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International and national policy responses to combating global warming and climate change in Nigeria

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Review article

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Abstract

Oil and gas exploration in Nigeria has contributed to global warming and climate change. The growing global impact of climate change and the need for resilience demand action to reform the impact thereof. This article reviews policy responses to reform climate change and global warming in Nigeria in light of oil exploration and gas flaring in the Niger Delta region. A desktop study of related literature, drawn from repositories such as SCOPUS, Google Scholar, and Web of Science, provided policy responses such as the Climate Change Act 2021, the implementation of the Nigeria Gas Flare Commercialisation Programme, and other gas utilisation programmes by the Nigerian National Petroleum Company, the Petroleum Industry Act 2021, and other global commitments to end gas flaring by 2030. The article reviews the provisions of climate change mitigation in these policy responses and how it was implemented in Nigeria. The review revealed the need for more commitment from Nigeria to various international agreements on climate change. It, therefore, recommends, among others, a better utilisation of gas from its oil-rich regions to meet the nation's power-generation need and other needs.

Keywords: Climate change, gas flaring, global warming, Kyoto Protocol, Paris Agreement, COP 26, COP 27, Nigeria

INTERNASIONALE EN NASIONALE BELEIDSREAKSIES OM AARDVERWARMING EN KLIMAATSVERANDERING IN NIGERIË TE BEKAMP

Olie- en gaseksplorasië in Nigerië het bygedra tot aardverwarming en klimaatsverandering. Die groeiende globale impak van klimaatsverandering en die behoefte aan veerkragtigheid vereis optrede om die impak daarvan te hervorm. Hierdie artikel hersien beleidsreaksies op die hervorming van klimaatsverandering en aardverwarming in Nigerië in die lig van olie-eksplorasië en gasopvlamming in die Niger Delta-streek. 'n Lessenaarstudie van verwante literatuur verkry uit databasisse soos SCOPUS, Google Scholar en Web of Science het beleidsreaksies verskaf soos die Wet op Klimaatsverandering 2021, die implementering van die Nigerië Gas Vlamming Kommersialiseringsprogram en ander gasbenuttingsprogramme deur die Nigeriese Nasionale Petroleum Maatskappy, die Petroleum Industry Act 2021, en ander wêreldwye verbintenisse om gasvlamming teen 2030 te beëindig. Die artikel hersien die bepalinge van die versagting van klimaatsverandering in hierdie beleidsreaksies en hoe dit in Nigerië geïmplementeer is. Die hersiening het die behoefte aan meer verbintenisse van Nigerië tot verskeie internasionale ooreenkomste oor klimaatsverandering aan die lig gebring. 'n Beter benutting van gas uit Nigerië se olieryke streke om in die land se kragopwekkingsbehoefte en ander behoeftes te voorsien, word aanbeveel.

MAANO A MACHABA LE A NAHA HO LOANTS'A HO FUTHUMALA HA LEFATŠE LE PHETOHO EA MAEMO A LEHOLIMO NIGERIA

Sengoliloeng sena se entse tlhahlobo e hlophisitsoeng ea lingoliloeng mabapi le maano a Nigeria a phetoho ea boemo ba leholimo le ho futhumala ha lefatše, khahlanong le semelo sa tšusumetso e ntseng e eketseha ea lefats'e ke phetoho ena, 'moho le tlhokahalo ea botsitso. Haholo-holo, e seka-seka kamahano ea Nigeria litumellanong

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le maanong a machaba amanang le phetoho ea maemo a leholimo - ho ikamahantsoe le tlhahlobo ea oli le ho phatloha ha khase seabakeng sa Niger-delta. Tlhahlobo ea komporo ea likopi tse amanang le lingoliloeng tse joalo ka SCOPUS, Google Scholar, le Web of Science e ile ea etsoa. Hape, likoranta tsa moo tsa letsatsi le letsatsi li ile tsa hlalohoa. Tsena li ile tsa eketsoa ka lingoliloeng tse fumanoeng setsing sa libuka le lirekoto sa Lefapha la Meralo ea Litoropo le Libaka, Profinseng ea Osun Nigeria. Tlhahlobo e senotse hore Nigeria e hloka ho eketsa boitlamo litumellanong tse fapaneng tsa machaba mabapi le phetoho ea boemo ba leholimo. Ka hona, har'a tse ling sengoliloeng se khothaletsa tšebeliso e betere ea khase ho tsoa libakeng tsa Nigeria tse nang le oli e ngata.

1. INTRODUCTION

The environment is where we live and development is what we do in attempting to improve our lot within that abode (Brundtland, 1987: 14). Various environmental challenges such as food shortages, climate change threat, loss of biodiversity, depletion of the ozone layer, endemic poverty, contamination and pollution by hazardous waste, as well as the problem of marine and atmospheric pollution have continued to manifest (Ismail & Umukoro, 2012; Olajide, 2022; Olujobi *et al.*, 2022). The impact of these challenges has led to a global appreciation of the vital nexus between the environment and the survival of humanity, as well as the need for the sustainable protection of this interaction.

In 1968, the UN General Assembly, by Resolution 2398 (XXIII), noted that there was “an urgent need for intensified action at national and international level to limit and, where possible, eliminate the impairment of the human environment” (Homer, 1971: 511). Although twenty years apart, the 1972 Stockholm Declaration (Sand, 2007: 33) and the 1992 Rio Declaration (Sand, 2007: 35) are outputs of the first and second global environmental conferences held by the United Nations. The Stockholm Declaration indicated the following: “A point has been reached in history when we must shape our actions throughout the world with a more

prudent care for their environmental consequences” (UN, 2022: 1). Both declarations undeniably represent major milestones in the evolution of international environmental law (Sand, 2007: 33-35).

Based on the 2022 Environmental Performance Index, Nigeria is ranked 162 out of 180 countries. This shows that Nigeria scores far below the average of all countries, especially in the categories ‘Environmental Health’ and ‘Climate Change Policy Objective’ (Wolf *et al.*, 2022: online). To combat climate change, several international and local policies have been formulated by different governments, including Nigeria. Yet, the country, like others in the Global South, is faced with activities that pose a climate change threat – including oil exploration. In 2019, the oil and gas sector in Nigeria accounted for 5.8% of real GDP and 95% of Nigeria’s foreign exchange earnings and contributes to 80% of its annual budget revenues (Nwuke, 2021). The country is the highest oil-producing country in Africa, with oil reserves estimated at 36,972 million barrels (PWC, 2019; Olujobi *et al.*, 2022; Olajide, 2022). Similarly, in 2018, Nigeria had the largest gas reserves in Africa and the 9th largest in the world with 5,675 billion cubic meters of natural gas (PWC, 2022). OPEC (2018) noted further that, globally, Nigeria accounts for 2.7% of proven gas reserves and produced 49.2 billion cubic meters of natural gas in 2018, which excludes gas flared or recycled. In oil-production activities, gas flaring is an unavoidable feature from the oil rigs, refineries, chemical and coal plants, where excess amounts of carbon dioxide, methane, and volatile organic compounds are released into the atmosphere, leading to the depletion of the ozone layer, acid rain, and global warming (PWC, 2019; Olajide, 2022; Olujobi *et al.*, 2022).

According to the World Bank, “gas flaring cost the global economy US\$20 billion in 2018 while in Nigeria estimates show that the Nigerian economy lost N233 billion (US\$761.6 million) to gas flaring which translates to 3.8% of global

total costs in 2018” (PWC, 2019: 3). The National Environmental Economic and Development Study (NEEDS) estimated the cost for gas flaring for climate change in Nigeria to amount to roughly N28.8 billion (US\$94 million) (PWC, 2019: 3).

Achieving a zero-carbon environment and sustainable societies in Nigeria requires that policies directed at attaining them be optimised. However, the optimality cannot be determined unless there is a thorough evaluation of existing policies, how they have been implemented, and the factors/challenges associated with their implementation. It is thus important to appraise both national and international policies on oil and gas exploration with a view to emphasising gas commercialisation and utilisation as a means to reduce gas flaring and combat climate change in Nigeria. The study reviews how these policies and agreements have been implemented in Nigeria, particularly in light of oil exploration and its associated gas flaring in the southern part of the country. This is done with a view to determining their effectiveness and suggest recommendations to strengthen the achievement of sustainable cities in Nigeria.

2. METHODS AND REVIEW APPROACH

The review provides an insight into policy responses to climate change and global warming, as it appraises the laws and regulations governing oil and gas exploration in Nigeria from the first legislation on gas flaring, the Petroleum (Drilling and Production) Regulation 1969 to the Petroleum Industry Act (PIA) 2021, and their inherent challenges as it affects the environment. First, the review summarises climate change and global warming and the implications thereof for the environment, human beings, and the economy in the global context. Secondly, the review introduces the contribution of gas flaring to global warming and climate change in Nigeria. Thirdly, global policies for abating climate change and global warming were reviewed as interventions that could help

developing countries understand climate change governance. In the discussion section, policy responses such as the provisions of the PIA Act 2021 and the Climate Change Act 2021 are highlighted in terms of the reforms embarked upon in Nigeria in light of oil exploration and gas flaring in the Niger-Delta. The implementation of the Nigeria Gas Flare Commercialisation Programme (NGFCP) and other gas utilisation programmes by the Nigerian National Petroleum Company (NNPC) as well as other global commitments to end gas flaring by 2030 are evaluated to determine how they have been able to address the issues relating to gas flaring in the Niger-Delta.

Qualitative research methods were employed for this study, primarily through the application of desktop research. Relevant materials used in this review consisted mainly of policies, strategies, legislation, and other documentation, obtained from online databases such as SCOPUS, Google Scholar, and Web of Science. A keyword search related to oil and gas exploration and its impact on climate change and global warming in Nigeria was performed between August 2021 and February 2022. Extracted documents that did not relate to policy responses were first excluded; thereafter, those that did not focus on issues relating to either Africa or Nigeria, were given less priority. Government sources were also prioritised to get statutes, laws, and other relevant legislations from the official Nigerian websites.

3. KEY ISSUES

3.1 Climate change and global warming

Climate change is “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time period” (UN, 1992: 3; UNEP, 2007: 517; UN, 2022). Global warming refers to an increase in average temperature of the earth’s near-surface air and oceans in recent decades and its

prospected continuation (IPCC, 2018: 51). Climate change is mainly caused by human activities that cause the presence of carbon dioxide, chlorofluorocarbons, methane, and nitrous oxides in the atmosphere. These pollutants trap long wave radiation emitted by the earth’s surface and prevent it from escaping, causing the earth to warm (the greenhouse effect) (Mushtaq, Bandh & Shafi, 2021: 89).

According to Oseni (2016), scientists from the Intergovernmental Panel on Climate Change (IPCC) predicted that the emission of greenhouse gases will alter the atmospheric temperature between 1.5°C and 4.5°C by the year 2030. It is predicted that very warm seasons would become more frequent, and that rainfall would increase and become more intense. Due to climate change, the global sea level in 2021 rose to 97mm above the 1993-2003 levels of 1.6-3.1mm per year. Between 1993 and 2021, the mean sea level rose in some ocean basins with 15-20cm (Lindsey, 2022: online). Such a rise would permanently submerge wetlands and lowlands, accelerate coastal erosion, exacerbate coastal flooding, and increase the salinity of underground water (Okorodudu-Fubara, 2007; Lindsey, 2022: online).

A changing global climate threatens species and ecosystems, and scientists fear that, by the end of the 21st century, 25% of existing species will be lost (UNEP, 2007). Increased numbers of hurricanes and cyclones, drought and desertification were predicted, resulting in expanded grassland and desert areas and shrinking forests (OECD, 2021). Vulnerable communities are already suffering from climate change variability, including the increasing drought in Africa (UNEP, 2002), the effects of Hurricane Katrina in 2005 in USA, the European heat wave of 2003 (UNEP, 2007). In the flood in May 2008, over 70,000 people were killed by an earthquake in southwest Sichuan province of China (Taylor, 2018).

Climate change has an impact on human health because an increase in temperature could result in higher

latitudes and altitudes, leading to the spread of tropical diseases such as malaria and other transmitting vectors disease organisms (Nel & Richards, 2022; Wu *et al.*, 2016: 14) with new diseases emerging in regions where they were previously not present.

The impact of climate change and global warming has been reported in different parts of Africa, especially for food security (WMO, 2022: 27). In Nigeria, decreasing fisheries resources in large lakes such as Lake Chad, attributed to the shrinking size and rising water temperatures, has been projected (Ogboi, 2012). It has been observed that a rise in temperature of 2°C has led to the shrinkage of land for the growing of Robusta coffee in Uganda (Adhikari, Nejadhashemi & Woznicki., 2015). In 2021, the hot and dry weather contributed to wildfires that burned thousands of hectares of land, damaging orchards, and affecting livestock in Morocco, Algeria, and Tunisia (WMO, 2022: 28). Persistent drought conditions of varying severity affect water availability and force communities to be displaced, in search of food, water, pastures, and humanitarian services (WMO, 2022: 29).

While a consensus exists that there will be some form of climate change if polluting emission is not reduced, there remains scientific uncertainty about the precise nature and extent of its effects, and this presents a problem for policymakers (OECD, 2021).

3.2 Climate change, global warming, and gas flaring in Nigeria

Gas flaring occurs when natural gas is brought to the surface but cannot easily be used; it is burned for disposal or “flared” (Thurber, 2019: online). Flaring releases black carbon and methane emissions and these emissions increase the concentration of greenhouse gases (GHG) in the atmosphere, which, in turn, contribute to global warming (Ismail & Umukoro, 2012). According to the IPCC, (2018), methane is over 80 times more powerful than carbon dioxide as a warming gas, thus contributing significantly to global

warming. Black carbon may have the second-largest warming effect on the atmosphere, after carbon dioxide. Scientists believe that it increases the rate at which snow and ice are melting (Stohl *et al.*, 2013: 8833).

Flaring is associated with acid rain, which is the incineration of sour gas that produces sulphur oxides that are released into the atmosphere (Ismail & Umukoro, 2012). Acid rain results in environmental degradation, including soil and water contamination, and have an impact on agriculture and forests (Odjugo & Osemwenkhae, 2009: 408). In Nigeria, the acid rain caused by gas flaring has altered the vegetation of the Niger Delta area (Clinton-Ezekwe *et al.*, 2022: 62). In some cases, there is no vegetation in the areas surrounding the flare, due partly to the tremendous heat that is produced and the acid nature of the soil pH.

Gas flaring has health implications for human beings (Ismail & Umukoro, 2012). Communities near gas-flaring areas suffer from increased health risks, including premature deaths, respiratory illnesses, asthma, and cancer (Clinton-Ezekwe *et al.*, 2022: 62). In Nigeria, local people near gas-flaring areas complain of respiratory problems such as asthma and bronchitis.

Gas flaring also severely impacts on the economics of a nation, in terms of the loss of funds and revenue, which it could have realised if it had conserved gas instead of flaring it (Ismail & Umukoro, 2012). Nigeria has the 9th largest non-associated and associated gas (produced during oil extraction) resource in the world, and this natural gas resource outnumbers its oil reserves (Olujobi *et al.*, 2022). Despite this, Nigeria has consistently fallen short of satisfying its domestic gas obligations (PWC, 2022). Prior to 1999, flared natural gas that was produced alongside crude oil left the domestic gas market mostly undeveloped. With the country's growing population, natural gas is viewed as essential to the country's long-term economic development. The Federal Government established the Nigerian Gas Master Plan

(NGMP) and other initiatives to make it possible to use rather than flare natural gas (NNPC, 2013). The NGMP enables private sectors (both local and foreign) to invest in the gas industry and build the infrastructure (such as pipelines) needed to capture, store, and transport the associated gas to market and thus address the gas-flaring problem. The first component of the infrastructure required the construction of Central Processing Facilities (CPFs) in the Niger Delta region to process wet gas supply to onshore gas-transportation networks and industrial plants (Boise, 2019). According to the NGMP, about 590km of gas pipelines have been completed and put into service. The NGMP developed the domestic gas supply to solve issues in the domestic market and offer a pricing mechanism for wholesale gas supply. The domestic supply obligation is divided into an annual delivery requirement on all gas producers (*i.e.*, delivery to the closest gas-transmission infrastructure), with total obligations equalling the anticipated domestic gas demand (IEA, 2017). Different gas prices were suggested by the National Domestic Gas Supply and Pricing Regulations of 2008 for various consumer groups. While being a strategic aggregator, the Gas Aggregation Company of Nigeria (GACN) was founded to oversee the implementation of the domestic supply requirement and aggregate pricing (IEA, 2017).

To fulfil the main goal of the NGMP, namely to completely use the massive gas reserves, the Nigerian National Petroleum Company (NNPC) and other significant Exploration and Production (E&P) operators have started several gas utilisation and commercialisation projects. The Escravos Gas-to-Liquid project is a Chevron initiative created to utilise the Fischer-Troph Process to process the abundant gas supplies of the Escravos field (Olujobi *et al.*, 2022). The Escravos Gasto-Liquid facility, constructed with a \$1.7 billion total investment cost, has a daily capacity of 34,000 barrels and it is targeted for the export of Liquefied Petroleum Gas.

Another gas commercialisation initiative is the West African Gas Pipeline Project (WAGP), a joint venture with different percentage shareholders involving Chevron (36.7%), NNPC (25%), Shell Overseas Holdings Limited (18%), Société Togolaise de Gaz and Société Ben Gas, 2% each) (Ubani & Ani, 2016: 533). The WAGP is responsible for delivering gas from Nigeria to Ghana, Benin, and Togo, all in Africa. Other natural gas Projects are the Trans-Sahara Gas Pipeline and the Domestic Gas Distribution Network (Olujobi *et al.*, 2022). A joint venture between NNPC and Shell is working on the Belema Gas Injection Project (IEA, 2022).

3.3 Policies for abating climate change

Several policy interventions have been directed towards abating both the incidence and the impact of climate change. Except for international policies, national policies have been formulated differently, depending on the technical know-how, financial and technological capacity, as well as political will in countries. The level of commitment to international policies by constituent nations also varies. Usually, highly influential nations are more prepared for climate change realities than their counterparts (IMF, 2019; OECD, 2021). Nonetheless, global cooperation is needed to help developing countries understand climate-change governance. To do that, responsibility for GHG emissions over time and across countries should be differentiated, and policies that are effective enough should be implemented (Luomi, 2020: 1). Global policy responses to climate-change interventions include the United Nations Framework Convention on Climate Change ([UNFCCC], 1992), the Kyoto Protocol (1997), the Paris Agreement (2015), COP 26, and COP 27.

3.3.1 The United Nations Framework Convention on Climate Change (UNFCCC 1992)

The UNFCCC is a framework convention which includes that developed countries must strive to reduce their overall emission of greenhouse gases to the 1990 level (49% less annual greenhouse gas effect in 2021) (NOAA, 2022). Roughly 154 countries signed the Framework Convention and agreed to set up a procedure for monitoring scientific advances in climate change, so that modifications could be undertaken, if necessary. Although the developed countries have a general commitment to make financial and technological transfer to developing countries, all parties are expected to keep inventories of GHGs as well as develop national mitigation and adaptation programmes to combat climate change.

The objective of the Convention is to stabilise GHGs levels in the atmosphere within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner. The developed countries are to develop a leadership role in reducing GHGs emissions in line with the 'common but, differentiated responsibility principles' epitomised by the Berlin Mandate of 1995. All the nations of the world were to assume responsibility in combating the threat of climate change.

Following the first report of the IPCC, formed in 1988 by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) in 1990, two years after its formation, the IPCC stated that it had reason to believe two matters: that the world was warming, and that man was responsible. In line with the earlier resolution of the Stockholm Conference to be meeting every decade, another world environmental conference was held in Rio de Janeiro in 1992 as the Second Earth Summit. As the name of the treaty

implies, it was not a full-blown action plan to combat climate change but simply a framework that was later filled by other meetings such as the Conference of Parties (COP) and Members of Parties (MOP). During the COP1 meeting in Berlin in 1995, the Berlin Mandate committed developed nations to the elaboration of national policies and measures to limit and reduce GHGs emissions. The COP2 meeting in Geneva, in 1996, adopted the Ministerial Declaration which firmly stated that the science of climate change was compelling and that legally binding commitment was warranted.

3.3.2 The Kyoto Protocol 1997

The Kyoto Protocol, an international agreement linked to the UNFCCC, sets binding targets for 37 industrialised countries and the European community for reducing GHGs emissions. The Protocol, using the 'common but differentiated responsibilities' principle, places a heavier burden on developed nations who, in roughly 15 years of industrial activity, are principally responsible for the current high levels of GHG emission in the atmosphere.

The signing of the Kyoto Protocol in 1997 is viewed as an important first step towards a truly global emission reduction regime that will stabilise GHG emissions and provide the essential architecture for any future international agreement on climate change (UNFCC, 2016). Effective from 2005, the Kyoto Protocol is rated as the highest international measure, its targets and timetables or qualified emissions limitation and reduction activities for industrialised parties (specified in the agreement) to reduce their net emission of GHGs. The implications of the Kyoto Protocol demanded legal commitments by the parties regarding emission trading, joint implementation projects, clean development mechanism, voluntary assumption of commitments, targets and time frame for emission reduction, as well as financial resources, policies, and measures (UNFCC, 2016). After intense negotiation in Kyoto Japan, the developed countries agreed to

reduce GHGs to 5% below their 1990 levels between 2008 and 2012.

3.3.3 The Paris Agreement 2015

The Paris Agreement is COP 21 of the UNFCCC and a watershed point in the global climate change negotiations to limit GHGs by mapping out an entirely new climate agenda (UNFCC, 2016). It is the first legally binding international treaty committing 195 parties (developed and developing countries) to kick-start climate change action and investment towards the goal of limiting global temperature increase to "well below 2°C" (UNFCC, 2016: online).

Parties equally had to perceive the possibility of increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low GHGs emission development in a manner that does not threaten food production (UNFCC, 2016). In line with the goal of sustainable development, in the agreement, the developed countries were poised to making financial flows consistent with a pathway towards low GHGs emission and climate-resilient development (UNFCC, 2016). The IPCC was mandated to develop a report by 2018 on how to reach this goal.

Finally, the Paris Agreement builds upon a history of international agreements. The 1992 UNFCCC set priority to "[s]tabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UN, 1992: 3). Based on the Kyoto agreements (1997), industries saw GHGs reductions and, in 2009, the COP15 in Copenhagen produced the Copenhagen Accord which was expanded and formally adopted in 2010 as the Cancun Agreement, where dozens of countries including the United States, China, the European Union, and India committed to reducing their emissions by 2020. Countries also agreed to a new set of mechanisms to help developing countries reduce emissions and adapt to climate change, as well as a new system to track countries' progress on their commitment. In

2011, the climate negotiation in Durban, South Africa, set 2015 as the deadline for a new international agreement that is 'applicable to all'.

The Agreement in Paris was built on the foundation laid earlier by the UNFCCC, the Copenhagen and Cancun Agreements. This informed the Paris Agreement to set minimum obligations for countries, implementing mechanisms to spur additional action in developing countries, supporting the most vulnerable countries in addressing climate change, and establishing systems to hold countries to their respective commitments. The climate objectives and measures contained in the countries' climate action plan is their Nationally Determined Contribution (NDC) and shows what they intend to achieve. Parties shall pursue domestic mitigation measures to achieve NDC. The NDCs are voluntary in nature, but legal requirements are contained in the plans, whereby countries publicly report on their progress in curbing emission compared to their plans every five years, starting from 2023 (UNFCC, 2016). The year 2023 will mark the year for the first global review to assess and provide suggestions to each country on their collective achievements towards the 2°C goal, with subsequent reviews every five years. Although countries are legally required to monitor and report on their emission levels and reduction, using a universal accounting system (UNFCC, 2016), no enforcement mechanism or infringement procedure is foreseen. The Paris Agreement is based on a system of global peer pressure.

It can be said that the Paris Agreement has comparatively strong procedural obligations, as it specifically requires countries to individually prepare, communicate, and maintain successive NDCs that they intend to achieve; provide information necessary for clarity, transparency, and understanding, when communicating their NDCs; communicate a successive NDC every five years which will represent a progression beyond the party's current NDC; account for its NDC so as to promote

environmental integrity and avoid double counting, and regularly provide a national GHG inventory and the information necessary to track progress in implementing and achieving its NDC (UNFCC, 2016).

3.3.4 COP 26 and COP 27

During the COP 26 meeting of the UNFCCC in Scotland in 2021, stakeholders reiterated their commitments to achieve the goals of the Paris Agreement by reducing gas flaring, which is a major source of GHGs emissions (UN, 2016; UN, 2021). COP 26 adopted the Glasgow Climate Pact, when participating countries unanimously agreed to either update or formulate new NDC emissions targets to cover about 80% of the world's emissions (Moller & Muhammed, 2021: 2).

In 2022, the COP 27 meeting of the UNFCCC in Egypt built on COP 26 to act in mitigating the global climate emergency. COP 27 renewed solidarity between countries to deliver on the Paris Agreement. COP 27 was concluded with a historic decision to establish and operationalise a loss and damage fund. Members were poised to rekindle the fight for climate justice and climate ambition to win the battle against fossil fuels. During the conference, the nexus between the Sustainable Development Goals (SDGs) and key areas of climate action and solutions being advanced included renewable energy and the need for a just and green transition.

The new climate deal saw a universal commitment of all countries to decarbonise their economies, which is expected to result in strong energy deployment on a global scale. This can drive down technology costs and create new market opportunities. Developed countries have already included renewable energy in their plans to meet their mitigation targets. Japan, for example, aims to derive 22%-24% of its electricity production from renewable sources by the year 2030, and the European Union plans to achieve 27% of renewable energy in its energy consumption. Over 160 countries now have renewable energy targets and policies (REN21, 2015). By 2025, the USA planned to cut economy-wide emissions of

GHG emission by 26%-28% below its 2005 level. By 2030, China aims to increase the use of non-fossil fuels to 20% and reduce carbon emission per unit Gross Domestic Product (GDP) by 65% from 2005 level. By 2030, India is to reduce emissions intensity by 35% down to the 2005 levels, increase cumulative electric power installed capacity from non-fossil fuel energy resources to 40%, and create additional carbon sequestration of 2.5 to 3 billion tons of carbon dioxide equivalent.

Developing countries are also setting targets to cut down the use of fossil fuels to power their economies. Cote d'Ivoire, for example, aims to use 16% less fossil fuels by 2030. Many countries with forest reserves are working towards halting deforestation trends. Forests are very important in this battle against greenhouse gases, as they serve as "carbon sinks" that are beneficial for adaptation and the preservation of biodiversity. The Democratic Republic of Congo intends to plant roughly 3 million hectares of forest by 2050, while Mexico aims to halt deforestation by 2030.

4. DISCUSSION

Based on the review, as signatories to different international agreements, countries across the globe have been readjusting to commit themselves to put these agreements into action. Countries responsible for over 80% of global GHG emissions made specific commitments to reduce their emission by 2020 as part of the Copenhagen and Cancun agreements. The Paris Agreement includes commitments that go beyond 2020, reflecting a greater level of ambition than in the previous commitments (UNFCC, 2014). Countries' emission reduction commitments reflect their different levels of development and capabilities. Whereas developing countries and emerging economies have committed to targets that reflect their level of development and historic contribution to climate change (e.g., GHG intensity targets).

Nigeria acceded to the Kyoto Protocol on the 10 December 2004

and, by virtue of Article 25(3), the Protocol shall enter into force for each state that ratifies, accepts, or approves it on the 90th day following the date of deposit of its instrument of ratification, acceptance, approval, or accession. Nigeria harbours a peculiar and uncertain environmental situation, taking into consideration the desert encroachment in the north and the rise in sea level leading to flooding in the south, which calls for well-articulated, accelerated, and organised remedial action plan on global warming. According to a World Bank Report on the environmental effects of gas flaring in Nigeria, it is estimated that the total emission of CO₂ from gas flaring in Nigeria amounts to 35 million tons/year, with methane from Delta and Rivers States expected to contribute to roughly 12 million tons per year (UNDP, 2005; Olajide, 2022).

Evidence of glaring adverse environmental and health effects in the Niger Delta vicinity of gas flaring includes asthma, bronchitis, skin problems, and respiratory illnesses, due to atmospheric pollution, acid rain, and acidic deposition of air pollutants harming the ecosystem (Olajide, 2022). The vulnerability of Nigeria to climate change is influenced by the country's population distribution and population concentrations in large centres. The outcomes include the devastating experience of acute soil erosion in Anambra State, flooding in coastal states of Rivers, Bayelsa, Delta, Edo and Lagos, as well as desertification in states such as Katsina, Borno, Kano, Sokoto, Kebbi, and Yobe. Lake Chad, which supports a population of over 20 million people and covers approximately 25,000km² in the 1960s, has dwindled to less than 2,500km² at present and is still receding, hence posing a serious threat to life sustenance and environment of the subregion (Suleiman, 2009).

The first legislation on gas flaring, the Petroleum (Drilling and Production) Regulation of 1969 Reg. 42, as recorded by Olujobi *et al.* (2022) states the following:

“Not later than five years after the commencement of production

from the relevant area, the licensee or lessee shall submit to the Minister any feasibility program proposal that he may have for the utilization of any natural gas, whether associated with oil or not, which has been discovered in a relevant area”.

This ‘grandfather’ statutory clause on gas flaring clearly did not prohibit gas flaring nor did it prescribe a penalty for breach of express statutory requirement. Oil operators were thus much at liberty with the choice to flare or not and the regulator/government often turned a blind eye or looked in the opposite direction, sometimes dealing the blows at the protesting local victims, not the violator of the law. The next important but short-lived legislation was the Associated Gas Re-Injection Decree 1979 promulgated by the military regime of General Olusegun Obasanjo's administration, which specifically required oil companies to submit a preliminary programme for gas re-injection; ceased gas flaring, and prescribed a penalty for contravention of the Decree (Olujobi *et al.*, 2022). The target date of submission of the programme and implementation plan was 1 April 1980, with the target date of cessation of gas flaring fixed for the 1 January 1984. As the above regime was no longer in power to implement the policy in 1985, the Associated Gas Re-Injection (Amendment) Decree promulgated by Major General Buhari's administration amended the 1979 Decree to permit companies engaged in the production of oil and gas to continue to flare on payment of a prescribed fee.

The Government has failed to show the will to legislate an outright ban on gas flaring. The flare for fee legislation is not in the spirit of sustainable development. Despite the legislative naivety, the Federal Government in the budget set a target date of 2010 for all oil-producing companies to pull out of all gas flaring in their operational areas (Tattersall, 2010). Equally SPDC, the largest oil company in the country, announced that it was committed to ‘flare down’, by adapting the following policy options: developing new local and international markets; backing out non-associated gas

supplies with gas currently being flared, and accelerating where possible the injection of flared gas. SPDC declared that it is on course to meeting its target of eliminating all routine flaring of gas by 2008, subject to funding, executive capacity, and conducive operating environment (SPDC, 2003).

The Parliament has addressed bills such as the Gas Flaring Bill 2009 to stop the environmental hazards in the Niger Delta region (Olujobi *et al.*, 2022). The Proposed National Desertification Control Commission Bill, which is presently at the committee stage and subject to scrutiny by the Senate Committee on establishment matters as a leading committee on Environment and Ecology, is intended to deal with the desert encroachment in the north. The Proposed Commission Bill has the responsibility and mandate of coming up with implementable policies to combat desertification not by planting trees only because that is only one part, but by coming up with strategies that will ensure sustainability in the implementation and strategies that will also help in one way or the other alleviate poverty (PWC, 2021).

The Gas Flaring (Prohibition and Punishment) Bill 2020 was proposed in Nigeria to prohibit gas flaring and to impose on the UN in 2021, pledged to end gas flaring by 2030 and has signed up to the Global Methane Pledge promising to cut emissions by 30%, along with 110 countries. Agencies whose mandate has to do with the Act include the Nigerian Institute of Geological and Mining Research; the Nigeria Institute of Oceanography; the Nigeria Meteorological Agency (NIMET); the Nigeria Communication Commission, and the Nigerian Regulatory Commission (NERC). Others are the Nigerian Atomic Energy Commission; the Nigerian Academy of Sciences; the National Planning Commission; the Power Holding Company of Nigeria; the Manufacturers Association of Nigeria; the Energy Commission of Nigeria; the Nigerian Society of Engineers, and the Nigerian National Petroleum Corporation (Olajide, 2022).

Another step to combat the gas-flaring challenge in Nigeria has been the recent promulgation to law of the Petroleum Industry Act (PIA) 2021, which, in sections 102(1)(a)(b), (2), (3)(a)(b)(4)(5)(6) of the Act requires a licensee or lessee who engages in upstream and midstream petroleum operations to, within one year of the effective date or six months after the grant of the applicable license or lease, submit for approval an environmental management plan regarding projects that require an environmental impact assessment (EIA) to the authority. This EIA must correspond with the extant laws on environmental standards. Section 103(1)(2) of the Act requires financial contributions to an environmental remediation fund set up by the authority for the restoration of the environment (PIA, 2021; Nwuke, 2022).

Section 104 (1)(2)(3)(4) of the PIA 2021 provides that the licensee or lessee or a marginal field operator can only flare or vent gas in case of emergency and final Section 107 of the Act provides that gas can only be flared for testing of gas equipment or plant, and failure would occasion a fine as prescribed by the commission (Olujobi *et al.*, 2022; Nwuke, 2021). The fees received from gas-flaring penalties are utilised for environmental remediation and relief of the host communities of the settlers on which the fines are imposed. Therefore, the innovations in the PIA 2021 including, among others, the Host Community Development Trust Fund (HCDF), with the objective to foster sustainability, and provide direct economic benefits to the host communities who will own the projects in their host communities, will ensure a cordial relationship between the host community and the licensees or lessees. Similarly, PIA 2021 also makes provision for two commissions, the Nigerian Upstream Petroleum Authority (NUPRC) and the Nigerian Midstream and Downstream Authority (NMDPRA) with the responsibility for technical and commercial regulations of the petroleum operations in their respective domains (Nwuke, 2021;

Moller & Mohammed, 2021). Another major innovation with PIA 2021 is the commercialisation of the epileptic NNPC refineries that have swallowed huge sums of monies over the years in turn-around maintenance without producing a single drop of fuel (Nwuke, 2021).

The Nigerian Government has embarked on a series of reforms in the gas-flaring sector, in order to diversify its economy, reduce wastage of natural resources, reduce environmental degradation, ensure a safe and healthy living environment, and combat the glooming challenges of climate change, by signing into law the Climate Change Act in 2021, the implementation of the Nigeria Gas Flare Commercialisation Programme (NGFCP) and other gas utilisation programmes by the Nigerian National Petroleum Company (NNPC), the signing into law of the PIA 2021, and other global commitments to end gas flaring by 2030. There has been poor enforcement, due to lack of strong political will of the government to enforce its anti-gas-flaring laws and regulations which has been the challenge working against its efficiency.

5. CONCLUSION AND RECOMMENDATION

The study appraised both national and international policies and reforms governing oil and gas exploration, with the emphasis on gas commercialisation and utilisation as a mitigation measure to reduce gas flaring in the Niger Delta region to combating climate change in Nigeria. The study indicates that global warming is a threat, hence the need for international cooperation and commitment for managing the phenomenon. All governments developed or developing, rich or poor, democratic or undemocratic have to adapt a more proactive international role in safeguarding planet earth through innovative multilateral agreements, practices, and national control with honest and effective monitoring and implementation mechanisms.

Developing countries are vulnerable to climate change and thus need

to show more commitment and seriousness into the drive to combat global warming. Nigeria, for instance, would find it difficult to mitigate the adverse effect of hurricanes, flooding, and desertification alone; they should, along with other developing countries, come forward in the fight against climate change rather than keep on shifting the goal post. The involvement of the private sector such as banks and other financial institutions, governmental and non-governmental organisations such as ICUN, GEF, UNEP, UNDP, the Earth Council, the Green Peace, and NGOs can contribute significantly to the campaign against global warming. It is noteworthy to mention the singular contributions of Prof. Wangari Mathai of Kenya who started the Green Revolution Movement in her country in the 1970s. Its aim was to encourage individuals to plant at least one tree. Today, in Kenya, to her credit, over three million trees have been planted. Other mitigating strategies may include:

1. Creating environmental awareness and education pursued by governments, NGOs, educational institutions, religious bodies, social clubs, industries, and cooperative societies.
2. Recognise and emphasise the fact that we all live in a global village and need to facilitate mutual cooperation and concerted actions to preserve the environment and exploit it for sustainable development.
3. Afforestation and preservation of forests, by planting trees on vast land and the preservation of existing forests to serve as a sink to contain the CO₂ in the atmosphere.
4. Better utilisation of flared gas. If gas that is predominantly flared in some oil-producing countries is utilised, it will reduce the level of GHGs emission into the atmosphere, as gas contains less carbon than fossil fuels. The Federal Government of Nigeria's commitment on flaring down directives is a positive step in the right direction.
5. Diversification or use of alternative energy sources in Nigeria such as solar energy, wind energy, and ethanol look

beyond crude oil exploitation and shift to more aggressively tapping alternative sustainable energy resources. For instance, the development of solar energy as a source of energy, as it is used in other third-world countries such as India, Botswana, and China, where millions of homes get energy from solar cells, should be encouraged. The implementation of solar energy can solve the electricity supply in Nigeria without emitting carbon dioxide.

6. Gas commercialisation also has great potential to create industries particularly for domestic gas bottles production, job creation, chain value addition that will equally reduce flaring, mitigate on climate change, and sustain the environment.
7. The Host Community Development Trust Fund (HCDTF), with the objective to foster sustainability, and to provide direct economic benefits to the host communities, is a welcome development, as it will go a long way to ensure a harmonious relationship between the host community and the licensees or lessees. HCDTF ensures that community projects are transferred to the host communities who will own these projects, thereby ensuring a sustainable, healthy living environment for human habitation.
8. One of the major challenges with the poor environmental management in Nigeria has to do with poor implementation of the regulations. Nigeria is a signatory to environmental treaties or regulations but it does not ensure their implementation. The PIA 2021 is monitored by two commissions, the upstream and downstream regulatory commissions which will monitor the implementation of the operations within their respective domains, acquire and dispose of property, and can sue and be sued, thereby ensuring its justiciable nature.

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