

Environmental laws as tools for effective management of Niger-Delta wetland: A case study of Upper Orashi Forest

A thesis approved by the Faculty of Environment and Natural Sciences at the Brandenburg University of Technology Cottbus-Senftenberg in partial fulfilment of the requirement for the award of the academic degree Doctor of Philosophy (Ph.D.)

in Environmental Sciences.

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Day of the oral examination: 26.10.2023

<https://doi.org/10.26127/BTUOpen-6624>

Declaration

I hereby declare that this thesis has not been previously published or written by another person; neither has it been submitted nor accepted for any other academic award. It is the result of my original work carried out at the Brandenburg University of Technology Cottbus-Senftenberg, Germany, within the framework of the Ph.D. program, “Environmental and Resource Management”. All materials from other sources have been duly and adequately acknowledged.

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Acknowledgments

My profound gratitude to my first supervisor Prof. Dr. iur. Eike Albrecht for granting me the opportunity to carry out my research under his supervision. His extraordinary guidance throughout my research was truly instrumental to the successful completion of this dissertation. To my second supervisor, Prof. Ijeoma F. Vincent-Akpu thank you for your guidance, support, and motivation.

I am most grateful to my brothers, Sunday Otoide, Kwukei Elliot Otoide and Chuks Otoide, for their moral support and understanding throughout the research process. Also, I appreciate my parents, late Sir, Edo Williams Otoide, who was the major motivator of this great journey and my late mom Mrs. Rebecca Edo Williams Otoide, I will forever love you.

I appreciate my friends and other family members for all the encouragement and enormous sacrifices.

Finally, to Mrs. Stella Okpaise Irekponor, thanks for the unquantifiable assistance throughout the course of my research

Dedication

This thesis is dedicated to the memory of my parents late Sir, Edo Williams Otoide and late Mrs. Rebbeca Edo Williams Otoide.

Abstract

With the increasing consciousness of the value of wetland ecological and environmental functions and its fast rate of decline in the size of this important and rich ecosystem globally, the Niger Delta ecosystem has been reported to be undergoing tremendous change, hence the need for this research, to identify the challenges and proffer solutions. This study focuses on ascertaining if a change has occurred in the Upper Orashi Forest Reserved wetland, to know and evaluate the policies used in managing the wetland in the region and Nigeria. To ascertain the wetland change, land cover change detection was carried out using Geographic Information Systems and Remote Sensing to produce paradigm or data to detect change occurrence in the wetland area. Supervised classification of land use and land cover change was carried out using LANDSAT data from 2002, 2008, and 2019. Thereafter, the land cover transition was mapped for the period 2002 to 2019 and this was computed for the net land cover change for the period of study. The site was classified into three different classes and each class was analyzed using the land use and land cover change model formula. The result from this part shows that there is a consistent decrease in the wetland area for the period under review and in the other two identified classes, some interchangeable compositions were observed for the period of study. To validate this result, the opinion of experts and the host community is needed. Two sets of questionnaires were designed for experts and local community dwellers to sample their opinion in relation to the wetland and its management. The information collected was analyzed using Microsoft excel and the result shows that changes have occurred in the wetland of Upper Orashi Forest (decrease in size and other challenging issues with respect to policies and regulations). This study has identified critical challenging issues facing wetlands in the region or driving factors of wetland loss in the study area. Thereafter making recommendations that will help address these issues to actualize environmental sustainability and sustainable wetland in the region and Nigeria at large.

Zusammenfassung

Angesichts des zunehmenden Bewusstseins für den Wert der ökologischen Funktionen von Feuchtgebieten und des zunehmenden Verlustes dieser wichtigen und wertvollen Ökosysteme auf der ganzen Welt. Auch das Ökosystem des Niger-Deltas ist Berichten zufolge einem enormen Wandel unterworfen. Diese Untersuchung soll die Herausforderungen ermitteln und Lösungen zum Schutz vorschlagen. Diese Studie konzentriert sich darauf, festzustellen, ob eine Veränderung im Upper Orashi Forest Feuchtgebiet stattgefunden hat, um die Politiken zu bewerten, die bei der Verwaltung des Feuchtgebietes in der Region und in Nigeria zum Einsatz kommen. Um die Veränderung des Feuchtgebiets festzustellen, wurde die Veränderung der Bodenbedeckung mit Hilfe von Geographischen Informationssystemen und Fernerkundung ermittelt, um ein Paradigma oder Daten zu erstellen, mit denen die Veränderung des Feuchtgebiets festgestellt werden kann. Die Klassifizierung von Landnutzungs- und Landbedeckungsänderungen wurde mit LANDSAT-Daten aus den Jahren 2002, 2008 und 2019 durchgeführt. Anschließend wurde der Übergang der Bodenbedeckung für den Zeitraum 2002 bis 2019 kartiert und daraus die Nettoveränderung der Bodenbedeckung für den Untersuchungszeitraum berechnet. Der Standort wurde in drei verschiedene Klassen eingeteilt, und jede Klasse wurde anhand der Formel für das Modell der Landnutzungs- und Landbedeckungsveränderung analysiert. Das Ergebnis dieses Teils zeigt, dass die Feuchtgebietsfläche im Untersuchungszeitraum durchgängig abgenommen hat und dass auch in den beiden anderen identifizierten Klassen relevante Veränderungen für den Untersuchungszeitraum beobachtet wurden. Um dieses Ergebnis zu validieren, wurden Experten und Bewohner der Region befragt.

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Abbreviations

AA – Accuracy Assessments

AGF – Attorney General of the Federation

C of O – Customary Right of Occupancy

COP – Conference of Party

CSP – Cooperate social Responsibility

DEAT – Department of Agriculture and Forestry

DRC – Democratic Republic of Congo

EIA – Environmental Impact Assessment

EPA – Environmental Protection Agency

FEPA – Federal Environmental Protection Agency

FMEnv – Federal Ministry of Environment

FoI – Freedom of Information

GIS – Geographic Information System

LULC – Land Use and Land Cover

NDDC – Niger Delta Development Commission

NESREA – National Environmental Standards and Regulations Enforcement Agency

NGO – Non-Governmental Organization

NOC – National Ocean Service

NOSDRA – National Oil Spill Detection and Response Agency

NRSCC – National Remote Sensing Center of China

OA – Over Accuracy

OND – Ordinary National Diploma

PA – Producer Accuracy

PCB – Polychlorobiphenyls RS – Remote Sensing

SCP – Special Criminal Provision

SPDC – Shell Petroleum Development Company SRO – Statutory Right of Occupancy

SRVSOC – Special Register for Vessels and Ship Owners Companies

UA – User A

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1.0 Introduction

Wetlands are identified or referred to as earthly or terrestrial ecosystems that have been categorized or characterized with a little trait of drainage, dawdling waters, or seldom-based water bodies filled with earth (Edo & Albrecht, 2021; Olalekan, et al., 2014). Wetlands are therefore classified to be either bog, marsh, or swamp in respect to the type of environment and associated soil types or soil constituents or mechanisms. They are sometimes referred to or classified as borderline ecosystems because of their presence and survival in nature at coastline or water body lines (Olalekan, et al., 2014). Wetlands are known to be very essential due to their ecological functions or roles in withholding water (water retention), decontamination of water, and its capability of erosion control (Adekola & Mitchell, 2011). They are used for wastewater treatment and recycling, they serve as a production and nurturing ground for aquatic lives (natural habitats) (Edo & Albrecht, 2021). These swamp areas called wetlands are also used for gaming, bird watching, and sailing (recreation). It is used for water quality improvement, shoreline erosion control and research activities. With these values of wetland, wetlands are still degrading at a fast rate globally as a result of human-induced impacts (Kar, 2013).

Globally, wetlands are said to have occupied about 12.8 million km² on the earth's surface (Ramsar Convention Secretariat, 2010). However, about 1,342,162.53 Km² are internationally recognized as wetlands of international importance, without the inclusion of the marine and coastline wetlands (Verones, et al., 2013) (Edo & Albrecht, 2021). According to (Davidson, 2014) it is estimated that about 50% of wetland have been lost globally in the 20th century. For the same period, the European Commission reported the about two-thirds of the European wetlands have been lost (Commission, 1995). Wetland has been reported to have covered about 6% of the total earth area (land) and harboring or hosting a remarkably high number of the world's biological diversity (Janaki & Varunprasath, 2018) (Verones, et al., 2013). Wetland degradation or loss has been attributed to developmental activities (dredging, reclamation, drainage, and water diversions) (Edo & Albrecht, 2021) (Janaki & Varunprasath, 2018). In Nigeria, there are several essential wetland zones and they are located as follows; Niger, Benue, and Chad Basins (Edo & Albrecht, 2021). Currently, Nigeria's wetland covers approximately 2.6% of the surface area of the country. The Niger Delta wetland is

always a point of discussion, or it is the most referred to whenever there is a discussion in respect to the wetlands in Nigeria, because, it is a hotspot of biodiversity, host to some endemic species, the biggest in the continent and third biggest in the world (Agbasi & Odiaka, 2016).

In the 1960s, the reason to manage wetlands arose (Edo & Albrecht, 2021). Thereafter, in 1971 both the governmental and non-governmental bodies who have been interested in biological diversity and its sustainability (Edo & Albrecht, 2021), came together and introduced a Multilateral Environmental Agreement (MEA) which is the Convention on wetlands called the Ramsar Convention (Adekola, et al., 2012). The conference was held in an Iranian city called Ramsar (Ramsar Convention Secretariat, 2010). The MEA was named after the city and is called the Ramsar Convention. This Convention was agreed upon in 1971, accepted, and entered into force in 1975 and as at today about 170 nations have ratified it (Ramsar, 2017). The idea behind the conference is to find a good methodological strategy to protect and conserve its resources (Gardner & Davidson, 2011).

The interrelationship between environmental management, economic progress, and individual well-being is a complex practice, which affects the cooperation of value and sustainability of the entire society or the environment in which they exist (Edo & Albrecht, 2021). Currently, the comprehension and a new perception on the environment and human societies, and much more beside the environmentalist. As environmental managers comprise of specialists from different fields and groups which include academics, policy-makers, non-governmental organization (NGO) workers, company employees, civil servants and a wide range of individuals or groups who make decisions about the use of natural resources by working interdependent. Previously, the global ecological unit is experiencing ecological impairment ensuing as a result of widespread industrialization and development (Rudolf, et al., 2006). There is a fast-growing population and this population relies on environmental resources; for example, the demand for fresh water in the world, of which the earth is unable to withstand a healthy and unwavering system. The need to sustain the demand of the increasing population has resulted in the overutilization of natural resources which implies that the natural resources used or exploited in an unsustainable manner (Goosen, 2012). Environmental management (EM) is known or recognized and viewed to be the unsurpassed inclusive possibility in respect of management. According to Edoho & Dibia (2000) define management as the “process of effectively utilizing scarce

environmental resources in order to achieve the goals set by the organization, during the planning of business practices". This means a business can only be successful when good management is in place. Management comprises supervision, organization, regulation, and monitoring of the resources (human, capital, and material) to achieve the best administrative management practice.

The National Environmental Standards and Regulations Enforcement Agency (NESREA) Act 2007 described environment to encompass the following; water, air, land, and the flora and fauna it supports and interacts with (Ladan, 2012) (NESREA, 2007). Understanding the definition of environment is in line with accepting that the environment on this ground can be classified into three different components; biotic, abiotic, and socio-economic/cultural systems in which they exist (Ladan, 2012). Therefore, environmental management can be described to be the management of social interaction and utilization of its resources in a sustainable manner that benefits humankind.

Environmental challenge in the Niger Delta is majorly attributed to oil and gas exploration and exploitation. Nigeria having gotten independence on the first of October 1960, ever since different businesses have been going on in Nigeria particularly, the Niger Delta is known for the oil and gas exploitation and exploration activities. Oil exploration activities started in the region in the 1950s and were first discovered in a small locality named Oloibiri, in present Bayelsa state. This is the first place Shell D'Arcy, now Shell Petroleum Development Company, first successfully drilled oil in Nigeria in June 1956. Since then, oil exploration and exploitation activities have been going on till this moment, and it is the principal source of income (revenue) for the nation (Adekola, et al., 2012) (Amnesty International, 2009). Nigeria is the highest oil-producing nation in Africa and ranked sixth highest producer in the world, having a production capacity to produce about 2,500,000 barrels per/day (Obinna, et al., 2015). Nigeria is said to be blessed with both human and natural resources with Niger Delta region as the main hub of natural resources in Nigeria with natural resources such as oil and gas, and ecological resources (Mayowa, 2012). This is the reason the area is being referred to as a hotspot for biodiversity because of the diversity of species found in the area. The region covers approximately 70,000 km² of the surface area, with the swamp area encompassing 9,000 km² (Edo & Albrecht, 2021). However, the tidal forest area is said to be around 10,000 km² which puts it over every other country in Africa and ranked third in the world next to Indonesia which is second and Brazil been the first

(Nwilo, 2003). Due to the high deposit of natural reserves in this area, so many businesses, like oil exploration which are currently on going in the region, and of which its activities are impacting the environment negatively by destroying the ecological nature and depleting natural resources in the region. For example, oil spills are as a result of technical failure of oil facility or human induced impact that pollutes the environment as a result of illegal refinery (Adekola, et al., 2012). It is interesting to know that the inhabitants of this region are not living their best life due to land deficiency as a result of environmental challenges, which ranges from land resource degradation that arises from oil spill and renewable resource diminution. The main occupation in the region is agriculture (Edo & Albrecht, 2021). However, the degradation impact has led to the irreversible effect which has placed some of the people in a state that they now rely or depend on natural resources to be able to meet up with their daily needs through illegal means (vandalization of oil pipelines (oil bunkers), deforestation of forested land). These have resulted in conflicts between the people, government and companies, also among the communities themselves. The influence of oil exploration activities is very visible, especially in the local communities in which the companies operate. For instance, Shell Petroleum Development Company (SPDC) is using up about 31,000 km² of land for its facilities in the region (pipelines, flow station, and drilled wells) (Amnesty International, 2009). Furthermore, these facilities are said to be sited or situated in areas that are close to farmlands, waters sources (rivers), and homes within the communities in which they operate. According to (NOSDRA, 2005), several oil spills occur yearly, but two of the spills has been described to be highly destructive, both occur in 2008 and 2009 respectively in a fishing town called Bodo, both spill is said to have a catastrophic impact. "Thick black oil leaked into rivers and creeks for weeks, killing fish and robbing people of their livelihoods". The residents in this locality are involved in agricultural pursuits, such as farming and fishing. The Upper Orashi Forest Reserve is a freshwater swamp forest located in the Ahoada West Local Government Area (LGA) of River State (Nwanesi, 2006). The Upper Orashi Forest as a reserve is known as a diminutive centrality of endemism, known for harboring or sustaining the significant rare or scarce species like (Sclater's Guenon and endangered White-throated guenon, Red Colobus monkey, and Heslop's Pygmy Hippotamus) (Ramsar, 2002), (Ramsar, 2017). The location is known to be a settlement for the Grey Parrot (*Psittacus erithacas*) (Ramsar, 2002) and also harbors a meaningful amount of water bird's class whose spreading or distribution is limited to the Guinea-Congo Forest biome (Chidumeje, et al., 2015).

Sustainable development specifies or put in place a framework for people to live in harmony with the environment and its resources, presently people live in a manner that they do not care about or consider the consequence of their attitude towards the environment, leaving it to the detriment of nature (Edo & Albrecht, 2021). Sustainability in respect to environmental resources or natural resources utilization does not have a satisfactory or accommodating legal basis, despite the several environmental and natural resource laws in place. To achieve the possibility of making progress in having a sustainable environment in respect to man and nature (sustainable society), there is need to establish or make a provision for new legal institutions using the gaps or lapses in the available laws for amendments for the future or new laws (Ejumudo & Ogochukwu, 2014). For instance, in Nigeria, several regulations are known to be available only in documents (papers) but not in reality because it is not implemented and where it is implemented, it is not enforced.

1.1 Background of Study

Environmental management has been understood and recognized universally as significant to sustainable development (Adekola, et al., 2015). This perceptible idea relies on the fact that the environment is known to be the foundation of every development, and the organization of the development is just a system that leads and supports its realization by achieving a reasonable balance in respect to the environment and development on a sustainable basis (Ejumudo & Ogochukwu, 2014).

In Nigeria, only a few scholars have talked about addressing policies and legislation with respect to governing or management of wetland (Adekola, et al., 2012) by discussing these challenging issues using data. However, there is still some level of little knowledge in respect to the wetland and its management, considering its management design or configuration in Nigeria. Hence, this research will investigate the policies and legislation available in terms of governing wetland and its management in Nigeria. Where they exist, the reason(s) is (are) not operative, thereby posing challenging issues in relation to wetland threats and the loss of these important ecosystems. It also seeks to analyze and evaluate the unfilled documents in respect to legislative statutes in the country and consider its applicability and capability in solving and ensuring sustainable management in wetlands in Nigeria.

Notably, contamination of resources arises when a natural or developmental project ensues in a pattern or form of disaster to the surrounding environment, example of such disaster can be land

subsiding, flooding, and environmental pollution which are all referred to as Environmental Degradation (United Nations International Strategy for Disaster Reduction, 2009). Environmental degradation can result in the payment of impairment to person(s) that have lost their possessions, by either individual or company whose actions or activities have resulted in the impairments. In the case whereby the individual or company(s) are identified and admitted to the liability of the damage, either willing or lawfully are made to pay for the damages (United Nation International Strategy for Disaster Reduction, 2009).

Talking about compensation in contamination of resources or activities that impact the environment negatively in Nigeria does not consider compensating the host communities, with reference to Niger-Delta oil spill in the region as a result of facilities-related issues, for example, blow out of drills and rusting of pipelines which result in oil spill that contaminate the environment. However, before 2015 no company has paid for liability of such in the records of oil spill/contamination in the region, currently there is a cleanup going on now by Shell, which started in 2018 with One billion US Dollar as Environmental Restoration Fund for Ogoni. Also in 2015, there was a court case between Bodo and Shell, which Bodo won and Shell was asked to pay £55 million out of court settlement and to assist in clean up (<https://www.leighday.co.uk/news/cases-and-testimonials/cases/shell-bodo/>). Before then what is being referred to as compensation is the payment made for the acquisition of land for their facilities (Akpan, 2006) (Nuhu, 2008).

1.2 Problem Statement

Environmental protection has been in existence before and after the Stockholm Conference on the Human Environment in 1972 (Christensen, 2012), protecting the environment has been on the corporate agenda in developed countries. But same cannot be said about developing countries, for example Nigeria. In terms of management of the environment, Nigeria has a well-established laws and a full-fledged ministry and agencies to govern its environment of which wetland is part of. However, the issue of environmental degradation is still a big challenge in Nigeria.

The undertaking of oil exploration activities has been recognized to be the main driver of environmental issues in the Niger Delta (Amnesty International, 2009). Nevertheless, these activities have been attributed to the increasing health-related challenges, poor soil fertility and wetland

degradation. These activities have dishonored or violated the regulations in respect to human fundamental rights and its self-respect or formality as seen in “Chapter 2 of Article 20 and Chapter 4 of Article 33 and 34 in the Constitution of the Federal Republic of Nigeria” (Okorodudu- Fubara, 1998). Having realized and observed the challenges from these activities, the authority through the then Federal Environmental Protection Agency (FEPA) now Federal Ministry of Environment (FMEnv), which was established in 1988 and mandated with the functions or obligation of conserving, preserving, and managing Nigeria environment. However, other environmental management tools were enacted to help expedite or assist in the actualization of sustainable environmental practices in Nigeria (Agbasi & Odiaka, 2016, Nigeria Constitution, 1992). This tool today is what is being referred to as the regulatory framework called Environmental Impact Assessment (EIA). This framework was ratified in 1992 and was denoted in the nation's constitution as EIA Decree Number 86 of 1992 (Agbasi & Odiaka., 2016). The major purpose of this framework is to inform the “decision makers and the public of the consequences of implementing a proposed project”. (Nigeria Constitution, 1992). Having done that, some institutions (agencies) were established to observe and monitor the fulfillment of the framework, the agencies are as follows: National Oil Spill Detection and Response Agency (NOSDRA) and National Environmental Standards and Regulations Enforcement Agency (NESREA). However, these institutions were put in place to help in monitoring the influence of business activities on the environment or business practices on the environment. Even these agencies put in place, the environment is still degrading and wetlands areas are being lost. The Department of Petroleum Resources (DPR) is an agency under the Federal Ministry of Petroleum Resources mandated or responsible for enforcing environmental directives in oil and gas industries (NNPC, 2015). Nigeria is suffering from management failure respect to environmental governance and its inability to hand-gripe or manage it has led to an unrelenting decline in the healthiness of the environment including the wetlands. Environmental Education or awareness is still lacking, as it has not been properly integrated into school curriculums and practice as a way of life or every aspect of life. Thus, it is very important to introduce environmental studies in the school curriculum; such an approach can help to influence people's behavior in relation to environmental issues or challenges in the country. However, one can agree that Nigeria is lacking in terms of sustainable governance in relation to environmental

issues and wetlands to be specific, as many people have no idea what wetland is despite its functions (Erhun, 2015).

For the past decades, it has been observed that the population of the Niger-Delta region of Nigeria is experiencing fast growth and high commercial activities that have enormous welfares for abutting states and Nigeria at large. Lately, the region is undergoing an extraordinary chapter of increment or growth in respect to the economic settings, causing or resulting in various environmental-related issues due to the pressure from the business-related activities. For example, oil and gas exploration, infrastructures (building of roads), construction of houses, and agriculture. The unsustainable exploration and exploitation of oil and gas-related activities will continue to result in the following environmental challenges: territory degradation, and aquatic pollution, gas flaring, forest vegetation degradation, littoral wetland loss as well as other environmental issues (Twumasi & Merem, 2006).

Nigeria has established different agencies like the NOSDRA and NESREA for the drive or interest of managing, monitoring environmental standards and procedure in more than a decade, the challenges of the environment are still persistent or increasing in the area. Nigeria have signed the Ramsar Convention and has not set up any agency to help protect the wetlands. This has resulted in continuous wetland degradation/disappearing. However, this highlights the importance and urgency for the nation to review the overall environmental monitoring process and procedure of the regulations being used for managing and protecting the general environment and specifically the wetland areas. However, if that is not achieving its aim or yielding a positive result, therefore there is need to investigate or review both the implementation and enforcement process, however, after that and the issue persist there is need to review or established other laws that will help achieve or realize a sustainable environment and protect the wetlands in the Niger Delta and Nigeria at large.

This research is very essential considering the value or importance of wetlands as seen in the introductory part, protecting the Upper Orashi Forest from dredging and conversion of wetlands area to crop land and over-utilization of wetlands resources or restricted assess will help protect and conserve the endemic and endangered species in the area which the region is known for. In general, finding a long-term solution for conserving the region's wetlands for the purpose of sustainability is

vital. The major activities or business activities that are threatening the region's environment or causing environmental degradation and wetland loss are the activities of oil exploration such as gas flaring and oil spill. Drilling fluids and additives are used for production, for corrosion control and also for the purpose of separating oil and overall industrial waste from the process are most time channeled into water bodies (Ejumudo & Ogochukwu, 2014). The region has had a series of conflicts arising from land disputes between different communities in the region, conflicts between the local communities and the oil companies operating in the locality and between the people and the government in respect to compensations for their destroyed farmland (Enuoh, 2016). However, the demand of the communities for compensations is one of the reasons that brought about the militant group in the region till today.

1.3 Aim and Objectives

There is an increasing demand for environmental resources for development and to sustain the increasing population from the regional level to global level, these have resulted in over utilization of the ecological resources (wetland resources). There are international laws for the protection and conservation of wetlands and these laws have been domesticated by some countries that have signed the Ramsar convention. Nigeria is one of those countries that have signed and domesticated this treaty. However, it is important to ascertain if the Upper Orashi Forest Reserve Wetland is being degraded or degrading, because of it functions as a breeding ground for aquatic lives. If yes at what rate is it degrading? Therefore, the need to critically examine the process and the instrument being used for managing it (policies) in order to sustain the natural ecosystem.

- To assess the effectiveness of human attitudes and conduct towards the realization of environmental sustainability in the region and human impact on wetland system.
- To know and appraise the regulatory framework that is obtainable for environmental governance in the country.
- To ascertain the challenges resulting from the poor management of the region's wetlands.
- To understand the impact of NGOs in respect to awareness creation about Wetland in Niger-Delta.

- To review policy makers' ideas for the protection of wetlands in the Niger Delta for sustainability.
- To ascertain if there are monitoring activities.
- To use geospatial analysis to ascertain if vegetation degradation causes wetland degradation.

1.4 Research Questions

- Is there any wetland management plan? If yes is it achieving its goals?
- What are the driving factors of wetlands degradation in the region?
- Is there any communication link between the government and local communities in respect of wetland management?
- What are the roles of local communities in wetland protection and management?
- What is the main source of environmental challenges transforming or altering the Niger Delta wetlands?

1.5 Hypothesis

The hypothesis assumes that the Niger-Delta wetlands are not reducing or disappearing as a result of its effective management.

1.6 Justification of Research

The increasing population has resulted in the increase in demand for agriculture, urbanization, and other raw materials, for the purpose of meeting up with the demand of the growing population in the world for food and shelter (Chidumeje, et al., 2015). However, this has continued to impact wetlands. The Ramsar Convention has brought manifestation of the rising awareness about the importance of wetlands. Presently, it has become fashionable at the international level to talk about sustainable use and sustainable development; members of parties of the Convention are meant to align their activities in a manner that the environment (wetlands) is not unduly degraded. This research will help to identify the threat faced by the wetlands in Niger Delta and to review the national policy or law available for

its conservation and protection. This research will create or raise awareness on the meaning or significance of wetlands and the reasons to conserve and preserve the Niger Delta wetland.

2.0 Literature Review

2.1 What is Wetland?

The most frequent questions most people ask when I talk about my research topic is “what exactly is a wetland?” or “is it the name of the Island? While some ask if it is the same as swamp?” These are very amazing but important questions. It is not clear that they have all been responded to or addressed fully, by wetland scientists and administrators. Wetlands characterization/relationships remain numerous that sometimes it is bewildering and contradicting. Still, it is essential to know that definitions are very vital for a precise understanding of the general system and its management (National Research Council, 1995).

However, in the 19th century, the drain of wetland areas was seen or known to be standard. Classification or characterization of wetlands was not important as a result, that it was anticipated to develop more land out of wetlands by bleeding them or converting it to crop land. According to (William & James, 2007) one of the first references to the word was in the journal “Wetlands of the United States of America” published by Shaw and Fredine in 1956. Before then swamp areas are being described by many individuals with different conventional terms which later changed in the 19th centenary before the other names like a swamp, fen, bog, marsh, etc. However, the value of the swamp area started gaining recognition and attracted interest in having specified definition in the early 1970s. Until the realization of an improved recording or accountability, the said swamp resources are indispensable or crucial for imminent future and references point. On this ground, the realization of definition was said to be necessary to achieve the inventory.

The late 1970s was when both state and international organizations began or started drafting regulations in respect to conservation and protection of wetlands, thereafter the necessity for accuracy was developed and it became better because the individuals who now understand the meaning were earlier having different thoughts or impression of what they might use or not use their plot or terrain for. The meaning of wetland then by insinuation is the borders which denote or are

being referred to as definition in the U.S.A. Presently the most acceptable definition of wetland is the definition by the Ramsar Convention of 1971 as stated in Article 1 of the Convention. This in the future will become more significant when the public start identifying the value of the systems and therefore start translating the value into guidelines to protect it from degrading. Just like the assessment of the borders of forested land which is based on systematical and justifiable standards, so also the definition of wetland remains on the ground of scientific procedures of high standards as doable. At this stage, all humanity decides whatsoever they choose to use their wetland for, once an agreement is reached in respect to the definition, whatever happens, remains political at that stage (Scott & Jones, 1995).

However, there are so many definitions of wetland but the definition by Ramsar Convention was the most acceptable and extensively used definition presently. Ramsar Convention defines wetlands “as an area of marsh, fen, peat-land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does exceed 6m”. In all, the Convention considered wetland to include “riparian and coastal zones adjacent to the wetland and island bodies of marine water deeper than 6m at low tide lying within the wetland” (Adekola, et al., 2012). With regards to this research, the above definition will be used. In Nigeria, the wetland is calculated to cover a total area of about 28,000 km² this is approximated to be around 3% of the nation’s land surface (Uluocha & Okeke, 2004).

2.1.1 Challenges of Defining Wetlands

Wetland has been known to have several unique characters, the highly visible uniqueness of them all is the static nature of the water for a particular time mostly in the cultivating period or season, exceptional topsoil settings and organisms in the vicinity, particularly the flora which are modified in order to resist the drenched soils. According to (William & James, 2007) wetlands are said to be unique due to their hydrological state and their function as a transitional zone amongst terrestrial and deep-water aquatic systems (ecotones). Some particular words like the marsh, swamp, and bog were already being used as a common word for centuries to mean wetland. Although, the same words are still being used till date and are misused. However, the official meaning has been established or put up by different intervention agencies (scientists) both in the United States of America and Canada. More also that of the international treaty that was adopted for this research. All the definitions given encompass

substantial factors and most of them are being used in both the scientific and management field. Wetland is complicated to define, especially with respect to the legal focus or function, since it is said to include a significant scale or variety of hydrological states because they exist in the banks of rivers or sea with the boundaries of uplands and deep-water system, which are as a result of its enormous difference in respect to its magnitude, position and human attitude towards it. However, (William & Gosselink, 2000) said there is no complete or total answer to the question “what is wetland” that has to be awaited, but the lawful meaning has to address the issue of wetland protection, which is gaining all-inclusive recognition presently.

As stated by William & James (2007) wetlands have been acknowledged as one of the most vital ecosystems on the planet. On a larger scale with things, the marshy environment of carbonaceous substances with historical value that chum out and also conserved some fossil fuels of which some society relied on for survival. Some years back, during biotic and human time, wetlands were used or their value is being used as a basin for transformation of several biological, chemical and heritable resources.

Nevertheless, wetlands' significance in terms of wildlife and fish has been realized for more than a hundred years now, recently more of its welfares has been recognized. Wetlands can sometimes be referred to or labeled as “the kidney of the landscape” due to their role and function for controlling water (flooding) and waste from man and nature. It also contributes to the stabilization of the water supply, therefore, ameliorating the issue of flooding and drought. In addition, wetlands have been discovered to be helpful in purifying contaminated water, shores protection, and groundwater recharge.

Wetland has been described as an “ecological supermarket” as a result of its wide food web and the high level of biological diversity it supports. Wetlands function in respect to the landscape, serving as a shelter, by providing habitats for plant and animal species (Lapologang & Lefatshe, 2009). Presently, there is a great concern in respect to the condition of the whole planet, the swamp area is being referred to by certain individuals or groups as a central carbon sink (because of its ability to absorb carbon dioxide from the surrounding) and its temperature stabilization capability on a large scale (climate stabilizer) (Mitsch & Gosselink, 2015).

The valuation or value of wetland is presently recognized to be very essential and the knowledge about it is gaining recognition worldwide and this has brought about the need for wetland protection and conservation using laws and regulations for its management plans (Mitsch, 2013). Presently, the wetland has been considered as “Cause celebre” i.e., before the famous individuals and groups that got wetlands conservation in mind globally (Mitsch, 2013). These were transformed into indicators of systematically disassembling of the water resources, indicating its loss or degradation, which is quite simple and straightforward in identifying and termed as a loss of natural environment of economic values. (Millenium Ecosystem Assessment, 2005). For the proper management, preservation of this important ecosystem, specialists from different fields are coming together in the interest of proffering a better solution, also reconstructing this fragile ecosystem at the global, regional and local level (Kusler, et al., 1994).

2.2 What Threatens Wetlands

According to Chidumeje, et al., (2015) work on “The Niger Delta wetland ecosystem: What threatens it and why should we protect it?” reports that the region’s ecosystem is rich in biological diversity with high economic value to both the people and the nation at large. The livelihood of most of the inhabitants depends on the rich resources in the region and the resources help in the stabilization of the ecosystems. However, Chidumeje, et al., (2015) stated that a huge change has befallen the region’s wetland due to human attitude and behavior towards it. This has drawn attention or raised awareness of the need to conserve and preserve this sensible ecosystem. Having a clear idea of the value and function of this important ecosystem is key to its protection and management (Edo & Albrecht, 2021). Chidumeje, et al., (2015) talked about the importance of wetlands as they are very important in the accomplishment of several ecosystem services (Barbier, et al., 1997). The work was only a review, as it does not have data to back up the points and it does not address or review the process or procedure of management to proffer a solution to the issue of wetland ecosystem degradation in the region.

According to Zabbey, N. (2004) due to the extraordinary biological diversity in the region’s, the region has been pronounced as the main area “for the conservation of the western coast of Africa” and extremely varied ecosystem which supports human life as well as the distinct species of fauna and flora. In this area, there are different species of flora found there and some of them are of high

economic importance (Chidumeje, et al., 2015), to produce medicine, gums, fuel for cooking, and fibers. In the earlier mentioned Upper Orashi Forest, located in Rivers state, is part of the three states classified as the central delta states due to its richness in terms of oil deposits in the states. Majority of the inhabitants in this area depend on wetland resources for food and about 70% of the families in this area get or make their daily income from the wetland either directly or indirectly, for instance, fishing and crop production (Ayansina & Proske, 2015).

According to Adekola, et al., (2015), it was reported that the annual calculated net value of resources extracted from the swamp area is valued to be US\$3,714 per family (household). This implies that the significance of these ecosystems in providing services to the inhabitants of the area is true. However, such activities are always allowed but it has to be done or carried out in a sustainable manner, for instance, fishing and farming is the main activity of the local dwellers or known to be the main occupation of the people, but both activities have not been identified to be a major threat to the wetland in the region or major threat to the ecosystem in the region (Ramsar Convention Secretariat, 2007). Logging of forest trees (timber) is linked with the widespread unearthing of the waterway which affects the hydrological circle of the area, which then impacts the quality of the water and healthiness of the wetland (Ayansina & Proske, 2015; Ramsar Convention Secretariat, 2007).

Since the discovery of oil in the Niger Delta in the 1950s, every part of the region has been explored for same activities, the mining process of natural gas and the industrial process that take place in the region are the major reason the Niger Delta is essential to the economic development of Nigeria as a country. It generates about 80% of the total state revenue (Adekola, et al., 2015). The exploitation of natural gas is linked with flaring, unearthing of rivers (dredging) which distracts the aquatic life, oil spills, and land reclamation activities resulting to wetland degradation in the region from oil and gas activities. Adekola, et al., (2015) reported that environmental degradation in the region annually is calculated to cost approximately US\$758 million. Having worked on the counteractive, it reports that approximately 75% of the value is suffered by the local dwellers (inhabitants) in form of water pollution, biological diversity loss, unproductive farmland, and lack of harvests (Adekola, et al., 2015). The focus of most papers is on economic, social, and environmental. The papers that address the

environmental part do not cover wetland in-depth, one of the reasons there is no data in the research field.

Currently, Nigeria has eleven Ramsar sites, with the determination to designate other important sites. However, there is no Ramsar office or a representative in Nigeria, as the monitoring status of these sites is seen not to be a major concern to any of the government agencies as none of the government agencies or NGOs has a record on the state of the sites. As a result, no agency or organization has a good idea about the size of the wetland for a specific period. The following agencies/ministries are supposed to be responsible for coordinating and organizing matters related to wetlands in Nigeria: Nigerian Conservation Foundation (NCF) and Federal Ministry of Environment (FMEnv), specifically the Department of Forestry (Nigeria Conservation Foundation, 2014a), (Nigerian Conservation Fund, 2014b). The NCF is mostly concerned with the issue of “environmental education, biodiversity conservation, policy advocacy, public sensitization on environmental matters, mitigating environmental pollution and poverty reduction” in Nigeria and also manages several conservation projects (Nigerian Conservation Fund, 2014b). NCF organized an event that talked about the susceptibility of the littoral areas in respect to changing climate and human impact. However, the emphasis/focus of NCF is said to be the capital city, Abuja on the conferences and seminars being organized, without specifically mentioning the region where the coastal wetland is located, knowing the value or its importance to the country (Nigerian Conservation Fund, 2014b; Ayansina & Proske, 2015).

The FMEnv is presently focusing on three main projects with the scope of biological diversity conservation, waste, and power management (Ayansina & Proske, 2015). However, it was noted that for the proposed projects wetland was not mentioned precisely or targeted in this project. It is very crucial to know that monitoring is a useful tool for effective management, therefore wetland monitoring status is very necessary for effective conservation and management of the region’s wetland.

This is the only viable way to determine or measure the degree of change that has occurred in the ecosystem termed ecosystem change. Considering this in relation to the Ramsar Convention, monitoring and reporting of the status of all Ramsar sites will help to evaluate and determine the

success achieved as far as an international treaty and its instruments for achieving wetland conservation and wise use (Ayansina & Proske, 2015) (Ramsar Convention Secretariat, 2010). Wise use in this case refers to sustainable utilization of wetlands resources in for the benefit of mankind in a pattern that companionable with the species and the reliability of the ecosystem. Consequently, after a site has been designated there is a need to regularly monitor the sites for a specified period in order to know the state of the site. Ramsar Convention has regulations designed for effective site-monitoring purposes and this is stated in the “Ramsar Convention Secretariat’s Resolution VI.1 and Handbooks Volume 13 and 18” (Ramsar Convention Secretariat, 2010). There are different techniques or indicators for monitoring wetland these are as follows; water, soil, and biological diversity on a selection local scale and earth observation techniques, with the help of radar and satellite images, on a regional scale (Ayansina & Proske, 2015). The use of conventional plants, water, and soil sample for wetland monitoring is a complicated one to be used in areas like the Niger-Delta region due to insecurity, political crisis, and communal crisis that often occur in the region. Another challenge is the lack of means of transportation in the riverine area. In such a vulnerable environment, it will be important to use environmental tools or software such as Geographic Information System (GIS) and Remote Sensing (Groom, et al., 2006), this will be suitable and safe to use in measuring the magnitude and the change of character of the wetland over a giving period.

In the same vein, plants are known to be a suitable indicator for monitoring the state of wetlands for different purposes which include their relativity in terms of species richness, plant growth, and its response to environmental changes. There are several human activities that result in changes in the environment or their action alters the environmental systems and causes degradation in wetlands ecosystem, which brings about an alteration in plant composition. Each species demonstrates a distinctive level of forbearance to a broad range of stressors. However, a change in environmental conditions results in a plant’s composition shift in response. It has been confirmed that plant communities transform as a result to change in the hydrological circle (Squires & van der Valk, 1992; van der Valk, 1981; Spence, 1982; Gosselink & Turner, 1978). Having examined the possible ways in which Nigeria communities can rescue or salvage the wetlands ecosystem in other to ensure sustainable fish production, Dauda (2014), accepted the fact that wetlands are one of the high valued

resources that are unprotected (unregulated or has unrestricted use). However, Dauda (2014) study on the “term wetlands, its values, and functions” highlights the production of fish in the country and the challenges of wetland sustainability in the country. According to the study, wetlands support both the local and national economy in terms of fish production and fiber, it also helps in the purification of water, use for recreational purposes and it provides other benefits such as flood control, pollution control, and for scientific or research purpose.

According to Moser, et al., (1998) “In differentiating wetland degradation and wetland loss” a wetland is said to be degraded when is completely dried up and at that point it becomes a concern for the stakeholders. Wetland degradation is the impairment of wetland functions as a result of human activity. Why wetland loss, is the loss of wetland, as a result of the conversion of wetland area to an area of non-wetland due to human activities (Zinhiva, et al., 2014), using tools or tractors for the purpose of agriculture or development. However, Ramsar Convention’s commitments and obligation is very clear as it mandates wise use and prevention of wetland degradation and loss. Ramsar Convention was established on the grand of address the challenges of wetland loss and degradation of the global wetlands, in order for wetlands to contribute to sustainable development (Zinhiva, et al., 2014).

According to the study carried out by Desta, et al. (2012) with respect to change in climate and its connection with wetlands and their functionalities, it has been acknowledged that wetlands are the major ecosystem with high vulnerability or it is vulnerable to human activities and being intensified by the changing climate. Climate change has the potential to affect wetlands by influencing the runoff rate, altering flow patterns, changing temperatures, and reshaping the overall physical characteristics of wetland ecosystems (Edo & Albrecht, 2021). Therefore, such distress will affect changes in the function of the ecosystem thereby impacting on services it renders and the goods it provides for humankind (Desta, et al., 2012).

Orimoogunje, et al., (2009) reported on their study, geospatial mapping of wetland potential of Ilesa in Osun State, southwest Nigeria, that agriculture and urban expansion is the main issue threatening wetland in the area. The study reported that urban expansion and agro-economic actions put pressure on the wetland in the study area, urbanization and excessive utilization of wetlands resources are due

to the increasing number of people inhabiting the area and the richness of the soil in respect to arable crops production. For these reasons, the area that was initially classified as wetlands has now been converted to plain land for agricultural purposes or residential areas. One of the results of the study reveals that the wetland area has significantly diminished, it reveals that agricultural area and residential or settlement area has increased as shown in table 1, without considering the process or possible way to put an end to the problem.

Table 1: Changes in wetlands area, agricultural area and settlement area (hectares between 1991 and 2002)

Study areas	Years	
	1991	2002
Wetland area	148	89
Agricultural area	9,017	14,435
Settlement area	4,541	10,012

Source: (Orimoogunje, et al., 2009)

Tijani, et al., (2011) report on their study which checked the impact of urbanization on wetland degradation around the Eleyele area of Ibadan, Nigeria highlights the environmental impact of urbanization and land use in relation to the degradation of the Eleyele wetland in Ibadan. The author describes Nigeria as a country that is highly blessed with natural wetlands (coastal and inland) and human resources (Aniekwe, 2019), most of the resources and some species are being endangered or threatened by human activities resulting from land use, agricultural activities, urban expansion due to the increasing population in the city and the general population growth coupled with the emerging threats of climate change.

Ajibola, et al., (2016) as reported in their study, “effects of urbanization in wetlands in Lagos”, validates the point that the main driver of wetland loss in Lagos is majorly human motivated. The activities are

listed as follows: high-rural urban migration, sand-filling, industrialization, and dredging of wetlands. The work, however, acknowledged the constant flooding in Lagos as one of the resultant effects from depletion and loss of its systems or ecosystem. The study also identifies certain effects of economic activities on wetlands and the impact of urbanization with respect to wetlands. The unequivocal habitat loss, hydrologic variation, changes in water quality, increased runoff amount, lowered infiltration, minimized stream-based flows and groundwater supply, and long dry periods.

2.3 Distinguishing Wetlands Features

The Ramsar Convention has outlined the characteristics of wetlands; the characteristics are used as an attribute to distinguish wetlands. Wetlands for example most have one or more of the following features: “at least periodically the land supports predominantly hydrophytes, the substrate is predominantly undrained hydric soil and the substrate is saturated with water or covered by shallow water at some time during the growing season of each year” (Cherry, 2011). Coastal wetlands are categorized to include the following: “estuaries, seagrass beds, and mangroves.” One can simply identify a coastal salt marsh, which has a pronounced standardization of grasses and its convolution of tidal creeks as a swamp or wetland. A cypress swamp with majestic trees decorated with Spanish moss and standing in knee-deep water offers a unique reorientation of wetlands. A northern Sphagnum bog which is known to be boarded by tamarack trees and that quake as people slog by is said to be an addition to easily known wetland. It is good to know that every site has the same or mutual structures as follows:

- I. They have superficial water or drenched soil.
- II. They accumulate biological plant materials that usually decompose gradually
- III. They support a diversity of flora and fauna adjusted to the drenched environment

However, according to (Kar, 2013) then wetlands definition regularly comprises three main constituents or integrates:

1. Wetlands are differentiated as a result of the water present in them, the water is likely to be at the surface or at the root zone.

2. Wetlands often have distinctive soil conditions which are normally dissimilar to nearby upland.
3. Wetlands assist the biota-like flora changes or modified to the saturated environment (*hydrophytes*) and are equally categorized by the absenteeism of flooding-intolerant ecosystem.

Climate and geomorphology determine or explain the degree to which a wetland or wetlands can survive (existence). However, the major aspect here is hydrology, which in turn alters the physiochemical environment which comprises the soil, which thereafter controls the hydrology, what and how much biota, plus vegetation, is discovered in the wetland.

2.3.1 Wetlands and Human History

The possibility of measuring or estimating the degree of human impact on wetland globally is by monitoring and observing its state. In advanced and highly populated areas of the world, the effect is way above the significant benchmark. the essentials of this important ecosystem called wetland in development and upholding of the cultures as regards to human history cannot be underscored. Since the days of civilization, several cultures have adapted a means or strategy in living in harmony with wetlands. However, it is important to know that they have profited economically from the surrounding wetlands and their resources, whereby some other cultures rapidly depleted the terrain. The Egyptians, ancient Babylonians, and Aztec in what is now Mexico established a dedicated system for water delivery which involves wetland. Some main cities in the world, for instance, Washington D.C. and Chicago in the United States of America, Christchurch in New Zealand, and Paris in France all stand in the sites that were once part of wetland or wetland areas. Also, some big airports like in Boston, J. F. Kennedy in New York, and New Orleans just to mention but a few, are all sited on a wetland area (William & James, 2007). The Niger Delta, wetland reclamation as a result of pipeline installation, agriculture, and urbanization is said to be the most worrisome challenge facing wetlands in the region as a result of population growth (Ajibola, et al., 2012).

However, global generalizations are sometimes said to be deceptive, there was and there is a tendency in the Eastern cultures never to ditch the valuable wetlands completely, just like as seen in the west,

but also to work inside the marine or water area or landscape, although in a well-organized system (Takayuki, et al., 2016).

Dugan, (1993) works on an interesting comparison between hydraulic civilizations and aquatic civilizations. Hydraulic civilization is of a European origin which controls the flow of water using channels, pumps, embankment, and effluvium. This is partly because the water was only periodic copious. Then the water refinement is of Asian source which is better designed to their surrounding due to the copious water, much floodplains, and deltas with the help of nature pulses like flooding.

This is as a result of the previous method of managing nature instead of working with it, it is so overriding today in the sense that it is resulting in high losses of wetlands which are recorded globally. Wetlands have been known to be part of many human cultures and will continue to be so for the rest of the time. According to Coles & Coles (1989), individuals who reside close to the wetland and their cultures connected to it are termed as Wet Landers, because part of their life depends on the wetland.

2.3.2 Sustainable Cultures in Wetland

For so many years now, some cultures have lived in harmony with wetlands. For instance, the Camarguais of southern France, the Cajuns of Louisiana in the United States of America, the Marsh Arabs of southern Iraq, and plenty of far Eastern cultures. They are the wet landers; however, this is not the case of wetlands in Nigeria. In Nigeria, some people depend on wetland resources for their livelihood. William & James, (2007) gave examples of excellent wet landers using the Sokaogon Chippewa in Wisconsin, they have for hundreds of years reaped and planted wild rice (*Zizania aquatica*) along the seacoast of the lakes and rivers. However, there is an aphorism that “wild rice is like money within the Bank” (Takayuki, et al., 2016). Wetlands are known to be an area of cultural isolation and worship; in Niger-Delta it is seen as an isolated place used for sacrifices and mosquito breeding place. Like the case of Mont St. Michel, Benedictine monastery, which was erected within the period 11th and 16th centuries in the northern part of France (Junk & Piedade, 2004).

2.3.3 Wetlands as Source of Food

Wetland resources serve as food, for example, the rice paddies are estimated to feed around 50% of the world’s population. So many aquatic plants besides rice are being harvested on daily basis as food,

for example, the Manchurian wild rice (*Zizania latifolia*) are reaped as legumes in China. Cranberries reaped from swamps and till today industries are still flourishing with it in North America. Also, the coastal marshes in northern Europe, New England, and the British Isles were all used for centuries and are still being used to date for feeding animals and hey production purpose (William & Gosselink, 2000). Wetland is known to be an essential supply for protein in the world, for instance, it is used for fish production, in narrow ponds or rice paddies developed so many decades ago are presently used in China and southern Asia and more also the Crayfish harvesting is still being practiced in the wetland in Philippines and Louisiana in the United States of America. Wetlands and shallow lakes are the major sources of protein in Nigeria (Vidy, 2000).

2.3.4 Wetlands and Ecotourism

Some countries are using wetlands for ecotourism in an attempt to increase tourist inflow into the country and for revenue generation. According to William & James (2007), the Okavango Delta in Botswana is known to be one of Africa's richest in terms of natural resources, since the 1960s the priority of the country in respect to this wetland is to protect it for the purpose of tourism and hunting. However, the local tribe in this area have put in place boats for a boat tour (in dugout canoes called Mokoros) to make money, through the basin, and to help the nature tours on the lowland. Also, in Senegal, there is a strong interest in bringing the European birder tourists to the mangrove swamps located around the Atlantic shoreline. It is obvious that the main advantage of ecotourism in this case or as a management plan is the income it will generate for the nation without requiring or giving opportunities for harvest from the wetland. However, there is a potential disadvantage to the site if the site becomes a well-known site, the pressure from humans will affect or impact the landscape of the site and the ecosystem which is the main and original attraction for tourists. Here are some wetlands or parks that are well known as a tourist destination area; Everglades, it is located in the state of Florida, United States of America. Everglades is a very vast, shallow, slow moving river of grass that covers from Lake Okeechobee to Florida Bay. The Kakadu Wetlands located in Kakadu National Park in Australia, provide one of the best wildlife viewing opportunities. The Mekong Delta is located in the southern Vietnam, with a very rich and lush area with rice fields, this area is known to produce about half of entire Vietnam's agricultural produce. As life in Mekong Delta is said to be revolving

around the river and all the communities around are accessible through the river rather by road (Dang, et al., 2021).

2.3.5 Wetland Destruction and Conservation

In the mid-1970s there was this practice of draining and destruction of this important ecosystem called wetland, agreement across the globe which encourage certain policies. In this case, wetlands were converted to agricultural lands, residential and for commercial activities or development. If such a manner of development were to be sustained, by now wetland resources would have gone into extinction. A country like New Zealand has lost about 90% of its wetland and some states like California, Ohio in the United States of America has also been reported to have lost up 90% of their wetland.

A combination effort or doings of hunters and fisher, engineers and scientists, conservationists and lawyers have made the world understand the value of wetland and its resources of which the destruction will impact negatively on the economy and as well as ecological and aesthetic effects in the nations of the world (Mitsch & Gosselink, 1993). However, in the United States of America, there is amplified respect which is being replicated in the activities; for instance, the sales of federal “duck stamps to waterfowl hunters” which started in the year 1934 in the state; other countries like New Zealand have followed suit. However according to William & James, (2007) “about 2.1 million hectares (ha) have been bought or leased as waterfowl habitat by the United States of America’ duck stamp program since the year 1934” (William & James, 2007). Presently government now supports varieties of agencies and programs that have to do with wetland protection through federal agencies; some states have on their own enacted laws for protecting wetlands or used the available status to preserve these valuable resources, Nigeria has not been able to enact specific laws for the wetland.

The curiosity in Wetlands’ protection and conservation first thrived in the United States of America in the 1970s, and it is now practiced in other parts of the world. The Ramsar Convention is an international treaty that stipulates some framework for member states and international collaboration to drive good conservation and sustainable use of wetland resources on earth (Ramsar, 2017). Ramsar Convention has about 150 member countries participating in the agreement, of which Nigeria is a member country and about 150 million hectares of wetlands area are designated for inclusion in its

list as Ramsar wetland of international importance (Ramsar Convention Secretariat, 2004). Presently many other countries and non-governmental organizations (NGOs) have now keyed into persevering wetlands because of their values.

2.3.6 Wetland Management and Managers

There are wetlands scientists that are carrying out research about wetland and discovering the values and functions of wetland, including individuals or groups working on other aspects either by choice or vocation on so many aspects of wetland management and protection. These individuals are termed wetland managers; they take part in activities ranging from waterfowl production to wastewater treatment. However, this is to gain a balance from the scientific view of wetland in relation to the so many legal, institutional, and economic controls in finding the best management plans for the wetland.

A good management design for the wetland is particularly important as many countries are doing so already through national policy and wetland regulations in respect to the reversal of ancient wetland losses through the continued draining or encroachment for the purpose of agriculture and urban development or expansion. The uncomplicated process supporting the identification of wetland boundaries has become an essential skill in the new field of wetland technicians in the USA referred to as wetland delineators (Tiner, 1998).

In some developed countries like the United States of America, private organizations for instance the Ducks Unlimited Incorporation, and the Nature conservancy have on their own protected wetland by acquiring thousands of hectares of wetlands around the continent or region of North America. Through the wetland treaty “Ramsar Convention” and a memorandum of understanding that was mutually endorsed by Canada and the United States of America called the North America Waterfowl management plan of 1986, wetlands was said to be protected majorly for their waterfowl value at the international scale and of the interest of the world at large (William & James, 2007). Conversely, in 1988 they established a national “sponsored National Wetlands Policy (NWP)” in the USA, which contributed to improved public and political awareness in respect to wetland degradation or loss and therefore suggested regulation of “no net loss” of wetland. This reference has influenced the increasing attention in wetland restoration and reestablishment of the lost wetland and “no net loss”

is the major wetland policy used for protecting wetland in the United States of America since the 1980s (William & James, 2007).

Afterward, there was a recount by the “National Research Council” (NRC) in the United States of America. in 1992 for the realization of the aim of securing about 4 million hectares by 2010 via the reconversion of crop and pastures land. Wetlands that are being created for a specific function is an exciting recent or current field of wetland management that needs skilled experts and might conclusively stem the current loss and possibly lead to an upsurge in the valuable resource. This is in accordance with the NRC report of 1995 which examined the scientific basis of wetland description and categorization, in respect to its relationship with regulations in the United States of America at that period (Kusler, et tal., 1994).

2.3.7 Wetland Science/Scientists

The people that specialize in the field of wetland are most times referred to or termed as wetland scientists or wetland ecologists. Before “mire ecologist is also used for them, some people have suggested that the study of wetland be termed Telmatology, (Telma is a greek word meaning bog) a term originally to mean Bog science” (Zobel & Masing, 1987). Whatever the field is referred to or called, what is important here are the several motivations for managing wetland ecosystem as a separate area of training due to the following:

- I. Wetland is known to have some exceptional assets which are not sufficiently enclosed or curtailed by the contemporary ecological paradigms and other areas such as “limnology, estuarine ecology, and the terrestrial ecology.”
- II. Wetland study is presently characterizing mutual properties of apparent distinctive wetland types.
- III. Wetland requires an integrative method or interdisciplinary approach for wetland investigation, not the habitual research or fusing into an academic plan of a university.
- IV. Presently there is growing attention in respect to framing or designing a comprehensive policy that will help in regulating and the management of wetland.

However, regulating and management methods entails a sound scientific basis incorporated as wetland ecology. There is an elevated level of signs which advocates about the distinctive features of wetland static water or drenched soils, anoxic situation, plants, and animals' acclimatization might help to offer several mutual views for the study that can be "terrestrial ecology or aquatic ecology" (William & James, 2007). Wetland is important because it is being use as an experimenting ground or carrying out some collective ecological assumptions or theories and principles which comprise sequence and flow of energy, as established for the terrestrial and aquatic ecosystem. For instance, Clements (1916) said wetland provided him the setting for his successional theories known as "successional theories of Clements 1916" and also the "energy flow approaches of Lindeman, 1941" (Thomas, 1989). Wetlands, however, offer or serve as exceptional laboratories for analyzing principles in respect to transition zones, ecological interface, and the transitional area between two adjacent ecological communities (ecotone).

By obtaining information about the various kinds of wetland, there is an isolation in distinctive literature and scientific cycles, whereby some of the literature however deal with the coastal wetland and others talk about the forested wetland, freshwater marsh, and another with peatland. According to William & James (2007), only a few investigators have worked on analyzing the assets and their roles, which are mutual to wetland. This area has been recognized to be electrifying in terms of wetland research since there is more to learn in this area. In the process of comparing wetland types, it has shown the differences, for instance, the importance of hydrological movement across, for the aim of conservation and efficiency or production of the ecosystems. However, it is said that anoxic organic procedures which are mutual in all wetlands offer a motivating space or opportunities for relative/relevant research which pose several questions regarding; what is the functions of the several types of wetlands in the local and international scale of biochemical sequences? In what way do the different actions of man impact the sequence of the different types of wetlands? What are the collective effects, impact of hydrology, chemical contributions, and the climatic situation on wetland life production? How can the plants and animals adjust in relation to anoxic pressure be evaluated in the different wetland types?

Wetland plant types are known for the sustenance of both terrestrial insects and aquatic fauna. Because hydrologic condition is very vital in establishing and organizing the role of the wetland ecosystem, wetland scientists must be knowledgeable about surface and groundwater hydrology. Similarly, the question of wetland as a resource, sink, or transformer of chemicals requires investigators to have a broad knowledge of many chemical and biological techniques. Whereby the identification of wetland vegetation and animals requires the knowledge of botanists and zoologists. However, a background in microbial biochemistry and soil science has an important responsibility in understanding the anoxic environment. To have a good understanding of adaptation for wetland ecosystem in relation to the submerging situation necessitates both the knowledge of biochemists and physiology. In this case, if wetland scientists have the intention to be more involved in the management process of wetland, then some engineering skills are required, mostly with regards to hydrological control or wetland creation.

2.4 Conclusion of Chapter Two

The world nature protection has classified wetland, ocean and forest as the three main ecosystem in the world. According to Sikhululekile, M., (2022), globally, wetlands are depleting three times faster than forests. Nigeria and some other countries have use legislation to protect forests and oceans to a reasonable level, for instance the national forest policy of 1988, 2006 and other forest policy that establishes forest guards and forest reserves in Nigeria. But, there is no specific laws for protecting and management of this important ecosystem called wetlands, that have been enacted or pass into law in Nigeria. As the laws available have not effectually regulated wetlands at system level, that are only for land resources, “animal and plant resources protection, nature reserve construction and management”. Hence the need for more research in wetland related fields to establish or design more and important policies and agencies that will effectively implement and enforce the laws to better protect these important ecosystems and as well help to ensure sustainable utilization of its resources.

3.0 Significances/Importance of Wetlands

According to history, wetlands are formerly considered as a wasteland, but presently it is known to be one of the most important natural resource centers in the world (Adekola & Mitchell, 2011). Presently, humanity is now appreciating the value of wetlands, there is an improved interest in maintaining the

available ones thereby working towards restoring degraded ones. Maintaining and restoring wetlands is a big task in developing countries including Nigeria. It requires technical tasks, cost to humanity in respect to insufficient availability of resources needed for development or survival.

According to McCartney, et al., (2004) as reported by (Mayowa, 2012) their report about Africa, “conducted for International Water Management Institute (IMWI), stated that throughout history, the wetland has played a significant role in human development”. However, wetlands are so beneficial and at the same time cause difficulties for people. The value of wetland has continually to be viewed based on societal sensitivities of its uses and the services it renders, or the benefit obtained from it in accordance with the location. The values of wetland arise due to its interconnection with ecological behavior in relation to human society. Presently, many countries in the world have decided to consider wetland as a special ecosystem that is very productive due to research findings compared to the past when wetlands are considered unproductive wastelands which are allied with diseases, difficult to access, and dangerous as believed in the past. It was believed in the past that wetland functions are of no benefit to the people and as well harmful (Honingsbaum, 2001). Honingsbaum (2001) also identifies wetlands as a habitat for mosquitoes that transmit diseases, this was acknowledged to be one of the many roles wetlands plays which has an undesirable impact on society according to history, thus one of the reasons behind the draining of wetlands.

According to McCartney, et al. (2004) recently, there has been a greater understanding in terms of ecological development which occurs usually around or in the wetland areas, creating or resulting to severe alteration in view. Presently wetlands are seen as a valued ecosystem whose functionality is important for preserving the environment, supporting biodiversity, and sustaining livelihoods. For example, In Africa, more than a million people depend on wetlands for their livelihoods especially in the “arid and semi-arid areas” (Adekola, et al., 2015). The comprehensive monetary value of the wetlands ecosystem, meaning the worth that has been ascribed to the direct physical benefits of the system is approximately \$70 billion per year (Adekola, et al., 2015). It also benefits some people in a nonphysical way and could be associated with spiritual enrichment, aesthetic experience, and cognitive development. Hence, wetlands have been known to have brought an extensive diversity of benefits both perceptible and imperceptible profit to many people. This is done in a simple and multi-

functional manner which is openly related to ecological functions, hence the situation of wetland and its value (Mayowa, 2012). However, it is clear to know that wetlands are allied with several other cost. “In the past, the case has always been that, as the cost are being recognized, the less quantifiable benefit to human welfare have tended to accrue without communities and decision- makers fully appreciating them. This is as a result that some of the benefits are often unrecognized in terms of development, resource planning, and management” (Mayowa, 2012).

The wetlands ecosystems are extremely diverse and are normal areas that accumulate runoff for a certain period or season annually. The hydrologic sequence of the wetland consistently keeps recycling via land, sea, and atmosphere in a procedure that guarantees originality and therefore balances its ecological purposes (Rudolf, et al., 2006). Wetlands are presently known to support a remarkably high level of biodiversity, they are the second richest ecosystem after tropical rainforests on the planet, which provides important life support for man, and other life that depends on it. For a long time, people have lived along with water areas (wetlands) and they have been benefiting from its services that are obtainable. However, the advancement of various great developments was principally based on their approach to its resources. This important ecosystem is known to be an important part of the hydrologic cycle, which plays a central responsibility in respect to water availability and maintenance of its quality and quantity on the ground for its support on every life in the world by ground water recharged, erosion control and service as a breeding ground for aquatic animals. Most of the time they are unified with more wetland and mostly create productive and various transition zones amid two dissimilar ecosystems (aquatic and terrestrial ecosystems) e.g., the forest and grassland.

It has been understood naturally that it is the public who receives most of the benefits that accrue from the healthy wetland, rather than the private landowners. The market failure in a way recommends or proposes that the personal deal by the owners of the lands for the purpose of conserving and restoration actions is lesser when compared to that which is said to be socially acceptable (Rudolf, et al., 2006).

However, the government can potentially stimulate investment in so many ways such as tax, subsidies, and credits, and the efficacy of different methods are possible to determine the way in which the personal market request changes in relation to investment (Barbier, et al., 1997).

3.1 Why Wetland Valuation?

Wetlands are known and recognized as a valuable ecosystem that provides raw materials and food, it provides other services like flood control and water purification, also as an imperceptible value for instance; cultural and religious values. The location of the wetland or area also determines the particular importance attached to it, in some cases it is predominantly vital for some people's livelihoods. Despite these services it renders the laws available for conserving it, is assume not to be sufficient as the rate of wetland loss keep increasing (Edo & Albrecht, 2021), with fifty percent of the global wetland estimated to be lost (William & Gosselink, 2000). Presently wetland degradation has gone beyond a collectively endurable level as a result of market failure since its real value or its market value is not reflected and the failure of government in giving or paying incentive and also the unclear definition of property rights has led to uncontrolled access of this important ecosystem. Moreover, the ignorance on the side of the administrators (decision-makers) in relation to wetlands value, because knowing its value or worth will help to make a good decision on how well to manage it.

Knowing the composite structure and functionality of the water and its related terrestrial ecosystems is particularly important to conserve it. Nevertheless, the system mostly produces the immeasurable formation of frequently substituting goods and services. The changes that occur in these ecosystems structure and functions, which goes to a certain level of determining the quantity and quality of its services. Thus, these imply that alternate strategy and good managerial opportunities can have a key implication in providing marine ecosystem services, and the sole responsibility for the economic assessment team to make available the value or estimated values and present it to the decision-makers to be able to aggregate the values in respect to gain or loss coming from each alternative or substituted policy in Nigeria.

Barbier, et al., (1997) is of the view that lack or inadequate accountability of non-market or sellable environmental values in respect to developmental choice is the main issue resulting in the degradation of wetland resources in Nigeria and in the Niger Delta. It was suggested that if a means is provided for the purpose of computing and evaluating different benefits that are obtained from wetland it will go a long way in attracting the decision-maker's interest or attention in considering the possible ways of protecting this unique area. However, economic valuation will be a vital tool for the purpose of helping

and improving or promoting sustainable use of wetland resources and their management both at the local and global levels. They went ahead to state that valuation in a way by allocating measurable or quantifiable values to its goods and services without or with a market value which is obtainable to help for the assessment in knowing or obtaining the value of wetlands resources.

Valuation is essential in this context as a result of the service being offered by aquatic ecosystems which have characteristics of public goods. In this case, public goods are known to be non-competitor and non-excludable in terms of consumption, this means not giving opportunities for the market to operate resourcefully or efficiently in offering its services. For example, groundwater filtration, since the amount of groundwater is not short supplied meaning it is readily available for everyone that has a borehole or well and they enjoy the benefits of unlimited potable and groundwater (Mayowa, 2012), in this case, there is no restriction to its access. Therefore, there is no market available for providing water-related services via wetland filtration, at this point, there would not be a practical or perceived cost to evaluate the amount each individual or household will accept or will pay/willing to pay for the service it renders and its benefits (Barbier, et al., 1997). However, if there is no market for the provision of water services through wetland filtration, then there would be no practical or known price to show how much each household or individual will want to pay for the benefits of such services (Mayowa, 2012; National Research Council, 2005). Every individual has the right to use the water, but nobody is mandated or made to handle the task of preventing it from being polluted. This is not a process or project that an individual or company can undertake without collecting money, since nobody has stewardship of the said process (wetland filtration).

The non-market value should be estimated to help evaluate the benefits of its common action with the assistance of the state environmental organization or FMEnv; however, this process may be more expensive than the cost of the planned actions for the protection of wetlands. Nevertheless, accurately assessing the non-market value is crucial for a comprehensive understanding of the true impact and benefits of the conservation efforts, ensuring informed decision-making and long-term environmental sustainability. Thus, “the wetland filtration process and the quality of the water in the aquifer for the purpose of drinking” (Mayowa, 2012) should be valued for evaluation purpose. Several aquatic ecosystems from one way to the other contribute to the services that are available in the market, of

which the ecological services cannot be traded or exchanged in the marketplace, an example of such is the estuarine marshland. It provides an essential process into a business coastal fishery and serves as a breeding place and nursery habitat for fry (juvenile fish) (Mayowa, 2012).

However, disturbance and transformation of marshland affect the biological output or production of the marsh, which will as well have an impact on its commercial fishery, there is no market for saleable fishery which they are made to pay for the purpose of maintaining the habitat services of the marsh area. The challenging issue here is the transaction cost and examples are as follows;

- I. It is a challenging situation or difficult to bring or organize those involved in commercial fishery together and to bargain with the marshland holders.
- II. There might be various holders of marshland of which protection arrangements have to be pursued.

“Estimation of the implicit for the (non-market) value of the fishery of marsh habitat can be used as a tool to test or understand if there are laws and rules that protect the breeding and nursery functions of the marsh” (Mayowa, 2012).

Any aquatic ecosystems services which do not own market prices normally are excepted from obvious deliberation in respect to cost-benefit analyses and other related economic assessment, and might not receive a complete deliberation during the process of policy decisions making. Valuation gives the opportunity to compare and contrast the main cost and benefits of the system use, loss and gives an opportunity for stable decision-making in respect to protecting and restoring the wetlands loss (Agbasi & Odiaka, 2016, Barbier, et al., 1997). This helps to facilitate optimal decision-making with respect to societal well-being. In a situation whereby the monetary value of ecosystems services has not been estimated, there is a high tendency that the major benefits of the ecosystems (aquatic) will not be put into consideration in terms of benefit-cost compensations. Such omission will result in not or protecting a little part of aquatic ecosystems and consequently, its services will be undersupplied for both those that use it directly or indirectly. Valuation is important because it helps to ensure that the non-traded ecosystem service in markets, and which do not have market prices receive explicit treatment in economic assessments. The goal of valuation, in this case, is not about creating value for

aquatic ecosystems, it is to formally estimate the non-market values that humans already hold when it comes to aquatic ecosystems due to their services and relevance to man. The information got from the valuation of non-market values will help in assessing whether or not to protect a particular or certain type of aquatic ecosystems enhance the provision of identified ecosystem services and/or restore damaged ecosystems (Mayowa, 2012). Finally, it has to be understood that it is only economic values that are often used when it comes to legal issues or litigation which have to do with the damage to aquatic ecosystems from pollution or other human activities (anthropogenic) (Mayowa, 2012). I think that valuation concerning the wetland is a tool used to gain indigenous and political support for its conservation and sustainable use. It helps in finding the causes of environmental problems that result in biodiversity loss and other related issues. It allows more stable planning and decision-making in a positive way and/or develops motivation and financing strategies or instruments for attaining sustainability in conservation (Barbier, et al. 1997).

3.1.1 Ecological Value of Wetland Services

“The ecological importance of wetland ecosystems has been articulated by natural scientists in reference to causal relationships between parts of the system, for example, the importance of a particular tree species to control erosion or the value of one species to the survival of another species or of an entire ecosystem” (Mayowa, 2012).

Globally, there are different types of ecosystems, and their species render services in the maintenance of relevant life support processes such as energy conversion, biogeochemical cycling, and evolution (Mayowa, 2012). According to this assessment, the significance of this is expressed via indicators such as species diversity, rarity, ecosystem integrity (health), and resilience, which have to do with the supporting and regulating services (Mayowa, 2012).

3.1.2 Socio-cultural Value of Wetland Services

Wetlands are known by many people as part of the natural systems, which is an essential source of nonmaterial wellbeing as a result of their effect on physical and mental health, historical, national, ethical, religious, and spiritual values (Mayowa, 2012). For instance, a certain area within the mountain, forest, or watershed may be used as a site for an important event (festival) or used in the past as the home or shrine of a deity, a monumental place, or a place to portray cultural heritage.

According to Mayowa, (2012) the major types of socio-cultural values are therapeutic value, amenity value, heritage value, spiritual value, and existence value.

3.1.3 Economic Value of Wetland Services

Considering cultural values and its social welfare indicators of a subset of economic values (Mayowa, 2012), economic valuation can be said to be limited to efficiency and cost-effectiveness analysis, which is said to be measured in monetary units, thereby not considering, or disregarding the importance of other values like the spiritual significances and cultural characteristics that are in several cases considered to be allied to ecosystem activities. However, figure 1 shows what is seen to be overall value as it cuts across ecological, socio-cultural, and economic.

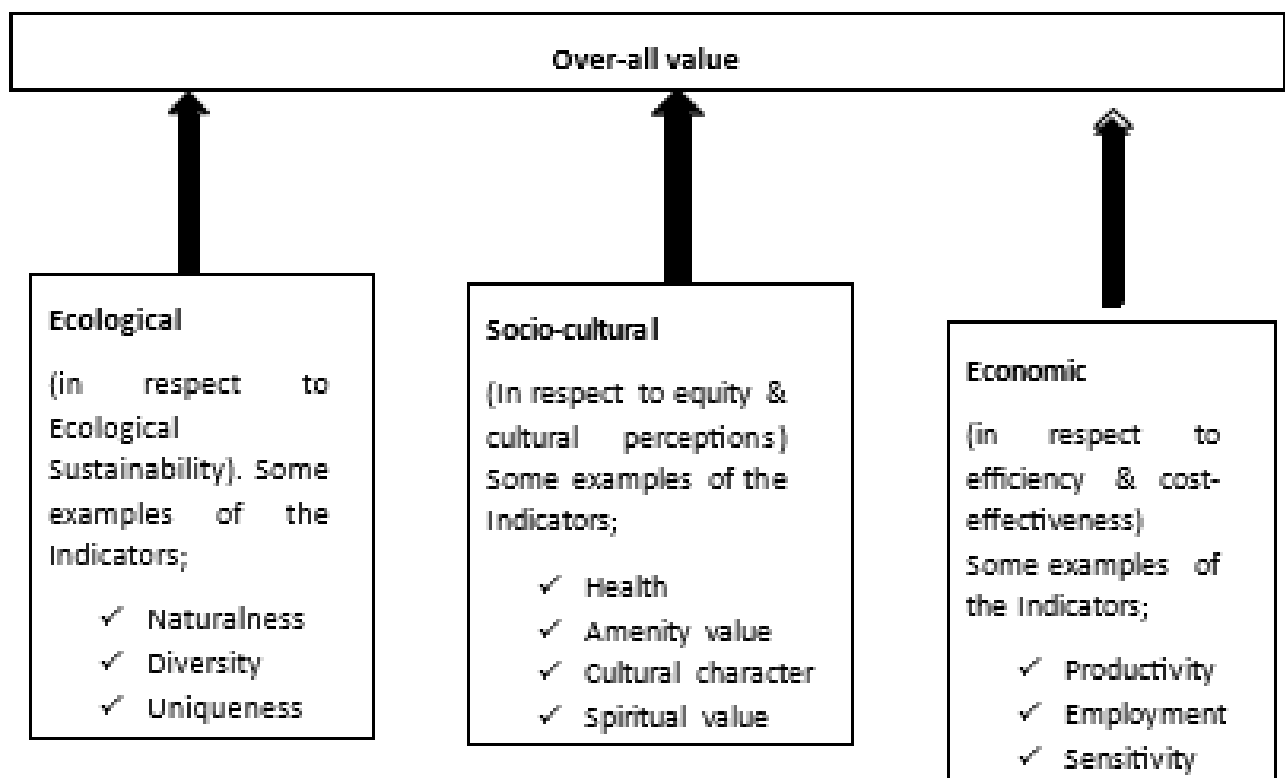


Figure 1: Components of overall value of wetlands

Source: (Mayowa, 2012)

Generally, valuation (economic and monetary) is most times treated independently, for example, socio-cultural valuation, in the process the valuation is done in a way that shows or explains the ecological, socio-cultural, and economic values of the socio-culture. This aspect of valuation has its own different and significant task that it takes care of in terms of administrative resolutions, which therefore can be viewed as importantly harmonizing bits of information for administrative purposes.

3.1.4 Wetlands and their Classifications

Mitsch & Gosselink (1993) stated in their report that no particular methodology was developed for wetland classification. However, the report states that the simplest means is to distinguish wetlands according to their natural state—wetlands that originate in geological settings due to water movement and accumulation in a particular area. And the artificial wetland (a man-made system that is being designed to imitate and function as the natural wetland systems). Gren & Soderqvist (1994) classified wetlands based on their own approach, which was centered entirely on the productivity of a wetland, and this is allocated to three groups about uses.

- I. For the purpose of maintenance and development.
- II. For the purpose of distributing it to other ecosystems.
- III. For its utilization by human society.

The uncertainty in the explanations seems to have been driven by the large diversity in the several types of wetlands which exist in the entire world and the lack of direct equivalent in terms of translations among different languages (Mayowa, 2012). The first type of output here refers or has to do with build-up and organizing capacity of a wetland ecosystem, and this is referred to as primary value; while the second and third types of output refer or have to do with the exported life-support values, and are classified to be the secondary value (Mayowa, 2012). In this case, it shows that the secondary value is dependent on the well-functioning of the wetland ecosystem, the primary value in this case, becomes essential for the existence of secondary value. However, the study does not in any way differentiate between primary values and secondary values in the classification of wetland ecosystems (Mayowa, 2012).

Shaw & Fredine (1956) came up with the first categorization system, in this categorization, twenty categories of wetland were labeled under four classes as follows:

- I. Inland fresh areas seasonally flooded basins, inland fresh meadows, inland shallow fresh marshes, inland deep fresh marshes, inland open freshwater shrub and swamps, wooded swamps and bogs.
- II. Inland saline areas inland saline flats, inland saline marshes, inland open saline water.
- III. Coastal freshwater areas coastal shallow fresh marshes, coastal deep fresh marshes, coastal open freshwater.
- IV. Coastal saline areas coastal salt flats, coastal salt meadows, irregularly flooded salt marshes, regularly flooded salt marshes, sounds and bays, mangrove swamps.

According to Cowardin et al. (1979), the categorization class used in the United States of America as the measure for National Wetland records was official, comprehensive, and the most widely used. The categorization system, however, was established on a taxonomic separation scheme, classifying all wetland and deep-water habitats into five different systems (marine, estuarine, riverine, lacustrine, and palustrine). These are further subdivided into several subsystems and classes (Mayowa, 2012). Mitsch & Gosselink (1993), in their study, grouped wetlands into two systems (coastal and inland). Novotny & Olem (1994), along with some other authors, categorize wetlands according to their source as natural or constructed wetlands, as stated above.

Agbi et al. (1995), in their study conducted in Nigeria, recognize two main forms of wetlands in the country, which include freshwater wetlands and coastal wetlands. The freshwater wetlands comprise swamps, marshes, bogs, and similar areas that are filled with water, either groundwater or surface water, regularly for a period that is conducive to the sustenance of the ecosystem (Mayowa, 2012). Coastal wetlands include all flooding and sub-flooding lands, encompassing areas identified to be below the debris line left by the actions of the flood. This area includes anywhere that vegetation is present and tolerant to salty water and estuarine habitat; and any type of swamp, marsh, bog, beach, flat, or others attached to the lowland that is the focus of flooding action within the period of maximum spring tide level which is stated in the tide tables and printed by the National Ocean Service.

Coastal wetlands can incorporate some portions of the coastal sandbanks, (Mayowa, 2012). The wetlands in Nigeria fall into two main classes which are as follows; the Coastal Wetlands (mangrove swamps), and the Freshwater Wetlands-Floodplains, (Mayowa, 2012; Fagorite, et al., 2019; Olalekan, et al., 2014; Bath, 2009). According to Ajibola & Awodiran (2013), they stated that the mangrove swamps cover an area of 9,000km² in the coastal States of Nigeria which includes; Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Lagos, Ogun, Ondo, and Rivers while the floodplains cover a total area of 2,585 km², which is mostly along with the Niger/Benue River system (Mayowa, 2012). They went ahead to say that there is no particular manner for classifying wetland resources (Mayowa, 2012).

3.2 Nigeria Environmental Laws and Policies Use for Wetland Management

It is particularly good to understand that conserving the environment is a vital link to human existence and health. Thus, the protection of wetlands is important in the sense that when destroyed, there is a high tendency that it will impact human health and the local economy of the host communities, the regional economy, and the nation at large. This research will review the policies and legislation available used for the conservation and management of wetlands in Nigeria. The Nigerian constitution guarantees members of society some rights such as the right to freedom, conscience, and association as envisioned in Part IV of the 1999 Constitution of the Federal Republic of Nigeria as amended (Agbasi & Odiaka, 2016).

According to Agbasi & Odiaka (2016), the right to a safe and healthy environment falls under the category of newly recognized rights. In this context, many state constitutions acknowledge the right to a healthy environment, providing effective, efficient, and viable processes and procedures for its management. It's important to note that the Nigerian Constitution does not explicitly outline sanctions for activities against the safety and healthiness of wetlands. Instead, common law reliefs are in place, but these may not align with the technological advancements of today's world, particularly in the oil and gas industry observed in the Niger Delta region of Nigeria.

Nevertheless, the constitution makes provision in Chapter two the important objectives and directive principles of the state plan or policy for guarding and improving the environment and to safeguard the water, air and land, forest, and wildlife of Nigeria. Section 20 of the fundamental objectives and directive principles of state policy, set out the guidelines to ensure a safe environment for its citizens

and highlights the duty of the states, not just only for the aim of guarding the environment, but also to improve the state of the environment (Constitution of the Federal Republic of Nigeria: as amended, 1999). However, these provisions are non-justiciable by virtue of section 6 (6c) of the constitution (Agbasi & Odiaka, 2016). According to Agbasi & Odiaka, (2016) it is usually regarded as policy guidelines rather than justiciable provisions which relate to the right to life as stated in section 33 of the 1999 Constitution. Section 46 of the constitution provides relief to the High Court for any person who feels that their fundamental rights under Chapter four of the Constitution have been compromised. At this stage, it becomes so important to consider if it is the appropriate time to include environmental rights in the constitution for the purpose of actualizing or ensuring a healthy environment (Agbasi & Odiaka, 2016).

3.2.1 Land Use Act

The Land Use Act was promulgated on 29th March 1978 and has been in operation for over four decades, before now the traditional mode of land use was in place with families owning land. Natural means of land conservation and restoration were used like crop rotation, fallowing, etc. The Land Use Act was primarily formulated to reduce the stress on the government for acquiring land for public usage. The interesting aspect of the Act is that it enables the government to determine the use of which the land can be put to as a planning tool, by bestowing land in each state territory in the care of the governor of the state. However, according to Agbasi & Odiaka, (2016), the idea of taking over of all land in the country should not be regarded as a socialist or social justice action by the government, it is seen as a deliberate attempt to put all the land firmly in the control of the government. However, by virtue of section 22 of the Land Use Act, a holder who has been granted a Statutory Right of Occupancy (SRO) or Customary Right of Occupancy (C of O) cannot alienate such rights without the governor's consent through the Ministry of land in the state (Constitution of the Federal Republic of Nigeria: as amended, 1999). An attempt to do so will risk revocation of the right of occupancy. However, section 36(2) preserves the rights of the owners of land who were using such for agricultural purposes prior to the establishment and enactment of the act. According to Agbasi & Odiaka (2016) recalls the challenges posed by accessibility to the land make it difficult for farmers to engage or go into agriculture. The aftereffect of this is the wetlands reclamation for agricultural

purposes in some areas. With the provisions of the Land Use Act, many of the wetlands in the country were reassigned to the government. As a result, it brought about wetlands pollution by farmers who are looking for alternative fertile land, hence resulting in the mass extinction of breeding grounds for fish and other marine life (wetland loss).

3.2.2 Environmental Impact Assessment (EIA)

The Rio Declaration on Environment and Development, known as Rio Declaration is a document (Albrecht, et al., 2016), which was adopted on the 13th of June 1992 during the United Nations Conference on Environment and Development (UNCED), which took place in Rio de Janeiro, Brazil in June 1992 (Takayuki, et al., 2016). This document was put in place to reaffirm the Declaration of the United Nations Conference on Human Environment commonly known as the Stockholm Declaration which was adopted in the city of Stockholm, Sweden in June 1972. The Rio Declaration has a clear definition of the right of the people to be part of the development and their responsibilities in safeguarding the environment. It also states that long-term economic achievement is only guaranteed if it relates to environmental protection. To actualize this, the nations on their own must establish a new global partnership involving the governments, their people, and the key stakeholders in society (Albrecht, et al., 2016).

Having analyzed the relationship between development and the environment, there is a need to ensure that all developmental projects or activities are sustainable, one of the reasons is the need to avoid damage to the regenerative capacity of the environment. The Rio Declaration consists of a preamble and 27 principles that may serve as a guide for future sustainable development around the world. Principle 17 talks about EIA, “as a national instrument, which shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and it is subject to a decision of a competent national authority” (Albrecht, et al., 2016).

This is where the need for an environmental impact assessment (EIA) regime in Nigeria comes into play. In Nigeria, one of the early build-ups to EIA can be found in the provision of the 1981 – 86 National Development Plan to the effect that ‘feasibility studies for both private and public projects should be done along with environmental impact statements’ (Okorodudu-Fubara, 1998). The National Council on the Environment at its meeting in November 1990 recognized the fact that EIA is an indispensable

requirement for active or effective implementation of the National Policy on the Environment (Ugochukwu & Ertel, 2008). It directed that EIA must be made mandatory for all developmental projects or activities with effect from March 1991 (Cherry, 2011). The body went ahead to make environmental auditing compulsory for all existing industries and urged FEPA presently the Federal Ministry of Environment (FMEnv) to establish EIA guidelines and procedures for operation all over the nation as shown in Figure 2.

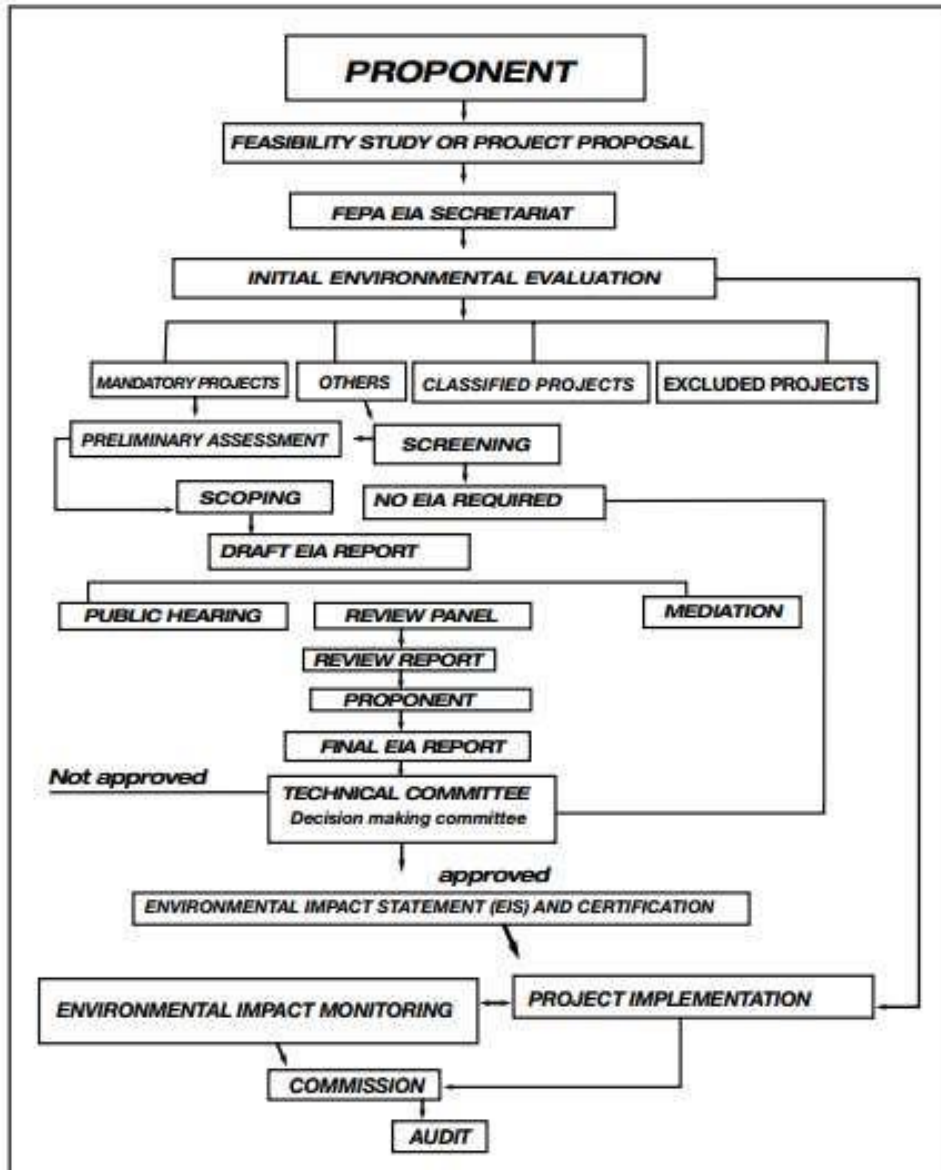


Figure 2: EIA guidelines and procedures (Source: (Echefu & Akpofure,(2015)

The major aim is to ensure that potential environmental effects are detected before the start of a project or at the stage of project design and resolved ahead of time before taking any decision on the project (Okorodudu-Fubara, 1998). It is essential to conserve the fishery, wildlife, creeks, wetlands, air, plants, and mineral resources from anthropogenic impact. EIA in Nigeria is mostly carried out by consultants concerning the specific projects that are paid for by their clients (companies), thereby ending their project reports within a stipulated time frame as agreed. The public is met to take part in this process in accordance with Rio Declaration, afterwards, the reports from the consultants are sent in for the public to comment on within twenty-one days (3 weeks). Thereafter, public opinion is taken into consideration to make the final decision for the project, either approved or disapproved. The projects that mostly link to wetlands are likely to have a direct impact on plants and animals, the area of agricultural development like reforestation/afforestation project, small scale irrigation, small scale aquaculture, sawmilling, logging, rubber processing, road rehabilitation and other forms of quarrying or mining activities for development (Agbasi & Odiaka, 2016).

According to Farmer (2017), FEPA as the apex body then was given the mandate to handle and ensure compliance with the available guidelines and procedure of this decree. Farmer (2017) further reports that FEPA directed all the companies to have an archetypal format for preparing and reporting EIA studies. The report is required to have a clear description of the activities, who is to be involved in it, potential effects on the environment, a feasible alternative, identification of knowledge gaps, identification and description of the mitigation measures, and the communication of the adverse effects (transboundary) of the project on the environment. In the principal legislation of EIA which is Decree 86 of 1992, that made EIA mandatory for both public and private sectors in respect to developmental projects. The decree 86 of 1992 was used to categorized developmental projects into three categories as shown in table 2. Category one comprises of projects; power generation plants, petroleum, Quarries, mining, airport etc. Category two projects include projects under agricultural and rural development projects; rubber processing projects, any fish processing projects. Also industry and infrastructural projects like mini hydro power development, any small scale industry development, small scale power transmission projects etc. The third category projects include; health programs, nutritional programs, educational programs, environmental awareness programs etc.

Table 2: EIA projects categories as classified by Nigeria

Category of Projects EIA Requirement

Category 1	Activities or projects that require full and mandatory EIA
Category 2	EIA is not required unless the project will be sited in environmentally sensitive areas
Category 3	Activities that have a beneficial impact on the environment (no EIA)

(Echefu & Akpofure, 2015)

However, any of the projects from the three categories that falls within the area that the decree refers to as environmental sensitive area will classified or referred to as category one project. The areas referred to as environmentally sensitive areas include coral reefs, mangrove swamps, small island, tropical rainforest area with erosion prone soils, wetlands of natural or international importance, area of historic and archaeological interest, and natural conservation areas etc.

3.2.3 The Harmful Waste (Special Criminal Provision)

The oil spill in Santa Barbara, California, the United States of America in 1969 was seen as a cataclysmic event that brought about the celebration of Earth Day for the first time on April 22nd, 1970 (Thulin, 2019) (Bressan, 2021) (Dunaway, 2008). This was the reason behind the lawmaker's decision to put in place or adopt a tough environmental stance. A similar case was the incident in Koko, Delta State of Nigeria in 1988, which then mark a turning point in the history of Nigeria's environmental protection (Liu, 1992) (Ndunofit, et al., 2015). In Nigeria, there have been so many legislations before now, but most of them are not effective because there was no serious commitment to their implementation (Ndunofit, et al., 2015). Then the best available threat for offenders was purely administrative, like seizing of operating licenses of the oil and gas companies, in the exercise of the power as conferred on the minister under the Petroleum Act. However, this system changed dramatically in 1988 when the Italian ship with five shipments loaded with the toxic waste of Polychlorobiphenyls (PCBs) berthed in Koko, Delta State, Nigeria (Agbasi & Odiaka, 2016). With the Koko incident, a potentially dangerous substance was brought in. However, the authorities stepped in, in their responsibility to protect the public. It was obvious that there was no regulatory framework to help deal with the situation with

respect to the amount of toxic waste and chemical infiltration brought into Koko (Ndunofit, et al., 2015). This event prompted the enactment of the Harmful Waste (Special Criminal Provisions) Decree No. 42 of 1988 in Nigeria, which is presently an Act responsible for implementing the maximum regulatory legal framework in agreement with international best practices to initiate action to stem in its infancy, which is said to be a new challenge to Nigeria (Agbasi & Odiaka, 2016).

3.3 Environmental (Wetland) Policies and Legislation in Nigeria

Talking about Wetland Policies and Legislation in Nigeria, four different periods will be discussed as follows: pre-colonial (before 1830), colonial pre-independence (1830 to 1960), the initial time of the post-independence era (1960 to 1980), and the current history (1981 till present) (Adekola, et al., 2012). This aspect is going to focus more on the official policies and the legal structure that is met to address wetlands and their resources (ecological and biological diversity) management in Nigeria. However, there are also unceremonious and private ingenuities that are available in helping to address the challenges of wetlands which are in Nigeria. In Nigeria, wetlands support over thirty million inhabitants, which is about twenty-two percent of the country's population (Adekola & Mitchell, 2011).

Pre-colonial wetland policy and legalization (before 1830), before this time many local communities in Nigeria (Adekola, et al., 2012) have on their own peculiar way of managing the wetlands in their communities long before the advent of colonialism (Etkin, 2002). At that time, the management system was principally driven by traditional and religious ideologies and conducted through the traditional reserves and harvesting seasons. For example, the traditional institution in Oporoma in Bayelsa State (Adekola, et al., 2012), which is one of the states in the Niger Delta region has long been regulating human activity on Boukpere Lake (Adekola, et al., 2012) in Bayelsa state. People are not permitted to go fishing, logging, farming, or any other human-related activities until the leaders (king and inkiye) in the community that have the traditional right give permission for people to carry out such activities in the lake. However, breaking these informal laws is considered a taboo and there is a curse placed on such. According to Adekola, et al., (2012), similar institutions still exist in some parts of the country while local communities respect them more compared to the policies by the government. During a recent informal discussion in the Niger Delta (Adekola, et al., 2012), majority of

the people from the local communities opined that when summoned either by traditional institutions or formal laws, they would honour the traditional rights to informal institutions, since potential repercussions were viewed as being of greater (Adekola, et al., 2012) punishment compared to the formal laws. Generally, this is as a result that informal sanctions are not strong enough, and no offender has been brought to book before now through formal means, which is the law. This implies that the laws are not achieving their set aim. However, this can truly be said to be beneficial to wetland management, although some areas of traditional practices might be dangerous to wetland integrity. Most communities still perceive wetlands as wastelands and tend to treat them as sites for dumping waste (Adekola, et al., 2012).

3.3.1 Colonial Pre-Independence Wetland Policy and Legislation (1830 to 1960)

The first formal law in respect to wetland management in Nigeria can be traced back to the year 1897 (Adekola, et al., 2012) when the Department of Wood and Forest for the Colony and Protectorate of Lagos was created. It is known that wetlands and forests are interwoven in the sense that they correlate to produce healthy and effective ecosystems, although functional differences exist between them. As a result of this, forestry laws cannot always address issues or challenges that are being faced by wetlands. The first forest ordinance was enacted in 1901 to regulate the sale of timber concessions and minimize exploitable girth limits (Okali & Eyog-Matig, 2004). This law was put in place for controlling the illegal harvesting of some timber products such as African mahoganies (*Khaya anthotheca*) which were many in the wetland areas of Benin, Degema, and Lagos. At this time, forestry fees and exporting tax were also imposed on exported logs and all concessionaires were instructed to replant 20 tree seedlings at each stump site. However, it was after 1914 that the amalgamation of the northern and southern protectorate (Adekola, et al., 2012), that the foundation for nature conservation laws in Nigeria was established with the Forestry Ordinance (FO) of 1916 (Adekola, et al., 2012), and it was enacted in the same year (Okali & Eyog-Matig, 2004). The main activities of the forestry service were to indicate boundaries in suitable sites for the purpose of forest reserves and the preparation of its working plans. However, in the ordinance, forest reserves were established by the central government then and later handed over to local authorities to manage. In the same year 1916, the Wild Animal Preservation Act (WAPA) of 1916 came into force to ensure that the indigenous

wildlife is preserved (Anadu, 1987). Within this period, there were other important relevant forestry legislation such as “(Southern Provinces Native Authorities) Rules of 1943, the Forestry (Northern Provinces Native Authorities) Rules of 1951, the Forestry (Northern Region Native Authorities) Rules of 1955, the Eastern Region Forest Law of 1955, the Forestry Regulations Eastern Region of 1956, the Forestry Ordinance with Amendments, and the northern Region of 1960” (Adekola, et al., 2012; Ebeku, 2004). The colonial acts, however, do not specifically cover or target wetlands, they covered various aspects of wetland ecosystem services including trees and wild animals. The effectiveness of these Acts was reduced because the policies were not relevant for the sustainable management of natural resources, but for the purpose of securing the continuous supply of timber for colonial infrastructure and export (Adekola, et al., 2012; Hogendon, 1975). For instance, there was an increase in the exploitation of timber in Nigeria during and after the Second World War for the purpose of meeting the wood shortage in Europe (Adekola, et al., 2012; Bee, 1990; Okali & Eyog-Matig, 2004). The idea was not to stop the exploration of timber products but to secure its continued supply to the developed world.

3.3.2 Early Period of Post-Independence Legislations (1960 to 1980)

Nigeria got its independence in 1960, at this time most of the nature conservation laws followed prior colonial practices which mostly focus on forestry and wildlife conservation (Adekola, et al., 2012). As far as its peculiar content was concerned, the legislation relies on the structure and provisions of the Forestry Ordinance. Some of the laws that were available in the preliminary period of independence include the “northern Nigeria Wild Animals Law of 1963, the Eastern Nigerian Wild Animals Law of 1965, and the Western State Forestry (amendment) Edict of 1969” (Adekola, et al., 2012). Currently, there are a lot of oil industry regulations with sections that address issues of land, water, and air pollution. These regulations if properly instituted can serve the purpose of protecting wetlands, especially the wetlands in the Niger Delta because the wetlands have vegetation of trees used as timbers. In the same vein, many of the acts were promulgated during colonial times but were eventually reviewed in the early years of independence (Adekola, et al., 2012).

The Petroleum Act of 1969 highlights the rules for safe drilling, handling, and storage of mineral oils by holders of land leases or licenses (Adekola, et al., 2012). It mandates that tanks must be built to

avoid leakage. It also mandates the discharge of noxious and inflammable gases released from tanks by mandating that such activity should be done in a safe and distant place from the known operating areas and should be disposed of in line with the acceptable standards to avoid the threat to the environment (Adekola, et al., 2012). In the same way, the Petroleum Regulation of 1967 disallowed or unaccepted the discharge of petroleum products into water bodies within harbor areas (Adekola, et al., 2012). It pointed out the precautions that are to be taken for safety in the transportation of petroleum products. This same regulation also oversees the regulations on safe pipeline operations and installations. The Oil Pipeline Act of 1965 was enacted to prevent the pollution of land and water across which pipelines pass through (Adekola, et al., 2012). The Act helps to regulate pipelines construction and “prohibits the construction works in, under or over waterways. It does not permit discharge of materials that will alter the flow, flood, diminish, or restrict the quantity of water required for domestic, industrial, or irrigational use, and restricts access to (for the construction of oil pipelines) any land containing graves, a grotto, an area of trees or anything held to be sacred or the object of veneration” (Adekola, et al., 2012). The regulation was established in 1968 on Oil in navigable waters and is known as the Oil in navigable waters regulations 1968. This regulation was enacted for preventing pollution in navigable waters in Nigeria. This regulation does not allow the discharge in any form of crude oil or any substance with oil content into territorial or navigable waters in Nigeria. This regulation has it that any ship from any of the states operating in Nigeria must install relevant equipment to prevent oil pollution. The act was established to help implement the agreements of the International Convention for the Prevention of Pollution of the Sea by Oil. Just like the Petroleum Refining Regulations of 1974 (Adekola, et al., 2012), which were established to deal with the specifications for constructing oil storage tanks to minimize any damage which might result from product pollution or product discharge into the environment (Adekola, et al., 2012).

The Petroleum Production and Distribution (Anti-Sabotage Act) of 1975 made willful acts to hamper or hinder the system of illegal distribution of petroleum products (Adekola, et al., 2012). Besides, industrial crude oil spills into the environment, acts of sabotage through illegal means are known to be a common source of oil spills in the Niger Delta (Adekola, et al., 2012) and are commonly known as oil bunkering in Nigeria. The Act, however, stated that offenders must be subjected to 21 years in

prison, or even to a death sentence (Adekola, et al., 2012). This Act also has in it the penalty for perpetual pipeline vandalism by members of oil-producing communities (bunkers). The Associated Gas Reinjection Act 1979 outlawed gas flare in Nigeria which is one of the threats to Niger-Delta wetlands (Adekola, et al., 2012). Section 3 of the Act set in 1984 as the deadline after which companies could only flare gas if they had lawfully issued ministerial certificates in the specified field(s) (Adekola, et al., 2012). All oil corporations operating in Nigeria were expected to give a comprehensive plan for gas utilization and guarantee zero flares according to the 1984 act. However, this deadline was not obeyed by the companies and till today gas flaring still takes place in Nigeria. This means the regulatory acts were not effectively implemented or enforced. Thus, the government decided to extend the deadline in response to the excuses from the oil companies on their failure to acquire and install the necessary technological equipment. On the contrary, the extension was made through executive order through speeches and remarks without any written document or any backing by law (Agbasi & Odiaka, 2016). In 2015, another deadline was proposed which could not be ascertain if the deadline was met. It has been observed that there is a rising influence on the oil sector or industry which has also resulted in institutional processes aimed at a move to continually exploit natural resources. There are some policies that were understood to be counterproductive just to sustainable development.

3.3.3 Later Period of Post-Independence Legislation (1981 Until the Present)

In 1981, a bill was sent to the then Federal House of Representatives to establish the Federal Environmental Protection Agency (FEPA) (Adekola, et al., 2012). Nothing meaningful came out of the side bill. The discovery of five shiploads of toxic waste of Italian origin in 1988 at the small port town of Koko in the Niger Delta as explained above was the reason that spurred the government into action and the people for environmental awareness. The government response was prompt and decisive with the immediate establishment of the Harmful (toxic) Wastes Criminal Provision of Decree 42 of 1988 (Adekola, et al., 2012). This led to the establishment of FEPA under Decree 58 in 1988. After this, there has been a series of law and policy documents (Adekola, et al., 2012) with the aim of conserving and protecting the Nigerian environment (Adekola & Mitchell, 2011). Some of the recent legislations are relevant to wetlands, especially the Niger-Delta wetlands which are (Adekola, et al., 2012) said and known to be very important economically, socially, and ecologically to Nigeria and the world.

This part will be addressing some of the recent legislation and how important or relevant they are to wetlands in Niger Delta, the years it was promulgated, summaries, and its implication on wetlands in Nigeria. In Nigeria, there are several policy documents governing the management of the environment and its biodiversity in Nigeria, none of them are specifically put in place to comprehensively deal with wetlands by addressing wetlands (Adekola, et al., 2012).

In 2000, the Niger Delta Development Commission (NDDC) Act was established with different aims amongst which is to help solve the ecological and environmental issues that arise from the exploitation of oil and gas resources in the Niger-Delta region (Adekola, et al., 2012). NDDC is one of Nigeria's richest government parastatals, through which the Federal government contributes funds necessary for the protection and management of the Niger-Delta wetlands (Adekola, et al., 2012). This is supposed to solve the issue of challenge that has been complained about by the stakeholders of their opinion of saying that they lack funds to effectively manage the wetlands in the region (Amnesty International, 2009). The huge budgetary allocation which is allocated to the commission is supposed to be used for the management of the environment and development of the region (Adekola, et al., 2012), however, the commission is characterized by corruption and is known to be one of the most corrupt agencies in Nigeria (Adekola, et al., 2012). Another reason for the high level of corrupt practices is the frequent change in the leadership because of party affiliation, and this has also limited the policy direction in achieving its set goals of sustainable development of the Niger Delta and its environment.

The Coast and Inland Shipping Act was established in 2003, this Act stipulates the nature and type of vessel that must engage in fishing on Nigerian coastal and inland water bodies. Section 22 of the Act specified the types of vessels, including fishing trawlers, to register on the Special Register for Vessels and Ship Owning Companies (SRVSOC) (Adekola, et al., 2012). With this Act, the heavy ships which can disturb the benthic flora and fauna can be regulated out of wetland zones especially around coastal wetlands (Adekola, et al., 2012; Agbasi & Odiaka., 2016).

In 2007, the National Environmental Standard and Regulation Enforcement Agency (NESREA) was established with the aim to regulate and enforce environmental standards in Nigeria, through

protecting and developing strategies for a better and quality environment, biodiversity conservation, and sustainable development of Nigeria's natural resources (Adekola, et al., 2012). In Nigeria, having scrapped FEPA many environmental regulations were lost, however, this Act created another regulation of activities in freshwater environments (NESREA, 2007). The agency was mandated to liaise with necessary stakeholders within and outside Nigeria on issues that have to do with enforcement of environmental standards, regulations, and guidelines, and as such, benefit from international best practices from the Ramsar Convention and other related agencies working on protecting wetlands in Nigeria (Adekola, et al., 2012) (NESREA, 2007).

National Oil Spill Detection and Response Agency (NOSDRA) Act 2006 established with the aim to restore and preserve Nigeria's environment, thereby ensuring the best oil exploration methods or practices in the field, which includes storage and transmission practices in exploration, production, and use of oil in the quest to achieve sustainable development in Nigeria. This is more of an enforcement agency targeted at the activities of oil companies or operators in the region that harbor these wetlands. NOSDRA is focused compared with other agencies, it can also focus specifically on cleaning up the environment without being side-tracked by other functions (Nnubia, 2008).

Wetland management in Nigeria is known not to have a specific policy but it is covered by the general forestry laws and more recently in nature conservation laws. The lack of specific policy documents for wetlands in Nigeria is a good indication that shows Nigeria is not giving adequate attention to its wetlands. However, lack of specific legislations or agencies mandated with the issue of wetlands or to address wetlands ecosystem suggests the reason behind wetland degradation. It is not just about lack of laws or policies documents, but also weak enforcement of the existing policies and implementation from the government (Adekola, et al., 2012). Considering the policies that are available in Nigeria for environmental management and protection, especially in the post-independence era, it shows that most of the policy's direction is simply to establish organizations, without assigning a proper, clearer, and define responsibility to it. This most often results in conflicting duties, which usually leads to no action or even friction among the agencies, each agency ought to have an enforcement team. This is evident in legislation establishing government agencies such as the River Basin Development Authorities, National Environmental Standards and Regulations Enforcement Agency, and National Oil

Spill Detection and Response Agency. This was done with the hope that relevant institutions will be regenerated and enforced. Instead, what happened was the setting up of various (Adekola, et al., 2012) organizations without a proper enforcement team and monitoring team for it to work effectively.

3.3.4 Institutions Met for Governing Wetlands in Nigeria (International Conventions)

In the later period of post-independence, Nigeria has ratified six international treaties, and agreements which are to support the regulation and the management of wetlands (Adekola, et al., 2012) as shown in table 3.

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) is the only one directly addressing wetlands, targeting conservation and sustainable utilization of its resources (Adekola, et al., 2012; Ramsar, 2017). However, the signing and adoption of these Conventions have not impacted or actualized the primary objective in Nigeria, which is the wise use of wetlands. Signing, domesticating, and designating a Ramsar site shows that the contracting party has fulfilled the requirement as a member. Presently, Nigeria has eleven Ramsar sites and has also received substantial international support in form of finance from donor agencies like the Royal Society for the Protection of Birds, Birdlife International, the Ramsar Convention Secretariat, and Wetlands International (Adekola, et al., 2012). Due to the support and basking from the exhilaration of designating a Ramsar site, this has led to the establishment of a National Wetland Unit in the Federal Ministry of Environment. This unit only existed for seven years afterward it was scrapped and/or merged with other units or departments. This might have affected the process of developing a national policy for wetlands. Since 2001, Nigeria has drafted a national policy for wetland which would have been the most direct wetland policy for wetland, but this is still in draft form to date. The other international Conventions are the Conservation of Migratory Species of Wild Animals (CSM).

Table 3: International conventions relating to wetlands management

Conventions	Aim/Remark
Convention on Wetlands of International Importance Especially As Waterfowl Habitat	An international treaty for the conservation and sustainable utilization of wetlands. Also known as the Ramsar Convention
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Aims to ensure that the international trade of wild animal and plant specimens does not threaten their survival. Implemented in Nigeria as Endangered Species (Control of International Trade and Traffic) Act 1985
Convention on the Conservation of Migratory Species of Wild Animals (CMS)	Aims to conserve terrestrial, marine and avian migratory species throughout their range. Also known as CMS or the Bonn Convention.
Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region	The convention (also known as the Abidjan Convention) provides an important framework through which national policy-makers and resource managers implement national control measures in the protection and development of the marine and coastal environment of the Region.
Convention on Biodiversity	Aims to conserve biological diversity, sustainable use of the components of biological diversity, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. This convention was the basis of the National Biodiversity Strategy and Action Plan 2003
Cartagena Protocol on Bio-safety	Aims to ensure the safe handling, transport and use of living modified organisms resulting from modern biotechnology that may have adverse effects on biological diversity, taking into account risks to human health.

Source: (Adekola, et al., 2012)

This Convention is aimed at conserving terrestrial, marine, and avian migratory species within their range. The Hadejia-Nguru wetland located in the northern part of Nigeria is well known today because it serves as a nesting ground for migratory birds (Agbasi & Odiaka., 2016). The Convention on

International Trade in Endangered Species of Wild Fauna and Flora (Tijani, et al., 2011), is aimed at ensuring that international trade of wild animal and plant species survival is not threatened. In Nigeria, there are quite several endangered species found in wetlands across the country, especially in the Niger-Delta region. According to Agrawal, (2007) and Sand, (1999), the signing of these Conventions in Nigeria is mostly a result of international pressure on the federal government, because of the conditions for financial aid that the country will be required to adopt the principles of the Convention in reciprocity for bilateral and multilateral donor grants (Adekola, et al., 2012). The government in this case often signs without appreciating the real aim or objective of the Conventions, thereby affecting the manner of implementation and enforcement of the Conventions (Adekola, et al., 2012). This might be one of the factors that till today Nigeria has been unable to establish a specific framework in addressing wetlands management in Nigeria.

3.3.5 State and Local Government Laws

Nigeria has 36 states and 774 local governments areas (Constitution of the Federal Republic of Nigeria: as amended, 1999), after the return of democratic rule in 1999, some of the state and local governments have enacted relevant laws in relation to the conservation of natural resources. Most of these laws are in line with that of the federal; for instance, the FEPA Act states that every state in Nigeria is expected to establish its own environmental protection body or agency in other to protect and improve the environment. The states' environmental laws must take their root from the federal laws, which are also direct outcomes of colonial forest legislation. For example, Cross River State is one of the Niger Delta states that the government has been able to set up a state-own task force on deforestation and enact a law on forest management with a ban on timbers (Adekola, et al., 2012). However, none of the state governments has legislation and policy documents that specifically talked or addressed wetland matters, instead, they use the forestry laws for its management. It is important to know that the state laws only operate within the state and under the federal laws.

3.3.6 Private (Voluntary) Initiatives for Environmental Management in Nigeria

Some private establishments in Nigeria have adopted self-regulations, that is corporate social responsibility for a better and healthy environment. The statements made by operators in the oil and gas industry which is of most interest because the activities of the industry produce much stress on

the environment (wetlands) in the Niger Delta. For example, the Shell Sustainability Report of 2006 mentioned that they were going to end “routine gas flaring everywhere in the world by 2008” (Adekola, et al., 2012; Royal Dutch Shell Plc, 2006). However, this has not been actualized in Nigeria. In Nigeria, there is also the voluntary adoption of the Environmental Management System (EMS) ISO 14000 by multinational and local oil and gas companies (Adekola, et al., 2012). This usually and clearly defines the company’s mission and environmental policy statement as an independent voluntary contribution (Adekola, et al., 2012) as a way of contributing to the improvement of the environment to appreciate the company’s commitment to preventing oil spills in operation. In November 1981, eleven major oil companies came together and established the Clean Nigeria Associates (CNA), an outfit with the primary aim of tackling oil spills in member’s operating areas or third-party areas of operation (Nwilo & Badejo, 2006). The outfit is equipped with the necessary responses that are needed for a fast and efficient response coupled with the technical expertise and equipment at its disposal in order to complement individual requirements needed for tackling oil spill issues (Nnubia, 2008). With all these in place by the companies, the companies continue unabated in the area. This has made the voluntary measures put in place to be seen as mere publicity, statement/documents because their action does not reflect the statement made by the companies or what is in the document. This shows that the attention given to wetlands in Nigeria is very minimal during this later period of post-independence (Adekola, et al., 2012), the only legislation that the wetlands ecosystem has been mentioned to be protected is the Environmental Impact Assessment (EIA) Decree No. 86. No other policy document or legislation has specifically mentioned wetlands, indicating its relevance given to its environmental decision making in Nigeria (Adekola, et al., 2012), most of the Acts only bear some semblance of wetland direct policy.

3.4 Regulations Governing Compensation in Nigeria

The idea of compensation simply means awarding or compensating someone in recognition for loss (Babatunde, 2003). It is a process or act of giving the owner of expropriated, an equivalent of the money value of the things he or she has been deprived of. Compensation valuation is the only valuation that has been treated as a statutory valuation of which the basis and valuation techniques are stipulated by law (Mayowa, 2012). The principle of compensation has to do with justice and equity,

this cannot be realized without legal backing. Under Article 42(1) of the 1999 constitution of the Federal Republic of Nigeria, it states the right to compensation in a situation of compulsory acquisition which is a fundamental human right hence the applicants or claimants must put in positions that do not have to be different from its original state before the occurrence of the disaster (Mayowa, 2012). However, emphasis is on the prompt disbursement of the compensation instead of the fair and adequate compensation in relation to the value. In Nigeria, there are other bases for assessing compensation amongst which are; State Lands Act No. 38 of 1968; Public Lands Acquisition (Miscellaneous Provision) Act 33 of 1976; Oil Pipelines Act (Cap. 338 LFN 1990); the Land Use Act, 1978 (Cap 202 of 1990), Petroleum Act, 1969 (Cap 350 of 1990), and the Mineral Act (Cap 226 of 1990) (Mayowa, 2012). Having taken a good look at these provisions of the law mentioned in respect of compensation, it shows that compensation is for the use of goods (Mayowa, 2012). An example can be seen in Section 44 (2)(m) of the 1999 Constitution of the Federal Republic of Nigeria as seen here: “subject to prompt payment of compensation for damage to buildings, economic trees or crops, providing for any authority or person to enter, survey or dig any land, or to lay, install or erect poles, cables, wires, pipes, or other conductors or structures on any land, in order to provide or maintain the supply or distribution of energy, fuel, water, sewage, telecommunication services or other public facilities or public utilities” (Constitution of the Federal Republic of Nigeria: as amended, 1999). On the other hand, Oil Pipelines Act provides for compensation in Sec 6(3), 11(5a) and 20(1, 2).

“The holder of a permit to survey acting under the authority of section 5 of this Act shall take all reasonable steps to avoid unnecessary damage to any land entered upon and any buildings, crops or profitable trees thereon, shall make compensation to the owners or occupiers for any damage done under such authority and not made good. Sec 6(3).”

“The holder of a license shall pay compensation to any person whose land or interest in land (whether or not it is land respect of which the license has been granted) is injuriously affected by the exercise of the rights conferred by the license, for any such injurious affection not otherwise made good Sec 11 (5a).”

“If a claim is made under subsection (3) of section 6 of this Act, the court shall award such compensation as it considers just in respect of any damage done to any buildings, economic crops or

profitable trees by the holder of the permit in the exercise of his rights thereunder and in addition may award such sum in respect of disturbance (if any) as it may consider Just Sec 20 (1).”

The most recent law or legislation that talks about compensation in Nigeria is the Land Use Act of 1978. The provisions for compensation under the Land Use Act are contained in Section 29 of the Act, and it provides the owner/occupier of the right of occupancy revoked for superseding or overriding public interest which shall be eligible for compensation under the following claims under section 29 as stated in the (Land Use Act: Chapter 202, Laws of the Federation of Nigeria 1990, 2019).

Sec 29 (4a) talks about land: For land, the amount equals to the payment for rent, if any, paid by the occupier during the period or year in which the right of occupancy was revoked is payable.

Sec 29 (4b) talks about Buildings, Installations, and Improvements thereon: the amount of the replacement of cost of the building, installation or improvement, that is to say, such cost as may be assessed on the basis of the prescribed method of assessment as determined by the appropriate officer less any depreciation, together with interest at the bank rate for delayed payment of compensation and in respect to any improvement in the nature of reclamation work, barring such cost thereof as may be substantiated by documentary evidence and proof to the satisfaction of the appropriate officer.

Sec 29 (4c) talks about Crop: crops on land apart from any building, installation, or improvement thereon, for an amount equals to the value as prescribed and determined by the appropriate officer.

Compensation in terms of oil spills is slightly different from the general term of compensation because of the clues of compulsory acquisition due to the social-economic components that will be impacted as a result of the pollution in the environment. The natural environment of wetland comprises both use and non-use goods, implying that any compensation which is to be made paid or payable to the expropriated person has to include the assessment of both values (use and non-use goods values) (Mayowa, 2012) which make valuation important. Otegbulu (2005) in his work has argued that the provision of the laws that talk about compensation in Nigeria does not fully capture the whole values of these natural resources or the goods and services of the said natural ecosystems as they do not place the actual values on the use and non-use goods.

Also, Otegbulu (2009) in another of his work as reported by Mayowa, (2012) argues that there is an absence of policy and legal framework for the full assessment of the economic value of individual species based on economic functions and for the assessment of natural resources that are being damaged (Mayowa, 2012). Mayowa, (2012) highlighted that the imbalances in the law and practices of environmental valuation are central to the challenges that is being faced by communities and the ecosystem in Niger-Delta. The researchers are of the idea that effective valuation practice could help to minimize conflict and civil strife which usually result from inadequate compensation for damage done to the sources of food, water, and other resources for livelihoods of communities within the Niger Delta, as well as Nigeria at large (Mayowa, 2012).

Compensation as a result of oil spills has brought about so many problems and controversy in Nigeria before now to an extent that valuers have continued to question the importance and the capability of regulatory laws and methods that is been used or adopted for its determination (Mayowa, 2012). The primary aim of any compensation is to ensure that the property owner agrees with or not at a lower level that will make him/her be worse off than that level he was before the damage. But in some cases, it is different because sometimes, the company has to discuss with the community leader and negotiate with them on behalf of the people that their property was damaged, and after some community leaders have collected bribe, they force the people to receive whatever is given to them without valuation.

3.5 Elements of Controlling the Series for Environmental Monitoring, as Implemented by United States EPA

Legislative development: this has to do with a process of regulations that is applicable in various forms of activities, which the environmental enforcement agencies enforce. Often this process incorporates both the primary and secondary legislation, “Primary legislation refers to an Act that has been passed by a parliament and secondary legislation is a documents that makes changes to the Act. The Act in this case most clearly states what changes can be made to it by the secondary legislation and the procedures that secondary legislation will take” (Bradley, 2010), this may also cover the event of guidance in other to interpret the regulations.

Strategic planning: this is a process of strategizing and planning or putting the process and procedures that are required for the effective implementation of a regulation. Often, this strategic process is required by law or put in place by the environmental enforcement agencies to help in directing or managing the work. For example, launching a general principle that can help to dispense its works, such as adopting a risk-based approach (Cherry, 2011). However, tactical plans are often put in place for the purpose of individual roles in terms of the regulatory functions like the planned inspection (Farmer, 2007).

Permitting: this is a process of issuing license, approval, consent, variance, or other authorization that is necessitated or issued in pursuant to pertinent law.

Monitoring: is a process of observing activity, characterizing its quality, and thereby establishing the parameters, for the interest of precisely quantifying the influence or effect of an activity on the environment. For example, processes like waste collection and for more general environmental quality to see if the permit conditions are being followed or not. Monitoring can also be referred to as a systematic and continuous process of collecting and analyzing data or information in relation to development or activity. It is done to guarantee that the stakeholders who are interested or involved in the intervention are well informed and that decisions can be taken promptly.

Inspection: this has to do with the spread of supervisory practices where the department or agencies accountable for environmental challenges check to ascertain that the activities going on in their jurisdictions is in line with its legal requirements, for example like those stated in the permits.

Enforcement: this has to do with different actions that are being taken against activities or behavior that contradict or go against the laws.

Reporting: this is a process whereby the information that is derived from permitting; monitoring and enforcement activities are made available to the necessary government authorities and the public. If this can be implemented or well adopted in Nigeria, it will go a long way in protecting our environment and its natural resources.

3.5.1 Stakeholder Analysis

Environmental challenges are typically composite, they are uncertain, and multi-scale and impact several actors and agencies (Mark, 2008). The main reason transparency is very important in decision-making is that they are flexible to challenging issues or the changing situations, thereby embracing varieties of data and values. For actualizing this, stakeholders' inclusiveness is increasingly being sought for and fully involved when it comes to environmental decision-making procedures both at the local and international scale (Mark, 2008). According to Rudolf, et al., (2006) "a stakeholder could be a person, organization or a gaggle of people who have an interest or a priority (for example project activities and development programs) or a specific resource. Stakeholders may be individuals who possess the facility to regulate resources or execute developmental projects or the folks rely on natural resources for his or her livelihood or people who are being laid low with the developmental program." However, Brown, et al., (2001) explained that stakeholder analysis is a vital systematic process of generating information from groups or individuals that are in one way involved or connected to environmental challenges, suffering from decisions. They further stated that classifying and analyzing available data to find out the possibilities and the likely impacts of the decisions made on the part of individual's interest help to understand possible conflicts that might arise within the groups involved. Nonetheless, this will support the process of identifying the potential strategies for the purpose of negotiations and resolving the issues that will arise within the stakeholder groups. The analysis, consequently crystallized on the shape, sizes, and the role of the stakeholders that are entangled or are involved by the option. The stakeholder's analysis considers in detail three main aspects: political, economic, and social effects in terms of developmental projects as an individual or as a group, the power and contributions of stakeholders in respect to the failure or success of the project in consideration (World Bank, 2002). This is aimed at characterizing the persons who have an unsystematic level of stakes in the process of decision making or project development. This brings about several basic features for the stakeholders in respect to a particular circumstance like; "the relative power and interest of stakeholder groups, the stakeholders' importance and political influence, and the network they form for survival" (Freeman & Gilbert, 1987). This analysis is essential as it has helped in identifying the major players in the sectors, it gives opportunity to explore their

idea, positions, insights, networks and interest regarding the project (Schmeer, 2000), and more reason it was adopted for this research work.

3.5.2 Stakeholders Survey and Sampling

Data collection began first with, finding the suitable group of stakeholders with relevant information required to generate data. Hence, analysis was done to identify these stakeholders to ascertain those who have an interest in wetlands and activities that impact wetlands in the study location. After carry out the stakeholder analysis, these stakeholder groups were identified and selected for the propose of gathering information: The Government Environmental Agencies (FMEnv and State Ministry of Environment), Communities, Environmental Consultants/Academics, Environmental NGOs, and Industrial Environmental Personnel. The justification for choosing these stakeholder groups is as a result of their various interest and impact on wetlands in the Niger-Delta. These stakeholder groups either benefit from wetland or their activities impact wetlands in a way. The selected stakeholder groups have concerns regarding the environment (wetlands) in the region and Nigeria in general. The government parastatals are in charge of regulating, monitoring and ensuring that environmental guidelines are implemented for wetland management in Nigeria. The Academics/Consultants are responsible for environmental consultancy for both the government, companies, and for their independent research for academic purpose. The Industrial Environment personnel (oil and gas companies) is another stakeholders' group because their activities contribute to wetland degradation in the region. The NGO groups help in creating environmental awareness in the region and lastly, the communities' stakeholders group depend on the wetland for their livelihood by utilizing its resources for sustenance. A quick description of figure 3, it shows that the green circle represents wetlands information (environmental information), and the uncolored ones represent the stakeholders with required information on wetland/environment and the state of the Niger Delta wetlands/environment. The craded arrows pointing from oil and gas companies' circle to the direction of the host community's circle indicates the effect of oil and gas production in this region and their environment (wetlands).

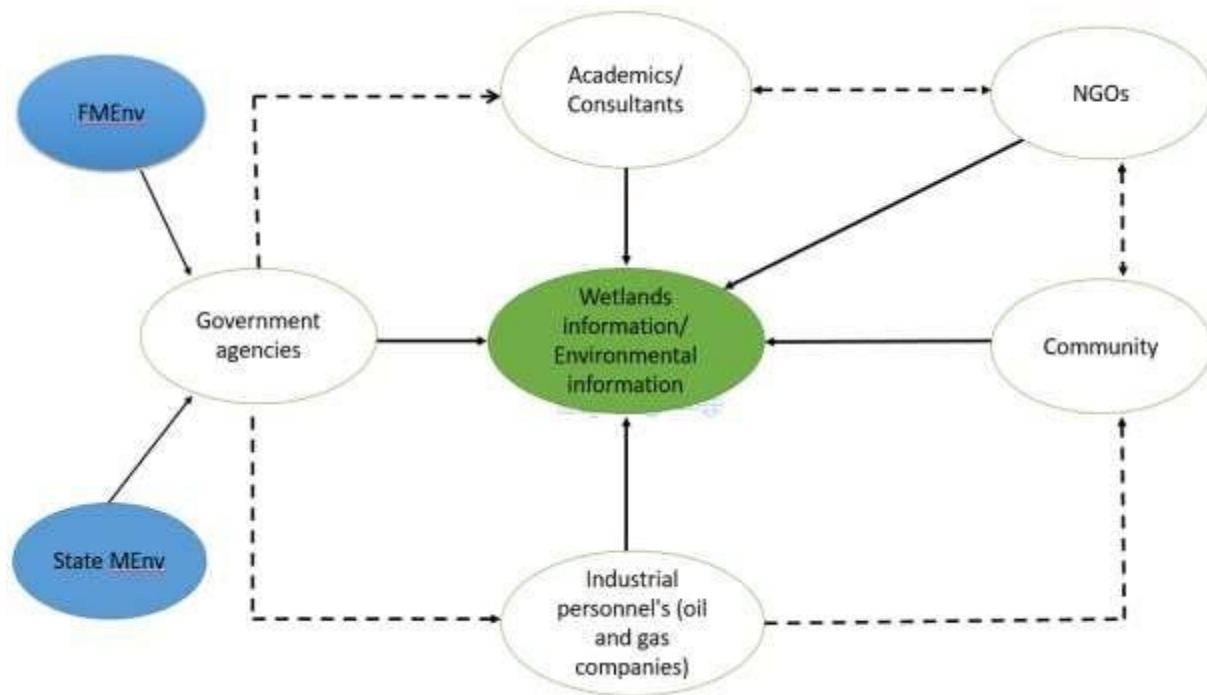


Figure 3: Stakeholders identified for the purpose of this research

As a result, the inhabitants of these communities are exposed to environmental pollution as well as the health hazards caused by oil and gas production; thus, the communities are well informed on the impacts of oil and gas explorations and its disruption to the natural conservation in their communities. The arrow line from oil and gas company circle to green circle shows that oil companies have information concerning environmental issues. Therefore, they are responsible for adopting strategic environmental management policies and sending environmental compliant and impact assessment reports to the government-owned agencies detailing their environmental performances. On the part of the academicians, as consultants to most oil and gas companies including government departments on environmental matters in Nigeria, they have information on wetlands/environmental management. The craded arrow pointing on both sides towards academic/consultants and NGOs shows that the two groups share information in relation to the wetland and environmental management because some students do carry out their thesis in collaboration with NGOs and internship, so in this, process, they exchange information. Considering the fact that government agencies are empowered to manage the country's (Nigeria's) environment, they should have reasonable volume of information on wetlands/environmental management available. In addition, every report and feedbacks reported by

other stakeholders are supposed to go to them as well. Moreover, all documents on the state of the wetland/environment and the environmental conditions, as well as grievances or complaints from communities are supposed to be in government custody or archives. However, the craded arrow going from the government agencies to the direction of the industrial personnel/oil and gas companies circle and academician's circles depicts the duties of the oil companies to report the environmental state and consultation reports given by the academicians to the government agencies respectively. The communities feel they are at the receiving end of the impact from the oil and gas companies and most of them depends on wetlands resources for their livelihood, then the dotted arrow from communities to NGOs and the reverse is to show that both stakeholders' group do exchange information through the process of awareness creation and meeting with the local people.

3.6 Sustainable Development

The needs of the increasing population continue to grow daily, thus causing harm to the environment. The effect causes instability in the use of natural resources, urbanization, industrialization thereby exposing the environment to risks and struggle for survival. As a matter of fact, human survival is dependent on how conducive the environment is. To effectively manage the environment there is need to balance the social and economic aspect of life as three of them are inter depended on each other, as they are referred to as the three pillar of sustainability. Figure 4 shows the three pillars of sustainability.

According to Brundtland Commission 1987 "sustainable development is the ability to make development sustainable, to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs".

The Niger-Delta region is controlled by the rural communities whose survival is dependent mainly on the natural resources in their environment (Eregha & Irughe, 2009). Emphatically, over seventy percent of its population's source of livelihood come from this rural environment (United Nation Development Program, 2006).

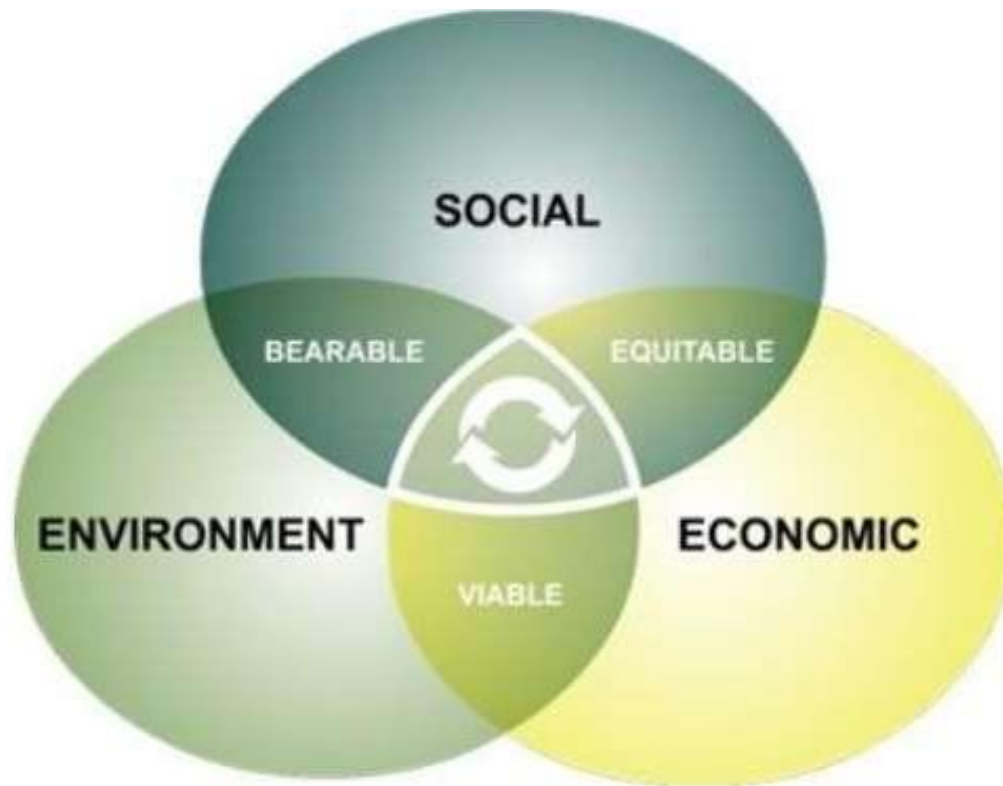


Figure 4: The three pillars of sustainability

Sources: Brundtland 1987

A large number of the population in developing countries are facing poverty making them vulnerable to health challenges and some environmental dynamics such as social, political, and economic factors which leave them with no other choice than to endure the uninhabitable state of this environment (Aluko, 2004). Also, they are faced with negative impact of natural hazards, biodiversity imbalance, environmental pollution, deforestation, and adverse effect of industrialization such as oil exploration. Therefore, environmental degradation remains a major cause for low performance in productivity and health problems in the Niger-Delta region (World Bank, 1995).

The environment is highly degraded hence evaluation of environmental development cannot be measured accurately. The available human resources can be harnessed for better courses and for sustainable development otherwise if not utilized effectively and efficiently, it would give a negative impact in economic development. Overall, sustainable development goes beyond environmental

protection and focus should also be on how to channel the natural resources for better productivity for the welfare of the populace, improved quality of life, elimination of poverty and quality health care services (Aluko, 2004). He further explained that there is no agreed definition of sustainable development, however, certain elements are identified in most definitions as follows:

- I. Economic and social stability of future generations.
- II. Poverty alleviation or eradication.
- III. Positive impact on the environment and resource allocation for better use.
- IV. Localization of developmental projects especially in planning and execution of such projects.

Prior to the commencement of commercial oil production in the Niger-Delta region over fifty- seven years ago, the region was an unpolluted environment being sustained by existing natural resources for the most sedentary populations. Such resources include medicinal herbs and shrubs, tree barks, fish, shrimp, crabs and clams, wood for energy and shelter including fertile soil for farming and habitat for exotic wildlife. During this period, there was existence of “Delta elephant, the white-crested monkey, the river hippopotamus, colorful array of exotic birds, crocodiles, turtles, and alligators” (Afinnotan & Ojakorotu, 2009). This region had significant number of commercial fisheries industry in Nigeria (Afinnotan & Ojakorotu, 2009). Unfortunately, as exploitation and drilling activities continue to increase in the region, the environment has been heavily depleted causing some of these animals to go into extinction. That is why, development has remained challenging in the Nigerian State with local communities who mostly express their grievances through a protest to get Government to solve their problems (Osuoka, 2007).

According to World Bank (1995), environmental degradation is termed to be major cause of “productivity losses and poor human health in the Niger-Delta region”. Arguably, environmental degradation is the resultant effect of pollution, unsustainable and regular exploitation of natural resources (Ibaba, 2010). The FEPA Act (1990) “stated that there are several environmental laws that seek to guide, conserve, control, and manage the exploitation of natural resources along with the control’s prohibition”. Nevertheless, it is worth stating that constant exploitation of the region’s environment is related to the insensitivity or failure in implementing the right environmental

policies/acts as well as correcting attitudes and beliefs of the people including the companies which its activities negatively impact the environment (Ibaba, 2010). The main issue is the separation of environmental laws from development programs and policies of the state, taking responsibility on implementation strategies, and laughable or unrealistic penalties for violators. In addition, non-participation of citizens in law and policy formulation and execution impedes effective implementation of the law. It is right to say that lack of enforcement of such laws has become the primary cause of the inability of the legislative bodies to protect the Niger- Delta environment (Edo, 2012; World Bank, 1995).

3.7 Theoretical Framework

The organizational framework of this thesis illustrates the evaluation cycle for measuring overall effectiveness and is referred to as the effectiveness triangulation test and the other is the policy circle. The focus is to relate policy to implementation to evaluation and relate the implications of performance back to policy for adjustment and process development when necessary.

Analyzing policy making as a process: the policy cycle

The main characteristics of policymaking can be identified in three distinctive features which are as follows: (1) Policymaking is established when there are numerous constraints, for example, improper time management and lack of resources, public opinion, and the constitution. (2) Policymaking has to do with existing processes in policy making. Governments are no unitary actor; however, they are made up of different departments that relate with and at the same time compete. (3) These policy processes form the integral cycle of decisions and policies. Notably, current policy decisions are not willful decisions taken in the past (Knill & Tosun, 2008), hence policies considered today may have 'knock-on effects that could trigger new policy formulations (Newton & van Deth, 2005).

Considering the nature of the policymaking process, it is wise or suitable to consider policy making as a process model, and it is also labeled or considered as a policy cycle. The policymaking process is modeled as a series of political engagements which comprises the following:

- I. Drafting Agenda
- II. Policy formulation

- III. Policy adoption
- IV. Implementation
- V. Evaluation/Assessment

Considering the policy cycle, each cycle always begins with the identification of existing problems in the society or challenge and how much attention it gets in the policy agenda. Afterward, the policy proposals are being formulated after which one will be deliberated upon and adopted. After that, the next stage is to implement the adopted policy (Knill & Tosun, 2008). Finally, the outcome of the policy is assessed or evaluated. The last stage of the process goes back to the first stage of the process. This indicates that the policy cycle is an unending process. No article or work has been able to link the last process with the first or identify the policy process to be an unending or continuous process. However, some authors end up saying that Nigeria's policy lack an implementation (Adekola & Mitchell, 2011, Adekola, et al., 2012, Agbasi & Odiaka, 2016, Ajibola, et al., 2012).

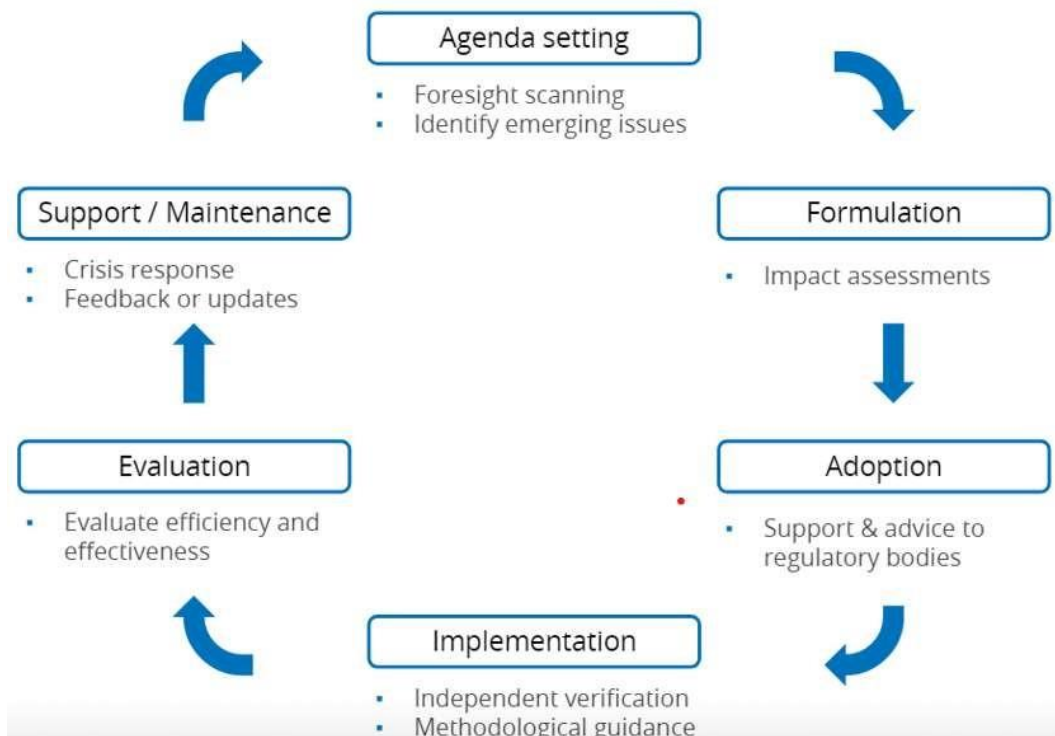


Figure 5: The policy cycle model

Source: (Christoph & Jale, 2008)

This successional model of the policy cycle represents a simplification; as shown in figure 5. In the real world, different actors (political and institutions) may be involved in a different stage of the processes at the same time. Still, the process provides a useful experiment for breaking policymaking into different units for being able to show or illustrate how policies are made (Knill & Tosun, 2008). The framework used for this research was adopted from the policy cycle, the agenda-setting, policy formulation, and policy adoption is being represented as policy in the framework, while implementation and evaluation stand on their own as shown in figure 5.

Implementation

Implementation is the process of putting laws and policies into practice or reality. When these policies or laws are not implemented well, it becomes meaningless. The success of the policies is dependent on how well the framework governing its implementation is executed. At a glance, implementation seems like an automatic continuation process of policymaking. However, there is a frequently substantial gap that exists between the presentation of a new law or legislation and its application, this gap reveals that the relationship between legislation of policy and implementation is slight at best (Knill & Tosun, 2008; Hill & Hupe, 2005).

Therefore, it is a straightforward objective of implementation research to help open the “black box” which is the process between generating information from the policy and its results. Regarding these, the several hypothetical approaches that were explained for the study of implementation (Pulzl & Treib, 2007), are classified into three categories (Hill & Hupe, 2005);

- I. “Top-down models” (Pressman & Wildavsky, 1973; Bardach, 1977; Mazmanian & Sabatier, 1983) primarily highlight the capability of policymakers to produce clear legislative agenda and monitor its implementation procedures (Knill & Tosun, 2008).
- II. Bottom-up models – here indigenous bureaucrats are regarded as the major players in transmitting policy, and it requires a synergy within the networks among the players (Lipsky, 1971).

- III. Hybrid models (Marth et al., 1977; Windhoff-Héritier, 1980) this model incorporates the elements of previous models mentioned 1 and 2 with other theoretical models (Knill & Tosun, 2008).

For implementation to be successful, there must be a unit with sufficient resources needed to be able to translate the policy objectives into an operational framework and will be accountable for its actions (Knill & Tosun, 2008; Gerston, 2004). Most times bureaucracies appear as principal actors when it comes to implementation. According to Meier (2000) in his study about USA bureaucracy, he states that implementation depends on the policy types which are either regulatory, distributive, or redistributive. For the purpose of this research, implementation and the regulatory policies, in a case such as this the agencies have to be receptive to the communities over which they control, whereby distributive policies are implemented with some bureaucratic choice (Knill & Tosun, 2008). Also, it involves establishing advocacy subcommittees and interest groups for oversight functions. For redistributive policy, it is only a little discretion that is left to bureaucracy because Congress (USA) has put a lot of effort into the process of designing the policies. However, it is important to conclude by saying that every design of a policy appears to be of importance for implementation success (Knill & Tosun, 2008).

Evaluation theory has to do with the process of evaluating in a formal way for any discipline or organization (Rossi, et al., 2004) (Alkin, 2004). The common meaning of “evaluate” is a process to identify the worth of a thing or what it can be said to appraise, thus, it carefully and “effectively” means when a particular thing or something serves its purpose or actualizes its goals (McGrath, 2010). The main aim of the evaluation is to compare something with criteria or benchmarks. Evaluation in whichever way (formal or informal) is an integral factor that contributes to the development of human activities. Reasonably, one could say that the theory of evaluation and its practices is factual and covers vast sections. The “Australasian Evaluation Society defines formal evaluation as the systematic collection and analysis of information to make judgments, usually about the effectiveness, efficiency and/or appropriateness of an activity” (Australasian Evaluation Society, 2002). Evaluation is being carried out to assess the effects and effectiveness of certain things like policy, practice or service,

innovation, and intervention and considers “effectiveness” in terms of reaching the aim of its establishment.

Policy to implementation: this will help to identify the challenges faced in terms of the process and procedures (effectiveness of the process) for the implementation of laws.

Implementation to Evaluation: This process helps to evaluate how much the implementation of the law is helping to realize the purpose of the law.

Evaluation of policy: this process will help communicate or report to the decision-makers how much the decision taken as a result of the available laws is meeting the set objectives or the aim for the establishment of the policy.

This framework covers all processes from lawmaking to implementation, to ensure that the law is effective, actualizing the purpose of its establishment.

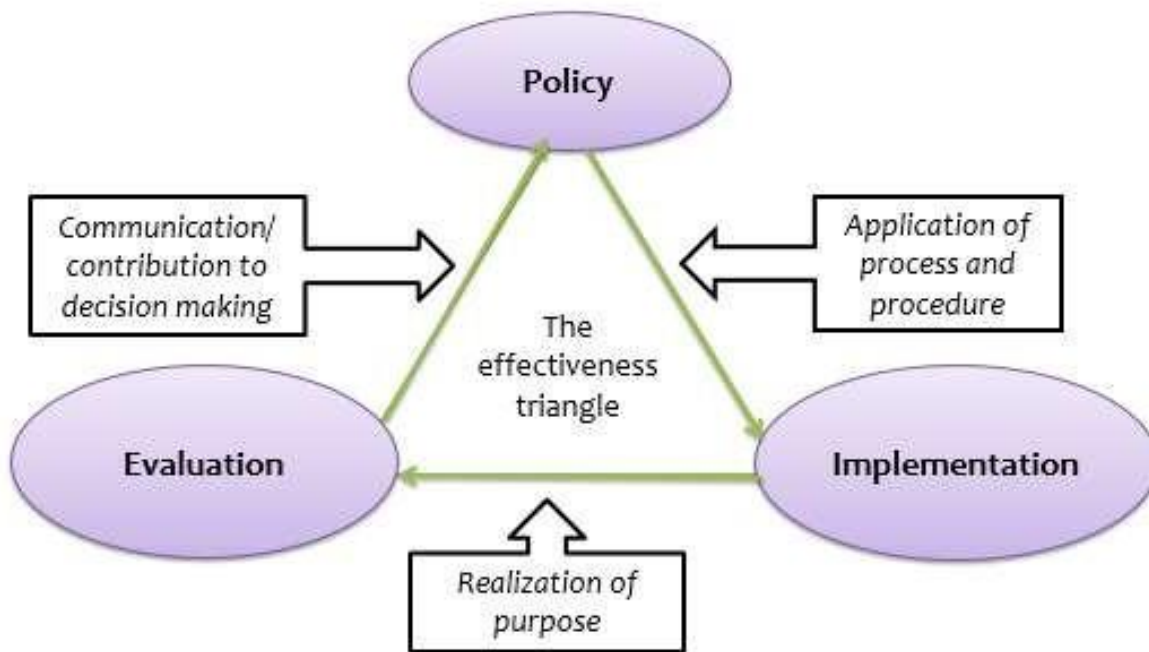


Figure 6: The effectiveness triangle

4.0 Methodology

4.1 Study Area

Upper Orashi Forests is a natural reserve area that has wetland in it, situated at the brinks of Orashi River with proximity to Ikodi community in Ahoada West Local government of Rivers State. It has a total area mass of 25,165 ha; 04°53'N 006°30'E. Upper Orashi Forest reserve is a freshwater marshland forest in the center Niger Delta with flood occurring from the period of September to November by the River Orashi resulting to proliferation in siltation and soil fertility. The Upper Orashi Reserve is known as a remnant of an indigenous small Centre, known serving as a niche for the sympathetically endangered “Sclater’s guenon and endangered White- throated guenon, Red Colobus monkey, and Heslop's pygmy hippotamus” (Ramsar, 2017). The site is a congregate for rest for the “Grey Parrot (*Psittacus erithacus*)” and host of numerous important water bird species (Ramsar, 2017). The Upper Orashi Forest is one of the two Ramsar sites in the Niger Delta and among eleven Ramsar sites of international importance in Nigeria as shown in figure 7.

“The trees species in the reserve include *Anthostema aubreyanum*, *Macaranga sp.*, *Hexalobus crispiflorus*, *Lophira alata*, *Pycnanthus sp.*, *Ricinodendron heudelotti*, *Sacoglottis gabonensis*, *Uapaca ap.*, *Hallea ledermannii*, *Albizia adianthifolia*, *Irvingia sp.*, *Ficus vogeliana*, oil palm (*Elaeis guineensis*), and rattans (*Calamus deerratus*)” (Ramsar, 2007). There are specific species that have been found in recent times, although they are still new in Nigerian habitat such as “Black- fronted duiker (*Cephalophus nigrifrons*), pygmy scaly tailed flying squirrel (*Idiurus sp.*), and small green squirrel (*Paraxerus poensis*)” (Ramsar, 2007). The site is a perch for the “Grey Parrot (*Psittacus erithacus*) and about 90 other bird species which includes the uncommon Congo serpent eagle (*Dryotriorchis spectabilis*)” (Ramsar, 2007).



Figure 7: Map of Nigeria showing the eleven Ramsar sites in Nigeria

Source: (Nigeria Conservation Foundation 2021).

Looking at the geography of the Niger Delta, it is in the southern part of Nigeria as shown in figure 8, with an area of about 70,000km² i.e., about 27,000 sq. mi; with a monthly average temperature of 27°C and recorded annual rainfall estimated to be from 3,000 to 4,500 mm. In terms of weather, Nigeria has two main seasons, raining season from April to October and the dry season from November to March (World Bank, 1995). The Niger-Delta region is made up of nine states which are as follows: Edo, Delta, Bayelsa, Rivers, Cross River, Abia, Imo, Ondo, and the Akwa- Ibom states as shown in figure 8. Regarding the culture, the Niger-Delta region has rich and diverse cultural heritage with various languages, dialects and varied ethnic groups.

From recent statistics, Nigeria produces as a median quote, 2.5 million barrels of crude oil per day with about 28.2-billion-barrels in reserve (NNPC, 2015). Due to huge volume of large oil and gas reserves in this region, exploration, refining, exportation and other related oil activities have been taking place since oil discovery in the 1950s till date. Further, this region has the second- largest wetland with mangrove swamps and rainforest vegetation in Africa. The Niger-Delta ecosystem is classified into four main sections from an environmental view with different boundaries characterized by the seasonal flooding patterns as follows: “mangrove swamps, freshwater swamps, saltwater rainforest, and sandy beach ridges” (Chibueze, 2018). The ecosystem here provides rich fertile soil for varieties of plants (economic crops such as “timber species, edible vegetables, fruits, nuts and seeds, medicinal plants, palm trees, tannins, bamboos, and grasses) including animals (monkeys, apes, mongoose, otters, squirrels, antelopes, elephants; reptiles, 330 distinct species of birds; insects and invertebrates) species” (Kuenzer et al., 2014). It is boundary with the Atlantic Ocean in the south and known to be the third-largest world producer of palm oil after Malaysia and Indonesia (Agbasi & Odiaka, 2016).

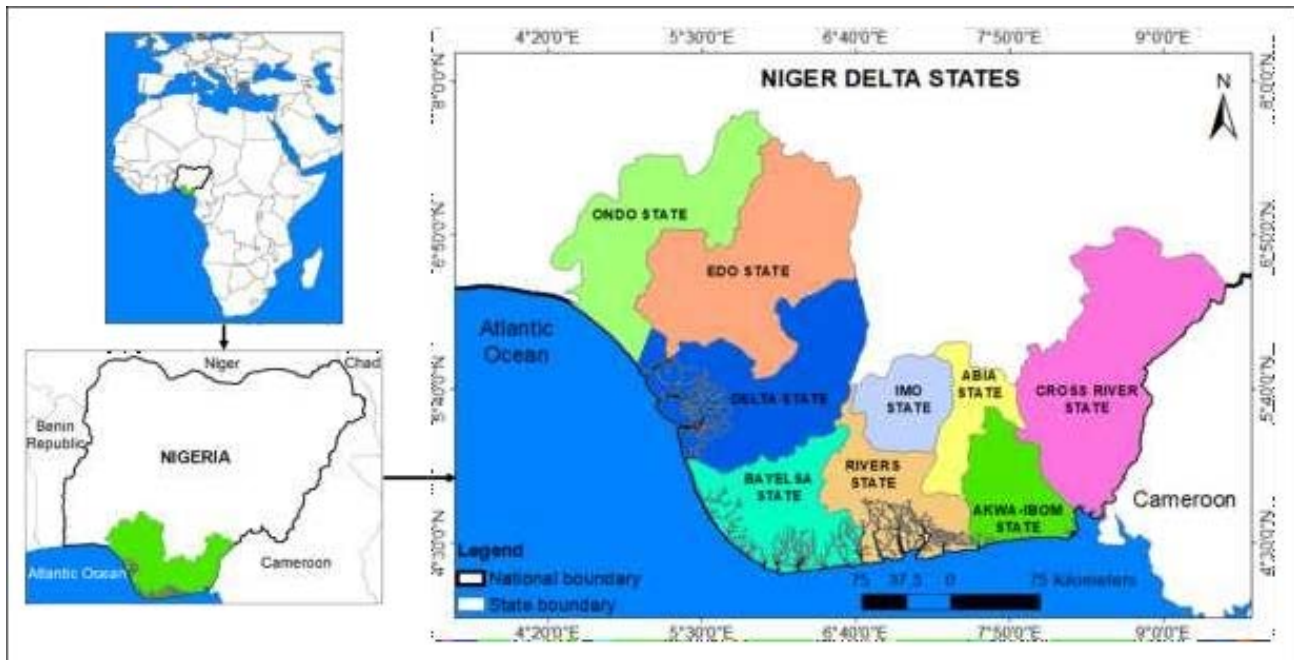


Figure 8: The location of Niger Delta in the southern part of Nigeria

Source: (Edo & Albrecht, 2021)

4.2 Data Collection and Analysis

For this research, non-probability or convenience sampling method was used. The convenience sampling method is a process whereby a convenient respondent who is available and is involved in the process (Alison, 2005; Hamed, 2016), no specific pattern is used (Andrade, 2018). To ensure that everyone involved belongs to one of the stakeholder groups identified. The choice of a non-probability sample is a result of the level of insecurity in the area. This area is a host of so many creeks where the militants are located. Many oil companies have relocated from the area and for those remaining use jets (air plane) to bring their staff to work, while the workplace is being guarded with heavily armed military men. Initially, their target was on expatriates of the oil companies, due to the high level of security around the companies they have no access to them and resorted to kidnapping non-oil workers like civil servant and business owners. When the kidnappers identify individuals who are not from the area, that individual will be held hostage or kidnapped and ransom demanded, until that demand is met the individual will not gain freedom. For this reason, I decided to use the convenience sampling method. The convenience sampling method is a process of selecting participants because they are often readily and easily available, as it is less expensive and easy (Showkat & Parveen, 2017).

The mixed-method approach to research emerged in the mid-to-late 1900s (Tashakkori & Teddlie, 2003). Researchers have incorporated two different methods of collecting and analyzing data from the qualitative (numerical data) and quantitative (narrative data) research approach in the study (Creswell, 1998; Johnson & Onwuegbuzie, 2004; Johnson & Onwuegbuzie 2004 and Tashakkori & Teddlie 2003). In this case, the researcher collects and analyzes not just only the numerical data which are thought to be customary for quantitative research, but also narrative data, which are typical for qualitative research to assist in addressing the research question(s) as defined in an exceedingly research study.

To acquire more resourceful information, questionnaires (survey) were designed using closed-ended question to gather numerical values or quantitative data including open-ended questions to get additional information apart from specified or directed question (narrative) qualitative data (Tashakkori & Teddlie, 2003).

For the purpose of this study, a mixed approach was adopted. With this approach, it was possible to have data in both numerical form and in narrative form. The information in the narrative form was

coded, and thereafter synthesized it into numerical data. This data was used for descriptive analysis. The narrative method helps to explore people's opinions or experiences concerning the Upper Orashi Forest Reserve. Open questions within the questionnaires give opportunities to people to give additional information that the questions within the questionnaire did not address or cover.

To find out the opinion and thoughts of the community on the degradation of wetland and its driving factors within the area (wetland conversion/depletion) the respondents were chosen using convenience sampling techniques. However, Guwahati University (2012) and Israel (1992) used a single proportion formula designed by Cochran (1977), in his study on land degradation assessment. The same was adopted for this research since the socioeconomic factors of this study are quite like his hence the decision to use the same methods.

The author makes an assumption about an inflated population size, lacking information about the variability among those who engage in the practice. Consequently, the assumption is set at $p=0.2$, indicating maximum variability. Additionally, if a 95% confidence level with a precision of $\pm 5\%$ is sought, the corresponding sample size, as calculated in the equation, amounts to a total of 244.

$n = (z^2 pq)/e^2$ Where:

n = number of sample size when the population is a smaller amount than 10,000. z = confidence limit.

p = the proportion of the population to be included within the sample.

$q = 1-p$.

e = is that the desired level of precision.

for the purpose of this research, 244 questionnaires were distributed, 226 were retrieved, and 18 were unable to be retrieved. Two (2) different set of questionnaires were designed for two different groups: The first group is the professional which incorporates academicians (lecturers and students), for the scholar the main focus was on Ph.D. and master's students of some universities within Rivers State, University of Port Harcourt, Rivers State University, and The Institute of Natural Resources, Environment and Sustainable Development (INRES), Government Environmental agencies (Federal and State Ministry of Environment, Niger Delta Development Commission), Oil and Gas company

(Department of Environment of the Liquefied Nigeria Gas Company) in Rivers State, and a few NGOs. A total of 162 professional questionnaires were distributed and 152 were retrieved.

While the second set of questionnaires were designed to capture the idea of the local communities in the area about the wetland. For this reason, a total of 82 questionnaires were distributed, 74 were retrieved and eight were lost as shown in table 4.

Table 4: Number of questionnaires distributed and retrieved

Targeted Groups	Distributed Questionnaires	Retrieved Questionnaires	Lost Questionnaires
Professional	162	152	10
Local Community	82	74	8
Total	244	226	18

There is much literature tackling the issue of environmental laws and policy, environmental degradation, and environmental pollution in the Niger Delta region of Nigeria. However, many of the related papers put attention more on issues of social, economic, equity, minority, and human rights, while others focused on political and resource control. Only a few of them addressed the wetland degradation issues. This research provides a detailed analysis of wetland cover as it relates to wetland loss in Upper Orashi Forest Reserve by using integrated methods, identifying the driving factors, and reviewing the available laws used for wetland management in the region. For the purpose of achieving environmental sustainability in respect to the Niger Delta wetland.

Data collection and analysis (GIS and Remote Sensing Data)

Geographic information systems (GIS) and remote sensing (RS) are known to be important software tools for checking and evaluating wetland distribution area and spatial-temporal dynamic diversification (Satish, et al., 2017). Within the last two-decade multiplicity of remotely sensed data and methods for changed detections have been developed and assessed. Remotely sensed data is

being used for measuring both the qualitative and quantitative land use and land cover change (Ashraf & Yasushi, 2009). Satellite remote sensing has several pros in terms of wetlands inventory and monitoring and provides information on the surrounded land use and its state over time (National Wetland Atlas, 2009; Audrey & Ricardo, 2011).

Satellite images that were captured in 2019, 2008 and 2002 by LANDSAT 8 and 7 were collected from the United States Geological Survey (USGS) Earth Explorer service (USGS 2019) (Enoguanbhor, 2021). The spatial resolution of the satellite images is 30m. While analyzing the satellite imagery, spatial analysis was performed using ArcGIS version 10.7, including a supervised classification with a maximum likelihood algorithm (Enoguanbhor, et al., 2020; Enoguanbhor, et al., 2019; Campbell & Wynne, 2011; Lu, et al., 2011; Tso & Mather, 2009). Supervised classification is a process whereby carefully selected samples of pixels in a satellite image are used to assign information classes to unknown pixels (Enoguanbhor, 2021; Enoguanbhor et al., 2019; Campbell & Wynne, 2011; Kaishan, et al., 2014). The maximum likelihood algorithm is a classifier that aligns “pixels to the class with the highest probability from different pixels that belong to different classes” (Enoguanbhor, 2021; Enoguanbhor et al., 2019; Lu et al., 2011).

The Normalize Difference Vegetation Index (NDVI) was analyzed to identify various pixels with different vegetation values and generate training samples for the classification (Jiang, et al., 2021; Kwan, et al., 2020). The NDVI is expressed as:

$$NDVI = \frac{NIR - R}{NIR + R}$$

where NIR and R denote near-infrared band and red band, respectively. The land cover types were classified into a wetland, light vegetation, and thick vegetation. To validate the land cover maps, accuracy assessments were performed using simple random sampling of 400 points and the composite satellite images as referenced data. The user accuracy (UA), producer accuracy (PA), and over accuracy (OA) for land cover types were assessed (Enoguanbhor, et al. 2019). Table 5 shows the outcome of the accuracy assessments.

Table 5: Accuracy assessments

Land cover types	2019			2008			2002		
	UA	PA	OA	UA	PA	OA	UA	PA	OA
Wetland	87.0%	85.8%		86.0%	87.9%		85.0%	88.3%	
Light vegetation	86.0%	91.3%	90.5%	85.4%	88.8%	89.6%	84.0%	87.4%	89.0%
Thick vegetation	88.2%	89.7%		85.9%	89.2%		86.7%	89.8%	

Secondary data were collected from relevant literature: Journals, textbooks, related government parastatals such as Niger Delta Development Commission, Federal Ministry of Environment, and State Ministries of Environment, articles and documents from the Health Safety and Environment Departments of Oil Companies operating within the Niger-Delta region. Also, reports from non-governmental and community-based organizations, and online websites are reviewed and adopted during this research.

5.0 Results

Having visualized and enumerated the spatial arrangement of land cover types for 2002, 2008, and 2019 by carrying out the supervised classification of land cover (Enoguanbhor, 2021), the results figure 9 and Table 6 show that there was a consistent decrease in the wetland area as follows; 2002 is 11.83%, 2008 is 6.1%, and 2019 is 2.23% while that of the class light vegetation in 2002 was 62.51%, in 2008 it increased to 68.58% and in 2019 it decreased to 65.07%. The class thick vegetation in 2002 was 25.66%, in 2008 it decreased to 25.41% and in 2019 it increased to 32.70% as shown in Table 8.

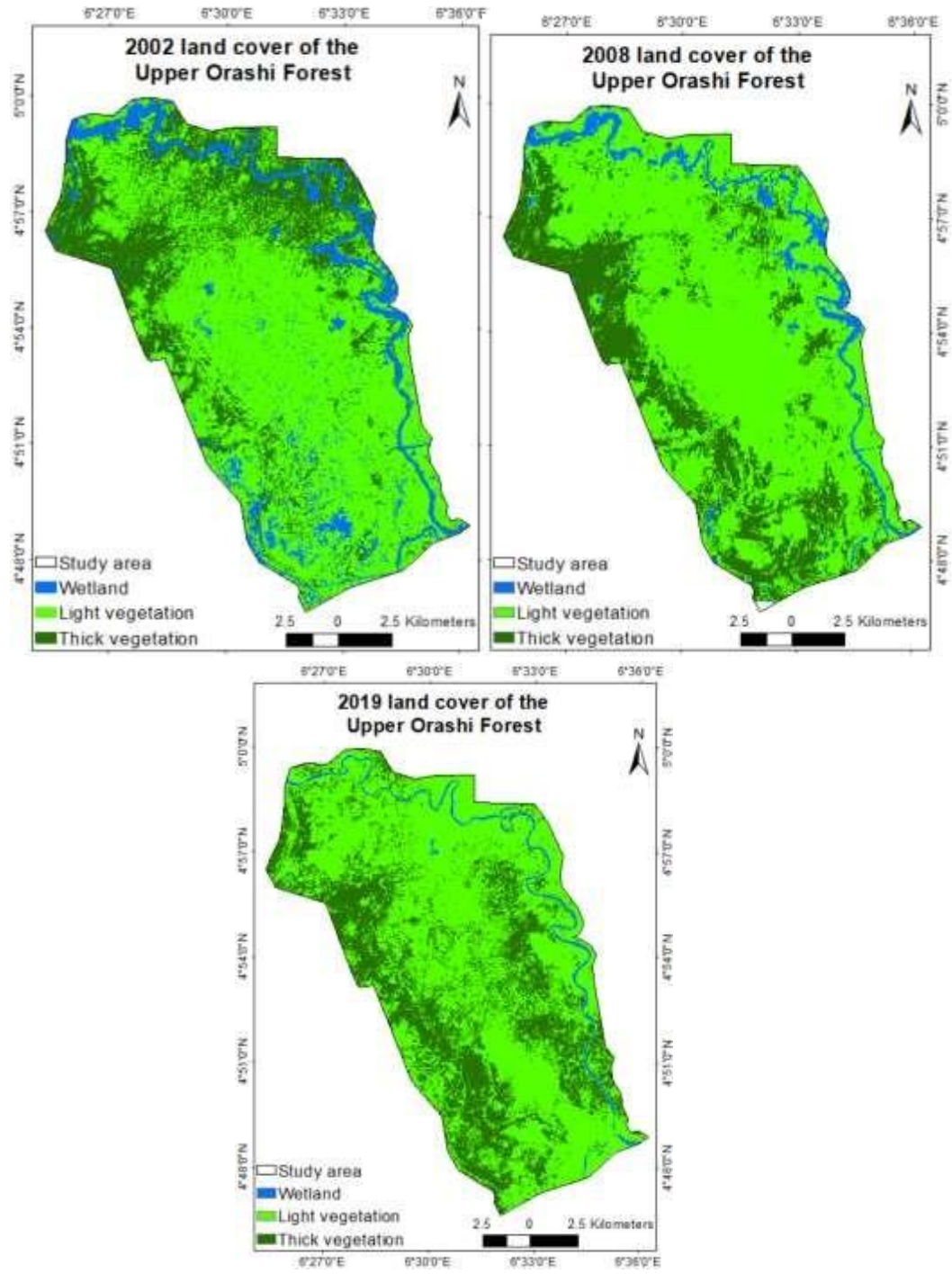


Figure 9: The state of Upper Orashi Forest vegetation in 2002, 2008 and 2019

Table 6: Land cover classes for 2002, 2008 and 2019

Land cover classes	2002	2008	2019
	Area m²	Area m²	Area m²
Wetland	30,828,600	15,695,100	5,805,900
Light vegetation	162,899,100	178,899,300	169,570,800
Thick vegetation	66,879,900	66,281,400	85,230,900
Total	260,607,600	260,875,800	260,607,600

Table 7: Land cover/wetlands ecosystem dynamics for Upper Orashi Forest Reserve for 2002, 2008 and 2019

Land cover classes	2002	2008	2019
	Area km²	Area km²	Area km²
Wetland	30.83	15.70	5.81
Light vegetation	162.90	178.90	169.57
Thick vegetation	66.88	66.28	85.23
Total	260.61	260.88	260.61

Table 8: Percentage of land cover change from 2002, 2008 and 2019

Land cover classes	2002	2008	2019
	Percentage %	Percentage %	Percentage %
Wetland	11.83	6.01	2.23
Light vegetation	62.51	68.58	65.07
Thick vegetation	25.66	25.41	32.70
Total	100%	100%	100%

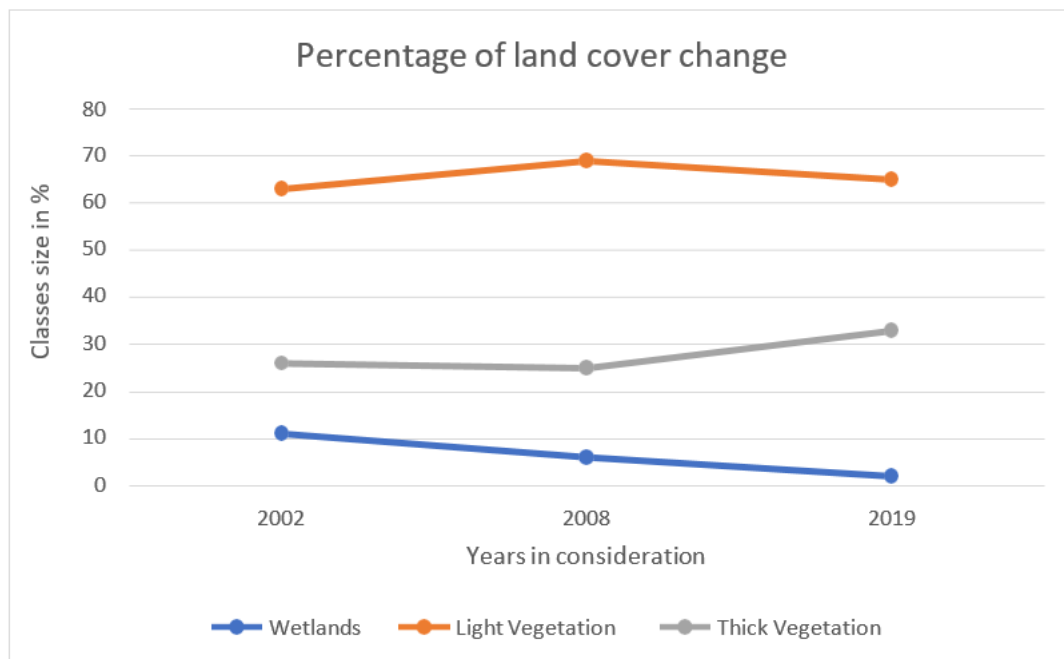


Figure 10: The percentage of land cover change

In order to calculate for the change detection, the following formula was use: $LC2 - LC1$ (Land cover change 2 substrates by Land cover change 1) for (2008 - 2002) and (2019 - 2008) as seen in table 9.

Table 9: Change detection between 2002-2008 and 2008-2019

Land cover class	Area in km ²	Wetland	Light vegetation	Thick vegetation
2008 - 2002	Km ²	-15.13	16.00	-0.60
2019 - 2008	Km ²	-9.89	-9.33	18.95
Total	Km²	-25.02	6.67	18.35

In order to calculate the rate at which wetlands and other vegetation are degrading, the following formula was used $LC2 - LC1/Time(Years)$.

Table 10: Average change in rate of wetland and other classified vegetation

Land cover class	Wetland	Light vegetation	Thick vegetation
2002 - 2008	-2.52	2.67	-0.1
2008 - 2019	-0.9	-0.85	1.72

5.2 Results from the professional questionnaire

Question number 3 for the professionals, it helps to understand the level of work experience for the respondents, it shows that 50% of the respondents who have work experience from (years) 0 – 10 is 50%, 38% have between 11 – 20, 7% have between 21 – 30, 4% have between 31 and above and 1% did not respond as shown in figure 11.

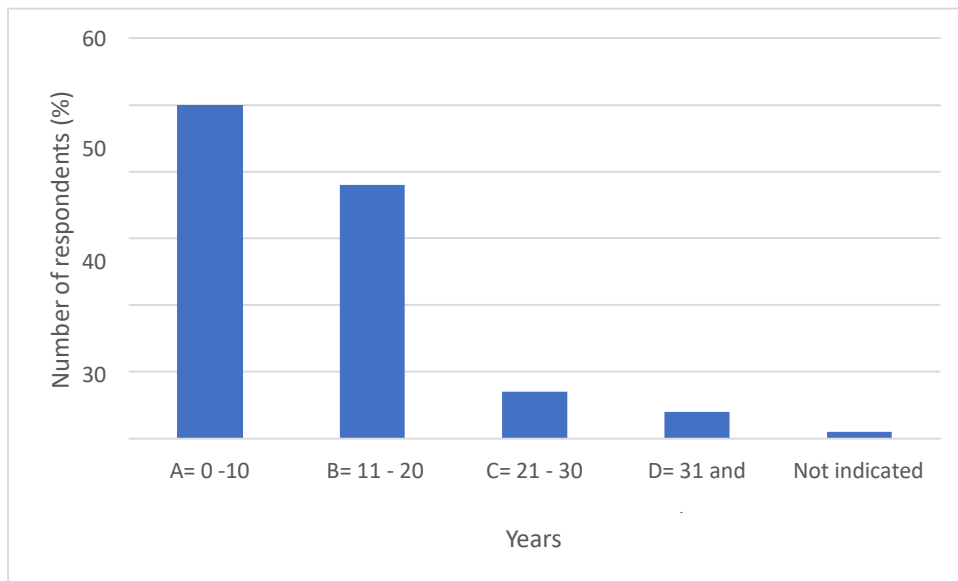


Figure 11: The years of work experience for respondents

This question helps to know the level of education of the respondents; however, it shows that there are no respondents with O level as the highest education, 2% had either advanced level, NCE (National Certificate of Education) or OND (Ordinary National Diploma), 30% have HND (Higher National

Diploma) BSc (Bachelor of Science) or BA (Bachelor Art), 59% have MSc (Master of Science) or MA (Master of Art) and 9% are Ph.D. holders or Professor as shown in figure 12.

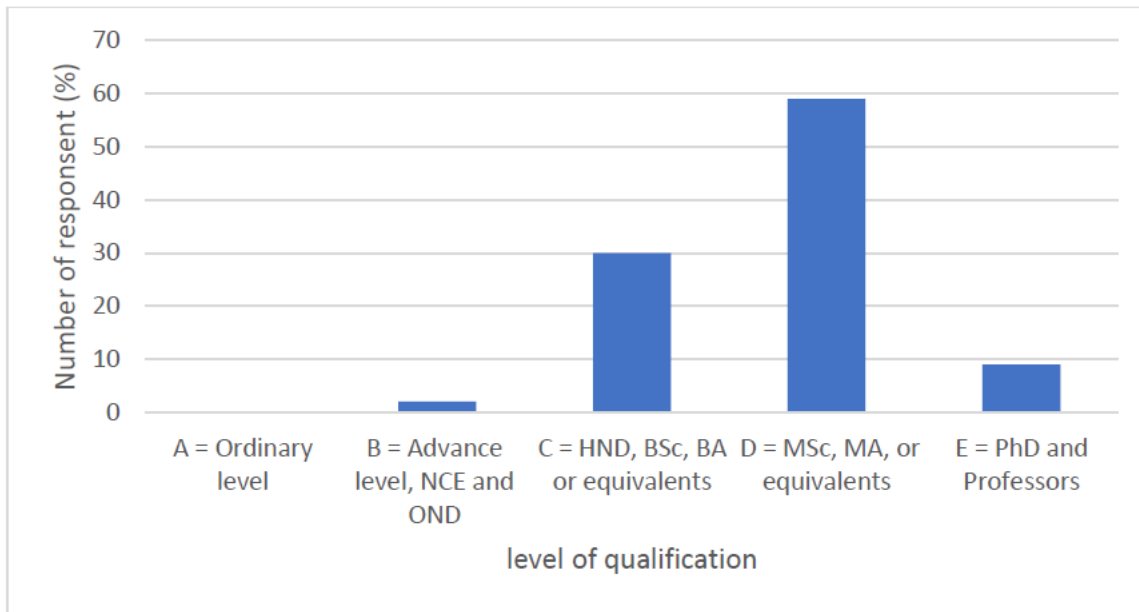


Figure 12: Academic level of respondents

Section B

This question helps to identify the major cause of wetland reduction or disappearance in the study area. However, the industrial factor is part of anthropogenic factors, but in this case, I differentiate it because of the high number of oil-related industrial activities and classified agriculture and other human activities as anthropogenic activities. The idea is to understand how much impact industrial factors (oil activities) impact wetlands in the area. However, 10.5% were of the opinion that industrial factors are the main cause of wetland reduction, while 2.63% said it's anthropogenic factors. 81.58% said it's both industrial and anthropogenic factors, 2.63% chose the option of other factors, and 2.63% did not respond to this question as shown in figure 13.

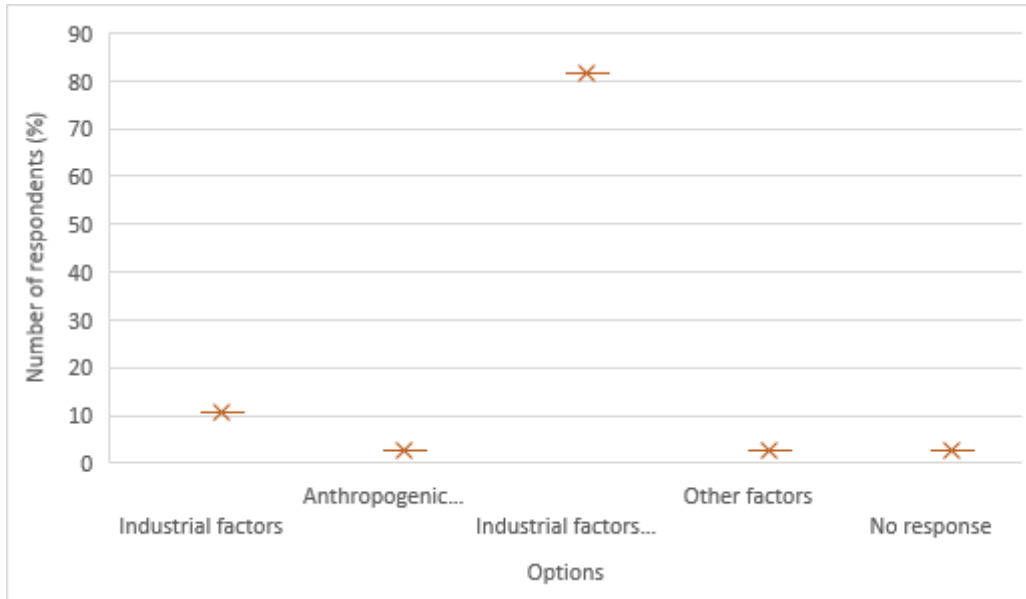


Figure 13: Activities that result in wetland degradation in Upper Orashi Forest Reserve

5.26% of the respondents are of the opinion that wetland degradation are as a result of agricultural purpose (A), 2.63% Infrastructural developments (roads and houses contraction) (B), 5.26% Building of industries (C), none of the respondent are of the opinion that only installation of oil and gas facilities are resulting to wetland loss in the study area (D), same for option (E) dredging, 5.26% of the responded choose option A and B, 9.21% of the respondents choose option A and D, 1.32% of the respondents choose option B and C, 10.53% of the respondents choose option B and D, 2.63% of the respondents choose option B and E, 1.32% of the respondents choose option B and F, 2.63% of the respondents choose option B and F, 2.63% of the respondents choose option C and D, 2.63% of the respondents choose option D and E, 2.63% of the respondents choose option A, B and C, 5.26% of the respondents choose option D and E, 2.63% of the respondents choose option A, B and C, 5.26% of the respondents choose option A, B and D, 15.79% of the respondents choose option A, C and D, 5.26% of the respondents choose the option B, C and D, 6.58% of the respondents choose the option A, B, C and D, 1.32% of the respondents choose option B, C, D and E, 2.63% of the respondents choose the option A, B, C, D and E and 2.63% did not respond to this question as show in figure 14.

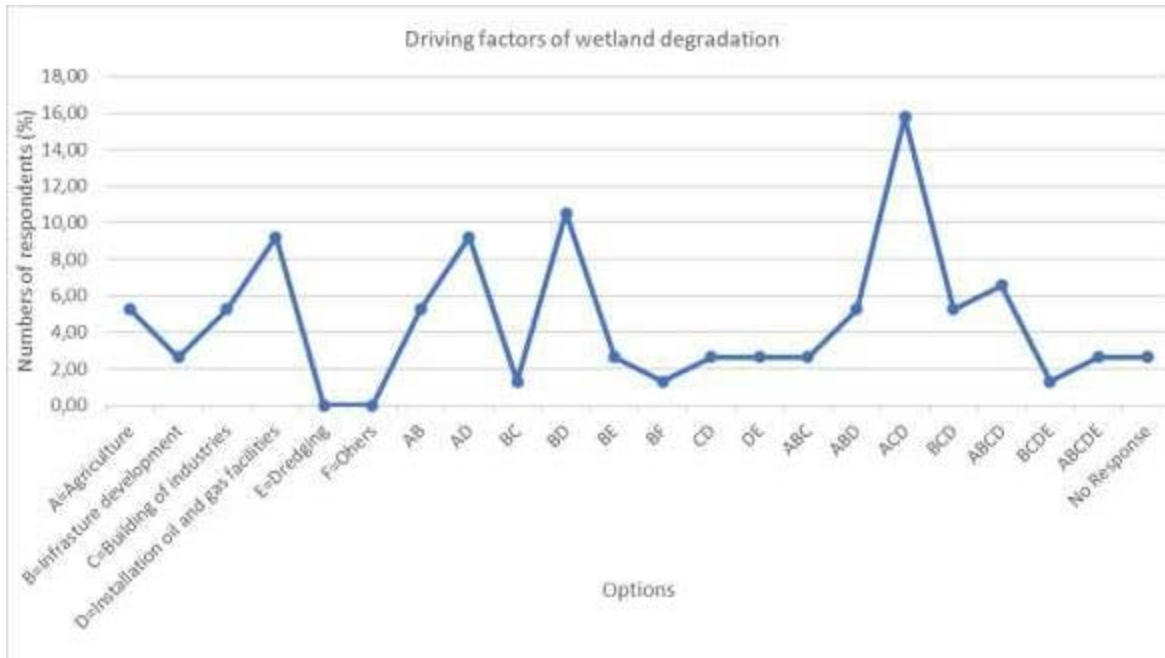


Figure 14: Activities that result in wetland degradation in Upper Orashi Forest Reserve

23% of the total respondents believed the available laws in Nigeria for management and protection of wetlands is effective, 59% said no that the available law is not enough to effectively manage the wetland and 18% said they have no idea about the question as shown in figure 15.

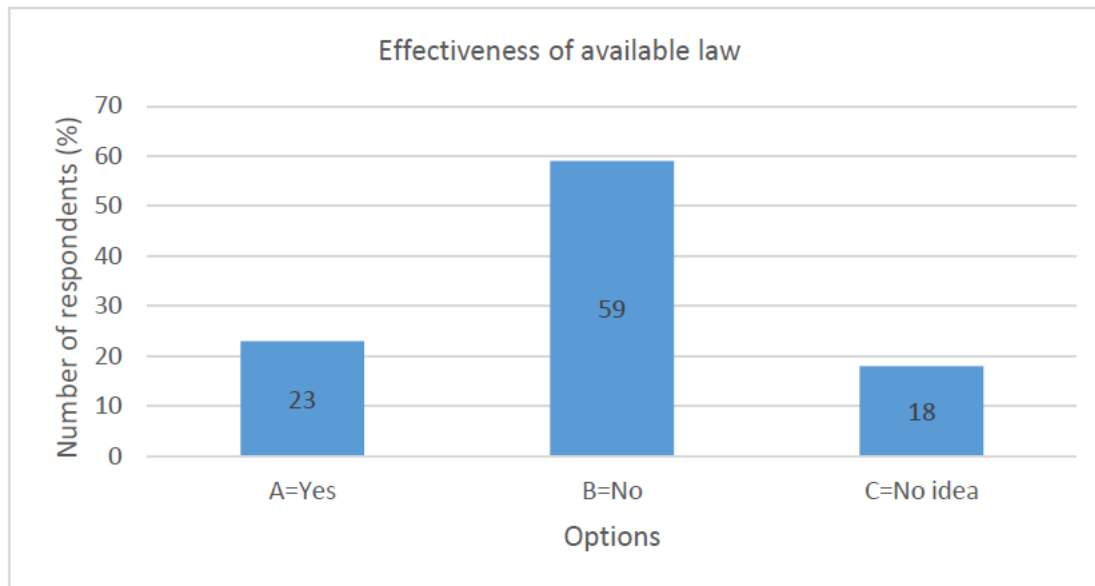


Figure 14: Response of the people on the effectiveness of the available law and wetland management

A = no reduction in the size of the wetlands. 29.4% of the participant that responded to this question said that there is no change in the size of the wetland under study and;

B = there is a reduction in the size of wetlands as a result of anthropogenic and natural phenomena. 70.6% of the participants agreed that there is a change in the wetland size under study.

For question 9: if you respond to question number 7 saying no, what should be done to make it effective? The value was coded and grouped into options A and B. thereafter, the values were calculated in frequency.

A = proper implementation of the available laws only B = implementation of law enforcement team only AB = Both options

However, it shows that 33% of the participants were of the opinion that if the general environmental law is properly implemented will effectively protect the wetlands, while 32% are of the opinion that if enforcement team is put in place, wetland management system will be effective and 35% agreed that proper implementation of environmental laws and implementation of law enforcement team will help bring about sustainable wetlands management and effective protect wetland in the area as show in table 11.

Table 11: Frequency value of the coded response of the questions 8 and 9

	A	B		Total
Response to Question 8	29.4%	70.6%		100%
	A	B	AB	Total
Response to Question 9	33%	32%	35%	100%

32% of the population that responded to this question are of the opinion that inadequate laws attribute to lack of protection and management in the Niger Delta wetlands, 37% said is lack of

implementation of the available laws, 29% said is lack of enforcement of the available and 2% choose other reasons as shown in figure 15.

Question 9: Which of these can be attributed to the ineffectiveness of laws available for the protection and management of the Niger-Delta wetlands? (you may choose more than one answer).

In question 10 it shows that 32% of the population that responded to this question are of the opinion that inadequate laws attribute to lack of protection and management in the Niger Delta wetlands, 37% said is lack of implementation of the available laws, 29% said is lack of enforcement of the available and 2% choose other reasons as shown in figure 16.

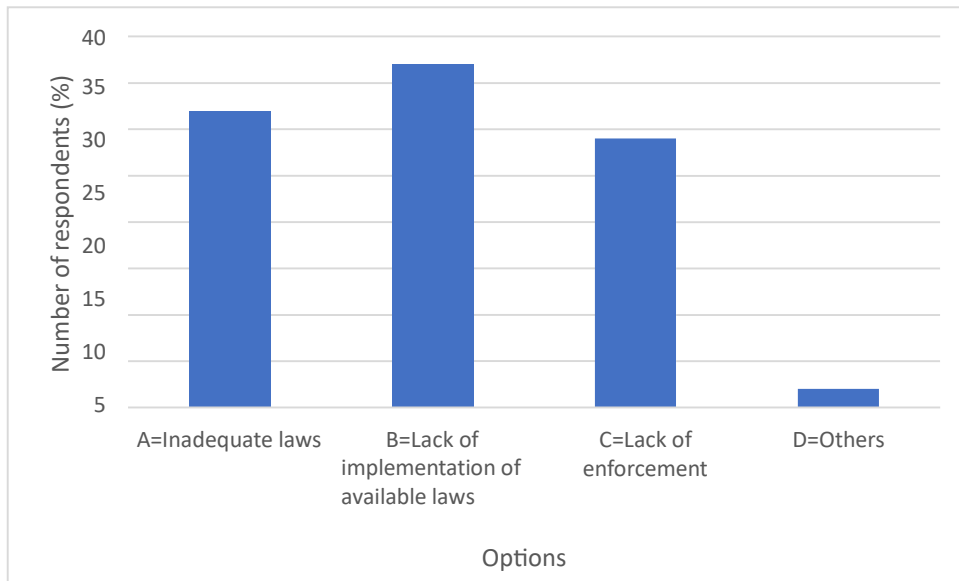


Figure 15: Response in respect to awareness program about wetland management and protection

Question 10. Is there any awareness program about wetland management and protection in the region?

This question is to understand if there is any program in place to enlighten the people in the region on It shows that 63% of the population that responded to the question are of the opinion that there is no awareness program organized in the area with respect to wetland management and protection. Whereby 33% of the population said awareness programs are being organized and 4% of the

population didn't respond to the question as show in figure 17, the importance of wetlands and why it has to be protected.

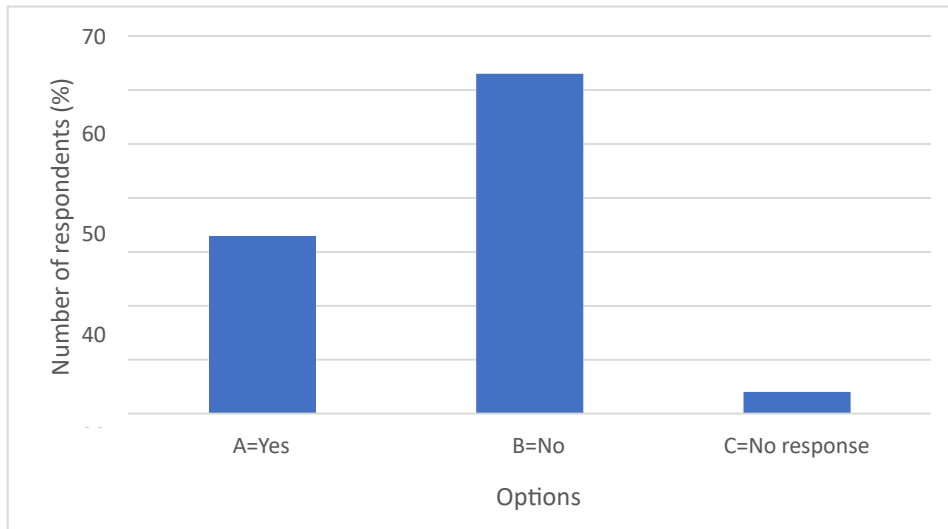


Figure 16: Response in respect to awareness program about wetland management and protection

The same method used in analyzing questions 8 and 9 was also used here. In this case, 50 respondents said yes to question 10, and were coded into numbers from 1-3; one represents the NGOs, two represents government agencies and three represents no response. However, 72% of the population that agreed that they do organize awareness programs in relation to wetland protection and management in the study area, said it is being organized by government agencies and 12% said NGOs and 16% were unresponsive to the question as shown in figure 18.

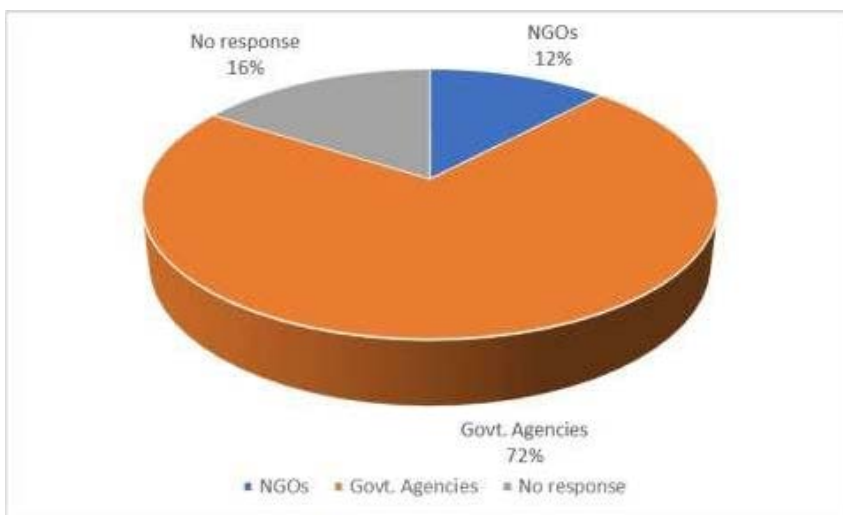


Figure 16: The agency(s) responsible for wetland awareness program in the region

From the response to question 12, it shows that 61% of the respondents are of the opinion that the knowledge of wetland in the region is low, 16% agreed are of the option of moderate, 12% was of the option that wetland knowledge is high, 9% choose the option of no idea and 2% did not respond to the question as in shown in figure 19.

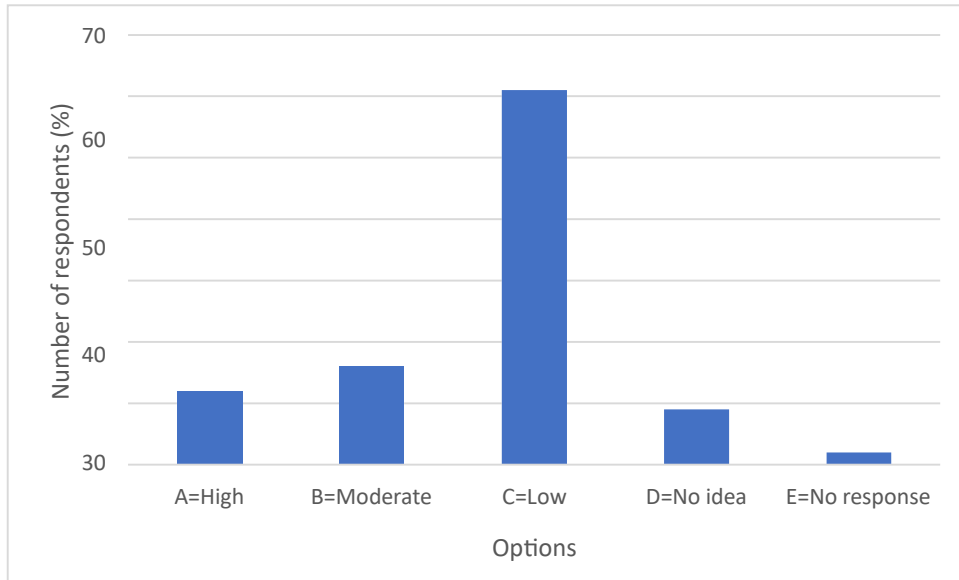


Figure 17: The rating of wetland knowledge in the region

The respondent to question 13, shows that 4% was of the opinion that the government is doing well in terms of wetland management and protection in relation to the Ramsar Convention, 82% was of the opinion that the government is not doing well in terms of wetland management and protection in relation to the Ramsar Convention and 14% did not respond to the question 19 as shown in figure 2

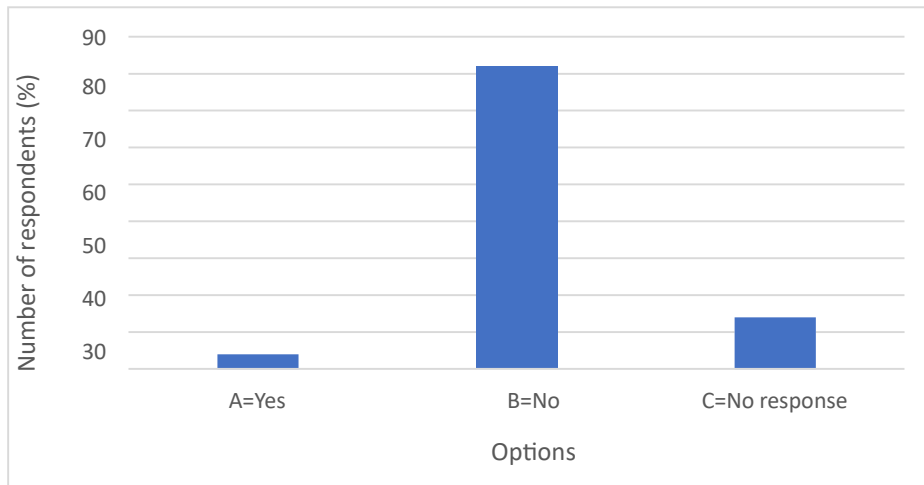


Figure 18: The response to ascertain if government is doing enough in respect to wetland management. Out of the 100% of the respondents to question 14, it shows that 13% of the respondents was of the opinion of not going close to the wetland area, 7% was of the opinion of using wetland resources for personal use only, 66% was of the opinion that local community can contribute to effective management of wetland through communication with the government agencies charge with the responsibility of managing wetland in Nigeria and 14% choose other reasons (the reason that is not specified under the options here) as shown in figure 21.

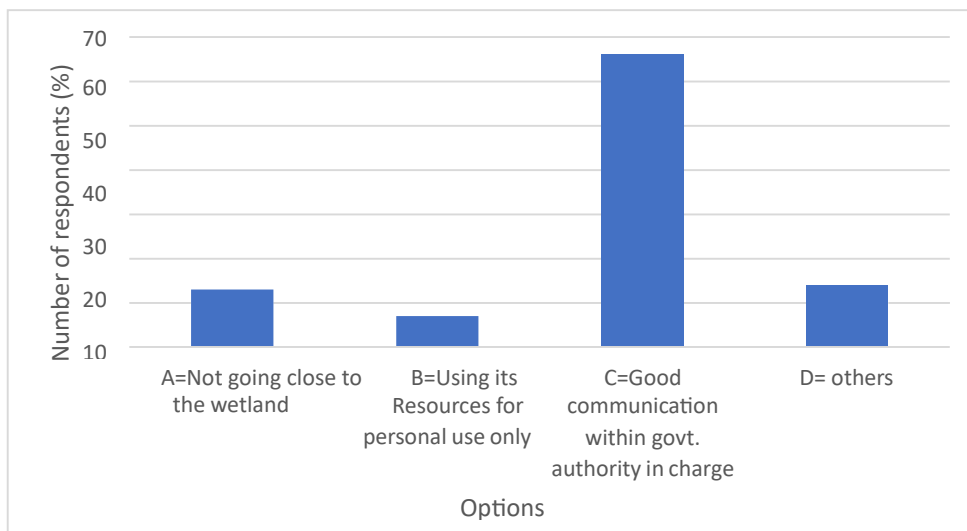


Figure 19: Possible ways in which the local communities can contribute to the effective management/protection of wetlands in the region

5.3 Results from the local communities

Table 12: Total number of respondents by gender

	Frequency	Percentage (%)
Male	41	55%
Female	33	45%
Total	74	100%

It shows that 38% of the respondents are between the age (years) of 15 – 30, 54% are between 31 – 50, and 8% are between 51 and above as shown in figure 22.

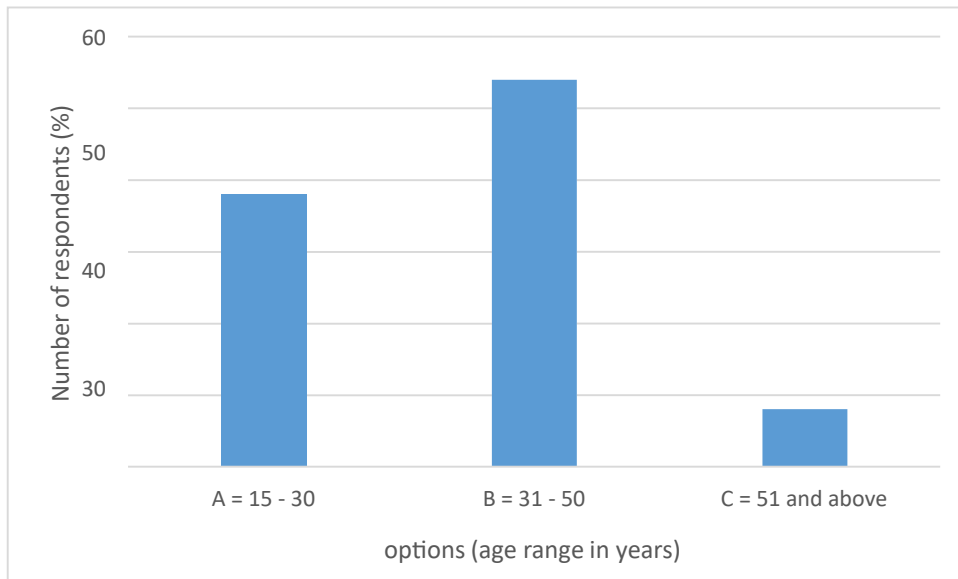


Figure 20: Age range of the respondents from the local community

It shows that 51% of the respondents have ordinary level, 24% have either advanced level, NCE or OND, 16% have either BSc or BA, 4% MSc. or MA, none had a Ph.D. degree, and 4% others as shown in figure 23. The profession of the respondents ranging from teachers, traders, farmers, fishers and hunters.

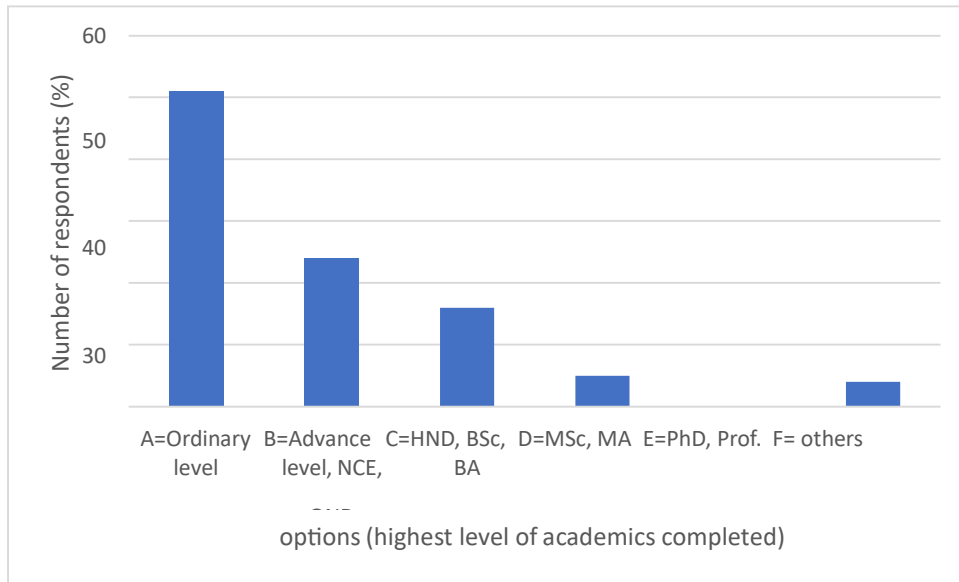


Figure 21: The academic level of the respondents

This question is to understand if the respondents are all from the study area or indigenous people only or mixed (migrants), however, it shows that 50% of the respondents are indigenous people and the others 50% are people who migrated to the area (not indigenes) as shown in figure 24.

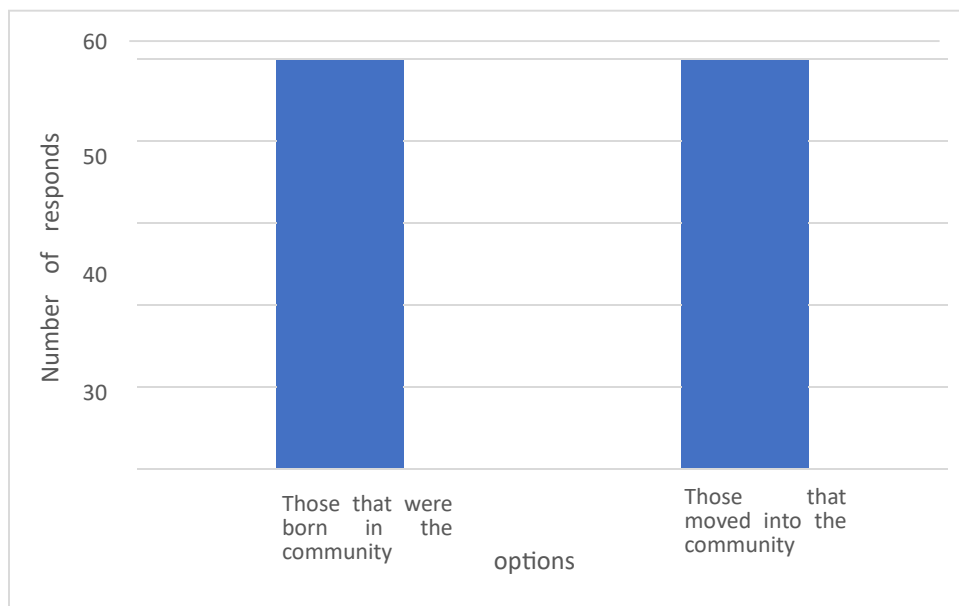


Figure 22: Number of the respondents that were born in the community and those that moved in here

This question is for those that choose “no option” to question number 5. It shows that 67.6% of the respondents to the question have lived between one month to five years in the area, while 32.4% of the respondents have lived six years and above in the area as in table 13.

Table 13: Number of years those that were not given birth in the communities has lived here

Years of stay	Frequency	Percentage
1 month – 5 years	25	67.6%
6yers and above	12	32.4%
Total	37	100%

This question helps to know if the respondents or participants know what wetland is, however, it shows that 55% said they know what wetland is, 11% said probably which implies that they are not too sure what wetland is, 31% said they do not know what wetland is and 3% did not respond to this question as shown in figure 25.

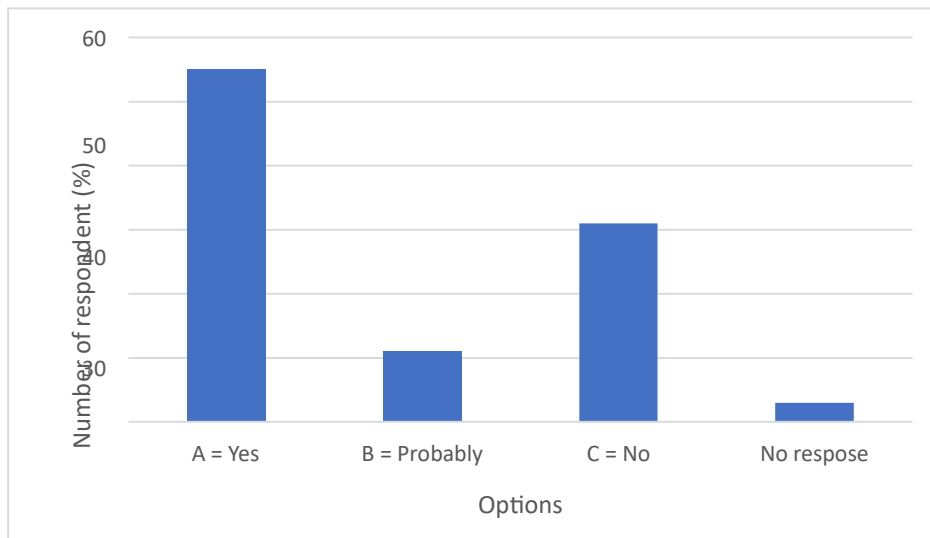


Figure 23: Knowledge of wetlands among the respondents

Question 8 was for those that said they know what wetlands are (those that said yes to question 7, the question is to ascertain if there is a change in the size of Upper Oranshi Forest. 82% was of the opinion that there is a change, 8% was of the opinion that there is no change and 10% did not respond to the question as shown in figure 26.

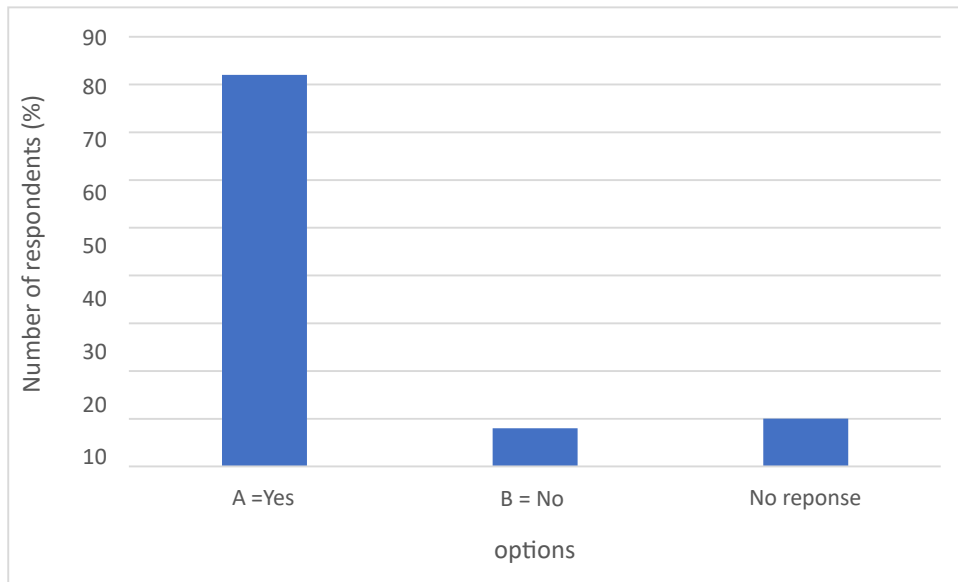


Figure 24: Response to ascertain if change has occurred in the Upper Orashi Forest Reserve

For the respondents that said yes to question number 8, is there a change in the wetland area? question 9 helps to determine if the change in the wetland area is experiencing an increase in size or a decrease in size of the wetland. However, it shows that 72% was of the opinion that the wetland size is decreasing which implies or means wetland loss and 28% said the wetland area is increasing as shown in figure 27.

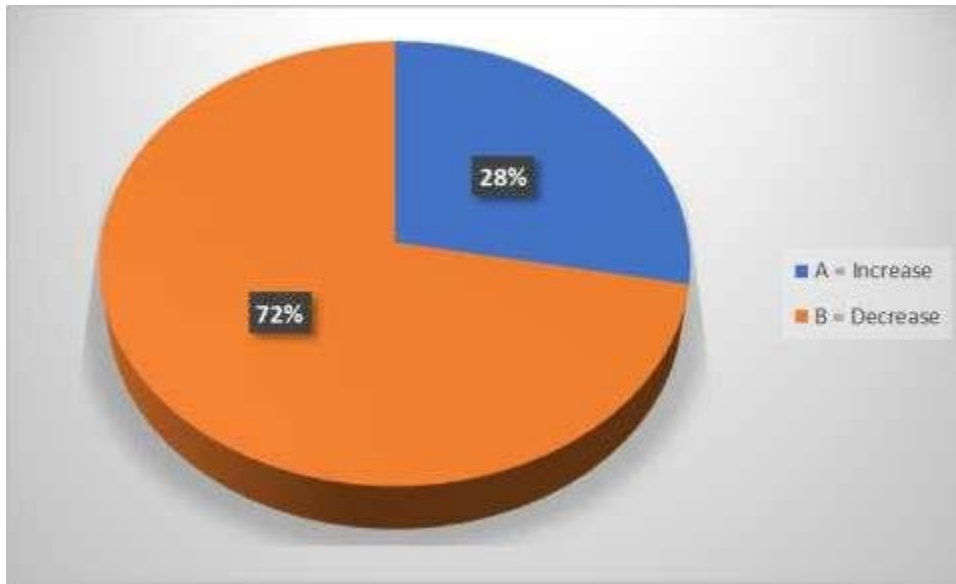


Figure 25: Respondents knowledge about the size of the wetland area

This helps to ascertain what the people in the area use wetland area for. As shown in figure 28, 37% of the participant was of the opinion that wetland in the area is used for the fishing purpose, 34% said it is used for farming, 7% was of the opinion that it is used for hunting, 21% was of the opinion that it is used for timber expectation (Falling timbers) and 1% did not respond to this question.

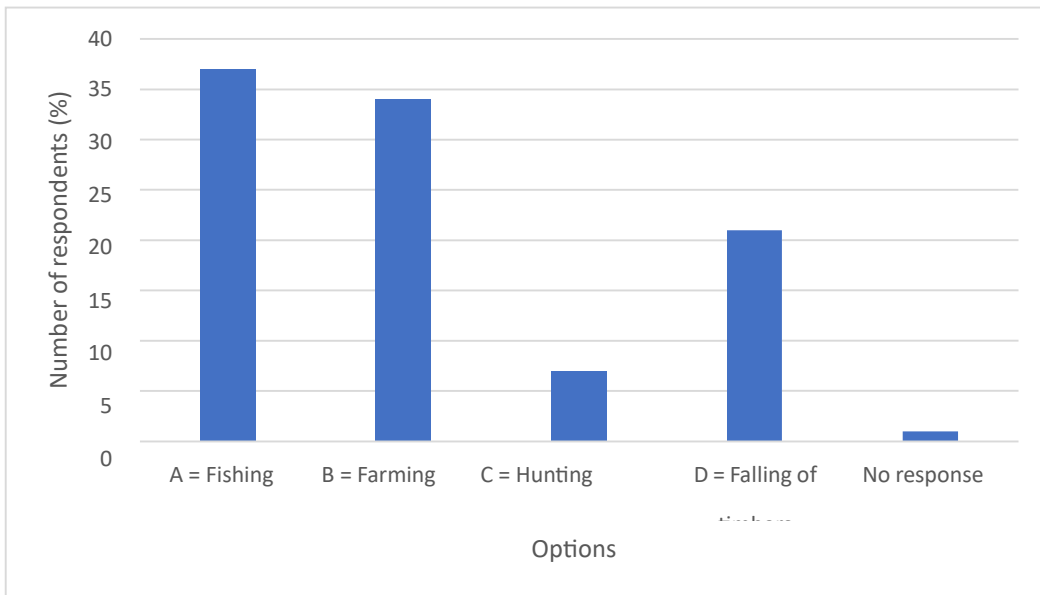


Figure 26: Use of wetland in the area

Table 14 shows the response to questions 11-14, in question 11 the questions say “are there government officials around or do they come around to monitor the wetland?” it shows that 12.2% of the participant said Yes with option “A” meaning government officials come around to monitor the wetland, option “B” is No, 78.8% said no government officials come around to monitor the wetlands and 9.5% did not respond to this question. Question 12 “Is there a restriction to the wetland for any activity or purpose?” Option “A” is the number of participants that said yes (17.5%) that there is a restriction to the wetlands for any activities, option “B,” 77% said there is no restriction for the use of wetlands for any activities in the area and 5.4% did not respond to this question. Question 13, “Have they ever organized any awareness program with respect to the importance of wetland, protection, and management?” option “A” is Yes, which means 18.9% agreed that they have organized an awareness program in relation to wetland importance, protection, and management in the area, option “B” which says No, which means 75.7% of the participant said there has not been any organized program in respect to wetlands protection, importance, and management in the area and 5.4% did not respond to the question. Question 14: If you answered question 13 yes, which organization or agency is doing so? Option “A” represents the government agencies, 64.3% of the participants agreed that programs are been organized by government agencies, while 14.3 said it is being organized by NGOs in the area and 21.4% did not respond to this question as shown in table 14.

Table 14: Result of question 11-14 in the questionnaire of the local communities (%)

A = Yes		B = No	C = No response	Total
Response for question 11	12.2	78.3	9.5	100%
Response for question 12	17.5	77.0	5.4	99.9%
Response for question 13	18.9	75.7	5.4	100%
Response for question 14	64.3	14.3	21.4	100%

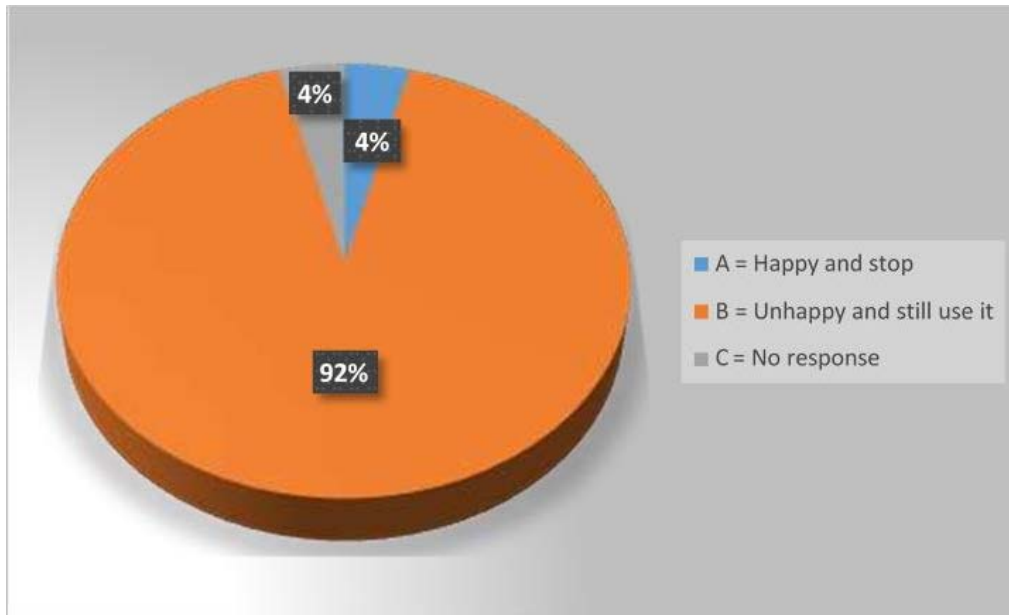


Figure 27: Response of the people if the government place restriction on wetland

6.0 Discussion

This research provides a comprehensive analysis of land cover change of wetland and vegetation in relation to the wetland of the Upper Orashi Forest in Ahoda Local Government Area of River State. The integrated method was adopted by using GIS and freely available RS data to examine the spatial trends of wetland change or loss and vegetation change in the Upper Orashi Forest, from 2002 to 2019, and the result analysis from questionnaires from both the professional and local communities.

The results obtained from the spatial data examined for wetland change show that there is an uncontrolled and rapid change in the Upper Orashi Forest wetland as shown in figure 9, 10, and table 6, 7, and 8. This is similar as observed by (Umeuduji, et al. 2018), Wetland Changes and Loss in Port Harcourt from the year 1986 to 2015, the results obtained showed that the forested wetland is 121.58km² in the year 1986, 106.15km² in 2000, and 78.81km² in 2015, which shows that there was a change in the wetland area of Port Harcourt, meaning that the wetland area lost 42.77km² during the study period of 30 years, which is 6.77% of the total wetland area that was studied. It shows that wetland degradation is occurring in Port Harcourt, but the research did not identify the driving factors of wetland degradation in the area. Also according to the second survey report of China in 2013 based

on the statistical caliber, it shows that China lost a total wetlands area of about 33,900 km² within the period ten years (2003-2013), with an average annual loss of 0.92% (Weiqing, et al., 2017). However, it shows that wetland loss or degradation is not only occurring in Upper Orashi Forest Wetland or in Nigeria, but also in other parts of the world like China etc.

According to the research carried out by the National Remote Sensing Center of China (NRSCC) on 30 Ramsar sites in Africa, it shows that the sites have lost a total of 200 km². However, the wetland ecosystem degradation is alarming. It shows that 17% of the river wetlands and 20% of inland wetlands have been degraded to cropland. The research shows that the Africa disturbance degradation index is extremely high and the trends keep increasing NRSCC 2014. The African transnational lake (Lake Chad) has also suffered and still suffering from degradation, it is said to have dropped 9% in lake surface and 89% drop in seasonal herbaceous swamps between a time frame of twelve years (2001 to 2013), which has been attributed to drought in the region as a result of climate change and drainage irrigation in the region (NRSCC, 2014), same cannot be attributed to the Upper Orashi Forest Reserve wetland due to its location, the southern part of Nigeria does not experience drought in the area, as the Niger-Delta is a water area. The Ngiri-Tumba-Maindombe located in the Democratic Republic of Congo (DRC) is highly threatened as a result of pressure from rapid urbanization and illegal activities (overexploitation of its resources) (Ripple, et al., 2017). Wetlands in DRC is important as it plays a very crucial role in terms of the conservation of rare and endangered flora and fauna of the region just like the way the Upper Orashi Forest harbors some endemic and endangered species as mentioned in the literature review. However, overexploitation is a common factor affecting or impacting both wetlands.

According to NRSCC research on Ramsar sites in Europe, it shows that a total area of ten Ramsar sites have lost 3% between the year 2001 to 2013, in marsh and lakes. It shows that 12% of the reservoirs and 34% of the marshes which are seasonal have degraded into a non-wetland area, and the European interference degradation has increased significantly, this, however, can or be attributed to the long-term development in Europe (NRSCC, 2014). Between the period that was studied, it shows that agricultural area of the region increased by 10%, which implies that agriculture is one of the driving factors of wetland degradation in Europe. This research has identified agriculture as one of the driving factors of Upper Orashi Forest. In Europe, the degraded wetland is being recovered through the

restoration of natural hydrology by using dams and reconnecting the waterways (Mitsch & Gosselink, 2015), which is in line with Article 4 section 2 of the Ramsar Convention. There is no recovering or restoration of degraded wetland that has taken place in Nigeria, this means that the regulation is not functional in Nigeria or not being implemented.

South America wetland area has decreased by 0.26 hectares between the period of 2001 to 2013 (marshes and lake), the degeneration of the wetlands ecosystems and the transformation taking place by transforming of the swamps area into artificial surface or bare land in the wetland areas simply indicates or tell that the major driving factor is human activities (agriculture) and precipitation change (NRSCC, 2014). In addition, the case of Lake Mar Chiquita which is known to be one of the largest saline lakes in the world, has its area being reduced by 26% and the cropland area has increased twice within the period 2001 to 2013. This is attributed to reclamation for agricultural purposes (NRSCC, 2014).

The United States of America Everglades National Park is one of the largest Ramsar sites of an antediluvian wetland, about half or more of the original Everglades has disappeared as a result of agriculture in the northern part and urbanization in the east and western part (Mitsch & Gosselink, 2015). In the recent past, measures have been put in place for the purpose of restoring the natural water flow and this has been implemented in the area and a satisfying result is being realized or achieved (NRSCC, 2014). One of the recognized important ecological estuaries in North America is the San Francisco Bay and it is one of the most altered and built-up wetland areas in the United States of America, this is the area where the first European settlers arrived in the United States of America. Over 90% of the wetland area have been degraded or destroyed as a result of agricultural purposes and salt industry, afterwards the vegetation was destroyed and built to drain the wetland, and that resulted in the rapid degradation of the said wetland. All the wetlands referred to above are all Ramsar sites and it shows that they are all degrading or reducing in size just like the Upper Orashi Forest, and they have some common driving factors as the case study of the research like agriculture, urbanization, and building industries, which are all human factors as shown in figure 13 and 14.

From the examples above it shows that Wetlands generally is experiencing an unprecedented rate of loss (wetland disappearance) (Shengjie, et al., 2017), this has resulted in wetlands alteration in respect

to the services it provides causing economic, socio-political, and environmental unrest with the major impacts on biodiversity and rural dwellers within the communities they are located (Odada, et al., 2009). However, figure 10 and table 8 show that there is a change in the wetland area of Upper Orashi Forest Wetland. It was observed that there is a consistent decrease in the size of the wetland area for the period under study (2002, 2008, and 2019) respectively. According to the classification of Upper Orashi Forest Reserve in terms of the ecosystem for the purpose of this study, it shows that the thick vegetation area decreases between 2002 to 2008, while light vegetation was increasing within the period. On the other hand, the result between the two classes shows that between the period 2008 to 2019, the thick vegetation was increasing while the light vegetation was decreasing, the reason was said to be that, at this period the bad boys (hoodlums) took over some part of the forest using it as a hideout and carrying out their criminal activities. Consequently, this prevented the people from going towards that part of the forest for any purpose, which has made some part of the light vegetation now thick vegetation. Urban migration was identified to be one of the factors that led to increase in thick vegetation for the period 2008 to 2019.

“Rural-urban migration is both a socioeconomic phenomenon and a spatial process involving the movement of people from rural areas into cities, either permanently or semi-permanently. At present, it occurs mainly in developing countries as they undergo rapid urbanization. Job opportunities created by industrialization attract the surplus rural labor to the cities to seek higher salaries through employment in the industrial sector. Rural-urban migration is widely considered an inevitable component of the development process, though it has a broad range of consequences and implications” (Harris & Forhad, 2021). The main impact that occurs as result of Rural-urban migration is urbanization which brings about increase in the population of the people living in cities. According to the longitudinal study carried for the period 1986 to 2007 shows a substantial decrease with respect to the size and shape of the water area in Port Harcourt city as occasioned by incessant land reclamation that is been carried out by successive government, this has resulted in stable decline in the area of swamp land cover from 26.5% in 1986 to 20.52% in 2007 (Owei & Ayotamuno, 2015), this is the effect of urban migration.

Rural-urban migration results to reduction in number of people living in rural area and this have undesirable effects on different sectors of the rural area, like the agriculture and workforce. Nevertheless, a significant portion of the migrant population consists of young individuals, leaving behind the elderly and children. This demographic shift has contributed to a decline in agricultural activities within the region, ultimately transforming light vegetation into thick vegetation. The primary driver behind this transition is the depletion of labor from capable men and women who have relocated to urban areas in pursuit of more lucrative opportunities, often prioritizing employment in multinational corporations that offer substantial wages over engaging in rural farming activities. As a consequence, the reduction in the local population engaged in farming has led to the overgrowth of light vegetation in thick vegetation in the area. Another factor that encourages urban migration is lack of access to credit facility or financial inclusion in Nigeria, as this discourages youths in engaging in agricultural activities rather migrate to cities.

According to Aworemi, et al., (2011), rural areas are mostly affected due to the fact that the youths who are anticipated or expected to live in the rural areas and contribute to the progress and sustainability of the community and agriculture in the area move to urban cities, on the idea that they will have a better life in urban cities. Urbanization in the scenario can be described as a multifaceted conception that is most times viewed from different perspectives as follows; demographic, structural transformation and behavioral transformation. The ideology of demographic transformation distinguishes urbanization against the background of fast growth of urban area which involves increase in population and corresponding increase in the growth and expansion within the area. The view of structural transformation has to with the changes from rural to an industrialized method as a way to source of living especially with regards to construction of buildings and social infrastructure. The behavioral transformation has to do with the changes in both the economic and social circles of urban life (Alam, 2011).

Generally, the driving factors of wetlands is classified into two; the natural factors comprise of climate change and biological invasion and the anthropogenic factors which includes; oil exploration, overgrazing, sewage discharge, urban construction and aquaculture.

6.1 Management and Policies

To conserve wetlands due to their importance, the Convention on Wetlands of International Importance was established to protect and manage this important ecosystem because of its functions as listed in the introduction part. Upper Orashi Forest Reserve is one of the eleven Ramsar sites in Nigeria.

The most major step towards the conservation and preservation of wetlands is to understand the level of degradation of this important and fragile ecosystem at the local, regional, and national spatial scales. Likewise providing the exact evaluation of the systems (spread and health) of the world's forest, grassland, water, agricultural, and land resources has turned out to be a very vital priority (Mangistu & Salami, 2007). Understanding this status, will help in proffering suggestion or idea that contributes to developing policies that can bring about sustainable use of wetlands and its resources in the study area and Nigeria at large.

It is interesting to know that Nigeria has well-structured and documented environmental policies as seen in the literature review, though none of them enumerated above extensively or comprehensively deal with wetlands by addressing them, they are only partly beneficial to other management plans. The first national park established in Nigeria was in the year 1976 in a wetland area called Kainji Lake, 24 years after Nigeria's wetland of international importance was recognized and accepted to the Ramsar list. This confirms or demonstrates the importance of those laws (policies) to wetland management and conservation in the country. The environmental regulatory agencies in Nigeria like FMEnv, NESREA, and NOSDRA sometimes are extremely strict and forceful in their regulation of human activities and enforcement of environmental policies (law) in the area. For example, some time ago NOSDRA has ordered the Agip Oil Company Ltd operating in Nigeria to pay the sum of 1 million naira (about \$2,220) as a penalty for failing to remediate the impact of oil on the wetland in operation in the Niger-Delta (Idioga, 2011). These agencies have also served as a platform for collaboration between international organizations working with respect to wetlands protection in Nigeria. These international organizations most times support funding to help manage and protect the wetlands area. These regulations brought a positive change for the possibility of litigation, contrary to those with harmful or damaging activities around wetlands, like the oil companies operating in the region. The

case of Oronto Douglas who sued Shell, NNPC, Mobile, Nigerian Liquefied Natural Gas (NLNG), and the Attorney-General of Nigeria for the companies' non-compliance with Environmental Impact Assessment (EIA) Decree 86 of 1992 in relation to their activities in the region wetlands, is an example or good of the laws (Frynas, 1999).

Despite the potential advantages of existing laws, their intended objectives have largely gone unmet, primarily due to factors such as inadequate enforcement, as depicted in figure 16, and the organizational fragmentation within the system. The sheer number of organizations involved does not necessarily translate into effective law enforcement and policy implementation. This discrepancy is underscored by the findings from participants who, in response to question 7 on the questionnaire (figure 15), expressed the perception that there is an absence of legislation dedicated to the management and protection of wetlands in Nigeria (Edinam, 2020).

The ineffectiveness of these organizations or agencies can be attributed, in part, to their leadership being entrusted to individuals lacking professional expertise, often politicians or individuals with interests aligned with those whose activities pose a threat to the wetlands in the region. Consequently, these agencies are frequently likened to the "five fingers of the leprous hand," illustrating their collective tendency to serve personal agendas, as observed in their alignment with the interests of those endangering the wetlands (Adekola, et al., 2012).

In figure 16, most of the participants think that wetland degradation is a result of lack of implementation of the available laws, while some others attribute it to lack of enforcement or inadequate laws, and only three give other reasons. The implementation and enforcement of environmental laws to wetland management in Nigeria remain poor as the wetlands keep degrading as a result of activities of both corporate entities and individuals, no violators have been caught, prosecuted, or punished in any form for violating environmental standards with wetlands area in the country (Adekola, et al., 2012). Another challenge related to enforcement in this context pertains to the willingness of the government to enforce existing laws, particularly in the Niger Delta. This region, being the primary oil-producing area in Nigeria, is crucial for the country's revenue, largely derived from oil operations. Consequently, the government may be reluctant to take actions that could potentially impact the income generated from the oil sector, commonly known as the "petrol dollar"

or "oil money" from the region. The economic significance of this revenue stream often results in a lack of rigorous scrutiny or oversight of the activities conducted by oil operators. Moreover, certain legislative provisions, such as those found in the Mining and NESREA Act, contain clauses that shield the activities of these operators. For instance, the NESREA Act grants the agency the authority to formulate and revise environmental guidelines, regulations, and standards, but explicitly excludes the oil and gas sectors (Adekola, et al., 2012). Similar to how the Mining Act provides definitions for minerals while expressly exempting oil and gas activities from its regulatory scope, these legislative measures indicate a clear preference for the oil and gas industries. Such preferential treatment sends a misleading message to sector operators, reflecting a lack of governmental transparency. Unfortunately, this approach does not contribute meaningfully or positively to environmental management in Nigeria, as highlighted by Odoeme (2013).

The oil and gas sectors, particularly multinational companies, are obligated to adhere to and respect the memorandum of understanding they have signed in the region. Although parent companies outline international commitments and standards, such as the Shell group biodiversity standards (Adekola, et al., 2012), the actual situation in the Niger Delta region of Nigeria differs significantly from their international representations. Many multinational oil companies in this area persistently violate legislation and directives, exploiting the considerable freedom granted to them by the government. This discrepancy highlights a lack of sincerity on the part of both the Nigerian government and the oil and gas operators Ramsar Convention/Wetland in Nigeria. The considerable authority granted to industrial operators by the government has resulted in a reluctance among enforcement agencies to fulfill their mandated responsibilities under the law. This extends to the judiciary, particularly in the context of granting injunctions to oil companies, adding a layer of complexity due to the critical role of the oil sector in the country's economy. Notably, some influential politicians with significant ties to the ruling class and government officials own oil wells and companies in Nigeria. This personal stake creates a conflict of interest, as these individuals are often tasked with enforcing legislation related to wetland degradation. The existence of such powerful networks undermines the effective implementation of these laws in both the region and the country at large.

Complicating matters further, key figures within regulatory agencies exhibit direct or indirect connections to multinational oil companies operating in the region. This nexus raises concerns about potential business interests and affiliations that could compromise the impartial execution of their duties. These intricate and intertwined relationships pose significant challenges to the management and conservation of wetlands in Nigeria, casting doubt on the efficacy of existing laws and the agencies responsible for their enforcement.

6.1.1 Ramsar Convention/Wetlands in Nigeria

Recognizing the significance of wetland degradation extends beyond the confines of the Upper Orashi Forest Reserve area; it is a widespread global concern affecting regions such as, Africa, Asia, Europe, North America, and beyond, as highlighted by Finlayson et al. (2011). Ramsar Convention has a lot of documentation with forward-looking resolutions, not the slightest being the prerequisite in 1971 when it was established “to make sustainable use of all wetlands and its resources”. The document as mentioned is said to contain the causes of wetland loss/degradation and this has been done on many occasions and is also summarized in the Millennium Ecosystem Assessment. The Convention receives national reports from the contracting parties before the triennial Conference of Parties (COP). However, the data in the reports are therefore tabled at the meeting of COP, in addition to the documentation which supports the 267 formal decisions that are available before, this will help to provide a substantial means for supporting the wise use of wetlands. Also, the information (technical) which accompanies the official decisions are thereafter presented or made available in the Convention’s Sustainable Use Handbooks together with the National Reports and this is made available on the Convention’s website (www.ramsar.org). The Convention having looked at the reports can establish other policies that can help preserve, conserve, and manage wetlands, stop or reduce their level of degradation.

The loss and degradation of wetlands can be attributed to member countries not implementing Article 3 of the Convention, by not formulating and implementing their plans to promote the conservation of wetland areas that are included as a Ramsar site (Albrecht, et al., 2016). In the case of Nigeria, there is no special policy for the management of wetland, the general environmental law is what is being used for wetland management as talked about above. First, there is a need to check the process and

procedure of wetland management in Niger-Delta and Nigeria at large, thereby, looking at the policies available (the general environmental laws), the implementation process, and enforcement as shown in figure 6 the effectiveness triangle. However, this process has to be evaluated and thereafter reported back to the policymakers for adjustment or improvement, as evaluation is important for appraisal and it is also being used to compare the criteria or benchmark to see if the process is achieving its purpose of establishment, as also shown in figure 5 policy cycle. It is important to know that the general environmental law used in Nigeria has some gaps and some contradictions or clues in relation to the oil and gas activities as discussed above. Therefore, there is an urgent need for the establishment of a separate law that will focus on wetlands alone just like the case of the United States of America. They have five federal agencies that are responsible for wetland protection which includes; the Department of Defense, the U.S. Army Corps of Engineers (Corps), The United States Environmental Protection Agency (EPA), The Department of the Interior, United States Fish and Wildlife Service (FWS), The Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) and Department of Agriculture, Natural Resources Conservation Service (NRCS) (formerly the Soil Conservation Service) with each of the agencies having its responsibility and mission which that implements wetlands protection (Lake and Wetland Management, 2021). Some states like New York, Massachusetts, Florida, New Jersey, Connecticut, and Minnesota are enacting state laws for the purpose of protecting wetland, same can be replicated in Nigeria.

Another approach that can be adopted for Nigeria is incorporating the objectives of wetland conservation and wise use into important sectoral policies, together with those policies that covers environment, biodiversity, agriculture and water as seen in South Africa. The idea of incorporating of wetlands into other sectors is of a high potential, this sector can help to control, manage and monitor wetlands. This way wetland will be made to be part of the business of the sectors, rather than putting in place or establishing separate wetlands management policies. “For instance, over a decade prior to the advent of the current suite of environmental and water legislation, the most powerful legal instrument to protect wetlands situated outside protected areas was the 1983 Conservation of Agricultural Resources Act. More recently, a range of other sectoral policy frameworks have incorporated wetlands. Government’s environmental management policy was formulated to give

effect to constitutionally enshrined rights to an environment that is not harmful to health or well-being and that is protected for the benefit of present and future generations” (Adekola, et al., 2012).

6.1.2 Unstated Wetland Loss

The Ramsar Convention is a mechanism put in place decades ago to prevent continuous wetland loss and degradation. Signing the treaty is a welcome development and a global commitment in respect of maintaining the ecological character of all wetlands, as stated in the guidelines of the Convention. However, recent paper analyses show that the obligation has not fulfilled its purpose (Millennium Ecosystem Assessment, 2005; Finlayson, 2012; Gardner et al., 2015). There are several motives behind this, and the motives are complex; it includes the insight that conserving wetlands struggles with efforts to help recover the immediate, short-term personal and economic comfort of the people. Because the Convention has been in place for more than four decades, it is unable to generate major government sustenance gestures; another approach is required. Finlayson (2012) outlines the specific policies or decisions transmitted by the Convention. Still, the incompetency of the governments to address and convey the needed or required outcome in the country was identified as a challenge.

6.2 Wetlands/Environmental Monitoring

This research and some other research across the globe have shown or detected a diminishing trend with wetlands in respect to area, health/quality, and all these are primarily or majorly linked to numerous human activities (anthropogenic) and the indirect forces of changing in climate (Eppink, et al., 2004; Hartig, et al., 2003). According to Wizer and Elekwachi (2020), and Eppink et al., (2004) each work explains how ecological fragmentation is mostly connected to human development in relation to wetlands, thereby generating a wish for establishing a management plan with a reasonable degree of land use and land cover that can generate or to generate a state of sustainability in the area. It is important to know that climate change and land-use practices in our environment presently are more copiously discernible. However, remote sensing as an environmental tool is especially important and required for the assessment of the status and well-being of wetlands (Cook, et al., 2009). Having a consistent and accurate record of the state of the wetlands generally is important for their preservation (Klemas, 2011; Robertson, 2016).

Furthermore, “the significance of GIS in wetland/environmental monitoring cannot be underscored, as this has been proven as one of the most effective ways of environmental monitoring. The Nigeria environmental management agencies are now beginning to look towards this direction but with less firepower” (Ahiauba, 2013). Considering the fact about the nature of Niger-Delta landscape and uncomfortable or uneasy accessibility due to the absence of roads, the use of GIS will meaningfully enhance data collection and generation of information for decision-makers in respect to environmental/wetland monitoring in the region.

In the questionnaire, a question was asked to ascertain if there are monitoring activities going on in the study area as shown in table 13, 78.3% said no which means there are no monitoring activities going on, the reason there is no restriction on how the wetland and its resource are used as also shown in table 18. Monitoring is a key step or stage when it comes to effective management as explained. Wetland can be monitored extensively using remote sensing, it monitors the overall behavior in relation to time (Roberston, 2016), by using a time series of images from different years as shown in chapter five above (Wright & Gallant, 2007). Using GIS gives the opportunity to acquire so much information through the evaluation of several images, the data gotten can be extrapolated or modeled to be able to predict future changes. However, the GIS tool gives the analyst the opportunity to control the scale of their work with respect to available data.

6.3 Adequate Funding

Insufficient funding has been identified as a big challenge to government agencies in Nigeria over the years, the ministry of environment is indifferent. The absence or unattainability of data can be attributed to lack of funding of the highest or apex organ responsible for environmental management in Nigeria (FMEnv). To change the narrative of this unpleasant trend, it is therefore important to empower the agencies with respect to discharging of their duties in total and effectively, the government should adequately fund the federal ministry of environment, thereby enabling the agency to evaluate its mandate and carry out its functions (establishment, implementation, and enforcement of laws) properly. This is significant to the unconventionality of the agency about the objective of environmental management, and this is commonly seen in the aspect of monitoring. This could help to resolve or reduce the level of decay in the system by not giving the chances to companies'

owners/project owners free hand to do whatever they want. Thereby giving project development owners the opportunity to carry out/comply with their corporate social responsibility (CSR) appropriately.

6.4 Communication: Transfer of Information/Awareness or Knowledge about Wetlands

Before 2011, information most times are only disclosed by government agencies for official purposes and this has made it impossible for inter-government agencies to disclose information on the state of the environment. Presently, with the signing into law of Freedom of Information Bill (Fol) 2011 in Nigeria, things are taking new dimension or changing, the idea of not making information available when there is information has change as result of the Fol Bill.

Nigeria's Fol Bill was signed into law on May 28, 2011, the act is one of the most longest legislative debate in the past, in Nigeria. The deliberation was said to have lasted for twelve years. The primary aim of this Bill is to empower the public with access to government information, for the purpose of accountability and transparency. The idea of this bill came from a group called "Freedom of Information Coalition", which comprises an association of about 180 civil society organizations in Nigeria, like "grassroots and community-based Non-Governmental Organizations campaigning, is Fol Bill to ensure accountability and transparency in public institutions in Nigeria" (Ifeoma, 2018). The target of Fol Bill is to make information and records freely accessible and to protect them in relation with the interest of the public and the protection of individual privacy. This bill also requests to safeguard or protect serving public office holders from any contrary penalties from unlawful release of some types of official information. The Bill additionally helps to standardizes issues between its provisions and other regulation that are in place already for example; "the Penal code, Criminal code and Official Secrets Act which sets criminal penalties for actions that have to do with release of information" (Ifeoma, 2018). The FOI bill gives citizens the opportunity to hold government responsible to account for its misappropriation of public resources or inability to deliver its mandate in terms of public services.

To consolidate this development, it means that information dissemination techniques should be adopted. Information disclosure to the public should be enhanced, thereby making information on the state of the wetland/environment available by providing information on environmental protection,

Health, Social equality, and economic viability to the public via articles and published books, national dailies, national radio, and television stations and on the internet which is the easiest and cheapest access from any part of the world. To understand the level of wetland knowledge in the Niger-Delta region, questions were asked in the questionnaires (professional) and the responses are shown in figure 20. It shows that most respondents (61%) said wetland knowledge in the area is low, these imply that only a few individuals know what wetlands are in the region. In the questionnaire for local communities, a question was asked to ascertain if there is or if they do organize awareness programs at the community level, their response is shown in Table 13, 75.7% responded no, and this is one of the reasons why wetland knowledge is low in the region. Making wetland information (data) available for everybody, through media (internet, TV, radio, etc,) as mentioned will help increase wetland and environmental awareness in the area. Therefore, people know the laws available for the protection and management of wetlands in Nigeria, and whoever goes against the law will be punished under the law. This can possibly make some people change their ideas about wetlands and the way they use their resources. Also, effective communication between the local communities and the management agencies will go a long way to contribute to the effective management/protection of the region's wetlands.

6.5 Adequate Manpower and Staff Competency

Insufficient workforce and lack of competence was outlined as the factors limiting the effectiveness of environmental/wetland monitoring and management in Niger Delta region of Nigeria. For effective and sustainable wetland/environmental management and monitoring, there is need for adequate and skilled manpower for the agencies, to enable them carry out their assigned responsibility effectively and independently. The government should invest more in training and retraining of staff of these agencies locally and internationally on a regular or on a periodical basis. This will enable them to get used to the modern ways and technology for environmental management (like the use of GIS and Remote Sensing tools). In addition to the training, the staff can be encouraged by receiving incentives from their agencies to avoid the collection of bribes from individuals or companies whose activities are impacting the wetland negatively. Employing qualified personnel with appropriate qualifications

and assigning them to the appropriate department or section of the agencies is important. This will go a long way in improving the system.

6.6 Land Use Change as an Indicator for Monitoring

Land-use change also known as land-use transformation simply means a man-made process of changing the land-use system to another form, for instance, the conversion of a wetland area or forest area into a planned land for agricultural purposes or sand filling of wetland area to erect a building as a resulting of the increasing demand for housing (urban expansion) due to the increasing population (Bimal & Harun, 2017; Shunlin, et al., 2012; Jamal & Ahmad, 2020). “Due to continuous transformation and change in livelihood activities of the people in the region and trying to respond to the depleting nature of resources from the aquatic environment (wetlands), as well as agricultural yields from farmlands, this has resulted in a rapid change in land use practice in the region”. During the field study, I observed people both individuals and groups taking part in aqua cultural projects which involve the digging of ponds in response to the depleted state of fish stock resources, these activities are negatively impacting the mangrove vegetation, resulting in its loss or destruction in the area. There is a critical concern about this and also about other ecosystem services of the mangrove forest that made up wetland, which is not considered or put into consideration (Pretty & Bharucha, 2014). This tends to expose the region to the possibility of flooding. However, having records of past and present land use change and wetland changes will help to make an appraisal that will enhance or provide the government agencies responsible with the necessary information to guide them on the possibility or how the situation can best be managed. This indicator is significant as it tracks trends in the advancement of agricultural areas, forests, wetlands, and residential and cultural developmental projects. Furthermore, the indicator will provide data on sensitive ecosystems, the use of protected areas, and local land use where facilities for oil and gas production-related projects are located. The primary occupation in the region is farming, implying that the majority of the population depends on land and its resources for their livelihood. Monitoring such indicators is crucial for effectively managing the environment and wetlands

6.7 Poor Forest Management and Security Challenges

Forest is known to pose large existential threats, especially when they are not properly protected, monitored, and managed. In Africa, forests by nature can be a security threat as criminals like rebel groups, terrorists, and armed groups use it as a hideout for carrying out their nefarious activities (Ladan, 2014), just like the Upper Orashi Forest Reserve. Forest naturally is a veritable or actual operational base for different criminal activities because a typical forest consists of different plant communities, a constellation of trees, and undergrowth of different types of vegetation. This area is usually isolated from human settlements and frequently estranged from the local communities and state police. The forest is oftentimes covering a large area of land (series of kilometers) in the countryside. With this uniqueness of the forest, it offers or serves as a conducive environment for criminals to carry out their nefarious activities.

The impact of this ugly menace cut across the three pillars or spheres of sustainable development; Social, economic, and environmental. The militants in the region are always operating from the forest and creeks, kidnapping and hostage-taking of many oil and gas workers, blowing and shutting down oil installations, illegal oil bunkering which results in loss of thousands of barrels of oil per day. However, these activities impact the wetlands/environment and result in wetlands degradation/environmental degradation and also economic loss. In Nigeria, most of the kidnapers have their settlement in the forest and victims are usually taken to the forest, for example, the 276 kidnapped Chibok schoolgirls that were kidnapped by Boko Haram in Borno state in North East of Nigeria, on April 14, 2014 were all taken into the forest, 300 Kankara schoolboys kidnapped on 11 December 2020 in Kastina State in North Central of Nigeria were also taken to the forest, 43 Kagara students kidnapped on 17 February 2021, by bandits in Niger State in North Central of Nigeria were also taken to the forest (Channels tv, 2021). Effective forest management would have helped to checkmate such nefarious activities in the forest, with the help of the forest guards, rangers, and other security agencies before the criminals made the forest their home. According to Nwogwugwu et al., (2012), such activities have affected the inflow of foreign direct investment by reducing it from \$20 billion in the year 2007 to \$6.1 billion in the year 2010 with a difference of \$13.9 billion in three years. Okonta & Oronta (2001) said that the above-listed menace is also observed to destroy farmlands,

rivers, and ponds within the area, which impact negatively on the economic life of the people in the area.

6.8 Securing the Niger Delta Forest/Nigerian Forest: The Imperative for Forest Policing

Forest in Nigeria has been experiencing under-regulation and under-policing for decades, with various existing frameworks for its control. Nigeria has only one existing instrument for policing its forest area and it is known as the Forest guard system. Forest guard is para-military personnel trained and mandated with the responsibility of protecting the forest reserves in the country. They are to ensure that inappropriate exploitation (illegal exploitation) of its resources is not occurring in the reserved area that no form of encroachments within and around the reserved area is taking place. In addition to that, the forest guards are also responsible for monitoring and controlling human trespasses in the reserved area (Adekola, et al., 2012; Oduntan, et al., 2013). Some of the challenging issue facing forest guard in Nigeria is training and resourcing (funding), they are only exposed to para-military training and equipped with less rudimentary weapons which cannot be compared to that of the criminals. The forest guards in Nigeria are limited compared to the forest area in the country that are required to be police. Therefore, the guards are only fit for the conventional routine of policing which does not require military erudition or intricacy. Recent activities of forest-based criminality in the country indicate or show that criminals are in possession of sophisticated modern arms and ammunition (Okoli & Okpaleke, 2014). The methods of their operations show that they are enhanced tactically and efficiently, facilitated by efficient syndication. The forest guard in Nigeria is under-equipped or ill-equipped to challenge or deal with the emerging issue of forest criminality. For this reason, there is a need for an alternative policing framework that could be acquiescent in respect to exigencies of the modern security issues in the forest areas. With these challenges, there is a need for the establishment of a special task force to substitute or augment the normal forest guard, for effective policing of Nigeria's forest. The special task force has to derive its members or team from the existing security agencies in the country (Military, Mobile Police, and Nigeria Civil Defense Corps). The officers of the special task force team must be exposed to specialized training in forest combat, counterterrorism, guerilla warfare, and anti-robbery campaign. Also, they need to be equipped with sophisticated weapons (state-of-the-art facilities) to be able to defeat the criminals (excel in their operations). The

team can be organized in cells and sectors in a way that it will have unit and sector command structures and be answerable to the Defense Headquarters which shall assign power of operational oversight over its activities. This challenge can also be referred to as a social problem, which might necessitate social interventions such as dialogue or amnesty to mitigate or resolve it.

6.9 Coastal Management in Nigeria

It is important to know that before the establishment and enactment of the Land Use Act (1978), land ownership especially the coastline was vested in the state and entirely controlled by the apex government (Federal Government) of Nigeria (Land Use Act: Chapter 202, Laws of the Federation of Nigeria 1990, 2019). This is a result of the fact that the transboundary waters are governed by international law which gives power to the sovereign state. However, it is interesting to know that the control of coastal habitats like wetlands, estuaries, beaches, and land within the coast is vested or under the control of the community as a communal property (Awolaja, 2010). The Land Use Act (1978) vested power on the state governor in control of the land in its territory except those land held by the Federal Government, sometimes this leads to blockages which might result in issues or challenges in locating the appropriate authority mandated with power to control and manage the coastal area in the territory of the state(s). An example of such is the case between the Attorney General of the Federation (AGF) and the Attorney General of Lagos State (AGLS) in 2003, where the AGLS challenged the right of the Federal Government over the physical planning power of the land in its territory. The Federal Government must protect the coastal area in the country as clearly stated in section 17 of the Nigerian constitution (Awolaja, 2010)

7.0 Enforcement of Environmental Law and its Challenges

“Enforcement is the actions put in place or taken by the government or its institution to achieve full implementation and compliance of environmental requirements within the regulated community and to correct or bring to stop situations or activities that pose threat to the environment and public health” (Wasserman, 1992).

The environment as we know has undergone different changes as a result of the economic, social, and political will. In protecting Nigeria’s environment for sustainable development, several regulations and policies have been implemented to effectively protect the environment at the international and

national levels. However, at the international level, there are international Conventions “The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, 1989, Convention on Biological Diversity and Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat. 1971” (Albrecht, et al., 2016; UNECE, 2020) and national laws like “National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, National Environment Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations and Environmental Impact Assessment Act of 1992 (EIA Act)” (Makinde & Adeyoke, 2007). It is imperative to note that Nigeria has no specific law for wetland management, the general environmental laws have been used for the management of wetlands (Budnukaeku & Hyginus, 2021; Adekola, et al., 2012). The literature and research results show that the available environmental laws are not effective as a result of the implementation of the laws and enforcement of the available laws, therefore the suitability or importance of the policy circle model used in this research is shown in Chapter 3.7. and mentioned in Chapter 6.1.1. South Africa has a Ministry of Environment that is charged with the responsibility of environmental issues. It is important to note that over a decade before the introduction of the current suite of environmental and water legislation (Adekola, et al., 2012), the most significant and powerful legal tool used for protecting wetlands that are situated outside the protection area was the Conservation of Agricultural Resources Act of 1983. Presently, it remains the most powerful instrument used in terms of regulating the drainage, cultivation, and utilization of vegetation in wetlands. However, the Act put in place a clear mandate to the Department of Fisheries and Forestry, and Agriculture for the conservation of wetlands and their sustainable use, from predominantly the viewpoint of ensuring the sustainable use of natural resources (Dini & Everard, 2018). A range of development in South Africa shows that other sectoral policy frameworks have incorporated wetlands, which means that sectoral policy is having a positive impact on the issue of concern as it also relates to wetland protection.

The Government’s environmental management policy was established to give effect to constitutionally preserved rights to an environment that is not harmful to health or well-being and that is protected for the benefit of present and future generations (Adekola, et al., 2012). For example, the National Environmental Management Act (NEMA) of 1998 places stress on “sensitive, vulnerable, highly

dynamic ecosystems, such as coastal shores, estuaries, wetlands, and similar systems,” stipulating special attention to be given to these in management and planning processes (Adekola, et al., 2012; Dini & Everard, 2018). No framework or Act specifically mentions wetlands as seen in South Africa or in the United States of America as discussed above, this makes wetlands in Nigeria challenging to effectively manage. The environmental law use is too general and as such is challenging to implement. Another possibility to effectively protect wetlands in Nigeria will be to establish a wetland management department under the Federal Ministry of Environment just like they have the Department of Forestry, fishery, GIS and remote sensing, etc.

Also in 2020, Zimbabwe as a country took a step towards developing a comprehensive wetlands legislative development through a written national wetlands policy, “to guide wetlands management to become incorporated in development planning by the Government, private sector, development partners, traditional leaders, communities and individuals” (Sikhululekile, 2022). The usefulness of such policy actions in Nigeria will require the government to do extensively more;

- I. Improving multi-sectoral efforts that will guarantee implementation and tougher enforcement of policies put in place to combat political interference and corruption.
- II. Implementation of practical moves that will help restore and rehabilitate degraded wetlands and encompass its natural value into development plans.
- III. Delegating power to local governing bodies and communities by the national bodies and institutionalizing their participation in a manner that permits them to confront political interference, and demand and secure accountability when wetlands face the risk of damage.
- IV. Offering environmental education and putting in place technology for early detection that will help protect and monitor wetlands.
- V. increasing funding opportunity (including Public Private Partnerships) to ensure the possibility of not depending solely on external financing or bailouts.

However, the protection of Nigeria's wetlands requires more than just the formulation of good policies. It necessitates the institutionalization and enforcement of environmental good governance practices by the government.

The laws available for the protection and management of the environment in the country are very articulate and good to be compared to that of developed countries, with a striking range of enforcement methods, which includes; "permit, license, certificate, inspection and search, seizure, arrest, sealing, notice of violation, notice of revocation of permit, revocation order, recourse to courts for civil penalties for violation, injunctive relief to require compliance, criminal sanctions for violations, citizen's suits to enforce the statutes in the absence of effective government enforcement as stated in the following sections 25-30, FEPA Decree, 1988; Sections 6, 10-12 Harmful Wastes Decree, 1984; National Environmental Protection (Effluent Limitations) Regulations 1991; National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations 1991; National Environmental Protection Management of Solid and Hazardous Wastes Regulations 1991; and Environmental Impact Assessment Decree, 1992" (Constitution of the Federal Republic of Nigeria: as amended, 1999).

Some of the enforcement instruments are elaborated below; Permit, license, and certificate: they are documents issued by the government authority upon application and satisfaction of the laid down rules in respect or before the issuance of the permit, license, or certificate. This is a good measure for the enforcement of environmental regulations, these documents are issued to individuals and companies to operate under the regulations as outlined upon the issuance of the permit, license, or certificate. In this process when the regulations have been violated, the permit, license, or certificate of operation is withdrawn from the individual or company, which implies that the individual or company has no right to operate until the necessary requirements are met as stated in the regulations. In this process, the documents serve as monitoring tools that help to regulate the activities that have the potential of polluting the environment.

Inspection and search: This is a process of ensuring that regulations that have to do with individuals, companies, or industries are being obeyed. This pattern of enforcement of environmental law or regulation is very important as it helps to find those who have violated the laws to take legal action

against them. In this case, the authority is mandated with the power to at any time request an examination of the certificate, permit, license, or any relevant documents or tools used for the protection of the environment. The agency has the power to search when they suspect that the laws have been violated. For instance, under the NESREA Act, the Act gives power to authorized officers or officials of the agency on the reasonable ground that if the laws are violated concerning the regulations, he/she has a warrant from the federal or state high court to search the building, car, vessel, or whatsoever structure it may be for the fact that he/she believes that the law has been violated, have to charge or presented before a competent court of law to prove if a crime has been committed or not, if a crime is committed the offender will be sanctioned in accordance to law. This contrasts with section 26 of the defunct FEPA act and also section 10 of the special criminal provisions Act of the Harmful Wastes, for the empowerment of environmental protection agencies to carry out a search without a warrant (Ladan, 2012). This then gives officials the power to search without a warrant, presently with the NESREA Act, the requirement of a search warrant from the court of law is the acknowledgment of the right of the people regarding their privacy as clearly stated and guaranteed in Nigeria constitution. This has to do with the acknowledgment of a citizen's entitlement to secure his/her own self, house, and efforts towards unlawful and unreasonable search. However, the major challenging issue with inspectors in Nigeria especially in the Niger Delta is the issue of fake inspectors' "impersonation" individuals or groups of people parading themselves as officials of NESREA and other agencies responsible for enforcement of regulations put in place for environmental protection. To curb this challenge of officials' impersonation, there is a need to introduce the use of uniforms, badges, and digital identification cards for easy identification.

Seizure and sealing: This constitutes another crucial method of environmental law enforcement employed in Nigeria. This approach involves the sealing of a site or area where activities have violated environmental regulations, either directly or indirectly. For example, if harmful waste is dumped into a water body, the responsible government agency, as outlined in the Harmful Waste (Special Criminal Provisions) Act of 1988, is empowered to carry out this action. According to the statutory authority granted by the law, the authorized enforcement agency has the right to seize any substances or items believed to have been used to commit the alleged crime or violate the laws stipulated in the Act.

Seizure is often carried out in the public interest to preemptively halt or prevent further pollution by removing the seized items or substances from the market or circulation (Okorodudu-Fubara, 1998).

Criminal Penalties: This method enforces environmental laws in Nigeria, involving the payment for damages resulting from the violation of environmental protection laws in the country. According to the NESREA Act, individuals or companies whose vessels, offshore or onshore facilities are responsible for the discharge of harmful substances, contrary to section 20 of the NESREA Act, will face criminal penalties outlined in the Act. These penalties include the costs associated with removing hazardous substances, expenses incurred by the Government or its agencies in restoring or replacing natural resources damaged or destroyed due to the discharge, and third-party costs for reparation, restoration, restitution, or compensation, as determined by NESREA from time to time, as stated in its Act (Okorodudu-Fubara, 1998).

In respect to environmental laws in Nigeria, several agencies are responsible for enforcing and implementing different laws and none of them clearly mention wetlands. The following are some of the environmental law enforcement agencies or departments in Nigeria;

National Environmental Standards and Regulations Enforcement Agency (NESREA):

In Nigeria, NESREA is mandated with the responsibility of implementing and enforcing environmental laws in the country. NESREA is the main environmental law enforcement agency in the country, empowered by law for the protection and development of the environment, biodiversity conservation, and the sustainable development of the country's natural resources, as well as environmental technology in general. Its responsibilities also include representing the country in partnerships with other organizations at the local and international levels (NESREA, 2007).

The agency plays a crucial role in initiating policies related to research and technology, subsequently advising higher authorities on natural environmental policies concerning the primacy of technological and scientific activities impacting the environment. NESREA is the enforcer of environmental regulations, standards, laws, guidelines, and rules, as stated in part (ii) of the NESREA Act (Agbazue et al., 2017).

Empowered with the authority to enforce compliance on environmental issues in Nigeria, the agency addresses concerns such as the use of tools or technologies that may compromise the quality of the country's environment. Consequently, NESREA conducts field follow-ups to ensure compliance with standards, employing prescribed procedures and laying down laws against individuals or companies violating regulations. The agency also conducts open investigations related to pollution and natural resources degradation, develops networks for monitoring the environment and environmental-related issues, excluding the oil and gas sector, which falls under the responsibility of another agency (NOSDRA).

National Oil Spill Detection and Response Agency (NOSDRA): This agency was established by the apex government as an institutional framework to implement the National Oil Spill Contingency Plan, a Blueprint/manual designed to address oil spill containment, recovery, and restoration/remediation (NOSDRA, 2005). It is tasked with addressing oil-related environmental issues.

National Water Resources Institute (NWRI): This institute was established and mandated with the responsibility of monitoring water pollution in the country, and it tasked enforcing drinking water treatment.

Nigeria Maritime Administration and Safety Agency (NIMASA): The primary function of this agency is to monitor marine pollution, prevent and control incidents, conduct rescue and search operations, enforce laws against sabotage, and, finally, train and certify seafarers.

7.1 Challenges of Environmental Laws Enforcement and Wetland Management

The policy operatives in Nigeria lack functionality in systemizing and monitoring the connection between environmental management and sustainable development (Independent Group of Scientists appointed by the Secretary-General, 2019). This deficiency has been attributed to the poor enforcement of environmental legislation in the country. One of the challenges in environmental enforcement stems from the ineffectiveness of enforcement strategies; many strategies and systems are not efficient due to a lack of implementation and monitoring. For instance, there is no centralized database for environmental data on facilities, including information on emissions, waste generation and transportation, carbon footprint, and wastewater.

In Nigeria, the multiplicity of regulations from different levels of government ranging from Federal, State, and Local government lacks a clear definition of the regulatory framework. This ambiguity has rendered the enforcement of environmental laws exceptionally challenging and difficult in Nigeria (Oruonye & Ahmed, 2020), as mentioned previously. Corruption poses a significant challenge to environmental management in Nigeria, impacting the enforcement of environmental laws and regulations, particularly in the Niger-Delta region. According to the World Bank (1997), corruption is defined as the "abuse of public power for private gain." Corruption is not only detrimental to social and economic development but also hinders environmental management (Welsch, 2004; Damania et al., 2003). Poor governance often leads to flawed policy formulation, management, and enforcement, becoming a significant obstacle to environmental sustainability (Damania et al., 2003). This is evident in Nigeria's case, as outlined earlier in terms of implementation and enforcement. An example is the dumping of toxic waste in the small town of Koko in Nigeria's Niger Delta, involving two Italian businessmen (Raffaelli and Pent) who signed an illegal agreement with a Nigerian businessman (Sunday Nana) to dispose of the waste in Koko.

In this scenario, the violators of environmental regulations are not being adequately addressed through legal provisions due to bribes collected by enforcement officers in some cases. This situation has led to the continuous degradation of the environment. The root cause can be traced to insufficient funding for enforcement agencies, with budgetary allocations to the environmental sector often not being fully released (Oruonye & Ahmed, 2020). Inadequate funding poses a challenge to the effective enforcement of environmental regulations. Additionally, the unsustainable take-home pay (salary) of enforcement agency staff contributes to their susceptibility to accepting bribes. Another factor is the high level of environmental unawareness, leading to ignorance of environmental laws and regulations among both literate and illiterate members of society. The consequence of this lack of awareness is non-compliance with environmental regulations in the country (Ladan, 2009; Ijaiya & Joseph, 2014).

The ineffectiveness in enforcing environmental regulations has contributed to the increase in illegal activities that degrade the environment. For example, illegal exploitation of forest resources, poaching of endangered species (fauna), mining, and the illegal siting of gas stations in public places. In Nigeria, environmental enforcement agencies lack the capacity and necessary tools or technology to monitor

environmental performance, which helps identify which aspect of the environment needs more attention at a given period.

The high level of informal institutions and the informal way of doing things often leads to the disregard of formal laws in the country. For example, the issue of giving one percent of the profit of oil production by oil-producing companies to the host communities, as it is not presented in a framework. They have only signed a memorandum of understanding (MoU), and the host communities cannot go to court on this ground. With the passage of the Petroleum Industry Bill (PIB) on July 1, 2021, by the legislative arm of the Nigerian government, host communities will now receive 3 percent of annual profits, as opposed to the 1 percent stated in the MoU. With the Petroleum Industry Act (PIA), any company not complying with the law will face legal consequences (Timipre Sylva, Minister of State for Petroleum Resources of Nigeria, 2021).

Informality has contributed to increasing corruption and informal sponsorship concerning structuring or allocating political power, thereby affecting government institutions by appointing unqualified individuals to head or manage agencies or departments they have no background in. This, in turn, results in the non-effectiveness of those agencies. The personal stake of political actors or those in power contributes to the ineffectiveness of environmental regulations because most of them own or have investments in businesses causing environmental degradation in the country, such as oil and gas companies and oil wells. Strict enforcement of the law regarding oil and gas would jeopardize their interests. Some government agencies in Nigeria are understaffed (Ahiauba, 2013). However, to effectively enforce environmental laws and regulations, a sizable number of trained staff are required to enforce and monitor compliance with the law, as stated (Oruonye & Ahmed, 2020).

The lack of political will has resulted in the ineffectiveness of environmental regulations in the country, as each government that comes put its own people into the leadership of the agencies. In some cases, the government have not been able to put up the needed resources (human, financial and technological) to effectively manage and protect the environment. For this reason, environmental degradation has continued to increase despite the well-drafted environmental laws both the national and international laws that have been signed and domesticated.

According to Ting, et al., (2019), the plans in each continent for the management of wetland are not faultless, specifically that of Africa and Asia. Most wetlands areas in Oceania and Europe have management plans in place, but they are still being threatened by several factors. To effectively manage wetland, it is essential for local, regional, and national measures and international cooperation to work collectively in order to continually strengthen global wetland conservation and restoration, for the purpose of implementing and realizing effective wetland management plans. This can be done through several means which include; management and policy, monitoring, restoration, knowledge, and funding.

8.0 Conclusion

This research investigated the dynamics of wetlands using the Land Use / Land Cover (LULC) model to determine the rate of change of the Upper Orashi Forest Reserve wetland and its vegetation from 2002 to 2019. The results from the research show that in the period under study, there is a continuous decline in wetland areas due to anthropogenic activities, including oil and gas operations, farming, and infrastructural development. The vegetation was categorized into three types: thick vegetation, light vegetation, and wetland. However, there was a decrease in thick vegetation from 2002 to 2008, followed by an increase from 2008 to 2019. For light vegetation, there was an increase from 2002 to 2008 and a decrease from 2008 to 2019. This implies that the existing laws used for wetland management in Nigeria are not effectively achieving their conservation objectives. With the increasing recognition of wetlands' value in the environment and their ecological functions, the degradation of Upper Orashi Forest wetlands is decreasing and the same can be said for other wetlands in the Niger Delta region (Edo & Albrecht, 2021). There is an urgent need to further reinforce or review the existing management measures. The ongoing degradation of wetlands can be attributed to a lack of implementation and enforcement of environmental laws. Effective management and protection of the region's wetland will improve the natural habitats, and increase the number of fauna. To achieve this, efforts from the government, communities, and individuals are essential. This includes the necessity for awareness creation, identifying, and involving stakeholders in wetland management and protection. The government and stakeholders must strategize to balance the driving factors of wetland degradation through practical institutionalization. This should involve all stakeholders in the process

and procedures of the strategies. It is crucial to note that in addressing wetland protection challenges in Nigeria, multiple government agencies need to effectively organize to reinforce existing laws and regulations for wetland management and sustainability at all levels. Alternatively, there may be a need to establish separate laws and regulations specifically for managing and protecting wetlands in Nigeria.

The EIA process is transparent and credible, and it remains the only environmental management system that has been effectively implemented in Nigeria. However, the lack of effective monitoring and enforcement poses major challenges to the EIA process. This is evident in the insufficient funding and lack of willpower demonstrated by the government. Companies typically do not conduct EIAs unless they require external funding from international banks. Consequently, many projects involving the EIA process are ongoing and often incur fines. In government projects, EIA is performed as part of the paperwork.

The challenge of Environmental Impact Assessment (EIA) in Nigeria is not the problem of the usual 21 days of public display not being enough, but rather finding a way to create awareness within the 21 days that the document is on display. In most cases, there is no feedback from the public within 21 days. For this reason, there is a need for the government to initiate awareness creation or intensify the level of awareness. A high percentage of the population lacks knowledge or has no idea about EIA provisions and their rights concerning opposing environmentally unpromising prospective projects during the usual 21-day public display of the draft.

However, the exploration and utilization of the resources of this important system might impact the stability of the environment, which is the system itself, and also the ecological system. Therefore, the need for Environmental Impact Assessment (EIA) awareness for any project that can impact wetlands/environment should not be reconsidered, as environmentally friendly measures have to be taken into consideration before the implementation of such projects.

Cooperation between the community and government is essential for monitoring and managing wetlands. They could leverage local knowledge and indigenous practices, such as Sacred Lakes and Evil Forest concepts, which discourage people from approaching the area. The information from both GIS and RS measurements, as well as perceptions, indicates degradation of wetlands. The degradation is

primarily a result of anthropogenic activities, while natural changes are minor. However, environmental laws in Nigeria are not effective due to a lack of implementation and enforcement, inadequate awareness, and a lack of monitoring.

In Nigeria, there is a general ignorance of environmental laws, regulations, and the benefits obtained in protecting the environment. It is the responsibility of the government to create this awareness, which they are not currently fulfilling. However, factors such as lack of funds, corruption, poverty, and ignorance, coupled with a conflict of interest from the government (oil revenue), are problems affecting wetlands.

9.0 Recommendations

- I. Awareness: It is crucial to cultivate and reinforce public awareness regarding the protection of wetland resources and the challenges they face. This can be achieved through education and by increasing awareness from the local scale to the national level.
- II. Management and policy: Effective management and policy play a crucial role in addressing the various threats faced by wetlands. Robust policies, when strictly implemented and enforced, can effectively control and conserve wetland areas by establishing clear limits.
- III. The regulations and laws should be reviewed by experts periodically. There must be checks and balances in the environmental sectors in Nigeria to ensure proper environmental monitoring and control.
- IV. Efficient and effective implementation of environmentally settled laws should be considered by the government and individuals before and after projects.
- V. Monitoring: A national wetland dynamics monitoring system should be established to assess the status of wetlands at various levels. Monitoring is crucial for wetland management and conservation. This can be achieved through the use of RS and field observations. It has been reported as an effective tool for monitoring wetlands at local, national, and regional scales. Furthermore, this research has demonstrated that RS can competently, accurately, and

objectively monitor the spatial and temporal distribution and dynamic changes of wetlands on various scales.

- VI. Restoration: This process entails the rejuvenation or rebuilding of deteriorated wetland areas through ecological technology, known as the ecological engineering process. In countries with limited access to technology (Developing countries), they can explore technological transfer or seek assistance from international organizations or Conventions like Ramsar.
- VII. Funding is a critical prerequisite for implementing the recommendations mentioned above. Securing a source of funding is of utmost importance for the effective conservation and protection of wetlands in Nigeria. The funds are essential for staff training and retraining, hiring professionals, and ensuring competitive salaries

Recommendations for Niger-Delta wetlands of Nigeria

- A. A board should be constituted for the purpose of wetlands management and conservation. This board, consisting of all stakeholder groups, will help harness the benefits and reduce degradation rates.
- B. Efforts should be intensified in urban planning and management, specifically regarding land allocation for housing, instead of converting wetlands for residential purposes.
- C. The government should implement programs that promote the restoration of wetland

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Appendixes

Appendix 1: Questionnaire for local community (residents)

Section A: General information

1. Gender.

(a) Male.

(b) Female.

2. Age.

(a) 11-30.

(b) 31-50.

(c) 51 and above.

3. Profession

4. Highest academic level completed.

(a) Ordinary Level.

(b) Advanced Level, OND, NCE, or equivalents.

(c) HND, BSc, BA, or equivalents.

(d) MSc, MA, or equivalents.

(e) PhD or equivalents.

(f) Others, specify:

Section B:

5. Were you born here in Ahoada?

(a) Yes.

(b) No.

6. If you answered (No) to question 5, how long have you lived here?

.....

7. Do you know what wetland is?

(a) Yes.

(b) No

8. If you answered (yes) to question 7 is there a change in the size of Upper Oranshi forest?

(a) Yes

(b) No. (if no move to question 10)

9. If you answered (yes) to question 8, is there a change in the size

(a) Increasing

(b) Decreasing

10. What do residents here use wetland for?

(a) Fishing

(b) Farming

(c) Hunting

(d) Falling of timbers

11. Are there government officials around or do they come around to monitor the wetlands?

(a) Yes

(b) No

12. Is there restriction to the wetland for any activity or purpose?

(a) Yes.

(b) No.

13. Have they ever organized any awareness program in respect to the importance of wetland, protection and management?

(a) Yes

(b) No

14. If you answered (yes) to question 13 by, which organization or agency?

(a) Government

(b) NGOs

Others, specify.....
.....

15. If the government should restrict you from using the wetland, how will you feel?

(a) Happy / stop

(b) Unhappy / still use it

Others, specify.....
.....

Appendix 2: Questionnaire for professionals

Section A: General information

1. Place of work

2. Profession.

3. Work experience.

(a) 0 - 10 years.

(b) 11 - 20 years.

(c) 21 - 30 years.

(d) 31 years and above.

4. Highest academic level completed.

(e) Ordinary Level.

(f) Advanced Level, OND, NCE, or equivalents.

(g) HND, BSc, BA, or equivalents.

(h) MSc, MA, or equivalents.

(i) PhD or equivalents.

Section B: Questions on driving factors of wetland disappearance/reduction in size?

5. Wetland disappearance/reduction in Niger-Delta is as a result of what? (You may choose more than one answer).

(a) Industrial factors

(b) Anthropogenic factors

(c) Industrial factors and anthropogenic factors

(d) Others, specify:

.....
6. Is there law available for the management and protection of wetlands in Nigeria?

(a) Yes

(b) No

(c) No idea

7. If you answered (yes) to question 6, why is there disappearance/reduction in size of the Niger-Delta wetland? Then move to question 10.

.....
.....
8. If you answered question 7 (No) what do you think should be done?

.....
.....
9. Which of this can be attributed to ineffectiveness of laws available for the protection and management of the Niger-Delta wetlands (you may choose more than one answer).

(a) Inadequate laws

(b) Lack of implementation of available law.

(c) Lack of enforcement of law.

(d) Others, specify:

.....
10. Is there any awareness program about wetland management and protection in the region?

(a) Yes

(b) No

11. Do you think the government is doing well in respect of wetland protection in relation to Ramsar Convention?

(a) Yes

(b) No

Reason.....

.....

12. In which way do you think the local community can contribute to effective managed/protect the Niger-Delta wetlands? (You may choose more than one answer).

(a) Not going close to the wetlands

(b) Using it resources for personal use only

(c) Good communication with the authority charge with wetland management in Nigeria

(d) Others,

specify.....

.....

Further