the engine. -It pollutes the environment mainly when water waves brings it out and deposit it in front of stalls especially when the stalls are located close to the bank of the water
Etikan, Ilepete, Obenla	Fishing	Oil pollution	-The oil that floats on the water has made it inhabitable for fish. Hence, the original activity this town was known for has been paralyzed. Oil spillage makes the fish in the adjoining river to die or they move to other water bodies, this then leads to low catch thus low income.
Ayetoro	Fishing	Coastal erosion	-The shoreline has been retreated by the action of coastal erosion occasioned by tidal waves and ocean surge. The effect of this on the community's major livelihood, which is fishing, is that there has been a drastic reduction in fish yields. This was aggravated due to higher and stronger tide, incursion of saline waters, and sedimentation of fishing grounds along the continental shelf.
Ipare	Fishing	Sand dredging	Sand dredging makes fishing difficult. The number of catch per day keeps reducing, thus there is a resultant effect on welfare.

Source: Analysis of Author's Field Survey Data

Table 3: Impact of most severe environmental problem on major livelihood of the settlements.

occurs. People tend not to visit markets to buy things during flood events; therefore, farm products that are mostly perishable are spoilt. Concerning trading, the people of Aradagun, Badagry, Ibereko, and other communities where trading is the dominant livelihood, complained about movement to market stalls, markets being filled with water, goods getting soaked up in water and eventually getting spoilt, infestation of mosquitoes and other dangerous animals, and low patronage. All these affect their livelihoods and reduce the standard of living. As for the water transporters the daily high tide were said to be normal and they are used to it, but they try to avoid going on the sea when there is seasonal flooding because the impact is always more disastrous, as waves can easily destabilize the boats or even capsize it. The discussants in the communities such as Ibasa also made the point that flooding makes people stay back at home, so they do not always have people to transport from one place to another. They also mentioned it that unlike communities that are mainly into fishing who will get completely out of livelihood during flood events, their own case is not like that, as they can help people move within the community using their small boats. In the words of Ibasa community discussants:

When flooding occurs, water takes over the whole community, that is when we bring out our canoes and paddle, and we help people move on land that has been taken over by water, until the water dries off. We don't go over the sea during flooding; we will rather make our livelihood on land (24/10/2016).

The spatial impact of water hyacinths in locations where it is the most severe is not the same, depending on the particular livelihood it affects. When it affects the fishermen, the complaint among them in Akarakumo is that it covers the creek and destroys the aquatic animals because it does not allow sufficient oxygen to reach the aquatic animals. In addition, discussants from Isekun and Olute said water hyacinths affects fishing by blocking nets from catching fish that is, nets catch hyacinths instead of fish. Also, just like the discussants from Badore opined that hyacinths spoils fishing boats by destroying the propellers those in Ajido feels it makes the water smelly after the hyacinths must have decayed and sank. According to the traders, water hyacinths make their journey to the markets or shops slowly. This is because the boat riders will always avoid it but once it hooks the propeller of the boat, then the boat will not be able to move again. Thus, their journey becomes hampered. In addition, the hyacinth makes the environment dirty especially when tides move it out to where shop sites are.

Oil pollution also as an environmental degradation type affects Etikan, Ilepete and Obenla fishing communities in similar ways. Those of Obenla reinstated that it has eventually made them leave their original livelihood, which is fishing.

In their words: *The oil that floats on the water has made it inhabitable for fish. Hence, the original activity this town was known for has been paralyzed (30/10/2016).*

They further explained that when there is oil on water bodies, it blocks off the penetration of oxygen into the water. The aquatic animal present in there will not be able to survive. In addition, oil is always poisonous to fish, thus it can easily kill the juvenile fishes and the matured ones.

Coastal erosion, which is the most severe environmental problem that affects Ayetoro, has affected the community's major livelihood, which is fishing. The shoreline has been retreated by the action of coastal erosion caused by tidal waves and ocean surge. The effect of this on the community's major livelihood, which is fishing, is that there has been a drastic reduction in fish yields. This was aggravated due to higher and stronger tide, incursion of saline waters, and sedimentation of fishing grounds along the continental shelf. Sand dredging which is most severe in Ipare also has serious effects on the community's major livelihood, which is fishing. The discussants in the community said sand dredging makes fishing difficult. Fish will always move into deep areas where sand had been mined out. Thus, it makes catching difficult. Also, over time, fishes feel threatened with continuous sand mining and their number are reduced. The number of catch per day keeps reducing, thus there is a resultant effect on welfare.

At the ecological level, as seen in Table 4, the same is the case as flooding remains the major environmental problem affecting livelihoods. Deforestation/mangrove degradation has no affect whatsoever on the livelihoods of the respondents both at the overall level and the ecological zone level. Thus, more emphasis can now be laid on flooding as the prevalent environmental degradation in the study area.

Test of Hypothesis: Variation in the impact of environmental degradation on livelihoods

The test of impact of environmental degradation on major livelihood as shown in Table 5 was with a Chi value of 55.341 at a degree of freedom of 7, $P < 0.05$ indicates that environmental degradation has significant impact on major livelihoods. Thus, the hypothesis that

environmental degradation has a significant impact on household livelihoods is accepted. This is not surprising on the heels that all the diverse environmental challenges that were perceived and indicated in the coastal community's understudy affects one livelihood or the other. Flooding and erosion threaten lives and properties by destroying goods and properties, washing away of fishes, leaching of soil and making roads impassable. Fishermen and water transporters mostly feel the impact of water hyacinths. Sand dredging is a threat to fishing activity while pollution especially the open dump site affects business patronage, and so on.

With a Chi value of 35.505 at a degree of freedom of 7, $P < 0.05$ in the strand, thick and forest ecological zone, 19.775 at a degree of freedom of 6, $P < 0.05$ in the deltaic ecological zone indicates that environmental degradation has significant impact on major livelihoods in the two ecological zones. Thus, the hypothesis that environmental degradation has a significant impact on household livelihoods is accepted. A different case was established in the mangrove ecological zone, which came out with a Chi value of 5.625 at a degree of freedom of 4, $P > 0.05$. This implies that hypothesis that environmental degradation has a significant impact on household livelihoods is rejected. Thus, environmental degradation has no impact on livelihood on the inhabitants in the mangrove ecological zone (Table 6).

Impact of most severe environmental degradation on subsidiary livelihood

Flooding remains the most dominant problem affecting the various subsidiary livelihoods being engaged in by the coastal inhabitants. This can be seen from Figure 2. About sixty-six percent of those involved in fishing and its related activities indicated flooding as the environmental problem they face. They indicated that flood carries away all the fish they should catch. Farmers also followed suit as 76.2% of them said flooding affects their farmlands the most as it destroys their crops, leaches the soil and leads to reduced quality and quantity of harvested

Variables	Strand	Deltaic Swamp	Mangrove
Coastal erosion	6.8	16.2	9.5
Flooding	69.0	56.8	55.2
Water hyacinth invasion	7.8	7.0	9.5
Deforestation/Mangrove degradation	-	-	-
Pollution	6.5	11.4	11.2
Soil infertility	5.3	2.2	6.9
Sand mining	3.2	2.7	5.2
Others	1.4	3.8	2.6
Total	100.0	100.0	100.0

Source: Analysis of Author's Field Survey Data (2018)

Table 4: Environmental problems affecting major livelihood in the ecological zones.

Variables	Yes	No
Coastal erosion	215 (67.2%)	105 (32.8%)
Flooding	667 (68.6%)	306 (31.4%)
Water hyacinth invasion	77 (73.3%)	28 (26.7%)
Deforestation / Mangrove degradation	0 (0.0%)	1 (100.0%)
Pollution	39 (38.6%)	62 (61.4%)
Soil infertility	2 (66.7%)	1 (33.3%)
Sand mining	10 (100.0%)	0 (0.0%)
Others	4 (28.6%)	10 (71.4%)
Total	1014 (66.4%)	513 (33.6%)

Source: Analysis of Author's Field Survey Data (2018)

Chi-Square Tests= 55.341; df= 7; p= 0.000

Table 5: Impact of environmental degradation on major livelihood across the location.

Variables	Strand, thick and forest ecological zone		Deltaic swamp ecological zone		Mangrove ecological zone	
	Yes	No	Yes	No	Yes	No
Coastal erosion	135 (67.8%)	64 (32.2%)	80 (66.1%)	41 (33.9%)	11 (64.7%)	6 (35.3%)
Flooding	492 (70.3%)	208 (29.7%)	175 (64.1%)	98 (35.9%)	48 (59.3%)	33 (40.7%)
Water hyacinth invasion	59 (75.6%)	19 (24.4%)	18 (66.7%)	9 (33.3%)	10 (76.9%)	3 (23.1%)
Deforestation / Mangrove degradation	0 (0.0%)	1 (100.0%)	-	-	-	-
Pollution	16 (38.1%)	26 (61.9%)	23 (39.0%)	36 (61.0%)	4 (44.4%)	5 (55.6%)
Soil infertility	1 (100.0%)	0 (0.0%)	1 (50.0%)	1 (50.0%)	-	-
Sand mining	8 (100.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)	-	-
Others	3 (33.3%)	6 (66.7%)	1 (20.0%)	4 (80.0%)	0 (0.0%)	2 (100.0%)
Total	714 (68.8%)	324 (31.2%)	300 (61.3%)	189 (38.7%)	73 (59.8%)	49 (40.2%)
	Chi-Square Tests= 32.505; df= 7; p= 0.000		Chi-Square Tests= 19.775; df= 6; p= 0.003		Chi-Square Tests= 5.625; df= 4; p= 0.229	

Source: Analysis of Author's Field Survey Data (2018)

Table 6: Impact of environmental degradation on major livelihood among different ecological zones.

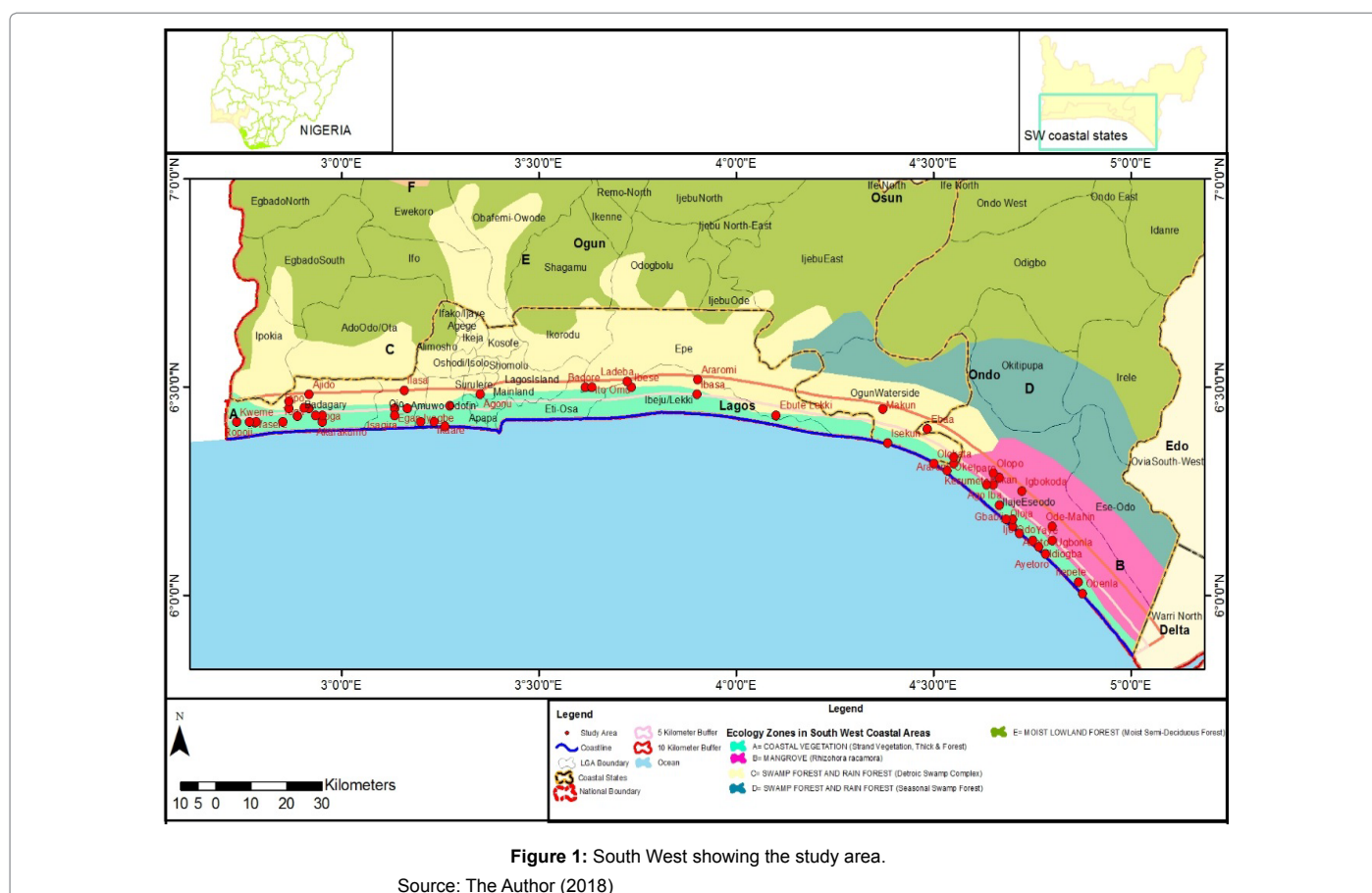


Figure 1: South West showing the study area.

Source: The Author (2018)

crops. Most (58.8%) of the respondents that are engaged in water transportation service also opined that flooding causes most of the problem they experience while about 29% indicated water hyacinth as the major problem they face because it spoils their boats' engine and increases maintenance cost.

The Lumbermen also majorly complained of flooding as it makes transportation of logged woods difficult and it inhibits their movement to the forest to cut trees. Respondents who mine sand as a subsidiary occupation mentioned flooding, water hyacinth invasion and pollution

as the environmental problems they face. However, a majority of 50% indicated flooding, because it washes away sand that has already being mined out of the water. Traders opined that flooding hinders their activity because it makes movement impossible to the market and floodwater fills up the market area. Those that hawk will not be able to do so because walking in the water is not easy. Civil servants said flooding makes going to work difficult because getting a vehicle or even boat is always not possible and transportation cost becomes high during flood period. The major effect flooding has on the artisans is that floodwater gives them no access to their point of sale, market, shops or

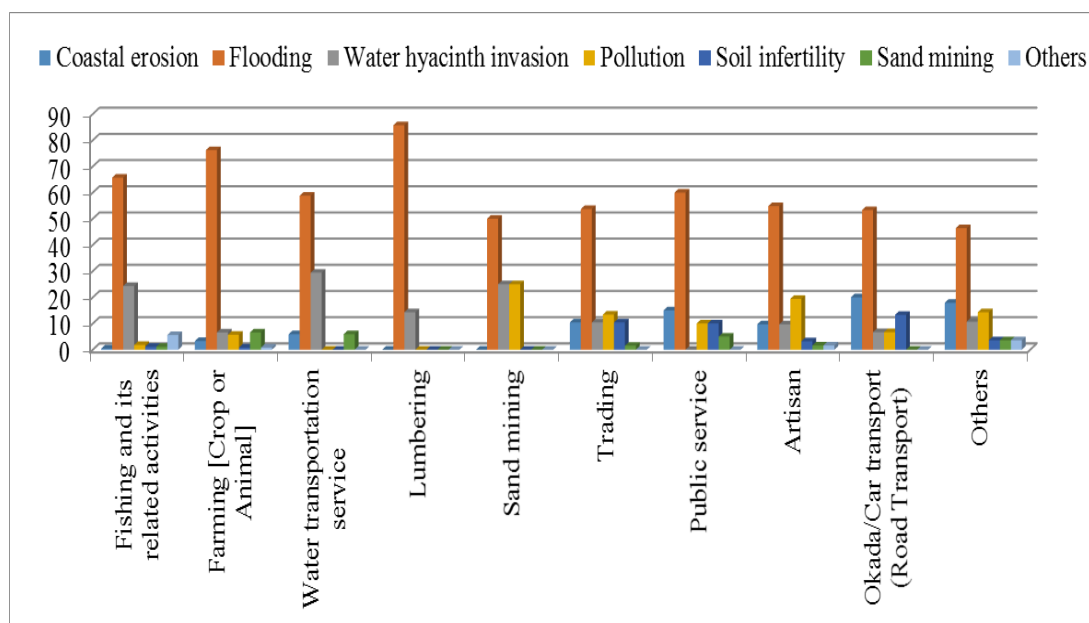


Figure 2: Subsidiary livelihoods and environmental problems affecting them.

Source: Analysis of Author's Field Survey Data (2018).

workshops. That is during flooding, every route that leads to the point where they carry out their economic activity gets covered up with water, thus it can be said that flood events do deny them job opportunities as they depend on wages from daily work. Respondents that are into road transportation services mostly complained also of flooding (53.3%). They said once the roads are flooded with water, it causes vehicular wear and tear, more fuel consumption and additional operating cost. They also said there is a monetary dimension to the flood impact on their livelihood. This happens if they choose not to move out; there will not be any income for them as they also survive on daily income. Another effect they made mention of during the Focus Group discussion was that due to lack of drainages, flood water becomes stagnant for too long on the roads, and this spoils the roads also.

Test of Hypothesis: Variation in the impact of environmental degradation on subsidiary livelihoods

As shown in Table 7, a Chi value of 11.769 and a degree of freedom of 5, $P < 0.05$ indicates that environmental degradation has significant impact on subsidiary livelihoods across the locations. Thus, the hypothesis that environmental degradation has a significant impact on subsidiary livelihoods is accepted. With a Chi value of 19.809 at a degree of freedom of 5, $P < 0.05$ indicates that environmental degradation has significant impact on subsidiary livelihoods in Strand, thick and forest ecological zone. In addition, environmental degradation has a significant impact on subsidiary livelihoods Deltaic swamp ecological zone (Chi value of 9.835 at a degree of freedom of 4, $P < 0.05$). However, environmental degradation has no significant impact on subsidiary livelihoods Mangrove ecological zone (Chi value of 9.391 at a degree of freedom of 3, $P > 0.05$) (Table 8).

Major livelihoods and most severe environmental problems affecting the study area

The precise environmental problem that affects every major livelihood can be seen from Figure 3. Here, it can be seen that the major

environmental problem affecting the artisans is flooding. The major effect flooding has on them is that floodwater gives them no access to their point of sale, market, shops or workshops. That is during flooding, every route that leads to the point where they carry out their economic activity gets covered up with water, thus it can be said that flood events do deny them job opportunities as they depend on wages from daily work.

Farmers in the coastal area are being faced with two major environmental challenges. These are flooding and soil infertility, but a greater percentage of 56.5% indicated flooding as the major problem that affects their livelihood. The main effect of flooding on farming is that it reduces the quality and quantity of harvested crops. From the focus group discussion conducted, the researcher was told that when floodwater enters into the farmlands, it either makes the soil water logged or washes away nutrients they have previously added to the soil. This in turn makes the crops they have planted yield low quality and quantity, or at times, the whole farm is washed away leaving them with no crop at all especially when crops grown are vegetables.

For respondents that are involved in fishing and its related activities, a greater percentage of about 60% indicated flooding as the main environmental problem that affects their livelihood. The effect of flooding can be felt by this category of people in diverse ways. This includes floodwater carrying all the fish away, hence fish scarcity; floodwater entering and destroying the sheds of those that sell and process fish; and then inability to hawk through floodwater by those who sell fish. Thus, those involved in fishing and its related activities do experience constant loss during flooding. The loss also includes destruction of the fishing implements and reduction in fish catches and consequently family income (Figures 4-6).

Lumbering as an activity in which only 2.1% of the respondents are engaged in as their major occupation, is also being faced with its own challenges majorly caused by flooding. During the focus group discussion, the lumbermen explained that during flooding, going to the

Variables	Whole study area	
	Yes	No
Coastal erosion	1 (12.5%)	7 (87.5%)
Flooding	42 (47.2%)	47 (52.8%)
Water hyacinth invasion	24 (43.6%)	31 (56.4%)
Pollution	4 (18.2%)	18 (81.8%)
Soil infertility	4 (22.2%)	14 (77.8%)
Sand mining	10 (45.5%)	12 (54.5%)
Total	85 (39.7%)	129 (60.3%)
Chi-Square Tests= 11.769; df= 5; p= 0.038		

Source: Analysis of Author's Field Survey Data (2018)

Table 7: Impact of environmental degradation on subsidiary livelihood across location.

Variables	Strand, thick and forest ecological zone		Deltaic swamp ecological zone		Mangrove ecological zone	
	Yes	No	Yes	No	Yes	No
Coastal erosion	27 (38.0%)	44 (62.0%)	15 (36.6%)	26 (63.4%)	2 (28.6%)	5 (71.4%)
Flooding	93 (48.2%)	100 (51.8%)	38 (46.9%)	43 (53.1%)	10 (50.0%)	10 (50.0%)
Water hyacinth invasion	7 (23.3%)	23 (76.7%)	3 (30.0%)	7 (70.0%)	1 (20.0%)	4 (80.0%)
Pollution	1 (7.7%)	12 (92.3%)	1 (6.7%)	14 (93.3%)	0 (0.0%)	2 (100.0%)
Sand mining	0 (0.0%)	5 (100.0%)	0 (0.0%)	1 (100.0%)	-	-
Others	0 (0.0%)	3 (100.0%)	-	-	-	-
Total	128 (40.6%)	187 (59.4%)	57 (38.5%)	91 (61.5%)	13 (38.2%)	21 (61.8%)
Chi-Square Tests= 19.809; df= 5; p= 0.038		Chi-Square Tests=9.835; df= 4; p= 0.043		Chi-Square Tests=3.391; df= 3; p= 0.335		

Source: Analysis of Author's Field Survey Data (2018)

Table 8: Impact of environmental degradation on subsidiary livelihood among different ecological zones.

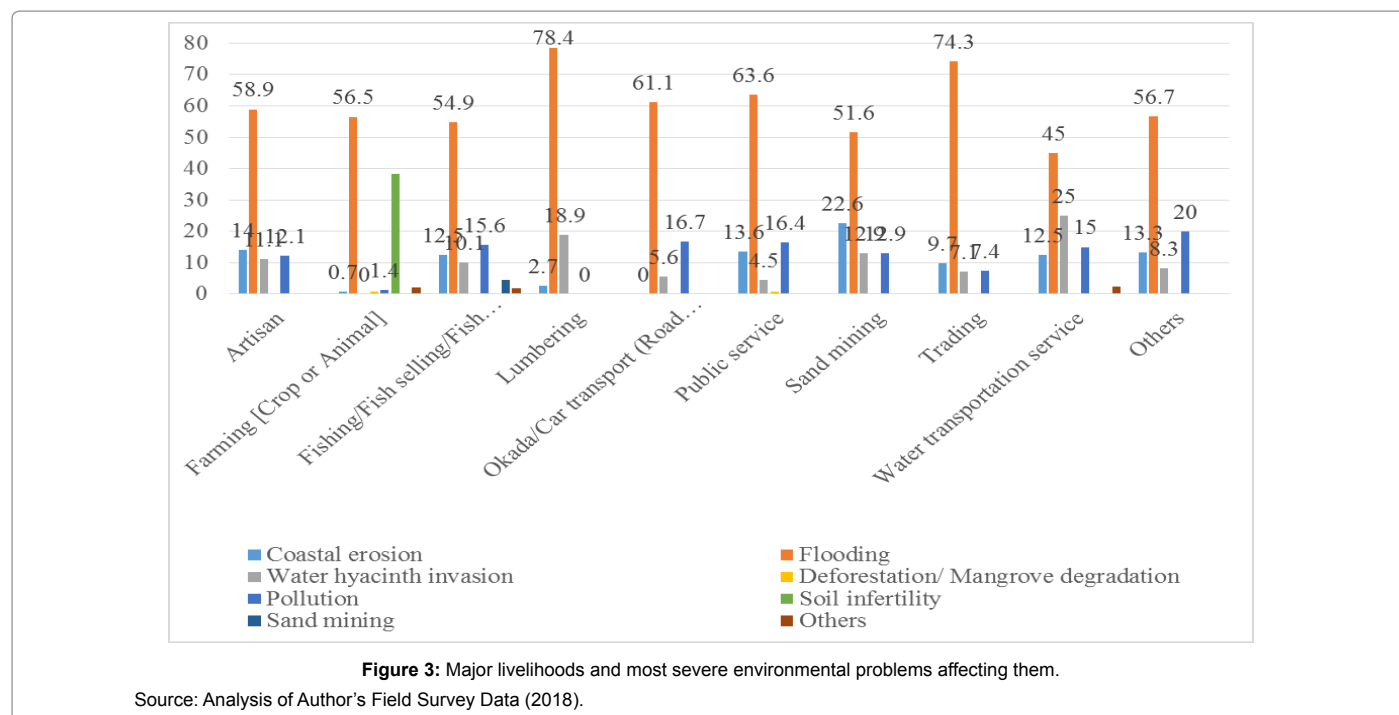


Figure 3: Major livelihoods and most severe environmental problems affecting them.

Source: Analysis of Author's Field Survey Data (2018).

forest where they always get trees to cut is always difficult. In addition, transporting logs that had previously being fell also becomes difficult whenever there is flooding. Thus, this leads to low or no income during the period of flooding. Respondents that are into road transportation services mostly complained also of flooding (75%). They said once the roads are flooded with water, it causes vehicular wear and tear, more fuel consumption and additional operating cost. They also said there

is a monetary dimension to the flood impact on their livelihood. This happens if they choose not to move out; there will not be any income for them as they also survive on daily income. Another effect they made mention of during the Focus Group discussion was that due to lack of drainages, flood water becomes stagnant for too long on the roads, and this spoils the roads also (Figures 7-9).



Figure 4: Flooded minor road in Ibereko community (Badagry) Lagos. Source: Author's Fieldwork, 2018.



Figure 7: Water hyacinths at docking sites. Source: Author's Fieldwork, 2018.



Figure 5: A multi-million-naira town hall in Makun community. The land on which the building is erected is reclaimed from the creek. Source: Author's Fieldwork, 2018.



Figure 8: Large-scale sand mining around Kweme community, Lagos state. Source: Author's Fieldwork, 2018.



Figure 6: Destruction and sand filling of mangrove. Source: Author's Fieldwork, 2018.



Figure 9: Sand dredging machine in operation. Source: Author's Fieldwork, 2018.

The public servants also opined that flooding is the major environmental challenge they face. They indicated that flood leads to scarcity of vehicle and high cost of transport back and forth work. This can be directly related to the increment in operational cost mentioned by the road transporters as an effect of flooding. When vehicles are scarce, then there will be lateness to work, then if cost of transport is high, some of the public servants may not be able to afford it, thus they trek to work

which also leads to lateness. As the researcher was told during a FGD lateness to work may attract query hence, the job becomes unsecured. The sand miners are also not spared from the impact of flooding as it accounts for over 70% of the environmental challenge they face. The sand miners complained that flooding washes away the sand they have already mined out from the river, therefore they will not have much sand to sell to their buyers (Figures 10-13).



Figure 10: People defecating into the water

Source: Author's Fieldwork, 2018.



Figure 13: Dumpsite located close to market stalls in Makun community

Source: Author's Fieldwork, 2018.



Figure 11: Toilet drains released into water.

Source: Author's Fieldwork, 2018.



Figure 14: Abandoned dredging machine pipes

Source: Author's Fieldwork, 2018.



Figure 12: Toilet drains released into water.

Source: Author's Fieldwork, 2018.



Figure 15: Oil pollution

Source: Author's Fieldwork, 2018.

The respondents who are into trading said flooding affect their livelihood the most. They opined that flooding does not give them access to their point of sale. That is floodwater takes over all routes leading to the markets and their individual stall, so navigating their ways to the market is always not easy. They also complained of low patronage whenever major flood happens, thus this leads to low income. Also,

flooding was said to have led to loss of items that are meant to be sold. When flood enters their shops, it carries away their items especially if they were left on the floor before the flood came in. Those involved in water transport were of the opinion that flooding especially those associated with tidal waves affects their livelihood the most. Those flooding do capsizing their boats; thus, people are always afraid of taking

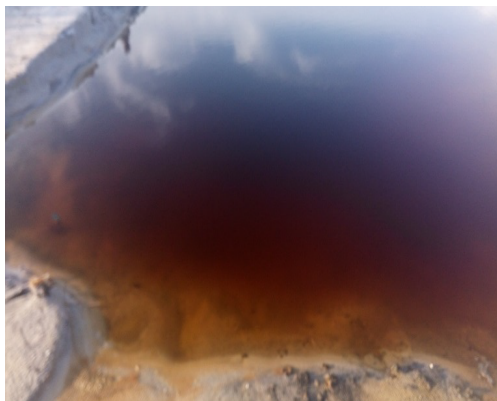


Figure 16: Coloured water caused by rusty abandoned dredging machine pipes
Source: Author's Fieldwork, 2018.

boats especially across the lagoon during flooding. However, they take it along small rivers (Figures 14-16).

Conclusion and Recommendations

Analysing the spatial pattern in the impact of environmental degradation on livelihood reveals that environmental degradation has significant impact on major livelihoods. Environmental degradation has significant impact on major livelihoods in the strand and deltaic ecological zones. A different case was established in the mangrove ecological zone where environmental degradation has no significant impact on livelihoods. While people in the coastal communities endanger the natural environment in the course of their livelihoods, the environment has also accommodated hazards, thereby reducing human livelihood opportunities. Flooding and erosion threaten lives and properties by destroying goods and properties, washing away of fishes, leaching of soil and making roads impassable. The impact of water hyacinths is mostly felt by fishermen and water transporters. This impact on fishermen is the same all through the locations where the problem persists. Pollution is an issue that affects almost all livelihoods and it impacts vary spatially especially based on the type of pollution. Thus, it can be said that the impact pollution pose on livelihoods vary spatially depending on the actual type of pollution problem the area face. The impact on soil infertility, which affects only farmers, does not vary across the locations. The impact, which is reduction of quality and quantity of harvested crops, remains the same in all the surveyed locations. Likewise, the impact sand mining pose, which affects mainly the fishermen, does not vary across the locations.

The study reveals that livelihoods of people have become deplorable, despite their attempts to subdue the environment. This indicates that environmental influence remains strong in the coastal environment. The downturns in livelihoods arise from contamination of natural resources and noncompliance with environmental laws. Based on the above findings, the study recommends that government and stakeholders in the study area should focus attention towards improving

the deplorable livelihoods in coastal communities. Essentially, good governance is central to improvement in the quality of livelihoods and the environment. Therefore, local governments' responsibilities should include provision of adequate social welfare services for coastal communities.

References

1. Yiran GAB, Kusimi JM, Kufogbe SK (2012) A synthesis of remote sensing and local knowledge approaches in Land Degradation in the Bakwu East District, Ghana. *Int J Appl Earth Obs Geoinf* 14: 204-213.
2. Getachew A, Demele Y (2000) Sustainable Development Indicators and Environmental Policy- Proceedings of the Symposium of the Forum for Social Studies. Addis Ababa, 15-16 Sept.2000, In Environment and Development in Ethiopia.
3. Izibili M (2005) Environmental Ethics: An urgent imperative. In Iroegbu P, Echekwube A (eds). *Kpim of Morality*, Heinemann Educ Ibadan, Nigeria.
4. Reynolds JF, Stafford-Smith DM, Lambin EF (2007) Global desertification: Building a science for dryland development. *Sci* 316: 847-851.
5. Nicholson SE (1990) The need for a reappraisal of the question of large-scale desertification: Some arguments based on consideration of rainfall fluctuations. Report of the SAREC-Lund International Meeting on Desertification, December 1990, Lund, Sweden.
6. Awosika LF, Osuntogun NC, Oyewo EO, Awobamise A (2001) Development and Protection of the Coastal and Marine Environment in Sub Sahara Africa.
7. Okebukola Peter (2001) *Our Environment Our Destiny*. 2nd Distinguished Lectures Series AOCCOED, Otto/Ijanikin Lagos, Nigeria.
8. Weller K (2005) Human Modification of The Nigerian Environment The University of Northern Iowa Geographic Alliance of Iowa, Cedar Falls Iowa background Information and study Areas on Nigeria
9. Zhao MY, Cheng CT, Chau KW, Li G (2006) Multiple criteria data envelopment analysis for full ranking units associated to environment impact assessment. *Int J Environ Pollution* 28: 448.
10. Muttill N, Chau KW (2007) Machine learning paradigms for selecting ecologically significant input variables. *Eng Appl Artif Intell* 20: 735-744.
11. Cheng CT, Wang WC, Xu DM, Chau KW (2008) Optimizing hydropower reservoir operation using hybrid genetic algorithm and chaos. *Water Resour Manag* 22: 895-909.
12. Cinner JE, McClanahan TR, Daw TM, Graham NAJ, Maina J, et al. (2009) Linking social and ecological systems to sustain coral reef fisheries. *Curr Biol* 19: 206-212.
13. Slater MJ, Napigkit FA, Stead SM (2013) Resource perception, livelihood choices and fishery exit in a Coastal Resource Management area. *Ocean Coast Manage* 71: 326-333.
14. Torell E, Redding CA, Blaney CL, Hernandez E, Sison O, et al. (2012) Population, health, and environment situational analysis for the Saadani National Park Area, Tanzania. *Ocean Coast Manage* 66: 1-11.
15. National Population Commission NPC (2006) Federal Republic of Nigeria Official Gazette.
16. Yamane T (1967) *Elementary sampling theory*.
17. Falade JE (2010) Tourism and recreation in M. Ogunleye and B. Aloeds State of the Environment Report, Lagos, Nigeria.
18. Food and Drink Federation (FDF) (2008) Fisheries Statistics of Nigeria. 4th Edn, Federal Department of Fisheries, Garki, Abuja, Nigeria.
19. International Fund for Agricultural Development (IFAD) (1997) Annual report. Rome, Italy.