

Just Energy Transition or “Just” Energy Transition?

A case study of how energy justice is integrated into energy policies in Nigeria.

Charlene Nkechi Ezeagu

Master Thesis Series in Environmental Studies and Sustainability Science,
No 2023:008

A thesis submitted in partial fulfillment of the requirements of Lund University
International Master’s Programme in Environmental Studies and Sustainability Science
(30hp/credits)



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Master’s Thesis

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Submitted May 9, 2023.

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Abstract

Climate change has had significant impacts, which have made it necessary to shift towards a just energy transition. However, there is a paucity of research on how energy justice is integrated into energy policies and documents in the global south, particularly in Nigeria. To address this gap, this study used thematic analysis to investigate how energy justice is integrated into the Nigerian National Energy Master Plan.

The results of this study indicate that energy justice principles are reasonably integrated into the document. However, there are policies that promote one principle while negatively impacting another. Thus, there is a need for further research to identify how these principles can be integrated complementarily while still achieving objectives such as providing nationwide access to modern energy sources.

Keywords: Energy justice, Just energy transition, Nigeria, Thematic document analysis, Global South, Climate Change.

Word count: 11,836

Acknowledgements

The thesis-writing experience has been nothing short of a roller-coaster and I would not have successfully completed it without the tremendous support I got from various people.

First, I want to thank my supervisor, Sara, for her guidance all through the process. We were told the process of writing a thesis is a messy one but no one could have prepared me for how messy mine got. Regardless, she guided me through the mess and helped me make sense of it all. I am also grateful for the support and the many useful feedbacks I got from her. On that note, I also want to thank every person that gave me feedback – Julia and Andrea, my thesis groupmates, Agoziem and John – my friends with much insight in the Nigerian energy arena, and Ronald who took his time to review my work even on a short notice.

Secondly, I want to thank everyone who provided me with moral support during this period. To my sister, Nneoma, for being my biggest cheerleader, to Hannah for the motivational biblical quotes and prayers, and to my friends, Titi, Alena and Elisa for the constant words of encouragement. I am also thankful for everyone in the LUMES WhatsApp group chat who responded to all the questions I had about the process and those that asked the questions I had even before I knew I had them.

Next, as Snoop Dogg once said, “I want to thank me for believing in me, I want to thank me for doing all this hard work ... and I want to thank me for never quitting...” Lastly, I want to thank God for being my strength and anchor. Without Him, I would have accomplished nothing.

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1. Introduction

1.1 Background

Technological progression and resource discovery has led to several sets of transitions from one energy source to another over the years. An important landmark in the energy transition occurred in the 1780s, as coal's share in the primary energy mix surpassed that of wood for the first time. The discovery of oil and the subsequent advancement of drilling, completion and refining technologies, led to oil and gas rapidly accounting for more than half of the primary energy mix in 1965 – the second energy transition (Zou et al., 2016). Climate change along with its impacts has brought about the need to transition from the incumbent fossil fuel system to one with low or zero carbon (IPCC, 2022). It has been established that the primary cause of climate change is the anthropogenic emissions of greenhouse gases, especially carbon dioxide into the atmosphere (Lyon et al., 2022). Consequently, the concentration of carbon dioxide in the atmosphere has changed and is still changing at a rate that exceeds those that have been recorded on Earth and that is both harmful to humans and the ecosystem (Lyon et al., 2022). This makes it clear that deep and rapid reductions in greenhouse gas emissions are vital to combat climate change (Lyon et al., 2022). Hence, there is a global upward trend of initiatives to decarbonize various economic sectors (Bélaïd & Al-Sarihi, 2022). Consequently, the world is undergoing a new process of transition from fossil fuels to renewable sources of energy which have little or no carbon footprint (Neacsu et al., 2022). The current energy transition has thus become a crucial part of the policy response to climate change as it offers such means of decarbonizing the economy (Thomas et al., 2022).

In 2022, Nigeria launched its Energy Transition Plan, following President Muhammadu Buhari's declaration of the country's commitment to realizing next-zero emissions by 2060 at the 2021 United Nations Conference of the Parties (COP26) held in Glasgow (Dioha, 2022). In the same year, the Energy Commission of Nigeria released the Revised National Energy Policy and National Energy Master Plan ('EnviroNews Nigeria', 2022). Nigeria's climate target is to cut its emissions by 20% by 2030 in a business-as-usual scenario and then increase this to between 45% to 47% based on availability of financial aid, capacity building and technology transfer. This is planned to be achieved via energy transition and improvements in energy efficiency in key sectors (REMap: Nigeria, 2023)

According to Aba et al. (2023), the transition pace and pathway could be different for countries that are dependent on petroleum. Norway for instance is simultaneously ambitious with its policies on climate change and environment and also expanding its oil and gas exploration. It has also found a justification for

oil and gas in its low-carbon future. (Tine S. Handeland & Oluf Langhelle, 2021). Nigeria may be following in Norway's footsteps as there is no mention of reducing crude oil production in the oil and gas sector in its Energy Transition Plan. Instead, there are plans to utilize Carbon Capture and Storage technologies in the future to abate emissions from the sector (*Nigeria ETP, 2022d*).

Furthermore, for developing economies like Nigeria that are reliant on their fossil fuel exports the transition process is also expected to be turbulent (Okafor et al., 2021). The transition is expected to lead to loss of jobs for those working in the fossil fuel industry and this in turn affects the economies wherein they reside. Since the industry plays a key role in the local tax revenue base of such economies, the decline in the industry could negatively impact public services such as education and transportation (Carley & Konisky, 2020). In general, regardless of where transition is happening, it will inevitably be accompanied by complex social-technical challenges which will have profound social impact (Wang & Lo, 2021a).

In consideration of such adverse impacts of energy transition as job loss, the term "just transition" was coined. It became associated with the promotion of green jobs as an essential part of the energy transition towards renewable sources of energy and away from fossil fuels (darren McCauley & Heffron, 2018). Since the term came to be, it has gone ahead to include other factors beyond job loss and creation associated with energy transition (Carley & Konisky, 2020). It has become "the intersection between the energy transition and energy justice bodies of literature, and establishes the importance of equity and justice in the planning, implementation, and assessment of every socio-energy system change that shapes the energy transition" (Carley & Konisky, 2020, p. 570). Transitioning to a low-carbon future in a just manner would require trade-offs between "energy and development and carbon growth" in order to ensure that the benefits from the transition are shared equally among nations (Wang & Lo, 2021a). Energy justice deals with theorizing these trade-offs and has been defined as "the pursuit of a global energy system that fairly distributes both the benefits and burdens of energy services, and one that contributes to more representative and inclusive energy decision-making (Wang & Lo, 2021b, p. 4)"

There have been several studies examining how to better understand the justice and equity dimensions of transition and how they can be integrated into energy transition efforts in the global North (Carley & Konisky, 2020; Hartvigsson et al., 2023; D. McCauley et al., 2023). Studies in the global south have focused on how to implement energy justice (Islar et al., 2017), and injustices related to the implementation of low carbon projects (Giovannetti & Ticci, 2016; Okpanachi et al., 2022). Despite the research that exists in the global south, there still remains a paucity of research on how policies targeted towards energy

transition engage with the justice aspects – a gap, which this research attempts to address using Nigeria as a case study.

1.2 Research Aim

Nigeria is a fossil-fuel dependent country with a history of injustice in its energy production process especially in the Niger Delta (Obi & Rustad, 2011). Considering energy transition has been framed as a potential solution to energy-related injustices (Nakaishi et al., 2022) and Nigeria has made a commitment to embark on energy transition (*Nigeria ETP, 2022c*), by analyzing Nigeria's policies and planned strategies for transition, the research aims to examine whether and how Nigeria integrates justice aspects into its transition efforts. To achieve this, I ask the main research question – how are the principles of energy justice integrated, if at all, in the the Revised National Energy Master Plan (NEMP) and how do these principles interact with each other?

1.3 Contribution to Sustainability Science

Sustainability science is motivated by problem-solving and understanding the complexity of the interlinkages between nature and the society (Miller, 2013). It is vital for society's progress towards sustainability, and being an opportunity to bring science closer to the people, it requires that profound changes are carried out in the way of organizing and conducting science. (Spangenberg, 2011). Sustainability science is distinguished by several structural elements such as its research purpose which usually is being able to come up with a set of actionable guidelines or recommendations to identified and researched sustainability problems (Spangenberg, 2011). Its research is also characterized by having a place-based focus on coupled human-natural systems from an interdisciplinary standpoint (Miller, 2013). Being a solution-oriented research field, sustainability science must address two different types of research questions:

1. Questions about the functioning and setup of coupled human–environment systems when they are in compliance with a wide range of value-laden goals and objectives. As an example the balance between environmental boundaries and socio-economic needs of the society.
2. Questions that are strategic and operational in nature which explore transition pathways for a sustainable coupled human–environment systems and solutions to sustainability problems. (Wiek et al., 2012).

This thesis contributes to sustainability science by contributing to the second type of question sustainability science seeks to answer. By analyzing how, if at all, justice is integrated into the energy

policies and plans in Nigeria, it can make actionable recommendations that can be utilized by policy-makers on how better to integrate and promote justice in energy transition sphere in Nigeria. Hence, providing solutions to the problems of injustice in energy transition. Consequently, it contributes towards the sustainable development goals 7 – affordable and clean energy and 10 – reduced inequalities. Lastly, it adds to the body of literature on energy transition and energy justice from a global south perspective.

1.4 Structure

Having outlined the introduction, research aim and the contribution of this paper to sustainability science, this paper continues by presenting the contextual background in the second section. This is followed by the theoretical framework within which this work is situated in section three and methodology in section four. Following those chapters, comes the results and discussion in the fifth section. Finally, in the seventh section, this paper presents its conclusion and future research recommendations.

2. Setting The Scene

2.1 Why Nigeria?

Nigeria has the largest population in Africa (Okafor et al., 2021) and the largest economy in Sub-Saharan Africa (Nwozor et al., 2019). Since the mid-1970s, oil has accounted for most of her foreign exchange commodity and about 75% of federal revenue comes from taxes from the oil and gas sector (Okafor et al., 2021). Nigeria has the 9th largest proven gas reserves in the world (PwC, 2020), the second largest crude oil reserve in Africa (Okafor et al., 2021) and consequently, is home to many multinational corporations which dominate the private sphere of the Nigerian oil sector (Oluwasanmi, 2019). Regardless of these, it is still an energy poor country with only 40% of residents having access to electricity (Nwozor et al., 2019). To make matters worse, energy demand is expected to rise as the Nigerian population is projected to increase to 440 million by 2050 (Pontianus & Oruonye, 2021).

Furthermore, the current energy regime and its history is chockfull of injustices. The Niger Delta of Nigeria, located in the south-south and south-eastern geopolitical zones, still remains the most poverty-stricken oil-bearing community in the world despite being bestowed with an abundance of crude oil and natural gas reserves which feed economies both on the national and global scale (Adeola, 2009). The people of the Niger Delta have generally not been involved in the entire process of exploration, concession and exploitation. Rather, their experience has been oil spillage from leaking pipelines and quenchless gas flares that heat up the atmosphere but produce no form of electricity and the accompanying socio-economic implications (Obi & Rustad, 2011). Conflicts have also arisen as a result of the Nigerian government and multinational oil companies being insensitive and neglectful towards the complaints of the local population in the region about the environmental degradation which has led to decline in their socio-economic conditions. These conflicts led to the deployment of military forces to the region by the Nigerian government to keep the peace (Oluyemi, 2020). As a result of the high handedness of the Nigerian Army in conflict resolution in these communities, many lives have been lost and many girls and women have been raped at the hands of these same soldiers (International, 2005).

Nonetheless, as energy transition has often been viewed as a pathway with the potential to reduce and eliminate existing injustices in the current energy regime (Nakaishi et al., 2022), there seems to be hope for Nigeria as it works towards transitioning. However, low-carbon technologies and their implementation are not without problems as research has shown that “at times, low-carbon transitions and climate action can promote squalor over sustainability and leave angry communities, disgruntled workers, scorned business partners, and degraded landscapes in their wake” (Sovacool, 2021, p. 1). Unfortunately, in some

cases of implementing low-carbon solutions in Nigeria, this has been the case. Hydropower, one of the low-carbon energy sources, have been utilized in Nigeria with a host of problems for the local communities living downstream. The Jebba dam, for instance led to the displacement and relocation of about 6,000 people. The resultant floods from the dam construction also led to loss of properties worth millions of naira and loss of livelihoods from fishing, one of the major economic activities for the local population in the region (Usman, 2020). Hence, with the history of energy injustice in Nigeria, the question of how Nigeria integrates various dimensions of energy justice into its energy policies and plans become a very crucial one.

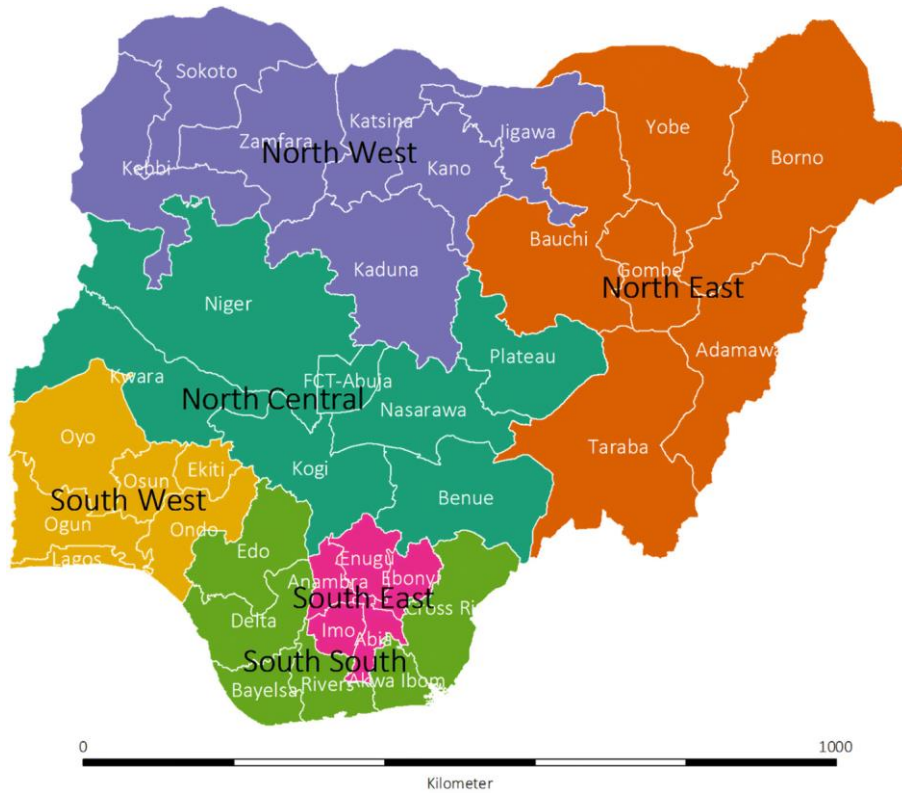


Image 1 - Map of Nigeria showing boundaries of six geopolitical zones, 36 states and Federal Capital Territory (FCT-Abuja). (Wong et al., 2018)

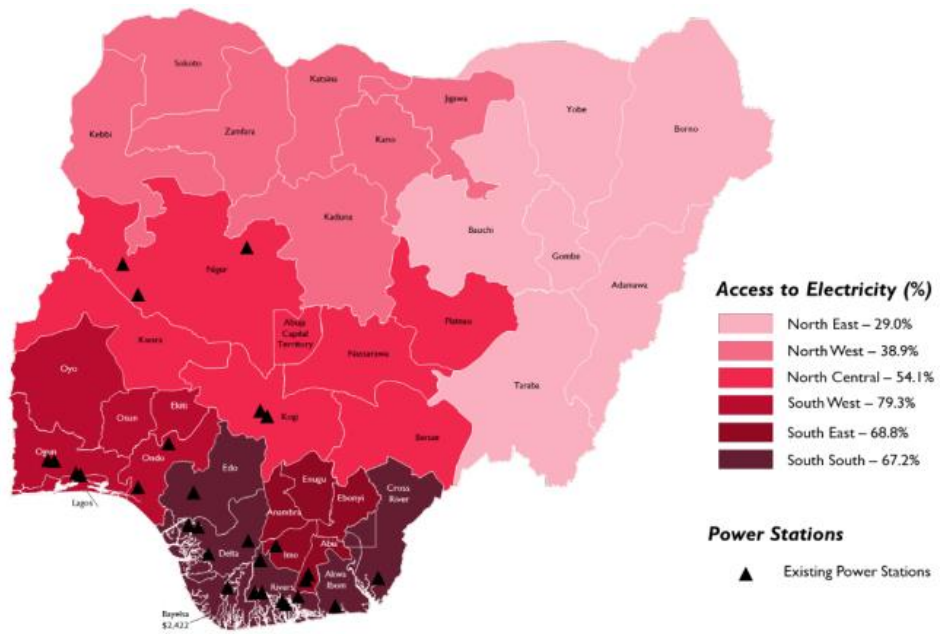


Image 2 - Map of Access to Electricity and Location of Power Stations in Nigeria (USAID, 2022).

3. Theoretical framework

This section introduces the theoretical framework of this study – energy justice, and how I applied it as an analytical tool within this thesis. I also detail the principles of energy justice developed by (Sovacool & Dworkin, 2015) which is the analytical basis upon which I conducted the analysis.

3.1 Energy Justice

Energy justice can be defined as “a global energy system that fairly disseminates both the benefits and costs of energy services, and one that has representative and impartial energy decision-making” (Sovacool & Dworkin, 2015, p. 436). Energy justice plays a vital role in the identification and analysis of injustices in the energy system. The energy justice framework is able to identify where injustices occur, which social groups are affected and whether processes to reveal and reduce identified inequities and injustices exist (Hanke et al., 2021). The framework has been used to provide new outlooks and viewpoints on various energy-related issues such as consumption, efficiency, transition and subsidies (Lappe-Osthege & Andreas, 2017). Generally, the framework is underpinned by four tenets: procedural justice, distributional justice, justice as recognition, and restorative justice (Wang & Lo, 2021a).

According to Sovacool & Dworkin (2015), the energy justice framework can function in three ways: as a conceptual, analytical and decision-making framework to make informed energy choices. As a conceptual tool, it focuses on the distribution of costs and benefits of energy systems and the procedures involved. As an analytical tool, it integrates better the distribution, recognition, cosmopolitan and procedural justice concerns. Lastly, as a decision-making tool, it assists energy planners, policy-makers and regulators and even consumers in making more informed choices by integrating the notions of distribution, recognition, cosmopolitan and procedural justice into a more detailed, practice-based set of principles.

3.2 Principles of Energy Justice

The principles of energy justice according to Sovacool & Dworkin (2015), are eight in number including availability, affordability, due process, good governance, sustainability, intragenerational equity, intergenerational equity and responsibility. Drawing inspiration from Islar et al (2017), I adapted the energy justice principles to suit the Nigerian context and my adaptation is explained in more details below.

Sovacool & Dworkin (2015), consider availability as the most basic principle and one of the most accepted ones. It is based on idea that “people deserve sufficient energy resources of high quality” (Sovacool & Dworkin, 2015, p. 440). It involves the availability of resources in a region, the technological structures put in place to produce, transport, store and distribute energy and also the region’s ability to overcome

both accidental and intentional disruptions in the supply chain (Sovacool & Dworkin, 2015). As previously mentioned, only 40% of the Nigerian population has access to modern sources of energy (Nwozor et al., 2019), thus making this relevant in the Nigerian context.

Due process and good governance “argues that countries should respect the rule of law and human rights in their production and use of energy and that all people should have access to high-quality data about energy and the environment and that communities must have access to fair, transparent, and accountable forms of energy decision-making” (Islar et al., 2017, p. 3). This is contextually relevant as the current energy regime in the country is filled with corruption (Olujobi, 2021) and is exclusionary to host communities (Obeagu, 2020).

Sustainability and Intergenerational equity justice argue that every nation has a duty to meet the energy needs of the current generation without reducing the capacity for the future generation to do same. This involves not depleting resources too rapidly, preventing environmental damage and also investing in adaptation measures (Sovacool & Dworkin, 2015). Being a global issue, climate change and its consequences are relevant in this context as well.

The Intragenerational equity principle argues that “people have the right to fairly access a certain set of minimal energy services enabling them to enjoy a basic minimum of wellbeing” (Islar et al., 2017, p. 4). This principle involves three aspects of distribution: the goods being distributed; between which entities they are being distributed; and their mode of distribution (Sovacool & Dworkin, 2015). Currently, there is an uneven distribution of energy resources within the country (see image 2), making this very relevant in the Nigerian setting.

4. Methodology

The following section outlines the process of data collection and the method applied in analyzing the collected data. Additionally, it also considers the limitations involved in both processes and limitations arising from my position as a Nigerian conducting research about Nigeria.

4.1 Data Collection

Sampling was utilized for my data collection. It is the “process of choosing actual data sources from a larger set of possibilities” (Given, 2008, p. 799). The most important factor in determining what sampling strategy to use depends on the knowledge a researcher is seeking and the aim of the research (Given, 2008). Purposeful sampling is commonly used in identifying and selecting participants and documents to use in qualitative research (Palinkas et al., 2015). This involves a series of strategic choices on the participants and documents to utilize for research (Given, 2008). Of the various purposeful sampling strategies, it seems criterion sampling is the most widely used (Palinkas et al., 2015). This involves using a pre-determined set of criteria to decide which participants and documents to include (Given, 2008). In this thesis, I used criterion sampling as it allowed me to select documents based on some pre-defined criteria:

1. Relevance to my topic: there were a host of policy and strategy documents to choose from but I narrowed down the results based on their relevance to energy transition.
2. Dates of publication: I further narrowed my selection of documents to those published after the President’s commitment to realizing net-zero emissions at the 2021 United Nations Conference of the Parties (COP26) held in Glasgow.

Another important criterion to consider is the sample size - the number of documents that is sufficient for research. In qualitative research, it is important to sample until data saturation is achieved (Moser & Korstjens, 2018). This occurs when “no new analytical information arises anymore, and the study provides maximum information on the phenomenon” (Moser & Korstjens, 2018, p. 11).

Considering the criteria above, I selected the following documents for my research – the Energy Transition Plan (ETP), revised National Energy Policy (NEP) and revised National Energy Master Plan (NEMP). However, due to time constraint, as a result of starting the thesis process afresh within 6 weeks of submission owing to challenges with obtaining permission to other data sources, I further narrowed my selection to one document – NEMP. The NEMP was the most comprehensive selection as it is a combination of the NEP and the associated plans to achieve set targets and policies in the NEP. Also, the NEMP contains policies for all energy sources being used or considered for use in Nigeria. This made it

possible for me to integrate the Nigeria ETP into my work by focusing on the energy sources that will be used for the transition as stipulated in the Nigeria ETP (refer to 5.2).

4.2 Data Analysis Method

When a researcher wants to discover a prominent issue, qualitative research is considered as a suitable method to utilize (Jamshed, 2014). In this thesis I used a thematic analysis which according to Braun & Clarke (2006), ought to be viewed as a foundational method for qualitative analysis. Thematic analysis is “a method for identifying, analysing and reporting patterns (themes) within data” (Braun & Clarke, 2006, p. 79). It involves looking across a data set in search of repeated patterns of meaning (Braun & Clarke, 2006).

As a first step, I familiarized myself with the collected data by immersing myself in the data. This meant reading the documents repeatedly and in an active way, on the lookout for meanings and patterns (Braun & Clarke, 2006). Next, I generated codes from the documents bearing in mind the research question I aim to answer since my themes are theory-driven (Braun & Clarke, 2006). The themes used are based on the principles of energy justice as detailed in section 3.2 above. Afterwards, I placed each code within as many themes as they fit as displayed in table 1, then I reviewed the themes based on the quantity of codes within each theme. Lastly, using these themes, I presented and described my data in a coherent and logical manner to make an argument concerning my research question (Braun & Clarke, 2006).

Some have argued that thematic analysis is not a separate research method but rather a tool to be used within and across different methods (Boyatzis, 1998). Others, however, have argued that thematic analysis is a method in its own right. Not only is it accessible, it also provides theoretical flexibility to the researcher and can “potentially provide a rich and detailed, yet complex, account of data” (Braun & Clarke, 2006, p. 78). On the background of these, thematic analysis is used a standalone method in this thesis.

Table 1 - Summary of Identified Codes and Relevant Themes

	THEMES	Availability	Sustainability & Intergenerational Equity Justice	Intragenerational Equity Justice
CODES				
Increase in Reserves and Production capacity		X	X	
Increase in distribution channels and utilization		X		x
R&D and human development		X	X	x
Environmental Protection			X	
Indigenous participation in means of energy production				X

4.3 Overview of Document

The National Energy Master Plan is an implementation plan and roadmap for achieving the energy policy objectives based on the strategies outlined in the NEP (*NEMP, 2022*). The current revision of the NEMP caters to the 3rd revision of the original National Energy Policy for Nigeria that was approved in 2003. The updated version of the NEP was reviewed in 2021 by the Energy Commission of Nigeria due to changes in the national and international energy arena and was approved by the Federal Executive Council (FEC) on the 27th of April, 2022 (*NEP, 2022a*). “The NEMP focuses on all energy sources, energy utilization; manpower development; energy financing; energy planning, implementation, monitoring and evaluation; and other cross-cutting issues. Thus It is a blueprint for the sustainable development, supply and utilization of the various sources of energy available within the country, and for the use of these resources in international trade and co-operation” (*NEMP, 2022, p. xvi*).

4.4 Energy Sources Analysed and Justification

As mentioned in 3.2, I incorporated the Nigeria ETP into my work by using it to narrow down my focus on only the energy sources that have been planned for use in the transition plan. This section details the energy sources analysed and the justification for them as is in the Nigeria ETP.

The Nigeria ETP targets emissions' reduction across 5 key sectors; Power, Cooking, Oil and Gas, Transport and Industry(Nigeria ETP, 2022c). For the power sector, the decarbonisation plan involves the utilization of mostly solar energy in the expansion of generation capacity. However, prior to 2030, generation capacity is planned to come from an increase in natural gas generation to allow adequate time to develop baseload capacity and promote the integration of renewables (Nigeria ETP, 2022e).

There is a focus on switching to electric vehicles as a means of decarbonizing the transport sector. However, just as in the power sector, this is expected to commence post-2030. In the interim, biofuels will be used as a decarbonisation measure (Nigeria ETP, 2022f). With respect to oil and gas, there are no plans to reduce oil production. Rather the focus is on using Carbon capture technologies to abate the emissions from the sector (Nigeria ETP, 2022d).

For cooking, prior to 2030 when biogas and electric cook stoves will be prioritized, Liquefied Petroleum Gas will play a great role in the transition from traditional firewood, charcoal and kerosene (Nigeria ETP, 2022a). Lastly, emissions in the industry will be abated through Bioenergy with Carbon Capture and Storage and the use of green and blue hydrogen (Nigeria ETP, 2022b).

With the above in mind, I narrowed my focus on the sections for the energy sources that will play a role in the Nigerian energy transition – Crude oil, Natural gas, Solar, Hydrogen and Biofuels.

4.5 Potential Limitations

One potential limitation of thematic analysis is that its interpretative power is restricted to just description unless used within a theoretical framework (Braun & Clarke, 2006). By utilizing theory-based themes in my analyses, I ensured that my analytical claims are rooted within the theoretical framework upon which my analysis is based.

One of the guidelines to ensure credibility is to have multiple people carry out the analysis or have someone who serves as an analytical 'auditor' to ensure there are no inconsistencies in data, errors or overstatements (Elliott et al., 1999). Since I did not write this thesis with any partner, this was not easy for

me. Instead, I asked some friends who are well versed in energy policies and strategies in Nigeria to go through my analysis and offer some feedback.

Lastly, this study investigates every energy source that is to be used for the energy transition according to the Nigeria ETP. Thus, the broad nature of this study does not allow for an in-depth investigation into each of the energy sources.

5. Results & Discussion

The results are presented and discussed simultaneously in this section under the three themes presented in table 1. Each theme contains three codes which are discussed in depth after a brief introduction and summary of the findings for each theme. The first theme - Availability, accounts for about half of the discussion as this is the most represented theme in the document.

5.1 Availability

In addition to the factors discussed under availability in section 3.2, I included policy and strategy initiatives that are aimed at promoting both technological advancement and financial investments in the production, transportation, storage and distribution processes and the energy system as a whole in my analysis. Availability is well integrated into the NEMP. Most of the efforts are targeted towards increasing the available reserves and production capacity of the energy sources, especially oil and gas. This poses a concern for the sustainability and intergenerational equity justice theme as it can be associated with issues of resource depletion and environmental harm. Solar in the form of mini-grids is targeted at serving the rural dwellers although the current rate of deployment is slow and the distribution is not exactly widespread. There is also a great emphasis on building transportation and storage facilities for crude oil and natural gas across all six geopolitical zones in Nigeria – efforts which will positively affect intragenerational equity justice. These and more, are presented and discussed in more details under the codes below.

5.1.1 *Increase in Reserves and Production Capacity*

This involves policies and strategies targeted directly at increasing reserves and production capacity and those that increase production capacity indirectly by using financial incentives, promoting investments and improving the market conditions for investing in those energy sources. With the exception of biofuels, for all the energy sources analysed, there are policies directly targeted at increasing their reserves and production. For both crude oil and natural gas these include policies aimed at ramping up the exploration and exploitation of these resources. Regarding the renewable energy sources, the policies come in the form on increasing the level of integration of these energy sources into the national energy mix. The policies that are indirectly targeted at increasing production are mostly aimed at improving market competitiveness and efficiency as is the case for natural gas. Others are aimed at increasing investments and providing financial incentives for investors as is the case for biofuels. These policies are shown in table 2 below.

Table 2 - Energy Sources and policies promoting an increase in their reserves and production capacity as seen in the National Energy Master Plan

Energy Sources	Associated Policies in the National Energy Master Plan (NEMP, 2022)
Crude oil	<ul style="list-style-type: none"> - the nation shall engage extensively in the exploration and production of crude oil and associated liquid petroleum - The nation shall complete deregulation and privatization of the oil industry <p>(p. 17)</p>
Natural gas	<ul style="list-style-type: none"> - the nation shall intensify efforts in gas exploration and development - The nation shall promote a competitive and efficient domestic market for natural gas and establish indigenous-based natural gas facilities - The nation’s gas resources shall be harnessed and optimally integrated into the national economy, energy mix and industrial processes. <p>(p. 25)</p>
Solar	<ul style="list-style-type: none"> - The nation shall aggressively pursue the integration of solar energy into the nation’s energy mix, which should be based on the established potentials and available technologies nationwide <p>(p. 68)</p>
Hydrogen	<ul style="list-style-type: none"> - The nation shall integrate hydrogen as an energy source in the energy mix of the country <p>(p. 78)</p>
Biofuel	<ul style="list-style-type: none"> - The nation shall promote investments in the biofuels industry. - The nation shall grant biofuels pioneer status for an initial 10-year period with the possibility of additional 5-year extension. - The nation shall support the emergence of an industry in which substantial portion of feedstock used by biofuel plants will be produced by large – scale producers and out growers <p>(p. 94)</p>

Crude Oil

Some planned strategies for increasing the reserves and production capacity include increasing utilization and capacity of refineries in the country and promoting fiscal incentives that will attract investments in the oil industry (*NEMP, 2022*).

Increasing the utilization rate and capacity of refineries will play a vital role in increasing the availability of energy in the country. Despite being one of the leading producers of crude oil in Africa, Nigeria's domestic consumption of petroleum products is mostly met by imports (Olujobi, 2021). As at 2020, Nigeria produces an average of about 1.778 million barrels per day yet it just has the capacity to refine 445,000 barrels per day, a capacity which is still not fully utilized (*NEP, 2022b*). The poor functioning of the refineries has been attributed to weak governance, pipeline vandalism, poor maintenance and age (Olujobi, 2021). The target is to ensure that at least 50% of crude oil produced in Nigeria is refined in the country by 2030 and 75% by 2035 (*NEMP, 2022*). Some strategies to achieve this involve promoting the involvement of the private sector in the refinement sector, which is in line with the policy to deregulate and privatize the oil industry as a whole. According to Olujobi (2021), "deregulation of the downstream oil industry will attract more foreign investors, eliminate the shortage of refined petroleum products, and combat refined petroleum commodities' smuggling around the country's boundaries" (Olujobi, 2021, p. 2).

In addition to maximizing refining capacity, there are policies and strategies promoting the exploration and production of crude oil. Some of the strategies involve promoting exploration programs to discover oil reserves in the oil bearing zones across the nation both onshore and offshore, engaging in large-scale exploration in frontier and nonproducing basins and reviewing existing fiscal frameworks in order to attract investment to develop deep-water acreages (*NEMP, 2022*). This may prove difficult to achieve as International Oil Companies (IOCs) continue to divest from the country due to vandalism, insecurity and slow implementation of regulations and reforms (Anyago, 2022). Additionally, societal pressures arising from climate change is causing a global unavailability of funding for oil projects (Oladipo, 2022).

However, in a case that the nation is able to achieve this, the increased exploration and production of crude oil may be a cause for concern given the potential effects such as environmental pollution and social injustices associated with crude oil production.

Natural Gas

Nigeria is among the top 7 gas flaring countries. It has contributed about 48 million tonnes of GHG emissions through gas flaring – greater than the combined emissions of the sub-Saharan Africa (Afinotan, 2022). This is gas which could have either been reinjected into the reserves or utilized for energy production. Hence, it comes as no surprise that most of the strategies and action plans for increasing gas reserves and production involve reducing gas flaring (*NEMP, 2022*). There is a strong focus on utilizing legislation and penalties to discourage gas flaring in the oil industry. It is also worthy to note that some efforts are already underway. In 2022, the Nigerian Gas Flare Commercialization Program was relaunched. Its aim is to end the flaring of gas in Nigeria, an objective to be achieved by offering flare gas for sale via a transparent and competitive bidding process (*NGFCP, 2022*). However, given that the industry is characterised by an inherent and widespread corruption (Olujobi, 2021), one must wonder how effective and transparent these proposed and implemented strategies will be. However, if they are successful, they have the potential to significantly reduce emissions in the sector and hence also have a positive impact on sustainability and intergenerational equity justice.

Other proposed strategies include providing financial incentives and ensuring natural gas infrastructure are properly protected in order to attract both foreign and local investors (*NEMP, 2022*). The safety of natural gas infrastructure is vital as there is a history of oil infrastructure vandalism in the Niger Delta. During the episode of vandalism between 2007 and 2009, the country lost at least US\$24 billion in the first eight months of 2008 alone (Adibe et al., 2018). Galadima et al. (2022), also mentioned the importance of improving security against vandalism. This, however, does not tackle the root cause of the problem which is aggrieved host communities whose environments have been degraded and have been deprived of the benefits from such infrastructures being located in their communities (Adibe et al., 2018).

Solar

Planned pathways to increase the production capacity of solar energy include incentivizing investments in the production of solar systems and the supply of solar services and making solar energy the main energy source in rural and peri-urban regions (*NEMP, 2022*).

Investments in the sector will play a major role in increasing the percentage of solar energy in the energy mix as inadequate financing and lack of adequate business models have been identified as some of the challenges to modern energy access in Nigeria (*REMap: Nigeria, 2023*). Early this year, the federal government laid the foundation for a 172-million-dollar solar cell production plant in Nasarawa state, a

project with the aim of making solar energy available and affordable in Nigeria, which will be funded 85% by China (Nwafor, 2023).

As at 2020, only 25% of rural dwellers in Nigeria had access to electricity according to the Sustainable Development Goal 7 (SDG7) tracker and only about 6% had access to clean cooking (*REMap: Nigeria*, 2023). Thus, making solar energy the major energy source in rural and peri-urban regions will have a great impact on increasing access to modern energy sources for the rural populace. According to the World Bank's Infrastructure Vice President, "Now more than ever, solar mini grids are a core solution for closing the energy access gap" (WorldBank, 2022). There is already an agency in place for this in the country - the Rural Electrification Agency (REA) with the mandate of promoting and co-ordinating Rural Electrification in the country (REA, 2017). Among other projects stated in their report, the REA installed 67 mini-grids over a 3-year period (2020 – 2022) providing electricity to 657 households (PUNCH, 2023a). The Managing Director of the agency currently announced that more than 1000 mini-grids are planned to be developed nationwide over a few years in partnership with the federal government and private investors (PUNCH, 2023b). Although no target date was set for the completion of the project, it is a great improvement from the past 3 years. Achieving set targets will have great positive impact on both sustainability and intergenerational equity justice and intragenerational equity justice.

Hydrogen

The strategies to be adopted for integrating hydrogen into the national energy mix involve the estimation of its resource base, development of market for hydrogen energy systems and provision of market incentives to attract investors (*NEMP*, 2022).

In 2021, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), created a hydrogen diplomacy office in Abuja, the country's capital to promote political dialogue on energy. The aim being to aid Nigeria in exchanging ideas on hydrogen and power-to-X technologies and enhancing the cooperation with the private sector (giz, 2021). This is the most significant activity that has occurred within this sector in Nigeria. This was also the case for Namibia, which consequently resulted in a German funding worth €30 million for hydrogen pilot projects in Namibia ('PtXHub', 2023). Nigeria should pursue the integration of hydrogen in energy mix as it has the potential to gain from a transition to green hydrogen production and export as it can take advantage of its existing expertise and skills base in LPG production given that it already is a notable exporter of fossil fuels (*REMap: Nigeria*, 2023).

Biofuel

The strategies to be adopted in achieving the associated Biofuel policies fall within either the use of financial incentives or the use of policy and regulations. Some of the planned financial incentives include tax exemptions, tax holidays, import duty waivers and preferential loans with low interest rates. These are geared towards all aspects and stages of biofuel production but there is an emphasis on incentivizing the establishment of large-scale out-growers schemes (NEMP, 2022). For instance, the preferential loan will only be made available to “...investors/organisations with commercially viable out-growers schemes as source of significant feedstock supply for bio-fuel production” (Nigerian Biofuel Policies and Incentives, n.d.). Similarly, the policies and regulations also focus mostly on the agricultural sector to ensure adequate feedstock for the biofuel industry.

One major challenge with this is the potential to create competition for land and water, which can be linked with reduced food security. Research has shown a decline in the availability and access to food in some African regions where farmers chose to produce cash crops like biofuel feedstock (Brinkman et al., 2020). Currently, Nigeria is facing food insecurity challenges as a combined result of post-harvest losses due to lack of infrastructure to store and transport harvested products, lack of adequate power supply and the ongoing conflicts across the country (Villacis et al., 2022). Hence, although increasing agricultural output is desirable, the primary reason for that should be for securing food supply in the country. Furthermore, large-scale land acquisitions for such plantation agriculture needed for out-grower schemes have been associated to displacement of customary land uses (Schoneveld et al., 2011). This is especially true in sub-Saharan Africa where green grabbing of land occurs regardless of the land tenure system in place (Giovannetti & Ticci, 2016). Hence, there is a great risk for this to negatively affect Due Process and Good Governance aspect of energy justice.

5.1.2 Increase in Distribution Channels and Utilization

This includes policies and strategies that promote the provision of and investment in infrastructures for the transmission and storage of energy from different sources. Also included are other means through which energy can be distributed such as the provision of infrastructure and appliances to utilize available energy. The only energy sources with such policies are Natural gas and solar energy as shown in table 3. Although, there are no specific policies for crude oil, there are strategies through which an increase in its distribution channels can be achieved. The successful implementation of these policies will also boost efforts towards promoting intragenerational equity justice.

Table 3 - Energy Sources and policies promoting an increase in their distribution channels and utilization as seen in the National Energy Master Plan

Energy Sources	Associated Policies in the National Energy Master Plan (NEMP, 2022)
Natural gas	<ul style="list-style-type: none"> - The nation shall put in place necessary infrastructure and incentives for adequate geographical coverage of the gas transmission and distribution network. - The nation shall develop Building Code to include domestic gas piping and installation within residential buildings <p>(p. 25)</p>
Solar	<ul style="list-style-type: none"> - The nation shall encourage individual and corporate bodies to generate solar power and feed into the grid <p>(p. 68)</p>

Crude Oil

Although no policy targeting an increase in distribution channels and utilization exists for crude oil, there are strategies and action plans with the objective “to ensure adequate and reliable supply and distribution of petroleum products to meet the demand of the domestic market” (NEMP, 2022, p. 17). These involve providing incentives for private investment in refineries in every part of the country and refurbishing existing rail infrastructure to enable nationwide distribution of petroleum products (NEMP, 2022). There are six geopolitical zones in Nigeria as depicted in figure 1, however, there are only 4 refineries in the country out of which 3 are located in the south-south zone (Oladimeji et al., 2015). The effect of this is seen in figure 2 as the south enjoys more access to electricity than the northern parts of the country. Furthermore, the Nigerian railway system is very much limited in structure and technology due to negligence and it accounts for just a negligible part of the total transportation within the country (Grever et al., 2019). Hence, the successful implementation of these strategies stand to make an impact in the availability of energy.

Another action plan being considered is the sustenance of the petroleum equalization fund (PEF) until an extensive network of petroleum supply and distribution is in place (NEMP, 2022). The PEF, was established in 1975 with the aim of ensuring the uniformity of prices of petroleum products across the nation by

refunding petroleum marketing companies for any losses they encounter by selling petroleum products at uniform prices throughout Nigeria (Ezeoha et al., 2016). However, many have argued that the PEF has been inefficient in accomplishing this mostly due to the massive corruption within the system (Ezeoha et al., 2016, Olujobi, 2021). Consequently, the PEF was made defunct in 2021 (TheGuardian, 2021) even prior to the launch of the revised NEMP, hence making this action pan redundant. Moreover, the planned sustenance of PEF, is in contradiction with the complete deregulation and privatization of the oil industry which is one of the policies targeted at increasing the reserves and production capacity of oil in the nation.

Lastly, another considered pathway for ensuring adequate and reliable supply of petroleum products is by guaranteeing the availability of storage capacity for petroleum products for at least 3 months of forward consumption. This will involve constructing such storage facilities in all six geopolitical regions in the nation and making sure they are always functional and constructing medium sized petrol stations in all Local Government Areas in the country (NEMP, 2022).

Natural Gas

The aim of the policies and associated strategies for natural gas is to guarantee a reliable supply of energy to all parts of the country (NEMP, 2022). Similar to crude oil, these strategies involve improving transmission and distribution lines and the geographic spread and capacity of storage facilities. An additional aspect includes the use of regulations to promote the incorporation of gas infrastructure in urban and regional planning (NEMP, 2022).

Currently, Nigeria has eight(8) LPG storage terminals all of which are located in the southern regions (KiaKiaGas, n.d.). Similar to the situation with crude oil, the effect is seen in image 2. Hence, increasing the geographic spread of such storage facilities will play a great role in making natural gas available across the nation. In addition to “developing a natural gas gathering and transmission infrastructure to deliver gas across the country” (NEMP, 2022, p. 27), there is also a plan to develop virtual pipelines to ensure supply to those who are not connected to a gathering and transmission system (NEMP, 2022). However, there is also a great emphasis on strategies involving the setting up of infrastructure for natural gas export, such as the completion of the ongoing Ajaokuta-Abuja-Kaduna-Kano project, a Trans-national gas pipeline. This brings about the concern of priority being placed on exports rather than domestic distribution – a concern which will be further discussed under the “Intragenerational Justice” theme.

Another planned strategy to achieving nationwide supply of natural gas is by “formulating and implementing suitable urban and regional planning regulations needed for the effective distribution of

natural gas to, and its utilization by, domestic, commercial and industrial consumers” (NEMP, 2022, p. 29). This involves the integration of gas utilization infrastructure into existing regulations and the formation and implementation of National Gas Safety Codes and Standards (NEMP, 2022). The challenge with this is that the enforcement of regulations within the building sector in Nigeria is weak. This is evident in the number of buildings that collapse each year due to non-adherence to building regulations (Qurix & Doshu, 2020). This then questions if this will have any real impact. However, this strategy also involves incentivizing the incorporation of gas-utilization facilities into newly built estates (NEMP, 2022). This has more chances of being effective as people respond to financial incentives (Zhang, 2023). Regardless, this means that this solution is only for a certain geographic of the population that can afford the cost of living in estate – another concern discussed more under the “intragenerational equity justice” theme.

Solar

Similar to natural gas, strategies employed in increasing the reach of solar energy involve integration into new and existing infrastructures and buildings. Additionally, mass campaign and advocacy for the use of solar energy is another planned strategy. (NEMP, 2022). Another strategy to increase its reach is by using it as the primary energy source in the rural and peri-urban areas which has already been discussed in section 6.1.1. However, as displayed in image 3 below, there are currently no ongoing projects in some of the northern regions which have the least access to electricity.

5.1.3 Research & Development and Building Human Capacity

This involves policies to boost research and development in each energy source for the purpose of increasing the energy availability and those that promote the development of human capacity. R&D policies exist for crude oil, natural gas and solar energy as shown in table 3. Despite no policies being available for hydrogen and biofuels, strategies promoting research and development in them are present and are considered in the discussion section. Similarly, though there is no policy targeted at building human capacity for all the energy sources analyzed, some strategies promoting human capacity with the aim of increasing the availability of solar and hydrogen energy sources are present in the document and are also considered in the discussion below.

Table 4 - Energy Sources and policies promoting an increase in their Research and Development as seen in the National Energy Master Plan

Energy Sources	Associated Policies in the National Energy Master Plan (NEMP, 2022)
Crude oil	<ul style="list-style-type: none"> - The nation shall aggressively pursue research and development and human capacity development to derive maximum economic benefit from its oil resources <p>(p. 17)</p>
Natural gas	<ul style="list-style-type: none"> - The nation shall aggressively pursue research and development and human capacity development to derive maximum economic benefit from its gas resources <p>(p. 25)</p>
Solar	<ul style="list-style-type: none"> - The nation shall encourage research and development in solar energy technology <p>(p. 68)</p>

The strategies employed in meeting associated R&D policies are almost similar across all energy sources. They include increased collaboration between the academia, research centres and industry, increased collaboration with International Centres of Excellence, introducing competitive research grants and improving access to data for R&D. Increasing collaboration between industry, universities and research institutes will play a great role in boosting the R&D output as the lack of corporation among them has been cited as a major challenge to R&D in the country (*THISDAYLIVE*, 2021). However, considering Nigeria spends just a negligible portion – 0.13% of its GDP on R&D (*Statista*, 2022), it is doubtful that tangible results can be obtained from its efforts to promote R&D.

Strategies aimed at building human capacity exist only for solar and hydrogen. Strategies common to both involve organizing national and international conferences to educate people. Establishment of demonstration schemes and training of extension workers are employed as additional strategies to build capacity for the application, installation and maintenance of solar energy systems (*NEMP*, 2022). Extension programs have proved to be useful in different sectors. They have been found to aid access to resources and technological transfer which promote resilience of small scale farmers (Baiyegunhi et al.,

2019). Additionally, they have contributed significantly to improved access and coverage of primary healthcare (Gobezie et al., 2023). If properly implemented, it has the potential to yield similar results.

Particular to hydrogen fuel, there are strategies to encourage post-graduate studies in hydrogen and fuel cell technologies at both national and international institutions (NEMP, 2022). However, the tertiary education system in Nigeria is largely impaired owing to challenges such as inadequate funding, lack of infrastructures, and frequent strike actions by university lecturers (Bello et al., 2023). These strategies will most likely have no impact if these challenges are not tackled.



Image 3 - : Map of all Nigerian Electrification Project Mini-grid Projects by Status (USAID, 2022)

5.2 Sustainability and Intergenerational Equity Justice

The sustainability and intergenerational equity justice theme is not very well integrated into the National Energy Master Plan. Its integration is mostly based on efforts to mitigate the environmental impacts from the production of the various energy sources especially crude oil and natural gas. Other ways in which it is integrated is by the incorporation of other environmental friendly energy sources into the national energy mix. However, some efforts that promote “availability” may pose a challenge for sustainability and intergenerational equity justice. The results are presented and discussed further under the codes below.

5.2.1 Increase in reserves and production Capacity

This includes policies and strategies that are targeted at increasing the reserves and production capacity of various energy sources in the country which would affect sustainability and intergenerational equity

justice negatively. The renewable energy sources generally have a positive effect on the environment as is already mentioned in the theme above and thus are left out in the discussion for this theme.

Table 5 - Energy Sources and policies promoting an increase in their reserves and production capacity as seen in the National Energy Master Plan

Energy Sources	Associated Policies in the National Energy Master Plan (NEMP, 2022)
Crude oil	<ul style="list-style-type: none"> - the nation shall engage extensively in the exploration and production of crude oil and associated liquid petroleum <p>(p. 17)</p>
Natural gas	<ul style="list-style-type: none"> - the nation shall intensify efforts in gas exploration and development - The nation’s gas resources shall be harnessed and optimally integrated into the national economy, energy mix and industrial processes. <p>(p. 25)</p>

Crude oil

To limit global warming, there needs to be a significant reduction in the use of fossil fuels as achieving the 2°C (3.6°F) target would require that global GHG emissions are reduced by a quarter by 2030 (IPCC, 2022). However, by 2030, Nigeria’s target is to have an estimated crude oil reserve of 40 billion barrels and the capacity to produce 4.5 million barrels per day – a 2.5 times increase from 2020 (NEMP, 2022). Not only is this in contradiction to IPCC recommendations, it also has implications for sustainability and intergenerational equity justice as global warming will continue even long after emissions are reduced (Joslyn & Demnitz, 2021). According to the Nigeria Energy transition plan, Carbon capture technologies will be used to abate the emissions from crude oil production (Nigeria ETP, 2022d). However, the economic and technical feasibility of such systems are still in question even in the developed world (Storrs et al., 2023), thus making its planned implementation more unlikely. Hence, by increasing production, Nigeria will not only contribute to the deterioration of today’s climate but that of the future generation.

Natural gas

Natural gas is often seen as a more environmental friendly option than other fossil fuels since burning it for energy leads to less emissions than burning all other forms of fossil fuels (Galadima et al., 2022). Hence, Nigeria plans to increase its production as a transitional fuel until 2030 (Nigeria ETP, 2022e). However,

according to *IPCC (2022)*, there should be a reduction in the use of all fossil fuels in order to achieve the 2°C (3.6°F) target. Hence, it will have similar implications for sustainability and intergenerational equity justice as crude oil although in a lesser scale since it emits less carbon.

5.2.2 **Environmental Protection**

This involves policies and strategies with the aim of reducing the environmental footprints associated with the production of the various energy sources. Such policies and strategies are available only for crude oil, natural gas and hydrogen.

Table 6 - Energy Sources and policies promoting a reduction in their environmental footprint as seen in the National Energy Master Plan

Energy Sources	Associated Policies in the National Energy Master Plan (NEMP, 2022)
Crude oil	<ul style="list-style-type: none"> - The nation shall encourage the adoption of environmentally friendly oil exploration, exploitation, handling and storage methods <p>(p. 17)</p>
Natural gas	<ul style="list-style-type: none"> - The nation shall develop policy to advocate the incorporation of desulphurization unit in the existing refinery and also ensure that any new refinery to be built contains desulphurization unit to ensure low level of sulphur to an acceptable level of 50ppm as against the current 150ppm - The nation shall develop corporate social responsibility document for implementation by the Oil Companies (OCs) in order to end conflict and insecurity in the oil producing areas <p>(p. 25)</p>
Hydrogen	<ul style="list-style-type: none"> - To ensure hydrogen utilization as a preferred energy source, where possible, on account of its high environmental friendliness <p>(p. 78)</p>

Crude oil

The policies that exist for crude oil aim to factor in climate change in both the upstream and downstream sectors of the oil industry and to reduce the negative environmental effects of crude oil production in the host communities (*NEMP, 2022*). However, with the exception of improving Environmental Impact Assessment (EIA) Audits, no other strategies are planned towards the implementation of these policies. This comes as a surprise considering the history of environmental pollution in the oil producing communities in the country. Most of the environmental hazards in the Niger Delta, the oil region of Nigeria, are as a result of crude oil activities in the region. Within 1978 to 1998, five major incidents occurred leading to a total oil spillage of about 1,338,818 bbl and even recently, oil spill still persists in the area (Ugwu et al., 2021). The effects of these spills that happened decades ago can still be seen and felt by the residents of the region today. However, the only mention of and consideration for the host communities involve efforts at providing socio-economic infrastructure such as schools and hospitals and the provision of scholarship for indigenes (*NEMP, 2022*).

Furthermore, considering that the target is for oil production to be increased by 2.5 times the 2020 level (*NEMP, 2022*), the implication is that several new wells will have to be drilled to achieve this. However, there is no mention of improving the current EIA process. Although petroleum production falls under projects that must undergo complete EIAs before obtaining authorization for their commencement, the current EIA decree 86 of 1992 is known for its low level of effective implementation and practice which has been attributed to high levels of bureaucracy (Choji et al., 2022). Kamijo & Huang (2017) identified the lack of meaningful stakeholder involvement in EIA processes as one of the constraints of EIAs in developing countries. This is the case in Nigeria as there is as the public is only involved at the reviewing stage of EIAs. Not only does this not align to international best practices, it affects the quality of EIAs (Choji et al., 2022) and has a negative impact on due process and good governance aspect of justice.

Lastly, improvements in the EIA auditing would be a welcome development if achieved. One of the implementing bodies as stipulated in the NEMP is NESREA (*NEMP, 2022*). The National Environmental Standards and Regulation Enforcement Agency (NESREA), is the primary federal body with the mandate to protect the environment. However, the provisions of the Act for the body has inherent confusions as it contains clauses that both empowers it to enforce environmental standards and regulations in the oil and gas sector and excludes the oil and gas sector from its authority (Ladan, 2012). Furthermore, NESREA is challenged by inadequate personnel and a lack of collaboration with state agencies established for same

purposes (Mantu, 2019). Hence, without tackling these issues, there may not be any sort of improvement to the EIA Audits.

Natural Gas

Similar to crude oil, the policies that exist for natural gas aim to factor in climate change in both the upstream and downstream sectors of the gas industry and to reduce the negative environmental effects of natural gas production in the host communities. The strategies to accomplish this involve penalizing gas flaring and implementing penalties (NEMP, 2022).

As established in earlier discussion, the oil and gas sector is inherently corrupt and thus there is a trend of lack of implementation of regulations in the industry. This trend also exists regarding gas flaring which has been illegal in Nigeria since 1984 when the Gas Re-Injection Act was introduced. In 2009, three deadlines were set to end flaring. The senate and the Federal Ministry set deadlines of December 2010 and December 2011 respectively while the oil companies stated that a feasible deadline would be 2013. Regardless, flaring still continues unabated till date (Bassey, 2020). Judging by history, it may be unlikely that the desired result will be achieved. Coupled with the planned increase in the exploration and exploitation of both crude oil and natural gas, this would have negative consequences on sustainability and intergenerational equity justice. However, with the Russian invasion of Ukraine and consequent sanctions on Russia, the European Union is increasingly looking to Africa for its supply of gas (Palleschi, 2022). This may serve as motivation for the re-injection or utilization of gas that would otherwise be flared and in such case, would have the potential to positively impact sustainability and intergenerational equity justice.

Regarding the policy on developing corporate social responsibility document in table 6, a successful implementation could potentially abate the situation in the Niger Delta. Angela et al. (2021), pointed out that one of the reasons that CSR efforts from the multinational oil companies seem negligible is because they are left to set their CSR standards as there are no minimum standards set by the government.

Hydrogen

The objective of ensuring that hydrogen is the preferred energy source where applicable is to gradually reduce dependence on fossil fuels whilst developing the hydrogen industry to provide sustainable jobs. Strategies to increase hydrogen utilization are targeted towards its application in transportation and these include carrying out research to ascertain the feasibility of hydrogen use as a transportation fuel in Nigeria and building capacity for its use in the sector (NEMP, 2022).

According to Emodi et al. (2022), decarbonizing the transport sector can play a great role in attaining net-zero in the Global South by mid-century. This is true in Nigeria as the transport sector accounts for 60% of total national emissions as a result of the use of fossil fuels as the only energy source in the sector (Aba et al., 2023). Hence, the integration of hydrogen fuel in the sector has the potential to reduce the country's total emissions. However, as pointed out by Emodi et al. (2022), the effective integration of hydrogen in the sector would require strong government policies and regulations.

5.2.3 Research & Development and Building Human Capacity

This involves policies to boost research and development in each energy source for the purpose of reducing the environmental footprints of each energy source and those that promote the development of human capacity. Although there are no direct policies related to R&D that directly target the reduction of environmental footprints, some planned R&D strategies have the potential to achieve the same results.

For crude oil, one objective is to use the best available technologies to minimize the impact of oil activities in host communities. However, there are no R&D measures targeted at improving such technologies for instance those needed to abate emissions. For solar energy, strategies include promoting R&D on technological innovations. Solar power is planned to be the primary source of power generation post 2030. This time is to allow for baseload capacity development and integration of renewables in the energy mix (*Nigeria ETP, 2022e*). Technological innovations may facilitate the integration of solar in the energy mix and hence reduce the timeframe to an earlier date. This has the potential to reduce the emissions from natural gas which is planned to be used until solar is fully integrated.

The planned integration of hydrogen in the energy mix is as a result of it being an environmental friendly option. The research and development focused strategies to promote its integration include providing competitive research grants R&D designs on hydrogen technology, identifying, encouraging and embarking on R&D on hydrogen energy technologies in the country (*NEMP, 2022*). The potential challenges with achieving desired outcome have been discussed in section 6.1.3. Similarly, the strategies to promote human capacity building for promoting hydrogen use and application have been discussed in the same section.

5.3 Intragenerational Equity Justice

In addition to analysing how energy is distributed within the country, an analysis of the distribution of the ownership of and participation in the means of production of energy was also carried out. This is a very important aspect in the Nigerian context given Nigeria's history of having the means of production of

energy being dominated by foreigners and multinational companies (Nwonu et al., 2019). This theme is very much incorporated into the NEMP especially as it concerns promoting the indigenous participation in the energy production process. However, in terms of distribution of energy, there is a risk that exports will be prioritized especially when it comes to natural gas which is planned to be the transition gas. This would most likely have an impact on the “availability” theme. Regarding domestic distribution, the majority of the strategies and policies exclude those living below the poverty line. These are presented and discussed under the codes below.

5.3.1 Increase in Distribution Channels and Utilization

This includes policies and strategies that play a role in determining which entities or demographic has access to the energy being distributed. These policies and strategies promote the transmission and storage of various energy sources and other means through which energy can be distributed such as the provision of infrastructure and appliances to utilize available energy.

Table 7 - Energy Sources and policies promoting an increase in their distribution channels and utilization as seen in the National Energy Master Plan

Energy Sources	Associated Policies in the National Energy Master Plan (NEMP, 2022)
Natural gas	<ul style="list-style-type: none"> - The nation shall put in place necessary infrastructure and incentives for adequate geographical coverage of the gas transmission and distribution network - The nation shall develop Building Code to include domestic gas piping and installation within residential buildings - (p. 25)
Solar	<ul style="list-style-type: none"> - The nation shall encourage individual and corporate bodies to generate solar power and feed into the grid - (p. 68)
Biofuel	<ul style="list-style-type: none"> - The nation shall promote the blending of biofuels as a component of fossil-based fuels in the country as required for all automotive use. The blend shall involve the process of upgrading fossil-based fuels. - (p. 94)

Natural Gas

Following the discussion from section 6.1.2, although there are strategies and policies aimed at ensuring the widespread distribution of natural gas across the nation, there are also strategies and policies aimed at facilitating the export of natural gas. Such policies as stated in the document include “ensuring speedy completion of the ongoing LNG and West African Gas Pipeline projects and establishing other suitable infrastructure for the export of natural gas” (*NEMP, 2022, p. 28*).

Nigeria has been identified as a strategic partner to the EU as the union aims to diversify its gas supply (Clowes, 2022). This has the potential to make exports the priority with regards to gas distribution. This in effect would negatively impact “Availability” aspect of justice, leaving less energy resources for distribution within the country especially since natural gas is considered the transition fuel for power generation according to the *Nigeria Energy Transition Plan (2022)*.

With respect to distribution within the country, strategies that exist do not necessarily ensure that every demographic is served exist. Promoting the integration of domestic gas piping and installation by incentivizing the incorporation of gas-utilization facilities into newly built estates exclude those who do not have the means to afford such housing. Although other strategies such as the use of virtual pipelines can serve the less affluent demographic who can afford to buy mini camp stoves, without any supporting financial aid, those living below the poverty line will be left out.

Solar

Regarding solar energy, policies and strategies that target all demographics are present. These include integrating solar energy into new and existing infrastructures and buildings, encouraging the generation of solar energy by individuals and feeding the excess into the grid and making solar energy the main energy source in the rural and peri-urban areas (*NEMP, 2022*).

Although similar to natural gas, strategies such as integrating solar energy into new and existing infrastructures and buildings and feeding excess solar energy into the grid exclude low-income citizens and those not connected to the grid. However, the plan to make solar energy the primary energy source in rural and peri-urban areas have the potential to cater to the unserved and underserved populace with limited resources. As mentioned in section 6.1.2, the country already has an agency with the mandate for rural electrification, although the efforts of electrification are yet to reach the northernmost parts of the country.

Hydrogen

The focus on the utilization of hydrogen is as fuel for transportation (*NEMP*, 2022). However, this is very exclusionary. As Emodi et al. (2022), pointed out, decarbonisation strategies in the transportation sector such as this could lead to crowding out of consumers with low-income. Considering that about 60% of the Nigerian population are living below the poverty line (Aba et al., 2023), this could translate to more than 60% of the population being excluded from such solution unless hydrogen fuel is utilized in decarbonizing long-haul transport.

Biofuels

“Enacting and enforcing Biofuels usage Act Mandate on use of E5, E10, B10 and B20 in Nigeria” is one of the strategies employed in promoting the blending of biofuels as a component of fossil-based fuels (*NEMP*, 2022, p. 96). According to Nwozor et al. (2021), implementation drives spearheaded by the Federal government to enable the policy projection of NNPC blending gasoline with bioethanol by 10% and diesel with biodiesel by 20% to form E10 and E20 blends is the only way to ensure that biofuels have the advantage of being able to use existing infrastructure and have the potential to be a lower-carbon alternative to typical fossil fuels. However, just as with the strategy employed for hydrogen fuel, this could exclude more than 60% of the populace living below the poverty line.

5.3.2 Increase in Indigenous Participation in Energy Production

These include policies and strategies aimed at increasing the participation of Nigerians in the ownership of means of production of various energy sources. These policies exist for crude oil, natural gas and solar energy. Although no direct policies exist for hydrogen, there are strategies that have the same aim for hydrogen power.

Table 8 - Energy Sources and policies promoting an increase in indigenous participation in their production as seen in the National Energy Master Plan

Energy Sources	Associated Policies in the National Energy Master Plan (NEMP, 2022)
Crude oil	<ul style="list-style-type: none"> - The nation shall encourage the participation of indigenous and foreign companies in both upstream and downstream activities of the oil industry - (p. 17)
Natural gas	<ul style="list-style-type: none"> - The nation shall put in place necessary infrastructure and incentives for indigenous and foreign investors. - (p. 25)
Solar	<ul style="list-style-type: none"> - The nation shall support the establishment of local manufacturing industries for solar energy conversion technologies and applications - (p. 68)

Crude Oil

The planned strategies for accomplishing set policies include establishing a special fund for Nigerians operating in the upstream sector, enforcing the local content principle in bidding for oil blocks, examining existing mechanisms to enable Nigerians to engage as major operators in joint venture agreements and promoting indigenous engineering design and manufacturing of equipment and spare parts in Nigeria. (NEMP, 2022).

According to Nwonu et al. (2019, p. 55), “Since 1960, political manipulation, capital requirements, corruption in government, sophisticated technology, market control, and native collaboration with imperialists have combined to render domination of the oil sector by multinational corporations highly effective”. However, efforts have been made to increase the participation of Nigerians in the industry. In 2010, Nigeria passed the Local Content Act to promote the participation of Nigerian oil firms in the sector as a way of creating more job opportunities within the industry for the local populace (Adedeji et al., 2018). It accomplishes this by guaranteeing preference for indigenous companies in awarding oil blocks. Furthermore, the act demands preference be given to products and equipment that are manufactured domestically and meet international standards (Abe, 2022). Although there have been some associated

benefits from the policy adoption, stronger government intervention is needed to ensure the policy is complied with effectively and efficiently (Adedeji et al., 2018). Additionally, Oguagha (2017), pointed out that the determination of the level of transparency in the extent to which the LCP is implemented and adhered to is up to the Nigerian Content Development & Monitoring Board and the oil companies thus leading to corrupt practices. This impacts negatively on due process and good governance principle. Hence, for the planned strategies to work, the government needs to be more actively involved in ensuring the enforcement and compliance to the Act and more transparency is required.

According to Nwonu et al. (2019), one of the elements sustaining multinationals' dominance in the country is the capital requirements for getting involved with oil business. Irrespective of the Local Content Act, small and medium scale enterprises continue to be frustrated by multinationals, pushing them even to the point of bankruptcy, as they are continuously expected to deliver projects without being provided any sort of mobilization fee (Abe, 2022). Hence the provision of funds for indigenous operators in the upstream sector will play an important role in promoting indigenous participation in the means of energy production. As pointed out by (Adedeji et al., 2018), in addition to enforcing the Local Content Act, there should be a focus on strategies to expand entrepreneurial opportunities in the sector. Thus, these strategies have to complement each other in order to produce the desired result.

Natural Gas

The objective of the policies that exist for natural gas is “to encourage indigenous entrepreneurial capability in the gas industry including the development of end-use devices” (NEMP, 2022, p. 25). The planned strategies to achieve this involve developing indigenous capabilities to boost natural gas exports and providing incentives such as securing gas infrastructure to facilitate indigenous participation in the gas industry (NEMP, 2022). The Local Content Act discussion in the “Crude oil” section above also applies here and the latter strategy has been discussed in section 6.1.1.

Solar

The aim of the policy in table 8 is to establish local production capacity for solar energy conversion technologies. The strategies to be employed to achieve this involve the use of monetary incentives such as suspension of import duties, provision of investment grants and tax holidays (NEMP, 2022). In Nigeria, tax holidays are offered under the Nigerian Investment Promotion Commission act and this has been adopted in agricultural and mining sectors with a tax holiday for up to 5years for companies that invest (PWC, 2023). This will go a long way to reduce the cost of importing solar panels and associated accessories

as Nigeria is an import dependent nation with respect to technology and manufacturing (Panshak et al., 2019) hence reducing the financial requirement for locals to enter the solar industry.

5.3.3 Research, Development and Building Human Capacity

This involves policies to boost research and development in each energy source for the purpose of increasing indigenous participation and building indigenous capacity in the production of each energy source. Although there are no direct policies related to R&D and building human capacity that directly target the reduction of environmental footprints, some planned R&D strategies have the potential to achieve the same results. As already discussed in section 6.1.4, the potentials and challenges of R&D in Nigeria still apply here.

Solar

For solar energy, some strategies to achieve this involve the intensification of R&D in the identification and development of indigenous capacities in designing, developing, installing and maintaining solar technologies and knowledge transfer via collaborations between academic institutions, research institutions and International Centers of Excellence. Lastly, the establishment of extension programs in rural and peri-urban areas is another planned strategy to promote the participation of indigenes (NEMP, 2022). The potentials for extension workers have been discussed in section 6.1.3, and like mentioned there, this has the potential to yield desirable results.

Hydrogen

With an objective of developing local production capacity for hydrogen, some of the strategies employed include providing domestic and international training on hydrogen energy and the installation of training facilities for hydrogen and fuel cell production (NEMP, 2022). The challenges with these planned strategies have already been discussed in section 6.1.3

Biofuel

The strategy adopted for research and development on biofuel differs in that it is structured in a way that the companies in the industry will fund the research – “....in which all biofuel companies shall contribute 0.25% of their revenue for research in feedstock production, local technology development and improved farming practices” (NEMP, 2022, p. 97). In their study, Hernández-Socha & Zuluaga-Jiménez (2022), highlighted the role the private sector played in promoting the production and transfer of both

technological and scientific knowledge to the agricultural sector via funding research centers. Hence, the successful implementation of this has the potential to yield desired results.

Concerning if and how the energy justice principles are integrated into the NEMP, the most integrated principles are availability and intragenerational equity justice. Policies and strategies to increase the production, distribution and integration of various energy sources in the energy mix and the increase of local participation in energy production promote these principles. The integration of sustainability and intergenerational justice is mostly via policies and strategies aimed at reducing the environmental footprint of producing the various energy sources.

Regarding how the energy justice principles interact, some strategies that promote availability such as those targeted towards the increased exploration and exploitation of crude oil and natural gas have the potential to negatively impact the sustainability and intergenerational equity justice principle. However, the Nigerian context has a peculiar nature. Nigeria is fossil-fuel dependent and has a high level of energy poverty. Additionally, Nigeria's climate target of cutting emissions by 45% to 47% post 2030 via transitioning to renewables and improving energy efficiency in major sectors depends on the availability of financial help, technological transfer and capacity building. Hence, trade-offs between availability and sustainability & intergenerational equity justice are expected. Similarly, some strategies promoting availability such as the increase in exploration and exploitation of natural gas and crude oil and the intensification of out-growers scheme for the biofuel industry also have the propensity to negatively affect due process and good governance.

6. Conclusion

This study aimed to investigate the extent to which energy justice is integrated into the Nigerian National Energy Master Plan. The findings revealed that availability was the most integrated principle in the document, while due process and good governance principles were insufficiently covered. Furthermore, certain policies and strategies that promoted one principle negatively impacted others. The study also showed that the most commonly used strategies involved financial incentives and regulations. To improve the integration of energy justice principles, the Energy Commission of Nigeria should develop additional strategies that address the needs of individuals who require them the most, particularly those in northern Nigeria, who have limited access to modern energy sources. Thus, two transitions need to be addressed: increasing access to modern energy sources and transitioning to renewables. Additionally, conscious efforts should be made to involve host communities in decision-making processes, as they have been excluded from the oil industry decision-making process in Nigeria (Angela et al., 2021, p. 4).

Furthermore, simply having policies is not sufficient; policy implementation is also critical. As there is a significant gap between policy-making and implementation in Nigeria (Ozoegwu & Akpan, 2021), it is necessary to focus on ensuring effective policy implementation.

This study provides a broad overview of the integration of energy justice into the policies and strategies associated with all the energy sources proposed for use in the Nigerian energy transition. Further in-depth research is required for each energy source to examine how these principles can be better incorporated to support each other. Additionally, it is necessary to investigate how corruption and lack of transparency in the oil and gas sector can be avoided in the renewable energy sector, as these factors have been identified as significant barriers to policy implementation (Olujobi, 2021). This will be critical in achieving the goals set for renewable energy integration in Nigeria's energy mix.

7. References

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