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IS NIGERIA READY?**

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CLIMATE CHANGE, AGRICULTURE AND WATER RESOURCES: THE NIGER DELTA IN FOCUS

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ABSTRACT

Nigeria is the most populous nation in Africa and contributes to Climate Change through its oil exploration activities, impact from extractive and manufacturing industries. Nigeria has a variety of ecosystems, from mangroves and rainforests on the Atlantic coast in the south, to the savannah in the north, bordering the Sahara and they are not immune from the damaging effects of climate change. While excessive flooding during the past decade has hurt farming in coastal communities, desertification is ravaging the Sahel. Rainfall in the Sahel has been declining steadily since the 1960's. The result has been the loss of farmlands and conflicts between farmers and herdsmen over ever-decreasing arable land. People in different communities, including fishermen, farmers and herdsmen, are now confronted with difficulties arising from climatic change. Peoples' livelihoods are being harmed, and people who are already poor are becoming even more impoverished. Climate refugees are being created, as the changes make some land unliveable and affect living conditions.

INTRODUCTION

Global Warming or Climate Change, measurable increases in the average temperature of Earth's atmosphere, oceans, and landmasses. Scientists believe Earth is currently facing a period of rapid warming brought on by rising levels of heat-trapping gases, known as greenhouse gases, in the atmosphere.¹

¹ Earth has warmed and cooled many times since its formation about 4.6 billion years ago. Global climate changes were due to many factors, including massive volcanic eruptions, which increased carbon dioxide in the atmosphere; changes in the intensity of energy emitted by the Sun; and variations in Earth's position relative to the Sun, both in its orbit and in the inclination of its spin axis. Variations in Earth's position, known as Milankovitch cycles, combine to produce cyclical changes in the global climate. These cycles are believed to be responsible for the repeated advance and retreat of glaciers and ice sheets during the Pleistocene Epoch (1.8 million to 11,500 years before present), when Earth went through fairly regular cycles of colder "glacial" periods (also known as ice ages) and warmer "interglacial" periods. Glacial periods occurred at roughly 100,000-year intervals. An interglacial period began about 10,000 years ago, when the last ice age came to an end. Prior to that ice age, an interglacial period occurred about 125,000

years ago. During interglacial periods, greenhouse gases such as carbon dioxide and methane naturally increase in the atmosphere from increased plant and animal life. But since 1750, greenhouse gases have increased dramatically to levels not seen in hundreds of thousands of years, due to the rapid growth of the human population combined with developments in technology and agriculture. Human activities now are a powerful factor influencing Earth's dynamic climate. The ice of the polar regions furnishes clues to the makeup of Earth's ancient atmosphere. Ice cores that scientists have bored from the ice sheets of Greenland and Antarctica provide natural records of both temperature and atmospheric greenhouse gases going back hundreds of thousands of years. Layers in these ice cores created by seasonal snowfall patterns allow scientists to determine the age of the ice in each core. By measuring tiny air bubbles trapped in the ice and properties of the ice itself, scientists can estimate the temperature and amount of greenhouse gases in Earth's past atmosphere at the time each layer formed. Based on this data, scientists know that greenhouse gases have now risen to levels higher than at any time in the last 650,000 years. Greenhouse gases are rising, and temperatures are following. Before the late 1800s, the average surface temperature of Earth was almost 15°C (59°F). Over the past 100 years, the average surface temperature has risen by about 0.7 Celsius degrees (1.3 Fahrenheit degrees), with most of the increase occurring since the 1970s. Scientists have linked even this amount of warming to numerous changes taking place around the world, including

Greenhouse gases retain the radiant energy (heat) provided to Earth by the Sun in a process known as the greenhouse effect. Greenhouse gases occur naturally, and without them the planet would be too cold to sustain life as we know it.¹ Since the beginning of the Industrial Revolution in the mid-1700s, however, human activities have added more of these gases into the atmosphere.² For example, the level of carbon dioxide, a powerful greenhouse gas, have risen by 35 percent since 1750, largely from the burning of fossil fuels such as coal, oil, and natural gas. With more greenhouse gases in the mix, the atmosphere acts like a thickening blanket and traps more heat.³ According to the Nigerian Climate Reports,⁴ Climate change is any long-term change in the statistics of weather over durations ranging from decades to millions of years. It can be manifest in changes to averages, extremes, or other statistical measures, and may occur in a specific region or the Earth as a whole. Climate change refers to a change in climate that is attributable directly or indirectly to human activities that alters the atmospheric composition of the earth which leads to global warming. Climate change has the potential of affecting all natural and human systems and may be a threat to human development and survival socially, politically and economically.⁵ It should be noted that climate change is capable of causing numerous damages on the earth, particularly on human life.⁶ The most notable of these damages is that the earth would be caused to be hot⁷. On this,

predictions have been made by scientists that the hotness of the earth will continue and even get worse. Activities of man and state are not only posing serious threats to fragile ecosystem but to the existence of entire human race, including future generation.⁸ Human beings are changing the climate by increasing the global concentration of green house gases such as carbon dioxide⁹, methane¹⁰ and nitrous oxide.¹¹

¹ Ibid.
² Carbon dioxide is the second most abundant greenhouse gas after water vapour. Carbon dioxide constantly circulates in the environment through a variety of natural processes known as the carbon cycle. It is released into the atmosphere from natural processes such as eruptions of volcanoes, the respiration of animals, which breathe in oxygen and exhale carbon dioxide; and the burning or decay of plants and other organic matter. Carbon dioxide leaves the atmosphere when it is absorbed into water, especially the oceans, and by plants, especially trees. Through a process called photosynthesis, plants use the energy of light to convert carbon dioxide and water into simple sugars, which they use as food. In the process, plants store carbon in new tissue and release oxygen as a by-product.

Humans are significantly increasing the amount of carbon dioxide released to the atmosphere through the burning of fossil fuels (such as coal, oil, and natural gas), solid wastes, and wood and wood products to heat buildings, drive vehicles, and generate electricity.

¹⁰ Methane is emitted into the atmosphere during the mining of coal and the production and transport of natural gas and oil. Methane also comes from rotting organic matter in landfills, rice paddies, and wetlands, as well as from certain animals, especially cows, as a by-product of digestion. Live plants also emit small amounts of methane. Scientists are increasingly concerned about the release of methane and carbon dioxide from melting permafrost, areas of frozen ground in the tundra (Arctic plains) of Alaska, Siberia, and other sub polar regions. Temperatures in the top layer of permafrost have increased, leading to a decrease in the area of seasonally frozen ground. Methane released from these areas as they melt would contribute to further warming and further melting, in what scientists call a feedback process. Since the beginning of the Industrial Revolution, the amount of methane in the atmosphere has more than doubled. Methane traps nearly 30 times more heat than the same amount of carbon dioxide. Compared to carbon dioxide, methane appears in lower concentrations in the atmosphere and remains in the atmosphere for a shorter time. In total, methane contributes about a third as much as carbon dioxide to global warming.

¹¹ Nitrous oxide is a potent greenhouse gas that is released primarily by ploughing farm soils and burning fossil fuels. Nitrous oxide traps about 300

melting mountain glaciers and polar ice, rising sea level, more intense and longer droughts, more intense storms, more frequent heat waves, and changes in the life cycles of many plants and animals. Warming has been most dramatic in the Arctic, where temperatures have risen almost twice as much as the global average.

² Mastrandrea, Michael, and Schneider, Stephen H. "Global Warming." Microsoft Student Encarta, Microsoft Corporation, 2007.

³ Ibid.

⁴ Ibid.

⁵ <http://ngrclimatereports.com>. Accessed on the 5/8/2010.

⁶ Ibid.

⁷ A.B. Abdulkadir and A.O. Sambo, Climate Change and Sustainable Development: Solution so far, Nigerian Journal of Food, Health and Drug Law, (A Publication of the Faculty of Law Kogi State University, 2010.) 81

⁸ Ibid.

CAUSES OF CLIMATE CHANGE

For many years, global warming was portrayed in the media as an issue with two sides, with some scientists arguing that global warming is occurring and others arguing that it is not. However, this portrayal was an oversimplification of the scientific debate. Sceptics of global warming, including some scientists, pointed to lingering scientific uncertainties to question whether global warming is actually occurring. However, there is now undeniable evidence that global temperatures are increasing, based on direct temperature measurements and observations of other impacts such as melting glaciers and polar ice, rising sea level, and changes in the lifecycles of plants and animals.¹³ As the scientific evidence on rising global temperature became indisputable, sceptics focused their argument on whether human activities are

times more heat than does the same amount of carbon dioxide. The concentration of nitrous oxide in the atmosphere has increased 18 percent over preindustrial levels. Nitrous oxide contributes about a tenth as much as carbon dioxide to global warming.¹³ While the behaviour of the climate system and the processes that cause global warming are well understood and grounded in basic scientific principles, scientists are still working to understand certain details of the climate system and its response to increasing greenhouse gases. Scientific uncertainty is inevitable with a system as complex as Earth's climate. However, advancements in measuring, analyzing, and modelling techniques have helped clarify many uncertainties in recent years. For example, there had been uncertainty regarding why the warming trend stopped for three decades in the middle of the 20th century. Records even showed some cooling before the climb resumed in the 1970s. The lack of warming at mid-century is now attributed largely to the sulphate aerosols in air pollution, which have a cooling effect because they reflect some incoming sunlight back to space. Continued warming has now overcome this effect in part because pollution control efforts have made the air cleaner. Satellite measurements of atmospheric temperature, which became available around 1980, originally were thought to measure much less warming in the lower region of the atmosphere than surface thermometers. This led to some doubt about the accuracy of the warming detected at the surface. Eventually, other researchers reanalyzed the satellite data using more advanced techniques and concluded that the satellites were detecting warming quite similar to surface measurements. While there is still some uncertainty, scientists examining the satellite data now agree that the record is consistent with a warming world.

in fact the cause of global warming. They argued that the observed warming could be caused by natural processes such as changes in the energy emitted by the Sun. However, the Sun's influence has been found to have contributed only slightly to observe warming, particularly since the mid-20th century.¹⁴ In fact, there is overwhelming evidence that greenhouse gas emissions from human activities are the main causes of the warming.¹⁵

In 1988, the United Nations Environment Program¹⁶ (UNEP) and the World Meteorological Organization¹⁷ (WMO)

¹⁴ See for example, Report on the Stern Commission on Climate Change Cited in, Martin Donohue, *Global Warming: A public Health Crisis demanding Immediate Action*, World Affairs Summers Vol. 11, No 2 2007.

¹⁵ Ibid.

¹⁶ United Nations Environment Program (UNEP), body established in 1972 by the United Nations General Assembly to promote international cooperation in environmental matters. Its tasks include constant surveillance of the environment through a program known as Earth watch, analysis of trends, the collection and dissemination of information, the adoption of environmentally sound policies, and the adaptation of environmental protection projects to fit the needs and priorities of developing countries. UNEP has initiated projects in the following areas: the ozone layer, climate, the transport and disposal of waste, the marine environment, water systems, soil degradation, deforestation, biodiversity, urban environment, sustainable development, energy conservation, human settlements and population issues, health, toxic chemicals, environmental law, and education. UNEP receives funds from the general budget of the United Nations (UN), from members' contributions, and from trust funds. The money is allocated proportionally: 20 percent to various regions of the world; 80 percent to global projects. UNEP, however, is not a funding agency. Its resources are used to start programs, which then draw funds from other sources, including governments and environmental agencies. It works in close cooperation with other UN bodies, especially the Food and Agriculture Organization (FAO), the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and the World Health Organization (WHO). UNEP also has links with more than 6,000 nongovernmental bodies concerned with the environment. The Administrative Committee on Coordination functions as a liaison between UNEP and other UN agencies and related programs. UNEP's Governing Council, with representatives from 58 member states, meets every two years. The organization's headquarters are in Nairobi, Kenya.

¹⁷ World Meteorological Organization (WMO), specialized agency of the United Nations, established in 1947 to coordinate, standardize, and improve

established the Intergovernmental Panel on Climate Change (IPCC). The panel comprises thousands of the top climate scientists from around the world and releases a report every six years describing the state of scientific knowledge on global warming. The IPCC's Fourth Assessment Report¹⁸, released in 2007, offered the strongest scientific consensus to date on global warming. The panel concluded that it is "very likely" (more than 90 percent probability) that human activities are responsible for most of the warming since the mid-20th century; that it is "extremely unlikely" (less than 5 percent probability) that the warming is due to natural variability; and that it is "very likely" the warming is not due to natural causes alone.¹⁹ This level of certainty is extremely

high, given the complexity of the climate system and of the influence of human activities on the climate. Several factors are responsible for climate change. There are natural and man-made causes.²⁰ Natural factors include volcanoes, ocean current, the earth's tilt, comets and meteorites. These include such process as variations in solar radiation, derivation in the earth's orbit, mountain building and continental drift and changes in green house gas concentrations. And the climate system can take centuries or longer to fully respond to new external forces.²¹ Human causes have been influenced by the industrial revolution of 19th century, which saw the large scale use of fossil fuel for industrial activities.²² Natural resources are being used extensively for construction, transportation and industries.²³ Human factors have contributed to climate change and presently, the scientific consensus on climate change is that human activity is the cause for the rapid increase in global average temperature over the past several decades.²⁴ The energy sector is responsible for about ¾ of carbon dioxide emissions, 1/5 of the methane emissions and a large quantity of nitrous oxide. It also produces nitrogen oxides and carbon monoxide which are not green house gases but do have an influence on the chemical cycles in the atmosphere that produce green house gases.²⁵

MULTI NATIONAL COMPANIES AND THE NIGER DELTA OF NIGERIA

The Niger-Delta is known in some circle as Nigeria's Kuwait, for its oil and geographical promises.²⁶ By most estimates, there are somewhere between 250 and 300 different

lay the foundation for the measures that are needed to counteract such change.

²⁰ Yusuf O.A., The legal profession and Climate Change in Nigeria, being paper presented at the faculty of law workshop on climate change 2010.

²¹ Ibid.

²² Ibid.

²³ Ibid.

²⁴ Ibid.

²⁵ Ibid.

²⁶ Paul M. Lubeck, Michal J., Convergent Interest US Energy Security and the Security of Nigerian Democracy in Radiance (No 12, June-December, 2008), pg. 19.

world meteorological information. Successor to the International Meteorological Organization, which had coordinated weather-reporting services among its members after 1878, the WMO has 187 members, consisting of countries and territories that maintain meteorological services. The organization facilitates international cooperation in the establishment of station networks and centers to provide meteorological and hydro meteorological service and observations. It promotes the establishment of systems for the rapid exchange of weather data and the standardization of meteorological observations, and encourages research and training to further the application of meteorology to aviation, shipping, agriculture, and other activities. The organizational structure of the WMO includes the policymaking body called the World Meteorological Congress, which meets at least once every four years; the executive committee, which carries out the resolutions of the congress, initiates studies, and makes recommendations on matters requiring international action; meteorological associations for six regions (Africa, Asia, South America, North and Central America, Europe, and the Southwest Pacific); and technical commissions composed of experts in such fields as climatology and maritime meteorology. The secretariat, which is headed by a secretary general, has its headquarters in Geneva.

¹⁸ The IPCC cautioned that even if greenhouse gas concentrations in the atmosphere ceased growing, the climate would continue to warm for an extended period as a result of past emissions, and with more dramatic effects than were observed during the 20th century. If greenhouse gas emissions continue to increase, scientists project severe climate changes.

¹⁹ Recently, the intergovernmental panel on climate change (IPCC) and Albert Arnold (Al) George Jr has been honoured with the Noble price for peace 2007 for their efforts to build up and disseminate greater knowledge about man-made climate change and to

ethnic groups in Nigeria, 42% of which are estimated to be in the Niger-Delta.²⁷ The region is said to be one of the largest deltaic square miles and 145 local governments. It is also home to the world's third largest mangrove forest and the most extensive freshwater swamp forests in west and central Africa.²⁸

The population of the eight Niger Delta states is said to be roughly 28-30 million, a third of whom are living in the three main oil producing states,²⁹ that is, Delta, Rivers and Bayelsa. If Nigeria is a fried-ricer of many ethnic nationalities, the Niger Delta region itself is a mini-Nigeria in this regard. It is a place of enormous ethnic and linguistic plurality, largely consisting of five major ethnic classes. These include the Ijaw, Yoruba, Edo, Igbo and Delta Cross. The Ijaw constitutes the largest of the lot. The Ijaw, the largest nationality accounts for 10% of the Nigeria population.³⁰

When oil was first struck in the Nigerian Delta, there was understandably so much optimism that it would be a source of enormous development for the country.³¹ Many years on, the development level of Nigeria vis-a-vis the depth of expectation is not encouraging. A World Bank source says that 80% of the oil money goes to or is pocketed by 1% of the population with 70% of private wealth held abroad. Despite the wealth derived from the Niger-Delta, oil producing states fall below national average on virtually every measures of social and economic development.³²

The genesis of the problems of the Niger Delta can be traced generally to the environmental degradation arising from petroleum exploration and production but more specifically to years of neglect and apathy on the part of the Federal and State government.³³ Thus, there has been a

arranged by the Federal Government of Nigeria (FGN) and the Niger Delta Development Commission (NDDC) to address the environmental degradation in the Niger Delta region. The NDDC was established in 1992 to coordinate and implement the development of the Niger Delta region. It has since then been working to improve the living standards of the people in the region. The NDDC has been successful in many of its projects, including the construction of roads, bridges, and schools. It has also been successful in improving the health and education of the people in the region. The NDDC has been successful in many of its projects, including the construction of roads, bridges, and schools. It has also been successful in improving the health and education of the people in the region.

* We witnessed the environmental degradation in the Niger Delta region. The region is the source of the oil that is used in many of the products that we use in our daily lives. The region is also the source of the oil that is used in many of the products that we use in our daily lives. The region is also the source of the oil that is used in many of the products that we use in our daily lives.

3. See 'Niger Delta Development Commission: Environmental Degradation in the Niger Delta Region', *Poverty in the Niger Delta: A Nigerian Journal*, Vol. 1, No. 1, (2006), p. 10.

34 The delta region is the source of the oil that is used in many of the products that we use in our daily lives. The region is also the source of the oil that is used in many of the products that we use in our daily lives. The region is also the source of the oil that is used in many of the products that we use in our daily lives. The region is also the source of the oil that is used in many of the products that we use in our daily lives. The region is also the source of the oil that is used in many of the products that we use in our daily lives.

²⁷ Ibid

²⁸ Ibid

²⁹ Wahab Egbewole, *Millennium Development Goal and the Niger-Delta: The Jurist- A publication of the law students' society, university of Ilorin*, (2006), p. 36.

³⁰ Paul M Lubeck (n) 169.

³¹ Etikeentse G. *Nigerian Petroleum Law*, (2nd edn.), Predev Publishers, (2004), p. 6

³² Ibid

³³ <http://www.wikipedia.com>.

abuses, which has created a vicious cycle of increasing conflict and violence. The regional and ethnic conflicts are numerous that fully describing each is impossible and impractical. However, there have been a number of major confrontations that deserve elaboration.³⁷ Nigeria, after nearly four decades of oil production, had by early 1990s become almost completely dependent on petroleum extraction economically, generating 20% of its GDP.³⁸ Despite the vast wealth created by petroleum, the benefits have been slow to trickle down to the majority of the population, who since the 1980s have increasingly been forced to abandon their traditional agricultural practices. Annual production of both cash and food crops dropped significantly in the latter decades of 20th century.³⁹ In spite of the large number of skilled, well-paid Nigerians who have been employed by the oil corporations, the majority of Nigerians and most especially the people of the Niger Delta states and the far north have become poorer since the 1960s.

However, it is generally comprehended that the recurring crisis in the Niger Delta region is the product of the deep-seated sense of neglect and marginalization by the government and oil companies in supporting critical human development, infrastructure, and provision of basic social amenities.

Since the advent of oil exploration over four decades ago, the region has become the bread-winner of the nation, which is main source of foreign exchange earnings for the nation as a whole. Since 1975 till date, the region's oil resources accounts for 90% of the nation's export earnings. Still, the region remains the sick man of the nation, the least developed constituency of the country in physical and socio-economic terms.

As far as oil and gas are concerned, agitators for revenue from their proceeds forget to

discuss environmental problems emanating from exploration. Some of these problems involve the control of chemical substance capable of causing illness, intensive heat due to gas flaring, air and water pollution, these would possibly lead to extinction of animals in our bushes, stream or ponds, fishes in our rivers, stream or ponds, and the loss of human lives.⁴⁰

Whereas the issue of environmental hazards through the spillage and gas flaring continue to raise the question of risk and uncertainty that the people in the Niger-Delta face which have become subtle and vexing. Those who do not come from the area have different interests and perspective that define their levels of assessment of the merit and demerit of investing on environmental programme for Niger Deltans.⁴¹

What we see today in the Niger Delta, especially the oil and gas producing areas is total neglect of the environment as defined by scholars. Reason being that these environmental problems merge with other profound political dilemmas.⁴² Negligence of the Niger Delta environment has created so much tension that has become central to our political ambitions as a nation. But collectively, we see ourselves as Nigerians wanting to identify with the benefits from the proceeds of oil and gas. Unfortunately, not all of us see ourselves as Nigerians or want to identify with discussing or finding solution to environmental problems affecting those from the region where we generate our national wealth.⁴³

EFFECTS ON AGRICULTURE AND WATER

The impact of the activities of Multi National Companies which also assisted in climate change can best be understood from below activities which are the resulting effects of the activities of Multi National Companies taken place in the Niger Delta Region.

A). Natural Gas Flaring

Nigeria flares more natural gas associated with oil extraction than any other country on the planet. The reason for this practice,

³⁷ An example of the situation that requires an elaboration is the case of Ogoniland between 1992-1995.

³⁸ This has since risen to 40% as of year 2000.

³⁹ Cocoa production dropped by 43% (Nigeria was the world's largest cocoa exporter in 1960), rubber dropped by 29%, cotton by 65% and groundnuts by 64%.

⁴⁰ See David Ifode, Niger Delta and Environmental Issues retrieved through Google website.

⁴¹ Saro-wiwa, K, "I am Ashamed that I am a Nigerian". Citizen, vol.2, No.35, (1992) August 31-September 6, Pp12-13.

⁴² Ibid

⁴³ Ibid

which is universally agreed to be wasteful both economically and environmentally, is that in order to maximize production of crude oil, the associated gas accompanying it is often burnt off. This occurs because it is costly to separate commercially viable associated gas from the oil. Therefore, the AG found with oil is often burnt off, in order to increase crude production. Even though companies operating in Nigeria also harvest natural gas for commercial purposes, they prefer to extract natural gas from deposits where it is found in isolation. This isolated gas is known as non-associated gas.

Historically, gas flaring began simultaneously with oil extraction in the 1960s by Shell-BP. Although, the British government subsequently acknowledged that the flaring was acceptable; it was allowed to continue without any real efforts to change infrastructure and prevent the waste of the gas. This is in contrast to Britain's policies on gas flaring in their own territory, where gas flaring has been reduced to a minimum.⁴⁴

Along with the inefficiency of gas flaring, another problem gas flaring poses is the release of large amounts of methane, which has very high global warming potential. The methane is accompanied by the other major greenhouse gas, carbon dioxide, of which Nigeria was estimated to have emitted more than 3,438 metric tons of in 2002, accounting for about 50% of all industrial emissions in the country and 30% of the total carbon dioxide emissions. As flaring in the west has been minimized, in Nigeria, it has grown proportionally with oil production.⁴⁵

⁴⁴ In fact, in Western Europe 99% of associated gas is used or re-injected into the ground. Gas flaring is generally discouraged and condemned by the international community, as it contributes greatly to climate change, which ironically can display its most devastating effects in developing countries like Nigeria, and particularly in the semi-arid Sahel region of sub-Saharan Africa. The Niger Delta's low-lying plain is vulnerable as they lie only a few meters above sea-level.

⁴⁵ OPEC and Shell, the biggest flares of natural gas in Nigeria, alike claim that only 50% of all associated gas are burnt off via flaring at present. However, this statistic is accepted by few. The World Bank reported in 2004 that Nigeria currently flares 75% of the gas it

It seems that the international community, the Nigeria government, and the oil corporations are all in agreement that gas flaring has a negative impact and needs to be stopped. However, in reality, efforts at stemming gas flaring have been slow to be implemented. The practice of gas flaring, allowed since oil production began under the British, has become set in stone and an overhaul to reduce flaring would be costly. As a result, little is done by oil companies. This is in spite of the fact that gas flaring in Nigeria has technically been illegal since 1984 under the "Associated Gas Reinjection Act". However, none of the regulations stipulated by this document have ever been made public.

Gas flares can have potentially harmful effects on the health and livelihood of the communities in their vicinity, as they release a variety of poisonous chemicals. Just some of combustion by-products include nitrogen dioxide, sulphur dioxide, volatile organic compounds like benzene, toluene, xylene and hydrogen sulphide, as well as carcinogenic like benzopyrene and dioxin. Humans exposed to such substance can suffer from a variety of respiratory problems, which have been reported amongst many children in the Delta but have apparently gone uninvestigated. These chemicals can aggravate asthma, causing breathing difficulties and pain, as well as chronic bronchitis. Of particular note is that the chemical benzene, which is known to be emitted from gas flares in undocumented quantities, is well researched as being a causative agent for leukaemia and other blood-related diseases.⁴⁶

Gases flaring are often located close to local communities, and regularly lack adequate fencing or protection for villagers who may risk nearing the tremendous heat of the flares in order to carry out their daily activities.⁴⁷ Many of these communities claim that nearby flares cause acid rain which corrodes their homes and other local

produces. Between 70 and 75% is the generally accepted percentage of gas flared.

⁴⁶ Ahston-Jones, Susi Arnott and Douglas, Oronto: *The Human Ecosystems of the Niger Delta*. An ERA Handbook, Benin City: Environmental Rights Action, Nigeria (1998).

⁴⁷ Ibid

structures, many of which have zinc-based roofing. Some people resort to the use of asbestos-based material, which is stronger in repelling acid rain deterioration. Unfortunately, this only contributes to their own declining health and the health of the environment.⁴⁸

Flares which are often older and inefficient are rarely relocated away from villages, and are known to coat the land and communities in the area with soot and to damage adjacent vegetation. Almost no vegetation can grow in the area directly surrounding the flares due to the tremendous heat it produces.

B). Impacts on Fisheries

The fishing industry is an essential part of Nigeria's sustainability because it provides much needed protein and nutrient for people, but with the higher demand on fishing, fish populations are declining as they are being depleted faster than they are able to restore their number. Fishing needs to be limited along the Niger River and Aquacultures should be created to provide for the growing demand on the fishing industry.⁴⁹

Over fishing is not the only impact on marine communities. Climate change, habitat loss, and pollution are all added pressures to these important ecosystems. The Niger River is an important ecosystem that needs to be protected, for it is home to 36 families and nearly 250 species of fish, of 20 are endemic, meaning they are found nowhere else on Earth. With the loss of habitat and the climate getting warmer, every prevention of temperature increase is necessary to maintain some of the marine environments.

Other than restoring habitat, pollution can also be reduced. Problems such as pesticides from agricultural fields could be reduced if a natural pesticide was used, or the fields were moved farther away from the local waterways.⁵⁰ Oil pollution can be

⁴⁸ A study done by climate justice estimates that exposure to benzene would result in eight new cases of cancer yearly in Bayelsa State alone.

⁴⁹ Aquaculture allows for fish to be farmed for production and provide more jobs for the local people of Nigeria

⁵⁰ The Niger bank of the Niger River are desirable and ideal locations for people to settle. The river provides

lowered as well; if spills were reduced, the habitat and environmental impacts could be minimized. By limiting the devastation caused by disturbances to the marine environment, such as pollution, over fishing, and habitat loss, the productivity and biodiversity of the marine ecosystems would increase.

C). Impact of Oil Spillage on Agriculture

We all know that when there is an oil spill on water, spreading immediately takes place. The gaseous and liquid components evaporate. Some get dissolved in water and even oxide, and yet some undergo bacterial changes and eventually sink to the bottom by gravitational action.⁵¹ The soil is then contaminated with a gross effect upon the terrestrial life. As the evaporation of the volatile lower molecular weight component affects aerial life, so the dissolution of the less volatile components with resulting emulsified water, affects aquatic life.⁵² Oil spillage has a major impact on the ecosystem into which it is released. Immense tracts of the mangrove forests, which are especially susceptible to oil, have been destroyed. An estimated 5 to 10% of Nigerian mangrove ecosystems have been wiped out either by settlement or oil. The rain forest which previously occupied some 7,400 km square of land has disappeared as well.

Spills in populated areas often spread out over a wide area, destroying crops and aquacultures through contamination of the ground water and soils.⁵³ The consumption of dissolved oxygen by bacteria feeding on

water for drinking, bathing, cleaning, and fishing for both the dinner table and trading to make a profit. As the people have settled along the shores of the rivers and coasts, marine and terrestrial habitats are being lost and ecosystems are being drastically changed. The shoreline along the Niger River is important in maintaining the temperature of the water because the slightest change in water temperature can be fatal to certain marine species. Trees and shrubs provide shade and habitat for marine species, while reducing fluctuation in water temperature.

⁵¹ Nwoli, Peter C., and Olusegun T. Badejo, Impacts and Management of Oil Spill Pollution Along the Nigerian Coastal Areas, accessed through http://www.fig.net/pub/figpub/pub36/chapter_8.pdf on 14th July, 2010.

⁵² Ibid

⁵³ Ibid

the death of fishes. In agricultural communities, often a year's supply of food can be destroyed. Because of the careless nature of oil operation in the Delta, the environment is growing increasingly uninhabitable.⁵⁴

D). Impacts on Mangrove Forest

Vegetation in the Niger River Delta is comprised of extensive mangrove forests, brackish swamp forests, and rain forests. The largest expanses of mangrove forests are estimated to cover approximately 5,000 to 8,580 km square of land. Mangrove remains very important to the indigenous people of Nigeria as well as to the various organism that are inhabitants of these ecosystems.⁵⁵

Human impact from poor land management upstream coupled with the constant pollution of oil has caused five to ten percent of these mangrove forests to disappear. The volatile, quickly penetrating, and viscous properties of oil have wiped out large areas of vegetation. When spills occur close to and within the basin, the hydrologic powers of both the river and tides spilled oil to move up into areas of vegetation.⁵⁶

Mangrove forests are included in a highly complex tropic system. If oil directly affects any organism within an ecosystem, it can indirectly affect a host of other organisms. These floral communities rely on nutrient cycling, clean water, sunlight, and proper substrates. With ideal conditions they offer habitat structure, and input of energy via photosynthesis to the organism they interact with. The effects of oil spills on mangroves are known to acidify the soil, halt cellular respiration, and starve roots of vital oxygen.⁵⁷

An area of mangrove that has been destroyed by oil may be susceptible to other problems. These areas may not be suitable for any native plant growth until bacteria

and microorganism can remediate the conditions⁵⁸. The loss of mangrove forests is not only degrading life for plant and animals, but for humans as well. These systems are highly valued by the indigenous people living in the affected areas.⁵⁹ Mangrove forests have been a major source of wood for local individuals. They also are important to a variety of species vital to subsistence practices for local indigenous groups, who unfortunately see little to none of the economic benefits of oil.⁶⁰

Mangroves also provide essential habitat for rare and endangered species like the manatee and pygmy hippopotamus.⁶¹ Poor policy decisions regarding the allocation of oil revenue has caused political unrest in Nigeria. This clash among governing bodies, oil corporations, and the people of Nigeria has resulted in sabotage to oil pipelines, further exacerbating the threat to mangrove forests.

CONCLUSION

There is a need to harmonize man's need to survival and develop himself with the ecosystem. This correct and vital perception of the true relationship between man and ecosystem has given birth to the school which remains the bedrock of environmental protection. That is, School of Sustainable Development. The theory of sustainable development postulates that the

⁵⁸ Uyi-Ojo, Godwin, *The Tragedy of Oil Discovery, In Ogoni Trials and Travails* Lagos Civil Liberties organization, Nigeria (1996).

⁵⁹ A particular species of mangrove, *Rhizophora racemosalives* higher in the delta system, *Nypa fruticians*, quickly colonises the area. This invasive species has a shallow that destabilizes the banks along the waterway, further impacting sediment distribution lower in the delta system. *N. Fruticians* also impedes navigation and decrease overall biodiversity. In places where *N. Fruticians* has invaded, communities are investigating how the palm can be used by local people.

⁶⁰ Ibid

⁶¹ The future for mangrove forests and other floral communities is not all negative. Local and outside groups have provided funds and labour to remediate and restore the destroyed mangrove swamps. The federal government of Nigeria established the Nigeria Delta development commission (NNDC) in 2000 which aims to suppress the environmental and ecological impacts oil has had in the region. Government and non-governmental organizations have also utilized technology to identify the source and movement of oil spills.

⁵⁴ Ibid

⁵⁵ Aluko, M.A.O, social dimensions and consequences of environmental degradation in the Niger Delta of Nigeria. *Unilag Sociological Review*, (2000), 112-126.

⁵⁶ Ahston-Jones, Susi Arnott and Douglas, Oronto: *The Human Ecosystems of the Niger Delta. An ERA Handbook*, Benin City; Environmental Rights Action, Nigeria (1998).

⁵⁷ Ibid

only way you can ensure that the future generation is not compromised is by ensuring the protection of the environment. See for example, principle 4 of the Rio Declaration which states that environmental protection shall form an inseparable part of the developmental process which cannot be dealt with separately. It follows that goals of economic

and social development now have to be defined in all states in terms of sustainability. The role of law in achieving sustainable development has been little discussed but is crucial in regulating use of resources and the biosphere. New concepts are emerging such as the inherent rights or interest of future generations, of equitable utilization, and the precautionary principle.