A Jurisprudential Analysis of the Climate Change Act, 2021 and the Challenges of its Enforcement

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Abstract

Climate change is causing planetary tipping points, with earth hitting temperature records and extreme events affecting communities in every state of Nigeria and other parts of the world, with weather and climate disasters costing huge sums of money as a result. These adverse impacts are expected to worsen in the coming years, and the window of opportunity to ensure a liveable future is closing rapidly. In order to course-correct, this research analysed the Climate Change Act, 2021 so as to identify the gaps to bridge, barriers to overcome and opportunities to replicate and scale up. The research adopted a doctrinal research methodology wherein both primary and secondary source of materials were consulted and utilised. The research found the challenges of climate change in Nigeria and the implementation of the climate change Act, 2021 in particular to include corruption, lack of political will on the part of the government to implement and enforcement the Act, endemic poverty of the people, inadequate funding etc. The research therefore made recommendations to address the challenges including the need for governments at all levels to support systems transformations that mainstream climate resilience, low greenhouse gas (GHG) emissions development and credible, accountable and transparent actions by all stakeholders to strengthen these efforts, in addition to the adoption of nature-based solutions, among others.

Keywords: Climate Change, Mitigation, Adaptation, Resilience and Enforcement.

I. Introduction

Climate is sometimes mistaken for weather. But climate is different from weather because it is measured over a long period of time, whereas weather can change from day to day, or from year to year. The climate of an area includes seasonal temperature and rainfall averages, and wind patterns. Different places have different climates. A

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desert, for example, is referred to as an arid climate because little water falls, as rain or snow, during the year. Other types of climates include tropical climates, which are hot and humid, and temperate climates, which have warm summers and cooler winters.[1]

Climate change is the long-term alteration of temperature and typical weather patterns in a particular location or the planet as a whole.[2] In other words, climate change is periodic modification of Earth's climate brought about as a result of changes in the atmosphere as well as interactions between the atmosphere and various other geologic, chemical, biological, and geographic factors within the Earth system. The atmosphere is a dynamic fluid that is continually in motion. Both its physical properties and its rate and direction of motion are influenced by a variety of factors, including solar radiation, the geographic position of continents, ocean currents, the location and orientation of mountain ranges, atmospheric chemistry, and vegetation growing on the land surface.[3] All these factors change through time. Some factors, such as the distribution of heat within the oceans, atmospheric chemistry, and surface vegetation, change at very short timescales. Others, such as the position of continents and the location and height of mountain ranges, change over very long timescales. Therefore, climate, which results from the physical properties and motion of the atmosphere, varies at every conceivable timescale.

Climate change may cause weather patterns to be less predictable. These unexpected weather patterns can make it difficult to maintain and grow crops in regions that rely on farming because expected temperature and rainfall levels can no longer be relied on. Climate change has also been connected with other damaging weather events such as more frequent and more intense hurricanes, floods, downpours, and winter storms. In polar regions, the warming global temperatures associated with climate change have meant ice sheets and glaciers are melting at an accelerated rate from season to season. This contributes to sea levels rising in different regions of the planet. Together with expanding ocean waters due to rising temperatures, the

1. https://education.nationalgeographic.org/resource/climate-change/-accessed on 13/02/2024
2. Ibid.
3. See Stephen T, Jackson, climate change: https://www.britannica.com/science/climate-change/Greenhouse-gases> accessed on 13/02/2024

resulting rise in sea level has begun to damage coastlines as a result of increased flooding and erosion.

The cause of current climate change is largely human activity, like burning fossil fuels, like natural gas, oil, and coal. Burning these materials releases what are called greenhouse gases into Earth's atmosphere. There, these gases trap heat from the sun's rays inside the atmosphere causing Earth's average temperature to rise. This rise in the planet's temperature is called global warming. The warming of the planet impacts local and regional climates. Throughout Earth's history, climate has continually changed. When occurring naturally, this is a slow process that has taken place over hundreds and thousands of years. The human influenced climate change that is happening now is occurring at a much faster rate.[4]

The main greenhouse gases that are causing climate change include carbon dioxide and methane. These come from using gasoline for driving a car or coal for heating a building, for example. Clearing land and cutting down forests can also release carbon dioxide. Agriculture, oil and gas operations are major sources of methane emissions. Energy, industry, transport, buildings, agriculture and land use are among the main sectors causing greenhouse gases.

The consequences of climate change now include, among others, intense droughts, water scarcity, severe fires, rising sea levels, flooding, melting polar ice, catastrophic storms and declining biodiversity. Climate change can affect our health, ability to grow food, housing, safety and work. Some of us are already more vulnerable to climate impacts, such as people living in small island nations and other developing countries. Conditions like sea-level rise and saltwater intrusion have advanced to the point where whole communities have had to relocate, and protracted droughts are putting people at risk of famine. In the future, the number of people displaced by weather-related events is expected to rise.

In a series of UN reports, thousands of scientists and government reviewers agreed that limiting global temperature rise to no more than 1.5°C would help us avoid the worst climate impacts and maintain a livable climate. Yet policies currently in place point to a 3°C temperature rise by the end of the century. The emissions that cause

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4. https://education.nationalgeographic.org/resource/climate-change/-13/02/2024> accessed on 13/02/2024

climate change come from every part of the world and affect everyone, but some countries produce much more than others. The seven biggest emitters alone (China, the United States of America, India, the European Union, Indonesia, the Russian Federation, and Brazil) accounted for about half of all global greenhouse gas emissions in 2020. Everyone must take climate action, but people and countries creating more of the problem have a greater responsibility to act first. Many climate change solutions can deliver economic benefits while improving our lives and protecting the environment. We also have global frameworks and agreements to guide progress, such as the Sustainable Development Goals, the UN Framework Convention on Climate Change and the Paris Agreement. Three broad categories of action are: cutting emissions, adapting to climate impacts and financing required adjustments.

Switching energy systems from fossil fuels to renewables like solar or wind will reduce the emissions driving climate change. But we have to act now. While a growing number of countries is committing to net zero emissions by 2050, emissions must be cut in half by 2030 to keep warming below 1.5°C. Achieving this means huge declines in the use of coal, oil and gas: over two-thirds of today's proven reserves of fossil fuels need to be kept in the ground by 2050 in order to prevent catastrophic levels of climate change.

Adapting to climate consequences protects people, homes, businesses, livelihoods, infrastructure and natural ecosystems. It covers current impacts and those likely in the future. Adaptation will be required everywhere, but must be prioritized now for the most vulnerable people with the fewest resources to cope with climate hazards. The rate of return can be high. Early warning systems for disasters, for instance, save lives and property, and can deliver benefits up to 10 times the initial cost. Climate action requires significant financial investments by governments and businesses. But climate inaction is vastly more expensive. One critical step is for industrialized countries to fulfil their commitment to provide $100 billion a year to developing countries so they can adapt and move towards greener economies.[5]

This article addresses the concept of climatic variation and change within the set of integrated natural features and processes known as the Earth system. The nature of the evidence for climate change is

5. See The Paris Agreement on Climate Change.

explained, as are the principal mechanisms that have caused climate change throughout the history of the Earth. Finally, a detailed analysis of Climate Change Act, 2021 was made. Causes and effects of climate change including the challenges of implementation of the Act were analysed and recommendations made.

II. CONCEPTUAL FRAMEWORK

In this article, some concepts relating to the topic have been explained. This is to bring such terms into conformity with their usage in this research and the provisions of the Act under reference.

Climate and Climate Change: By section 35 of the Act, climate means the average weather condition, as the statistical description in terms of the mean and variability of relevant quantities over a period of time. Climate is often defined loosely as the average weather at a particular place, incorporating such features as temperature, precipitation, humidity, and windiness. A more specific definition would state that climate is the mean state and variability of these features over some extended time period. Both definitions acknowledge that the weather is always changing, owing to instabilities in the atmosphere. And as weather varies from day to day, so too does climate vary, from daily day-and-night cycles up to periods of geologic time hundreds of millions of years long. In a very real sense, *climate variation* is a redundant expression—climate is always varying. No two years are exactly alike, nor are any two decades, any two centuries, or any two millennia.

The United Nations framework convention on climate change define climate change as "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 periods.[6] In the same vein, section 35 of the Act defined climate change to mean a change of climate, which is attributed directly or indirectly to human activity or natural climate variability that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. For this purpose, climate change variability refers to the variability in the average state and in other statistics of the

6. See Article 1 (2) UNFCCC, 1992

climate on all temporal and spatial scales beyond that of individual weather events.

Climate change, is therefore, a periodic modification of Earth's climate brought about as a result of changes in the atmosphere as well as interactions between the atmosphere and various other geologic, chemical, biological, and geographic factors within the Earth system. Climate change also refers to the long-term changes in the earth's climate that are warming the atmosphere, ocean and land. Climate change is affecting the balance of ecosystems that support life and biodiversity, and impacting health. It also causes more extreme weather events, such as more intense and/or frequent hurricanes, floods, heat waves, and droughts, and leads to sea level rise and coastal erosion as a result of ocean warming, melting of glaciers, and loss of ice sheets.[7] Climate change can exacerbate food, water, and livelihood insecurity, with cascading effects such as displacement and migration and increased competition over natural resources, all of which can lead to increased tensions and instability in a country or state. Furthermore, the impacts of climate change can aggravate or prolong existing violent conflicts and make it more difficult to deliver climate action and to reach a sustain peace.

Greenhouse effect and greenhouse gases: By the Climate Change Act, 2021, greenhouse effect refers to the natural process by which heat from the sun's energy is trapped by a layer of gases surrounding the earth to keep it warm.[8] Some incoming sunlight is reflected by Earth's atmosphere and surface, but most is absorbed by the surface, which is warmed. Infrared (IR) radiation is then emitted from the surface. Some IR radiation escapes to space, but some is absorbed by the atmosphere's greenhouse gases (especially water vapour, carbon dioxide, and methane) and reradiated in all directions, some to space and some back toward the surface, where it further warms the surface and the lower atmosphere.

By the Climate Change Act, 2021, greenhouse gases or GHG refers to the constitutions of the atmosphere that contribute to the greenhouse effect. These include (a) carbon dioxide; (b) methane; (c) nitrous oxide; (d) hydro fluorocarbons; (e) per fluorocarbons; (f) sulphur

7. The Climate Dictionary, P.37
8. See Section 35 of the Climate Change Act, 2021

hexafluoride and (g) indirect greenhouse gases. The United Nations Framework Convention on Climate Change (UNFCC) has defined greenhouse gases as "those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation."[9] By this definition, not all greenhouse gases are due to human activities. In other words, there are greenhouse gases that are caused by natural processes and those that are anthropogenically caused.

According to Thornton, et al, greenhouse gases are gases that have the capacity of reflecting or trapping heat thereby causing the world to warm up rather as if a blanket had been wrapped around it, or as if it had been placed in a greenhouse, hence the so-called greenhouse effect.[10] Greenhouse gases are gas molecules that have the property of absorbing infrared radiation (net heat energy) emitted from Earth's surface and reradiating it back to Earth's surface, thus contributing to the phenomenon known as the greenhouse effect. Carbon dioxide, methane, and water vapour are the most important greenhouse gases, and they have a profound effect on the energy budget of the Earth system despite making up only a fraction of all atmospheric gases.

Concentrations of greenhouse gases have varied substantially during Earth's history, and these variations have driven substantial climate changes at a wide range of timescales. In general, greenhouse gas concentrations have been particularly high during warm periods and low during cold phases. A number of processes influence greenhouse gas concentrations. Some, such as tectonic activities, operate at timescales of millions of years, whereas others, such as vegetation, soil, wetland, and ocean sources and sinks, operate at timescales of hundreds to thousands of years. Human activities—especially fossil-fuel combustion since the Industrial Revolution—are responsible for steady increases in atmospheric concentrations of various greenhouse gases, especially carbon dioxide, methane, ozone, and chlorofluorocarbons (CFCs).

Mitigation or mitigation measure: Climate change mitigation refers to any action taken by governments, businesses, or people to reduce or prevent greenhouse gas emissions, or to enhance carbon sinks that remove these gases from the atmosphere. In the context of climate

9. See Article 1(5) UNFCC, 1992
10. Thornton, J. et al, Environmental Law, 2nd edition (Sweet and Maxwell, 2004) P.52.

change, the Act defined mitigation or mitigation measures to mean efforts that seek to prevent or slowdown the increase of atmospheric greenhouse gas concentrations by limiting current or future emissions and improving potential sinks for greenhouse gases.[11]

Reducing or preventing greenhouse gas emissions can be achieved by transitioning to renewable energy sources like wind and solar, using energy more efficiently, adopting low carbon or carbon-free transportation modalities, promoting sustainable agriculture and land use, and changing production and consumption models and diet behaviours. Enhancing carbon sinks can be achieved by restoring forests, wetlands, and marshland, maintaining soil health, and protecting terrestrial and marine ecosystems. In order for mitigation actions to be successful, it is crucial that countries develop supportive environments through legislation, policies and investments. To limit global warming to 1.5ºC which is the critical goal of the Paris Agreement, the world must implement climate change mitigation actions to reduce greenhouse gas emissions by 45% before 2030 and reach net-zero greenhouse gas emissions by mid-century.[12]

Adaptation and adaptation measure: By section 35 of the Climate Change Act, 2021, adaptation is the process of adjustment to actual or expected climate and its effects. Adaptation measure on the other hand means any action take or intervention to help communities and ecosystems cope with changing climate conditions. The Act also explained adaptive capacity to mean the ability of systems, institutions, humans and other organisms to adjust to the consequences of climate change, taking into cognisance available opportunities.

Nationally Determined Contributions: By the provisions of the climate change Act, 2021, nationally determined contributions refer to national climate plans highlighting climate actions, including climate related targets, and policies and measures that government aims to implement in response to climate change, and as a contribution to global climate action.[13] In other words, nationally determine contributions (NDCs) are climate pledges and action plans that each country is required to develop in line with the Paris Agreement goal of limiting

11. See Section 35 of the Climate Change Act, 2021
12. The Climate Dictionary, P.55.
13. See Section 35 of the Climate Change Act, 2021.

global warming to 1.5ºC. NDCs represent short to medium-term plans that are updated every five years with higher ambition on climate. NDCs outline mitigation and adaptation priorities a country will pursue to reduce greenhouse gas emissions, build resilience, and adapt to climate change, as well as financing strategies and monitoring and verification approaches.[14]

National Adaptation Plans (NAPs): National adaptation plans help countries plan and implement actions to reduce vulnerability to the impacts of climate change and strengthen adaptive capacity and resilience. NAPs link to NDCs and other national and sectoral policies and programmes. For NAPs to be successful they need to be participatory, inclusive, gender-responsive, and transparent. This means that at the design stage, NAPs need to evaluate the specific needs and vulnerabilities of different groups in the country, paying particular attention to those most vulnerable to climate change impacts and involving them in developing and implementing strategies and programmes.

International climate change obligations: This refers to those commitment under international conventions on climate change and other environmental matters, to which Nigeria is signatory.

Enforcement: Enforcement is defined as the art of compelling observance of or compliance with a law, rule or obligation.[15] Enforcement can also mean the use of legal tools to assist in the compliance with environmental requirements, such as issuance of enforcement notice, appeal by aggrieved persons, appointment of inspectors and their power to enforce compliance and deal with administrative and litigation processes.[16] The NESREA Act, 2018 empowers the agency to develop instruments, guidelines and standards to facilitate the enforcement procedure or mechanism. In this sense, enforcement means the range of procedures and actions employed by the state, its competent authorities or agencies to ensure that those who failed to comply with environmental laws or regulations are made or

14. The Climate Dictionary, P.57.
15. See Oxford Languages <https//www.google.com/searchenforcement> Accessed 23rd January, 2024
16. See section 7 of the NESREA Act, 2018

compelled to comply with the laws or punished through civil, administrative or criminal actions.

III. AN ANALYSIS OF THE CLIMATE CHANGE ACT, 2021 AS THE LEGAL FRAMEWORK FOR THE REGULATION OF CLIMATE CHANGE IN NIGERIA

The climate change Act, 2021 was enacted to provide a framework for mainstreaming climate change actions, provide for a system of carbon budgeting and the establishment of the National Council on climate change. The Act was signed into law by President Muhammadu Buhari on the 17th day of November, 2021. The climate change Act, 2021 is made up of 36 sections arranged under eight (8) parts. Part I provides for the objectives and application of the Act. Part II is on the establishment of the National Council on climate change, while Part III relates to administration and Control of the national Council on climate change. Financial provision is provided for in Part IV while Part V provides for carbon budget and National climate change action plan. Part VI is on the obligations relating to climate change and Part VII is on Nature-based solutions. The final Part is part VIII which is on miscellaneous provisions.

Part I contains section 1 and 2. Section 1 provides for the objectives of the Act. It states that the Act provides a framework for achieving low greenhouse gas emission (GHG), inclusive green growth and sustainable economic development by;

(a) ensuring that Nigeria formulates programmes for achieving its long-term goals on climate change mitigation and adaptation;
(b) facilitating the coordination of climate change action needed to achieve long-term climate objectives;
(c) mainstreaming climate change actions in line with national development priorities;
(d) facilitating the mobilization of finance, and other resources necessary to ensure effective action on climate change;
(e) ensuring that climate change policies and actions are integrated with other related policies for promoting socio-economic development and environmental integrity;
(f) setting a target for year 2050 – 2070 for the attainment of a net zero GHG emission, in line with Nigeria's international climate change obligations;

(g) identifying risks and vulnerabilities, building resilience and strengthening existing adaptive capacities to the impacts of climate change;
(h) implementing mitigation measures that promote low carbon economy and sustainable livelihood; and
(i) ensuring that private and public entities comply with stated climate change strategies, targets and National climate change action plan.

Section 2 makes provision for the application of the Act. Accordingly, the Act applies to the Ministries, Departments and Agencies (MDAs) of the Federal Government of Nigeria, and to public and private entities within the territorial boundaries of Nigeria for the development and implementation of mechanisms geared towards fostering low carbon emission, environmentally sustainable and climate resilient society.

Part II of the Act consists of sections 3, 4, 5, and 6 that deals with the establishment of the National Council on climate change, functions and powers of the Council, membership of the Council and cessation of membership. By section 3(1) there is established the National Council on climate change which shall be vested with powers to make policies and decisions on all matters concerning climate change in Nigeria. The Council shall be a body corporate with perpetual succession and a common seal; and may sue and be sued in its corporate name.[17] The affixing of the seal of the Council shall be authenticated by the Chairman of the Council. The Council shall pay to its members such allowances, as may be determined by the salaries and Wages Commission.[18]

Section 4 of the Act provides for the functions and powers of the Council. Accordingly, the Council shall: (a) Coordinate the implementation of sectoral targets and guidelines for the regulation of GHG emissions and other anthropogenic causes of climate change; (b) approve and oversee the implementation of the Action Plan; (c) administer the Climate Change Fund established under the Act; (d) ensure the mainstreaming of climate change into the national development plans and programmes; (e) formulate policies and

17. See Climate Change Act, 2021, section 3(2) (a) & (b).
18. Ibid, section 3(3) & (4).

programmes on climate change to serve as the basis for climate change planning, research, monitoring, and development; (f) formulate guidelines for determining vulnerability to climate change impact and adaptation assessment, and facilitate the provision of technical assistance for their implementation and monitoring; (g) recommend legislative, policy, appropriation, and other measures for climate change adaptation, mitigation, and other related activities; (h) mobilise financial resources to support climate change actions; (i) collaborate with the Federal Inland Revenue Service to develop a mechanism for carbon tax in Nigeria; (j) collaborate with the Federal Ministry responsible for Environment and the Federal Ministry responsible for Trade to develop and implement a mechanism for carbon emission trading; (k) review international agreements related to climate change and make the necessary recommendation for ratification and compliance by the government on matters pertaining thereto; (I) disseminate information on climate change, local vulnerabilities and risk, relevant laws and protocols, and adaptation and mitigation measures; (m) advice and recommend on technical, scientific, and legal matters relating to climate change, in accordance with the provisions of this Act; (n) acquire, hold, or dispose of any property, whether movable or immovable, for the purposes of performing its functions; (o) supervise the activities of and recommendations by the Secretariat of the National Council on Climate Change with the aim of attaining the objectives of the Act; (p) collaborate with the Nigeria Sovereign Green Bond in meeting Nigeria's Nationally Determined Contributions (NDCs); and (q) perform such other functions necessary for the fulfilment of the objectives of this Act.

Membership of the Council is provided for in section 5(1) of the Act. Thus, the Council shall consist of: (a) the President of the Federal Republic of Nigeria, who shall Head the Council, as Chairman; (b) the Vice-President of the Federal Republic of Nigeria, who shall be the Vice Chairman; (c) the Minister responsible for Environment; (d) the Minister responsible for Petroleum Resources; (e) the Minister responsible for Budget and National Planning; (f) the Minister of Justice; (g) the Minister responsible for Mines and Steel Development; (h) the Minister of Finance; (i) the Minister responsible for Agriculture and Rural Development; U) the Minister responsible for Powe; (k) the Minister responsible for Women Affairs; (I) the Minister responsible for Transportation; (m) the Minister responsible for Water Resources; (n) the Governor of the Central Bank of Nigeria; (o) the National Security

Adviser; (p) the Chairman of Nigerian Governors' Forum; (q) the President of Association of Local Governments of Nigeria; (r) a representative of the private sector on climate change or environment related matters, nominated by the most representative registered national umbrella association; (s) a representative of- (i) women, (ii) youths, and (iii) persons with disabilities, to each be nominated by the most representative registered national umbrella association; (t) a representative of environment related Civil Society Organisations (CSOs), appointed by the President, on the recommendation of the Minister responsible for Environment; and (u) the Director-General of the National Council on Climate Change, who shall be the Secretary.

By section 5(2) of the Act, the Council shall meet, as and when necessary, for the performance of its functions under the Act. The proceedings of the meeting of the Council is as set out in the schedule to the Act. By the schedule to the Act; (1) the Council shall meet at such time and place, as the chairman may determine, at least, twice in a year. (2) A special meeting of the council shall be convened upon written request of the chairman or by a majority decision of members addressed to the Secretary of the Council. (3) the Chairman shall preside at any meeting of the Council but in the absence of the Chairman, the Vice-Chairman shall preside. (4) Decisions shall be determined by a simple majority of members present and voting, and where there is equality of votes, the presiding officer shall have a casting vote (5) the quorum at a meeting shall be one-third of the total members including the Chairman but excluding the Secretary. (6) where the Council desires to obtain the advice of any person on a particular matter, the Council may co-opt the person to attend its meetings and the person shall not vote on any matter affecting the decision of the Council. (7) Except otherwise provided by the Act, the Council shall regulate its own proceedings.

On the validity of proceedings of the Council meetings, the schedule to the Act provides that the validity of proceedings of the Council shall not be affected by: (a) any vacancy in the membership of the Council; or (b) the reason that any person not entitled to do so took part in the proceedings of the Council.

Note that members of the Council except the Director-General, shall serve on part-time basis.[19] And members of the Council referred to in section 5(1) (r – t) other tan ex-officio members, shall hold office (a)

[19]. Ibid, Section 5(3).

for a term of four (4) years and shall not be eligible for reappointment, and (b) on such terms and conditions as may be specified in the letter of appointment.[20]

By section 6(1) of the Act, a member may cease to hold office where the member: (a) resigns from the appointment by giving a one-month notice addressed to the Council; (b) is of unsound mind; (c) becomes bankrupt; (d) is convicted of a criminal offence or found guilty of sabotaging Nigeria's efforts to meet her climate change mitigation and adaptation obligations; or (e) dies. Note that where a vacancy occurs in the membership of the Council, in respect of a member referred to under section 5(1) paragraphs (r)-(t) of the Act, it shall be filled with the appointment of a successive representative to complete the remainders of the term of office of the predecessor.[21]

Part III of the Act on the administration and control of the National Council on climate change consists of sections 7 to 14. Section 7(1) is on the establishment of the secretariat of the Council. It states that there is established for the Council, a secretariat, which shall be the administrative (including secretarial and clerical) scientific and technical arm of the Council and shall perform the functions and discharge the duties assigned to it under the Act. The Council shall have powers to establish for the secretariat, offices, including zonal and state offices, committees, and such other administrative apparatus, as it may deem necessary to facilitate the proper implementation of the Act.[22] Section 8 provides for the functions of the secretariat. It states that the secretariat shall: (a) advise and assist the Council in the performance of the Council's functions and discharge of its duties in accordance with the objectives set under the Act.

Powers of the Secretariat are provided for in section 9 of the Act. According to that section, in performing its functions under the Act, the secretariat shall have powers, subject to the approval of the council to: (a) request reports, data, document or any information necessary for the performance of its functions under the Act; (b) establish and manage a national registry for capturing mitigation and adaptation actions by public and private entities; (c) mobilise financial resources to support climate change actions; (d) visit the premises of MDAs, and private and public entities for the purposes of monitoring, verifying and reporting of

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20. Ibid, Section 5(4)
21. Ibid, section 6(2).
22. Ibid, section 7(2)

emission profile or the collection of any other data necessary to undertake the functions and duties prescribed in the Act; and (e) do other things, as may be approved by the Council.

On the appointment, qualifications and tenure of the Director-General, the Act provides that there shall be for the secretariat a Director-General who shall be appointed by the President on the recommendation of the Council to see to the administration of the Council.[23] By section 10(2), the Director-General shall (a) hold a minimum of a Master's Degree in any Environmental related field; (b) have at least 10 years cognate experience in climate change policy development and implementation, and have an understanding of the international climate policy landscape; (c) have experience in developing, implementing and managing projects on climate change at national and international level.

The Director-General (a) shall hold office (i) for a term of four years, and may be re-appointed for another term of four years and no more; and (ii) on such terms and conditions as may be specified in the letter of appointment; and (b) may resign from office by giving a one-month notice addressed to the President.[24] The President shall without notice terminate the appointment of the Director-General, where the Director-General: (a) fails to meet the functions stipulated in the Act: or (b) on other grounds specified under section 6(1) (b) – (d) of the Act.[25]

A Zonal Coordinator or State Director provided for under section 11(1) of the Act shall (a) be appointed by the Council on the recommendation of the Minister responsible for Environment; (b) hold a degree in any Environmental related field; (c) have at least five years cognate experience in climate change policy design and implementation; (d) hold office for a term of four years without any option of renewal; and (e) resign from office by giving a one-month notice addressed to the Council.[26] The Council shall, without notice, terminate the appointment of a Zonal Coordinator or State Director, in the event of (a) failure to discharge the duties prescribed by the Council or the provisions of the Act; or (b) on other grounds specified under section 6(1) (b) – (d) of the Act.[27]

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23. Ibid, section 10(1).
24. Ibid, Section 10(3)
25. Ibid, section 10(4)
26. Ibid, section 11(2).
27. Ibid, section 11(3).

Note that where a vacancy occurs under section 11(2) (d) or (3) of the Act, or in the event of death, the Council shall, in respect of filling the office of: (a) a Zonal Coordinator, appoint a qualified person from the same state as the deceased to complete the remainder of the term; or (b) a State Director appoint a qualified person from the same senatorial district as the deceased, to complete the remainder of the term.[28] The Council shall ensure that in respect of appointment made under section 11(1) of the Act: (a) each state of a geographical zone shall produce a Zonal Coordinator; and (b) each senatorial district shall produce a State Director on rotational basis.[29]

Section 12 provides for the remuneration of the Director-General and principal officers of the Council. It states that notwithstanding the provision of any Act, the Director-General and principal officers referred to in section 11 of the Act shall be paid such remuneration and allowances as may be determined by the salaries and wages commission. Section 13 of the Act provides for appointment of staff and condition of service of the staff of the Council. Thus, by section 13(1) the secretariat may, with the approval of the Council, appoint such staff and employees as it deems necessary and expedient. Subject to the Pension Reform Act,[30] the terms and conditions of service, including the remunerations, allowances, benefits, and pensions of staff and employees, shall be determined by the Secretariat on the approval of the Council.[31] And without prejudice to the provisions of section 13(2) of the Act, nothing in the Act shall prevent the appointment of a person to any office on condition which preclude the grant of pension and other retirement benefits in respect of that office[32] and the provisions of the Public Service Rules on retirement from service shall apply to staff of the Council.[33] Note that the Council shall make staff regulations relating generally to the conditions of service of the staff and without prejudice to the generality of the foregoing, such regulations may provide for the appointment, promotion, transfer and disciplinary control of staff of the Council.[34]

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28. Ibid, section 11(4).
29. Ibid, Section 11(5).
30. Pension Reform Act, No. 4 of 2014)
31. See Section 13(2) of the Climate Change Act, 2021.
32. Ibid, Section 13(3)
33. Ibid, Section 14
34. Ibid, Section 13(4)

Part IV on financial provisions consists of sections 15, 16, 17 and 18 respectively. Section 15(1) provides for the climate change fund. It states that there is established a climate change fund to be maintained by the Council, into which shall be paid: (a) sums appropriated by the National Assembly for the running of the Council; (b) subventions, grants and donations, fees and charges for services rendered or publications made by the Council; (c) funding from International Organisations and funds due to Nigeria for meeting her NDCs; (d) fines and charges from private and public entities for flouting their climate change mitigation and adaptation obligations; (e) carbon tax and emissions trading; and (f) such other funds as the Council may prescribe from time to time.

By section 15(2) of the Act, the fund of the Council shall be applied towards: (a) he cost of administration of the Council and offices established under the Council; (b) the payment of emoluments, allowances and benefits of members of the Council, reimbursing members of the Council or any committee set up by it, and for such expenses incurred while implementing activities expressly authorised by the Council; (c) the payment of salaries, other remunerations or allowances and other retirement benefits payable to the staff of the Council; (d) the development and maintenance of any property vested in or owned by the Council; (e) climate change advocacy and information dissemination; (f) funding innovative climate change mitigation and adaption projects, subject to the approval of the Council; (g) supporting climate change advocacy and information dissemination; (h) defraying the fees of auditors and other expenses incurred from auditing the Council; (i) conducting assessment of climate change impact on vulnerable communities and population; (j) incentivizing private and public entities for their efforts towards transiting to clean energy and sustaining a reduction in GHG emissions; and (k) any other expenditure in connection with any function of the Council under the Act. Section 15(3) allows the Council to review the source of the fund and its application.

Accounts, audit and estimate are provided for in section 16. Thus, by section 16(1) the secretariat shall (a) keep proper accounts and records of the Council's income and expenditure; (b) prepare and submit to the Council a comprehensive report of all the activities of the secretariat; and (c) prepare a statement of account in respect of each financial year. The secretariat shall as soon as be directed by the Council

or within six months after the end of the financial year to which the accounts relate, cause the accounts to be audited in accordance with the guidelines supplied by the Auditor-General for the Federation.[35] The Secretariat shall, not later than six months to the end of every financial year, prepare and submit through the Council to the National Assembly, the estimates of revenue and expenditure of the Council for the following financial year.[36]

The power to borrow is given to the Council under section 17 of the Act. It states that the Council may borrow money from financial organizations or other institutions for the purpose of executing its mandate under the Act. Furthermore, the Council may accept gifts of land, money or other property on such terms and conditions, as may be specified by the person or organisation making the gift, provided that these conditions are not inconsistent with the functions of the Council under the Act.[37]

Part V contained provisions on carbon budget and national climate change Action plan and consists of section 19, 20 and 21 respectively. Section19(1) carbon budget provides that the Federal Ministry responsible for Environment shall, in consultation with the Federal Ministry responsible for National Planning: (a) set carbon budget for Nigeria, to keep average increases in global temperature within 2^{o}C and pursue efforts to limit the temperature increase to 1.5^{o}C above pre-industrial levels; and (b) by an order (i) set the carbon budget and budgetary period; and (ii) periodically revise the carbon budget, in line with the Nigeria's NDCs and with a view to complying with Nigeria's international obligations.

Note that prior to setting the pilot carbon budget in line with the provisions of section 19(1) of the Act, the carbon budget shall be presented through the Council to the Federal Executive Council for approval not later than 12 months from the date that the Climate Change Act, 2021 was assented to by the President of the Federal Republic of Nigeria.[38]

Pursuant to section 19(1) of the Act, the Federal Ministry responsible for Environment shall, not later than 12 months to the end of the carbon budget cycle, set and submit through the Council to the

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35. Ibid, section 16(2)
36. Ibid, Section 16(3)
37. Ibid, section 18 of the Act
38. Ibid, section 19(2)

Federal Executive Council for approval, a new carbon budget for the next carbon budget cycle.[39] Where there is a need to review carbon budget within a carbon budget cycle, the Federal Ministry responsible for Environment shall, within three months of the revision of the carbon budget, submit through the Council to the Federal Executive Council for approval.[40]

By section 19(5) Federal Ministry of Environment; (a) shall publish detailed national, regional and sectoral climate vulnerability and risk assessments that will serve as the basis for the adaptation components of the Action plan; and (b) may by an order publish guidelines for measurement; reporting and verification of national emissions that will serve as the basis for the setting and annual review of the carbon budget.

National climate change Action plan is provided for in section 20 of the Act. Thus, by section 20(1), the secretariat, in consultation with the Federal Ministries responsible for Environment, and Budget and National Planning, respectively, shall formulate and Action Plan in every five-year cycle. The Pilot Action Plan shall be produced, not later than 12 months from the commencement of the Climate Change Act, 2021.[41]

By section 20(3) of the Act, before the presentation of the Action Plan to the Council and Federal Executive Council, respectively for approval, it shall first be published to the general public for consultation for a period of not less than eight weeks ending 14 days before its presentation to the Council. By section 20(4) of the Act, the Action Plan shall: (a) serve as a basis for (i) identifying the activities aimed at ensuring that the national emissions profile is consistent with the carbon budget goals; and (ii) establishing national goals, objectives and priorities on climate adaptation; (b) prescribe measures and mechanisms (i) for identifying and assessing risks, vulnerabilities and extremes of impact of climate change on vulnerable communities and population, and ecosystems; (ii) for setting out actions for mainstreaming climate change response into sector functions; (iii) for identifying action for adaptation and mitigation against climate change; (iv) geared towards mainstreaming climate change disaster risk reduction actions in development programmes; (v) for setting out a

[39]. Ibid, Section 19(3)
[40]. Ibid, Section 19(4)
[41]. Ibid, section 20(2)

structure for public awareness and engagement in climate change actions; (vi) for identifying strategic areas of national infrastructure requiring climate proofing; (vii) to enhance energy conservation, efficiency and use of renewable energy in industrial, commercial, transport, domestic and other uses; (viii) for reviewing levels and trends of greenhouse gas emissions; and (ix) for achieving Nigeria's climate change goals; (c) make provision for research, planning and action on climate change mitigation and adaptation; and (d) contain a projection of fiscal and budgetary needs, for the execution of climate change projects and related activities.

The components of the Action Plan as stated in section 20(5) include: (a) an articulated carbon budget for the five-year cycle, consistent with the carbon budget; (b) an articulated annual carbon budget for each of the years that make up the five-year cycle; (c) past, current and projected GHG emission profile of GHG emission sectors of the economy; (d) details of past, current and proposed climate mitigation and adaptation actions across the sectors of the economy including the rationale, costs, funding source and benefit of such action; (e) details on the level of compliance with international climate commitments, and (f) proposed incentives for private and public entities which achieve GHG emission reduction.

The final aspect of Part V is section 21 that has to do with the report of the Director-General to the National Assembly. By section 21(1) the Director-General shall, within one year of formulating the Action Plan for the first five-year cycle and for subsequent other cycles, submit to the council and National Assembly Committees on Climate change, a detailed report on the state of the nation with regards to climate change. The report shall include: (a) progress on the implementation of the Action Plan; (b) the extent to which GHG emission profile is consistent with annual carbon budget; (c) identification of the vulnerable areas to the impacts of climate change; (d) the identification of differential impacts of climate change on men, women and children, (e) the assessment and management of risks and vulnerability; (f) the identification of GHG mitigation and adaptation potential; (g) the identification of options, prioritisation of appropriate mitigation and adaptation measures for joint projects of national, state, local governments and the private sector; (h) identification of the efforts being made by public and private entities in attaining the carbon budget; (i) incentives granted private and public entities for their efforts towards

transiting to clean energy and sustaining a reduction in GHG emissions; and (j) fines issued against private and public entities for non-compliance with the provisions of the climate change Act, 2021.[42] The Director-General shall within three months after the end of every financial year publish publicly and submit to the National Assembly an evaluation report on performance of climate change duties by private and public entities.[43]

Part VI of the Climate Change Act, 2021 concern obligations relating to climate change. The part consists of sections 22, 23, 24, 25 and 26. Section 22 (1) places obligation on the MDAs with regards to climate change. It states that MDAs shall establish a climate change desk to be supervised by an officer not below the Directorate cadre, who shall be responsible for ensuring integration of climate change activities into their core mandate. The Desk officer shall ensure adequate planning and budgeting for all climate change programmes, projects and activities.[44] By section 22(3) the ministry responsible for Finance, Budget, and National planning shall ensure that all budget proposals submitted by MDAs have been properly vetted and costed for climate change considerations, and that adequate allocation is provided for them under appropriate sub-heads in the annual budget.

It is important to note that MDAs shall adhere to the annual carbon emission reduction targets, in line with the action Plan and carbon budget made under the Act. Thus, any MDA that fails to meet its carbon emission reduction target shall be subjected to a review and its principal officer upon being found liable, sanctioned and where appropriate fined as determined by the Council.[45] Note too that where an evaluation report from an MDA discloses unsatisfactory performance: (a) the secretariat shall undertake investigations and report its findings to the Council; and (b) the Council acting on that report may recommend appropriate measures and sanctions.[46]

Section 23 of the Act made provision for climate change obligations of public entities. It states that the Council may be regulations (a) impose obligations relating to climate change on any public entity; and (b) vary or revoke any such obligations, where

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42. Ibid, section 21(2)
43. Ibid, section 21(3)
44. Ibid, section 22(2)
45. Ibid, section 22(4) & (5).
46. Ibid, Section 22(6)

necessary. In the same vein, section 24 of the Act made provisions for climate change obligations of private entities. By section 24(1) any private entity with employees numbering 50 and above shall (a) put in place measures to achieve the annual carbon emission reduction targets in line with the Action Plan; and (b) designate a climate change officer or an Environmental Sustainability officer, who shall submit to the secretariat, through the State Director, annual reports on the entity's efforts at meeting its carbon emission reduction and climate adaptation plan. Note that a private entity that fails to meet its target, as specified under section 24(1) of the Act shall be liable to a fine to be determined by the Council, relying on a system of Environmental Economic Accounting with attention on the health impacts, impacts on climate variation, and total damage to ecosystem services.[47]

Notwithstanding the provisions in the climate change Act, 2021, the Council may be notice in the Federal Government Gazette, require a private entity under the Act: (a) to prepare reports on the status of its performance of its climate change obligations, and prescribe the period for reporting; or (b) who fails to comply with its climate change obligations, to prepare a report within a specified time, on its past and current actions, and future action to be taken to secure future performance with those obligations.[48]

The Climate Change Act, 2021 made provision for the Council to partner with civil society organisations within the country in the performance of its functions. Thus, section 25(1) of the Act is to the effect that the secretariat, with the approval of the Council, shall work in partnership with the Federal Ministry of Environment, civil society organisations (CSOs), women, youths, and others, to monitor plans, programmes, projects, engage in climate advocacy and related activities. In pursuance of the partnership, the secretariat shall, upon request and in line with the Freedom of Information Act, 2021 furnish the CSOs, women, youth, and others, data and such other information relevant to Nigeria's drive for climate change mitigation and adaptation.[49]

Climate change education is provided for in section 26(1) of the Act. It states that the secretariat shall, with the approval of the Council, advise the MDAs responsible for regulating educational curriculum in Nigeria on the integration of climate change into the various discipline

47. Ibid, Section 24 (2)
48. Section 24(3) (a) & (b)
49. See section 25(2) of the Act

and subjects across all educational levels. In doing that, the secretariat, with the approval of the Council may (a) partner with such MDAs or (b) support scientific researches and other similar projects, relevant to the formulation and development of educational curricula and programmes geared towards adaptation and risk mitigation.[50]

Part VII on nature-based solutions consists of sections 27, 28 and 29. Section 27 states that the Council shall promote and adopt nature-based solutions to reducing GHG emissions and mitigating climate change issues in Nigeria. By section 28(1) the Federal Ministry responsible for Environment shall set-up a registry with sub-national nodes for capturing REDD$^+$ activities in Nigeria, including updates on Forest Reference Emission Level (FREL). Note that REDD$^+$ means Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and the enhancement of forest carbon stocks.[51] The Council may, in fulfillment of Nigeria's climate change obligations, provide fiscal support for REDD$^+$ activities.[52]

Section 29 of the Act made provision for Natural Capital Account and National Development Plans. Accordingly, by section 29(1), the Council shall collaborate with and equip the national Bureau of Statistics for developing Nigeria's Natural Capital Accounts. The data from the National Capital Accounts shall be made available to MDAs, and used in policy formulation and development of Action Plan in line with the carbon budget.[53] In the same vein, the Ministry responsible for Finance, Budget, and National Planning shall ensure that the data referred to in section 29(2) is captured in the National Development Plan and expenditure framework as a means of measuring the impact of climate change on sustainable development.[54]

Part VIII is the one of miscellaneous provisions and consists of sections 30, 31, 32, 33, 34 and 35 respectively. Section 30 is on the public engagement strategy. By section 30(1) therefore, the secretariat shall, not later than six months to the end of every year prepare and publish its public engagement strategy for the following year. The public engagement strategy shall set out the modalities to be adopted

50. See section 26(2)
51. Ibid, section 28(2)
52. Ibid, section 28(3)
53. See section 29(2)
54. Ibid, section 29(3)

towards achieving the Objectives under the Act, such as (a) informing the public about the Action Plan; and (b) identifying actions and encouraging the public to contribute to the achievement of the Objectives of the Action Plan and the Act.[55] The Council shall (a) when the need arises, review the public engagement strategy; and (b) within one month of the review, publish the reviewed public engagement strategy in the Federal Government Gazette.[56]

Section 31 of the Act is on conflict of interest. Accordingly, by section 31(1) a member of the Council, staff or employee of the Council, who has interest in any matter before the Council for consideration shall disclose in writing the nature of such interest. Such member, staff or employee shall be disqualified from participating in any deliberation in respect of the matter and the disclosure of interest so made shall be recorded in the minutes of the meeting.[57] Note that by section 31(4) of the Act, a person who contravenes the provision of section 31(1) commits an offence and is liable on conviction to (a) a fine not more than 1,000,000 or to imprisonment for a term not more than one year; and (b) forfeit any benefit derived from the non-disclosure. Note also that, no member, staff or employee of the Council shall transact any business or trade with the Council.[58]

Section 32 of the Act empowered the Council to make regulations. To this end, the Council may make regulations (a) requiring private and public entities to report annually on GHG reductions and reduction measures, and have corporate climate change responsibilities; (b) on sectoral and cross-sectoral GHG emission reductions; (c) to supervise market-based mechanisms and instruments relating to climate change; (d) to provide fiscal incentives for the (i) promotion of GHG emission reduction, and (ii) encouragement of private sector participation in climate actions; (e) creating further offences, derived from non-compliance with the provisions of any regulation made under the Act, and penalties for such offences; and (f) as is necessary for the carrying into effect of the provisions of the Act.

Note that the provisions of the Public Officers Protection Act, 2004 shall apply in relation to any suit instituted against any staff or employee of the Council. Note further that notwithstanding anything

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55. See section 30(2)
56. Ibid, Section 30(30)
57. Ibid, section 31(2) & (3)
58. Ibid, section 31(5)

contained in any other law, no suit shall be instituted against the Council, member of the Council, or staff or employee of the Council for any act done in pursuance or execution of the Act or any other law, provided the suit is commenced (a) within three months after the act, neglect, or default complained of; or (b) in the case of a continuation of damage or injury, within six months after the ceasing of such damage or injury.[59]

Section 34 (1) makes provision on offences. It states that a person, or private or public entity that acts in a manner that negatively affects efforts towards mitigation and adaptation measures made under the Act commits an offence and is liable to a penalty to be determined by the Council. A Court, before which a suit regarding climate change or environmental matters is instituted, may make an order (a) to protect, stop or discontinue the performance of any act that is harmful to the environment; (b) compelling any public official to act in order to prevent or stop the performance of any act that is harmful to the environment; (c) of compensation to the victim directly affected by the acts that are harmful to the environment.

IV. CAUSES AND EFFECTS OF CLIMATE CHANGE IN NIGERIA

1. Causes of Climate Change: Recognition of global climate change as an environmental issue has drawn attention to the climatic impact of human activities. Most of this attention has focused on carbon dioxide emission via fossil-fuel combustion and deforestation. Human activities also yield releases of other greenhouse gases, such as methane (from rice cultivation, livestock, landfills, and other sources) and chlorofluorocarbons (from industrial sources). There is little doubt among climatologists that these greenhouse gases affect the radiation budget of Earth; the nature and magnitude of the climatic response are a subject of intense research activity. Paleoclimate records from tree rings, coral, and ice cores indicate a clear warming trend spanning the entire 20th century and the first decade of the 21st century. In fact, the 20th century was the warmest of the past 10 centuries, and the decade 2011–20 was the warmest decade since the beginning of modern instrumental record keeping. Many climatologists have pointed to this

[59]. Ibid, section 33(1) & (2) (a) & (b)

warming pattern as clear evidence of human-induced climate change resulting from the production of greenhouse gases. A second type of human impact, the conversion of vegetation by deforestation, afforestation, and agriculture, is receiving mounting attention as a further source of climate change. It is becoming increasingly clear that human impacts on vegetation cover can have local, regional, and even global effects on climate, due to changes in the sensible and latent heat flux to the atmosphere and the distribution of energy within the climate system. The extent to which these factors contribute to recent and ongoing climate change is an important, emerging area of study.

It is much easier to document the evidence of climate variability and past climate change than it is to determine their underlying mechanisms. Climate is influenced by a multitude of factors that operate at timescales ranging from hours to hundreds of millions of years. Many of the causes of climate change are external to the Earth system. Others are part of the Earth system but external to the atmosphere. Still others involve interactions between the atmosphere and other components of the Earth system and are collectively described as feedbacks within the Earth system. Feedbacks are among the most recently discovered and challenging causal factors to study. Nevertheless, these factors are increasingly recognized as playing fundamental roles in climate variation. The most important mechanisms for climate change are described as follows:

Volcanic activity: Volcanic activity can influence climate in a number of ways at different timescales. Individual volcanic eruptions can release large quantities of sulfur dioxide and other aerosols into the stratosphere, reducing atmospheric transparency and thus the amount of solar radiation reaching Earth's surface and troposphere. A recent example is the 1991 eruption in the Philippines of Mount Pinatubo, which had measurable influences on atmospheric circulation and heat budgets.[60] Volcanoes and related phenomena, such as ocean rifting and subduction, release carbon dioxide into both the oceans and the atmosphere. Emissions are low; even a massive volcanic eruption such as Mount Pinatubo releases only a fraction of the carbon dioxide emitted

[60]. Mount Pinatubo in the Philippines on June 12, 1991, just days before the volcano's climactic explosion on June 15.

by fossil-fuel combustion in a year. At geologic timescales, however, release of this greenhouse gas can have important effects. Variations in carbon dioxide release by volcanoes and ocean rifts over millions of years can alter the chemistry of the atmosphere. Such changeability in carbon dioxide concentrations probably accounts for much of the climatic variation that has taken place during the Phanerozoic Eon.[61]

Tectonic activity: Tectonic movements of Earth's crust have had profound effects on climate at timescales of millions to tens of millions of years. These movements have changed the shape, size, position, and elevation of the continental masses as well as the bathymetry of the oceans. Topographic and bathymetric changes in turn have had strong effects on the circulation of both the atmosphere and the oceans. For example, the uplift of the Tibetan Plateau during the Cenozoic Era affected atmospheric circulation patterns, creating the South Asian monsoon and influencing climate over much of the rest of Asia and neighbouring regions. Tectonic activity also influences atmospheric chemistry, particularly carbon dioxide concentrations. Carbon dioxide is emitted from volcanoes and vents in rift zones and subduction zones. Variations in the rate of spreading in rift zones and the degree of volcanic activity near plate margins have influenced atmospheric carbon dioxide concentrations throughout Earth's history. Even the chemical weathering of rock constitutes an important sink for carbon dioxide.[62] Carbonic acid, formed from carbon dioxide and water, is a reactant in dissolution of silicates and other minerals. Weathering rates are related to the mass, elevation, and exposure of bedrock. Tectonic uplift can increase all these factors and thus lead to increased weathering and carbon dioxide absorption. For example, the chemical weathering of the rising Tibetan Plateau may have played an important role in depleting the atmosphere of carbon dioxide during a global cooling period in the late Cenozoic Era.

Fossil fuels: Coal, oil and gas – are by far the largest contributor to global climate change, accounting for over 75 per cent of global

61. See Stephen T, Jackson, climate change: https://www.britannica.com/science/climate-change/Greenhouse-gases> accessed on 13/02/2024
62. A carbon sink is any process that removes carbon dioxide from the atmosphere by the chemical conversion of CO_2 to organic or inorganic carbon compounds.

greenhouse gas emissions and nearly 90 per cent of all carbon dioxide emissions. As greenhouse gas emissions blanket the Earth, they trap the sun's heat. This leads to global warming and climate change. The world is now warming faster than at any point in recorded history. Warmer temperatures over time are changing weather patterns and disrupting the usual balance of nature. This poses many risks to human beings and all other forms of life on Earth. In addition, gnerating electricity and heat by burning fossil fuels causes a large chunk of global emissions. Most electricity is still generated by burning coal, oil, or gas, which produces carbon dioxide and nitrous oxide – powerful greenhouse gases that blanket the Earth and trap the sun's heat. Globally, a bit more than a quarter of electricity comes from wind, solar and other renewable sources which, as opposed to fossil fuels, emit little to no greenhouse gases or pollutants into the air.

Manufacturing goods: Manufacturing and industry produce emissions, mostly from burning fossil fuels to produce energy for making things like cement, iron, steel, electronics, plastics, clothes, and other goods. Mining and other industrial processes also release gases, as does the construction industry. Machines used in the manufacturing process often run on coal, oil, or gas; and some materials, like plastics, are made from chemicals sourced from fossil fuels. The manufacturing industry is one of the largest contributors to greenhouse gas emissions worldwide.

Cutting down forests: Cutting down forests to create farms or pastures, or for other reasons, causes emissions, since trees, when they are cut, release the carbon they have been storing. Each year approximately 12 million hectares of forest are destroyed. Since forests absorb carbon dioxide, destroying them also limits nature's ability to keep emissions out of the atmosphere. Deforestation, together with agriculture and other land use changes, is responsible for roughly a quarter of global greenhouse gas emissions.[63]

Using transportation: Most cars, trucks, ships, and planes run on fossil fuels. That makes transportation a major contributor of greenhouse gases, especially carbon-dioxide emissions. Road vehicles account for

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63. Ikoni, U. D. "An Analysis of the Legal and Administrative Challenges to Combating Deforestation and Desertification in Nigeria." (ABUJPIL) Vol. 1 No. 4, 2010. A publication of the Dept of Public Law, Faculty of Law, ABU, Zaria. P. 70.

the largest part, due to the combustion of petroleum-based products, like petrol or desel, in internal combustion engines. But emissions from ships and planes continue to grow. Transport accounts for nearly one quarter of global energy-related carbon-dioxide emissions. And trends point to a significant increase in energy use for transport over the coming years.

Producing food: Producing food causes emissions of carbon dioxide, methane, and other greenhouse gases in various ways, including through deforestation and clearing of land for agriculture and grazing, digestion by cows and sheep, the production and use of fertilizers and manure for growing crops, and the use of energy to run farm equipment or fishing boats, usually with fossil fuels. All this makes food production a major contributor to climate change. And greenhouse gas emissions also come from packaging and distributing food.

Powering buildings: Globally, residential and commercial buildings consume over half of all electricity. As they continue to draw on coal, oil, and natural gas for heating and cooling, they emit significant quantities of greenhouse gas emissions. Growing energy demand for heating and cooling, with rising air-conditioner ownership, as well as increased electricity consumption for lighting, appliances, and connected devices, has contributed to a rise in energy-related carbon-dioxide emissions from buildings in recent years.

Consuming too much: Your home and use of power, how you move around, what you eat and how much you throw away all contribute to greenhouse gas emissions. So does the consumption of goods such as clothing, electronics, and plastics. A large chunk of global greenhouse gas emissions is linked to private households. Our lifestyles have a profound impact on our planet. The wealthiest bear the greatest responsibility: the richest 1 per cent of the global population combined account for more greenhouse gas emissions than the poorest 50 per cent.[64]

Feedback: Perhaps the most intensively discussed and researched topic in climate variability is the role of interactions and feedbacks among the

[64]. Raven, P. H. Environment 2nd Edn. Saunders College Publishing, 1998) 462

various components of the Earth system. The feedbacks involve different components that operate at different rates and timescales. Ice sheets, sea ice, terrestrial vegetation, ocean temperatures, weathering rates, ocean circulation, and greenhouse gas concentrations are all influenced either directly or indirectly by the atmosphere; however, they also all feed back into the atmosphere, thereby influencing it in important ways. For example, different forms and densities of vegetation on the land surface influence the albedo, or reflectivity, of Earth's surface, thus affecting the overall radiation budget at local to regional scales. At the same time, the transfer of water molecules from soil to the atmosphere is mediated by vegetation, both directly (from transpiration through plant stomata) and indirectly (from shading and temperature influences on direct evaporation from soil). This regulation of latent heat flux by vegetation can influence climate at local to global scales.[65] As a result, changes in vegetation, which are partially controlled by climate, can in turn influence the climate system. Vegetation also influences greenhouse gas concentrations; living plants constitute an important sink for atmospheric carbon dioxide, whereas they act as sources of carbon dioxide when they are burned by wildfires or undergo decomposition. These and other feedbacks among the various components of the Earth system are critical for both understanding past climate changes and predicting future ones.

2. Effects of Climate Change

Hotter temperatures: As greenhouse gas concentrations rise, so does the global surface temperature. The last decade, 2011-2020, is the warmest on record. Since the 1980s, each decade has been warmer than the previous one. Nearly all land areas are seeing more hot days and heat waves. Higher temperatures increase heat-related illnesses and make working outdoors more difficult. Wildfires start more easily and spread more rapidly when conditions are hotter. Temperatures in the Arctic have warmed at least twice as fast as the global average.

More severe storms: Destructive storms have become more intense and more frequent in many regions. As temperatures rise, more moisture

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[65]. See Stephen T, Jackson, climate change: https://www.britannica.com/science/climate-change/Greenhouse-gases > accessed on 13/02/2024

evaporates, which exacerbates extreme rainfall and flooding, causing more destructive storms. The frequency and extent of tropical storms is also affected by the warming ocean. Cyclones, hurricanes, and typhoons feed on warm waters at the ocean surface. Such storms often destroy homes and communities, causing deaths and huge economic losses.

Increased drought: Climate change is changing water availability, making it scarcer in more regions. Global warming exacerbates water shortages in already water-stressed regions and is leading to an increased risk of agricultural droughts affecting crops, and ecological droughts increasing the vulnerability of ecosystems. Droughts can also stir destructive sand and dust storms that can move billions of tons of sand across continents. Deserts are expanding, reducing land for growing food. Many people now face the threat of not having enough water on a regular basis.[66]

A warming, rising ocean: The ocean soaks up most of the heat from global warming. The rate at which the ocean is warming strongly increased over the past two decades, across all depths of the ocean. As the ocean warms, its volume increases since water expands as it gets warmer. Melting ice sheets also cause sea levels to rise, threatening coastal and island communities. In addition, the ocean absorbs carbon dioxide, keeping it from the atmosphere. But more carbon dioxide makes the ocean more acidic, which endangers marine life and coral reefs.[67]

Loss of species: Climate change poses risks to the survival of species on land and in the ocean. These risks increase as temperatures climb. Exacerbated by climate change, the world is losing species at a rate 1,000 times greater than at any other time in recorded human history. One million species are at risk of becoming extinct within the next few decades. Forest fires, extreme weather, and invasive pests and diseases are among many threats related to climate change. Some species will be able to relocate and survive, but others will not.

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[66]. Donald K. Anton, "A Beginner's Guide to International Environmental Law" University of Michigan Law School Working Paper, No. 118, June 2008. P. 25

[67]. Ibid.

Not enough food: Changes in the climate and increases in extreme weather events are among the reasons behind a global rise in hunger and poor nutrition. Fisheries, crops, and livestock may be destroyed or become less productive. With the ocean becoming more acidic, marine resources that feed billions of people are at risk. Changes in snow and ice cover in many Arctic regions have disrupted food supplies from herding, hunting, and fishing. Heat stress can diminish water and grasslands for grazing, causing declining crop yields and affecting livestock.

More health risks: Climate change is the single biggest health threat facing humanity. Climate impacts are already harming health, through air pollution, disease, extreme weather events, forced displacement, pressures on mental health, and increased hunger and poor nutrition in places where people cannot grow or find sufficient food. Every year, environmental factors take the lives of around 13 million people. Changing weather patterns are expanding diseases, and extreme weather events increase deaths and make it difficult for health care systems to keep up.[68]

Poverty and displacement: Climate change increases the factors that put and keep people in poverty. Floods may sweep away urban slums, destroying homes and livelihoods. Heat can make it difficult to work in outdoor jobs. Water scarcity may affect crops. Over the past decade (2010–2019), weather-related events displaced an estimated 23.1 million people on average each year, leaving many more vulnerable to poverty. Most refugees come from countries that are most vulnerable and least ready to adapt to the impacts of climate change.[69]

V. CHALLENGES OF ENFORCEMENT OF THE CLIMATE ACT, 2021 IN NIGERIA

Challenges to enforcement of environmental laws in Nigeria are traceable to environmental policies and strategies. The need to update and review the contents of the National Policy on Environment in response to advancement and development in science and technology and the necessity to integrate environmental concerns into the activities

68. Richard T. Wright, et al, Environmental Science: Towards a Sustainable Future 8th Edn. Prentice-Hall, Inc. 2002) p. 524
69. Ikoni, U. D. An Introduction to Nigerian Environmental Law, Malthouse Press Ltd, 2010 p. 29

of all sectors of the economy cannot be overemphasised. A number of factors could be stated here as the characteristics of the Nigerian environmental problems, these include the consequences of rapid urbanization and industrialization which has led to increased demand for variety of goods and services, including construction of roads, houses and industrial buildings leading to environmental problems. In addition, inadequate coordination and monitoring of policies affect environmental management and sustainable development. This leads to poor enforcement of the environmental protection legislations, including the Climate Change Act, 2021. An ineffective enforcement strategy is one of the environmental law enforcement challenges.[70] Some specific challenges to enforcement of the Climate Change Act, 2021 are:

Legal challenges: One of the legal challenges confronting the enforcement of subsisting environmental legislations is poor enforcement policies and lack-lustre attitude of the staff of the agencies responsible for implementation and enforcement. A good example in this regard is the policy makers' neglect of the negative impacts of oil pollution on environment, especially pollution through oil spillage and gas flaring, as consequences of oil exploration. There is, therefore, need for the government to ensure that environmental policies move from mere control and management of environmental health hazards to policies that emphasise on prevention of environmental pollution through adequate sanctions or penalties for all forms of violation. Above all, the agencies that has the responsibility of enforcing the existing regulations should summon enough courage or political will to prosecute other sister agencies that violate environmental standard or regulation in Nigeria.[71]

Administrative Challenges: Administratively, government agencies are reluctant to embark on vigorous programmes of pollution-control. One factor is that policy or decision-makers in government just do not believe that the benefits from the policy of pollution-control outweigh the costs and thus they refuse the evidence that is presented to them until

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70. See I.L. Worika, Environmental Law and Policy of Petroleum Development Strategies and Mechanism for Sustainable Management in Africa (Anpez Centre for Environment and Development, 2002) Pp.38-43.
71. Ikoni, U. D. "An Analysis of the Legal and Administrative Challenges to Combating Deforestation and Desertification in Nigeria." (ABUJPIL) Vol. 1 No. 4, 2010. A publication of the Dept of Public Law, Faculty of Law, ABU, Zaria. P. 80.

a disaster occurs. Additionally, there is lack of serious or popular pressure on the government on the need to enforce pollution-control policies. There is therefore need to educate citizens about the consequences of their indifference to environmental issues. It is important to sensitize the people to the effect that it is their environment which is at risk, and that if they do not speak out or take responsibility to protect it, nobody will and the consequences of their action will be grave.[72]

Lack of Proper Funding: Inadequate financial resources in implementing and promoting environmental policies at all levels of government is a major challenge of enforcement of environmental policies and regulations on the part of agencies. In some cases, the budgetary allocations for environmental protection and enforcement of environmental policies and regulations are either inadequate and/or not released to the agencies thus, hindering enforcement mechanisms.[73]

Corruption: Corruption is a dishonest behaviour by those in position of power, such as managers, Directors and other similar government or private office holders.[74] A vivid explanation of the word corruption is given by the World Bank to the effect that corruption is the abuse of public office for private gains, public office is abused for private gain when an official accepts, solicits or extorts a bribe. It is also abused when private agents actively offer bribes to circumvent public policies and processes or competitive advantage and profit. Public office can also be abused for personal benefit even if no bribery occurs, through patronage and nepotism, the theft of State assets or diversion of the State revenues.[75] When the officials of the agencies responsible for environmental regulations enforcement are neck deep in corruption, it will be practically impossible for them to enforce policies and regulations as they supposed to do.

Ignorance and Problem of Proof of Evidence: Ignorance of environmental harm and the anthropogenic effects of such harm on

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72. Ibid. p. 79
73. See 2023 Budget Appropriation Revision Estimate <https://www.budgetoffice.gov.ng> Accessed on 25th January, 2024.
74. See Investopedia <www.investopedia.com> terms>corruption> accessed 25th January, 2024.
75. World Bank: "Helping Countries Combat Corruption: The Role of the World Bank" (2007) World Bank Working Paper, 35

human health and the environment is a factor inhibiting environmental litigation and therefore a challenge to enforcement of the policies and regulations in Nigeria. In other words, institution of cases for environmental damage results from the awareness by victims of the harm. Where there is no awareness of environmental damage, no action can be taken to address it. A related issue is that environmental harm takes time to manifest. Thus, an act causing environmental harm may be committed today, but the harm resulting from the act may manifest some years afterward. Proving such harm where the suit is filed immediately after the act was committed becomes a problem. Moreover, if litigation is delayed until the manifestation of the harm, then proving causation for the purpose of attributing liability becomes a problem due to proximity rule.[76]

Challenge of Lack of Judicial Personnel: Environmental Law is perhaps the most challenging area facing the world's judiciary today. Yet, paradoxically, it is one of the areas of the administration of justice with which the judiciary is least familiar and least equipped to handle, whether by way of conceptions, procedures, background information or access to relevant materials. The reason is not far-fetched. Most of the judicial personnel in our courts today had no opportunity to study environmental law in the course of their training to become lawyers. Thus, they have limited knowledge of the law and its application to environmental disputes.

Poverty: Poverty is also one of the inhibiting factors militating against the enforcement of environmental legislations in Nigeria. Poverty as one of the inhibiting factors is rooted in the character or nature of environmental litigation which requires scientific evidence. In proving scientific evidence, expert witnesses knowledgeable in the area are needed. These experts are rather too expensive and cannot come within the reach of the ordinary victim of environmental harm.[77] Relatedly is the issue of destruction of forest by the poor settlers who invade the virgin forests every planting season for farming and timber resources. Because of their poverty level or state, they cannot afford to buy the expensive fertilizer to improve their farm produce. The only alternative

[76]. See George Thorsfall & Ors V. Shell B.P. Dev. Co. (1974) 2 R.S.L.R. 126.
[77]. See the case of Seismograph Services Ltd V. Onokpasa (1972)4 SC 123; see also Ogaile V. Shell Petroleum Development Co. Ltd. (1997) NWLR (Pt. 480)148.

is to continue to clear the forests for farming purposes with the attendant consequences on climate change.[78]

VI. MEASURES TO ADDRESS CLIMATE CHANGE CHALLENGES IN NIGERIA

Climate change adaptation: Climate change adaptation refers to actions that help reduce vulnerability to the current or expected impacts of climate change like weather extremes and natural disasters, sea-level rise, biodiversity loss, or food and water insecurity.[79] Many adaptation measures need to happen at the local level, so rural communities and cities have a big role to play. Such measures include planting crop varieties that are more resistant to drought and practicing regenerative agriculture, improving water storage and use, managing land to reduce wildfire risks, and building stronger defences against extreme weather like floods and heat waves.

However, adaptation also needs to be driven at the national and international levels. In addition to developing the policies needed to guide adaptation, governments need to look at large-scale measures such as strengthening or relocating infrastructure from coastal areas affected by sea-level rise, building infrastructure able to withstand more extreme weather conditions, enhancing early warning systems and access to disaster information, developing insurance mechanisms specific to climate-related threats, and creating new protections for wildlife and natural ecosystems.

Adoption of nature-based solutions: Nature-based solutions are actions to protect, conserve, restore, and sustainably use and manage ecosystems to support climate change adaptation and mitigation efforts, preserve biodiversity, and enable sustainable livelihoods. They are actions that prioritize the importance of ecosystems and biodiversity and are designed and implemented with the full engagement and consent of local communities and indigenous peoples, who hold generational knowledge on protecting nature.[80]

Nature-based solutions are used in many ways, across terrestrial, freshwater, coastal, and marine ecosystems. Restoring wetlands protects

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78. Ikoni, U. D. An Introduction to Nigerian Environmental Law, Malthouse Press Ltd, 2010 p. 29
79. See the Climate Dictionary, United Nations Development Programme I United Nations Plaza, New York, NY10017, 2023) P.7
80. The Climate Dictionary, P.61

communities from floods, while conserving mangrove forests supports food sources and minimizes the impact of storms. Forests absorb carbon dioxide, allow biodiversity to thrive, increase water security, and combat landslides, while urban parks and gardens help cool down cities and limit the impact of heatwaves. Regenerative agriculture practices increase the amount of carbon captured by the soil and restore its health and productivity. Nature-based solutions are seen as a win-win for people and nature, addressing multiple problems at once. They can create jobs, provide new and more resilient livelihood opportunities, and increase income while also protecting the planet and addressing climate change.

Reforestation and Afforestation: Forests provide immense benefits by removing carbon dioxide and pollutants from the atmosphere, preventing soil erosion, filtering water, and housing half of the world's land species of animals, plants and insects. Reforestation and afforestation are two of the most effective nature-based solutions in fighting climate change and limiting its impacts. Restoration is the process of replanting trees in areas that had recent tree cover but where forests were lost, due to wildfires, drought, disease, or human activity such as agricultural clearing. Afforestation is the process of planting trees in areas that have not been forested in recent history. Afforestation helps restore abandoned and degraded agricultural lands, prevent desertification, create carbon sinks, and generate new economic opportunities for local communities.

Reducing Deforestation and Forest Degradation (REDD$^+$): Forest conservation and restoration can provide more than one quarter of the greenhouse gas emissions reductions needed to avoid the worst impacts of climate change. REDD$^+$ is a framework agreed by countries in the international climate negotiations that aims to curb climate change by reducing deforestation and forest degradation, and sustainably managing and conserving forests in developing countries. REDD stands for "Reducing Emissions from Deforestation and Forest Degradation." The "+" signifies the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.[81]

[81]. The Climate Dictionary, P.69

Adoption of Regenerative Agriculture: Regenerative agriculture is a way of farming that nurtures and restores soil health, and therefore reduces water use, prevents land degradation, and promotes biodiversity. By minimizing land ploughing, practicing rotating crops, and using animal manure and compost, regenerative agriculture ensures that the soil stores more carbon, conserves more moisture, and is healthier due to thriving fungal communities. Intensive agriculture is responsible for a third of global greenhouse gas emissions, uses 70 percent of the fresh water we consume, and leads to soil degradation through its use of heavy machinery, chemical fertilizers, and pesticides. It is also the biggest contributor to biodiversity loss. By contrast regenerative agriculture helps lower greenhouse gas emissions, conserves water and restores land. Moreover, healthy soil produces more food and better nutrition and has other positive impacts on ecosystems and biodiversity.[82]

Utilisation of Renewable Energy: Renewable energy is energy derived from natural sources that are constantly being replenished, such as wind, sunlight, the flow of moving water, and geothermal heat. In contrast to energy sourced from fossil fuels like coal, oil, and gas, which accounts for 75 percent of the harmful greenhouse gas emissions that are causing climate change, energy from renewable sources is cheap, clean, sustainable, and generates more jobs. Transitioning from fossil fuels to renewable energy in all sectors – power, heating and cooling, transportation, and industry – is key to addressing the climate crisis. To stay under 1.5^{o}C of global warming, the world needs to immediately phase out fossil fuel use and undergo a profound transformation of the energy system through rapid electrification and sourcing energy from renewable sources. Thus, it was said that with the right investments, electricity from renewable sources could provide 65% of the world's total electricity supply by 2030.[83]

Generating renewable energy creates far lower emissions than burning fossil fuels. Transitioning from fossil fuels, which currently account for the lion's share of emissions, to renewable energy is key to addressing the climate crisis. Renewables are now cheaper in most countries, and generate three times more jobs than fossil fuels. Some of

82. Ibid, p. 71
83. The Climate Dictionary, P.73

the common sources of renewable energy include: (1) Solar energy is the most abundant of all energy resources and can even be harnessed in cloudy weather. The rate at which solar energy is intercepted by the Earth is about 10,000 times greater than the rate at which humankind consumes energy. Solar technologies can deliver heat, cooling, natural lighting, electricity, and fuels for a host of applications. Solar technologies convert sunlight into electrical energy either through photovoltaic panels or through mirrors that concentrate solar radiation. Although not all countries are equally endowed with solar energy, a significant contribution to the energy mix from direct solar energy is possible for every country. The cost of manufacturing solar panels has plummeted dramatically in the last decade, making them not only affordable but often the cheapest form of electricity. Solar panels have a lifespan of roughly 30 years, and come in variety of shades depending on the type of material used in manufacturing. (2) Wind energy harnesses the kinetic energy of moving air by using large wind turbines located on land (onshore) or in sea- or freshwater (offshore). Wind energy has been used for millennia, but onshore and offshore wind energy technologies have evolved over the last few years to maximize the electricity produced - with taller turbines and larger rotor diameters. Though average wind speeds vary considerably by location, the world's technical potential for wind energy exceeds global electricity production, and ample potential exists in most regions of the world to enable significant wind energy deployment. Many parts of the world have strong wind speeds, but the best locations for generating wind power are sometimes remote ones. Offshore wind power offers tremendous potential. (3) Geothermal energy utilizes the accessible thermal energy from the Earth's interior. Heat is extracted from geothermal reservoirs using wells or other means. Reservoirs that are naturally sufficiently hot and permeable are called hydrothermal reservoirs, whereas reservoirs that are sufficiently hot but that are improved with hydraulic stimulation are called enhanced geothermal systems. Once at the surface, fluids of various temperatures can be used to generate electricity. The technology for electricity generation from hydrothermal reservoirs is mature and reliable, and has been operating for more than 100 years. (4) Hydropower harnesses the energy of water moving from higher to lower elevations. It can be generated from reservoirs and rivers. Reservoir hydropower plants rely on stored water in a reservoir, while run-of-river hydropower plants harness energy from

the available flow of the river. Hydropower reservoirs often have multiple uses - providing drinking water, water for irrigation, flood and drought control, navigation services, as well as energy supply. Hydropower currently is the largest source of renewable energy in the electricity sector. It relies on generally stable rainfall patterns, and can be negatively impacted by climate-induced droughts or changes to ecosystems which impact rainfall patterns. The infrastructure needed to create hydropower can also impact on ecosystems in adverse ways. For this reason, many consider small-scale hydro a more environmentally-friendly option, and especially suitable for communities in remote locations. (5) Bioenergy is produced from a variety of organic materials, called biomass, such as wood, charcoal, dung and other manures for heat and power production, and agricultural crops for liquid biofuels. Most biomass is used in rural areas for cooking, lighting and space heating, generally by poorer populations in developing countries. Modern biomass systems include dedicated crops or trees, residues from agriculture and forestry, and various organic waste streams. Energy created by burning biomass creates greenhouse gas emissions, but at lower levels than burning fossil fuels like coal, oil or gas. However, bioenergy should only be used in limited applications, given potential negative environmental impacts related to large-scale increases in forest and bioenergy plantations, and resulting deforestation and land-use change.

There are some reasons why accelerating the transition to clean energy is the pathway to a healthy, liveable planet today and for generations to come. Some of these reasons are:

1. *Renewable energy sources are all around us: About 80 percent of the global population lives in countries that are net-importers of fossil fuels -- that's about 6 billion people who are dependent on fossil fuels from other countries, which makes them vulnerable to geopolitical shocks and crises. In contrast, renewable energy sources are available in all countries, and their potential is yet to be fully harnessed. The International Renewable Energy Agency (IRENA) estimates that 90 percent of the world's electricity can and should come from renewable energy by 2050. Renewables offer a way out of import dependency, allowing countries to diversify their economies and protect them from*

the unpredictable price swings of fossil fuels, while driving inclusive economic growth, new jobs, and poverty alleviation.

2. Renewable energy is cheaper: Renewable energy actually is the cheapest power option in most parts of the world today. Prices for renewable energy technologies are dropping rapidly. The cost of electricity from solar power fell by 85 percent between 2010 and 2020. Costs of onshore and offshore wind energy fell by 56 percent and 48 percent respectively. Falling prices make renewable energy more attractive all around – including to low- and middle-income countries, where most of the additional demand for new electricity will come from. With falling costs, there is a real opportunity for much of the new power supply over the coming years to be provided by low-carbon sources. Cheap electricity from renewable sources could provide 65 percent of the world's total electricity supply by 2030. It could decarbonize 90 percent of the power sector by 2050, massively cutting carbon emissions and helping to mitigate climate change. Although solar and wind power costs are expected to remain higher in 2022 and 2023 then pre-pandemic levels due to general elevated commodity and freight prices, their competitiveness actually improves due to much sharper increases in gas and coal prices, says the International Energy Agency (IEA).

3. Renewable energy is healthier: According to the World Health Organization (WHO), about 99 percent of people in the world breathe air that exceeds air quality limits and threatens their health, and more than 13 million deaths around the world each year are due to avoidable environmental causes, including air pollution. The unhealthy levels of fine particulate matter and nitrogen dioxide originate mainly from the burning of fossil fuels. In 2018, air pollution from fossil fuels caused $2.9 trillion in health and economic costs, about $8 billion a day. Switching to clean sources of energy, such as wind and solar, thus helps address not only climate change but also air pollution and health.

4. Renewable energy creates jobs: Every dollar of investment in renewables creates three times more jobs than in the fossil fuel industry. The IEA estimates that the transition towards net-zero emissions will lead to an overall increase in energy sector jobs: while about 5 million

jobs in fossil fuel production could be lost by 2030, an estimated 14 million new jobs would be created in clean energy, resulting in a net gain of 9 million jobs. In addition, energy-related industries would require a further 16 million workers, for instance to take on new roles in manufacturing of electric vehicles and hyper-efficient appliances or in innovative technologies such as hydrogen. This means that a total of more than 30 million jobs could be created in clean energy, efficiency, and low-emissions technologies by 2030. Ensuring a just transition, placing the needs and rights of people at the heart of the energy transition, will be paramount to make sure no one is left behind.

5. Renewable energy makes economic sense: About $7 trillion was spent on subsidizing the fossil fuel industry in 2022, including through explicit subsidies, tax breaks, and health and environmental damages that were not priced into the cost of fossil fuels. In comparison, about $4 trillion a year needs to be invested in renewable energy until 2030 – including investments in technology and infrastructure – to allow us to reach net-zero emissions by 2050. The upfront cost can be daunting for many countries with limited resources, and many will need financial and technical support to make the transition. But investments in renewable energy will pay off. The reduction of pollution and climate impacts alone could save the world up to $4.2 trillion per year by 2030. Moreover, efficient, reliable renewable technologies can create a system less prone to market shocks and improve resilience and energy security by diversifying power supply options.[84]

Furthermore, the Secretary-General of the United Nations has outlined five critical actions the world needs to prioritize as a matter of urgency to transform our energy systems and speed up the shift to renewable energy. According to him, this is so "because without renewables, there can be no future." Some of the critical actions suggested by him include the followings:

1. **Make renewable energy technology a global public good:** For renewable energy technology to be a global public good - meaning available to all, and not just to the wealthy - it will be essential to remove roadblocks to knowledge sharing and technological transfer,

[84]. See Renewable energy – powering a safer future https://www.un.org/en/climatechange/raising-ambition/renewable-energy

including intellectual property rights barriers. Essential technologies such as battery storage systems allow energy from renewables, like solar and wind, to be stored and released when people, communities and businesses need power. They help to increase energy system flexibility due to their unique capability to quickly absorb, hold and re-inject electricity, says the International Renewable Energy Agency. Moreover, when paired with renewable generators, battery storage technologies can provide reliable and cheaper electricity in isolated grids and to off-grid communities in remote locations.

2. **Improve global access to components and raw materials:** A robust supply of renewable energy components and raw materials is essential. More widespread access to all the key components and materials - from the minerals needed to produce wind turbines and electricity networks, to electric vehicles - will be key. It will take significant international coordination to expand and diversify manufacturing capacity globally. Moreover, greater investments are needed to ensure a just transition - including in people's skills training, research and innovation, and incentives to build supply chains through sustainable practices that protect ecosystems and cultures.

3. Level the playing field for renewable energy technologies: **While global cooperation and coordination is critical, domestic policy frameworks must urgently be reformed to streamline and fast-track renewable energy projects and catalyze private sector investments. Technology, capacity and funds for renewable energy transition exist, but there needs to be policies and processes in place to reduce market risk and enable and incentivize investments - including through streamlining the planning, permitting and regulatory processes, and preventing bottlenecks and red tape. This could include allocating space to enable large-scale build-outs in special Renewable Energy Zones.**

Nationally Determined Contributions, countries' individual climate action plans to cut emissions and adapt to climate impacts, must set 1.5C aligned renewable energy targets - and the share of renewables in global electricity generation must increase from today's 29 percent to 60 percent by 2030. Clear and robust policies, transparent processes, public support and the availability of modern energy transmission

systems are key to accelerating the uptake of wind and solar energy technologies.

4. **Shift energy subsidies from fossil fuels to renewable energy:** Fossil-fuel subsidies are one of the biggest financial barriers hampering the world's shift to renewable energy. The International Monetary Fund (IMF) says that about $5.9 trillion was spent on subsidizing the fossil fuel industry in 2020 alone, including through explicit subsidies, tax breaks, and health and environmental damages that were not priced into the cost of fossil fuels. That's roughly $11 billion a day. Fossil fuel subsidies are both inefficient and inequitable. Across developing countries, about half of the public resources spent to support fossil fuel consumption benefits the richest 20 percent of the population, according to the IMF. Shifting subsidies from fossil fuels to renewable energy not only cuts emissions, it also contributes to the sustainable economic growth, job creation, better public health and more equality, particularly for the poor and most vulnerable communities around the world.

5. Triple investments in renewables: **At least $4 trillion a year needs to be invested in renewable energy until 2030 – including investments in technology and infrastructure – to allow us to reach net-zero emissions by 2050. Not nearly as high as yearly fossil fuel subsidies, this investment will pay off. The reduction of pollution and climate impact alone could save the world up to $4.2 trillion per year by 2030. The funding is there - what is needed is commitment and accountability, particularly from the global financial systems, including multilateral development banks and other public and private financial institutions, that must align their lending portfolios towards accelerating the renewable energy transition. In the Secretary-General's words, "renewables are the only path to real energy security, stable power prices and sustainable employment opportunities."[85] Other measures include the followings:**

6. Be Climate Resilience Conscious: Climate resilience is the capacity of a community or environment to anticipate and manage climate impacts, minimize their damage, and recover and transform as

[85]. See UN Secretary-General António Guterres, "Five ways to jump-start the renewable energy transition now"-https://www.un.org/en/climatechange/raising-ambition/renewable-energy-transition

needed after the initial shock.[86] To best safeguard societal wellbeing, economic activity, and the environment, people, communities, and governments need to be equipped to deal with the unavoidable impacts of climate change. This can be done by training people to obtain new skills and diversity the sources of their household income, building more robust disaster response and recovery capacities, enhancing climate information and early warning systems, and working on long-term planning, among others. Ultimately, a truly climate resilient society is a low-carbon one, because drastically reducing greenhouse gas emissions is the best way to limit how severe climate impacts will be in the future. It is also a society based in equity and climate justice that prioritizes support for people and communities most exposed to climate impacts or least able to cope with them.

7. **Practice of Rewilding of Ecosystems:** Rewilding is the mass restoration of ecosystems that have been damaged by human activity. More than conservation, which focuses on saving specific species through dedicated human intervention, rewilding refers to setting aside large areas for the natural world to regenerate in on its own terms. This sometimes requires the reintroduction of key species that have been driven extinct in a particular region, such as bearers, wolves, or large herbivores, who help shape entire ecosystems. Rewilding can help combat climate change by removing more carbon dioxide from the atmosphere through healthy natural processes such as natural woodland regeneration. It also helps prevent species extinction by creating nature-rich habitats that allow wildlife to adapt to climate change and migrate as warming intensities.[87]

8. **Promotion of Transparency Reporting:** Under the Paris Agreement, countries must regularly report on the implementation of their Nationally Determined Contributions. It is crucial that this reporting is done with transparency to allow the global community to accurately assess collective progress and build trust that everyone is playing their part. Transparent reporting allows governments and international bodies to have access to reliable data and make evidence-based decisions. It also enhances our scientific understanding of climate

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86. The Climate Dictionary, P.75
87. Ibid, P.77; See also UNFCCC: Yearbook of Global Climate Action, 2023-Marrakesh Partnership for Global Climate Action. UNFCC Secretariat, p. 21

change and the actions and policies needed to mitigate it and adapt to its impacts. Ultimately, transparency is key to unlocking the full potential of the Paris Agreement, by promoting trust, collaboration and knowledge transfer and encouraging further ambition on climate targets.

9. **International Cooperation:** Climate change is a global emergency that goes beyond national borders. It is an issue that requires international cooperation and coordinated solutions at all levels. To tackle climate change and its negative impacts, world leaders at the UN Climate Change Conference (COP21) in Paris reached a breakthrough on 12 December 2015: the historic Paris Agreement. The Paris Agreement is a legally binding international treaty aiming to limit global warming to well below 2ºC, preferably to 1.5ºC, compared to pre-industrial levels. It was adopted by 196 parties in 2015 at COP21 in Paris and entered into force on 4 November 2016.[88] The Paris Agreement is a landmark achievement in international cooperation on climate change because it is a binding agreement for all parties to scale up efforts to combat climate change and adapt to its effects. It also provides the instruments for developed nations to assist developing nations in their climate mitigation and adaptation efforts, while creating a framework for transparent monitoring and reporting of results. The Agreement sets long-term goals to guide all nations to:

i. substantially reduce global greenhouse gas emissions to hold global temperature increase to well below 2°C above pre-industrial levels and pursue efforts to limit it to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
ii. periodically assess the collective progress towards achieving the purpose of this agreement and its long-term goals;
iii. provide financing to developing countries to mitigate climate change, strengthen resilience and enhance abilities to adapt to climate impacts.

The Agreement includes commitments from all countries to reduce their emissions and work together to adapt to the impacts of climate change, and calls on countries to strengthen their commitments over time. The Agreement provides a pathway for developed nations to assist developing nations in their climate mitigation and adaptation

88. The Climate Dictionary, P.65

efforts while creating a framework for the transparent monitoring and reporting of countries' climate goals. The Paris Agreement provides a durable framework guiding the global effort for decades to come. It marks the beginning of a shift towards a net-zero emissions world. Implementation of the Agreement is also essential for the achievement of the Sustainable Development Goals. How does the Paris Agreement work? The Paris Agreement works on a five- year cycle of increasingly ambitious climate action carried out by countries. Every five years, each country is expected to submit an updated national climate action plan - known as **Nationally Determined Contribution**, or NDC. In their NDCs, countries communicate actions they will take to reduce their greenhouse gas emissions in order to reach the goals of the Paris Agreement. Countries also communicate in the NDCs actions they will take to build resilience to adapt to the impacts of rising temperatures.[89]

VII. CONCLUSION

Weather refers to atmospheric conditions at a particular time in a particular location, including temperature, humidity, precipitation, cloudiness, wind, and visibility. Weather Conditions do not happen in isolation; they have a ripple effect. The weather in one region will eventually affect the weather hundreds or thousands of kilometers away. Climate is the average of weather patterns in a specific area over a longer period of time, usually 30 or more years, that represents the overall state of the climate system. Human activity in the industrial age, and particularly during the last century, is significantly altering our planet's climate through the release of harmful greenhouse gases.[90]

The climate crisis refers to the serious problems that are being caused, or are likely to be caused, by changes in the planet's climate, including weather extremes and natural disasters, ocean acidification and sea-level rise, loss of biodiversity, food and water insecurity, health risks, economic disruption, displacement, and even violent conflict. Since the 1800s, human activities have caused the earth's average temperature to increase by about 1.2^{o}C with more than two-thirds of this warming occurring since 1975. This is already causing significant damage to human societies and natural ecosystems in many parts of the world. More than 3 billion people live in places that are very vulnerable

[89]. UNFCCC: Yearbook of Global Climate Action, 2023-Marrakesh Partnership for Global Climate Action. UNFCC Secretariat, p. 20

[90]. The Climate Dictionary, P.85

to the climate crisis, with lower income countries being disproportionately affected. Scientists expect that an increase beyond 1.5ºC would begin to lead to a series of dangerous tipping points that would make many changes irreversible and pose a very serious threat to human civilization. This is why governments must act now and drastically reduce greenhouse gas emissions and chart a course for marching net zero in the coming decades, invest in adaptation to the unavoidable impacts of climate change, and protect and restore natural ecosystems and biomes upon which the planet depends.

Many people think climate change mainly means warmer temperatures. But temperature rise is only the beginning of the story. Because the Earth is a system, where everything is connected, changes in one area can influence changes in all others. The consequences of climate change now include, among others, intense droughts, water scarcity, severe fires, rising sea levels, flooding, melting polar ice, catastrophic storms and declining biodiversity. Climate change can affect our health, ability to grow food, housing, safety and work. Some of us are already more vulnerable to climate impacts, such as people living in small island nations and other developing countries. Conditions like sea-level rise and saltwater intrusion have advanced to the point where whole communities have had to relocate, and protracted droughts are putting people at risk of famine. In the future, the number of people displaced by weather-related events is expected to rise.

Many climate change solutions can deliver economic benefits while improving our lives and protecting the environment. We also have global frameworks and agreements to guide progress, such as the Sustainable Development Goals, the UN Framework Convention on Climate Change and the Paris Agreement. Three broad categories of action are: cutting emissions, adapting to climate impacts and financing required adjustments. Switching energy systems from fossil fuels to renewables like solar or wind will reduce the emissions driving climate change. But we have to act now. While a growing number of countries is committing to net zero emissions by 2050, emissions must be cut in half by 2030 to keep warming below 1.5°C. Achieving this means huge declines in the use of coal, oil and gas: over two-thirds of today's proven reserves of fossil fuels need to be kept in the ground by 2050 in order to prevent catastrophic levels of climate change.

Adapting to climate consequences protects people, homes, businesses, livelihoods, infrastructure and natural ecosystems. It covers

current impacts and those likely in the future. Adaptation will be required everywhere, but must be prioritized now for the most vulnerable people with the fewest resources to cope with climate hazards. The rate of return can be high. Early warning systems for disasters, for instance, save lives and property, and can deliver benefits up to 10 times the initial cost. Climate action requires significant financial investments by governments and businesses. But climate inaction is vastly more expensive. One critical step is for industrialized countries to fulfil their commitment to provide $100 billion a year to developing countries so they can adapt and move towards greener economies.

This article addresses the concept of climatic variation and change within the set of integrated natural features and processes known as the Earth system. It analyses the Climate Change Act, 2021 and the challenges of its enforcement. The nature of the evidence for climate change is explained, as are the principal mechanisms that have caused climate change throughout the history of Earth. Finally, a detailed description is given of climate change over many different timescales, ranging from a typical human life span to all of geologic time. The causes and effects of climate change as well as suggestions to address the effects were also discussed.