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Navigating Pathways for Community Renewable Electricity in Rural Areas: Stakeholders' Perspectives on the *Shape* Community Project, Nigeria

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ABSTRACT

The transition to community-scale renewables is recommended as a panacea for the energy infrastructure challenges encountered by off-grid rural communities. Government and development agencies are encouraging the acceleration of the transition process through pilot community projects. While relative success has been recorded in some of these projects, the transition pace is quite slow in developing countries. This raises several questions on various aspects of such an energy transition. Of relevance to this paper is the governance approach through which community projects are developed. This paper draws on Strategic Niche Management (SNM) to investigate the planning and implementation of such a project in *Shape*, a rural community in Nigeria. Data was gathered using face-to-face semi-structured interviews from 24 key actors. Results reveal non-involvement of many important actors with potentially negative implications for future investments in community renewables. The findings highlight fragmentation in the efforts of transition actors and raises questions on their knowledge of transition management. The paper also raises questions on the level of awareness of local citizens and their impact on transition projects. Findings reveal passive involvement and limited opportunities for skilled employment. The paper concludes by recommending further research on how poverty-ridden rural communities can get more involved in what is generally termed as a socially inclusive, transparent, and participatory model of energy provision.

Keywords

Off-grid rural community;
Community renewables;
Solar photovoltaic;
Energy transition;
Strategic Niche Management;
Socio-technical transition;
Sustainability transition.

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1. Introduction

Access to clean and affordable energy is fundamental to realising the United Nations Sustainable Development Goals [1]. It is, however, estimated that about 60 percent of the 196 million people in Nigeria do not have access to basic energy infrastructure [2]. The majority reside in off-grid rural communities and rely on traditional fuelwoods [3-4]. The few who are connected to the grid often experience interruptions because of its insufficient capacity and state of disrepair [5]. Those people who can afford it, generate their electricity using fossil fuel (i.e. diesel and petrol) generators [6-7].

Strachan et al. [8] and Haggett and Aiken [9] have advocated for the transition to community-scale renewables to address energy infrastructure challenges, especially in remote off-grid areas. This is not only for its low-carbon benefits but also to address equity and justice concerns [10-11]. In what appears to be a positive response to this call, the Nigerian government has enacted several policies and programmes to facilitate the shift from a centralised fossil-fuel dominated system to a more decentralised community-scale renewable energy system. Moreover, agencies including some non-governmental organisations have equally responded with several of them carrying out pilot community renewable energy projects in rural locations [12].

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For such projects, the aim is to provide the context within which transition pathways can be piloted to trigger learning and stimulate the development of technology and practice. Whilst relative success has been noticeable in some community projects, the transition process has been quite slow due to alleged transition inertia resulting mostly from governance and institutional-related bottlenecks [6-7]. This has raised questions on whether such projects can contribute to accelerating the transition envisaged in rural communities.

Transition scholars have pointed out that transition such as that in the electricity industry does not occur easily [13]. The reason is that electricity infrastructure is regarded as a socio-technical system which comprises a complex set of technology artefacts, market structures, user practices, regulatory regimes, and scientific knowledge, which are difficult to change [14-15].

Nevertheless, many studies have shown that the transition pace can be influenced or accelerated through effective governance (i.e. effectively coordination) of actors, technology, and policies to achieve the desired set of objectives [15-20].

While significant literature is evident in the socio-technical transition field, little is known of the governance of such an energy transition. In the context of Nigeria see for example [20-22] where the emphasis has been on the: historical nature of transition governance [20]; role of public policy and its influence on transition [21]; and roles of incumbent actors and politics of transition [22]. Whilst these studies laid emphasis on the nature and dynamics of transition governance at the regime level, little is known at the incubation or nurturing stage of a transition project. Thus, this paper contributes to the literature by assessing the development of a community-scale renewable energy project in *Shape*, a rural community in Nigeria. The overarching aims of the paper are to firstly, assess the extent of stakeholder engagement in nurturing transition at the incubation stage. Secondly, to evaluate the level of local citizen participation in the project. Thirdly, to assess the level of efforts towards learning and communicating outcomes to a wider network. The outcomes of this study are intended to assist transition project developers in planning and decision making in formulating future projects.

The paper is structured in five main sections. The first section has placed the paper within geographical context and outlined its aims and significance. Section 2 presents an overview of the theoretical lens of the study. Section 3 provides a snapshot of the Nigerian electricity landscape as well as the *Shape* community project and the attempts to place it within the realms of socio-technical transition concepts. The methodology used is presented in Section 4. It starts by explaining the reasons for selecting a case study and qualitative research approach. This section subsequently outlines the approaches employed for the selection of research participants, sample size, data collection as well as how the data was analysed. Section 5 presents and discusses the evidence collected from the research participants. The last section provides the conclusion and offers important recommendations resulting from the study.

2. Analytical lens

Transition scholars have argued that physical piloting or experimentation of projects is ideally carried out to explore new socio-technical pathways [23]. It is considered as a means where transition projects are put into trial to facilitate understanding of the interactions between the innovation and the real-world context [16, 23]. Scholars such as Raven [24], Hellsmark [25], and Karlström and Sandén [26], identified different aims of a transition project, which include to:

- Facilitate the formation of knowledge networks;
- Facilitate learning that can be instrumental in decisions on technology choice;
- Create public awareness of technologies;
- Explore user preferences and possibilities for changing the innovation, as well as learning about how future experiments should be set up;
- Stimulate debate and assess the feasibility of innovations in different environments;
- Showcase innovation to potential adopters; and,
- Publicise tested techniques, methods, or models through replication.

Hoogma et al. [27] stressed that a pilot project could contribute to a transition when it helps in the process of niche building and intrusion into a market dominated by an existing regime. Such transformation happens either because the current energy system started to adopt elements from the niche or because the niche competed head-to-head with the existing regime [26-28]. It has also been pointed out that experimental or pilot projects contribute to niche building when certain conditions such as the adequate presence of stakeholder networks and effective protection from the existing mainstream environment are evident [27-29]. Scholars have maintained that market forces alone are not adequate to bring about stakeholder networks or effective protection for a niche that is capable to inspire transition. Consequently, Bugge et al. [30] and Nylén [16] posited that a form of governance approach is required not only to bring the network of actors together but to amongst others steer the actors in the effective planning and implementation of a transition project. Following the foregoing understandings, Strategic Niche Management (SNM) was formulated to serve as an analytical approach to guide the nurturing, development, and expansion of

new innovative projects [29-33]. The proponents of SNM claim that when new innovative technologies emerge, they are often characterised by low performance, high costs and absence of networks to support and move the innovations forward [34-35]. Consequently, novelty projects are deprived of a level playing field when competing with an existing system that is favoured by path dependence and lock-in [34-36]. The starting point of SNM is that innovative projects are facilitated by moderating them in technological niches – a protected space that not only allows for nurturing and development of innovative technology, but also the co-evolution of user practices, and regulatory structures [31, 34]. This aspect in transition is important in that socio-technical projects require better support to advance the technological shift envisaged [15, 37].

Drawing on SNM this paper examines the impact of stakeholder participation and networking; assesses the importance of understanding and aligning the expectations of such stakeholders; and explores the role of local community engagement and the significance of learning, monitoring and communication on the *Shape* project. Forming the analytical foundation of the paper these key elements are now introduced.

2.1. Stakeholders' participation and networking

Schot and Geels [38] pointed out that an important requirement for transition projects to contribute to niche building is the adequate presence of a stable network of actors. Networks support the development of learning-by-doing and learning-by-interacting [38]. Given the fact that a niche is a "small network of dedicated actors" [38 pp: 4000], Lopolito et al. [39-40] and Meroni [41] have stated that powerful actors must be carried along in the network both during the design and development of the transition project.

Stakeholder networking and its analysis are useful in learning about the expectations of each actor [32, 42]. Actor networks can lead to successful project development and the expansion of a transition project. Transition scholars have argued that to achieve this task, such a network must fulfil the following conditions. One, the network must be comprehensive, that is, several kinds of actors such as policy makers, users, researchers, regulators, and other stakeholders from within and outside the existing regime must be involved. Two, such actors need to have the capacity to present the outcomes of a transition project and be able to inspire the people within and outside their organisations [30, 34, 42-44].

Weber et al. [45] stated that actors with a stake in the existing regime technology might not necessarily be interested in stimulating a new competitive technology. Given this argument, Bos and Brown [46] suggested that key powerful actors who advocate and influence transition should purposely be involved in the network of transition projects. Ceschin [47] outlined that such powerful actors might include regime *outsiders* and *insiders.*

In the case of community-scale renewable energy transition, *outsider* actors can include civil society groups, scientists, non-governmental organisations and societal pressure groups. On one hand, these actors are required in a transition project network because they do not share the existing institutions and practices with an existing regime and therefore, may protect the innovation [38, 48]. *Insider* actors, on the other hand, are, for instance, the electricity regulatory agency, policy, and development organisation, all of which are needed to provide support for scaling up the new practices and institutions [46]. *Insider* actors may also include existing regime players such as current electricity generation and distribution companies. However, the dominance of such agents in socio-technical transition projects are often criticised because they tend to influence the trajectories in support of their vested interests [47- 49].

Similarly, in community-scale energy transitions, other *insider* actors may include local authorities that can play a prominent role in building support for socio-technical innovation at the grassroots level [50, 51]. Gouchoe and Larsen [51] argued that such actors are important stakeholders in transition projects because not only are local authorities in close contact with the people, but they can act as educators, customers, regulators, financiers, and investment partners in a localised energy system. Therefore, both *insider* and *outsider* actors are required in transition not just because they provide the financial investment and technical expertise required, but they also provide the social legitimacy required for a transition to happen [52-54].

2.2. Articulation of stakeholders' expectations

Business organisations, policymakers, entrepreneurs, users, and other relevant stakeholders partake in the development of transition projects based on their expectations [43]. SNM scholars have established that articulating the expectations of these actors is crucial for the successful development of such projects [55]. When expectations are robust, precise, and shared by many actors, they can legitimise actions, and act as the driving force in social interactions as well as reducing the uncertainties actors have about innovation [32, 55-57]. Articulating actors' expectations, therefore, facilitates the creation of a shared agenda and attracts actors' knowledge as well as their financial and managerial resources for niche building [32-33]. Typically, articulating stakeholders' expectations involves articulating technical

problem users' requirements and experiences, as well as identifying ways in which technology diffusion barriers can be solved [55].

2.3. Local community involvement

Ceschin [47] posited that when designing a transition project, it is not only important to engage actors who can create the settings necessary to protect and support the project through a top-down process, but also those actors from the bottom who are crucial in triggering system change. This line of argument is further supported by Meroni [41] who emphasised the engagement of local citizens or end-users not only in the development of a transition project but also in the design of the project from the onset.

In Nigeria, many rural communities still hold the view that community development projects such as renewable energy are exclusively the responsibility of the government [58]. On the governments' part, community participation tends to be top-down in the form of communities receiving information via consultation [58]. Abiona and Bello [58] concluded that many rural community projects have been designed and implemented without truly involving local communities, and such projects often failed because they lacked commitments on the part of local people.

Studies have been conducted in Nigeria to understand local community participation in rural infrastructure projects such as water supply, sanitation, health, education, and rural roads (see for example [59-61]). These studies focused primarily on local community participation in infrastructure projects. Apart from being limited in terms of the nature of the projects, the studies were not conducted to understand how a project can stimulate and accelerate societal transitions.

2.4. Learning, monitoring and communication

The purpose of developing a transition project is to change the perspectives of those actors required for a transition to happen through learning [62]. In SNM literature, learning is viewed as a socially interactive process of gaining new knowledge, norms, values, or competencies [35-38]. Learning experienced through piloting or experimentation is, therefore, regarded as crucial in socio-technical transition [43, 45]. The reason is that it allows adjustments to existing configurations and permits social embedding required for overcoming path dependence and system lock-in [35, 43].

Sterrenberg et al. [57] stressed the importance and role of learning within and between transition projects. They argued that learning practice would lead to successful niche building if they were not only targeted at the gathering of facts and data but also when they can provoke changes in the perception and expectations of the actors involved. Transition scholars argue that once a transition project commences, learning-by-doing is triggered to augment available knowledge [62]. The knowledge gained will typically be shared among the actors partaking in the innovation project for the further improvement of the innovation through a learning-by-interacting process [63]. Thus, both learning-by-doing and learning-by-interacting are crucial in helping pilot projects reduce the uncertainties that characterise new socio-technical innovations; and therefore create opportunities for the project to develop further. According to Morone and Lopolito [64], this process is the last stage of generating a socio-technical niche capable of replacing an existing regime.

However, effective social learning must follow reflexive monitoring and evaluation of the outcomes of the project in terms of activity, process, progress, and impact (see for example Bussels et al. [65]). van Mierlo et al. [66] set out that monitoring is used to document the inventory of the results of the experimentation project that allows project actors to learn from them. They suggested that it is important to start monitoring the project as soon as the first activities are undertaken regardless of their success. The authors further suggested that monitoring should reflect on four key aspects and their relationships: the current state of the project; the objectives already achieved; opportunities and barriers; and the extent to which activities and results contribute to the goal of inducing a change in practice and institutions.

Keeping an inventory of data through monitoring is considered by Bussels et al. [65] as the basis of information upon which an evaluation can be made. Rotmans and Kemp [67] pointed out the importance of sound and transparent communications amongst parties. Therefore, it is also crucial that the outcomes of project monitoring and evaluation be reported or communicated to all relevant actors to keep them abreast of what is happening at each stage of the transition project.

These foregoing discussions will be utilised to access the development of the *Shape* community renewable energy project. As mentioned earlier, the aim of this paper is threefold. First, to assess the extent of stakeholder engagement in nurturing transition at the incubation stage. Second, to evaluate the level of local citizen engagement and participation in a project impacting their community. Third, to appraise the level of efforts towards learning and communicating outcomes to a wider network.

3. The research context

The Nigerian fossil-fuel dominated centralised electricity regime started with the government overseeing the production, transmission, and distribution of electricity

throughout the country [68-69]. The industry is characterised by a series of challenges that include low generation capacity; inadequate and weak transmission and distribution infrastructure; vandalism and acts of sabotage; inadequate maintenance; and lack of a cost-reflective tariff [6, 68-72]. It has witnessed a dearth of investment in infrastructure, with some efforts at times translating into disproportionate outcomes [71]. This has resulted in shortfalls in generation and transmission capacities, leaving a large expanse of the population without access to electricity [6-7]. Thus, it became apparent that the public controlled electricity system was failing to provide for the electricity needs of Nigerians. The situation is even more severe in remote rural communities, where people live at distant locations to the grid infrastructure. This in addition to other landscape forces including the concerns for sustainable economic development and environmental sustainability have put pressure on the system, requiring urgent action to be taken to transform the system.

In response, Nigeria has strengthened its commitment to liberalise the electricity market through the reform exercise which started in 2005 [72-76]. Consequently, by the end of 2013, the generation and distribution segments of the industry were privatised and handed over to commercial developers [74].

The reform described above highlights attempts made to overcome the regime challenges especially in urban areas. Rural communities however have been neglected in these policy developments [75-76]. To ensure an even development across the urban and rural areas, several other strategies and policies aimed at transiting to community-scale renewable energy in providing electricity to off-grid rural locations have been adopted [77-79]. However, the appropriate settings capable of attracting private investors, as well as distribution companies and communities to buy-in to the transformation has not been realised. To ensure diffusion and stimulate general acceptance, several demonstration projects were set up [12]. As mentioned earlier, the reason for such projects is to provide the context within which transition pathways can be experimented with to stimulate learnings that can contribute to the development of community renewable projects.

One such pilot project of interest is the *Shape* community renewable energy project. As the name implies, the project was situated in *Shape* – a small rural community located 7 kilometres away from the federal capital, Abuja. It represents one of the three rural communities selected by the federal government to trial community renewable energy projects under its programme tagged Operation Light-up Rural Nigeria [80]. The project which was funded and commissioned by the federal government has three substations that transmit electricity to various households through a mini-grid system [80]. It provides 200-kilowatt of solar photovoltaic electricity for the community of about 1,300 people [80]. The project provides light points and sockets for the use of small energy-consuming appliances to most households. The project also utilises energy-efficient bulbs [80]. The inhabitants of the *Shape* community are mostly farmers and generally live below the $2 per day income benchmark. Most people carry out their farming and general business during the day and utilise electricity at night. The project, therefore, is equipped with batteries that allow for the storage of electricity generated to be used when it is needed. The *Shape* community energy project represents a unique experience of a renewable energy mini-grid system that is still operating long after its commencement of operation.

The reason for the selection of this single case study was to develop a deeper understanding of the socio-technical complexities involved in the development and implementation of an energy project which may not be feasible when studying multiple cases. Notwithstanding the rationale outlined above for investigating this project, the paper acknowledges the limitations associated with a single case study research approach. That said, in terms of access to energy infrastructure and economic indices, it suffices to say that the *Shape* rural community shares a similar outlook with other rural communities in Nigeria. As such some of the paper's findings can be generalised to other projects in rural locations.

4. Methodology

This paper aims to provoke a rich and in-depth understanding of the approaches through which transition projects are planned and implemented in rural areas. Therefore, this research adopts a case study approach as outlined above. A case study is considered more appropriate for this research because it offers the researcher the chance to explain holistically and in a real-life context, the processes by which community renewable energy is being developed and expanded for off-grid rural applications. Case study research has a unique strength in that it tries to explain or analyse contextual issues that a researcher has little or no control over [81].

In addition to the selection of case study research, a qualitative method was adopted for this investigation rather than quantitative approaches which might have been considered more suitable for a relatively stable socio-technical system where the parameters are well established. Community renewable energy is not well established in Nigeria. Therefore, qualitative research was considered more appropriate for this investigation.

Different groups of participants were identified as stakeholders for this paper. The identification was rooted according to transition theory which states that transition occurs through the dynamic interaction of social and technological factors at different levels, mediated by various actions of actors [81, 82]. Those actors that greatly influence energy transition are identified and classified by scholars into three key stakeholder groups: policy makers (decision makers and regulators); market (consumers, financial providers, and developers); and other societal actors [82-84].

In arriving at the size of the research participant sample, the paper follows studies that argue that one occurrence of an event is potentially as useful as many in understanding a process behind a subject matter [84-85]. Here frequency is rarely important because in qualitative research the concern is understanding or giving meaning to a phenomenon rather than making a generalisation [86]. On this note, this paper is guided by data saturation [87].

The paper employed a purposive sampling technique. The justification for choosing the technique is that it offers the researcher the greatest chance of gleaning valuable information that can address the research questions [88]. Scholars indicate that purposive sampling means sampling in a calculated way, with a purpose or focal point in mind [88-89]. This technique was then followed by a snowballing technique to identify additional participants via previous interviewees. This allowed the researcher to gain access to key individuals who were not considered at the initial stages of the research.

Semi-structured interviews were conducted across key actors who participated in the *Shape* community project as well as members of the Nigerian electricity industry including regulators, policy makers, investors, government development bodies, researchers, and community members who by their functions and impact formed the relevant stakeholders of the *Shape* community project. The interview was tape-recorded and each interview lasted one hour to one hour thirty minutes. To ensure a more meaningful presentation of findings without disclosing the identity of research participants, they were assigned codes. Such that members of the electricity regulatory body, the Nigerian Electricity Regulatory Commission (NERC), were assigned codes from NERC01 to NERC04. The Energy Commission of Nigeria (ECN), the body in charge of advising the federal government on energy policies were assigned codes from ECN01 to ECN04. The representatives from the Federal Ministry of Power who are responsible for formulating and implementing policies related to the generation, transmission and distribution of electricity were assigned codes from FMPower01 to FMPower03. This ministry is the developer of the project in *Shape*. The Rural Electrification Agency (REA) is the government body in charge of promoting and coordinating rural electrification. This agency is responsible for mobilising capital for private sector investment in addition to managing the Rural Electrification Fund (REF). The representatives of the REA were assigned codes from REA01 to REA05. Investors were assigned codes from Investor01 to Investor02. The single representative from the Federal Ministry of Environment was assigned the code FMEnvironment01. Local community members are represented by their leaders and influential members of the community. The community group were assigned codes Community01 to Community04. Lastly, the lone member from the research communities was assigned the code Researcher01. The participants are top-ranking officials of their various fields of endeavours. The final distribution of participants is presented in Appendix 1.

The data is analysed using thematic analysis which allows for both the inductive and deductive interpretation of the transcript data [90]. This is carried out using a systematic classification process of coding and identifying themes and categories to draw descriptive or explanatory conclusions around the identified themes and categories [90]. The thematic analysis draws on both manifest and latent themes and even where the focus is on the manifest or recurring themes, the aim of thematic analysis is to understand the latent meaning of the manifest themes as attached to it by the research participants.

Data coding and analysis were carried out in two stages. In the first stage, the researcher began the initial coding by reading a few of the interview transcripts line by line and in detail without any theoretical assumptions. This step allowed the researcher to familiarise himself with the data. Recurring and relevant passages or quotes were highlighted and coloured as they become worthy of attention. To become worthy of researcher attention, codes referred to substantive things (for example a particular behaviour or incident), values (for example those that inform or underpin certain statements), emotions (for example frustration or the like) and more impressionistic/methodological elements (for example the interviewee found something difficult to explain or became emotional or the interviewer felt uncomfortable). This follows the coding process suggested by Gale et al. [91] and Saldaña [92].

Upon further reading of the transcripts, the reiterative process of aligning assigned codes to the highlighted or coloured passages continued. To check if a code was properly assigned, transcripts were compared line by line to see if previously assigned codes reflected the same concept throughout. As the process progressed, the codes became more refined, and some of the initial codes were

subsumed by other codes while others were relabelled. The codes developed were subsequently grouped into categories.

In the second stage, all the transcripts were imported into a computer-aided software programme, NVivo. The researcher repeated the same process of coding using the NVivo software. Again, as the process progressed, the codes became more refined, and some of the initial codes were again subsumed by other codes while a few new codes emerged. As more passages were reviewed through this process, a conclusion was reached at the end of the 24th interview transcript that no new additional code or category was forthcoming, and the final coding sheet was developed. Saturation point was reached and then a full coding sheet was developed reflecting the views and experiences of the participants involved in the research.

5. Results and discussion

The following sections present and analyse the research participants understandings as collected in the case study and are structured based on the literature to provide a more rounded feel. Verbatim quotations are also presented in the main body of the text to highlight and illustrate key findings.

5.1. Stakeholder participation

The results derived from the interviews made clear that the *Shape* community project was developed to put into practice the policy initiatives of the Inter-Ministerial Committee on Renewable Energy and Energy Efficiency (ICREEE) headed by the Federal Ministry of Power. Confirming this, research participant FMPower01 stated:

> *"Having drafted the policy on renewable energy and energy efficiency, the Ministry of Power was recommended to carry out some pilot schemes on an off-grid basis. The Ministry decided to conduct three pilot projects. Shape* [project] *is one of these projects."*

All research participants showed a level of consensus on the *Shape* community project as a transition project aimed at trialling socio-technical innovations in a real-world context. Evidently however most stakeholders were not involved in the planning and development of the project. Illustrating this, research participant ECN01 said:

> *"Not all of them* [actors] *were involved, in fact, the way they do things in this country, even the Energy Commission of Nigeria that is the policy maker of the government, were not informed, we only heard about it."*

The comment above suggests that the *Shape* transition project was conceived and designed more by a single actor – the Federal Ministry of Power – without the participation of relevant stakeholders. The study found that the Ministry, acting as the transition manager, implemented the project without the involvement of most of the frontrunner stakeholders that participated in the strategic development process. This is contrary to the recommendations put forward by studies such as [37-40] who argue that the involvement of network actors both during the design and development of a transition project is a critical success factor.

5.2. Local community involvement

On first inspection statements regarding local community participation in the *Shape* project suggest that local community members seemed to be involved in different aspects and stages of the project development, even to the extent of employment opportunities arising. Research participant Investor01 stated:

> *"… before we started the project… we had a series of meetings with them* [the community]. *The first thing we did was we called on the community leader to help us in recruiting technicians, welders, cement mixers and casters from the community. We recruited security personnel for the equipment from the community. We trained technicians on how to install the equipment."*

The statement outlined above is supported by research participant Community02:

> *"… we had a series of meetings with them* [developers]*… They informed us about the intention of the Federal Government to carry out this* [Shape] *project… Also, two people from the village were trained to provide security cover to the project."*

The view expressed indicated that consultation with the local community was made before the commencement of the project and that some employment opportunities in the form of security for the project did arise. The level of skilled employment opportunities does not seem to have been realised in practice contradicting the statement of Investor01 above. The consultation process also centred on informing the community of the project and in seeking security protection in the construction stage. Although the involvement of local people in a series of meetings and in some practical tasks is regarded as positive, nonetheless, such participation appeared passive. It reiterates the assertion by the literature that

community engagement and participation in transition projects are often in the form of communities receiving information via consultation [58] which it was in the case in *Shape*, and this can be a barrier to the success of such projects.

5.3. Learning, monitoring and communication

It was posited that learning-by-doing is triggered once a transition project commences. Research participants expressed different learning outcomes resulting from the *Shape* community project. Criticising the size or scale of the project, research participant FMPower01 said for example:

> *"We have learnt that subsequent projects should be of higher capacity because Shape's capacity is very low."*

The view presented above can be regarded as first-order learning. However, this type of learning alone cannot contribute to niche building and subsequent regime change. Therefore, it must be complemented by second-order learning to effect changes to the dominant set of configurations. Some research participants, generated what appears to be second-order learning outcomes as presented in the following statement by Investor01:

> *"And if you are going to up-scale: this project has shown or teaches the people the importance of energy management."*

Whilst both learnings uncovered in this study are positive, it appears that little effort was being made to monitor and communicate such learning outcomes to the wider network. Research participant REA02 expressed doubt about the efforts being made to monitor the *Shape* project. The following statement illustrates this:

> *"…it would have been wise if there was a deliberate effort to be logging information from the site. So that you will be able to assess the performance, the maintenance, the weakness of the system; whether there is a reason to increase the capacity; whether there is a reason for reorientation of the people, the usage and so on. But right now I don't think this is the case."*

Research participant Researcher01 stated that insufficient effort had been made by the actors in charge of the project to share the lessons learned from the implementation of the *Shape* project:

> *"The information is not easily accessible. When you go to the website of these organisations, some of them are not interactive neither are they engaging. So you need to make an extra effort… There has always been an information gap even on how success stories are being passed out. I am not satisfied because you have to go an extra mile to get some of this information."*

This finding shows insufficient effort at sharing knowledge gained in the *Shape* project with stakeholders. This is despite the significance of learning-by-interaction in developing innovation projects as put forward in study [62].

5.4. Stakeholder expectations

Regarding the economic sustainability of the *Shape* community project, the views of the research participants showed that the *Shape* project did not meet the technical requirements of a commercial business project. According to respondents, the project had no electricity meters through which consumer usage could be determined and charged, and therefore, the local people obtained electricity free of any charge. Research participant NERC02 stated:

> *"Of course, we have privatised the industry, and if we are to integrate that system with existing ones, no customer should take energy free. Whether they were metered or not, they should pay for the electricity they consumed. That is the only way we can sustain the industry."*

As noted, the *Shape* project did not incorporate a commercial framework into the design of the project. The implementation, therefore, disregards the concerns of some stakeholders, especially financial investors. This view is shared by research participant Investor01:

> *"… but things like this are usually government-led, but we need to think of a model that will generate revenue for whoever invested his money. That is the missing element of the Shape project… There is not much of thinking on the part of the return on investment for any investor that is coming in to invest."*

This research participant believed that investors would not be attracted to make investments on future projects because there was no way of ensuring one could recoup the investment. The comments presented indicate the gaps in addressing the concerns of investor stakeholders in the design of the *Shape* project. According to [32], such action can result in depriving transition projects of much needed financial and managerial support of

investment network actors.

6. Conclusion and recommendations

This study found what seems to be a transition testing bed at the operational level in the *Shape* rural community. There is a consensus that the *Shape* community electricity initiative was helpful in trialling socio-technical innovation at the community level. However, the study revealed that the project was conceived, designed, and developed by a single actor – the Federal Ministry of Power – without the active engagement and participation of most of the relevant outsider and insider actors, who are required for project success.

The non-participation of these actors highlights some implications for the success of the *Shape* community project and its chances of contributing to niche building. Firstly, conducting a pilot project by a single actor limits the projects chances of getting the wider resources of actors who have the required experience and expertise that will bring legitimacy to the project. This is primarily because no single actor unilaterally has the power or resources to make a transition at the incubation stage to happen. Secondly, it also limits the chances of developing wider second-order learnings which are also required for a transition niche to transpire.

The study also revealed that the local community was not sufficiently involved in the design of the *Shape* community project. This serves to highlight the passive involvement of local people in the development stage of the project and for the community to provide local labour for what was perceived to be unskilled security jobs. For a community that live below the $2 income per day threshold, this outcome is perhaps not that surprising. It opens an avenue for further research on how poverty-ridden rural communities can get actively involved in what is generally termed as a socially inclusive, transparent, and participatory model of energy provision.

The study, nonetheless, has found that the project had instigated some first and second-order learnings. The project developers, for instance, have learned from the experiences of the project and have established from an investor perspective the need to incorporate financial considerations into the design of community projects. The project also highlights the need to educate local communities on community ownership models.

The financial design of the *Shape* project also came into question. This research revealed that the project supplied electricity without meters being installed in the various consuming units, thereby allowing end-users to receive free electricity. This indicated the absence of any mechanism to measure usage or charge individual consumers. The findings presented here showed that the concerns of actors for a commercial and sustainable business model were insufficiently articulated in the design of the *Shape* project.

This study has shown that several efforts were made by the project developer to monitor and evaluate the outcome of the transition project. However, the wider study also showed that it was difficult for stakeholders to know what was happening or taking place at the *Shape* project and to access the right information that they required. This is because of the gap that existed in how information and/or the success of the *Shape* community renewable project was being communicated.

The paper also recommends engaging a wider network of stakeholders in the planning and implementation of future community renewable projects. Of significance, this paper further recommends the active involvement of local authorities in future projects throughout their life-cycle. Local authorities are believed to be closer to the rural set-up than central government and have responsibilities in areas that are pertinent for instigating social change. This recommendation follows Strachan et al. [8].

There is also the need for actors from outside (for example firms, scientists, and societal pressure groups) to be involved in such a transition process. The reason is that they do not share the same thinking with existing regime members and therefore they may play a significant role in the development of new practices capable of driving forward the system transition.

Another important implication from this paper is the need to strengthen transition projects through the continuous process of communication to feed the relevant actors with background information and detailed knowledge of a particular topic or action taken. This would enable learning among the participants, an important component of transition because participants may lack specific knowledge to expand their understanding. Therefore, it is the responsibility of the Federal Ministry of Power in its role as transition manager to have an overview of all the activities involved. This includes considering the outcomes of transition projects and communicating these outcomes to all the parties in the transition process.

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Appendix 1: Research Participants

Organisation	Designation	Code	Number of Participants
Federal Ministry of Power	Government	FMPower	3
Nigeria Electricity Regulatory Commission	Regulators	NERC	4
Nigeria Energy Commission	Policy Advisor	ECN	4
Rural Electrification Agency	Development Agency	REA	5
Private Investors	Investor	Investor	2
Community Members	Community	Community	4
World Council on Renewable Energy	NGO Researcher	Researcher	1
Federal Ministry of Environment	Government	FMEnvironment	1