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# Accelerating grid-based renewable electricity sector transition in Nigeria.

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# ACCELERATING GRID-BASED RENEWABLE ELECTRICITY SECTOR TRANSITION IN NIGERIA

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## INTRODUCTION

Globally, there is a drive to transition fossil fuel-dependent systems to cleaner alternatives. The focus is to make renewable energy (RE) central to electricity generation. Nigeria and most sub-Saharan African countries are faced with climate change issues and a challenging situation of energy poverty due to limited energy supply and low access. This has had a spiral impact on the country's economy and the livability of its 40 cities (with each city having a population of over 300,000) and hampers sustainable development.<sup>1</sup> The energy supply of 5300 megawatt (MW) peak generation capacity is grossly inadequate to meet 17520MW demand, although there is an enhancement plan to improve the supply on the Nigerian grid from 26%, 48% and 70% in 2016, 2020 and 2030, respectively. In addition, to improve energy access levels to 65% (2016), 75% (2020) and 90% (2030) for urban areas.<sup>2</sup> However, little progress has been made in achieving this target.<sup>3</sup>

Policymakers, planners, and researchers have confirmed RE is a solution to tackle energy challenges and address CO<sub>2</sub> emissions in Nigeria.<sup>4</sup> Though Nigeria contributed about 0.37% of CO<sub>2</sub> emissions globally in 2021 and African countries 2.9%,<sup>5</sup> there are concerns that emissions might increase as the population and urbanisation grow. Several studies have demonstrated the strong linkage between urbanisation, economic growth, energy demand and subsequent CO<sub>2</sub> emissions in countries that rely on non-RE systems, recognising that energy supply is pivotal for economic development and improved quality of life.<sup>6</sup>

About 53% of Nigerians live in urban areas, which is projected to increase to 70% by 2050.<sup>7</sup> Furthermore, population growth, especially in urban areas and cities, is exerting pressure on the existing infrastructure, as well as the energy infrastructure fundamental to cities' livability, with Lagos, being the biggest city with a population of 15.9 million, ranked 170 out of 173 cities in livability with a 53.3% weighting in the infrastructure category which relates to the quality of energy provided by the Economic Intelligence.<sup>8</sup>

To improve the quality of electricity supply, the Government formulated RE policies to accelerate the development of the Nigerian national grid, the primary electricity source for Nigerian cities. However, implementation has remained challenging, with the planning process and governance criticised as problematic with accountability and transparency issues.<sup>9</sup> Existing research has not paid attention to investigating these issues. This could be because the electricity sector has complex and wicked problems from economic, technical and social perspectives.<sup>10</sup> This paper investigates grid RE's planning process and governance and determines how accountable and transparent the process is. The paper seeks to answer the questions:

What are the planning process and governance of grid-RE in Nigeria?

Is the planning process and governance of grid-RE accountable and transparent?

This study argues that addressing the planning process and governance challenges especially elements of accountability and transparency will accelerate grid RE development across the 40 cities in Nigeria and promote livability within these cities. Also, it draws on the extant literature on RE development and findings from policymakers, planners, energy, and non-actors. These findings can be utilised to develop and propose recommendations expounding the elements of the planning process and stakeholders that should be involved with accountability measures and transparency goals suggested, which will foster the development of the technologies (solar and wind) on the grid. It will inform Nigerian policymakers and planners on strategies that can be adopted to accelerate electricity transition.

### AN OVERVIEW OF THE NIGERIAN RE POLICY

Nigeria has, over time, developed several RE policies, strategies, actions and programmes - see Table 1. The target is to include and increase the share of RE in the national energy mix to solve energy access and security concerns.<sup>11</sup> The policies were developed to improve the electricity sector and increase RE contribution to the total power generation of the country.<sup>12</sup> They also provide frameworks for achieving the Paris Agreement and the Nationally Determined Contributions (NDC).<sup>13</sup> Moreover, the policies are meant to help harness the RE potential of Nigeria since, as of now, there is minimal utilisation, especially from wind and solar energy.<sup>14</sup>

Furthermore, the RE policies were primarily aimed at engendering a system that allows for the development and full utilisation of all the energy resources abundantly available in the country.<sup>15</sup> The RE policies also encourage financing and investment in the RE sector and provide a framework for innovation and technology development in the grid and off-grid connections.<sup>16</sup> Fundamentally, the RE policies aim to achieve improved electricity access and security by introducing RE sources (large and small hydro, biomass, solar and wind) into the country’s energy mix.<sup>17</sup>

Documents	YEAR
RE Master Plan, 2005, 2012 (Update)	2013
National RE and Energy Efficiency Policy (NREEEP)	2015
Nationally Determined Contribution (NDC)	2015
National RE Action Plans (NREAP)	2016

*Table 1. Major RE policies, strategies, actions and programmes*

### BARRIERS TO RE DEVELOPMENT IN NIGERIA

Existing literature identifies several barriers to the development of RE in Nigeria. This includes shortcomings in planning, governance, transparency, and accountability.<sup>18</sup>

Cantarero<sup>19</sup> described the various strategic issues that developing countries, including Nigeria, face. Although short-, medium- and long-term plans and investment profiles have been earmarked, little to no programmes and plans are being implemented.<sup>20</sup> Daudu and Idehen<sup>21</sup> also opined that social inequalities are deepened, and socio-economic development is hampered because these issues are not addressed. Furthermore, RE policies that have been created have lacked the efficacy to achieve their purposes.<sup>22</sup> There have been several advancements and innovations in the field of RE globally, Nigeria's policies are out of date and do not address the modern day challenges of RE production and usage.<sup>23</sup> Therefore, there is a need for the continuous update of Nigeria’s RE policies to ensure they are dynamic and fit for purpose.<sup>24</sup>

Moreover, Nigeria is faced with high reliance on fossil fuels to cater for its rapidly increasing population. It is a country with significant oil and gas deposits and all the inherent demands result from that, especially for transportation.<sup>25</sup> According to Cantarero<sup>26</sup>, there is need for the planning process, which is ineffective to consider social concerns and adequately capture and address in the country's strategic processes and plans. Also, billions of dollars spent annually to subsidise oil production<sup>27</sup> constitute a barrier to introducing RE for electricity generation.

Also, Mostafaeipour et al.<sup>28</sup> identified bureaucracy as another critical issue which impacts RE development. Government and regulatory agencies have created unnecessary structures that impede investments and deter other stakeholders from driving RE, resulting in sluggish implementation. Butu and Strachan<sup>29</sup> also highlighted the lack of participation of key stakeholders in RE project design and execution inhibits successful implementation. Furthermore, because of the lack of transparency and accountable processes, there is a lack of adequate data for analysis. This also acts as a hindrance to the RE powered electricity projects. Elum and Mjimba<sup>30</sup> argued that the existing regulations are weak, coupled with inadequate data, such as market information limiting the effective strategic planning, monitoring and evaluation of RE development processes.<sup>31</sup> Other barriers identified include institutional, market-related, organisational, financial, political, technological, social, infrastructural, and behavioural barriers.<sup>32</sup> This emphasises the need to investigate the strategic planning process and governance relating to the grid RE sector.

## **THEORETICAL BACKGROUND**

This study adopted a socio-technical perspective supported by accountability and transparency concepts in investigating the complexity of the energy system by applying the Transition Management Framework (TMF) and Multi-Level Perspective (MLP). Socio-technical transitions have been used to analyse large systems such as electricity and transportation and are defined by Cherp et al.<sup>33</sup> as the interaction between society and technology that is novel and capable of going mainstream surmounting lock-in. The transition management theory was developed in the Socio-technical literature for accelerating and facilitating energy transition with the TMF and MLP as an offshoot. The MLP is a prominent framework used in strategic planning for energy transitions to understand the changes and dynamics of socio-technical systems along three analytical lenses (socio-technical landscape, regime and niche).<sup>34</sup> On the other hand, TMF is a governance approach used in navigating change to a desired direction towards sustainability.<sup>35</sup> In recent years, it has gained tremendous popularity in sustainability and energy transitions for its reflexive and evolutionary governance process to transition.<sup>36</sup>

Despite the wide application of MLP and TMF in sustainability transition in developed countries, their application in developing countries is still limited, especially in the context of electricity generation. Batinge<sup>37</sup> argues that a context awareness for designing transitions is pivotal for countries with inadequate electricity as these frameworks were developed in developed countries where there is institutional, infrastructure, and technological maturity compared to developing countries like Nigeria. This study adds to the energy transitions literature by applying MLP and TMF to the Nigerian grid electricity sector. It supports Batinge's<sup>38</sup> arguments that the perceived benefits significantly impact the socio-technical dynamics of new technology as the context of Nigeria is peculiar with energy access and supply challenges. This is different from developed countries where transition is not aimed at augmenting the existing unsustainable and insufficient energy systems but abating the existing infrastructure which is dominated by fossil fuels.

One of the weaknesses of the theories is the absence of transparency and accountability measures which is vital for electricity system transformation as it involves multiple stakeholders with

conflicting interests and thus requires accountability and transparency to ensure effective implementation of grid RE strategies.

In the context of Nigeria, there is a need for integrating RE sources such as wind and solar to the existing fossil-fuel-powered grid. Since there is a need for an optimal energy mix and transformation of social and technical systems, it is important to ensure accountability and transparency in electricity governance. The national grid system, in its current form lacks transparency because of bureaucracy and involvement of multiple stakeholders. Existing studies have found that the policy landscape, governance arrangement and strategic planning process are largely ineffective.

Also, in Nigeria, electricity governance involves integrating RE such as solar and wind, which puts more emphasis on ensuring the accountability and transparency mechanism evolves with the transformation of the social and technical systems. The reason being that the national grid system involves a series of activities with multiple complex actors exceeding the fossil fuel domain, which blurs the accountability and transparency chain. Existing literature has found that the policy landscape, governance arrangement and strategic planning process are ineffective.<sup>39</sup>

This has implications for the strategic planning process and governance of the grid systems for RE development, as shown in this study, and gives rise to questions such as what the level of transparency/accountability in RE development is and who should be accountable for RE, and the role of transparency and mechanism to foster transitions. Hence, this study proposes coupling accountability and transparency concepts into MLP and TMF for strategic planning and governance in energy transition. This study adopts the Bovens<sup>40</sup> definition of accountability and transparency, with the latter referred to as the actors responsible for their actions, agenda and programmes, while the former is the dissemination and access to information.

## **METHOD**

An exploratory qualitative research approach was adopted as it enabled informants to present a rich picture and opinions and determine the challenges of the strategic planning process and governance with insight into the accountability and transparency elements. A mono-method research design supported this approach through a qualitative approach of in-depth semi-structured interviews with 31 experts, executives, and policymakers in Nigeria's energy and non-energy industry.<sup>41</sup> These included public organisations, R&D institutes, associations, climate change movement actors, NGOs, universities, independent researchers, RE investment companies, and businesses and experts' opinions across the electricity value chain. Data were obtained from these multiple perspectives to provide a detailed and holistic view and interpretation of the data, which aligns with cross-sectional research in the domain. A case study grounded in inductive research provided an opportunity to understand the informants' experiences, knowledge, opinion and beliefs.<sup>42</sup>

## **PARTICIPANTS**

The informants were recruited through a purposive sampling technique and a snowballing method was utilised.<sup>43</sup> A research information sheet was provided to participants and a consent form was completed upon acceptance by participants to ensure a valid and reliable process of obtaining consent.<sup>44</sup> The in-depth semi-structured interview was conducted using Teams/Zoom platform due to covid travel restrictions. Participants were recruited remotely and interviewed at a mutually convenient time online through a video and audio medium for 30 to 90 minutes. This occurred between April and December 2021, and a consistent interview protocol was observed for all informants, and participation was voluntary.

## **DATA COLLECTION AND ANALYSIS**

Data collection was concluded at data saturation.<sup>45</sup> The interview was recorded and transcribed. Due to the sensitivity of the research and the high profile of the respondents, the informants were anonymised. The transcribed interviews were analysed through thematic analysis, an inductive approach; themes and patterns were identified.<sup>46</sup> The analysis process was observed following Braun and Clarke's<sup>47</sup> six steps process and supported using NVivo software, enabling a systematic approach to collate, sort and arrange the data. The first step was familiarisation; understanding the data involved a reiterative process of reading the transcript and jotting notes of patterns. The second step was highlighting important and relevant sentences and generating initial codes. The third step involved searching for themes based on the patterns from data collated into groups. And then, the fourth and fifth steps involved reviewing the themes and defining and naming them, respectively. The last step was producing the report.

## **A SUMMARY OF THE RESEARCH FINDINGS**

Findings from the thematic analysis of the interviews of 31 in-depth semi-structured energy and non-energy actors are briefly explained in two sections: the planning process and governance of grid RE transitions, and accountability and transparency in the transition to RE sources of electricity.

## **TRANSITION PLANNING PROCESS AND GOVERNANCE**

Findings show that the planning process faces numerous barriers, such as a lack of a dedicated renewable agency spearheading transition, deep thinking, government commitments and incumbent energy players' buy-in. Furthermore, it was revealed that the transition process started with forming a transition arena. It was discovered that the arena constituted an international and national arena. Some respondents indicated that this included the international community, which influenced the direction of the transition. There also was an inter-ministerial committee and national council at the national level playing an important role in RE policy formation in crafting the vision of transition design centred on a long-term vision to have 30% of a planned 30 gigawatt of electricity from RE sources. However, a few respondents indicated that the international community's involvement in the transition planning process has merits, but it also prevented the proper scoping of the transition problem. Furthermore, the study found the presence of experiments through the consideration of 14 solar companies, which were aimed at generating electricity for the national grid. However, respondents commented that this had reached a gridlock with no new grid RE technology; some attributed this challenge to the absence of key stakeholders such as the financing agencies and consumers. Also, this finding suggested that the transition process constituted numerous stakeholders such as the government parastatals and agencies, which respondents indicated inhibited the progress. Lastly, it was discovered that no monitoring or review process is in place. However, suggestions were provided that learning from the successful deployment of renewable energy technologies in the off-grid space could serve as a good starting point for the grid space.

## **ACCOUNTABILITY AND TRANSPARENCY**

Accountability and transparency were identified as critical for the success of the transition. However, this needs to be improved in the present grid RE space. The data analysis showed that there were divided opinions; some respondents perceived the level of accountability and transparency as low, with others indicating that relative to other sectors, there is a level of transparency and accountability; however, it needed to be improved. Also, some stated affirmatively that the planning and governance processes are accountable and transparent.

Five key themes emerged from the analysis of suggestions to improve transparency: public information, competitive bidding system, consumer metering, improved leadership, monitoring, and audit. An emphasis was placed on the need to keep the populace abreast of projects and initiatives, and there should be competitive bidding progress for RE projects which is lacking in the sector. Furthermore, respondents suggested that end users' metering should be improved, and regular monitoring and audit of projects and activities should be carried out.

Respondents also identified various roles of transparency in facilitating the on-grid renewable energy deployment process. Five key themes that relate to transparency will lead to a more effective and efficient electricity system; it will promote the knowledge of electricity and foster best practices and acceptance of actual electricity supply costs. Furthermore, it will boost the attractiveness of the sector and investment and growth in renewable energy and, lastly, improve the sector's governance.

Furthermore, findings show that there is no dedicated agency tasked with the responsibility of grid renewable energy initiatives and projects compared to the off-grid space, where there is a dedicated agency called the rural electrification agency, which inhibits accountability. The data analysis shows that the Nigerian Government and ministries, the Nigerian electricity regulatory commission and the energy commission of Nigeria have critical roles to play in ensuring accountability is upheld. Also, findings suggest that all stakeholders in the transition process should be held accountable, and there is a need for a dedicated agency to handle all on-grid renewable energy affairs.

To conclude, when analysing the challenges of the transition planning process and governance, our findings will provide an understanding of what has gone wrong, and the lessons learnt with implications for RE policy and planning.

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