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Climate Change: Implications and Adaptations by Rural Ogba Communities in Rivers State of Nigeria

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Abstract:
This paper examined climate change, its implications and adaptations among rural Ogba communities. Climate change is an ongoing change and process in the geophysical, biochemical and structural statics of the earth caused by the effects of naturally occurring events or the activities of man. Naturally the earth is under the effects of changing earth Pressure, mass (Volume), and Temperature so called the PVT equation. The consequences of these changes include increasing radiation and heat, de-glaciations, flooding, ecosystem disruptions, geo-structural changes, volcanic activities etc. that negatively impact on the environment, human health and development. Man has equally responded to these changes based on available capacity and technology. For methodology, this paper adopted the qualitative approach of review and discussions of relevant literatures. Study adopted climate change effects as a system concept with varied cause and effect implications. Field visits and open focal point discussions was conducted with native Ogba people. Climate change in Ogba land is real and the people have long practised adaptation strategies in responding to it in the areas of flooding, deforestation, pollution and waste management. The coming of oil/gas companies into Ogba communities in 1962 changed the game and introduced large scale pollution and ecosystem degradations. Findings indicated a declining interest on matters of eco-sustainability and accountability among indigenous Ogba people. The dynamics and effects of climate change have however overwhelmed local capacity. Paper recommends adequate capacity building of the population through technical and environmental education; local economy improvement and empowerment; relevant impact assessments/studies, geographic information mapping and impact remediation action plan; political, corporate and technical support for a green revolution, and assurance of an integrated sustainable development framework to tackle the gregarious issues of climate change.

Keywords: *Ogba communities, climate change and implications, indigenous technology, adaptations*

1. Introduction

Rural Communities are those human settlements (homesteads) that live separate from the urban centres and are generally of low economic livelihood and income. Linard et al (2012), summised rural settlement on the basis of spatial population density, local economy capacities, and the governance system (social and administrative) in place. In third world nations, rural communities constitute a great percentage of the entire population and have rich ecology and natural resources (Shaaban & Petinrin, 2014). Their primary occupation is agriculture as in farming, fishing and animal husbandry. Such communities do not usually have portable water, electricity, good housing and good road network. The settlements are in contiguous and humongous neighbourhoods.

Climate change represents a whole lot of changes in temperature, radiation, air and water mass movements, earth structural movements, changing natural and elemental cycles over the years that have altered the geo-biochemical and physical statistics of the earth. Climate change and other associated effects apply to rural and urban communities alike in varying degrees and Ogba communities fit into the rural classification. Pielke (2004), described climate change as change in the statistical distribution of weather patterns observed in regularity and consistency over a period of time, usually from a decade upwards. Today, the growing effects of climate change on global and rural communities has become of great concern and apprehension especially as it affects human life, environment, sustainability and overall development of man. In recommending guidelines for climate change modelling and reporting, Hess et al (2020) advocated for inclusive stakeholder engagement on issues relating to measurement, reporting, mitigation and management of climate change systems and effects. Parker (2013), situated the challenges of climate change today to a global war, a crisis and a catastrophe and posited that present climatic changes and effects have been heightened by man`s consumerist attitude, fast growing industrialisation and associated air, land and water pollutions. The effects and vulnerability vary according to urban and rural community location. In apparent recognition of the increasing challenge of climate change, world leaders met in 1992 at Rio de Janeiro (Brazil) to discuss what Roberts (2009), described as the possibility of ameliorating the cause and effects of climate change on the environment, population and human sustainability. That conference tagged the

'Earth Summit', produced the United Nations Framework Convention on Climate Change (UNFCCC), a body essentially on advocacy for global response strategies and policies on climate and environmental changes and their effects. In 2007, the United Nations Environment Programme (UNEP), World Meteorological Organisation (WMO) and others, championed the establishment of the Inter-Governmental Panel on Climate Change (IPCC) to technically monitor, assess and report on global and governmental action plans, and status change on climate issues. Since the 1992 earth summit, several global conferences on climate change and associated effects have been held to build capacity, advance knowledge and technology for effective response, adaptation and management of impacts.

Authors are generally agreed that climate change have two cause agents and sources (Huber & Knutti, 2012). Human activity otherwise known as the anthropogenic is one and include human activities that impact on natural habitat and ecosystem e.g., deforestation, bush burning and other crude farming methods, burning of fossil fuels and hydrocarbons; lumbering, floral and faunal decapitations; air, water and land pollution; issues on waste mismanagement etc, that have resulted in the disbalance of the physical, chemical and biological constituents of the ecosystem. Clapp (2014), upheld that the advent of industrial revolution in Britain brought about increased search and utilisation of raw materials consequent on emerging ecosystem degradations and pollutions. Both Davidson et al (2012) and Celentano et al (2017) are agreed that the underdevelopment of the Amazon Basin (Region) is due to the effects of extractive activities positing that the excessive decapitation of natural habitats and resources hoisted on developing countries by the developed world without a reciprocal renewability and remediation programme has contributed largely to the plundering of environment and ecosystem. This description fits well into the Niger Delta Region of Nigeria, Africa`s largest and richest basin, where human activities have reflected in wanton exploitation of the rich natural habitat, environment and resources (Mmon & Arokoyu, 2010; Kadafa, 2012) of the region. According to Ajugwo (2013), the global depletion of the ozone layer, the disbalance of natural elemental circles of nitrogen, carbon dioxide and oxygen have contributed significantly to increasing solar radiation and de-glaciation, flooding, drought and associated environmental hazards. The second source of climate change is the naturally occurring elemental activities and this include effects of ocean currents, wind and substructural movements as expressed in wild hurricanes, mudslides, windstorms, surnames, earthquakes, volcanic eruptions among others, which are not directly caused by man. Both sources of climate change have caustic effects on human life, environment and economy, demanding divergent response approaches by man.

1.1. Adopted Methodology

Qualitative research method of open focal group discussion was had in 28 of the 37 towns and villages of Ogba land representing 76% coverage of family heads, elders, elites, women and youths especially of towns and villages along the shores of Rivers Orashi and Sombreiro, and those within the corridors of oil and gas companies. The system concept approach as advocated by Fiksel (2006) is also adopted in this investigation as it recognises the complex nature of climate change systems arising from the various elements that affect it ranging from the natural to the human. Five open ended questions were raised for discussions:

- Has climate change ever affected the environment and landscape of Ogba land?
- If it has, how have the Ogba people responded to climate change effects?
- Is there a variant of change in the last 10years on the landscape, ecosystem and environment?
- Are there challenges within local capacities and technologies in addressing climate change issues?
- Do the people have sustainability plans in addressing climate change issues?

Applying the Ordinary Least Square (OLS) regression analysis method in climate change segregation and profiling, Faradiba & Zet (2020), observed that a strong relationship exists between climate change occasioned in effects and disaster, with adopted community response behaviour and approaches. The choice of response methodology is also tangential to the degree of effects. This is evident in Ogba community whose approach has been of adaptation. Environmental sustainability should drive response strategies in corporate social responsibilities (Orlitzky et al, 2011).

For practical demonstration, empirical cases have been selected and examined from a qualitative point of view on climate change implications, challenges and response approach through adaptation by Ogba rural communities.

1.2. The Study Area: Ogba Communities in Rivers State of Nigeria

Ogba communities are geographically located within 4`50' N - 5`39' N and 6`26'E - 6`40' E. Ogba is the major of the three ethnic groups that make up Ogba/Egbema/Ndoni local government area of Rivers State. The geographic space is traditionally known as and called Ali-Ogba and its language also called Ogba language. Literally *O`gba* means 'door', a symbolic gateway. Ogba community has thirty-seven (37) towns and villages drawn from two clans Egi and Igburu. The Ogba people have a common ancestral language, geography, history, culture, social system and political structure; migrated from the then Bini Kingdom in about 1897 and settled in the confluence of Rivers Sombreiro by her east and Orashi by her west, down south of the River Niger (Ellah, 1995). The major river lines are Omoku, Kreigani and Idu rivers bathed by the Orashi while the Sombreiro passed through Elehia, Ohiuga, Obiosimini and Itu communities. The population is about 280, 000 adults (2016 National population commission estimate). Ogba land situates in the Niger Delta Region of Nigeria and is made up of rainforest and wet (swamp) land. According to Ellah (1995), geographically, Ogba land enjoys an almost year-round rains with average annual rainfall at 80inches. The major occupation of the people is farming and fishing. Ellah (1995) also described the physical landscape of the land as rich in ecosystem with fertile land, variety of food crops and abundant natural oil/gas resources. Ogba communities are of rural setting where basic amenities such as portable water, electricity, functional health and educational facilities are not adequate. Ogba communities play host to

two major oil/gas companies of Total E & P Nigeria Limited (TEPNG) and Nigeria Agip Oil Company Limited (AGIP) with their motley support service companies in the oil/gas exploration and production business.

2. Climate Change: A Conceptual Approach

According to Fussel (2007), climate change as a phraseology can more aptly be understood under environmental vulnerability and sustainability. This zeroes climate change to the concept of vulnerability and sustainability. Hammer (2000), held that climate change as a global phenomenon is made up of affecting systems including the natural ecosystem and its varying characteristics and causes; and the human response systems i.e., adopted technology; level of economic, social and cultural development; governance system and policy decision. Trenberth et al (2002) have held that there is a challenge of effective articulation and congregation of these systems into a single manageable framework hence the conceptualisation of the climate change effects and perspectives. Magni (2017), opined that the global adoption of the 2016-2030 Sustainable Development Goals (SDGs) framework has committed man to addressing the issues of sustainability on planet earth in the face of ravaging climatic change effects and other human challenges. Under the global SDGs, the instruments for a sustainable response approach to climate change includes appropriate and quality education, poverty alleviation, access to safe energy, green revolution and most importantly the use of human friendly technology through choice of safer production system. Bhatarasa & Nyamwanza (2018), have noted that environmental sustainability is the key to effective climate change adaptation while Lee (2007), maintained that technical, financial and economic capability largely determine the choice of response technology and adaptations. Brown et al (2007), sounded a safety warning that the livelihood and sustainability of man on planet earth is under threat by the effect and impacts of climate change. A good case is the loss of arable land to desert encroachment, drought and famine as now experienced in the Lake Chad Basin in Africa, an area once a geographic water basin for agriculture and water source for human and animal pasture. The receding water level in the basin is largely responsible for the mass migration of man and animal herds away from the region, which has inevitably thrown up challenges in managing the consequent cross border movements with its associated economic, political, social, religious, security and cultural impacts, more especially on food and human security. Cameron, Nigeria, Chad Republic, Niger and Central African Republic (CAR) are victims of this changing tide in the Chad basin. The challenges and hazards of climate change have equally contributed in regional conflicts and crisis (Froese & Schilling, 2019). Thus, a human friendly and healthy climate will definitely cushion the effects of global and local environmental challenges and help address socio-political, economic and development issues at rural communities' level where modern facilities are inadequate. Ziervogel et al (2006), thus described climate change as one of the most serious threats facing mankind worldwide, negatively affecting agriculture and food production in Africa.

Indigenous technology has largely defined the choice and tempo of rural communities in the approaches to climate change. Choice of approach is underlined and influenced by either of the impact sensitivity (degree of effect), vulnerability (degree of injury or harm), resilience (degree to which the system recovers) and adaptation (degree or ability to affect impact to achieve desired results). Noble et al (2014), highly recommends the adaptation approach in the case of local response. Smith & Wandel (2006), are also agreed that adaptation is largely determined by local technical capacity and the influencing factors of the economy, culture; and geographic locality.

2.1. Ogba Communities and Implications of Climate Change

The advent of oil/gas producing companies in Ogba land changed all of its physical features. For almost six decades the land witnessed oil/gas exploration and exploitation that negatively impacted on the environment and human life and sources of livelihood. Thus, flaring of poorly burnt hydrocarbon fuels into space by oil/gas production centres constituted challenges to human health and the environment. Egwurugwu & Nwafor (2013), have associated the increasing cases of cancer, eye (sight) problems, skin infections, cough, high blood pressure and associated cardiovascular and pulmonary diseases among oil/gas producing communities to negative effects of oil/gas activities. Efforts especially by oil/gas multinational corporations to alleviate health challenges experienced by hosting communities have gained very poor results as the free healthcare campaigns they carry out are more curative than preventive. Frynas (2005) and Ojo (2012) are agreed that the philanthropic postering of corporate social responsibility (CSR) coupled with its lack of technical capacity to effectively deliver development, has greatly flawed the use of CSR functions to deliver in climate change cases. The activities of illegal oil bunkering and refining by local militant groups, locally called 'Kpokpofi' that take place in the creeks, swamps and river lines of the Niger Delta region have negatively impacted on the environment and health of the people (Obende & Amangabara, 2014). These illegal activities are damaging on human health and sociology, the environment and rural development resulting equally in unhealthy relationship, conflicts and crises between host communities, government and oil/gas companies (Achinulo, 2017).

2.1.1. Indigenous Adaptation Approaches by Rural Ogba Communities

Siders (2019), in a study on climate change observed a growing emphasis and prominence on adaptation technology in recent climate change research works. Sriver (2011), posits that there is a strong relationship between climate change effects being induced by man (anthropogenic) to that by natural activities both of which are responsible for disruptions in earth geo-biochemical statics and consequent increases in global warming. Thus, natural cycles and activities designed and defined in space, value and rates suitable for human health and the ecosystem, by mother nature, have been altered with serious consequences and impacts on man and the environment. Hamichi et al (2020), described above scenario as energy imbalance caused by anthropogenic disruptions. Ogba land is affected by these climatic changes

and effects which equally have defined her adaptation and response approaches. Notable areas of effects or better tagged climate disrupted areas are in flooding, deforestation, pollution and waste management.

2.1.1.1. Flooding

Ogba Communities is a washed by the confluence of Rivers Sombreiro on the east and the Orashi by the west. These two water sources have direct influence and impact on water level changes in the rivers, creeks and communities of Ogba land. A significant consequence of this strategic river tributary location is perennial flooding. The flooding of 1972, 2012, 2014 and 2018 have had great devastations on the land and people of Ogba. According to Magami et al (2014), the major cause of flooding in the Niger Delta region has been traced to heavy local rainfall, excess water released from the dams up north e.g., the Lagbo Dam in Cameroun in 2012, coastal overflow from River Niger and the Atlantic, and to poor urban and rural drainage systems. The overflows from these sources which are themselves great water buckets, empty into the Sombreiro and the Orashi river. Ibim & Bongilli (2018), have described the Sombreiro river system as one of the most important in terms of water source and water nutrient supplies in the Niger Delta. According to Akinro et al (2008), increasing global temperature resulting in increased earth warming and associated climatic changes have been responsible forde-glaciation and increased flooding. The concern for flooding is equally home to Ogba Communities who are prone to perennial flooding caused by overflows drawn from primary source water. Variant climate effects have impacted on the social ecology of the people, and their adaptation responses to flooding in a region that is generally lying below sea level.

2.1.1.2. Deforestation

The occupation of Ogba people is basically farming, fishing and gaming. Farming is done on communal basis and highly peasant and unmechanised. Land is owned by families within the communities, and shared to every married male member of family for annual shifting cultivation farming. The process requires farm clearing and bush burning which process is unscientific and unhealthy for the environment. There is lumbering for timbers and woods for housing needs and for sale for domestic furniture works. This age-old tradition has caused massive deforestation of the rain forest, swamps and creeks, decapitating them of trees, palms, shrubs etc and exposing the area to unhealthy climate impacts and changes. Lawrence & Vandecar (2015) observed that bush burning is more domestic but warned that exceeding the required threshold could present critical challenges to climate change conditions. Ogba community farming method is basically through bush clearing (deforestation) and bush burning.

2.1.1.3. Pollution

Pollution is basically the introduction of either solid, liquid or gaseous substance into an already (another) constituted ecosystem which introduction automatically alters the nature, characteristics and utility of the original substance. According to Appanangari (2017), pollutions are generally against natural constitution hence injurious to man and the environment. Pollution experienced in native Ogba communities before the advent of oil/gas companies is mainly of human and domestic wastes and organic materials discharged into surrounding rivers and streams. Present pollutions have occurred mainly in water aquifer contaminations caused by seismic and other drilling activities; flaring of partially burnt hydrocarbon fossils; oil, gas and chemical spills from pipeline ruptures and sabotages; acid rain; and other ecosystem degradations. Ndubuisi & Asia (2007), in a study in the Niger Delta opined that oil spillage, gas flaring and other pollutions constitute major environmental problems observed in the region. Commonscene of hydrocarbon flare and discharges from oil/gas production processes in flare and burrow pits can be seen at Akabuka, Ogbogu, Obagi, Obite, Idu Obosiukwu, Omoku, Obrikom, Obie and Ebogoro communities, constituting environmental and human health challenges (Chinedu & Chukwuemeka, 2018). Consequently, these have affected soil fertility and agricultural production among oil/gas producing communities of the region. Akpokodje & Salau (2015), have held that environmental pollution has degraded agricultural lands and its production potentials in the Niger delta. Perennial floods experienced by Ogba people have also contributed in this pollution chain by the injection of hazardous metallic ions and toxic chemicals eroded upstream and flushed into her water sources, adding to her public health concerns.

2.1.1.4. Waste Management

In efforts to tackle climate change at rural community level, waste management has presented a new dimension to the challenge especially due to lack of adequate local technology for handling waste products. Worse still, the use of improperly managed waste dumpsites, burrow-pits, landfills and pit toilet systems have released methane and other harmful gases from decomposing wastes into space thus impacting negatively on human health and public environmental sustainability (Bogner et al, 2008). Recently, the disposal of plastics, polyethene and other none biodegradable materials into streams and rivers has thrown up challenges in water ways transportation and portable water source.

2.1.2. Ogba Communities and Indigenous Response to Climate Change

Before the advent of oil/gas companies and their operations, adaptations and response to changing climate conditions have been to a good extent successful with Ogba people through application of indigenous knowledge and technology. This is knowledge acquired through observations and experience by the people for response to climate and environmental changes as against the use of westernised scientific knowledge. The responses have been more of adaptation than mitigation. Local (indigenous) knowledge and approach to issues of climate change is people driven and distinct to the people. Empirical cases of response approaches by the people are here discussed:

2.1.2.1. Empirical Case 1: Flood

According to Nkwunonwo et al (2015), there is generally three flood seasons known as the fluvial flooding which is caused by overflow from a river, lake or stream into the surrounding land; the pluvial flooding which is caused by excessive rainfall leading to increased water level and consequent overflow into surrounding environment; and the coastal flooding which is caused by overflow of water from the coast or seashore into the land. The three are common to Ogba communities and usually vary in terms of overflow volume, velocity (intensity), and extent of overflow. Observation by the locals have shown that October is generally the peak month for flooding. Aside from the negative effects, flooding also have served as lifeline for riverine communities in terms of providing for water sources, food nutrients and energy, and opening up of the waterways for transportation and commerce. Notations on flood cycles has helped the people prepare themselves for response and contingent actions. Part of the response action is to build and keep ready, big wooden canoes and the smaller speedy woodcraft canoe popularly called 'Ugbo Akri'.

The people have a means of measuring flood heights as guide for response actions or strategies for adaptation. Daily knife cut marks on big trees by locals have helped in determining flood heights so as to ascertain whether water level is increasing or decreasing. These tree marks have served as flood observatories. In a flood risk assessment study of Port Harcourt metropolis by Chiadikobi et al (2011), it was reported of how residents mark flood heights on buildings and tall standing structures. Among Ogba communities, water level marks on trees during flood seasons at Oboburu, Idu Obosiukwu, Idu Osobele, Ohali Usomini, Kreigani, Omoku and Obrikom communities have been used for benchmarking the degree of flooding from the Orashi River outlets. For water level sightings among Sombreiro River outlets, the level of water marks at Ikiri, Ohiuga, Elehia, Itu and Obiosimini towns have been used for benchmarking the height of flooding. Other adaptive measures include building of wooden platforms or embarkments (called Akwaa) to take care of the aged, women, children and others while waiting for evacuation. This is a stop gap measure practised by the people for evacuation of family members to communities that are less affected. This practice is very common among ethnic riverine (coastal) communities of Niger Delta region and constitutes indigenous response approaches and the use of local technology in responding to climate change effects during flooding. However, the degree of flooding, its impact and devastation vary according to geographic location of community in the Niger Delta region, especially with consideration for heavy rainfall and proximity to Atlantic Ocean.

2.1.2.2. Empirical Case 2: Deforestation

Among the Ogba people, deforestation has generally been at subsistence level, not on a large scale or economic level. Activities classified as deforestation include lumbering for sale of timbers and woods for domestic furniture works, and for firewood; and the impact of bush clearing and burning for farmsteads. Enaruvbe & Atafo (2016), in a study of the Niger Delta have posited among others, that deforestation causes loss of water body, loss of biodiversity and decrease in forest utility. As a response action to the negative effects of bush clearing and burning, Ogba people operate the shifting cultivation method. This is an indigenous response strategy to allow already farmed portions of land to fallow for seven (7) years to undergo natural, biochemical and organic regeneration, rehabilitation and restoration. Modern mechanised system of farming also practices this shifting cultivation method. In Ogba land, it is not traditional and permissible to farm on already farmed portion of land within this specified number of years. However, this tradition varies with communities depending on the availability of land and the population, but not usually lower than four years re-fertilisation period. The mixed cropping method wherein basic crops are planted together with legumes in a planned pattern for effective and adequate land nourishment and management, is a local adaptation method that helps cushion the effects of climate change on land. A careful observation of the seasons (raining and dry seasons) by the people with special look out for rainfall, humidity and early morning dews, precipitation etc determines to a large extent when the planting or harvest seasons begins. Land has become part and parcel of the people's life and culture. These are adaptive measures learned through indigenous observations and experiences on changing climate conditions over years.

2.1.2.3. Empirical Case 3: Pollution

The impact of pollution has not been significant on native Ogba land before the advent of oil/gas companies. Water pollution had been only human and domestic (kitchen) wastes dumped into water streams and rivers. Air pollution from bush burning for farming is seasonal and highly insignificant with equally very low hydrocarbon releases. Pollutions in pre-oil/gas Ogba land are from basic organic sources not from fossil fuels or other hydrocarbon sources and they lie within permissible standards and safe environmental and human health thresholds. Thus, the people have lived in an adaptive and considerably safe environment within a practising subsistence economy that predates industrial exploitations and its associated pollutions. However, the advent of oil/gas companies and their operations have altered the biotic, physical and chemical properties of natural habitats. Contributing in studies on environmental pollution in the Niger Delta, Solomon et al (2017), opined that changing consumption pattern of man has catalysed into over stretched utilisation of natural resources, its pollution and degradations with harmful effects on human health and the environment.

2.1.2.4. Empirical Case 4: Waste Management

There is no significant evidence at combating climate change through waste disposal and management by native Ogba community. Rural wastes are essentially from organic sources and human dungs. Farm and some animal wastes are packaged for use as composite soil for nutrient support to planted crops. Domestic and human wastes though at very low hazard threshold have not been effectively managed within the ambits of standard environmental practice as practices such as use of pit toilet system and other crude ways of waste disposals are still observed among native Ogba people.

Generally, Ogba people have responded and adapted to climate change with local technology and resources distinct and available to them. They have acquired the art of blacksmithing from their Ibo ethnic neighbours on the northern flank, for the production of hoes, matchets, spears, dane guns, cutting tools and metal implements among others for farming, hunting, warfare, canoe making and other purposes. In the area of community healthcare system and delivery, there is the indigenous method of transfer of knowledge and technology from generation to generation by native doctors known as herbsmen (herbalists). Ogba people have sustained these indigenous technologies over the years and provided for medical needs of the people in response to environmentally induced diseases e.g., water and airborne diseases. These diseases are related to raining season, flooding, heatwaves and radiations which are also associated with climate change systems. For rainfall and flood controls, inclusive of proficiency for weather forecasting (modern hydrology and meteorology science) the people have long practised indigenous knowledge and technology endowed and claimed through a particular family kindred and lineage in responding to flooding and climate changes.

The Umu Oshikpa (Umu Orodu) kindred family found in almost all towns and villages of Ogba land are largely associated with hereditary and proprietary local prowess for management of rainfalls, flooding and other environmental and climate change issues. Male descendants of this family lineage especially as endowed on the oldest (eldest man) of each family unit are said to possess native powers to control rainfall. This indigenous knowledge has been applied in measures to check the occurrence and degree of rainfall and their consequences for farming, agricultural purposes and sometimes for consummate pleasure and pastimes e.g., rainfall and weather controls during cultural and traditional festivals, gaming sessions and wrestling competitions. These traditional methods have however been dubbed unscientific by modern technology. Each family lineage (kindred) in the whole of Ogba Communities have one or more of such native hereditary and proprietary responsibility for one aspect of life of the people or the other as in agriculture, warfare, defence, environment, seasonal ceremonies, chieftaincy and governance systems. Tanyanyiwa (2018), and Hosen & Hitoshi (2020) are both agreed that the use of traditional knowledge and technology (TKT) by native peoples have helped them overcome harsh climate change and environmental challenges, and increased their resilience to adaptation. Ogba people have used these measures to respond to the menace of flooding, the seasons and other hazards associated with climate change.

3. Findings

Outcome of the open group focal discussions in all of the questions raised have returned with affirmative responses and also indicating an all agreement that climate change in Ogba land is real. This work has noted a demonstrated decline in interest on matters of eco-sustainability and the application of indigenous technology among Ogba rural women, youths, elites and leadership of the people. Paradoxically, the people have become deluded by the gushing oil wealth to the challenging impact of environmental and climatic changes with consequent abandonment of traditional response mechanisms and value systems. Worst still, issues of climate change have not yet been considered a serious political agenda by the people in electioneering campaigns and governance at national and local community levels. Ite et al (2016), noted that the oil/gas companies have been accused by host community people of negligence and lack of transparency especially as it concerns implementation of international environmental laws and standards.

Kadafa (2012), held that the seeming deficiency on technical capacity and economic power on the part of rural host communities has also incapacitated their ability to respond effectively to new climes of climate change necessitated by oil/gas operations. The new sociology of the people starting from early 1990s have placed emphasis on acquisition of oil wealth and contracting, political money-bags, and urbanised white-collar jobs in the banks and oil/gas industry, to the detriment of local nature preservation and ecosystem protection. Unfortunately, the rural community are the most vulnerable to climate change effects due to lack of technical response capabilities to tackle the menace. Climate change effects have combined to impact negatively on rural human health (Chukwuma, 2017), the environment (Taleb, 2017) and economy of the people (Ebeku, 2006).

The approach by multinational oil/gas companies whose activities have gravely degraded the environment have not been proactive on climate change issues. Rowe et al (2014) have held that operating oil/gas companies are responsible for the devastating damage to host community's ecosystem, environment and livelihood. The absence of affirmative actions stated in MoU agreements between these oil/gas giants and host communities have been very unhelpful. This explains the palpable danger and absence of sustainability plans in tackling climate change effects by stakeholders. Oil/gas multinationals on their part have alleged that the vulnerable state of community life resulting in insecurity, violence, assets vandalizations and lack of respect for human life and order, has largely accounted for inability of these MNCs in delivering sustainable development in Niger Delta region (Enuoh, 2014).

Consequent on climate change effects mostly from anthropogenic factors, Ogba people who had before now been self-sufficient in basic foods now depend on rice, yam, plantain, beans, fish and cattle meat sourced from urban centres and neighbouring communities. This is caused by the dearth of agricultural occupations as fishing and farming that were primary means of livelihood of the people have now been abandoned substantially due to ecosystem pollutions, people neglect and shortage of available land.

3.1. Way Forward

Climate change requires a united global, national government, corporate, community and non- governmental agencies effort at public mobilisation, innovation, integration, adaptation and inclusion (Few et al, 2007). Nyong et al (2007), recommended the adoption of adaptation technology in tackling issues of climate change in Sahel Africa while Egbule et al (2011), affirmed that the adaptive indigenous knowledge base is an appropriate approach in the

circumstances of rural communities in terms of cost effectiveness and resource power. Ogba communities fit into this illustration. Authorities are in agreement that climate change issues are developmental and that the Niger delta region where Ogba communities are located is a distinct geographic area, vulnerable to climate change largely to anthropogenic activities. Concluding Egbule et al (2011), posited that farmers in the region have actually practised some form of innovative indigenous adaptations in response to climate and environmental changes. Mmom & Aifeshi (2013), argued that adaptation regimes and new measures in the case of flooding in the Niger Delta region should essentially include the creation of flood plains and water channels; coast lines and shorelines modifications and protections, to address the issues of erosion and flooding. Amosu et al (2012), is in agreement with the above positions and canvassed for a concerted effort at checking and ameliorating the increasing effects of global climatic changes shown in diminishing ozone layer, increasing radiation, de-glaciation, flooding; and anthropogenic degradations of the environment etc.

Ogba people and communities have from time past responded to climate changes and have adapted indigenous knowledge and local technologies in addressing the issues arising therefrom. Kadafa (2012), have however noted that the advent of exploration (seimic and drilling activities) and exploitation (production and transportation) of oil/gas in the region have produced disastrous impacts on the environment and people. The new challenge requires a more drastic and technology driven approach in terms of mitigation, remediation, funding and sustainability, which the local community (people) are presently incapable of executing themselves. Loison (2015), advocated for local economy diversification of the people. A multistakeholder and multifaceted approach is required in addressing climate change and its effects. Nevertheless, the approach of indigenous (native) Ogba people to climate change have been more of adaptation than mitigation, and this has to a large extent preserved her ecosystem and environment prior to the advent of industrial exploitations.

Going forward in efforts for effective response, adaptation and management of climate change effects among rural communities with reference to Ogba rural communities, the following measures are proposed:

- Local (rural) communities should stimulate and encourage indigenous technologies that uphold environmental preservation, conservation and protection; and revive local ecology.
- Stakeholders (community, government, oil/gas companies, others) should improve existing local capacities with respect to response capabilities and technologies. Diversification and improvement of rural economy is key to a proactive and effective response to hazards of climate and environmental changes.
- Stakeholders should engage in massive environmental education, sensitisation and mobilisations e.g., tree planting campaigns, forestry conservations (parks and gardens), green clubs, agricultural shows; merit awards to climate friendly regimes, persons and organisations; and adoption of an early child environmental education curriculum at basic and secondary school levels
- Environmental Impact Assessment (EIA) and other basic assessments should be carried out by operators, truly validated by all affected parties and implemented to minimise negative impacts Climate monitoring and contingency plans should be proactive and remediation measures deployed on time and adequate, as recommended by international operating rules and standards.
- Climate and environmental change issues should be integrated into a sustainable development policy framework by government, corporate bodies and stakeholders; and entrenched in negotiated MoU agreements. Such frameworks should be well funded and designed to include measures on flooding, pollution and erosion control, reduction in land degradation sand expropriations
- The Directorate of Petroleum Resources (DPR), Federal Environmental Protection Agency (FEPA), National Oil Spill Detection and Response Agency (NOSDRA), National Environmental Standards and Regulation Enforcement Agency (NESREA), Nigerian Meteorological Agency (NiMet) etc as national environment watchdogs should be streamlined, restructured and strengthened technically to deliver on mandate especially with respect to monitoring and forecasting, response, containment etc
- Stakeholders should respect internationally accepted standards of operations and regulations in terms of human health, safety and environment (HSE).

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