

## TRANSITION TO SUSTAINABLE ENERGY AS A TOOL FOR DECARBONISATION IN NIGERIA: REGULATORY CHALLENGES

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### ABSTRACT

Global energy mix is shifting from fossil fuels to renewable energy. Most developed nations are working towards decarbonizing their economy while ensuring sustainable energy. This energy transformation is also expected to gain momentum in the developing world as new ecosystems are forming and new technologies are emerging. These developments in technology that developed nations have keyed into are helping to grow renewable, develop new energy carriers, improve energy efficiency, reduce emissions and create new markets for carbon and other by-products as part of an increasingly circular economy. At COP26, it was made compulsory for developing countries to transition from fossil fuels to a decarbonized economy. Climate change financing is now viewed as part of adaptation, mitigation and economic development measures. These measures are expected to help reduce the harsh effects of global climate change. This is not the case in Nigeria where many of these commonly pursued steps to decarbonisation, such as increased electrification, wide-scale use of renewable energy and intensifying energy efficiency measures are mired by regulatory challenges. This article using doctrinal research methodology aims to explore how developing countries like Nigeria with heavy reliance on fossil fuel can accelerate decarbonisation over the next decade and achieve the timelines for the 2030 National Determined Contributions (NDCs), which has been advanced from 2025 to the end of 2022 at the COP26.

**Keywords:** Sustainable energy; Decarbonisation; Energy mix; Regulatory challenges

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## Transition to Sustainable Energy as a Tool for Decarbonisation in Nigeria: Regulatory Challenges

### 1. INTRODUCTION

Nigeria is home to approximately 10% of the un-electrified population of Sub-Saharan Africa.<sup>1</sup> In 2019, 77 million Nigerians or 40% of the population had no access to affordable, reliable and sustainable electricity despite the abundance of renewable energy sources in the country.<sup>2</sup> The reality is that the use of diesel and petrol-fuelled back-up generators supply the vast majority of electricity in the country.<sup>3</sup> Nigeria has marshalled out three key long-term ambitions that will ensure decarbonisation of the electricity sector and use of renewable sources in electrification.<sup>4</sup> These include improving energy efficiency by 20% by providing 13 giga watt (GW) of renewable electricity to rural communities who are currently not connected to the electric power grid. The second long-term ambition is to end the flaring of gas and significantly reduce the use of generators. This would lead to a 45% reduction of greenhouse gas emissions (GHG) emissions by 2030.<sup>5</sup> However, Nigeria may not meet up with the implementation of any of these plans as well as the timelines of the Nationally-Determined Contribution (NDC), which are countries that set targets for mitigating the greenhouse gas emissions that cause climate change and for adapting to climate impacts agreed upon in Article 4 paragraph 2 of the Paris Agreement.<sup>6</sup> The timelines of the NDCs have been advanced from 2025 to the end of 2022 at COP26 held at Glasgow from 31 October to 12 November 2021.<sup>7</sup> The reason Nigeria may not meet up with the implementation of any of the plans mentioned earlier is that more than 60% of the greenhouse gas emissions (GHG) reductions are foreseen in the Nigerian power sector.<sup>8</sup> However, the current grid-based sector suffers from insufficient generation, transmission, and distribution, infrastructure deficit

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<sup>1</sup> Maria Yetano Roche and Others, 'Achieving Sustainable Development Goals in Nigeria's Power Sector: Assessment of Transition Pathways' (2020) 20 (7) *Climate Policy Journal* 846-865.

<sup>2</sup> Agaptus Nwozor, and Others, 'Energy Poverty and Environmental Sustainability in Nigeria: An Exploratory Assessment' (2019) 332 *Earth and Environmental Science Journal* 1-12.

<sup>3</sup> Sunday Olayinka Oyedepo, 'Energy and Sustainable Development in Nigeria: The Way Forward' (2012) 15(10) *Energy, Sustainability and Society Journal* 10.

<sup>4</sup> Centre for Climate Change and Development, 'Nigerian Deep Decarbonisation Pathways Project' <<https://cccd.funai.edu.ng>> accessed 20 October 2021.

<sup>5</sup> Ibid.

<sup>6</sup> The Nationally Determined Contribution (NDC) is provided for under Article 4 (2) of the Paris agreement which enjoins each Party to the Paris Agreement to prepare, communicate and maintain successive NDCs that it intends to achieve. Parties shall pursue domestic mitigation measures, to achieve the objectives of such contributions. Developed country Parties should continue taking the lead by undertaking economywide absolute emission reduction targets. Developing country Parties should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the light of different national circumstances. The least developed countries and small island developing States may prepare and communicate strategies, plans, and actions for low greenhouse gas emissions development reflecting their special circumstances. Paris Agreement <<https://unfccc.int>> accessed 11 March 2022.

<sup>7</sup> United Nations, 'Department of Economic and Social Affairs' <<https://www.un.org/>> 20 December 2021.

<sup>8</sup> Maria Yetano Roche and Others, 'Achieving Sustainable Development Goals in Nigeria's Power Sector: Assessment of Transition Pathways' (2020) 20 (7) *Climate Policy Journal* 846-865.

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as well as corruption. Also, Nigeria has been unable to meet the 12 months' timeline of the Solar Power Strategy in the Nigerian Economic Sustainability Plan.<sup>9</sup> This has made petrol and diesel backed up generators the preferred source of electricity despite the high emission rate.<sup>10</sup>

There is a need for transformation of Nigeria's power sector to meet the ambitions and set targets on decarbonisation because National Determined Contributions Nigeria pledged at the Paris Agreement with a close mark timeline agreed at COP26.<sup>11</sup> Though the transformation process faces various and interconnected challenges, some of which are common to both grid-based and decentralized electricity. The identifiable challenges are lack of finance, high investment risks, and a poor enabling environment resulting from regulatory challenges.<sup>12</sup> Many businesses in Nigeria have declared their intention to go carbon neutral shortly, while their visions are clear the challenges lie in the enabling environment to achieve their intentions. This is because there are currently insufficient electricity generations and distribution in the country, reliance on the electricity sector to do business in Nigeria may not to be practicable.<sup>13</sup>

This research will focus on the challenges facing the regulation of the energy generation of the electricity sector in a bid to finding lasting solutions to the energy crises and decarbonisation of the Nigerian electricity sector. This paper, therefore, seeks to identify and critically examine the pathways available to Nigeria to meet NDCs by the end of 2022 and also meet their decarbonisation goals by having access to clean energy by 2030. The paper is structured into five sections: the section 2 examines the subtopic Sustainable Energy as a pathway to decarbonisation in Nigeria; section 3 examines sustainable energy: comparative study between selected developed nations and Nigeria; section 4 analyses the regulatory challenges towards sustainable energy and decarbonisation in Nigeria; section 5 concludes and makes appropriate recommendations.

## 2. SUSTAINABLE ENERGY AS A PATHWAY TO DECARBONISATION IN NIGERIA

Energy is a key driver for agriculture, industries and service sectors that influence sustainable economic development, but today there is an increased concern over its sustainability, and this has placed Nigeria in a critical position.<sup>14</sup> The burning of fossil fuels has caused multiple

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<sup>9</sup> Nigerian Economic Sustainability Plan, 'Energy for All: Solar Power Strategy' <<https://budgetoffice.gov.ng>> accessed 11 March 2022.

<sup>10</sup> Vanessa Ferrero and Others, 'Developing Clean Energy in Nigeria: Data Centric Solutions for a Solar Hybrid Company' <<https://dukespace.lib.duke.edu/>> accessed 15 October 2021.

<sup>11</sup> Institute for Security Studies, 'COP26 a Mixed Bag for Africa' <<https://issafrica.org/>> accessed 19 December 2021.

<sup>12</sup> Economist Intelligence, 'Challenges Facing the Nigerian Power Sector' <<http://country.eiu.com/>> accessed 10 October 2021.

<sup>13</sup> Ibid

<sup>14</sup> Oxford Business Group, 'Energy Resources are a Key Driver of Nigeria's Economy' <<https://oxfordbusinessgroup.com>> accessed 12 October 2021.

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environmental problems such as air pollution and global climate change.<sup>15</sup> Statistics show that the CO<sub>2</sub> emissions for Nigeria as of 2020 are at 126.9 million tonnes. Though Nigeria CO<sub>2</sub> emissions fluctuated substantially in recent years, it tended to increase through the 1971 to 2020 period.<sup>16</sup> However, in the NDC submitted in July 2021, Nigeria is committed to an unconditional contribution of reducing carbon emissions by 20 percent below business-as-usual by 2030, while it increased its conditional target to 47 percent as against the 45 percent captured in the 2015 NDC and is committed to cut carbon emissions to net-zero by 2060.<sup>17</sup> This is because Nigeria, just like other African countries, is considered vulnerable to climate change and is also aware that global climate change threatens the very existence of life on earth. The strategies to achieve these goals were contained in the revised nationally determined contribution, which provides the additional priority sectors. Thus, nature-based solution such as renewable energy sources that are abundant in Nigeria, such as solar, biomass and wind to generate energy, adaptation and resilience, vulnerability assessment, clean cooking, gender and green job assessment, as well as a bottom-up renewable energy transition are the identified additional priority sectors.<sup>18</sup> However, transforming the present crude oil-dominated energy mix in Nigeria to renewable and sustainable energy use is one of the Herculean tasks facing Nigeria, at risks having stranded assets.<sup>19</sup> Despite that, decarbonisation is key to achieving climate goals and saving the earth from global warming. Therefore, a fine balance of environmental sustainability with necessary economic development is required to mitigate the harsh effects of climate change.<sup>20</sup> On the other hand, the transition to sustainable and renewable energy technologies provides an opportunity to address not only the environmental problems but also overall economic and developmental needs to improve the living standards of people with equity and economic sustainability.<sup>21</sup>

It has become clearer to the global community that management of the considerable risks due to air pollution and climate change, necessitate decarbonisation through reduction in fossil fuel utilization, as has been explained in several reports including the sixth assessment report released by the Intergovernmental Panel on Climate Change (IPCC).<sup>22</sup> Considering

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<sup>15</sup> Maren Borok and Others, 'Energy Exploitation and Environmental Impact in Nigeria: The Way Forward' (2013) 3(7) *Journal of Energy Technologies and Policy* 13.

<sup>16</sup> World Data Atlas, 'Nigeria – CO<sub>2</sub> Emissions' <<https://knoema.com>> accessed 12 March 2022

<sup>17</sup> Babatunde Akintunde, 'Analysis, COP26: Nigeria Plans to Cut Carbon Emissions to Net-zero by 2060 is Short on Details' *Premium Times* <<https://www.premiumtimesng.com>> accessed 12 March 2022.

<sup>18</sup> Ibid.

<sup>19</sup> Huma Haider, 'Climate change in Nigeria: Impacts and Responses' <<https://opendocs.ids.ac.uk/>> accessed 12 October 2021.

<sup>20</sup> Economist Intelligence, 'Challenges Facing the Nigerian Power Sector' <<http://country.eiu.com/>> accessed 10 October 2021.

<sup>21</sup> Oludamilare Bode Adewuyi and others, 'Challenges and Prospects of Nigeria's Sustainable Energy Transition with Lessons from Other Countries' Experiences' (2020) *Energy Reports* 6, pp.993-1009.

<sup>22</sup> IPCC, 'Sixth Assessment' <<https://www.ipcc.ch/>> accessed 17 October 2021.

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how the global community accepted Nigerian's commitment to an unconditional reduction of carbon emissions by 20 percent below business as usual by 2030 and net zero by 2060 at COP26, it is noteworthy to state that it is of utmost importance, urgency and priority to ensure decarbonisation in Nigeria. This is because ensuring decarbonisation in Nigeria will help preserve the elementary natural systems, mitigate global climate change, arrest environmental degradation and promote sustainable, fair and civilized world for the generation unborn.<sup>23</sup>

### 2.1 Meaning of Sustainable Energy

What then is sustainable energy? The United Nations (the UN's Brundtland Commission popularized the term in 1987) defined sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."<sup>24</sup> Using the above definition for sustainability, sustainable energy, therefore, refers to energy that meets the needs of the present generations without compromising the ability of future generations to meet their own needs.<sup>25</sup> Sustainable energy is about finding clean, renewable sources of energy, rather than sources that can be depleted.<sup>26</sup> Sustainable energy is the energy that we will never use up or deplete because it is inexhaustible.<sup>27</sup> Several forms of energy can be considered sustainable, in addition to the most commonly considered sources like wind, solar, and water. There is also bioenergy and geothermal energy. Bioenergy is the process of creating energy from biological masses such as straw, manure and other agricultural by-products. Geothermal energy is energy from Earth's internal energy sources, like geysers.<sup>28</sup> Energy sustainability can also be achieved through improved energy conservation and efficiency.<sup>29</sup> Though the sources of energy most commonly used may meet our current needs, these common sources of energy, such as coal and natural gas, may deplete, leaving none behind for the future generation.<sup>30</sup> Sustainable energy is not only naturally replenished, but it causes no harm to the environment, as there are no greenhouse gases or other pollutants emitted that can result in global warming, and it is also a viable tool for decarbonisation.<sup>31</sup>

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<sup>23</sup> Oxford Business Group, 'Energy Resources are a Key Driver of Nigeria's Economy' <<https://oxfordbusinessgroup.com>> accessed 12 October 2021.

<sup>24</sup> United Nations, 'Sustainability' <<https://www.un.org/>> accessed 14 October 2021.

<sup>25</sup> Energy Labama, 'What is Sustainable Energy?' <<https://alcse.org/>> accessed 18 September 2021.

<sup>26</sup> Oxford Business Group, 'Energy Resources are a Key Driver of Nigeria's Economy' <<https://oxfordbusinessgroup.com>> accessed 12 October 2021.

<sup>27</sup> Sustainable Energy for All, 'Energizing Finance 2021' <<https://www.seforall.org/>> accessed 13 October 2021.

<sup>28</sup> Hedgerow Group, 'What is Sustainable Energy?' <<https://hedgerowgroup.com>> accessed 15 October 2021.

<sup>29</sup> Fortune Ganda, and Collins Ngwakwe, 'Role of Energy Efficiency in Sustainable Development' (2014) 1 (86) *Environmental Economics* 5, pp.19.

<sup>30</sup> Marc A. Rosen, 'Energy Sustainability: A Pragmatic Approach and Illustrations' (2009) 55 (80) *Sustainability Journal* 1, pp.34.

<sup>31</sup> Sunday Olayinka Oyedepo, 'Energy and Sustainable Development in Nigeria: The Way Forward' (2012) 15(10) *Energy, Sustainability and Society Journal* 10.

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### 2.2 Meaning of Decarbonisation

The term decarbonisation refers to the process of reducing 'carbon intensity', lowering the amount of greenhouse gas emissions produced by the burning of fossil fuels.<sup>32</sup> Decarbonisation in the energy sector involves decreasing CO<sub>2</sub> output of energy generated. Reducing the amount of carbon dioxide occurring as a result of transport and electricity generation is essential to meet global temperature standards set by the Paris Agreement.<sup>33</sup> There are different approaches in achieving decarbonisation and some of these approaches include decarbonising electricity generation through the shift to renewable sources, like wind and solar, which are considered cheaper, more efficient and abundant. Also, stationary energy can be decarbonised through application of some renewable technologies or new options like using hydrogen (created from renewable energy) as a fuel source. The transport sector can be decarbonised through increasing the use of electric vehicles or moving to lower emission fuels, potentially including renewable hydrogen in the future.<sup>34</sup>

Sustainable energy sources are the best sources of energy because they are not only renewable but are also frequently developed closer to the end-user than fossil fuels. Many countries are already making the move towards solar, wind, and other sources of sustainable energy.<sup>35</sup> The innovation in new and advanced energy technologies will enable developing countries such as Nigeria to resolve the barriers of commercial production of sustainable energy. Therefore, transition to sustainable energy will lead to decarbonisation and also provide ways for development opportunities that result in a world that is healthy, viable and has a secure energy source for the generations unborn. Above all, it will help Nigeria meet the goals of agenda 2030 on sustainable development.<sup>36</sup>

### 3. ACHIEVING SUSTAINABLE ENERGY: COMPARATIVE STUDY BETWEEN SELECTED DEVELOPED NATIONS AND NIGERIA

Most developed countries have deployed technology to harness renewable energy sources, ensure decarbonization and promote sustainable energy as a direct response to strong public pressure.<sup>37</sup> This is not obtainable in developing countries like Nigeria and this may be because most

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<sup>32</sup> The London School of Economics and Political Science, 'What is Decarbonisation of the Power Sector?' <<https://www.lse.ac.uk/>> accessed 20 November 2021.

<sup>33</sup> TWI, 'What is Decarbonisation?' <<https://www.twi-global.com/>> accessed 14 October 2021.

<sup>34</sup> Western Power, 'What is Decarbonisation?' <<https://www.westernpower.com.au/>> accessed 5 December 2021.

<sup>35</sup> Energy Labama, 'What is Sustainable Energy?' <<https://hedgerowgroup.com>> accessed 15 October 2021.

<sup>36</sup> Hedgerow Group, 'What is Sustainable Energy?' <<https://hedgerowgroup.com>> accessed 15 October 2021.

<sup>37</sup> Dilip Ahuja, Marika Tatsutani and Daniel Schaffer, 'Sustainable Energy for Developing Countries Surveys and Perspectives' (2009) 1(6) Integrating Environments and Society Journal 10.

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developing countries lack a high degree of economic development, advanced education systems, consumers' demand for environmentally friendly technologies and the level of responsibility and political maturity obtainable in developed countries.<sup>38</sup> Policies and legislation on decarbonisation have been developed in most advanced climes, so it can be said that the systems in developed countries almost entirely support the concept of sustainable energy. It is pertinent to state that developing nations like South Africa have taken a step ahead of other developing nations to work towards decarbonisation of their economies. A case insight is the 'Just Energy' Transition Partnership of the Government of South Africa at COP26 in Glasgow. The Just Energy Transition Partnership is an agreement between America, France, Germany, the United Kingdom, the European Union (EU) and South Africa aimed to accelerate the decarbonisation of South Africa's economy, with a focus on the electricity system, to help it achieve the ambitious goals set out in its updated Nationally Determined Contribution emissions goals.<sup>39</sup> The developed countries mentioned above have agreed to mobilise an initial commitment of USD 8.5 billion for the first phase of financing the Just Energy Transition of South Africa from fossil fuel to cleaner energy, through various mechanisms including grants, concessional loan and investment, risk-sharing instruments, including to mobilise the private sector. The Partnership is expected to prevent up to 1-1.5 giga tonnes of emissions over the next 20 years and support South Africa to move away from coal and to accelerate its transition to a low emission, climate-resilient economy.<sup>40</sup>

The United Kingdom, the United States, Canada and Japan are leading in terms of showing the actual importance of energy sustainability. Energy sustainability in these countries includes economical use of energy resources, energy-efficient operation, production of energy-efficient products, and use of renewable energy sources.

In the United Kingdom, electricity system has greatly reduced its carbon intensity in the last decade, decarbonising twice as fast as any other major economy, demonstrating the UK's climate leadership. The rise of renewables means British households have reduced their CO<sub>2</sub> emissions by three quarter of a tonne per year.<sup>41</sup> The United Kingdom is not relenting in its effort and still aspires to grow offshore wind to 40 giga watts by 2030, though this will require the expansion of energy storage technologies to capture excess power.<sup>42</sup> Independent analysis, conducted by academics from Imperial College London (via Imperial Consultants) for Drax Electric

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<sup>38</sup> Marc A. Rosen, 'Energy Sustainability: A Pragmatic Approach and Illustrations' (2009) 55 (80) Sustainability Journal 34.

<sup>39</sup> Institute for Security Studies, 'Africa @COP26' <<https://issafrica.org>> accessed 3 January 2022.

<sup>40</sup> European Commission, 'France, Germany, UK, US and EU launch Ground-Breaking International Just Energy Transition Partnership with South Africa' <<https://ec.europa.eu>> accessed 5 January 2022.

<sup>41</sup> Philip Gordon, 'UK Energy Sector has the fastest Rate of Decarbonisation in the World' <<https://www.smart-energy.com>> accessed 13 October 2022.

<sup>42</sup> Conor McNally, 'UK offshore Wind Target Must be at Least Doubled to Deliver Net-Zero Electricity' <<https://www.imperial.ac.uk/>> accessed 14 October 2021.

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Insights, shows the UK's move away from coal to renewable power sources, such as biomass and wind, has dramatically driven down carbon emissions.<sup>43</sup> Renewable power has grown six-fold in the last decade, helping the UK to cut its carbon intensity by 58%.<sup>44</sup> This is double the reduction seen in other major economies over the same period. Also, generation from coal fell from 30 percent to just 2 percent of power produced over the period, with renewables rising at the same time, from 8 percent to supplying 42 percent of the country's electricity.<sup>45</sup> According to Dr Iain Staffell<sup>46</sup>, the UK has decarbonised its power grid at an astonishing rate. Over the last decade the country has transformed itself from relying on coal to keep the lights on, to having its first coal-free month since the industrial revolution<sup>47</sup>. While this rapid progress in the power sector, the United Kingdom needs to decarbonise wider society by using electricity to heat homes and power the cars to achieve net zero electricity by 2050.<sup>48</sup> As the world marks 5 years since the Paris Agreement, the UK offers an example of how fast energy transitions can be made.<sup>49</sup> The UK's power system is set to grow even greener after the Prime Minister set a new target of installing 40 giga watts (GW) of offshore wind by 2030.<sup>50</sup> The UK has set example for developing countries like Nigeria by showing that transition to sustainable energy sources is possible as an effective tool for decarbonisation.<sup>51</sup>

The European Union (EU) member States are also not left out in the decarbonisation process, the EU aims to be climate-neutral by 2050, that is an economy with net zero greenhouse gas emissions. This objective is the reason for the European Green Deal and it is in line with the EU's commitment to global climate action under the Paris Agreement.<sup>52</sup> In 2018, the European Commission set out visions for EU to go climate neutral by looking at all the key sectors and exploring pathways for the transition.<sup>53</sup> The Commission's vision covers nearly all EU policies and is in line with the Paris Agreement objectives to keep the global temperature increase below 2°C and

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<sup>43</sup> David Silverman, 'Expert Insights Driving Forward Renewable Power' <<https://www.imperial.ac.uk/>> accessed 15 October 2021.

<sup>44</sup> The London School of Economics and Political Science, 'What is Decarbonisation of the Power Sector?' <<https://www.lse.ac.uk/>> accessed 20 November 2021.

<sup>45</sup> Department for Business, 'Energy and Industrial Strategy, Energy Trends' <<https://assets.publishing.service.gov.uk/>> accessed 14 October 2021.

<sup>46</sup> Toby Hill, 'Renewable Revolution Powers UK to top of Decarbonisation League Table' <<https://www.businessgreen.com/>> accessed 1 November 2021.

<sup>47</sup> Energy Labama, 'What is Sustainable Energy?' <<https://hedgerowgroup.com>> accessed 15 October 2021.

<sup>48</sup> HM Government, 'Net Zero Strategy: Build Back Greener' <<https://assets.publishing.service.gov.uk/>> accessed 2 October 2021.

<sup>49</sup> The London School of Economics and Political Science, 'What is Decarbonisation of the Power Sector?' <<https://www.lse.ac.uk/>> accessed 20 November 2021.

<sup>50</sup> Gov.Uk, 'New Plans to make UK World Leader in Green Energy' <<https://www.gov.uk/>> accessed 4 November 2021.

<sup>51</sup> Aidan Kerr, 'UK tops Global Decarbonisation League amid Renewable Revolution' <[https://www.drax.com/press\\_rel](https://www.drax.com/press_rel)> accessed 14 October 2021.

<sup>52</sup> European Commission, '2050 Long Term Strategy', <<https://ec.europa.eu/>> accessed 9 December 2021.

<sup>53</sup> Sebastian Oberthür and Claire Dupont, *Decarbonisation in the European Union: Internal Policies and External Strategies* (Palgrave Macmillan Press 2015) pp.1-24.

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pursue efforts to keep it to 1.5°C.<sup>54</sup> The Commission proposed the first European Climate Law as part of the green deal to enshrine the 2050 climate neutrality target into law. The EU also developed national strategy for member States to enable meet the objectives of the green deal. In the national strategies, member States of EU are required to develop national long-term strategies on how they plan to achieve the greenhouse gas emission reduction commitments under the Paris agreement.<sup>55</sup> The commitment of the member States of EU is a lesson for developing Countries like Nigeria to strive towards decarbonisation to reduce the harsh effects of global climate change and also meet their commitments under the Paris agreement.

The United States has set targets to reduce GHG emissions in the range of 17 percent in 2020 and 26-28 percent in 2025, with both the goals defined relative to 2005 levels. As described in the U.S. Second Biennial Report<sup>56</sup>, the United States has laid the foundation for achieving its 2025 decarbonisation target.<sup>57</sup> Individual States have also taken important actions towards decarbonisation, for example, California's economy-wide Global Warming Solutions Act and the nine-state Regional Greenhouse Gas Initiative that addresses power sector emissions in the Northeast, as well as renewable portfolio standards in 29 states and energy efficiency resource standards in 20 states.<sup>58</sup> At the same time, the United States recognizes the need for deeper decarbonisation to constrain global temperature increases. In 2009, the United States joined the "Group of Eight" nations in calling for global emissions reductions of 50 percent by 2050, including reductions of 80 percent or more by developed countries.<sup>59</sup> The U.S. National Determined Contribution to the Paris Agreement noted that a 26-28 percent reduction in 2025 is consistent with a straight-line emissions reduction pathway to economy-wide emission reductions of 80 percent or more by 2050.<sup>60</sup> In keeping with these previously stated objectives, the United States is presenting a mid-century strategy (MCS) that envisions economy-wide net decarbonisation below 2005 levels by 2050.<sup>61</sup> The United States MCS charts a path that is achievable, consistent with the goals of the Paris Agreement.

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<sup>54</sup> Babatunde Akintunde, 'Analysis, COP26: Nigeria Plans to Cut Carbon Emissions to Net-zero by 2060 is Short on Details' *Premium Times* <<https://www.premiumtimesng.com>> accessed 12 March 2022.

<sup>55</sup> United Nations Climate Change, 'Long Term Low Greenhouse Gas Emission Development Strategy of the European Union and Its Member States' <<https://unfccc.int/>> accessed 15 October 2021.

<sup>56</sup> U.S. Department of States, '2016 Second Biennial Report of the United States of America' <<https://unfccc.int/>> accessed 18 October 2021.

<sup>57</sup> The White House, 'The Fact Sheet: US Reports its 2025 Emissions Targets to the UNFCCC' <<https://obamawhitehouse.archives.gov/>> accessed 15 October 2021.

<sup>58</sup> The White House, 'United States Mid-Century Strategy for Deep Decarbonisation' <<https://unfccc.int/>> accessed 12 November 2021.

<sup>59</sup> Ibid.

<sup>60</sup> US Emissions Under 2020 and 2025 Targets <<https://www4.unfccc.int/>> accessed 3 October 2021.

<sup>61</sup> The London School of Economics and Political Science, 'What is Decarbonisation of the Power Sector?' <<https://www.lse.ac.uk/>> accessed 20 November 2021.

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**4. REGULATORY CHALLENGES TOWARDS THE REALIZATION OF  
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The Nigerian energy sector largely comprises of the petroleum sector where fuels are produced for energy production and the electricity sector.<sup>62</sup> The electricity sector is highly dependent on natural gas which accounts for over 80 percent of electricity generation.<sup>63</sup> Nigeria has a plethora of laws, policies and regulations that regulate the energy sector; however, the country is still enmeshed in energy crises especially the electricity sector.<sup>64</sup> Both the urban and rural areas of the country are experiencing energy crises resulting in reliance on alternative sources of energy such as generators, which are one of the major causes of CO<sub>2</sub> emissions in Nigeria.<sup>65</sup> Though, Nigeria has pledged at the Paris agreement to reduce her CO<sub>2</sub> emissions in her national determined contribution, this may not be feasible considering the shortage of energy in the electricity sector in the country.<sup>66</sup> This poses a challenge to decarbonisation in the country.

Achieving decarbonisation in the energy sector of Nigeria will require an energy mix or a switch to renewable energy sources, which are in abundance in the country.<sup>67</sup> However, energy switch will not be possible without an effective regulatory framework. In Nigeria, there are quite a lot of challenges with the existing regulatory framework on energy especially the petroleum and electricity sectors which are regulated by independent regulators.<sup>68</sup> The 1999, Constitution of the Federal Republic of Nigeria places electricity generation, transmission, distribution and renewable energy on the Concurrent Legislative List<sup>69</sup>. This allows the two tiers of government to be involved in major aspects of electricity generation. Also, this is the reason so many states in Nigeria, such as Akwa-Ibom, Cross River, and Imo, have resorted to generating electricity through sustainable energy sources such as renewable.<sup>70</sup> The challenge these states face is that the energy generation through sustainable energy sources is limited resulting in energy crises. However, it is encouraging to know that these states are still practicing energy mix and gradually moving to renewable energy sources, which are

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<sup>62</sup> Gbite Adeniji and Jumoke Fajemirokun, 'The Energy Regulation and market Review: Nigeria' <<https://thelawreviews.co.uk>> accessed 4 September 2021.

<sup>63</sup> European Commission, '2050 Long Term Strategy' <<https://ec.europa.eu/>> accessed 9 December 2021.

<sup>64</sup> Eric Kehinde Ogunleye, 'Political Economy of Nigerian Power Sector, The Political Economy of Clean Energy Transitions' (2017) 402 Oxford Scholarship Online 23.

<sup>65</sup> Access to Energy Institute, 'Putting an End to Nigeria's Generator crises: The Path Forward' <<https://a2ei.org/resources>> accessed 5 September 2021.

<sup>66</sup> Abdulkareem Mojeed, 'How Nigeria Plans to Meet Low Carbon Pledge by 2030' <<https://www.premiumtimesng.com/>> accessed 20 October 2021.

<sup>67</sup> Chukwuebuka Okafor and Others, 'Moving Beyond Fossil Fuel in an Oil-Exporting and Emerging Economy: Paradigm Shift' <<https://www.aimspress.com/>> accessed 13 October 2021.

<sup>68</sup> Aidan Kerr, 'UK tops Global Decarbonisation League amid Renewable Revolution' <[https://www.drax.com/press\\_rel](https://www.drax.com/press_rel)> accessed 14 October 2021.

<sup>69</sup> International Center for Energy, Environment and Development (ICEED), 'Renewable Electricity Policy Guidelines, 2006' <[www.iceednigeria.org](http://www.iceednigeria.org)> accessed 28 July 2021.

<sup>70</sup> Cross River State Government, 'State Electrification Agency' <<http://www.crossriverstate.gov.ng>> accessed 20 September 2021.

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considered sustainable. Also, the Federal Government of Nigeria has made conscious efforts towards the energy mix through regulatory challenges that are hampering the effective implementation of the projects that will expedite decarbonisation in Nigeria.<sup>71</sup>

We cannot discuss the energy sector of Nigeria without mentioning the Energy Commission of Nigeria. This Commission is established by Energy Commission of Nigeria Act.<sup>72</sup> The Commission is charged with the responsibility of coordinating and general surveillance of systematic development of the various energy resources of Nigeria including new and renewable energy sources.<sup>73</sup> The Commission is also responsible for policy formulation, implementation, strategic planning, and coordination of national policies on energy.<sup>74</sup> The Minister of Power is empowered under the Electric Power Sector Reform Act 2005 (EPSRA), to trigger the different phases outlined in EPSRA for the development of a competitive market and to issue policy directives on matters concerning electricity.<sup>75</sup> However, the challenge facing the Commission is the lack of implementation of the policies on the energy sector.<sup>76</sup> This is one of the reason for energy crises in Nigeria.

The Nigerian electricity sector is primarily regulated by the provisions of the Electric Power Sector Reform Act 2005 (EPSRA)<sup>77</sup>, which, among other responsibilities, establishes the Nigerian Electricity Regulatory Commission (NERC) as the apex sector regulator and authorizes it to make rules, regulations, and policies relating to Nigeria's electricity sector.<sup>78</sup> Among other things, the EPSRA also establishes the Rural Electrification Agency (REA), which is charged with the expansion of the main grid, developing isolated mini-grid systems, and promoting sustainable energy generation.<sup>79</sup> The REA is also mandated to set up and administer a Rural Electrification Fund (REF), which promotes, supports and provides rural electrification programmes to achieve more equitable regional access to electricity.<sup>80</sup> In recent years, the focus on renewables as the major source of sustainable energy has become more intensive and it is growing to become a focus of the Federal Government of Nigeria electricity policy.<sup>81</sup> This has resulted in the introduction of policies and regulatory instruments geared towards

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<sup>71</sup> Raffaello Cervigni and Others, 'Assessing Low Carbon Development in Nigeria: An Analysis of Four Sectors' <<https://elibrary.worldbank.org>> accessed 15 October 2021.

<sup>72</sup> The Energy Commission of Nigeria Act of 1979 (as amended)

<sup>73</sup> Energy Commission Act, Section 1 (2)(b) made provisions for the commission to explore alternative/renewable energy sources.

<sup>74</sup> Gbite Adeniji and Jumoke Fajemirokun, 'The Energy Regulation and market Review: Nigeria' <<https://thelawreviews.co.uk>> accessed 4 September 2021.

<sup>75</sup> Electric Power Sector Reform Act 2005, S.28.

<sup>76</sup> Oluseyi Ajayi and Kolawole Ajanaku, 'Nigeria's Energy Challenge and Power Development: The Way Forward' (2009) 20(3) Energy and Environment Journal 20 <<https://www.jstor.org/>> accessed 17 December 2021.

<sup>77</sup> Electric Power Sector Reform Act 2005, S.31.

<sup>78</sup> Electric Power Sector Reform Act 2005, S.32.

<sup>79</sup> Electric Power Sector Reform Act 2005, 88.

<sup>80</sup> Gbite Adeniji and Jumoke Fajemirokun, 'The Energy Regulation and market Review: Nigeria' <<https://thelawreviews.co.uk>> accessed 4 September 2021.

<sup>81</sup> The National Renewable Energy and Energy Efficiency Policy 2015 <<http://admin.theiguides.org>> accessed 3 October 2021.

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stimulating investment in renewables and both NERC and the REA have played key roles.

There have been efforts by the Nigerian government to ensure energy mix while promoting decarbonisation through the promotion of energy generation through renewable energy sources. For instance, in 2015 the Federal Executive Council approved the National Renewable Energy and Energy Efficiency Policy (NREEEP), which is broadly geared at removing barriers that put renewable energy and energy efficiency at economic, regulatory or institutional disadvantages and providing a conducive political environment that will attract investments in the renewable energy sources.<sup>82</sup> Based on this National Renewable Energy and Energy Efficiency Policy, Nigerian Bulk Electricity Trading Limited (NBET), the government-owned utility serving as a central counterparty between generators and retail distributors, executed power purchase agreements with 14 solar photovoltaic IPP developers.<sup>83</sup> This aims at demonstrating a drive to adopt renewable energy sources as viable electricity generating sources.<sup>84</sup> However, there are challenges with the implementation of those projects as the projects appear to have been stalled, with the Federal Government seemingly choosing to focus on promoting off-grid solar projects, which is also yet to serve the unserved areas in Nigeria.

In 2015, the NERC issued the Regulations on Feed-In-Tariff for Renewable Energy Sourced Electricity in Nigeria (REFIT).<sup>85</sup> This applies to energy generated and supplied through the national grid and orders that NBET and electricity distribution companies shall, as a matter of priority, purchase 50 per cent of the renewable energy electricity capacity limit established by the regulations.<sup>86</sup> In line with the policy's priority of diversifying Nigeria's on-grid energy mix, REFIT also provides a special tariff framework for renewables, in the form of feed-in-tariffs, which were designed to be attractive to private investors.<sup>87</sup> The feed-in-tariff must be approved by the NERC and shall be fixed (subject to periodic reviews).<sup>88</sup> REFIT, nevertheless, has its limitations, as it only applies to renewable projects with a capacity of between 1 megawatt and 30 megawatts<sup>89</sup>, this obviously will not encourage huge investment that will promote energy mix and, therefore, this poses a regulatory challenge.

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<sup>82</sup> Cross River State Government, 'State Electrification Agency' <<http://www.crossriverstate.gov.ng>> accessed 20 September 2021.

<sup>83</sup> Wolemi Esan, and Others, 'Renewable Energy in Nigeria: Law, Regulation, Trends and Opportunities' <<https://www.ibanet.org>> accessed 12 December 2021.

<sup>84</sup> The Energy Commission of Nigeria Act of 1979 (as amended)

<sup>85</sup> Nigerian Electricity Regulatory Commission Regulations on Feed-In-Tariff for Renewable Energy Sourced Electricity in Nigeria 2015.

<sup>86</sup> Nigerian Electricity Regulatory Commission Regulations on Feed-In-Tariff for Renewable Energy Sourced Electricity in Nigeria 2015, S.5.

<sup>87</sup> Nigerian Electricity Regulatory Commission Regulations on Feed-In-Tariff for Renewable Energy Sourced Electricity in Nigeria 2015, S.6.

<sup>88</sup> Nigerian Electricity Regulatory Commission Regulations on Feed-In-Tariff for Renewable Energy Sourced Electricity in Nigeria 2015, S.11 and 12.

<sup>89</sup> Nigerian Electricity Regulatory Commission Regulations on Feed-In-Tariff for Renewable Energy Sourced Electricity in Nigeria 2015, S.19.

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Another regulatory challenge is found in the mini-grid regulations of 2016.<sup>90</sup> It is important to note that NERC through its regulatory powers issued the mini-grid regulations, which create a framework for the establishment and operation of mini-grids in Nigeria.<sup>91</sup> The objective of the mini-grid regulations is to accelerate electrification and sustainable energy supply in unreserved or underserved areas of the country.<sup>92</sup> NERC in the regulation prescribed a simplified process for establishment of certain kinds of mini-grids under which projects do not need to be licensed but may simply register with NERC.<sup>93</sup> There is also a provision for compensation mechanism for mini-grid projects to cover the possibility of the national grid eventually extending to cover the areas served by the mini-grid.<sup>94</sup>

Though the provisions of the regulations are applauded as it serves as a lead way towards promoting sustainable energy, however, the regulatory challenge is that the regulation is not limited to renewable energy projects. This has slowed down investment in these areas as well as energy supply in the underserved and unserved areas in Nigeria. The mini-grid regulation was meant to serve as a regulatory framework for transition to sustainable energy and decarbonisation in Nigeria.

In 2020, the Nigerian Government issued the Value Added Tax Act (VAT) (Modification Order), 2020 in the Official Gazette.<sup>95</sup> This was in a bid to incentivize renewable energy investments in Nigeria. This exempts specified renewable energy equipment from the application of VAT with respect to the importation or in-country sale of the equipments, but the exemption did not extend to services rendered with the use of these equipments.<sup>96</sup> However, a challenge arose when the Federal Inland Revenue Service subsequently issued a public notice on Value Added Tax Act (Modification Order), 2020: items not exempted from VAT. The agency stated that renewable energy equipments are not exempted from VAT and will continue to attract VAT at the standard rate of 7.5 per cent.<sup>97</sup> The validity of this public notice has been called into question as Federal Inland Revenue Service (FIRS) notices are expected not to override any tax law or validly issued instrument, and the power to vary, modify or amend the VAT exemption list as contained in the First Schedule to the VAT Act is vested only in the Minister of Finance.<sup>98</sup> This conflicting information on exemption or application of VAT on renewable energy equipments is another challenge hindering transition to sustainable energy and decarbonisation in Nigeria.

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<sup>90</sup> Nigerian Electricity Regulatory Commission Regulation for Mini-Grids 2016.

<sup>91</sup> Nigerian Electricity Regulatory Commission Regulation for Mini-Grids 2016, S.4.

<sup>92</sup> Nigerian Electricity Regulatory Commission Regulation for Mini-Grids 2016, S.6.

<sup>93</sup> Nigerian Electricity Regulatory Commission Regulation for Mini-Grids 2016, S.7.

<sup>94</sup> Nigerian Electricity Regulatory Commission Regulation for Mini-Grids 2016, S.19.

<sup>95</sup> Value Added Tax (Modification Order), 2020 <<https://assets.kpmg/>> accessed 13 October 2021.

<sup>96</sup> Value Added Tax (Modification Order), 2020, Order 3.

<sup>97</sup> KPMG, 'FIRS issues Public Notice on VAT (Modification Order) 2020 - Items not exempted from VAT', <<https://assets.kpmg/>> accessed 4 October 2021.

<sup>98</sup> KPMG, 'FIRS issues Public Notice on VAT (Modification Order) 2020 - Items not exempted from VAT' <<https://assets.kpmg/>> accessed 4 October 2021.

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Further, the Federal Government of Nigeria, launched the Solar Power for All Project in December 2020 in response to the Covid-19 pandemic.<sup>99</sup> It focuses on providing 5 million households with solar home systems for off-grid communities, under the Nigeria Economic Sustainability Plan (NESP). The implementation of the project is to be facilitated by the Central Bank of Nigeria, which will make available NGN 140 billion (approximately US\$ 340 million) in direct and indirect loans to qualifying projects. However, this project is yet to be fully implemented. This poses a challenge to achieving sustainable energy in Nigeria and also meeting the timeline for implementation of NDCs, the goals and targets of SDGs.<sup>100</sup>

### 5. WAY FORWARD

Abundant and cheap renewable energy is a prerequisite to achieve the remaining 60 percent CO<sub>2</sub> reduction globally.<sup>101</sup> In order to become climate neutral, there is need for full substitution of electricity generation through fossil hydrocarbons with renewable energy sources, such as solar (photovoltaic or concentrated), wind power, bioenergy, waste-to-energy, heat pumps, energy storage, hydropower (tidal or wave), geothermal, or green hydrogen.<sup>102</sup> It will also require substituting climate-neutral feedstocks, beyond those sourced from waste, biomass or circularity, for fossil hydrocarbon-based feedstocks.<sup>103</sup> Electrification of the transport system should be considered in the near future as it will reduce emissions from transportation, especially vehicular emissions. These transitions to sustainable energy will not be possible with weak regulatory measures in place in Nigeria. There is a need to facilitate the Solar for All Project in the economic sustainability plan to ensure that the unserved and underserved households who are still dependent on generating sets are served as this will put an end to reliance on generators for electricity supply and reduce CO<sub>2</sub> emissions from generating sets. There is also a need to ban generating sets especially when the target of the Solar for All Projects is meant to reduce emissions from generating sets.

There is a need for the Federal Inland Revenue Service to comply with the provisions of the VAT (Modification Order), 2020 that is officially gazetted, and exempts specified renewable energy equipment from the application of VAT concerning the importation or in-country sale of the

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<sup>99</sup> Rural Electrification Agency, 'FG Launches Solar Power Naija A 5 Million Solar Connection Programme for Off Grid Communities' <<https://rea.gov.ng/>> accessed 15 October 2021.

<sup>100</sup> Wolemi Esan, and Others, 'Renewable Energy in Nigeria: Law, Regulation, Trends and Opportunities' <<https://www.ibanet.org/>> accessed 12 December 2021.

<sup>101</sup> Dilip Ahuja, Marika Tatsutani and Daniel Schaffer, 'Sustainable Energy for Developing Countries' (2009) 1(56) *Surveys and Perspectives Integrating Environment and Society* 2.

<sup>102</sup> N. Funahashi, 'Steam Turbine Roles and Necessary Technologies for Stabilization of the Electricity Grid in the Renewable Energy Era' <<https://www.sciencedirect.com/>> accessed 4 October 2021.

<sup>103</sup> N. Funahashi, 'Steam Turbine Roles and Necessary Technologies for Stabilization of the Electricity Grid in the Renewable Energy Era' <<https://www.sciencedirect.com/>> accessed 4 October 2021.

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equipment. This will encourage investment in sustainable energy equipment and also bring about innovations that will aid the transition to sustainable energy and help in decarbonising the Nigerian electricity sector. There is also a need to implement and ensure effective carbon taxing as this will help reduce CO<sub>2</sub> emissions in Nigeria while ensuring sustainable development.<sup>104</sup> It is important for NERC as a regulator of the electricity sector to ensure that the mini-grid regulations of 2017 is fully implemented with a special focus on promoting the execution of renewable energy projects. This will no doubt facilitate a transition to sustainable energy projects. Finally, Nigeria can take a clue from South Africa's Just Energy transition partnership, which will enable the country to secure finance and support from wealthier nations to enable a transition from fossil fuels like coal to cleaner energy sources.<sup>105</sup>

## 5. CONCLUSION

Energy supply, especially electricity, is said to be one of the biggest CO<sub>2</sub> emitters globally.<sup>106</sup> To keep global warming well below 2°C, several paths lead to zero emissions in the energy sector, and each has its potential environmental impacts such as air and water pollution, land use or water demand.<sup>107</sup> An international team of researchers led by the Potsdam Institute for Climate Impact Research (PIK) has stated that transition to sustainable energy sources would be beneficial to human health and the planet.<sup>108</sup> Therefore, switching to renewable-based electricity production in Nigeria will not only help in serving the underserved or unserved households but will help cut the negative impact of emissions on human health and global climate change. Decarbonisation of the Nigerian energy sector especially the electricity sector is overdue; however, a lot of regulatory challenges are hampering the implementation of the existing legal frameworks that can aid a smooth transition to sustainable energy sources. Tackling some of the challenges requires, incentivizing the renewable energy sector and fast-tracking the implementation of the projects such as Solar for All Project that aims to ensure electrification of most households in Nigeria through sustainable energy sources.<sup>109</sup> Transition to sustainable energy sources is the pathway to decarbonise the Nigerian electricity sector that is currently

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<sup>104</sup> Ude Fortune Chiziterem, 'Carbon Tax: A Market Based Alternative to Carbon Emissions in Nigeria' <<https://nairametrics.com>> accessed 14 October 2021.

<sup>105</sup> Jaysim Hanspal, 'COP26: South Africa to receive \$8.5bn to Stop Using Coal' <<https://www.theafricareport.com>> accessed 18 December 2021.

<sup>106</sup> Lamiaa Abdallah and Other, 'Reducing Carbon Dioxide Emissions from Electricity Sector Using Smart Electric Grid' (2013) 1 Applications Journal of Engineering 23.

<sup>107</sup> Potsdam Institute for Climate Impact Research, 'Decarbonising the Power Sector Renewable Energy Offers Most Benefits for Health and Environment' <<https://www.sciencedaily.com/>> accessed 8 October 2021.

<sup>108</sup> Potsdam Institute for Climate Impact Research, 'Decarbonising the Power Sector Renewable Energy Offers Most Benefits for Health and Environment' <<https://www.sciencedaily.com/>> accessed 8 October 2021.

<sup>109</sup> Environ News Nigeria, 'Decarbonising Power Sector: How Renewable Energy Benefits Health, Environment' <<https://www.environnewsnigeria.com/decarbonising-power-sector-how-renewable-energy-benefits>> accessed 16 October 2021.

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powered by fossil fuel which is one of the greatest emitters of CO<sub>2</sub> and a sure way for Nigeria to meet her commitment to the Paris Agreement and the Sustainable Development Goals.

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**AUTHOR'S DECLARATION AND ESSENTIAL ETHICAL COMPLIANCES**

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This article is 100% contributed by the sole author. She conceived and designed the research or analysis, collected the data, contributed to data analysis & interpretation, wrote the article, performed critical revision of the article/paper, edited the article, and supervised and administered the field work.

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*Research involving human bodies (Helsinki Declaration)*

Has this research used human subjects for experimentation? No

*Research involving animals (ARRIVE Checklist)*

Has this research involved animal subjects for experimentation? No

*Research involving Plants*

During the research, the author followed the principles of the Convention on Biological Diversity and the Convention on the Trade in Endangered Species of Wild Fauna and Flora.

*Research on Indigenous Peoples and/or Traditional Knowledge*

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