“Our dependence on oil simply cannot continue. As the years go by, oil is becoming less important. Cars are the largest users of petrol. But technology is changing all that. And if we look at what is happening today, the birth of the electric car shows us that whether we like it or not, we may not be depending on oil for much longer.”

Professor Yemi Osinbajo, Vice President of the Federal Republic of Nigeria, quoted by Onyedika-Ugoeze, 2016
1.1 BACKGROUND

The last two decades have seen a surge in new energy technology development and energy policy designs as part of a global agenda to promote sustainability. This trend, largely propelled by economic, social, environmental and security concerns has created a comprehensive agenda, which interlocks with the development of renewable energy solutions (de Vries, van Vuuren, & Hoogwijk, 2007). Today, renewable energy technologies (RETs) are favoured (by scientists and some policy makers) to provide long-term solutions to environmental challenges and climate change while also delivering off-grid energy access solutions to rural dwellers (Fischlein, Feldpausch-Parker, Peterson, Stephens, & Wilson, 2014).

Consequently, in the last ten years, investments in renewable energy technologies have grown exponentially from 39.5 billion in 2004 to 279.6 billion in 2015 (REN21, 2015a). Primary energy supply from renewable energy grew by 30 % from 57.7 EJ in 2004 to 76 EJ in 2013. Solar power generation surged by 70 fold from 2.6GW in 2004 to 139 GW in 2014 while wind energy increased from 48 GW in 2004 to 487 GW in 2016 (REN21, 2017). In 2015, renewable energy contributed an estimated 23% to global final energy consumption. Also in 2015, there was a 50% decline in the cost of solar power generators, mostly attributable to China’s current domination of the solar photovoltaic (PV) market. Industry analysts and experts speculate that prices of solar energy will continue to decline in the coming years (REN21, 2015a). The introduction of green bonds and renewable energy financing bonds in industrialised countries like the United Kingdom, United States and France supports similar developments (Jamasb, Nuttall, & Pollitt, 2008).

In the past, the development and policy support of renewable energy has mostly been associated with advanced industrialised countries like Denmark, Germany and the Netherlands and big emerging economies like China, Brazil, India and South Africa (Never, 2012). Currently, however, over 176 countries have incorporated renewable energy targets and other supporting policy instruments in their national energy portfolio (REN21, 2017). Likewise, numerous cities and islands have stated commitments towards 100% renewable energy use.¹

Most importantly, from this thesis’ perspective, recent trends suggest that fossil-rich yet rent-dependent countries of the Arab Gulf (e.g. Saudi Arabia, UAE, Qatar, Algeria) and North Africa have begun to invest in the development of renewable energy (Brand & Zingerle, 2011; REN21, 2013). While these investments are small when compared with financial

¹. Small islands in the pacific
investments in oil and gas, the observed patterns of renewable energy growth is projected to have a profound influence on the energy profile of these countries. For example, as at 2016, seven of the Net Oil-Exporting Countries (NOEC) within the Arab region recorded a sum of 1,326 renewable energy projects in the pipeline totalling over 10 GW of new power generation capacity (RCREEE, 2016).

In Nigeria too, the focus of this thesis, there have been numerous regional and national debates on how to abate barriers to energy transitions. Such discussions have taken off in several contexts such as the post-2015 sustainability agenda, the Sustainable Energy for All (SE4ALL) initiative, and the United Nations Industrial Development Organisation's sponsored ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE).

Yet, in contrast to Arab Gulf states, the deployment of renewable energy technologies and the promotion of RET investments lag behind in Nigeria (Cervigni, Rogers, & Dvorak, 2013; Fatimah, Raven, & Arora, 2015; REN21, 2014a). Policy makers still consider RETs, such as solar PV, an expensive off-grid energy generating solution —with a limited potential for grid-connection and the delivery of large-scale electricity (see chapter 3). With this perception, the last few years have been characterised by regressive policies, and technological over-estimation (cases of solar and Jatropha) (see chapter 4&5)— ultimately translating to challenges for renewable energy financing and investments. Despite Nigeria's vast energy resources i.e. renewables and non-renewables (see chapter 2), its per capita electricity consumption rate remains one of the lowest in Africa.

In 2016, due to gas pipeline vandalisms, grid constraints and water shortages, total installed electricity capacity was 13,308 MW, with energy generation floating between 3500 to 4500MW (EUEI PDF, 2016). With energy demand surpassing production, access to electricity services within the country remains difficult. Contrasting the ambitiously set technological, economic and environmental targets of the aforementioned energy transition efforts, with the overall low trends in renewable energy deployment, one might ask the question as to why these initiatives have been less successful, despite clear objectives and regionally supported ambitious goals.

Perhaps the answer to the above question lies in the fact that current renewable energy transition targets are devoid of the necessary political commitments and leadership at national and local levels (IEA, 2013). Also, moving to alternative low carbon technologies will necessarily involve drastic changes to dominant energy systems, which will require high innovative skills, technological spaces, and industrial processes that are currently limited in Nigeria. Likewise, current regime members might find the introduction of these technological changes and innovation competitive or highly un-complementary to their
current goals (Geels, 2011). This suggests that there is a need to understand the trickle-down effects of politics on the adoption of renewable energy technologies and how this shape institutional, regime and local responses to calls for transitions. Lack of attention to this issue mires current global and local efforts at transitions.

This thesis recognises that for a transition to renewable energy to occur in a rentier state like Nigeria, it is imperative to understand the processes of transitions from a political perspective. Specifically, this research focuses on the politics of energy transitions, a more recent, yet a symbolic aspect of transitions studies that has been relatively underexplored but has begun to gain momentum in the transition literature. By focusing on the politics of transitions, this thesis also aims to contribute to the current theoretical understanding of the geographies of sustainability transitions. In this regard, this thesis explores the role of the political economy of the state and its influence on energy transitions in developing countries like Nigeria. With this, this thesis addresses current research gaps concerning the impacts of politics on transitions by presenting an integrated approach to understand the interactions between the socio-technological and the politico-economic arena while exploring its impacts on the penetration of renewable energy technologies within the society. The next section introduces the theoretical background for this study.

1.2 PUTTING POLITICS IN THE ANALYSIS OF ENERGY TRANSITIONS: A FORAY INTO THE MULTI-LEVEL PERSPECTIVE ON SOCIO-TECHNICAL TRANSITIONS

In the early 1990s, attempts were made in the sustainability transition and innovation literature to analyse pathways for low carbon transitions. Such efforts led to linear narratives, which contextualised transitions as achievable “when a scientific invention is made; the invention is industrially applied to improve its effectiveness, and an adoption of such invention takes place in the society” (Rip, Misa, & Schot, 1995). However, such narratives failed to account for the various complexities involved in technological innovation, the denseness of networks and the compelling capabilities of exogenous pressures influencing the trajectory of transitions (Rotmans, Kemp, & van Asselt, 2001; Verbong & Geels, 2007). Also, these linear narratives were developed in the context of industrialised countries with an optimistic bias towards the development gap between the North and South.

As a result, many innovation models emerged to explain the role of societal factors, exogenous influences and user practices in shaping the trajectory of transitions (Geels, 2002; Safarzyńska, Frenken, & Van Den Bergh, 2012). These sustainability transitions models are rooted in various disciplinary traditions. These include the behavioural perspective (Haas,
Watson, & Eichhammer, 2008) the socio-technical perspective (Geels & Schot, 2007; Smith, Stirling, & Berkhout, 2005; Unruh, 2002) and economic studies that focus on “de-growth,” dematerialisation and the production cost of renewables (Jefferson, 2008; Martínez-Alier, Pascual, Vivien, & Zaccai, 2010).

One of such theoretical constructs is the Multi-Level Perspective (MLP) on socio-technical transitions — a theory initially developed to understand Dutch energy transitions. The MLP acknowledges that energy transitions are strategic processes of social change within a particular energy system — where long-term structural transformations are experienced via changes in structures of existing organisations, markets and socio-cultural norms (Geels, 2002; Grin, Rotmans, & Schot, 2011). Hence energy transitions should be considered to be socio-technical in nature (Geels, 2013). The MLP recognises that technological innovations in energy systems must be embedded within socio-technical institutions to co-evolve (Nelson & Winter, 1982). The purpose is to mould technological developments in energy systems to emerging societal needs.

This requires identifying how actors within the energy system gain insights for the development of innovative technologies, how recursive practices of the existing energy system (such as formal and informal rules) constrain them, and how these actors re-strategize to realise their visions (Geels, 2002). Following this process is critical in understanding how long-term transformations within the energy system unfold. Furthermore, this trajectory provides insights on the various complexities of energy transitions, including the generation of knowledge, the motivation of actors (innovation or ecological), the identification of different perspectives to industrial application and its implications for a shift in technological culture, structure and practices. This multi-faceted perspective to energy transitions underscores the interactions between humans, technologies and the natural system. By and large, this point of view provides a baseline of methods and approaches to evaluate transition processes, which has since dominated energy transition agenda among member states of the Organisation for Economic Cooperation and Development (OECD) and some emerging economies like China and India (Berkhout, Angel, & Wieczorek, 2009; OECD, 2015).

1.2.1 UNDERSTANDING THE LIMITATIONS OF THE MULTI-LEVEL PERSPECTIVE ON SOCIO-TECHNICAL TRANSITIONS

Some criticisms have emerged with regards to the use of MLP to study energy transitions. While some of these criticisms can explain the observed bridge in transitions between the industrialised countries of the North and the developing countries of the South — they are however narrowly focused on economic, technological and institutional concerns. This thesis explores three salient criticisms of the MLP.
First, the treatment of energy transitions in industrialised countries as mainly reliant on several processes of technological innovation, limits transitions to a techno-economic anomaly, which is basically fixable with the presence of technological inventions, and markets oriented policies. Such assumptions become problematic when considering spaces and scales of technological development. It unfavourably disregards the geographical contexts in which distinctive cases of sustainability transitions occur while reducing the comparability between countries thus limiting a coherent problematisation of the theory (Coenen, Benneworth, & Truffer, 2012).

For instance, new technological innovations are often created within a particular national context, although their introduction into domestic markets might be slightly resisted (as the case of genetically modified foods in Europe), yet, there is a larger chance of acceptance if these innovations are built to shape and meet accepted societal visions on innovation. However, in developing countries where capacities for technological innovation is relatively scarce, technology transfer often has an opposite effect. This is because these technologies receive less public attention and this affects how such technologies become embedded in the society (Dewar & Dutton, 1986; Ulsrud, Winther, Palit, & Rohracher, 2015). Essentially, there are local specificities that shape each national system and such technological transfers might not fit or perform well.

Second, the MLP positions industry actors, technology developers, and other institutional and organisational actors as drivers of change within the energy system. However, this conceptualisation is more applicable to countries which have a larger and advanced industrial sector and the fiscal capacity to invest in high-tech energy solutions without hampering the socio-economic conditions of their population (Blühdorn, 2011). For instance, while energy systems in industrialised countries or OECD member states still rely on fossil fuels, a major number of these countries are not large producers of fossil fuels. As such, renewable energy technologies are constructed as a WIN-WIN public policy goal i.e. reduction of oil imports, increases the amount of employment, innovation and funding in the renewable energy sector (Popp, 2006). This assumption, however, contradicts established narratives and structures in developing countries where the reliance on fossil fuels actively drives the socio-economic system (employment, research and finance). A sudden reduction in fossil fuels consumption translates to a breakdown in economic, social, and civic structures (see figure 1).

Lastly, earlier versions of the MLP have been criticised for under-theorising the relationship between shifting power hierarchies, relations among political actors, interests, natural

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2. Transform and Knowledge Network Systems Innovation in the Netherlands
resources and the politics of energy transition (Avelino & Wittmayer, 2015; Meadowcroft, 2011; Nastar & Ramasar, 2012; Smith, Voß, & Grin, 2010). As such, energy transitions were often projected to emerge as a result of a rational consensus in decision-making among actors with almost common interests (ecological concerns). However, recent empirical examples from Chilvers & Longhurst, (2016) and Hoffman & Loeber, (2015) suggest that this notion is overly optimistic as actors have conflicting interests which sometimes creates a struggle in values, determines technological choice and transition trajectories (Smith et al., 2005). Even actors with shared goals (European Union member countries) on energy transitions often differ in the space and scales of transitions (Coenen & Truffer, 2012).

FIGURE 1.1 An abrupt reduction of fossil fuels consumption translates to a breakdown in economic, social, law and order in Nigeria
Importantly, in cases where natural resources (point resources like crude oil) dominates a country’s energy infrastructure and economy, actors tend to imagine and construct energy transition pathways tailored to their divergent interests. This often results into the “power technology” of who gets what, when and the how of transition (Foucault, 1982). Going by evidence from Späth & Rohracher, (2010), the development of shared goals on energy technologies by a larger group of actors is much likely to result in transitions if it resonates with current political visions and societal needs. In order words, energy transitions are driven by the political capacities of actors (resources and influence), and this shape the choice, time and the scale of technological adoption.

Realising this gap, recent studies within the MLP have begun to emphasise the importance of politics in energy transitions. Regarding a conceptual expansion of the MLP to accommodate issues on politics and power, Geels, (2014) argues for a neo-Gramscian political economy perspective in understanding the role of actors and the strategies employed in transitions. Here, he deconstructs how mutual dependencies among actors are facilitated by a coalition of “historic blocs” and how this leads to relational networks within the regime. Meanwhile, Hendriks & Grin, (2007) and Loorbach, Frantzeskaki, & Thissen, (2011) suggests the adoption of governance, structural and complex system perspectives towards the analysis of agency in transitions, specifically as agents are determinants of the pace of transitions. Also, Raven, Kern, Verhees, & Smith, (2015) and Smith & Raven, (2012) proposed the adoption of an actor-oriented approach, focusing on strategies adopted in constructing and expanding protective spaces for niches. Similarly Smink, Hekkert, and Negro (2015) recommend an analysis of institutional and corporate political strategies employed by firms and industry actors or incumbents in influencing innovation trajectories. By emphasising that energy transitions occur due to various complex political interactions among actors where resources, interests, power and political windows of opportunities (Normann, 2015) play a pivotal role, the MLP has shifted the focus of inquiry away from the traditional techno-economic analysis.

Building upon these suggestions, this thesis will be addressing and providing a clear theoretical conceptualisation of the political economy of energy transitions. The political economy scholarship accommodates interests and beliefs as conflicting factors with differences in power relations, which produces contestations and compromises as a condition for system stability (Phelan, Henderson-Sellers, & Taplin, 2013). The application of this approach to energy systems focuses solely on the dynamics of political contestations by connecting focal areas such as the role of politics, interests and resources (physical and material) in complementing policy processes or creating barriers in the system. Linking the political economy approach with the MLP can sharpen explanations of energy transition processes in resource-dependent states in the developing south, as this approach provides
insights on how actors form “historical hegemonic blocs” to interact with systems defined by resources. In the next section, to contextualise the political economy of energy transitions in wider relations with politics and interests, the thesis presents the rentier perspective.

1.2.2 INTRODUCING THE RENTIER THEORY

The need to understand the political economy of energy transitions provides an opportunity to draw from the theory of economic rent. This section covers a brief overview of the rentier theory, a demonstration of the influence of rent on the political formation of resource-rich states, and a highlight of the powerful dominance of the state in the economic realm through relationships built around energy systems in such countries. Mahdavy’s 1970 work on pre-revolutionary Iran introduced the term rentier states. He described a rentier state as one, which receives a significant amount of economic rent from foreign aid or individuals.

Beblawi & Luciani’s (1987) study-popularised rentierism as a theoretical explanation for the type of state system observed in the oil extractive countries of the Middle East. They argued that rent accrued within such states through several processes such as foreign aid and export of first-grade natural resources (oil and gas) organises the politico-economic arena of the state to favour clientelist transfers and wealth redistribution among a selected few (Beblawi & Luciani, 1987). Their contributions suggest that resource booms generate a sort of myopia among policymakers; who adopt resource exports as a means of empowering sectors or interest groups that favour growth-impeding policies while weakening state institutions (Ross, 1999). Subsequent analyses have concentrated on five key areas; (i) the management of resources, (ii) the (re) distribution of rent through energy subsidies Collier, (2005), (iii) investment of rent through sovereign wealth funds Atkinson & Hamilton, (2003), Hertog, (2010), Macintyre, (2000), (iv) the interaction of state and non-state actors in shaping state policies, and (v) the consequence of non-taxation on regime survival (Smith, 2004; Tsui, 2010).

Expanding this theory to other oil producing yet rent dependent states worldwide (Venezuela, Nigeria, Russia, Equatorial Guinea), studies have shown the influence of energy intensive industries in the formation of state structures. At the root of such state formation lies the application of subsidies in the energy and electricity sector as a mechanism for meeting citizens’ expectations (Khan, 2005; Watts, 2007). As argued by Charles, Moerenhout, & Bridle, (2014) and Fattouh & El-Katiri, (2012) this lock-in in the energy system (proliferation of subsidies in the energy market) is one of the main barriers to the diffusion of renewable energy technologies in these states. Such energy systems are characterised by un-liberalised, rigid and monopolistic market structures, which actively hampers growth and access to finance for infrastructure projects.
Scholars like Bacon & Kojima, (2006), Chaudhry, (1994); and Khan & Sundaram, (2000) have argued that if energy prices in these countries accurately reflected the true costs of power generation, i.e. government taxation on the production and supply chain of energy services, it would mean an opposition to the “ruling bargain” of the state system hence making political stability unattainable (Collier & Hoefle, 2004). For these countries, the energy systems are configurative fragile, and any slight or significant change can lead to a state of political instability (see chapter 6). This is critical as transitions to renewable energy signifies a weakening of the state carved fossil fuel blocs and a shift from a centralised system of energy governance, to a more decentralised and liberalised form of energy governance.

Fattouh & El-Katiri, (2012) and Reiche, (2010) argue that the very nature of these states may serve as a motivation for investment in low-carbon technologies, as this becomes a cost-effective way to divert previously domestically consumed oil for more export. However, findings from Atalay, Biermann, and Kalfagianni (2016) suggest that this notion does not represent the current realities of rentier countries like Kuwait, Saudi Arabia and Bahrain. Though heavily dependent on oil rents and much likely to benefit from a transition to low carbon technologies,3 remained laggards in the adoption of RE when compared with fellow petro states like the United Arab Emirates or Qatar. This corroborates the argument that even when “windows of opportunities” present themselves, historical blocs of hegemonic actors (i.e. the government and other existing elites) through an alignment of material capabilities and discourses can block transitions (Geels, 2014). As Torvanger & Meadowcroft, (2011) suggest, such government may choose to not invest in these new technologies as “the lowest cost option is observed as a threat to existing powerful interests and accepted structures” hence a less effective strategy is adopted to ensure that all groups “have a slice of the national cake”. This selection process confirms earlier argument made by O’Riordan (1981) that rather than promoting sustainable development and societal change, innovation can be manipulated to be the mechanism of control employed by the elites.

Interestingly, attempts to understand how energy transitions occur in rentier states have mostly focused on economic and institutional barriers to technological deployments (Al-Saleh & Vidican, 2013). To date, little is known about the role of the political systems and the current configurations of power (Stirling, 2014) in shaping energy transition processes in general and in rentier states particularly. Baker, Newell, & Phillips, (2014) and Power et al., (2016) represents the best attempt so far to analyse the role of political systems in sustainable energy transitions research. These authors analyse the role of the Mineral Energy Complex and the influence of historical power structures like the apartheid regime

3. In 2010, Bloomberg estimated that Kuwait could earn USD22.7 million daily by exporting 12% of its daily oil production used domestically.
in explaining the trajectory of low carbon and fossil fuel based energy pathways in emerging economies like South Africa and Mozambique.

This approach is relevant in explaining state-capital-labour relations such as the role of trade or labour unions in influencing the pace and scale of transition away from fossil fuels. Still, this analogy is not reflective of the rentier state, which is devoid of a well-coordinated labour or trade union due to structuration within the political system and the collapse of local manufacturing sectors. There is also the absence of a clear theoretical enquiry into how political actors construct their interests through capabilities, how such interests are attached to the political survival of the state and how this influences the trajectory of transitions. Therefore, to address these gaps, this thesis provides a conceptual analysis through an integrated framework (see Chapter 3), which combines insights from the MLP and the rentier perspective.

1.2.3 CASE SELECTION

To illustrate the influence of economic rent and political systems on energy transitions and empirically apply the proposed analytical framework, this thesis draws examples from Nigeria, a rentier state with a resilient fossil fuel industry. Nigeria presents an interesting case due to its broader similarities with emerging economies like China, South Africa and India, its political parallels with oil-rich countries of the Arab Gulf, and its socio-economic semblances with energy-poor countries of sub-Saharan Africa. Nigeria's socio-political and economic fabric including its current energy system is mainly reliant on fossil fuel. In the last fifty years, the dependence on oil rent has informed Nigeria's "energy statecraft" i.e. the application of energy resources as a mechanism for foreign policy (Dalgaard, 2010). It has shaped its diplomatic interactions with major energy trade partners like India, sub-regional level actors like ECOWAS member states or global energy governing institutions like the Organisation of Petroleum Exporting Countries (OPEC). Nigeria's large dependence on oil is due to three components; it's extractive and exports capacities (see chapter 2), its reliance on oil revenues for economic development and its importation of refined petroleum products for energy generation.

Using the case of Nigeria, this thesis has two aims. The first intention is to understand what the effects of the pervasive dependence on fossil fuels are in the development or transfer of low carbon technologies. The second aim is to unpack the role of rentier elites in shaping energy transition discourses and technological diffusion at sub-national and local levels. Ultimately analysing this process will show how actors leave an imprint on policy knowledge while redefining political expectations by proposing less substantive and superficial "transformations". As earlier specified, this thesis combines insights from the MLP and rentier theory in analysing the political dynamics of energy transitions in Nigeria.
and the extreme distortions it brings. The combination of both theories as an integrated framework mostly stems from the desire to test methods and theories, which have been largely applied in developed countries but remain under-researched in rentier developing countries like Nigeria, with diverse socio-political dynamics.

1.3 RESEARCH DESIGN

The goal of this thesis is to analyse the political dimensions of energy transitions. Hence, the objectives are fourfold:

I. To gain insight into the political nature of energy transitions in Nigeria
II. To investigate how political structures, resources, hierarchies and actors interact with technological innovations to shape energy transition trajectories in Nigeria.
III. To identify barriers to energy transitions in Nigeria, why energy transition efforts have failed and strategies that can potentially trigger a shift to renewable energy technologies
IV. To contribute to the conceptual and theoretical debate on energy transitions and address the knowledge gaps in the multi-level socio-technical theory

Based on theoretical assumptions, adoption of renewable energy technologies by developing countries like Nigeria would involve technological catch-up through transfers and collaborative research with developed countries like Germany and Japan (Gosens, Lu, & Coenen, 2015a; Wieczorek, Raven, & Berkhout, 2015). However, this thesis hypothesises that the proposed change would be primarily political. Accordingly, the overarching research question is “what is the political feasibility of energy transitions in Nigeria?” Political feasibility was operationalised as part of the opportunities, constraints and implications of energy transition in Nigeria. Based on the overall research question and the three identified themes, the research was guided by five additional sub-questions investigated in five studies and a concluding chapter.

a) An exploratory study on the technological and policy options available to facilitate energy transitions in Nigeria (study 1).
b) A conceptual study on the extensibility of the multi-level socio-technical theory on transitions in Nigeria and what is left unexplained (study 2).
c) A study explaining variation in the adoption of renewable energy technologies among the thirty-seven states of the Nigerian federation (study 3).
d) A study on the non-commercialisation on biofuels in Nigeria and its implications for the post-oil transition economy (study 4).
e) A study on fuel subsidy reforms and its implications for renewable energy transition in Nigeria (study 5).
f) A concluding chapter on the opportunities, constraints and implications of energy transitions in Nigeria.

1.3.1 RESEARCH SETTING AND BOUNDARIES

To address the aims of this thesis, the research primarily focuses on renewable energy transitions in Nigeria. The thesis limits its analysis to five types of renewable energy sources (hydro, solar, wind, biogas and biofuels) and technologies that can be found in Nigeria. With regards to solar, wind and biogas technologies, essentially the thesis focused on grid-connected, off-grid and mini-grids systems. The analysis on biofuels was limited to first generation biofuels (energy crops). Although this thesis examines energy transitions in Nigeria at the national level, it narrows down to explain locally observed renewable energy transitions both in the urban and rural parts of Nigeria.

1.3.1.1 RESEARCH METHODS

The research is largely qualitative, linking sustainability transitions, political science and policy science fields of study. The thesis is developed based on four main methods: literature review, process tracing methodology, semi-structured interviews, and lastly the use of fuzzy set qualitative comparative analysis for the conducted cross-national study.

The first phase of the research covered an extensive literature review on energy transitions in both developed and developing countries, which led to the identification of the knowledge gap. Subsequently, an additional literature search was conducted to explain the research gap, leading to the adoption of the rentier theory (chapter 3). Historical and empirical data on economic and political rent in Nigeria were obtained to buttress this analysis. The fuzzy set qualitative comparative analysis was employed in analysing multiple pathways engineering transitions at the local level in Nigeria. Reasons for variation in the adoption of renewable energy among states were examined using three analytical lenses (niches, regimes and landscapes) from MLP theory (chapter 4). The non-commercialisation of renewable energy technologies in Nigeria were investigated by adopting the process tracing method as a complementary tool of analysis to identify events pre-empting policy changes and actors negotiating this process. Finally, in analysing the effects of fuel reforms on renewable energy transitions in Nigeria, an analysis of the politics of regime-landscape interactions was applied in interpreting competing ideas, languages, strategies and practices that led to the development of RE in Nigeria after reforms. The literature review process, consolidated evidence from multiple sources related to energy transition and Nigeria. These included published literature from peer-reviewed journals, conference publications, unpublished
articles, government and non-government agency websites, speeches and newspapers. Information from the literature and public documents were analysed, categorised, and sorted based on relevance to research questions.

The second phase of the study relied on thirty semi-structured interviews with important Nigerian policymakers such as commissioners, directors and staffs of the Nigerian National Petroleum (NNPC), directors of energy research centres, NGOs, financial workers and agricultural researchers. Respondents were selected with the aim of incorporating the views of experts and non-experts on energy transitions in Nigeria. The interview questions were derived from the thesis sub-questions (see 1.3) concerning the role of politics, actors, resources and rent in Nigeria’s energy transition. Specifically, interviewees in the scientific sector were questioned about the scope of research executed in their organisation to gain insights into current technological developments, identify types of experiments, the scale of designs, evaluate partnerships with foreign expertise and knowledge on their interactions with government. The scientific interviewees were questioned about the projected impact of their work on societal development, the foreseeable barriers as well as desirable futures of energy transitions in Nigeria.

Interviewees in the policy (political and organisational actors) sphere were questioned about their organisational/institutional role in the energy regime in order to gain knowledge on internal dynamics especially with regards to agenda setting, and preferred state of affairs in the energy sector (i.e. policy preferences and institutional frameworks adopted in ensuring the attainment of such preferences). Interviewees in the financial and NGO sectors were questioned about their interaction with actors within the scientific and policy sphere to understand investment choices and barriers as well as the influence of civil society pressure on energy transitions in Nigeria. Furthermore, the author conducted informal and participatory interviews with some employees of the power distribution companies. Here issues of infrastructure, poor management and corruption were reoccurring themes. Also, the author informally talked to end-users or energy consumers to gauge their perspective on energy transitions as well as their sense of identity towards fossil fuels. The interviews were anonymous and conducted twice. Once assured of anonymity, interviewees became more open to discuss the perceived role of state structures in the transition process. The first set of interviews occurred in the first and second quarter of 2014 while the last set was conducted in the 1st quarter of 2015. To complement this approach, this study also used existing primary data from the national database, industry reports and working documents, press releases and internal memos. Lastly, direct observations of deployed renewable energy technologies were made during field trips to deployment sites.
1.3.1.2 NOVELTY

This research is the first to present a holistic approach to renewable energy transition in Nigeria. It can be placed within the socio-technical perspective of transitions. However, this thesis adds value to the socio-technical perspective by bridging the discussions on political science and international relations and how this redefines the debates on the politics of energy transitions, as we know it. In this sense, it is the first to give a detailed perspective on the politics of energy transitions in rentier states. As such the aim is to nudge current sustainability transitions studies towards the spatial sensitivities of developing countries of the South. If not, sustainability transitions studies would continue to overlook and miss out on some valuable insights such as concerns about the compatibility of low carbon technologies with existing political regimes, the need for geopolitical relevance and its impacts on technological choice, and lastly the socio-cultural constructs that emerge as a result of energy transitions.

From a policy standpoint, this research has the potential to assist in incorporating energy concerns, into communal, state and national development planning exercise and policies. Hopefully, findings from this thesis might promote dialogue between communities, technical experts, private corporations and government on the issue of renewable energy development in Nigeria and beyond.

1.4 THESIS OUTLINE

This thesis has seven Chapters. Chapter 2 provides a broad historical perspective on Nigeria's energy system and its numerous technical and policy challenges. This analysis is based on a thorough examination of the financial opportunities, technological and policy options supporting energy transition in Nigeria. The analysis is relevant for this thesis as it provides numerous dimensions to the pieces that make up Nigeria's energy transition story. This chapter highlights the reason or need for energy transition; principally offering both international and domestic perspectives necessitating the policy discourse towards transitions.

Chapter 3 continues with an examination of Nigeria's energy transition trajectory. Using a widely-accepted theory of transitions, the MLP, this chapter analyses the socio-technical nature of Nigeria's energy system. Importantly, it provides an insight into the symbiotic relationship between Nigeria's socio-technical system and its politico-economic nature as a rentier state and designs an integrated framework of analysis. Moreover, this chapter makes a conceptual and empirical contribution to the energy transition literature by discussing strategies employed by rentier incumbencies in resisting change.
Chapter 4 identifies trends and patterns of renewable energy adoption among the thirty-seven Nigerian states. It identifies a small but steady increase in the adoption of renewable energy among the thirty-six Nigerian states with some qualifying as pioneers and others as laggards. This chapter adopts the fuzzy-set methodology to analyse the reasons behind such variation along three analytical lenses: niches, regime and landscapes. Importantly this chapter explains most prominently how states can overcome structural dependence on oil and emerge as pioneers.

Two more chapters examine the implications of energy transition in Nigeria. Chapter 5 discusses the non-commercialisation of biofuels in Nigeria; principally focusing on how biofuels emerged on the political agenda. This chapter examines how actors negotiated the biofuels policy process, identified their preferences, examines what conditions or socio-economic externalities influenced policy changes leading to the development of biofuels, and why it failed. Particular attention is devoted to the implications of this policy failure on Nigeria’s transition agenda.

Chapter 6 investigates the effects of fuel subsidy reforms on energy transitions, the development of renewable energy technologies and green policies. Finally, Chapter 7 concludes and synthesises how the identified constraints, opportunities and implications can trigger an institutionalised and decentralised energy transition in Nigeria.
FIGURE 1.2 Illustrative Overview of the thesis

Theorising Nigeria’s energy transitions

Energy Transition
Chapter 1: Introduction

Chapter 2: Historical perspective on Nigeria’s energy system

Chapter 3: Limitations of the MLP in a politico-economic complex
Extensibility of the MLP in Africa (Nigeria)

Transitions at the local level
Chapter 4: Multiple pathways causing variation in energy transitions

Chapter 5: Policy changes (biofuels) towards energy transitions

Chapter 6: Fossil fuel reforms and impacts on renewable energy development

Barriers/Opportunities towards energy transitions

Chapter 7: Conclusion and recommendations on greening Nigeria’s energy sector