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Drivers of energy transitions: Analysing factors promoting energy policy changes towards renewable energy development in Kenya.

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Abstract

East-African countries have recently undergone socio-technical transitions towards the development of low-carbon technologies. Understanding the dynamics characterising these transitions can facilitate the steering of current and future global developments of clean solutions and the extrication of inherent interrelation existing between the North and the South. Transition theories have been largely utilised to investigate recent energy transition in Northern countries' contexts. It has been barely applied to assess the complex dynamics behind the occurrence of energy transitions in least-developing contexts. Using the lenses of the multi-level perspective, this dissertation investigated the drivers of socio-technical transformations and governance changes occurred between 2006 and 2015 in Kenya: It has analysed the role that international energy regimes have in originating purposive transitions, facilitated by changes in governance arrangement and empowering policy strategy that have enhanced the competitiveness of clean technologies with mainstream technology. The study provides a comprehensive understanding of the macro (socio-technical landscape), meso (socio-technical regime) and micro level (socio-technical niches) of socio-technical systems driving the diffusion of renewables' utilisation in Kenya. Results showed that the Kenyan transition has been characterised by a high-level coordination to integrate international articulating pressures, however, the transformation of the energy sector would not have been possible without the collection of resources available externally the incumbent regime. The process of power devolution has been found to have positive effects on the quality and extension of renewable energy electrification, whereas the stretch-and-transform strategy has underpinned private investments in *green* technology.

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Abbreviation

AFD French Development Agency

AfDB African Development Bank

ERC Energy Regulatory Commission

FIT Feed-in-Tariff

GoK Government of Kenya

MLP Multi-level perspective

PV Photovoltaic

PVS Photovoltaic system

RE Renewable energy

REFiT Renewable Energy Feed-in-Tariff

RES Renewable energy sources

RET Renewable energy technology

SHS Solar home system

SWHS Solar-water heating system

UNDP United Nations Development Programme

UNEP United Nations Environment Programme

UNFCCC United Nations Framework Convention on Climate Change

WB World Bank

WBG World Bank Group

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1. Introduction

In recent years, energy socio-technical regimes, intended as the configuration of institutions, technologies and artefacts, intertwined with rules, practices and networks (Rip & Kemp, 1998), have worldwide shifted towards renewable energy (RE). This global energy transition implies a process of departure from the incumbent regime chiefly based on oil, gas and coal, to achieve a more sustainable use of energy sources. This *evolution* implies structural changes, entailing the creation of new international institutions, the establishment of global overarching goals and the integration of RE policy into national and supranational programs. Despite the universality of this process, the paths of RE transitions are not the same for all countries: they are influenced by different factors, thus explaining different speeds and directions of transitions. For this reason, scholars have recently attempted to develop policy theories to explain trends and determinants of energy transitions in different contexts.

Least developed Sub-Saharan countries are not excluded from the pursuit of RE, currently experiencing peculiar energy transition pathways: some of them imply structural governance reconfigurations, socio-political reforms, financial and executive international support aiming at accelerate the shift to RE and promoting policy cohesion and data reporting (Osunmuyiwa & Kalfagianni, 2016). The policy theory on sustainable socio-technical transitions (Berkhout et al., 2004; Geels, 2002, 2010, 2011,2012; Smith et al. 2005;) gives significant contribution to the investigation of determinants of energy transitions. Specifically, these theories have been mainly developed to explain transitions in Western European countries. More recently they have also been applied in other world's regions, but very little information has been gathered on the African transition. The multi-level perspective (MLP) on socio-technical transitions has been recently applied to explain transitions in developing countries, since it appears to tackle particularly well the dynamic behind these processes: The division into niche, regime and landscape levels, firstly introduced by Rip and Kemp (1998), becomes particularly useful to gain a comprehensive depict of the dynamics behind the transition process.

East African countries, such as Tanzania, Kenya and Ethiopia, have experienced similar development patterns, characterized by socio-economic pressures, such as a high population growth rate, rural-urban migration of population, poorly planned urbanization, scarce rural electrification, deforestation, inequitable patterns of land ownership, low level of literacy and high levels of unemployment (African Development Bank Group, 2012; World Bank, 2016). Despite this, significant social development progresses have been observed, underpinned by governmental reforms and steady economic growths. According to the World Bank Group's economic analysis (World Bank Group, 2016), East African countries own a large potential for productivity growth considering infrastructure, agricultural production, energy production and manufacturing (World Bank, 2016); furthermore, they are characterized by an outstanding growth of national labour forces. This African region faces significant energy challenges, such as low energy access, low electrification levels and unevenly distributed connection to the grids among urban and rural areas. However, it also benefits from large solar, geothermal and wind energy potential, besides abundant available biomass and other bioenergy inputs, such as firewood and charcoal. The interaction between a multitude of national and transnational pressures constitutes the base of socio-technical transitions in least developed countries, thus the identification of such dynamics may facilitate the overcoming of both political and social barriers to the adoption and deployment of RE sources.

Hence, the focus of this dissertation is an analysis of the energy transition, intended as structural energy systems' changes guided by the design of energy policies (Leach, 1992), to identify the drivers of the shift towards renewables, using a multi-level socio-technical perspective. Drivers are intended as '*any technical, economic, institutional, organizational, political, social, or environmental factor that enhances the deployment of new technology*' (Ahlborg & Hammar, 2014). This investigation aims at understanding what are the determinants and what pathway they imply, explaining the energy transitions in such *unlikely* contexts particularly focusing on policy changes leading such transitions.

Kenya is taken as case study, on a ten-year timeframe (2006-2016), since international pressures, governance reconfiguration and public environmental concerns have underpinned the recent shift to clean technology. Hence, it is a vivid example of how multiple socio-economic forces interact at different levels.

The appliance of the transition theory to explain the Kenyan governance context has also become a cornerstone, particularly of scholars at the University of Sussex (Byrne, 2011; Byrne & Mbeva, 2017; Newell et al., 2014). However, few researchers have assessed factors influencing the departure from the incumbent energy regime from a policy theory perspective. The Kenyan pursuit of RE has been investigated from different points of view, where every literature constitutes a tile of a larger mosaic of such a complex process: Aker & Kammen (1996) defined the Kenyan energy revolution as a 'quiet' process, paying exclusive attention to the utilization of small scale private photovoltaic power systems technologies, analysing the actors' influence on the unsuccessful dissemination of the photovoltaic system on a larger scale; other studies have looked at viable policy measures that may enhance energy access of rural and poor-urban inhabitants (Karekezi et al., 2008); World Bank's reports give particular contribution to the research on RE expansion in Kenya; Tenenbaum et al. (2014) take Kenya as an example of unsuccessful policy practices and regulatory systems in Africa looking at small power producers (SPPs) and to the potential of national mini-grid connections. Nevertheless, energy transition, in its complexity, remains understudied in developing countries' contexts: few studies have combined a socio-technical analysis approach with a high-level governance assessment, looking at public policy processes and related drivers.

1.1 Research question

Which key changes towards a low-carbon economy can be observed in Kenya between 2006 and 2016? And what are the drivers of these changes?

To answer this questions, a theoretical framework is built based on the transition theory, using the MLP approach; three hypotheses are advanced on key drivers of RE adoption at micro, meso and macro levels. The identification of such drivers has been based on empirical evidences observed in Kenya between 2006 and 2016, which has been a period of social and governmental relevant changes.
In sum, the research question is answered following three major steps, namely:
1. In the first section, is developed a theoretical framework from which are derived the hypotheses, built on an extensive literature review concerning the transition theory.
2. In the second section, is explained the methodology used to develop the dissertation and the hypotheses that are advanced, addressing the factors driving the shift to RE at three different levels (landscape, regime and niche) occurred Kenya between 2006 and 2016.

3. The third section presents the empirical assessment of variables which are selected on the following assumptions: (a) energy transitions are enacted by energy policies adaptation, reconfiguration and development; (b) the occurrence of energy transition would entail an enhancement of total RE installed capacity.

1.2 Societal relevance of this dissertation

This study investigates energy transition in an understudied part of the world: Kenya. It provides a high-level insight on determinants that could explain the origin and development of such a process, as opposed to other countries.

This contributes to the transition literature by investigating RE development in a context characterized by (a) strong international pressures, (b) recent structural changes of the governance system, (c) an incumbent energy regime mainly relying on hydropower, characterised by recent oil discovers and rich in RE sources.

This dissertation explores what factors are likely to influence the shift to RE, considering the complementarity of the three levels (Mazur et al. 2015). By developing a theoretical framework based on a literature review on transition theory, by using semi-structured interviews to key actors and by analysing primary and secondary data, this dissertation aims to add a key tile to the transition theory's *mosaic*, providing future researchers with analytical tools that can be extended to other developing contexts.

2. Theoretical framework

This chapter introduces the theoretical framework guiding this dissertation, built on the Transition theory: In the first section, is provided a general insight of the Multi-Level Perspective, selected as the central analytical approach.

Afterwards, the three heuristic analytical concepts of socio-technical landscapes, regimes and niches (Rip & Kemp, 1998; Geels, 2002) are singularly explicated. The theoretical framework embraces notions derived from the Transition Management theory and the Institutional theory, as well as the Strategic Niche Management framework.

2.1 The Multi-Level Perspective to investigate energy transition

As defined by Rotmans, transitions are perceived as '*gradual, continuous processes of change where the structural character of a society (or a complex sub-system of society) transforms*.' (Rotmans et al., 2001). As per the multi-level perspective, transitions are formed by the interaction between regimes and niches, where regimes are considered the dominant configuration of actors, while niches are small clusters of actors that originate innovations (Avelino & Rotmans, 2009). This interaction is shaped by the influence exercised by material and immaterial elements coexisting at macro level: the socio-technical landscape. Hence, transitions result from the interrelations between these three heuristic levels: first, changes at landscape level exert pressures on the existing system, that is likely to create an overall destabilization of the incumbent socio-technical regime, opening new windows of opportunities for technology innovations. Niches are thus enabled to emerge, guided by technology advocates and supported by powerful groups (Geels, 2007).

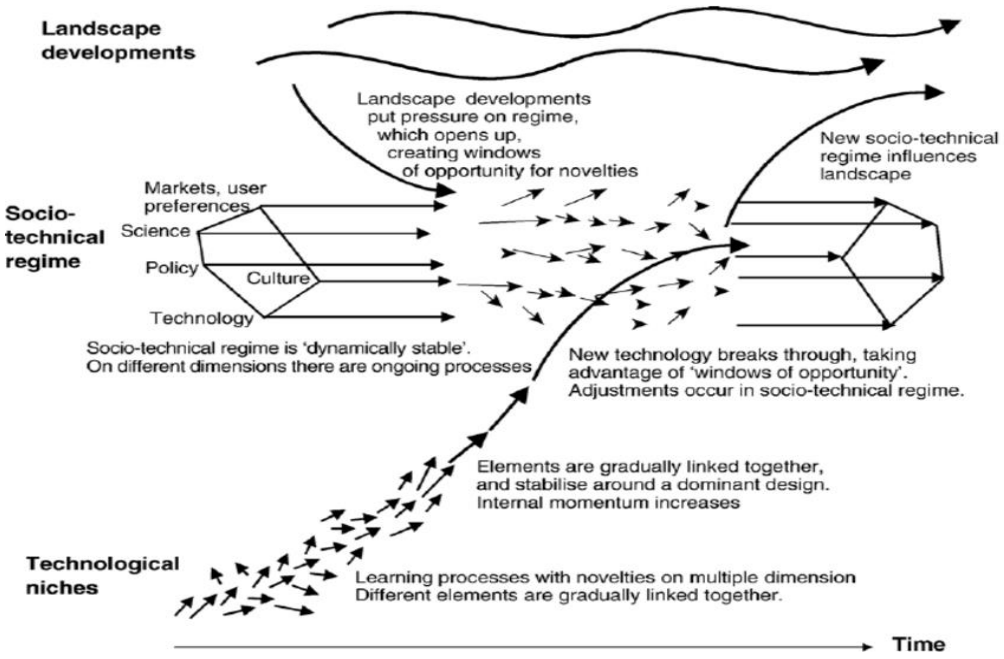


Figure 1. Source: Smith et al., 2005

This dissertation focuses on changes observed between 2006 and 2016, that have led Kenya to an incremental shift to RE and advanced technologies. Interacting forces at multiple levels, such as dependence on unsustainable biomass utilisation, low electrification levels, recent commitment to RE deployment, recent oil reserves discoveries, governance changes, strong international pressures, make Kenya an interesting case study to investigate energy transition using the MLP's triple lens approach on socio-technical transitions. Following an in-depth literature study, the MLP appears to represent the most appropriate insightful approach to explain and interpret energy transition in a context such as East African developing countries, where the energy regime is shaped by intertwined national and transnational socio-economic and political interests.

The appropriateness of the MLP approach derives from the consideration of all the determinants that can explain the policy-making process, such as external influences, institutions, market, society and niche technology. Transitions are not linear and cannot be entirely controlled by governance policy; nevertheless, policy-making process can influence some characteristics of the development paths, such as the direction, scale or speed (Rotmans et al., 2001). This is particularly applicable to energy transitions in developing countries' contexts, where is particularly difficult to define a uniform transition pathway due to the complexity of the dynamics and influential factors. Nevertheless, is necessary to see transitions, as 'the result of developments in different domains (Rotmans et al., 2001), by identifying the drivers of this process and by assessing to what extent and in which way the development paths of such an evolution have been shaped throughout the process. Hence, a literature review of the transition theory allowed the triple identification of key determinants explaining energy transition to RE.

2.1.1 **Socio-technical landscapes**

The unicity of sustainability transitions founds its roots in the fact that they do not influence directly the private sphere of individuals, rather 'sustainability' is perceived as a collective good. To undertake effective environmental innovation pathways, external pressures are needed (Geels, 2011). Hence, the creation of supranational institutions and of global environmental goals, are intended as necessary to achieve sustainability transitions by structural-functionalism advocates (Geels & Schot, 2010). Nevertheless, '*climate institutions and development goals do not enter a political vacuum, but are shaped by on-going and pre-existing political and institutional contexts and decision making processes* (…) *which strongly influence the social and environmental outcomes'* (Naess et al., 2015). Therefore, articulated pressures at landscape level do not directly impact national energy regimes, but they need *'to be perceived and translated by actors to exert influence'* (Geels, 2007). Governmental agency is therefore indispensable in transitional processes, in order to elaborate internal or external pressures to be translated into policy instruments appropriate to enable the shift towards a new regime (Smith et al., 2005).

Whether the shifting selection pressures on the socio-technical regime, is one side of the transition's function, as intended by Smith et al., the coordination of resources to adapt to such pressures constitutes the other side of the function (Smith et al., 2005). Resources can be located either outside or inside the existing regime, thus is regarded that national regime actors should make '*conscious and planned efforts in response'* to build adequate responses to achieve the goal (Berkhout et al., 2004). Transition are therefore characterized by a vision-driven approach, leading towards the embeddedness of international environmental goals (Berkhout et al., 2004). Four different patterns of transition emerge from the socio-technical transition model described by Smith et al. (2005), namely: *endogenous renewals; re-orientation of trajectories; emergent transformation and purposive transitions.* These are characterised by the level of coordination to selective pressures (high coordination, low coordination) and the *locus* of the resources (internal, external).

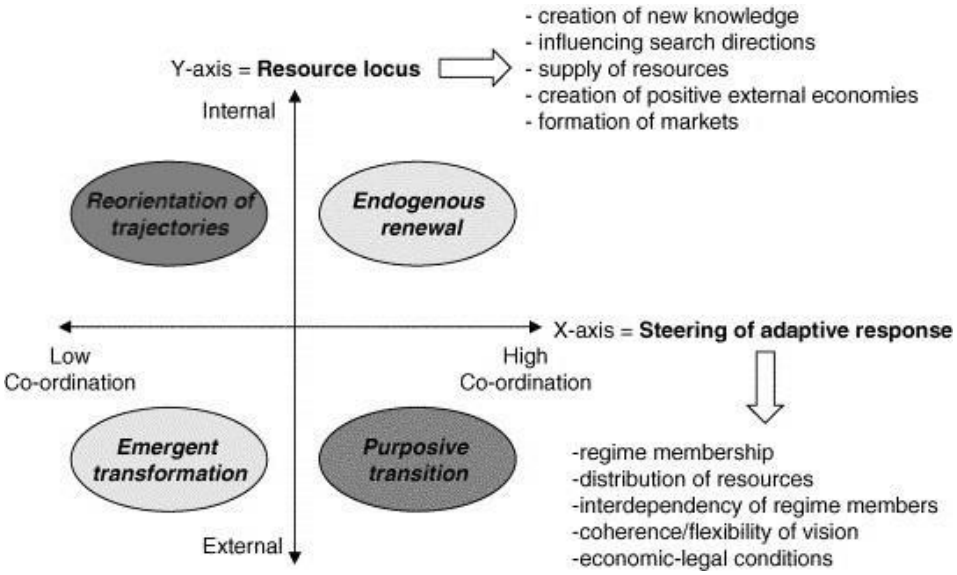


Figure 2. Source: Smith et al., 2005

The concept of *coordination* to selection pressures relates to the difference between actively coordinated changes and changes that are brought about by steering mechanisms that are inherent

in co-evolutionary behaviours (Smith et al., 2005); The resources necessary to build responses to the shift of landscape pressures can be identified in financial resources, as well as competences and political resources (Smith et al., 2005).

The establishment of the global environmental regime has been mainly driven by concerns risen in rich-democratic northern countries, at the end of the 20th century, when the triple interrelation between human activities, climate change and environmental crisis attracted increasing attention of media and policy-makers, creating a knock-on effect. Furthermore, the dependence on imports/exports of oil and gases from foreign countries, accompanied by the volatility of oil prices, underpinned the rise of environmental issues in the national agenda. In the Northern experience, most of transitions occurred in contexts characterised by either high or low coordinated responses, and a chiefly internal resources' localisation. At that time, Northern countries owned a governance and social system that facilitated the translation of landscape pressures into national systems, whereas the general South needed to reconfigure the overall context: key factors such as the form of governments, lack of financial/natural resources, hampered a quick shift to sustainability.

The creation of synergies addressing the complementarity of climate mitigation, adaptation and development, and implementation of related mechanisms, have been recently implemented by most of developing countries (Naess et al., 2015). However, in these areas of the world, the playground where energy transitions occur largely differs from that of the North: in developing countries, supranational environmental regimes have entered a socio-political context unlikely to enact a transition straightforward, due to the inadequacy of institutions, competences, mechanisms and policy programmes appertaining to incumbent regimes. Also, the influence exerted by overarching environmental goals, was developed at a time when niche-innovations in developing countries was still either in an embryonic state or inexistent, in need of financial and know-how support from developed countries. Hence, developing countries are more likely to face major difficulties in creating long-term regulatory framework and institutions, due to unadapt governance system, constrained capabilities, lack of financial resources and social constraint due to the lack of information resources: in such contexts, policy-makers may require resources located externally the incumbent regime, to re-configure the entire governance system, made of policies, legislations and institutions, in order to enable socio-technical transitions. Also, they need to gather necessary financial, competences and knowledge from external sources (e.g. international regime, donors, etc.).
Hence, this dissertation focusses on the concept of intentional and purposively governed transitions to adapt to pressures that put the regime in tension. To reflect global-societal expectations brought about by non-state actors, such transitions are guided by a coordinated response to selection pressures and external resources (purposive transition). The case of Kenya is hypothesised to follow a purposive low-carbon transition, driven by environmental international regimes and overarching goals. The analysis concerning the localisation of resources is drawn on financial resources, competences and political resources and are operationalised as (a) creation of new institutions concerned with environmental issues, (b) the provenience of capabilities (internal or external the regime), such as capital and knowledge.

2.1.2 **Socio-technical regimes**

Regimes are clusters of institutions, actors and interests that create and maintain stability within a system (Smink et al.,2015; Osunmuyia & Kalfagianni, 2016). They constitute the *deep structure* on

which the stability of existing socio-technical systems is constructed (Geels, 2004). Changes in the dominant configuration of actors and rules constituting the regime, are necessary to enable transitions at every level. Cognitive routines, common beliefs, capabilities, institutional arrangements, distribution of control amid authorities, regulations and legally binding contracts are only some examples of regime rules (Geels, 2011).

As abovementioned, landscape pressures are likely to put in tension socio-technical regimes, thus conditioning structural adaptation; on the other hand, niche development shall be facilitated by new designs of governance regimes, facilitating the emergence of technology innovation. Therefore, actors' ability to intervene addressing the adaptation and conformation of selection pressures within the socio-technical regime is highly dependent on the effective implementation of agency in the socio-technical transformations (Smith et al., 2005). The reconfiguration of governance implies high levels of agency: As scholars suggested, power can both circumscribes and facilitate agency, thus implying a strict interconnection and interdependence between agency and power (Smith et al. 2005).

Centralised forms of government are often the causes of deeply-rooted authoritarian states, characterized by constrained public participation and the presence of public services' monopoly controlled by the elite: These conditions intensified the establishment of lock-in effects that may hamper the shift from incumbent regimes. The devolution of power to sub-national level is a fundament for accountability and voice for the public (World Bank, 1992). On the other hand, empirical evidences show that decentralised systems, entailing power distribution among central government actors and local governments, are likely to bring about progressive visions and expectation of actors involved in the regime transformation, playing a '*vital constitutive role'* in the future of regimes (Smith et al., 2005). According to Foucault, power is a structure circumscribing the actors' sphere of action (Foucault & Deleuze, 1977): this structure can be conditionate to either support or constrain transitions. Hence, changes in governance addressing this structure is important to understand actors' legitimacy to intervene in transition processes (Smith et al., 2005).

Distribution of power is a key feature of the transition management theory, since political control is distributed across various units and at different layers also within the government, therefore development cannot be steered from the top in multicentral societies (Pierre, 2000; Kemp et al., 2007). It is demonstrated that, to facilitate long-term socio-technical regime changes, the decentralization of powers should be configured, leaving to local government autonomy and *'discretion regarding what to do'* (Kemp et al., 2007). This is critical also to create spaces for different voices and solutions, from different actors and institutions. Hence, actors should coordinate a consideration of different interests and expectations that influence the shape of adaptation of selection pressures within the regime (Glynn & Abzug, 2002). In this regards, scholars highlighted the importance of avoiding the suppression of knowledge and visions emerged at local level (Kemp et al., 2007). Policies at national level should be built upon lessons learned at different levels to embrace different visions, expectations and interests. Hence, the consideration, evaluation and integration of community opinions and local experiences are necessary to achieve an overall more effective governance at the upper level, shaped from below.

Cases of political power decentralization have recently occurred in many developing countries, creating new expectations for more accountable forms of governance and the enhancement of public services (Larson & Ribot, 2004; Batterbury & Fernando, 2006). Decentralisation of power can enhance

the efficiency of the administration of the energy sector, the management of natural resources by communities and the privatization of service delivery (Batterbury & Fernando, 2006). Also, the performance of governance in developing countries has been considered by non-state actors, such as multilateral development banks and development agencies, as a precondition for the deployment of financial resources (Batterbury & Fernando, 2006).

In this study, the achievement of a good governance through the conditioning of the power's structure, is analysed at higher level to investigate the effects it may exert on the administration and planning of renewable energy resources within the transition: it is thus evaluated the role that governance may have in the shift towards a socio-technical low-carbon regime, such as modified configurations of power and control distribution. Several studies have assessed the criteria on which governance's performance shall be measured, namely: Openness, participation and accountability, as well as effectiveness, coherence and civic peace (EU Commission, 2001; UNDP, 1997).

In this dissertation three factors, namely citizens' engagement in public governance, level of corruption and transparency are taken as indicators to measure the devolution's achievements. According to previous governance studies and experiences learned from developed countries, good governance is likely to facilitate transitions towards low-carbon economies for several reasons: among others, (a) transparency can enhance access to public information, through increased availability and reliability of public datasets; (b) public participation is likely to enhance a more efficient allocation of public resources, and to increase the efficiency of the problem-solving approach of the policy-making process, since citizens are more familiar with local problems and potential solutions. Furthermore, low levels of (c) corruption are necessary to avoid that climate and low-carbon financing deployed by donors would end up in the wrong hands and from being inefficiently allocated (Transparency International, 2014).

2.1.3 **Socio-technical niches**

Niches are the micro-level of energy transitions, the *locus* and *cluster of actors* were technology are first conceived and incubated during their development phase (Avelino & Rotmans, 2009). The presence of technology advocates committed to the support and development of innovation is crucial for the creation of such spaces, necessary to undertake transitions (Augenstein, 2005). This is based on the assumption that sustainable technologies are inherently disadvantaged compared to incumbent technologies, in terms of price, performance and infrastructure: Hence, the need for the implementation of strategies that support both investors and consumers while they develop (Raven et al., 2015).

Research institutions and technological firms, are the locus where technologies are normally conceived and protected from multidimensional *selective pressures*; thus, they are enabled to develop (Raven et al.,2015). This process is known as *shielding* and can be performed either in a passive or in an active manner: the former one entails the utilisation of already existing spaces; the latter includes the implementation of specific measures, such as the introduction of market subsidies, industrial strategies, etc. The appropriateness of the shielding space contributes to the evolution of the technology, which is also affected by several interactive processes developing in both passive and active spaces. In fact, during the *nurturing* phase, technology advocates' efforts are concentrated in the creation of networks, the rising of social acceptance and expectations concerning the potential of the new technology (Raven et al., 2015).

However, the successful emergence of technology innovation is highly dependent on the empowerment process (Avelino & Rotmans, 2009). Whether a groundbreaking technology can compete and eventually substitute an incumbent technology, depends on the strategy technology advocates adopt to steer the development process within the existing system. Per the niche management theory, niche *empowerment* can be achieved following two different approaches, namely the 'fit-and-conform' and a 'stretch-and-transform' empowerment process (Raven et al.,2015). Smith and Raven (2012), defined the former process as a gradual integration of niche technologies within the predominant regime (e.g. existing market and institutional structure), involving limited structural changes, such as R&D public financial support or policies reducing the associated generation costs. Through this strategy, low-carbon technologies are enabled to become "competitive with mainstream socio-technical practices in otherwise unchanged selection environments" (Smith & Raven, 2012). On the other hand, the stretch-and-transform approach, implies pro-active actions and radical reconfigurations, such as institutional and regulative reforms to make the mainstream environment adapt to new technologies (Raven et al., 2015). Also, it normally implies changes of evaluative parameters to enhance the competitiveness with incumbent technologies (e.g. measuring the performance of an energy technology considering the emission per kWh associated with the generation, besides the costs per kWh), as well as the creation of new capabilities and development of different *know-how* to be embedded in the system (Smith & Raven, 2012).

Table 1 provides a schematic description of the two above-mentioned concepts:

Operationalisation of fit-and-conform and stretch-and-transform concepts		
Fit-and-conform strategies	Actions from technology advocates aimed at making low-carbon technologies more competitive with mainstream socio-technical practices in otherwise unchanged selection environments	R&D efforts or public policies targeting lower costs and performance improvements
Stretch-and-transform strategies	Actions from technology advocates aimed at changing mainstream selection environments in ways that more amenable for the niche innovation	Public or private institutional reforms such as changes in regulatory frameworks or organisational networks, infrastructural changes

Table 1. Operationalisation of fit-and-conform and stretch-and-transform concepts. Source : Raven et al., 2015

Appropriate governance arrangements shall open windows of opportunity for development by, for example, covering the risks borne by private investors, by limiting the risk of lock-ins and/or by incentivizing investments in RET.

Empirical studies on developed countries have shown that fit-and-conform is likely to support more easily the development of innovative sustainable technologies, since it does not require major changes and adaptation of social perception. However, in most of the cases, both the strategies have been required for the integration of renewable energy technologies. Fit-and-conform strategy have normally been supported by the reconfiguration of market regulations and specific policies addressing the energy private sector (Raven et al., 2015). Examples can be found in the Dutch solar PV market with the establishment of a subsidy scheme underpinning the development of the solar technology, and in the introduction of the Feed-in-Tariff system in Germany: both countries have actively

endeavored policy process to address failures in the existing socio-technical system (Raven et al.,2015; Hoppmann et al., 2014).
Evidences from developing countries' experiences show that energy transitions implied the diffusion of RET involving both the creation of active spaces and the use of existing spaces (e.g. off-grid sites) to enable the shielding, nurturing and empowerment of new RE technology niches. Most of them, have critically reformed the existing policy and regulatory systems; others have attempted to introduce market-based solutions leading to the gradual integration in the energy system of new niche technologies. Countries such as Kenya, have supported the development of new technology firms with the introduction of specific institutional incentives and have created policy spaces to guarantee the correct regulation and licensing of RET manufacturer and contractors.
The increased total RE installed capacity can be therefore partly ascribed to the creation of a *protected* market space for the development of the private sector involved in the evolution of RET.
The *institutional reformation approach* traces the concept of stretch-and-transform strategies: actions tackling obstacles to the emergence of environmental innovative technology shall be taken by technology advocates in order to create an environment that better suits the niche innovation (Raven et al. 2015).
This dissertation focus on the idea of pro-active niche-empowerment (stretch-and-transform), through the reconfiguration of governance arrangements, addressing private investments in path-breaking technology, when innovations are sufficiently robust to leave their protective spaces and compete with other established technologies (Raven et al., 2015).
Renewable energy adoption is a product of the strengthening of the private sector, the emergence of private RET firms as Independent Power Producers (IPP) on a larger scale, underpinning market competition and leapfrogging effect, thus reducing the inherent disadvantage of sustainable technologies.

2.1.4 **Sum of the theoretical framework**

In sum, it can be assumed that RE transitions are guided by complementary events occurring at the three heuristic levels. The transition process is influenced by the timing at which developments at each level occur. Landscape pressures and changes at the regime level are likely to open windows of opportunity at the micro level, enabling departure from the incumbent regime (Rotmans et al.,2001).
In this study hypotheses are drawn on the above-mentioned theoretical concepts:
Landscape articulated pressures are exerted on socio-technical regime, where responses are managed by regime actors through institutional and policy reconfiguration, where the necessary resources are likely to be located *beyond the members of the incumbent regime* (Smith et al., 2005). Governance arrangements associated with changes in distribution of power and control are considered determinants to achieve an overall better governance. This is perceived as a cornerstone factors leading to the shift of the socio-technical regime, since it is likely to enhance the administration and planning of the energy sector.
The development of niche technology is driven by a stretch-and-transform approach undertaken by technology advocates and powerful group actors, through consistent re-arrangement of the regulatory and legislative system. This enable to take advantage of the window of opportunity opened by landscape pressures and regime reconfiguration. It is therefore hypothesized a stretch-and-transform approach that enabled the emergence of innovative low-carbon technology.

3. Research Design and Methods

This chapter is concerned with the research design and methods utilised to develop this dissertation. First is introduced the rationale behind the selection of the case study: Kenya; Second, the three hypotheses associated with the macro, meso and micro levels are advanced, explaining the variables implied in the analysis. The last section provides a description of the implemented methodology and of research limitations encountered during the investigation process.

3.1 Rationale for the Kenyan case study

Kenya is taken as case study to understand the dynamic of recent energy transitions occurring in East African developing countries, through the identification of key drivers, investigating as dependent variables (a) energy policy changes, (b) RE electricity output and (c) private investments in RE, over a ten-year timeline (2006 and 2016). This time frame has been chosen to focus on a recent and relatively short-term, enabling the observation of policies' adoption and development, as well as variations in RE installed capacity.

This case study has been selected since its political scene in the last decade has been dominated by significant changes addressing critical issues related to energy security and national electrification. Many reforms have been introduced in Kenya, culminating in 2010 with the enactment of the new Constitution and the constitution of 47 Counties to which have been devolved part of the national power. Furthermore, the Kenyan socio-economic and environmental energy-related features reflect the characteristics spotted in the East African region: Kenya is characterized by limited access to water, electricity and electricity's infrastructures; a vulnerable ecosystem complicated by human activities; international pressures and recent oil reserves discovery. The ongoing unregulated exploitation of natural resources has caused the depletion of forests, soil cover and water sources. This negative loop has been exacerbated by the rapid increase in population, meaning higher demand for human settlements and agricultural land, resulting in an overuse of construction materials and fuel material, such as fuel-wood, charcoal and kerosene (African Development Bank, 2017). This general context, combined with a low electrification rate and an unevenly connection to the national grid, place energy access and energy security on the top of the Kenyan political agenda. Between 2006 and 2013 the use of electric power consumption per capita experienced a steady increase in the country (World Bank – IEA statistics OECD/IED 2014); the share of non-carbohydrate energy, such as hydropower, nuclear, geothermal and solar power, has tripled since 2000, reaching the 9.6 % of the total energy consumption in 2013 (World Bank database – IEA statistics OECD/IED 2014). This tangible transition rises the importance of assessing energy-related issues, such as policy-making processes supporting energy development, production, distribution and consumption.

3.2 Research Design

The theoretical framework has been based on an extensive literature review of the transition theory, focusing on the MLP approach (Geels, 2002,2010, 2011, 2012; Smith et al., 2005; Raven et al.,2015; etc.). This framework, which is developed in the following chapter, enabled an analytical identification of drivers at multiple levels and other factors influencing the transition (e.g. timing and localization of resources), to be intended as complementary to each other, acting as a triple unidirectional force, forming a positive loop for RE policy changes.

The three hypotheses, are advanced to identify the potential main drivers of transitions and related conditions (independent variables) that could explain the undergoing shift to RE in Kenya.

First, it can be hypothesized that international environmental regimes and the establishment of overarching environment goals have originated a purposive transition towards a low-carbon development.

This first hypothesis entails the importance of transnational pressures, leading to the creation of a coordinated responses to articulated landscape pressures. The accession to international treaties (e.g. the Kyoto Protocol; the Copenhagen Treaty, etc.) implies the commitment of state and non-state actors to a deliberately intended transition, in a context characterised by the external localisation of resources and a purposive and coordinated reorganisation of the existing socio-technical regime (purposive transition).

The analysis focusses on the localization of resources, intended as '*the degree to which the resources required for effective regime transformation (factor endowments, capabilities and knowledge) is available either within or beyond the members of the incumbent regime'* (Smith et al., 2005). Converging with the description of purposive transition given by Smith et al. (2005), this dissertation investigates whether the resources where located externally or internally the existing regime. Independent variables are: (a) the creation of new institutions, (b) the provenience of knowledge and capital, and (c) information resources.

Second, it can be hypothesized that energy transition is influenced by endogenous changes of governance arrangements enhanced energy transition: the devolution of power to sub-national levels has lead Kenya to an overall better governance, implying the enhanced administration and planning of the energy sector.

The Kenyan reconfiguration of power distribution, through the enactment of the devolution, is considered a key driver of energy transition towards low-carbon development, being likely to promote public participation, transparency, as well as reducing corruption of the public system; these three features are necessary aspects to achieve an overall good governance, thus enhancing the likelihood of efficient low-carbon policy programmes, thanks to major flexibility of the policy-making process, higher responsiveness of public officials and a more efficient allocation of natural resources. This hypothesis implies that the transition is led by sub-national entities (counties). The three abovementioned factors are likely to enhance the shift to sustainability, as demonstrated by empirical evidences from *Northern* transitions. Furthermore, the creation of sub-national entities addressing energy administration and planning at local level (local ministries of energy) is likely to promote horizontal policy transfer among counties, diffusing good practices and enhancing the national RE installed capacity. Hence, this analysis considers three main independent variables to evaluate the effective achievement of a *better* governance through the process of devolution, namely: (a) level of public participation and (b) level of transparency and (c) level of corruption.

Third, it is hypothesized that stretch-and-transform strategy has enabled the emergence of low-carbon technologies.

The creation of an appropriate space for the protection and empowerment of low-carbon technologies is crucial for a nation-wide development and adoption of RET. Such a bottom-up transformation must be supported by appropriate energy policies and market regulations (e.g. Feed-in-Tariff). This hypothesis implies that the emergence of RET has been steered by structural transformations, that can be identified as a stretch-and-transform strategy (Raven et al.,2015), implying a pro-active approach to market creation, led by the implementation of specific policies and regulations creating a new environment where RET can compete with mainstream technologies. It has

been investigated looking at three independent variables, namely: (a) policy changes that can be ascribed to the stretch-and-transform strategy; (b) the number of approved proposals under the RE Feed-in-Tariffs; (c) the number of licenses issued under the solar-water heating systems, solar photovoltaic systems and energy management Regulations enacted in 2012.

Three independent variables are associated with the three hypotheses, namely: (a) the total RE installed capacity, (2) connectivity to the grid and (3) private investments in renewable technologies. These are quantitative variables whose changes may have been explained by variations in independent variables investigated in this dissertation. Renewable energy sources investigated will be: solar, wind, hydro, biomass and geothermal.

Thus, considering the complementarity of these main drivers, energy transition can be seen as a *purposive transition* (Smith et al. 2005) towards RE, characterized by an intentional re-configuration of the energy socio-technical regime, accelerated by exogenous pressures and a stretch-and-transform strategy implemented to enable niche technologies. The veracity of this statement is investigated by chiefly applying a qualitative assessment, that will be presented in the third part of this dissertation.

Dependent and independent variables are specified in the following table:

Hypotheses	**Description**	**Independent variables**	**Methodology**	**Dependent variable**
Landscape	International environmental regimes and the establishment of overarching environment goals have originated a purposive transition towards a low-carbon development.	(a) Creation of institutions (b) The localization of resources (knowledge, financial resources, social acceptance).	(a) Number of institution created (b) Support by donors in USD deployed in leading energy projects (c) Qualitative assessment of information access	Energy policy changes
Regime	Endogenous changes of governance arrangements enhanced energy transition: the devolution of power to sub-national levels has lead Kenya to an overall better governance, implying the enhanced	(a)Level of public participation, (b)Level of public transparency (c)Level of corruption.	(a) Increase in public participation. (b) Performance of access to information. (c) Performance of anti-corruption measures.	RE electricity output (kWh)

	administration and planning of the energy sector.			
Niche	Stretch-and-transform strategy has enabled the emergence of low-carbon technology.	(a)Type of policies created to facilitating the formation of a RET market (whether fit-and-conform or stretch-and-transform) (b)FiT enhancement of the private sector. (c)Regulations of 2012	(a) Number of policies created and qualitative assessment. (b) Additional installed capacity under the RE Feed-in-Tariffs (c) Licenses issued by the Energy Regulatory Commission under the Regulations of 2012.	Private investment in RET

Table 2. Operationalisation of the hypotheses. Created by the author.

4. Methods guiding data collection

The dissertation has been chiefly conducted through a qualitative analysis, making use of extensive desk reviews of grey literature and semi-structured interviews. A qualitative analysis was inherently more flexible as opposed to a sole quantitative research, enabling the overcoming of lack of quantitative data and enabling the exploratory research needed to address the socio-political aspect of this dissertation. Both primary and secondary, quantitative and qualitative data have been utilised. Quantitative data were used to gather evidences about the current state of affair of the Kenyan energy context such as the country's RE installed capacity, the level of private investments and the country's electrification level. The investigation was partly constrained by the difficult access to data, thus, the study mainly relied on semi-structured expert interviews. Hence, a total of eleven interviews have been conducted with both local and non-local experts, which constituted a cornerstone of this study, gathering opinions and relevant information needed to verify the reliability of the hypotheses.

The following sections explain in details the applied approaches and the sources of information used for the development of this dissertation.

4.1 Bibliographic study and desk research

The theoretical framework on Transition theory has been conducted on an extensive bibliographic study on relevant literature addressing socio-technical transitions-related theoretical framework, with focus on the MLP approach. Therefore, key literatures have been used: see, specifically, Avelino & Rotmans, (2009); Geels (2011); Geels & Schoot (2007; 2010), Kemp & Van Asselt, (2001), Raven et al. (2015), Rip & Kemp (1998), Smith et al. (2005).

Data were collected on each of the advanced hypotheses through desk review on grey literature, including development agencies' research projects, conference abstracts, ongoing researches, as well

as local media such as web newspapers and other sources. Furthermore, it has been made extensive use of materials and analyses of existing researches on the development of specific renewable resources (e.g. PV niche in Kenya, conducted by Byrne 2001; Byrne et al. 2014); as well as previous researches concerning climate change governance (see Oulu, 2015). Moreover, the works developed by the STEPS Centre (Social, Technological and Environmental Pathways to Sustainability) of the University of Sussex, which has deepened the topic of the energy transformation in Kenya, conducting valuable researches from the political economy perspective (see, specifically, Byrne & Mbeva, 2017). Also, other energy transitions' studies concerning Sub-Saharan countries have been extensively reviewed to gather essential knowledge and empirical evidences from geographically close countries; among others a study on the political economy of energy transitions in Mozambique and South Africa (see Power et al., 2016); a research on rural electrification in Tanzania and Mozambique (see Ahlborg & Hammar, 2012); and insights from the Nigerian energy transition's experience (see Osunmuyiwa & Kalfagianni, 2017).

4.2 Quantitative analysis

A data analysis has been used to provide an assessment of RE technologies adoption and development, through the measurement of RE utilisation.

This analysis has been based on second data gathered from official national reports, statistics and governmental documents. Quantitative data collection has been based on national and international statistic reports and data banks retrieved, among others, on official website of the Kenyan National Bureau of Statistics, the World Bank Reports, the Transparency International, the Climatescope website and main donors' database (e.g. World Bank, African Development Bank, Danida, etc.). Data have been gathered on a two-year basis, covering the time-frame between 2006-2016. Nevertheless, open data access represented a major hurdle to the gathering of most recent data (2015 and 2016), therefore the research results is not guaranteed.

Relevant secondary data that have been gathered, analysed and compared since 2006:

Installed capacity of RE technologies (MW/year)
Time observation: 2006–2015.
Type of Energy: Solar, Wind, Geothermal, Biomass, Hydropower.
Sources: World Bank, UNDP, IRENA, ERC, IEA, Ministry of Energy and Petroleum.

Total RE electricity output (kWh/year)
Time observation: 2006–2015.
Type of Energy: Solar, Wind, Geothermal, Biomass.
Sources: World Bank, UNDP, IRENA, IEA.

Total RET private investments (USD/year)
Time observation: 2006–2015.
Type of Energy: Solar, Wind, Geothermal, Biomass, Hydropower.
Sources: World Bank, ERC, IEA.

4.3 Interview approach

Information gathered through ten experts' interviews have been integrated to support the investigation. A semi-structured interview approach has been used, tailored on the field of expertise of each interviewee, thus allowing to gather specific information. Interviewees have presented with pre-arranged questions, leaving rooms for non-standardized question, based on a personal valuation of the interviewer and the availability of the interviewee.

The interviews have been essential to gather relevant primary data and different opinions to evaluate independent variables explaining Kenyan energy transition towards sustainability. The interviewees have been accurately chosen based on: (a) the field of energy/climate change-related expertise, (b) their participation in energy-related institutions. The selected respondents were mainly academic or independent researchers, working the field of renewable energy, climate change and political economy. The total of the interviewees has been carried out between April and June 2017.

The list of experts interviewed is shown below, specifying the relevant field of expertise, institute of reference (when applicable) and the date, as well as the reference institute:

Interview	Type	Field of expertise	Institute	Date
Interview 1	Renewable energy engineer	Renewable Energy	Nairobi University	08.05.2017
Interview 2	Researcher	Climate change policy and mainstreaming expert	Lund University	09.05.2017
Interview 3	Researcher and activist	Climate change awareness	Climate Change Awareness Kenya	19.05.2017
Interview 4	Journalist	Climate change	Freelance	20.05.2017
Interview 5	Researcher	Energy governance and climate change mitigation	Institute of Development Studies, Sussex University	22.05.2017
Interview 6	Senior Researcher	Climate resilient economy	Netfund	24.05.2017
Interview 7	Researcher	Renewable energy	Strathmore Energy Research Centre, University of Strathmore	24.05.2017
Interview 8	Researcher	Energy	SEI - International	30.05.2017
Interview 9	Researcher	Climate Resilient Economies/Responsible Natural Resource Economies	Independent	02.06.2017
Interview 10	Independent Researcher	Public Policy, Political Economy Technology and Environmental Politics,	University of Stellenbosch	26.06.2017

Table 3. Interview table. Created by the author.

4.4 Research limitations

While conducting the research, several significant issues have been encountered with regard to access to data and information, at every level: the absence of official databases on every type of parameter; institutional website were normally missing relevant data or incomplete information concerning finances and deployment of energy resources (Ministry of Energy and Petroleum); many information retrieved at institutional websites were often not available or out of date; significant quantitative data retrieved on international agencies (e.g. Energy International Agency, Transparency International) are outdated, since the last Kenyan statistics have been posted in 2014; national surveys conducted and reported on the National Statistical Bureau website were normally found out of date; the Renewable Energy Portal provides information on policy and RE-related regulation, but lack of data on RE utilization and the register for the registration of technicians and RE business are normally out of date. The Government of Kenya (GoK), supported by major donors, has been working on the access of data and information in the public scene. Nevertheless, data availability on public participation, citizens' awareness, and county-level GDP, is still lacking any form of specificity. Many local activists and NGOs, have been pro-actively working on the enhancement of public information, however, this still constitute a major constraint in the development of quantitative researches and dissertation. The collection of information about corruption and bribery level were particularly problematic, quantitative information were missing, thus they have been collected by the researcher consulting the International Transparency Kenya's (IT-Kenya) reports, which are based on surveys conducted on the perceptions and the National Bribery Index. Also, information about the level of public participation is not collected from institutions: as explained by one of the interviewees, to collect the number of participation for each governmental activity, one should refer to the prominent authority/body (many e-mail requests yielded no information). Thus, empirical evidences on public participation have been chiefly collected through the opinion of interviewees and previous work-papers conducted by international authorities, such as the World Bank and the DANIDA, which are the international institutions majorly concerned with the Kenyan process of devolution.
Moreover, many request e-mail and virtual meeting with Ministry officers yielded no follow up.
In the absence of access to relevant data, the research has encountered major constraints and has been limited in terms of quantitative approach. Nevertheless, the researcher has enriched the research with 10 expert interviewees, whose opinions have been highly relevant.
Despite the above-mentioned hurdles, the willingness of experts and activists to provide high-level opinion concerning the local energy transition, provided important insights in the Kenyan low-carbon development and made possible the conduction of this dissertation, shedding light on new aspects and opening room on the expansion of new possible researches as soon as the transparency and data collection capacity of the country will develop.

5. Case study

This chapter examines the Kenyan case study: First, it introduces the reader to the local energy context; Second, the dependent variables are here empirically assessed, namely energy policy changes, RE electricity output and private investments in RET. Second, it provides an analysis of the above-mentioned hypotheses.

5.1 Energy context in Kenya

To pursue a new roadmap for sustainable growth and energy production, the Government of Kenya is advocating a shift from the present, carbon-intensive development model to a low-carbon pathway (UNEP 2012e). The national goal is to achieve the 100% electrification by 2020 (Government of the Republic of Kenya, 2007). Per the long-term development policy, The Kenya Vision 2030, launched on June 2008 by the President Mwai Kibaki, recognised the government's ambition to transform Kenya in "*a globally competitive and prosperous country with a high quality of life by 2030.*" (Government of Kenya, 2007). To allow the shift to a middle-income country by 2030, it has been estimated the need for an increase in total energy installed capacity of about 18,000 MW by 2030 (World Bank Group, 2015). For an East-African least developing country as Kenya, where renewable energy infrastructures, knowledge and renewable technology performance are relatively scarce, such an increase in installed capacity can constitute a real challenge. Furthermore, the Vision 2030 aims to ensure a clean and safe environment to the Kenyan population, while supporting industrialisation. In order to turn challenges into an effective transformation, the Government of Kenya tackled the problem on more than one front. If on one hand, it cannot be neglected the need of traditional fuel utilisation, on the other hand, the development of RES and the expansion of clean energy technology becomes necessary to allow the progress. In addition to their unsustainability, conventional energy resources are insufficient to respond to the demand of electricity, therefore the deployment of RE sources such as geothermal, solar, wind, biomass and small hydro-power, is a priority for the Government, which has initiated several projects and plans with the objective of enhancing the expansion of these resources (World Bank Group, 2015).

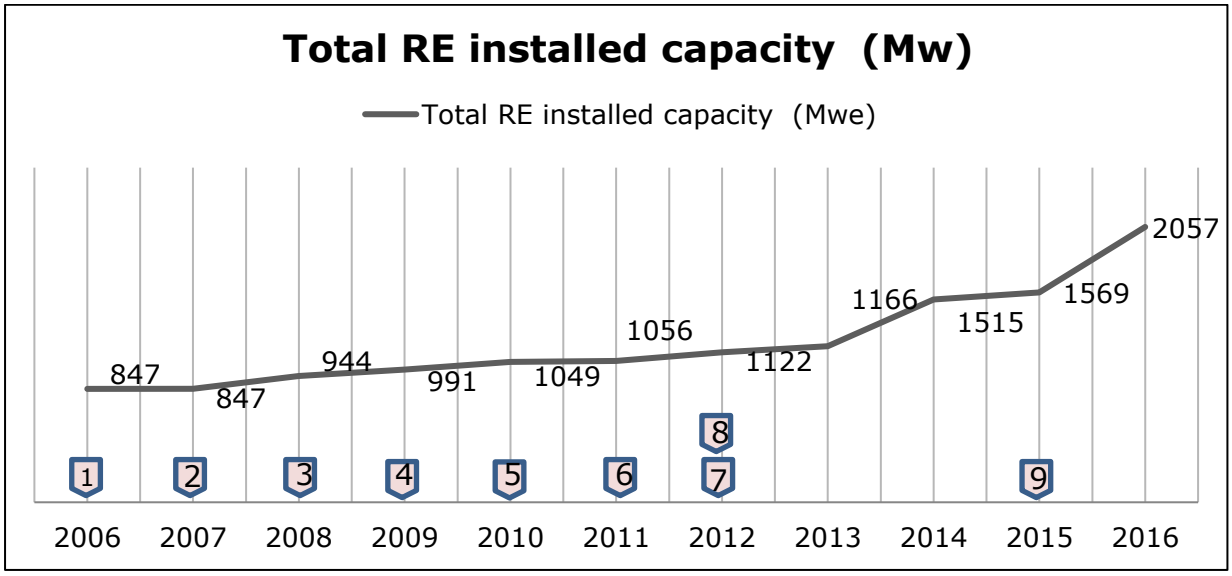
The energy policy in Kenya has historically developed through sessional papers, where the major innovations have been introduced by the Sessional Paper, 2004 (UNEP, 2006). The key changes contained in the Sessional Paper of 2004 have been put into practice with the enactment of the Energy Act 2006, among others:

1. The creation of the Energy Regulatory Commission (ERC), an independent commission for the regulation of the energy sector, with the main role of licensing the generation, and monitoring the fair transmission and distribution.
2. The creation of the Geothermal Development Company
3. The institution of the Rural Electrification Authority (REA) specifically addressing rural electrification.
4. The privatization of the distribution of energy, by dividing the KPLC into two different entities (the generation remained publicly owned).
5. The privatisation of KENGEN.
6. The promotion entities operating in the RE or hybrid field, both private or community owned.
7. The enablement of power generation companies to establish contracts for bulk supply of electricity.
8. The Ministry of Energy has been officially entrusted of the regulation of the RE sector.
9. The introduction of a specific session addressing the legislation of the Renewable Energy sector, promoting and facilitating the generation and transmission of RE. Specific regulation are: the exemption from duties for full RE equipment; financial support for relevant RE; the authorization of RE private producers to produce energy without license (up to 400 MW).

10. The establishment of a specific unit concerned with the appeals from decision of the Commission, namely the Energy Tribunal.

(IEA, 2014; UNEP, 2006).

The following graph shows the total RE installed capacity in relation with the energy policy changes implemented over the decade 2006-2016. It can be observed that the former variable has steadily increased between 2006 and 2016.



Legend:

1. **Energy Act 12 of 2006**
2. **Energy Regulatory Commission Established**
3. **Feed-in tariffs for Renewable Energy Resource Generated Electricity**
4. **Energy Regulation 1009 on Biodiesel Licensing**
5. **Revised FiT for renewable energy**
6. **Least Cost Power Development Plan 2011-2031**
7. **Solar-water-heating regulations**
8. **2nd revision for FiT for renewable energy**
9. **Tax incentives for renewable energy**

Graph 1. Total renewable energy installed capacity (MW) and joint policy and measures. Created by the author. Data source: IEA, 2017; IRENA, 2017.

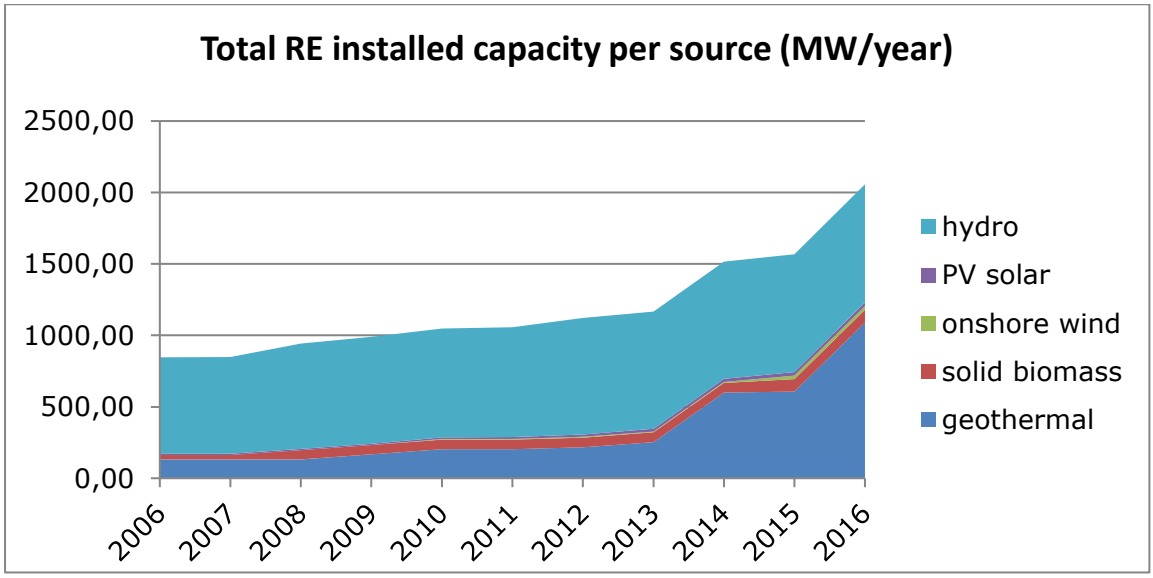
The renewable resources main utilised in Kenya are: PV solar, geothermal, hydropower, biomass and onshore wind. For many years, Kenya has mainly relied on hydropower, covering almost the 50% of the total installed capacity. Nevertheless, increasing intensity and frequency of droughts during the last decade, have influenced the raise in energy price and lowered the reliability on hydropower (Newell et al., 2014). The hydropower installed capacity, between 2014 and 2016, has been stable at 826 MW (IRENA, 2017). Between 2007 and 2013, the hydropower's share of total RE installed capacity has been decreasing between 1-3 Mw per year.

The increase in RE utilisation has been underpinned by the steady growth of geothermal installed capacity: from a capacity of barely 132 MW in 2007 has nosed up to 1091 MW in 2016, covering 53% of the total RE installed capacity. The major increase has been observed between 2013 and 2014, when geothermal installed capacity has increased of 347 MW (IRENA, 2017). Geothermal energy has been considered over the last decades as the most scalable source of energy, reaching the top of the Ministry of Energy agenda, referring to it as resource '*priority for energy*'; Also, it aligns the interests with international donors, recognising its potential for future corporate investments (Newell et al., 2014).

Being in an Equatorial area, Kenya is not endowed of a rich wind regime. However, some mountainous and high-land areas have attracted generous investments in onshore wind (e.g. Rift Valley). This source of energy has been used since 2015, shifting from 5.10 MW in 2014 to 26 MW installed capacity in 2016. In 2017 the largest wind farm in East African (and largest private investment in Kenya) located near to Lake Turkana, is expected to produce 33% of the total installed capacity (310 MW). Hence, onshore wind energy has started been considered a potential Kenyan renewable source, and has recently started been used for electricity generation and as off-grid technology to provide electricity and water-pumping solutions.

Solar power has been chiefly developed as an off-grid solution, mostly in the technology form of Solar Home Systems (SHS) constituting three-quarters of solar PV capacity of the country (Newell et al.,2014).

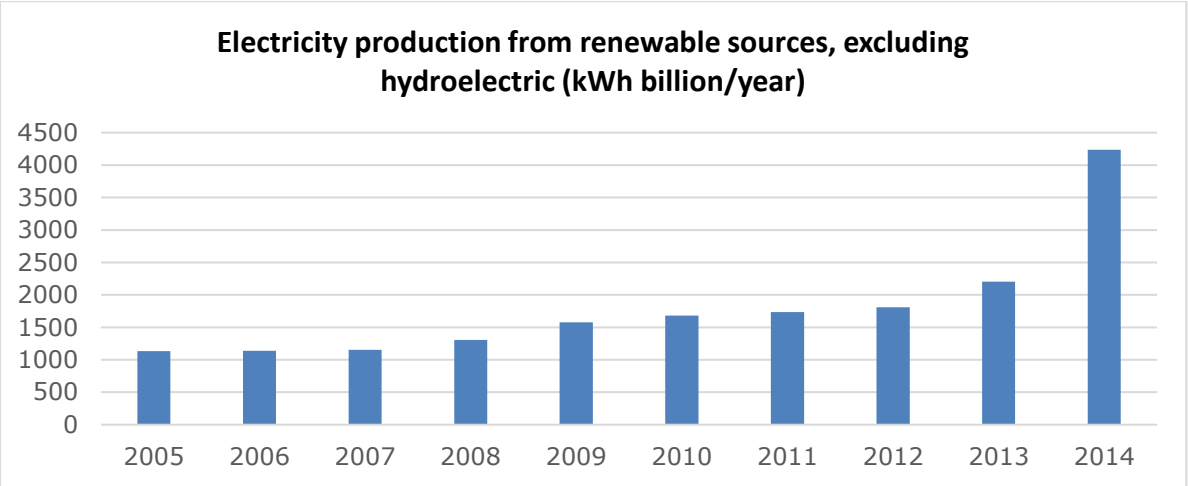
Biomass is mostly used in the form of firewood, charcoal and agricultural waste, contributing to almost 90% of the rural population energy demand. Most of the rural and peri-urban population of the country relies on inefficient and unsustainable use of biomass, causing widespread deforestation and dangerous health issues.



Graph 2. Installed capacity per RE source (MW). Created by the author. Data source: IRENA, 2017.

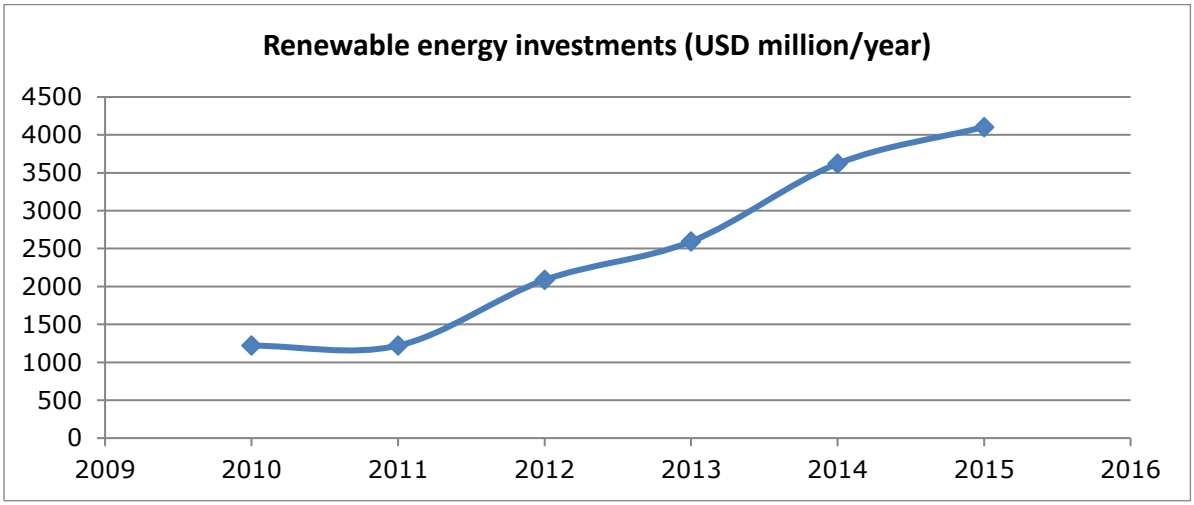
The Kenyan economic growth has been accompanied by an increase in electricity demand of 139% between 2005 and 2011, with an electricity generation increase of 37% during the same years (Ministry of Energy, 2012). It can be observed that a steady increase has occurred since 2006.

However, the RE electricity capacity has almost doubled between 2013 and 2014, rising questions concerning the factors that may have determined this variation.



Graph 3. Electricity production from RE, excluding hydroelectric (kWh billion/year)). Created by the author. Data source: IRENA, 2017.

The trend of private investments in renewable technologies has also demonstrated a significant increase. Because of lack of historical data, Graph 4 only shows values starting from 2010, showing a rapid increase between 2011 and 2012, followed by a steady growth during the following years.



Graph 4. RE investments (USD million/year). Created by the author. Data source: Climatescope, 2016.

The following sections provide an analysis of the independent variables that have been hypothesised to explain the overall positive variations traced by the trends of the abovementioned dependent variables.

5.2 Landscape Hypothesis

It can be hypothesised that international environmental regimes and the establishment of overarching environment goals have originated a purposive transition towards a low-carbon development.

In this section is investigated the first hypothesis related to the landscape level: As stated earlier in this dissertation, the selective pressures exerted by international environment regimes have initiated a purposive socio-technical transition towards renewables. Accordingly, the dependent variable observed to assess this hypothesis is the number of energy policy changes, that is hypothesised to be influenced by the undergone purposive transition towards low-carbon solutions, characterised by high coordinated responses to selective pressures and endogenous localisation of resources. The investigation is thus based on the variation in independent variables: the number of new institutions, the provenience of capital, knowledge and access to information. The latter is intended as necessary resource to vary the mainstream social values, rising social acceptance of green energy resources.

This section is developed as following: first, is described the Kenyan transformation path, introducing the general vision and the commitment of the country to the international environmental regime. Afterwards, it will be conducted an analysis of the independent variables, related to environmental international energy regimes and the achievement of climate change goals, of:

1. The number of institution created since the commitment to the international regime;
2. The role of donors in supporting the gathering of capital, as well as enhancing capabilities and knowledge;
3. The access to information resources.

5.2.1 Landscape's articulated pressures

As per many other developing countries, multiple factors steered Kenya to the commitment to the international low-carbon regime, such as the (a) the enhancement of development and the boost of adaptive capacity; (b) the opportunity of leapfrog northern technology innovation; (c) the promise of gaining access to global climate finance schemes; and finally, the (c) ideological national aspiration to show leadership (Oulu, 2015). Also, the increase in intensity and frequency of environmental crises, electricity shortfalls and hydropower vulnerability, increased the public concerns. Since begin of the ´90s, Kenya is a signatory to several multilateral environmental agreements addressing climate change, among others: Ramsar Convention on Wetlands of International Importance for the conservation and sustainable use of wetlands, entered into force in 1990; the Convention on Biodiversity (CBD) ratified in 1994; the ratification in 1994 of the United Nations Framework Convention on Climate Change (UNFCCC); United Nations Convention to Combat Desertification (UNCCD) ratified in 2002; the Stockholm Convention on Persistent Organic Pollutants (POPS), ratified by Kenya in 2004 (Ministry of Environment and Natural Resources, 2002) ; the accession to the Kyoto Protocol in 2006; the Paris Climate Agreement signed in 2015 during the Paris Climate Conference (COP21) in December 2015.

Name	Year of accession/ratification
Ramsar Convention on Wetlands	1990
Convention on Biodiversity (CBD)	1994
United Nations Framework Convention on Climate Change	1994
United Nations Convention to Combat Desertification (UNCCD)	2002
Stockholm Convention on Persistent Organic Pollutants	2004
Kyoto Protocol	2006
Paris Climate Agreement	2015

Table 4. International climate change treaties signed by Kenya. Created by the author.

Based on previous researches and experts' opinions, international pressures are regarded to be one of the major contributors to the energy transition in Kenya. In particular, the Kenyan accession to the Kyoto Protocol in 2006 and the ratification of the signing of the Paris Agreement in December 2015, have denoted the country´s commitment to climate mitigation efforts. The agreement achieved with the signatory of the Paris Climate Pact 2015, have impacted the proliferation energy policies in Sub-Saharan nations: many African countries have committed (or intensified their commitment) to clean energy target (Climatescope, 2016).

According to a Kenyan climate change expert interviewee, the influence of international pressures has been crucial for the creation of a national low-carbon pathways, initiating the shift from the incumbent energy regime (Interview 2, 2017). During the last decade, the accession to the Paris Agreement (2015) and the Kyoto Protocol (2005), implied a pro-active commitment of the GoK to address strengthen institutional capacity to overcome structural barriers and to integrate climate change issues into the country's development; thus, accelerating the advancement towards an overall low-carbon development. Especially, the enactment of the Kyoto Protocol can be regarded as the official global recognition of climate change (Lorenzoni et al., 2007). International pressure can be said to have been a high-level contributor of energy transition, according to the convergent opinion of experts' interviewees: Kenya being a signatory to the UNFCCC and other relevant international bodies has steered the commitment to a new energy regime. As perceived by one of the interviewees, this can also be viewed in terms of Kenya trying to show leadership internationally, especially considering that developed countries have failed in showing leadership in terms of reducing their emissions (Interview 2, 2017).
The promised financial help by multilateral and bilateral development agencies, have underpinned the governmental efforts to coordinate an adequate response to integrate environmental issues within the national agenda: *´It must also be appreciated that a lot of climate finance has been promised (though not delivered) by the international community, and Kenya like other developing countries is getting into the low-carbon transition bandwagon to cash in on the expected finances.'* (Interview 2, 2017).
The Kenyan first accession to the international low-carbon regime occurred in a tumultuous moment in the development of the country, characterized by a socio-politic momentum in which economic growth was regarded as the national priority and the energy generation insufficient to support this massive industrialization.

As stated above, the integration of environmental regime into national policy schemes, highly depended on the localization of resources necessary to create a coordinated response to articulated pressures exerted at the landscape level on the incumbent socio-technical regime. The decision of creating a coordinated response has been led by the potentials of the 'green growth' in Kenya has been expressed by mutual consensus from the Government of Kenya and donors (Ministry of Energy,2012). The achievement of supranational low-carbon goals required the gathering and organization of necessary resources (e.g. capital, competences and political resources) that has entailed the need for support from international donors and development agencies, as well as institutional and national institutional changes. In the following section is conducted a qualitative analysis, based on semi-structured interviews and literature reviews, analysing the characterisation of the hypostasised Kenyan purposive transition.

5.2.2 **The creation of new institutions**

A coordinated response to the articulated landscape pressures has been developed by state and non-state actors, implemented by the creation of new institutions and the strengthen of existing bodies. The Climate Change Response Strategy (2010), mostly funded by DANIDA and SIDA, has been the first official insight for the integration of climate issues in the national policy context, aimed at the promotion of climate mitigation and adaptation and prepared under the leadership of the Government of Kenya (Government of Kenya, 2010). Officially published in April 2010, it is the first national preparative document exploring both the social and governance characteristics and potentials towards a low-carbon development, endorsing measures tackling climate change effects and to strengthen the resilience of the country. The development of the National Climate Change Response Strategy (2010), can be chiefly accredited to the Prime Minister Raila Odinga (Interview 2, 2017). It provides policy recommendation addressing national resilience and adaptation to climate change by means of creation, transformation and integration of environmental policies into the national governance. This document was prepared with the purpose of creating an overall national strategy to tackle climate change, pursuing a sustainable economic growth in line with Vision 2030 and stressing the urge for the enhancement of RE utilization (Government of Kenya, 2010). It has been operationalized in 2013 with the enactment of the National Climate Change Action Plan (Oulu, 2015). Using a participatory approach country-wide, several stakeholders have been involved in the document´s preparatory phase to provide a comprehensive vision of the country commitment to enhance the national sustainability. This multi-perspective process has provided a comprehensive portrait of the current energy situation and potentials.

The Strategy can be intended as a statement of the need to reform the national social and governance attitude towards climate change, since it stresses the inadequacy of the current institutions and financial budget to govern solid sustainable transition and to govern climate change affairs (Government of Kenya, 2010). It provides a list of options that may help the country to achieve this ambitious goal, by including the implementation of CDM projects under the provision of the Kyoto Protocol, by accelerating foreign investments, implementing learning by doing approaches in local technology centres, the United Industrial Development Organization (UNIDO). It reads the need to enhance clean technology and advanced GHG emission mitigation solutions by increasing the financial support given to R&D; It stresses the importance of accelerating South-South cooperation, besides strengthen partnerships with developed countries. Furthermore, it claims for the renovation of communication and education programmes to pursue a green development, by means of a general transformation of the education system and information diffusion approach to diffuse awareness on climate change.

The need for a *capacity building framework,* to be developed both at local and national level, was considered necessary by the NCCRS commission, because of the lack of high-level expertise in the field of green technology. The NCCRS commission recommended the *modernisation and strengthening* of existing institutions, such as the Kenya Meteorological Department, the institution in charge of Disaster Risk Reduction (DRR) and the National Designated Authority (DNA*)* (Government of Kenya, 2010). For instance, creating of a GHG emissions focused institution has been proposed, as necessary to observe international requirements established under the UNFCC of National Communications on GHG emissions. The Strategy also proposed the enactment of the Nationally Appropriate Mitigation Actions (NAMAs) under the UNFCC mitigation works, recognising the efforts to adequate to the

international climate regime. The implementation of the NAMAs in various sectors (e.g. geothermal sector, diary sector, etc.), has been recently regarded as an important step to make the National Climate Change Action Plan '*a reality on the ground*' (Climate and Development Knowledge Network, 2014). Recommendations also concerned the creation of completely new targeting institutions: as stated by one of the interviewee, the creation of '*a new high-level cross-sectoral climate change institution with the representation from a wide cross section of stakeholders*' (Oulu, 2015) is a general trend amidst countries shifting towards the new energy regime. The NCCRS proposed the establishment of a secretariat specifically dedicated to climate change issues, known as the National Climate Change Steering Committee, under the Ministry of Environment and Mineral Resources (MENR); furthermore, the creation of a National Climate Change Activities Coordinating Committee (NCCAC) devoted to the coordination of and advisory on climate affairs. To achieve a long-term sustainable development, an annual budget of approximately USD 3.14 billion has been estimated necessary, to be financed from both the national budgetary finances and international development agencies. The highest budget share was intended to the development of the energy sector, amounting to 31,25% of the total budget (USD 73.71 million). The ambitious climbing towards a low-carbon development stressed the country´s need of renovation and improvement of '*mechanisms, institutions and governance systems*', in order to allow the access and efficient utilisation of international funds, that are considered essential for the development of the country (Stockholm Environmental Institute, Project Report, 2009).

No	Climate change and environmental institutions created
1	Institution for national disaster Risk Reduction
2	National Designated Authority
3	National Climate Change Steering Committee
4	Nationally Appropriate Mitigation Actions
5	Ministry of Environment and Mineral Resources
6	National Environmental Management Agency
7	National Climate Change Activities Coordinating Committee
8	Kenya Meteorological Department
9	The Energy Regulatory Commission

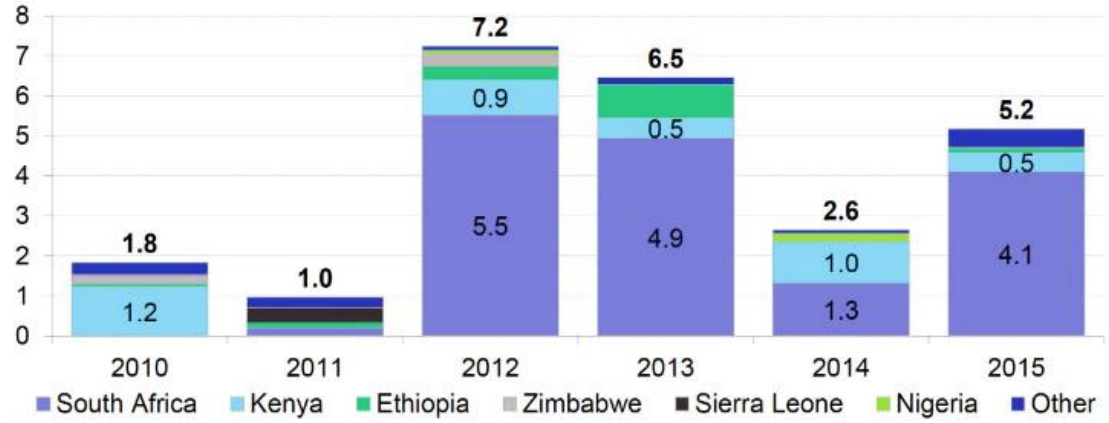
Table 5. Institutions created between 2006 and 2015. Created by the author.

5.2.3 **Resource locus: capital and knowledge**

Donors have been key actors in the development of the Kenyan energy sector, especially concerning the deployment of capital, the creation of knowledge, expertise and policy development (Interview 4, 2017; Interview 8, 2017; Newell et al., 2014). The role of international multi-stakeholder funding has been necessary to reduce risks associated with capital intensive investments in RE, as well as particularly instrumental to the enhancement of the national capacity building (Stockholm Environmental Institute, 2009). Consistent with expert opinions, the major hurdle to the integration of climate change and environmental policy in the national context, was the lack of expertise, knowledge and know-how (Interview 6,7,8,9, 2017). Hence, besides the capital resource deployed, the role of donors has been crucial in the provision of high-level knowledge transfer and establishing learning-by-doing approaches that would allow development in targeting sectors concerned with a low carbon pathway (Stockholm Environmental Institute, 2009). Kenya is considered a promising investment for international donors, since it is well served by renewable energy sources and it owns a strong market-oriented attitude and private sector focused (Newell et al.2014). Furthermore, the

efforts to integrate climate change mitigation strategies in the energy policy, shed light on its ambitious opening to the global environmental regime. In addition to direct funding, donors have been heavily involved in the supporting of the national energy policy changing process, namely: the revision of the Energy Policy 2004 and Energy Policy 2013 (respectively from the International Finance Corporation and from the UNDP); the preparation of the NCCRS (IDA and SIDA); the preparation of the National Climate Change Action Plan 2013-2017 (DfID, Danida, JICA and ADB); the revision of the FiT (KfW) (Newell et al,2014). Regarding investments in specific energy sectors, large-scale wind and geothermal energy have received relevant amount of funding, since they are expected to serve different stakeholders' ambitions, namely: the priority of governmental agencies, international climate change reduction goal and the international companies' interest in first line for the development of resources (Neass et al., 2015).

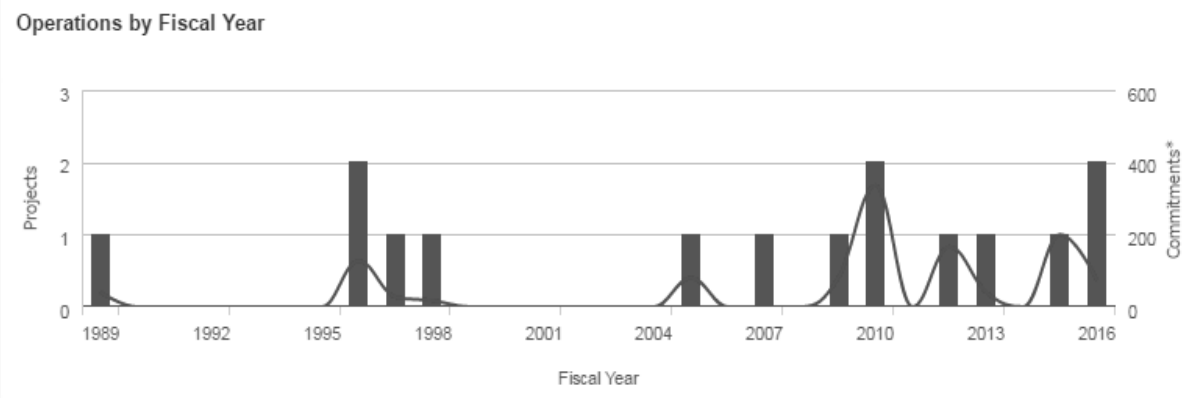
Between 2011 and 2015 a total amount of USD 960,5 have been deployed from international development agencies supporting the development of the country´s green energy capacity, energy access and the rural electrification (Climatescope, 2015).
Graph 5 shows the financing trends between 2010 and 2015 of Sub-Saharan clean energy investments from international donors: Investments in Kenya have been relatively high compared to other Sub-Saharan countries, performing second in the last four years only to South Africa. In 2010, Kenya received USD 1.2 billion in clean energy investments from international agencies.



Graph 5. Sub-Saharan Africa Climatescope Clean Energy Investment by country 2010-2015. Source: Climatescope, 2016.

The World Bank is regarded to be the development bank more heavily involved in the Kenyan case: The World Bank Group´s country survey of 2015 shows that the WB´s energy sector is considered among the top five investment areas in terms of importance (following the areas of economic growth, poverty reduction, agriculture and development, health education and food security). The climate change investment area is instead positioned lower in the ranking. Also, in terms of effectiveness, the WB's involvement scores highest in the areas of: economic growth, with a mean of 6.70/10, energy with a mean of 6.69/10 and transportation with a mean of 6.82/10 (WBG, 2015).

The Graph 6 shows the trends of the World Bank's financial support contributing to the Kenyan green development since 2006: it can be observed that since 2005, a rather stable flow of finances has been set up to support Kenyan low-carbon development.



Graph 6. Source: World Bank, 2016

Following the national commitment to the low-carbon international regime, Kenya has been considered by the World Bank as a promising choice for the programme Scaling-Up Renewable Energy in Low Income Countries (SREP) (Government of Kenya, 2011). The SREP funding, to which the country has been designated since 2011, is apt to achieve a *sustainable* energy transition, by tackling societal, technological and political barriers; it thrives the adaptation of successful experiences in the Northern transitions to the national context. The funding is not exclusively aimed at providing financial backing to both the public and private sector, so to reduce the risk associated with the development of RET, but also to provide technology capacity and knowledge transfer, as well as providing support to the financial and institutional energy-related system, that would facilitate the enhancement of the total installed capacity. The political commitment to the reconfiguration of the energy regime has been recognized with the Government efforts placed in the preparation of the Investment Plan, considered by Norway a '*broad and inclusive process (…)*' the demonstration of a *'strong national ownership to the Investment Plan (IP)*' (Weisser. B, Norway Sub-Committee Member, 2011), entailing the Members' positive attitudes towards Kenyan RE perspectives. The ambitious and determination in pursuing an alternative energy regime is made clear in the Investment Plan, in which the GoK recognizes the central role of *green sources* in the national energy mix to tackle poverty reduction, enhance adaptation and to support economic growth. Also, the Spanish committee member expressed his appreciation for the *impressive work* showed in the preparation of the IP, giving a broad assessment of the energy sector in Kenya and highlighting the country priorities in pursuing an energy transition. International officers have mutually agreed on the potential of the geothermal sector development, as instrumental to achieve low-carbon economy, enhance energy efficiency and achieve international environmental goals, besides the estimated high economic returns on investments (Joint Development Partner Scoping Mission, 2011). In fact, the interests of the Government of Kenya and international donors are aligned concerning the type of resources to be prioritized and on the priority of private investments to deliver them (Newell et al. 2014).

The largest part of the SREP funding has been devolved to the Menengai geothermal project, recognizing '*demonstrative impact and transformative potential of the development of geothermal resources in the Menengai field*', as defined by the Swiss representative subcommittee representative (Swiss Confederation, 2011). Also, a senior policy adviser RE, on behalf of the Dutch Climate and Energy Division Ministry of Foreign Affairs, discussed the funding of the Menengai project as a '*realistic and reliable balance between public and private sector players and roles*'. Despite the high expectation placed in the Menengai geothermal development, doubtful committee members expressed their

concerns about the high risk related to the geothermal project, hence leading to discordance on the exact amount of the fund to be devolved to the Menengai project. Concerns were mostly associated to the uncertainty of the availability amount of geothermal energy and the capital-intensive investments required for the exploration and drilling. As stated by the UK and Australian committee members the risk was connected to the fact that the SREP fund allocated to the geothermal project, would be '*almost completely focused on drilling pilot holes, our understanding is that this is first loss risk money to develop this resource, while other finance is waiting to see whether geothermal is viable at this site*' (Green, B., 2011). The Dutch Ministry of Affair, expressed concerns on the institutional risks related to the capacity of the recently formed GDC, supposed to cover the major role in the development of the major funding share project. The Dutch recommendation was therefore to consider the shift part of the tasks and roles of the GDC to the private sector, considered as '*better risk management approach than more training and hiring more staff*' (Van der Vleuten, 2011). The Spanish and Swedish committee members stated their concerns about the large share of investment required to be devolved to the geothermal project, recommending a reconsideration of the percentage of financial support given to mini-grid development. Members, also agreed on the need of devolving lower amount of the fund to project addressing the enhancement of knowledge and know-how related to the geothermal, to increase the efficiency of the project. The Swiss Confederation proposed to devolve USD 10 million to support knowledge base in the field of geothermal energy. Furthermore, the Dutch Ministry stressed the importance of the inclusion of the private sector in the development and power generation process, as based to previous experience in field project (e.g. Olkaria II), stating that '*is important to pay more attention to how private sector capacity can best be mobilised and catalysed for these tasks*.' (Van der Vleuten, 2011). The Solar Water Heating and the development of hybrid mini-grids in remoter areas of the country, were majorly considered as instrumental for poverty alleviation and rural electrification, whereas less efficient in terms of energy efficiency and deployment of RES on a larger scale.

As a final mutual decision, in 2011, the following projects were financed by the SREP's funding:

- USD 175,00 200 MW Geothermal Phase A by the AfDB
- USD 175,00 200 MW Geothermal Phase A by the IBRD
- USD 210,000 Hybrid Mini-Grid Systems Project by the IBRD

Other investments have followed in the second tranche of the funding programme: in 2014, a first funding tranche of USD 175 million, have been devolved to the implementation of a solar power project, named *Kopere Solar Park*; In 2015, the CIF approved the funding proposal submitted by the GoK and the IBRD of USD 7.5 million to implement the project *Kenya - Electricity Modernization Project*, followed by a request submitted from the World Bank for a second tranche, to which was granted a second amount of USD 218 million.

The following table shows the consolidated external funding received by the Kenyan Ministry of Energy, during the years immediately following the accession of the Kyoto Protocol (2006-2016).

Donor	**Activity**	**Cost (million USD)**	**Type of support**	**Theme**
AFD	Energy generation	51	Loan	Adaptation
	Energy generation	33	Loan	Adaptation

	Energy efficiency	39	Loan	Adaptation
	Energy distribution - enhance connectivity	61	Loan	Adaptation
	Energy transmission	78	Loan	Adaptation
	Energy transmission	35	Loan	Adaptation
	Renewable Energy	26	Loan	Adaptation
	Renewable Energy	196	Loan	Adaptation
	Renewable Energy	73	Loan	Adaptation
	Geothermal generation	30	Loan	Generation
Nordic Development Fund	Climate change grant project (grants)	5	Grant	Adaptation
China - government	Renewable Energy	95	Loan	Adaptation
Go Spain	Renewable Energy	26	Loan	Adaptation
AfDB	Renewable Energy	N/A	Loan	Adaptation
	Renewable energy (Wind farm Lake Turkana)	65	Loan	Generation
IDA/WB	Renewable Energy (Agriculture)	2	Loan	Mitigation
IDA/Carbon finance	Renewable Energy (emission reduction purchase agreement)	N/A	Loan	Mitigation
	Climate change policy		Loan	Mitigation
KfW	Renewable energy	13	Loan	Mitigation
	Renewable energy	78	Loan	Mitigation
UNDP	Renewable energy	0.2	Grant	Mitigation
Finland and Austria 2	Renewable energy	12	N/A	Adaptation
IFC	Renewable energy (advisory services and investments)	100	N/A	Adaptation
SREP/CIFs	SREP programme	60	N/A	Adaptation
IBRD	SREP programme	7.5	N/A	Electricity modernisation
Total		**1048**		

Table 6. Donors' funding between 2006 and 2016. Adapted by the author. Source: Transparency International Kenya, 2017. Data sources: UN Framework Convention on Climate Change Fast Start Finance database; Kenya Institute for Public Policy Research and Analysis, 2012.

5.2.4 **Information resources**

Access to information is a powerful tool to enable the coordinated responses to selection pressures, because it is necessary for the creation of new knowledge. Hence, a better access to information is likely to increase the level of public acceptance, enhancing the effectiveness of institutional and policy changes. The enactment of *evolutionary* approaches towards clean-technology and changes of the regulatory or the financial systems, may risk to fail or to create socio-economic discrepancy when encounter information barriers. As stated by Moula et al. (2013), rising social awareness is a necessary action to guarantee the implementation and utilization of RE, in contexts where social pro-active approaches are required to achieve environmental goals. The low level of awareness on climate change across Sub-Saharan Africa is chiefly due to the few information resources available in these

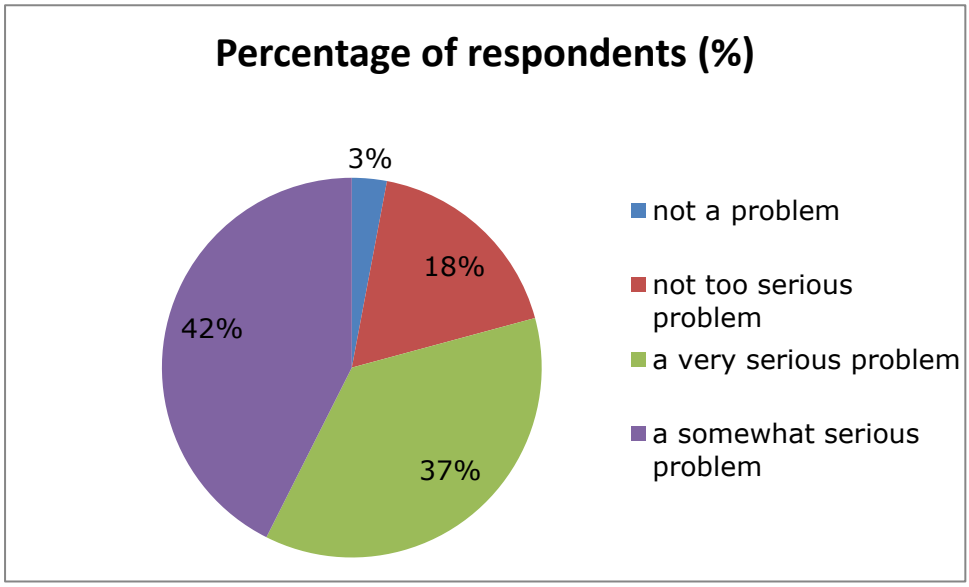
countries (UNFCCC, 2007; UNDP, 2007). The access and quality of information resources available is a key factor to enable citizens' long-term choices addressing sustainability, therefore underpinning the regime´s shift towards low-carbon economy (Godfrey et al.,2009). Social acceptance is widely discussed in transition literature, perceived as a positive attitude towards a measure or technology, which may entail a supportive behaviour and others´ resistance counteractions (Hofman & Van der Gaast, 2014).

This low level of climate change awareness is due to a shortage of relevant information on the issues, hampering the population action towards sustainability: '*The only way to accelerate the energy transition is by diffusing information among people. People do not know enough about new technologies, renewable energy and other green innovations. They ignore the fact that they could produce electricity at zero costs just installing solar panels. People in rural areas are poor and they do not have electricity, thus if they only would be better informed they would definitely take advantage of new energy technology.*' (Interview 1, 2017).

Many surveys have been conducted worldwide on public perception of climate change, analysing how public opinion on climate change-related causes and effects vary among countries and regions, mainly correlated to the level of economic, political and social aspects. Public awareness of climate change tends to be higher in developed countries and lower in developing countries. In accordance with several studies, Sub-Saharan Africa shows the lowest awareness rate worldwide, with only the 44% of adults having knowledge of at least one climate change-related issue (Gallup survey, 2007-2008).

A study financed by the World Bank in Kenya, shows the importance of funding addressing the diffusion of climate information, especially by implementing programmes enhancing knowledge and know-how among local extension offices, to overcome the limitation posed by lack of information among pastoral communities (Silvestri et al., 2012). The perception of climate change amid Kenyan pastoral communities has been found to be higher in people with affinity with farm activities, since direct effects are more likely to be related to rainfall variability and temperatures. Also, the level of farming experiences and access to extension services are positively related with climate change perception (Silvestri et al., 2012). Most of the Kenyans are not familiar with the concepts of climate change and global warming: '*They believe the term "climate change" refers to changes in the weather or seasons and have little knowledge of its global context or the greenhouse effect.*' (Godfrey et al.,2009). Moreover, large fraction of the population recognizes changes in climate patterns, such as unpredictability of precipitation and the shift in seasons, but it resulted to be misleadingly informed about global climate change: most of Kenyans are found to neglect the interrelation between environmental changes and climate change (Godfrey et al.,2009).

Even amidst local stakeholders of the World Bank Group, climate change is considered one of the last development priorities of the country, scoring only the 1.6%; whereas energy is placed in the middle with 7.8% and environmental sustainability is among the lowest scores with only a 4% (The official World Bank survey of 2015). A similar picture is found for the list of sectoral areas in which WB is expected to focus more in terms of resources (energy 8.1%, climate change 2.5%, environmental sustainability 2.4%). Also, the 18% of stakeholders of the World Bank Group still considers global climate change as ´*not too serious problem*.´ (World Bank, 2015).



Graph 7. Created by the author. Source: World Bank, 2015.

Media played a fundamental role in the diffusion of information. Nevertheless, in line with recent researches, the level of support, access to data and people to interview, threats the work of local journalists (Godfrey et al.,2009). On the other hands, the level of public awareness has been partly increased due to higher level of internet penetration: the diffusion of devices as mobile phones and television, internet penetration, underpinned by electrification of urban and rural areas, are factors that shape the cultural and social development of countries. In Kenya, internet users (per 100 people) experienced a steady increase between 2005 and 2015, from 3.102 to 45.623 million people in 2015, without taking into consideration the type of device used to access internet (computer, mobile phone, digital TV, etc. (World Bank, 2015). Consequently, larger fractions of population can access information that can be relevant to raise awareness concerning energy-related issues, changing the belief system, influencing the public view of RE and climate change. Contribution to the raise in awareness has been given from international donors. To cite with the words of an expert interviewee: '*I think they do contribute positively, either through supporting of awareness campaign programs, or through the development projects they fund (which also raise awareness).*' (Interview 2, 2017).

The creation of institutions and informative portals have played a key role: for example, the National Environmental Management Agency (NEMA) and the creation of the Renewable Energy Portal, under the Energy Regulatory Commission, as well as national and international NGOs, have the important task of enhancing public support to boost public awareness and environmental education. The Renewable Energy Commission oversees publishing at the end of every financial year an annual report including energy related data and achievement, as well as the updated energy plan (Ministry of Energy, 2006). Moreover, the NEMA, administrated under the Ministry of Environment and Natural Resources, have the task to publish and disseminate managerial and preventive information addressing environmental degradation; providing advice and technical support to bodies concerned with environmental protection and natural resources management; preparing informative annual report and disseminating fact and figures on the state of the environment and natural resources in Kenya. The diffusion of information has also been addressed at subnational levels: in the year following the devolution, have been observed a few initiatives to enhance access to information.

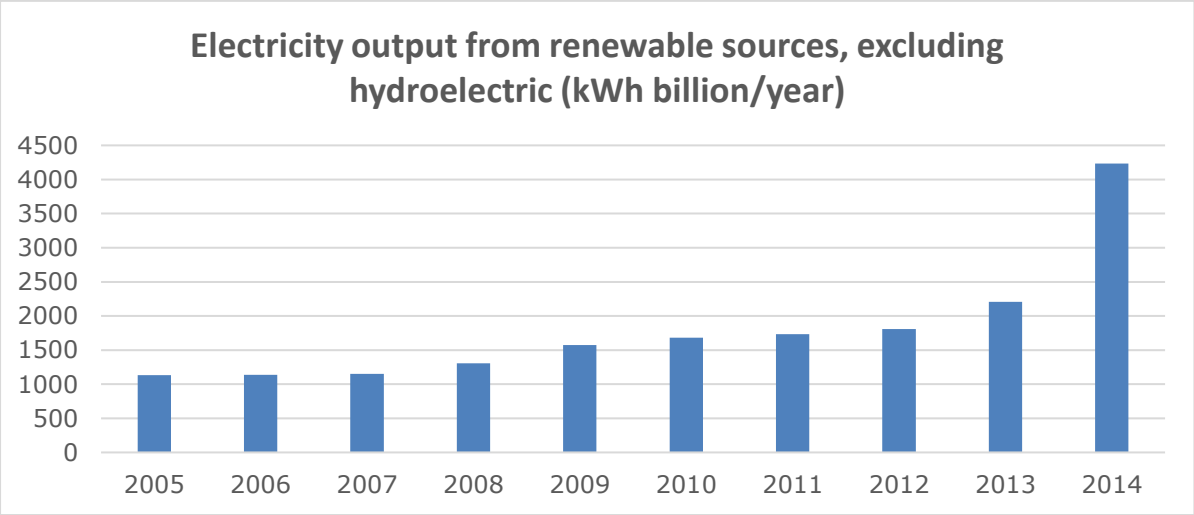
Nevertheless, only a limited number of counties has developed freedom of information legislation and published local energy information online (e.g. official websites, Facebook, etc.) (World Bank, 2015).

5.3 Regime Hypothesis

It is hypothesised that endogenous transformation in governance arrangements has enhanced energy transition: the devolution process has lead Kenya to an overall better governance, implying the enhanced administration and planning of the energy sector.

Based on the assumption that endogenous changes in governance arrangements are likely to influence the effectiveness of governmental agency in enabling energy transitions, this section investigates the effect of alterations in the actors' sphere of action (power).
The Kenyan case of power devolution has influenced society and politics at different levels, since it embodied a departure from the traditionally centralised governance, placing expectations on the enhancement of public participation and transparency, as well as lower levels of corruption. These key factors are considered determinants for the achievement of a *good* governance, steering the transition towards the new low-carbon energy regime. In agreement with previous studies, good governance is correlated with higher quality of the electricity supply (IEA, 2014).

The dependent variable is the percentage of electricity production from renewables (excluded hydro) and the total renewable electricity output. The Graph 8 shows the trend of electricity generation from RES: it can be observed a steady increase over a decade: The total production has increased of 3000 billion kWh, almost doubling over between 2013 and 2014.



Graph 8. Electricity output from renewable sources, excluding hydroelectric (KWh billion/year). Created by the author. Data source: IEA, 2014.

The following section is organised as following:

1. First, a descriptive overview of the Kenyan new Constitution and devolved system is provided;
2. Second, an analysis on the independent variables (*a, b, c*) will be given: it should be intended as overall governance analysis, not focused on the energy sector, but indirectly influencing it transitional development process;

5.3.1 A case of power devolution: expectations and challenges.

Devolution is generally defined as '*a process of transfer of political, administrative and fiscal management powers between the central government and lower levels of government primarily operating at city and regional levels*' (Potter, 2001). Hence, it is a form of governmental decentralization of power, that is generally perceived as an important step towards the enhancement of democratic governances (Cheema & Rondinelli, 1987). In fact, centralization of power is normally synonymous of authoritarian states, characterised by power centralization in the hands of few and highly constrained involvement of citizens, the transfer of decision-making power to sub-national level is perceived as an opening towards more democratic political schemes. Furthermore, devolution is likely to facilitate the public accountability since governments and officials are brought closer to people and community, increasing the responsiveness and the effectiveness of governance (Visser, 2005).

In Kenya, the national decision of undertaking radical political and governmental changes, has been chiefly led by the urge of constructing a reformative system, eradicating those major obstacles and lock-ins that, for many years, have been rooted within corrupted centralized system. On August 2010, President Mwai Kibaki promulgated the new Constitution endorsing reformative democratic insights (Government of Kenya, 2010b): It emphasizes public participation, transparency and accountability to facilitate and promote '*efficiency, accountability, equity and inclusiveness of government and service delivery'* (Centre for Devolution Studies, 2015). Chapter 11 of the new Constitution confers high-level power, functions, responsibilities to the county governments, that have been put into practice by the Parliament of Kenya with the creation of The County Government Act No 17 of 2012, reviewed in 2015 (Government of Kenya, 2012).

Thereafter, as mandated by the new constitutional provisions, Kenya has undergone an ambitious pathway towards the decentralization of power to newly created counties. In fact, the country has been divided into 47 semi-independent sub-national entities, each of them with its own local government (Booth et al.,2014). These entities have started being operative since March 2013, with the elections of local officials and ministries. This process has signified a challenging depart from the historical centralised Kenyan system, entailing not few structural, systematic and political implementation hurdles (World Bank Group, 2015; Patey, 2014).

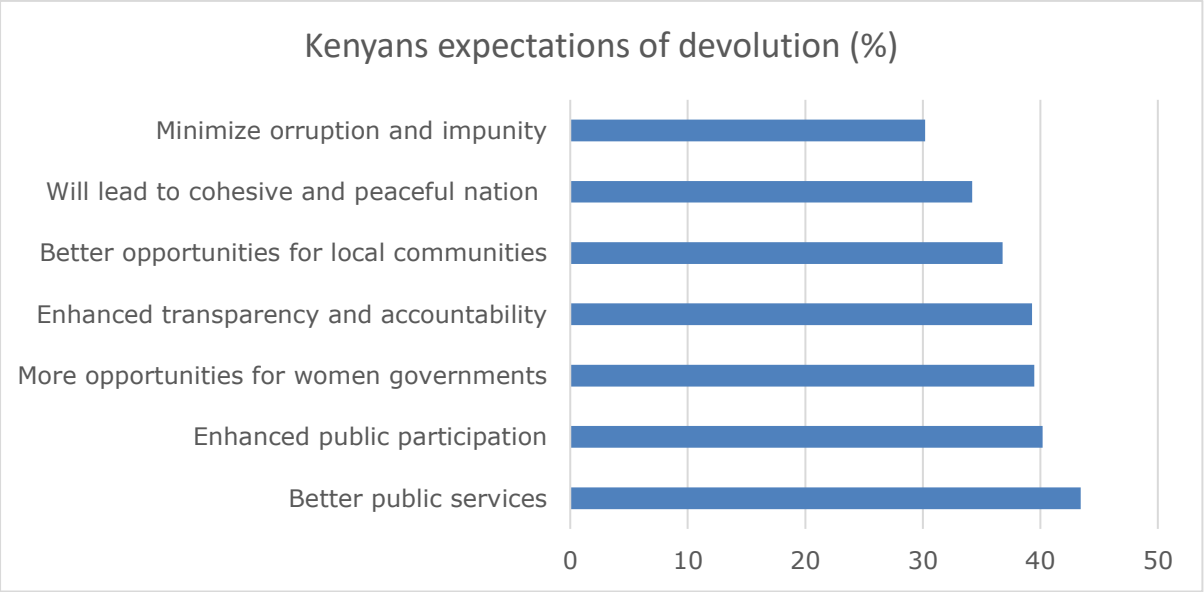
The key role of the central government in devolution has been the institutionalisation of new agencies, as well as the management of national resources and monitoring of counties' activities, to guarantee the implementation of the Constitution and to facilitate decentralization of power (Centre of Devolution Studies, 2015).

According to a political-economy expert, devolution is developing very quickly on the ground (Interview 5, 2017). So far, a multitude of vital documents and policy programmes have been put in place, as well as the creation of many designed authorities and institutions at every level, accelerating the transfer of power to subnational governments and enabling in the short-term, an efficient devolution implementation. Hence, independent commissions and offices with broad mandates have been created: The Commission on the Implementation of the Constitution (CIC), with the mandate of operationalising the new Constitution and monitoring its development; the Commission on Revenue Allocation; the Kenya National Human Rights and Equality Commission; the Salaries and Remuneration Commission; the Ethics and Anti-Corruption Commission (Booth et al., 2014).

At national level, led by the newly constituted Ministry of Devolution and Planning (MODP), a number vital documents have been published to support the efficient implementation of the devolution

national programme, namely: National Capacity Building Framework (NCBF); The County Public Financial Management modules on budget presentation (The National Treasury with the support of the World Bank).

Devolution has been perceived by Kenyans as a key to improving the governance of the country (Booth et al., 2014). The promised commitment to the enhancement of transparency, public participation and efficient management of local issues, have risen in Kenyans high expectations on the acceleration of the country development and on an improvement of the relation between government and citizens (Centre of Devolution Studies, 2015). The aim of the Government of Kenya was to achieve the foundations to enhance citizens' quality of life, achieving excellent planning and service delivery (Ministry of Devolution and Planning, 2017).
The purpose of the devolution was the shift of the power structure from a top-down to a bottom-up approach, encouraging the intensification of the role of citizens in the national policy-making process, not only at county level, but national. Accordingly, the citizens' expectations prior to the implementation of devolution were chiefly related to getting better public services (43% of Kenyans) and better opportunities to participate (40,2% of Kenyans) (Society for Development, 2012).



Graph 9: Kenyans expectation of devolution. Create by the author. Data source: Society for Development, 2012.

Despite the high expectations placed in the idea of a well-implemented devolution process, socio-political issues hampering the process are unlikely to be overcome in the short-term (Booth et a., 2014). First, the trustworthiness of an effective decentralization has been weakened by Kenyans' past experiences: in the 1960 Kenya introduced a federal system based on devolved regional governments, that was dismantled after few months by the central government. Furthermore, there is still unanimity about the level of power that should be transferred to sub-national entities, since central government stresses that certain functions are better performed in a centralized manner (Booth et al., 2014). Also, the articles 187 (1) and (2) of the Constitution, leave enough rooms for flexibility for the bi-directional transfer of functions between the two hierarchical levels.

The publishing of Booth et al. (2014) is quite critical on the adoption of such a decentralized model and on the implementation of constitutional reforms on participatory basis, that seems to be not

properly reflective of the reality of Kenyan politic (Booth et al.2014). Therefore, despite the reformative concepts and regulation agreed upon in official documents, major hurdles may be encountered when looking at the functioning of the system few years after devolution. It can be observed that most of the Kenyan state actors and central institutions have maintained overall control over policy-making, avoiding the complete dismantling of the long-standing centralized systems, by means of vested interests. This may hamper the effective devolution of power to sub-national levels and delay the achievement of such high-level expectations.

Furthermore, due to inherent large-scale changes at political, fiscal and administrative levels, several hurdles must be dismantled by means of coordination between national and county governments. For instance, the level of public awareness on the concept of devolution should be enhanced: In a context historically characterized by limited public involvement, the creation of space for dialogs and participation among citizens, entails leading approaches by means of advanced supportive learning programmes and civic education, as well as diffused information campaigns. A study conducted just prior the implementation of the devolution (2012) has observed that the level of citizens' understanding on this topic was relatively low: only the 24,7 percent of citizens was considered acquainted with the meaning of devolution, whereas the 29 percent stated an overall understanding on the structuring of counties of the devolved governments (Society for International Development, 2012).

As stated above, the energy sector is likely to be influenced by endogenous changes in governance arrangements: The national government devolved to the sub-national level energy administration and planning, while maintaining at the upper level the function of formulating national energy policy (Government of Kenya, 2010b). In line with the aim of the art 176(2) of the new Constitution, concerned with the decentralization of functions and provision of services directly and closer to communities, to each county has been assigned a ministry delegated to the administration and planning of local energy resources (Government of Kenya, 2010b). This implies that local governments can decide to develop and pursue their own energy strategy planning, depending on their own strategic priority and taking advantage of the resources available locally. This governance arrangement is likely to enhance the allocation and utilisation management of local renewable energy resources, since every local government is called to pursue a sustainable energy pathway aligned with the principles and goals established by the Vision 2030. *'It is therefore the strategic decisions of each county which might play a determining role, in conjunction with what renewable energy policies and projects the national government is pursuing in each county.'* (interview 2, 2017). The proliferation of environment-related bodies, is thus likely to help the general country's commitment to green energy: the enactment of 47 environmental ministries within every county government is a supportive policy decision towards a low carbon economy: '*In total we have 47 counties, meaning that we have 47 environmental ministries within each county mandated with the task of coordinating activities geared towards a low carbon economy in Kenya. These ministries help monitor pollution related activities and put a stop to them by imposing fines on the perpetrators.*' (Interview 3, 2017).

Examples can be found in the implementation of specific energy policy strategies at county level: The Turkana County has decided to invest in recently discovered oil resources. On the other hand, national and donors' interests have pushed to the development of the largest wind farm project in East Africa, that might be shipped to other areas, depending on the agreement between the Turkana county and

the national Government. The county of Nakuru has, instead, focused on the development of its abundant abounding geothermal resources in the floor of the Rift Valley, aligned with the national and international interests.

The director of NETFUND stated that, at the end of 2016, four years after the initiation of the decentralization process, a significant expansion of the electricity national grid can be observed, giving positive responses to the hopes of Kenyans. The interviewee, provided some examples of empirical evidences he had personally experienced with regards to enhanced electrification in rural areas: He specified that even if at sub-national level there are major problems of lack of financial resources, county governments have now the power to influence how energy development should take place in the next few years. Even if power is upset, they have an increased power of inform the Government of Kenya in terms of what invest and how to invest, supporting the implementation of energy projects that are likely to be locally adapt (Interview 6, 2017).

In line with another expert's viewpoint and some recent devolution studies, the role of powerful institutions, such as the central Ministry of Energy, remains quite critical since it has settled interests in maintaining an overall control on energy policy, limiting proper decentralization (Interview 5, 2017; Booth et al.,2014). Hence, the central government remains responsible for energy policy; while the county governments are accountable for the administration and planning of the energy sector at local scale. The priority of the central Ministry of Energy and Petroleum is the extension of the national grid, covering the demand of developing industrial areas to achieve economic growth, to the detriment of low-electrified rural areas; Also, the MEP seems remaining committed to the idea that 'the most efficient way of generating and distributing electricity remain a centralized model' (Interview 5, 2017). To achieve national goals, the central Ministry has instituted local offices with the purpose of supporting the implementation of national energy policies at sub-national level: county governments are therefore called to the implementation of national energy strategic policy, with high-level central control exerted by the central Ministry. This has been cause of tensions between local and national authorities, since the central government is mainly focused on on-grid implementation, while the county governments are mostly interested in developing off-grid solutions (Interview 9, 2017). Priority of county governments is the enhancement of population access to electricity, as well as sustainability issues, at the basis of welfare of local citizens.

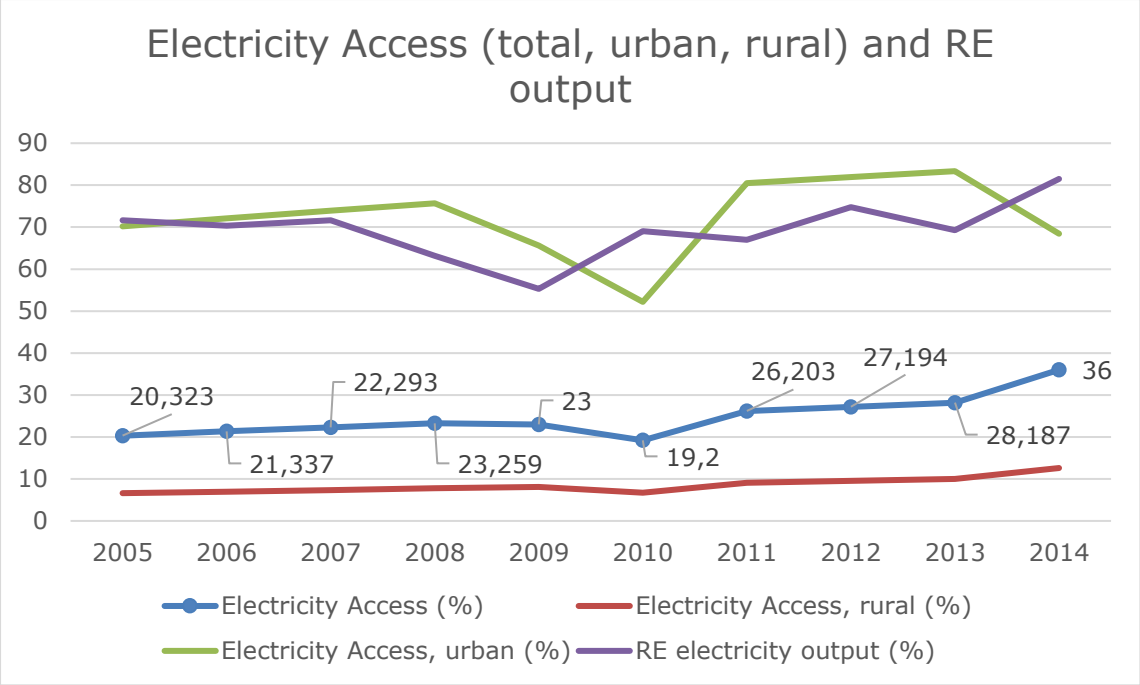
In sum, central and county governments hold aligned interests in expanding access to electricity and increase the sustainability and better allocation of natural resources. However, the national price of electricity for domestic utilization stays relatively high (0.20 USD/Kwh), making on-grid electricity prohibitive to rural and urban-poor people. Local governments are thus committed to find cost-effective solutions that may cover the demand of local people, reaching also more displaced rural areas. Hence, cheaper off-grid technologies are seen by county governments as the most cost-effective solutions, with higher potential in increasing the number of people with access to electricity compared to national grid. According to an expert of responsible natural resource economies, even if exists a conflict of interests between on-grid and off-grid development, that can seem contradictory on papers, central and county governments' development plans can result complementary to each other. Thus, devolution is likely to promote the placement of RET both on-grid and off-grid (Interview 9, 2017).

People displaced in rural areas have placed hopes in the creation of devolved governments with regards to the connectivity to the grid. Kenyans, saw the possibility of a closer citizens-local governments relation as an opportunity to tackle more efficiently local problems, including the necessity of connectivity to the national grid or the development of off-grid solutions (Interview 6, 2017).

Looking at World Bank data, it can be observed that since the election of local governments, rural electrification access in Kenya has increased of 2% in one year, reaching the 2.6% of rural population; the RE electricity output experienced a significant increase of 12% of the total electricity output between 2013 and 2014. The total electricity access has significantly nosed up since 2013, passing from the 28% to the 36% in only one year (IEA, 2014), despite a decrease in urban electricity access, probably due to the migratory population movement from the rural areas to the urban areas, thus creating a quick expansion of cities.

Year	**Electricity Access (%)**	**Electricity Access, rural (%)**	**Electricity Access, urban (%)**	**RE electricity output (%)**
2005	20.323	6.613	70.185	71.662
2006	21.337	6.975	72.123	70.341
2007	22.293	7.362	73.96	71.601
2008	23.259	7.77	75.704	63.131
2009	23.00	8.10	65.60	55.292
2010	19.2	6.70	52.20	69.07
2011	26.203	9.093	80.485	66.973
2012	27.194	9.554	81.939	74.77
2013	**28.187**	**10.018**	**83.337**	**69.288**
2014	**36.00**	**12.6**	**68.4**	**81.486**

Table 7. Access to electricity (rural, urban, total) and RE electricity output. Created by the author. Data source: IEA, 2014.



Graph 10. Access to electricity (rural, urban, total) and RE electricity output. Created by the author. Data source: IEA, 2014.

The President of the Kenya Climate Change Awareness, believes that the development of a county-level governance is likely to enhance the economic development of the country. This is because counties are directly concerned with environmental local issues. He also argues the necessity of finances to pursue sub-national low-carbon development pathway: In this sense, devolution has brought about benefits in terms of low-carbon economy, since every environmental ministry can embrace its own network of investors, donors and community, addressing specific local energy issues and exploiting local energy sources (Interview 3, 2017). The utilisation of local energy resources is therefore likely to result more efficient rather than contexts where energy governance is overall centralized, addressing issues from a national perspective and pursuing a national objective rather than looking at specific local needs. This can be ascribed to the closeness of local authorities to citizens, which entail an increased responsiveness to local issues.

In the following sections, empirical evidences of the three main indicators of the devolutions' performance (public participation, transparency and corruption) supported by devolution advocates are presented. As earlier mentioned in this dissertation, higher degree of transparency can enhance access to public information, through increased availability and reliability of public datasets; public participation is likely to enhance a more efficient allocation of public resources, and to increase the efficiency of the problem-solving approach of the policy-making process, since citizens are more familiar with local problems and potential solutions. Furthermore, low levels of corruption are necessary to avoid that climate and low-carbon financing deployed by donors would end up in the wrong hands and from being inefficiently allocated (Transparency International, 2014).

5.3.2 **Public participation**

The need for a bottom-up approach, substituting a formal representative government, has been one of the key determinants promoting the devolution process: The concept of public participation is a

corner stone of the new Constitution of 2010 and has been entrenched in participatory mechanisms for manipulative and cynical purposes, that should be implemented by county governments and newly created institutions (Scarrow, 2001; Society for International development, 2012). Such mechanisms should enable local governments to open decision making processes to the voice of the public (Khobe, 2012).

Most of the interviewees agreed on the fact that devolution is a very new topic for Kenyans, where most of the people do not have a clear understanding of the entire process of the new devolved system. Policy tools and programmes, at every level, are thus necessary to increase the level of awareness among citizens. The public should be appropriately aware of their role in governance: the article 196 of the Constitution, reads that county assemblies are obliged to 'hold sittings of their committees in public and to facilitate public participation and involvement of citizens' (Government of Kenya, 2010). At county level, the County Government Act (section 96), for the first time, established a legislative basis that obliged county governments to guarantee access to information (Government of Kenya, 2012). A survey conducted in 2012, found out that about the 28% of the respondents did not have the perception of having any role in the correct implementation of the Constitution (Society for International Development, 2012).

Table 8 shows the percentage of citizens' understanding of specific devolution-related topics: It can be observed that prior of the implementation of the devolution (2012) almost half of the Kenyan population do not own a clear knowledge of the concept of devolution, while very few understand what are the role of devolved functions.

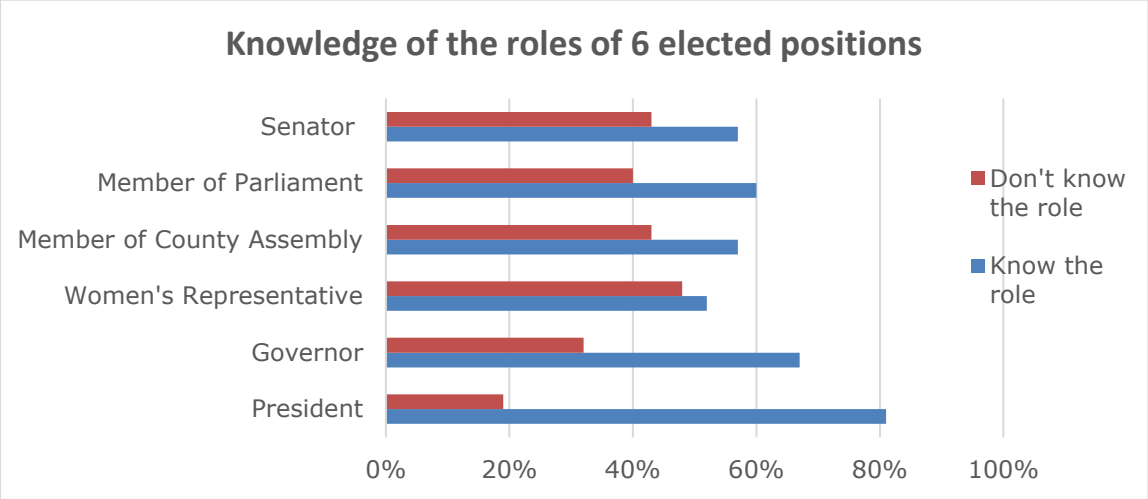
Devolved functions	**%**
Sharing of powers/ distribution of national leadership to small branches / taking power to the people	13.3
Decentralization of government structure/cascading major government departments to the county	10.8
Bringing resources to the grassroots/ taking public services closer to the people/ equity and equal resource distribution	11.4
Not very sure but economics and distribution of government power	6.0
Devolution involves equal beneficiaries/ recognizing diversity / protecting rights of minorities	3.1
The act of governing through county/ dividing the country into segments/ government as a county	6.4
Change/ new beginning/ Constitution	1.6
Leadership of high quality	0.8
Practice peace at ground level	0.5
Gradual development in the government	0.2
Others	0.2

Don't know	45.8
Total	**100**

Table 8: Kenya's devolved government. Created by the author. Data source: Society for International Development, 2012

Another study revealed that the level of understanding of devolution in 2012 was also related to the gender of the respondents: 56.8% of the people that had a discrete understanding of how devolution would have been worked was male, while 43,2 % were female (Society for International Development, 2012). This has been probably influenced by differences in medias' utilization, traditional roles and level of education associated with genders.

In a survey conducted by the TIK one year after the election of the county government, the level of awareness of citizens on the roles of officials they had voted for, was critical: it was estimated that most of the citizens were aware about the role covered by the President (81%) and by the Governor (68%), whereas only the 52% and 57% respectively, knew the role of the Women's Representative and of the Member of County Assembly and Senator.



Graph 11. Knowledge of the roles of 6 elected positions. Created by the author. Data source: Transparency International Kenya, 2014.

The survey found also out that, even citizens that declared to know what the role of the leaders was, provided generic information. Moreover, the awareness of vital documents, such as County Fiscal Paper Strategy, the Finance Bill 2013, etc. was between the 7% and the 41% depending on the document; only the 1% - 4% declared to own a copy.

Some studies shows that the Kenyan regulatory framework does not ensure that public receives notice of county meetings to guarantee the participation: A survey realized in 2014 by the Transparency International Kenya, assessed the citizen awareness and appreciation of the Kenyan devolved system, showing that the county governments' commitment to the enhancement of public information on devolution were not sufficiently high: only the 38% of Kenyans were aware of the existence of any county meetings and the attendance to the meeting scored just the 15%; The 83% of citizens were not aware of the funds allocated to their own county (Transparency International Kenya, 2014).

Capacity building is also a key feature for the enhancement of public participation, considering both

public officials and citizens (Khobe, 2012). Most of Kenyans lack of basic knowledge concerning the devolved functions stated in the Constitution: the 48.8% of Kenyans have no understanding of devolved governments (Society for International Development, 2012). When asking to local respondents what are the county functions, the 28% of the respondents answered that health services were devolved to county and the 23% infrastructures, followed by education (15%), employment and security (13%). County governments are obliged to establish civic education unit to appropriately educate the public on certain civic issues, as well as to implement a civic education programmes (Khobe, 2012).
A survey conducted the year prior the implementation of the devolution, showed that only the 17% of the respondents would have been willing to participate to civic education, while the 12.1 % would have actively participate to local debate and community reviews (Society for Development, 2012).
Furthermore, high-level knowledge and capabilities among public officials need to be enhanced: At sub-national levels, limited capacity of newly created local governments implies the need for capacity building to achieve an effective implementation of decentralization reforms (Centre of Devolution Studies, 2015). Limited experience of devolved authorities is likely to constrain the achievement of concrete results of the policymaking process, undermining the level of government accountability.
Also, at national level, capacity building programmes are needed to enhance the capacity of the public in the planning, implementation, monitoring and evaluation of these policies (Society for International Development, 2012). However, the County Government Act does not refer to the need to engage administrators into capacity building programs, therefore ignoring the necessity of public officials' capacity building to enhance the governance process. Furthermore, it should be noted that the most of the population in the rural counties, have a low degree of alphabetization, therefore programmes addressing citizens that should be assisted in writing are not been implemented (Khobe, 2012).

According to a recent study conducted by the Centre for Devolution Studies, Kenya can be taken as an example of progressive citizen-state interaction: the level of independency of media by regional standard is considered quite high, as well as its outspokenness. Media are considered fundamental for the diffusion of information and for increasing public awareness on public issues, as well as to report cases of corruption and debates. Public participation embraces also the citizens' participation in the planning process, which is legislated by the Section 108, 112 and 115 of the County Government Act: counties' government should ensure the participation of the public in the county development plans and their amendment. The study conducted by Khobe (2012) shows many flaws in the legislation of the Act, the legislative framework has not been accompanied by enforcing activities likely to pose a challenge. Some other key obstacles are represented by the lack of counties' budget addressing public engagement: the implementation of programmes and project engaging communities remains costly and not every county has the financial resources to undertake such modules. Furthermore, the capabilities of authority employees are crucial in the implementation of public participation provisions (Centre for Devolution studies, 2015). The development of clear guidelines for citizens is still in an earlier stage, therefore several steps must be taken to rise confidence of the public in governmental authorities and therefore achieve an effective number of citizens participating in planning and governance policy-making process.

However, a shared feeling of positivity towards devolution has transpired by expert evaluations: the general opinion is that devolution has in some way shrunk the gap between state actors and citizens, bringing governance closer to the public opinion and becoming more responsive to local issues.

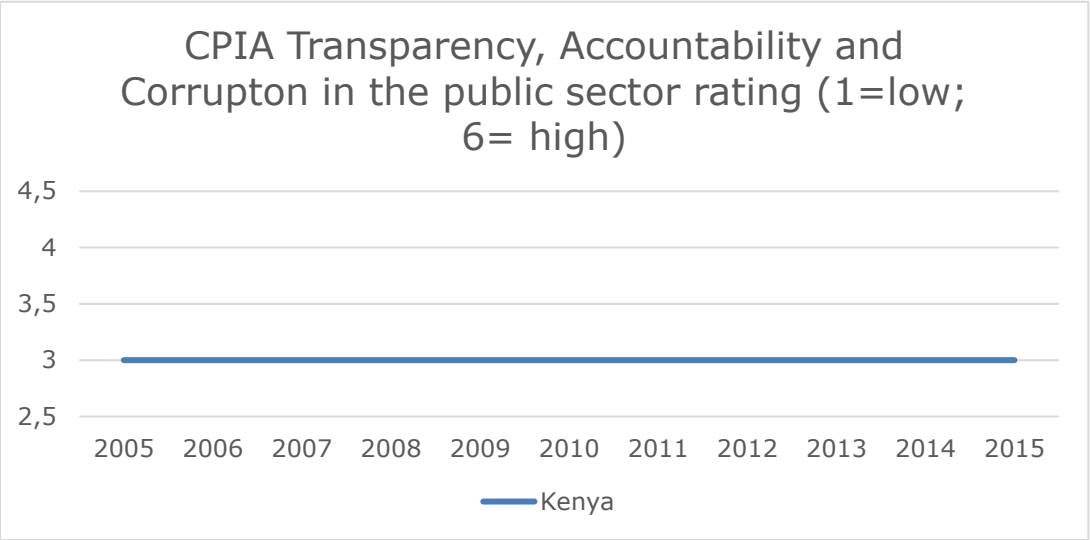
(Interview 2, 2017; Interview 5, 2017; Interview 6, 2017; Interview 9, 2017) Public participation has been enhanced also in the formulation of energy policy (e.g. the Green Economy Plan, The Strategy Implementation Plan, etc.), since the central government invited many stakeholders from the civic society, the private sector, education institutions, etc. (Interview 9, 2017).

Both local and national governments seem having performed well in the achievement of a better energy governance, from the citizen engagement perspective: '*I think, something very interesting about devolution is that it has brought services closer to people*' (Interview 6, 2017).

5.3.3 **Transparency**

Transparency is a prerequisite for effective public participation and for avoiding dissemination of corruption. The right to information has been firstly officially recognised in 1964 as human right by the United Nations Assembly and as cornerstone for achievement of all freedom (UNESCO, 2000). The Article 19 of the Universal declaration of human rights, reads '*Everyone has the right to freedom of opinion and expression; this right includes the right to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.*' (Assembly UN General, 1948). This broad concepts of transparency, includes also the level of transparency that the public sector shall guarantee concerning public affairs. Transparency in the public provision of services and decision-making process, is necessary to increase awareness among citizens, facilitating public participation and general understanding of issues of public *dominion*. It concerns the obligation for public officials of reporting their activities and expenditures in a clear modality and understandable manner, guaranteeing access to every citizen. Nevertheless, the principle of transparency is likely to remains just an utopic principle in most of the developing countries cases, in which state authorities are normally not committed to the effort of bringing public information available, and affected by corruption: the achievement of a proper level of transparency in public and private affairs requires ongoing efforts at all level of the state, implying the adoption of legislative and other policy measures in order to guarantee the access to information resources.
The lack of transparency has been the *foundation* for corruption diffusion in Kenya, both in public and private affairs, compromising the stability of governments, the enhancement of democracy, human rights, and undermining economic growth and development of the country (German Development Service in Kenya, 2000). Kenyan affairs have been historically accompanied by widespread cases of corruption, nepotism and bribery, that have been enabled by the lack of a regulatory system on transparency and accountability of the public sector.

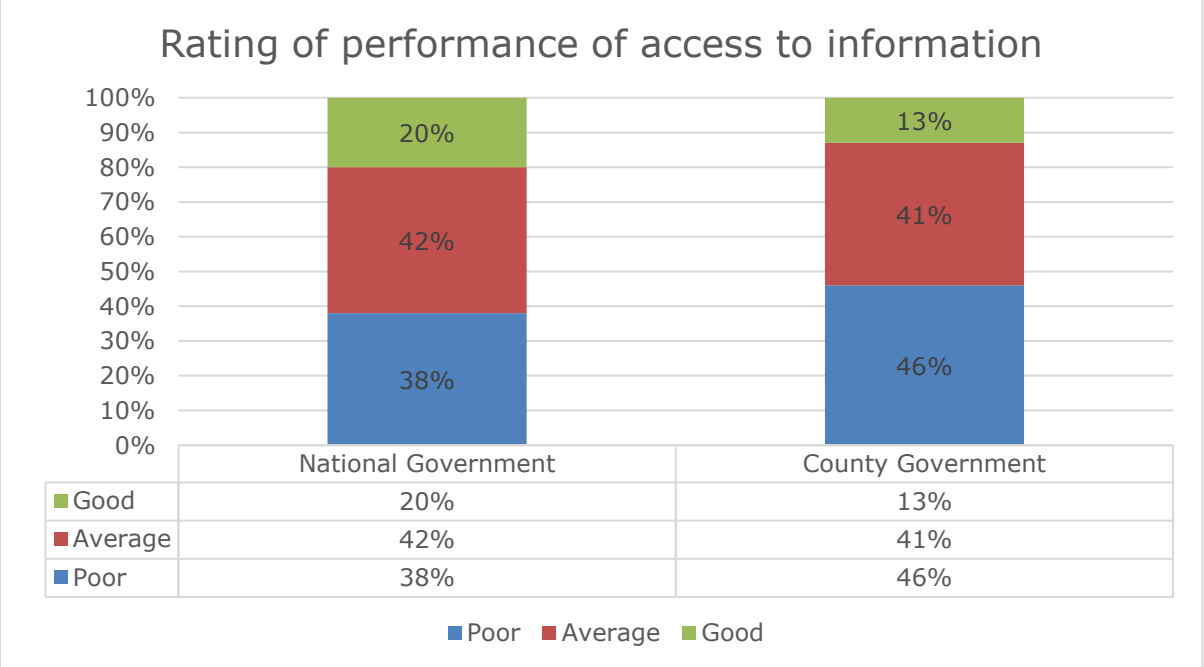
On a scale between 1 (low) and 6 (high), the country's level of transparency, accountability and corruption in the public sector, was estimated stable at a middle stage of 3, since 2005 (World Bank, 2016). Differently from other East-African countries, such as Tanzania and Ethiopia, the Kenyan CPIA's index has not experienced variations during the last decade, despite the several changes in government leaders.



Graph 12. CPIA Transparency, Accountability and Corruption in the public-sector rating. Data source: World Bank (2016).

With the new Constitution, the Government of Kenya has made explicit its commitment to enhancement of transparency of the public sector: The Article 35 reads that every citizen has the right of access to information held by the State (Constitution, 2010). Moreover, counties are encouraged to deliver services in line with principles of transparency and accountability as read in the article 116(2) of the County Government Act (Government of Kenya, 2012).

Studies have showed that access to information and its costs have not been fairly managed in the years prior and following the devolution, therefore facilitating the dissemination of information to cover up vested interests of public officials (Khobe, 2012). The lack of a legislation avoiding the release of incomplete and of manipulated information, is the first cause of alienation of the public from public governance, leading to various forms of corruption.



Graph 13. Rating of performance of County and National Government on access to information. Created by the author. Data source: Transparency International Kenya, 2014.

Section 95 of the County Government Act addresses the need for media informative procedures that would support access to information and public communication '*with the widest form of outreach in the county*' (Government of Kenya, 2012). Furthermore, information should be elaborated and presented to the public in a way that is understandable and can be used effectively (Khobe, 2012). Diffusion of information, in a country that has been historically characterised by low democratic insights, is critical to build up basic knowledge on democratic concepts and functioning to steer citizens to political participation.

In order to enhance the free circulation of relevant data, both at local and national level, on the 8th July 2011, the President Mbwai Kibaki launched an important initiative apt to collect every important data and to build up, for the first time in the Kenyan history, national and regional datasets that may be used and freely consulted by the public. In 2015, the Open Data platform counted 500 datasets freely available to the public (Government of Kenya, 2015). Hence, the Kenya Open Data Initiative, was the first web-based dataset collecting key information on both the public sector, facilitating the collection of data and their accessibility. Kenya has been the first developing country to implement an open data portal, demonstrating its commitment to enhance the public access to information. The various governments agencies gained therefore a space where they can publish their own datasets with the purpose of increasing public awareness, public welfare and overall accountability. On February 2010, another important step have been undertaken by the central Ministry of Finance and Treasury, launching a learning programme for government officials and technicians for the utilization of the Electronic Projects Monitoring System (e-ProMIS), a comprehensive monitoring and evaluation tool apt to the enhancement of transparency of government and donors' financed projects (Synergy, 2010). The purpose of this system is to enable the public to gain easy online access to the flows deployed by international and national institutions to the promotion of national projects and programmes.
Furthermore, on February 2014, the President Uhuru Kenyatta and Anne Waiguru of the Cabinet Secretary Devolution and Planning, declared their fight against corruption, addressing transparency issues and engaging with Transparency International to tackle national constraints. The IT aim in supporting Kenya towards higher level of transparency, is founded on the need of facilitate and encourage the government and companies to the public disclosure of information at every level (Transparency International Kenya, 2014). The commitment of the Government of Kenya to transparency issues, attracted finances from the major multi-lateral agencies (e.g. IDA and IBRD), in 2014 a second tranche financing supporting Kenyan transparency, deployed USD 30 million to the Ministry of Information and Communications Technology (ICT) (World Bank, 2017). According to the work paper No 5, published by the Centre for Devolution Studies, a number of different approaches and initiatives addressing availability and access of public information have been implemented among the counties: almost every county government has developed an interactive approach by creating websites, Facebook pages and web-forums that are likely to enhance the participation of people. However, few counties have published on online their budgets, fiscal strategy papers and expenditure reports Some counties have put into place frameworks legislating information access. (Centre of Devolution Studies, 2015).

5.3.4 **Level of corruption**

High levels of corruptions have always characterised the Government of Kenya at every level, undermining the governance performance and government accountability. Corruption is likely to affect the efficiency of the work of public and private employees and institutional provisions. Its eradication normally requires long-term reformative processes. Kenyans perceive actions addressing anti-corruption as a national priority that should be tackled both at national and at county level (TIK, 2014).

The Bribery Index may provide an idea of the level of corruption in the country, since 2005. Bribery are private payments to public or private officials apt to influence the decision-making process. In Kenya, the presence of high frequency and severity of bribery, is one of the first causes of deviation from good governance: policy-making process are likely to be steered towards ineffective and/or unsustainable decisions, far from addressing the welfare of the population (Transparency International Kenya, 2014). The following table shows the Aggregate Bribery Index observed in Kenya, estimated on a survey conducted by the Transparency International Kenya.

Year	**Aggregate Index (%)**	**National Rank**
2005	25.2%	3
2008	47 %	2
2010	31.9 %	3
2011	28.8 %	4

Table 9. Aggregate Bribery Index. Created by the author. Data source: Transparency International, 2014.

Per the Transparency International Global Corruption Barometer, in 2013, the 33% of people participating to the survey stated that the level of corruption over the past two year has significantly increased. Kenyan population feel the parliament and legislative system, as well as police and public official and civil servants as the institutional bodies most corrupted. Table 10 shows the percentage of corruption perception attributed to each institution.

Institution	**Corruption Perception (%)**
Political parties	53%
Parliament and legislature	68%
Military	43%
NGOs	19%
Media	12%
Religious bodies	15%
Business	29%
Education systems	27%
Judiciary	58%
Medical and health services	43%
Police	95%
Public official and civil servants	59%

Table 10. Corruption Perception. Created by the author. Data source: Transparency International, 2014.

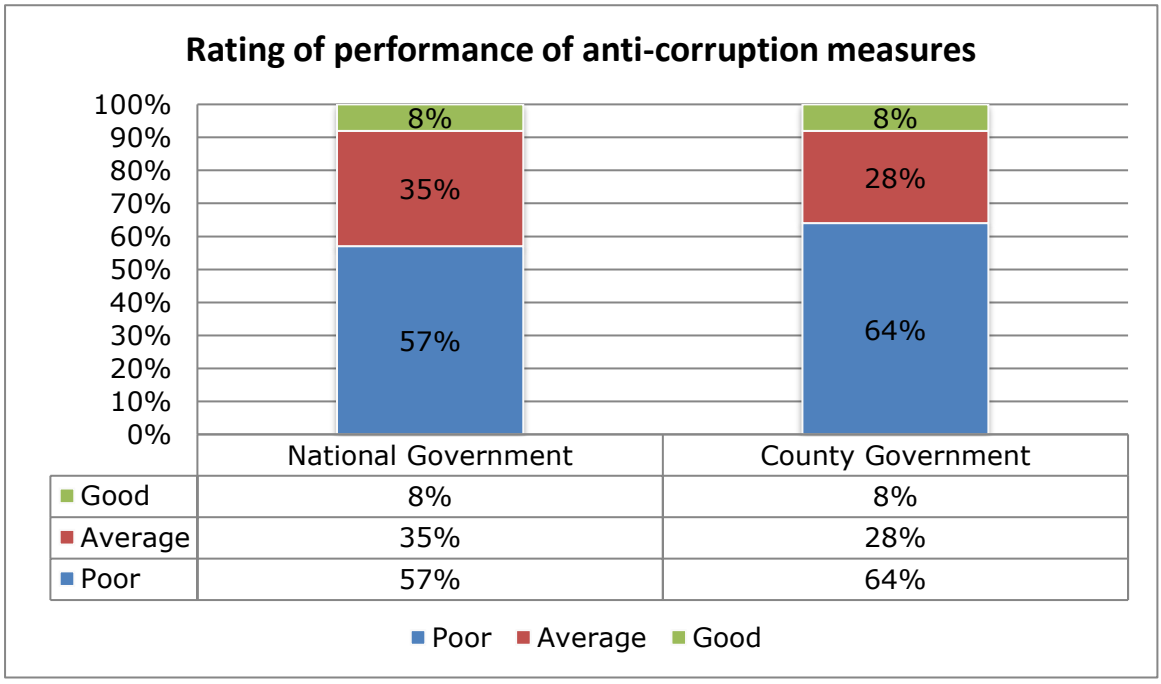
In 2015 the country was ranking at position 139 out of 168 countries. In 2016 Kenya lost ranking position, scoring a Corruption Perception Index of 26% and appearing again in the list of most

corrupted countries, ranking 145 out of the 176 countries in the Transparency International list. According to the Corruption Perception Index published by the IT in 2016, the perception level of corruption has increased of one percentage point compared to the previous year (Transparency International, 2016). This high corruption index was mainly attributed to the lack of public access of information, the shrinking media space and a Judiciary power that is not considered as independent as should be to guarantee lower corruption level among public officials. This has been exacerbated by the corruption perception that is historical intrinsic in the country and the low conviction of corrupted individuals (Daily Nation, 2014).

Year	Corruption Perception Index
2012	27
2013	27
2014	26
2015	25
2016	26

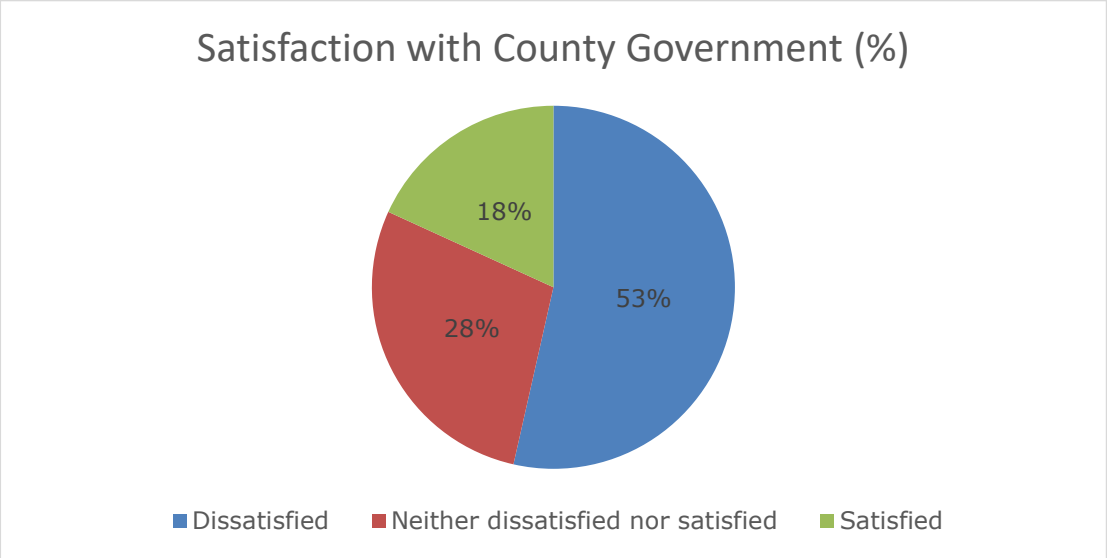
Table 11. Corruption Perception Index. Created by the author. Data source: Transparency International, 2014.

One year after the implementation of devolved functions, citizens rated the performance of county governance on anti-corruption, resulting that the 61% of Kenyans were dissatisfied with the anti-corruption measures implemented at county level, considered poor and inappropriate to tackle corruption and bribery. A comparison with the performance rating of the pro-active approach undertaken by the National Government, were the 57% of respondents considered themselves dissatisfied (TIK, 2014). Thus, the survey showed that the percentage score was not significantly changed compared to the scoring the was attributed to the National governance in the same field of governance. Only the 8% of the respondents perceived activities performed by the County Government as appropriately tackling the problem. The Graph 14 compares the performance rating of the National and County Governments on the anti-corruption measures.



Graph 14. Rating of performance of anti-corruption measures. Created by the author. Data source: Transparency International Kenya, 2014.

One year after devolution the 53% of Kenyans were not satisfied by the county government, mostly due to the lack of visible developments (54%), to unfulfilled campaign promises and to the non-tackled corruption/tribalism and nepotism issues (19%) (Transparency International Kenya, 2014).



Graph 15. Satisfaction with County Government. Data source: Transparency International Kenya (2014).

Corruption is therefore considered still deeply embedded in the national government, at every level. County governments are required to undertake more pro-active actions to achieve visible developments towards a more trustworthy system. High Kenyans expectations have been so far not satisfied by empirical evidences, but should be noted that, as above mentioned, the fight against corruption normally entail a long-term process. Therefore, whether devolution has led to less corruption, is difficult to be investigated few years after the occurring of structural changes. According to one of the interviewees, devolution sort of reduces the obstruction of the process: the more projects are focused on local levels, the more people are involved at closer levels, creating less chances for deliberate corruption. Hence, evidences on the dismantled are more likely to be observed in the following years (Interview 9, 2017).

5.4 **Niche Hypothesis**

It is hypothesized that a 'stretch-and-transform' empowerment process has been implemented to create a more amenable environment facilitating low-carbon niche innovation.

In the previous chapters, drivers of energy transition at regime and landscape levels have been analysed: first, it has been hypothesized that international regimes and overarching goals have steered changes at policy level (landscape), leading to the integration of renewables and climate change policies in the national policy design. Second, it has been investigated the effects brought about by the country's governance arrangements reconfiguration (regime), aiming at enhancing good governance of the national and sub-national energy administration and planning.

In this section, determinants at the micro-level will be assessed, to provide a comprehensive picture on the drivers of the Kenyan energy transition. It will be analysed whether low-carbon private investments in Kenya have mainly been benefited from a specific niche management strategy. The stretch-and-transform approach promotes the development of innovative technologies and is here

hypothesised to be the last tile of the energy transition's mosaic. Specific policy strategies and regulations may be considered necessary to help to determine the emergence and competitiveness of low-carbon niche technology. Hence, the nation-wide diffusion of private investments in clean energy projects (dependent variable) are likely to be enhanced by regulative transformations, aim at facilitating technology development across the country. Policies designed under the fit-and-conform approach have not been sufficient to enhance the competitiveness of RET; rather, it has been steered by technology advocates' supporting significant transformation of the energy regulative scheme.

The dependent variable is the level of private investments in clean technologies: The amount of USD million invested in RE innovation has steadily increased since 2011, reaching 4103 Mio USD in 2015.

In sum, it is here hypothesized that low-carbon technology advocates in Kenya have undertaken a stretch-and-conform empowerment process to create a market space for RE private investors, functioning as the *nucleus* where innovative technologies are empowered to break through the market.

This chapter will be organised as following: first, the reader is introduced to a general overview of the fit-and-conform and stretch-and-transform strategies that can be individuate in Kenya; Second, it will be provided an assessment of three case studies, namely the Feed-in-tariff and the regulations of 2012 concerning Solar photovoltaic systems, Solar-water heating systems and Energy Management. The hypothesis is verified by analysing the number of policies changes, the number of projects approved under the FiT since 2008, as well as the number of operators licensed under the Regulations of 2012.

5.4.1 **Fit-and-conform strategy**

Over the last two decades, many Sub-Saharan countries have faced the challenge of increasing power generation, electricity security and rural electrification. In most of the cases, public financial resources resulted merely scarce to support national power needs and the possibility to contract debts at affordable rates remained very low (World Bank, 2015). However, opportunities for investors in RET exist and they are affected by regulatory schemes, energy policies, public awareness, products' quality, consumer finances and the presence of active technology and policy advocacy groups. Therefore, a policy-making pro-active approach is needed to open market opportunities to clean energy technology niches. Kenya enacted a fit-and-conform strategy, implying '*actions from technology advocates aimed at making low-carbon technologies more competitive with mainstream socio-technical practices in otherwise unchanged selection environments'* (Raven et al., 2015).

Since 1980, the Government of Kenya, as many other Sub-Saharan governments, decided to facilitate the development of the energy private sector, by undertaking gradual privatization processes, and starting the implementation of policy programmes tackling obstacles placed to the deployment of private investments. Kenya has historically traced a market-oriented pattern, promoting business opportunities to the creation of competitive open-markets, leading the economic growth of the country: The Government of Kenya implemented a number of programmes apt to accelerate the national industrialization process under the Private Sector Development Strategy, addressing both fundamentals and selective interventions: fundamental interventions refer to the commitment of the public sector to the effective servicing of critical public goods (e.g. electricity) meaning the enhancement of macroeconomic stability and good governance, the openness to foreign technologies; on the other hands, selective interventions address the development of certain niches,

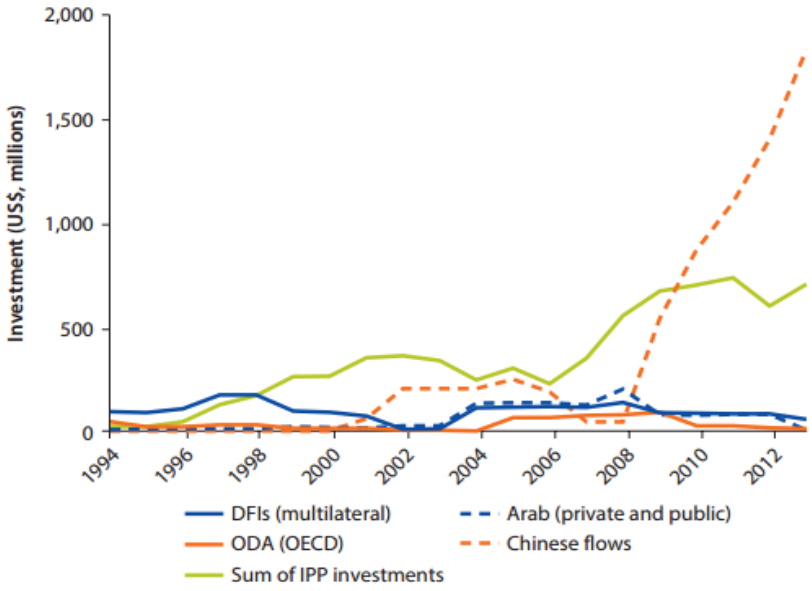
through the creation of specific policies and specific lines of credits (World Bank, 2014). Also, the promulgation of the Public Private Partnership Act of 2013 was an important step taken by the GoK to regulate and promote private investments. This neo-liberal approach enabled the development of certain niche markets, due to the reduction of risks and up-front business costs, fostering vested interests of the Government.

The GoK, since the beginning of 2000, has adopted neoliberal reforms in the energy sector to attract international support by donors addressing the deployment of sustainable niche (Newell & Phillips, 2016). It can be therefore perceived as a fit-and-conform strategy attempting to underpin and gradually integrate innovative technologies within the mainstream technology pathway. The Government of Kenya has developed a new energy economy strategy, transforming the private sector in the key actor, while the '*entrepreneurial state' was taking the risk and setting the direction of change of investors and donors*' (Mazzuccato, 2011; Newell & Phillips, 2014). The national goal of achieving additional 5000 MW installed capacity was expected to be developed by IPPs through the implementation of the PPP Act of 2013 (USAID, 2015). The growing electricity demand and the need for enhancing energy efficiency and national electrification, can be regarded as a central issue steering energy transition. Between 2011 and 2014 the weight of the private sector in energy investments has significantly increased, considering the number of electricity infrastructures and RE projects, receiving financial closure. According to one of the interviewees, the private sector has played a central role in terms of transforming industries from the fossil-fuel based economy to the low-carbon economy. '*This can be seen through initiatives such as implementation of energy (and money) saving strategies in industries by members of the Kenya Association of Manufacturers*' (Interview 2, 2017). New opportunities have therefore been opened at national level, entailing the proliferation of new business concerned with RE technologies. International companies and entrepreneurs in the RE fields have not been left out from the Kenyan investment arena (Embassy of the Federal Republic of Germany, 2017).

Since 1984, the development of a private household market for PV has been chiefly driven by the necessity of increasing off-grid solutions in rural areas, due to the low electrification (Byrne, 2011). Whether the PV niche diffusion has been entirely ascribed to a neoliberal transition has been proved wrong by a recent study, demonstrating that the financial support deployed in 2007 by to major donors, has been critical in the development of the PVs private sector (Byrne, 2011; Byrne & Mbeva, 2017).

Moreover, socio-technical narratives have been diffused by technology advocates through information campaigns related to the advantages of reducing GHGs emissions through the utilization of niche technologies. Also, donors' support has been crucial to deploy finances and technical assistance tackling obstacles faced by public and private investors (Newell & Phillips, 2014).

Fit-and-conform strategy can also be individuated by the adaptation of the electric power industry to Independent Private Producers (IPPs). IPPs are private investors involved in the generation of renewables: '*IPPs are investment transactions regulated by the underlying contracts, most notably the power purchase agreement (PPA)*' (Eberhard et al., 2016). The recent diffusion of IPPs in Sub-Saharan countries has been a critical source of investments in sub-continental African countries: since 1994, 126 IPPs have emerged across 18 countries, accounting for 13% of the total Sub-Saharan installed capacity (Eberhard et al., 2016).



Graph 16. Source : Eberhard et al., 2016.

As many other Sub-Saharan countries, the Government of Kenya decided to decentralize the power system, by unbundling the vertical integration of power generation, transmission and distribution, simultaneously it opened new rooms to the development of the energy private sector. Kenya reformed the power sector by unbundling utility generation and including a strong component of IPPs (Eberhard et al., 2016). The process of decentralization of power started in 1994, when the generation of electricity has been progressively separated from transmission and distribution (T&D). The process of decentralization has advanced further, culminating with the creation of two important documents: the reformative Sessional Paper N.4 of 2004 and the publication of the Energy Act N.12 of 2006. Currently, the country electricity chain is held by three principal institutions, namely Kenya Power, Kenya Generating Company (KenGen) and Kenya Electricity Transmission Company (KETRACO). Kenya Power holds the management of electricity distribution, whereas state-owned companies KenGen and KETRACO cover respectively the function of electricity generation and the general ownership and management of national electricity grids and regional power interconnectors (Ketraco, 2017; Word Bank, 2015). However, policy reforms put in place by the GoK, facilitated the licensing of power generation by independent companies, despite the Kenyan energy power generation system were traditionally lead by public and utility financing as the main source of investments.

In 1996 the first IPP entered the Kenyan power market; soon the country reached the highest number of energy projects owned by IPPs in Sub-Saharan Africa (Eberhard et al., 2016). In 2006, through the Energy Act of 2006, Kenya instituted an electricity regulator agency to enhance the regulatory governance of electricity generation, tackling transparency, accountability and fairness of the regulatory system. According to USAID, in 2015 Kenya counted a total of 10 projects implemented by IPPs, reaching the 28% of the country's total installed capacity. IPPs concerned with the generation of power from RES have recently diffused nation-wide: Several private companies currently own some of the power plants generating the most of RE installed capacity (USAID, 2015).

The diffusion of IPPs in the mainstream environment has facilitated the advancement of technology niche: first, because competition is likely to be created amid private companies, enhancing the opportunity to develop new efficient energy solutions; Second, the openness of the market to international IPPs is likely to increase the leapfrog effect among northern countries and developing countries. Also, private companies historically dealing with heavy fuel technology (HF) and oil, may become promoter of new clean innovation to stay in the market and increase competitiveness.

Through the creation of new policies and supporting programmes, the GoK acted as regulator of the energy market, with the purpose of creating an open space for new local business opportunities, as well as investments from foreign companies (USAID, 2015). Public finance played a key role in absorbing the risk and building networks facilitating the private sector; The role of donors has been crucial also in the construction of active spaces through socio-technical narratives addressing transnational business promotions, building up commercial diplomacy, though, for example, the organization of low carbon networking events (Newell and Phillips, 2016).

However, especially concerning large investments in geothermal and wind power, high-level uncertainty was faced by RET private investors, despite the neoliberal pathways and the abundance of donors' financial and expertise support (Newell & Phillips, 2016). High up-front investment costs and low operational costs undermined for decades the enhancement of competitiveness of RET development compared to fossil fuel alternatives (Newell et al., 2014). Hence, the GoK has been committed to tackle this issues through the enactment of policy strategy and regulations that made low-carbon investments more attractive for IPPs (*stretch-and-transform strategy discussed below).* The fit-and-conform approach has been thus considered insufficient to bear the comparison with price and performance with existing technologies, such as fuel and charcoal utilisation. The adaptation to the existent mainstream technology environment, has not been considered sufficient to undertake an appropriate empowerment process for RET niches.

5.4.2 **Stretch-and-transform national strategy**

The inherent disadvantage associated with investments in sustainable technologies have been addressed by the implementation of financial incentives and process simplification, as well as the introduction of permits and standards, limiting the utilization of fossil fuels. Since 2006, the Ministry of Energy attempted, through a national strategy, to create a new environment in which RET niches such as wind power, solar systems, small hydro-power, biomass cogeneration (heat and power), biomass and geothermal, could easily develop without being loomed by mainstream technologies. Hence, evidences for stretch-and-transform strategies can be found also in the enactment of the Energy Act of 2006, that introduced license exemption for systems below 4 MW capacity, as well as tax reduction and exemptions. It included the establishment of income tax holidays for some generation and transmission projects and tax exemptions for imports concerning equipment to be used for renewable energy equipment (IEA, 2016).

Moreover, an independent energy sector regulator, the Energy Regulatory Commission (ERC), was officially established in 2007, under the Energy Act of 2006. The Commission has been designed to manage the approval of Power Purchase Agreements (PPAs) and to prepare national energy plans. The main tasks ascribed to the Commission are: to set licensing procedures, to issue licenses and permits, to review regulations implemented by the Ministry of Energy, as well as environmental,

health, safety and quality standards. It has also the power to review and adjust energy's tariffs and to assist IPPs with the deployment of finances by the public sector (IEA, 2016).

In 2008 has been introduced the Feed-in-Tariffs policy, aiming at incentivizing the electricity generation from renewable energy resources. It revolutionised the RE regulatory framework, by creating an active space only for such kind of technology. For the first time, the FiT regulated the purchase of renewable energy generated by IPPs to fed the national grid. The REFiT gradually reduced the role of fossil fuels in the energy mix, in line with national mitigation goals (Newell et al., 2014). Donors have also played an active role in supporting this niche policy intervention: especially those that had implemented a FiT scheme in their own country (e.g. Germany) and the World Bank, that enforced the policy programme providing technical assistance on the FiT.
In line with most of the interviewees, Kenya is considered a good opportunity for investments in RE technologies: The Feed-in-tariff policy is the most supportive program.

In 2009, a policy programme addressing the transporting sector has been introduced to regulate the implementation of biodiesel generation projects: it instituted a mandatory authorization by the designated authority, requiring impact environmental assessment, health and safety standards.

In 2012, several regulations concerned with renewable technologies, have been implemented, addressing the reduction of GHG emissions in to enhance the capability levels of practitioners in the solar sector. The regulations were associated with solar water heating systems and the solar photovoltaic systems: The former regulation established that new premises with hot water requirements above 100 litres, are required to install a solar heating system; Already existent hot water premises should install a solar heating system within 5 years and use a solar heating systems reaching at least 60% of their hot water demand. The latter regulation introduced a licensing scheme that would help ensuring that all practitioners and installers of photovoltaic system would own high-level capabilities and know-how (Energy Regulatory Commission, 2014; IEA, 2016)

Moreover, in 2012, other important regulations concerning efficient energy management: these regulations concerned industrial, commercial and institutional consumers of energy, introducing provisions on the implementation and management of more efficient energy efficiency and utilization measures (Energy Regulatory Commission, 2014; IEA, 2016)

In 2015, regulation introducing tax incentives on imported renewable power-generating supplies has been implemented.

The table below show the timeline of the abovementioned implemented policies:

Policy	**Year effective**
Establishment of the Energy Regulatory Commission	2007
Feed-in-Tariffs	2008
Energy Regulation 1009 on Biodiesel Licensing	2009
Revision of the Feed-in-Tariffs	2010
Least Cost Power Development Plan	2010
Solar water heating regulation	2012
Solar photovoltaic regulation	2012

Energy Management regulation	2012
Second Revision of the Feed-in-Tariffs	2012
Tax incentives for renewable energy	2015

Table 12. Implemented policies (2007-2015). Created by the author. Data source: International Energy Agency.

By the total installed capacity (MW) per year, it can be observed that between 2000 and 2007, modest changes have occurred in the production of RE. Since 2008, geothermal power capacity has been enhanced. In correspondence with the enforcement of the stretch-and-transform strategy, between 2008 and 2009, the national RE capacity start to be significantly enhanced.

It can be observed that both strategies have been implemented by the Kenyan government. Initially, a process of liberalisation of the energy sector, that tried to increase competitiveness among traditional and new energy technologies and to attract major donors' support to develop sustainable technologies. Nevertheless, this *smooth*er approach has been later integrated with more active policy strategies enacted by powerful RE technology advocates. Here below is showed an outline of the Kenyan strategies:

Fit-and-conform and stretch-and-conform strategies in Kenya		
Fit-and-conform strategies	Actions from technology advocates aimed at making low-carbon technologies more competitive with mainstream socio-technical practices in otherwise unchanged selection environments	1. Neo-liberalisation of the energy sector (IPPs). 2. Low-carbon networking events (by donors) 3. Technical assistance (by donors)
Stretch-and-transform strategies	Actions from technology advocates aimed at changing mainstream selection environments in ways that more amenable for the niche innovation	1. Creation of new institution (Energy Regulatory Commission). 2. Introduction of the financial incentives and regulations (FiT) 3. Enactment of regulations addressing specific RE technologies (SWH and solar PV system) 4. Regulation on energy efficiency (Energy Management) 5. Subsidies and tax exemption of RET

Table 13. Niche management strategies. Created by the author. Data source: International Energy Agency.

5.4.3 **The Feed-In-Tariff**

Considered worldwide as one of the most successful policy scheme in the promotion of private investments in renewables, many developing countries have recently applied lessons learned by northern countries' experiences by introducing different models of Feed-in-Tariff policy.

In 2008, the Kenyan Ministry of Energy has enacted a Feed-in Tariff scheme, approved by the Kenya's Public Procurement Oversight Authority. In such policy-making process were involved the Ministry of Energy, The Energy Regulatory Commission (ERC), Kenya Power, and Kenya Electricity Generation Company (KENGEN) (Ngang et al., 2013). The purpose of these authorities was to increase the general power capacity generation of the country; to promote the utilisation of RES; to facilitate the development of small-scale projects. Specifically, the aim was to set up the renewable electricity market and to open rooms to private investors (Ngang et al., 2013). Therefore, the policy has been designed to increase investment security of RE electricity generation, providing adequate incentives to private investors, thus enabling the nation-wide diffusion of private investments by creating price certainty (Ministry of Energy, 2012). This policy mechanism guarantees fixed payments and long-term contracts to electricity producers utilising low-carbon power sources. The FiT policy advocates the advantages associated with the utilization of RES, such as the reduction of GHGs emissions, the enhancement of sustainable economic growth (e.g. job creation, financial risk reduction, etc.) and the enhancement of electricity security.

According to the president of Netfund, the introduction of the Feed-In-Tariff (FiT) has been one of the most critical policy programmes addressing the development of the Kenyan RE technology niches (Interview 6, 2017).

This policy mechanism introduced a regulatory scheme for negotiation between RE Independent Power Producers (IPPs) and off-takers at a pre-determined tariff for a given period: The mechanism required system operators to connect plants generating renewable energy, ensuring priority purchase of their electricity. Policy-makers attempted to tackle costs borne by off-takers (small producers), as well as transaction costs associated with the introduction of standardised PPAs (Ministry of Energy, 2012). The regulation establishes an upper threshold concerning the capacity and the tariff that the grid operators are required to pay to the power producers. The tariffs are technology and capacity-specific and are guaranteed for 20 years (15 years in the first FiT version of 2008) from the beginning of the Power Purchase Agreement (PPA), signed by the investor and the off-taker. One of the main advantages derived from the RE FiT is the 'burden-sharing' mechanisms, which implies the equal distribution of additional costs caused by policy among electricity consumers (Ngang et al., 2013). Grid operators can recover part of the costs (up to 2.6 cents/kWh) directly from consumers, by applying a fixed marginal increase over the electricity price (Ministry of Energy, 2012).

The retail tariffs are designated considering the valuation of the costs implied in the building, operation and maintenance of the power plants, as well as the estimated lifetime and installed capacity of the plant. These tariffs vary accordingly to the generation capacity, the type of energy source and the type of producer (firm or non-firm).

Under the FiT, project applicants are required to undertake a pre-feasibility and feasibility study, necessary to obtain the approval from the designed institution (e.g. the Ministry of Energy), respecting established valuation schemes (Ministry of Energy, 2012). Also, they shall present an official

expression of interest (EOI) to the authority. Renewable projects should be valued as technologically and economically viable; also, they must conform with grid connection requirements and should secure adequate financial availability and meet legal and regulatory approval. The final approval shall be provided by the Energy Regulatory Commission, under the Ministry of Energy and projects are accepted on a first-served basis (IEA, 2014; Ministry of Energy, 2012). The Feed-in-Tariff shall be reviewed every 3 years from the first enactment to correct observed implementation flaws, to adjust to current costs and to adapt to technology advancement (Ministry of Energy, 2012).

The Feed-in-tariff policy in Kenya (2008) was initially concerned with the generation of electricity from only three RES, namely wind power, small-hydro power and biomass (IEA, 2014). Wind power and biomass power's producers were assigned a maximum capacity of respectively 50 and 30 MW; whereas small hydro-power's investments could achieve a maximum of 10 MW installed capacity.

Source	**Minimum capacity (MW)**	**Maximum capacity (MW)**	**Tariff USD/kWh (firm)**	**Tariff USD/kWh (non-firm)**	**Appliance**
Wind	N/A	50	0.09/kWh	N/A	The first 150MW of firm power generated and the first 50MW of non-firm
Small Hydro-Power	0.5	1	0.12	0.10	The first 100MW of firm power generated and the first 50MW of non-firm
	5	10	0.08	0.06	
Biomass	N/A	40	0.07	0.045	The first 150MW of firm power generated and the first 50MW of non-firm

Table 14. Created by the author. Data source: Ministry of Energy, 2012; USAID, 2015; IEA, 2016.

The policy has been reviewed twice since the first enactment in 2008, respectively in 2010 and 2012. Policy changes addressed the clarity and understanding of some of the clauses and in terms of tariff and capacity thresholds, to adapt to the requirement of power producer utilizing different sources. The first revision of the policy was put into force in 2010, aiming at enhancing the support given to private investors in RES power generation. Also, it introduced few changes to the established tariffs related to wind, hydro and biomass power and it introduced the regulation of three other RES, namely: geothermal, solar and biogas. Second, it prolonged the obligatory length of the agreement up to 20 years from the effectiveness of the Power Purchase Agreement (PPA).
To the first 150MW of firm power generated and the first 50MW of non-firm.

Source	**Minimum capacity (MW)**	**Maximum capacity (MW)**	**Tariff USD/kWh (firm)**	**Tariff USD/kWh (non-firm)**
Wind	0.5	100	0.12	0.12
Small Hydro-power	0.5	0.99	0.12	0.08
	5	10	0.08	0.06
Biomass	0.5	100	0.08	0.06
Geothermal	N/A	70	0.085	N/A

Biogas	0.5	40	0.08	0.06
Solar	0.5	10	0.20	0.10

Table 15. Created by the author. Data source: Ministry of Energy, 2012; USAID, 2015; IEA, 2016

The FiT policy has been revised in 2012 and introduced three important variations. First, it created standardised PPA contract agreements for both small and large-capacity projects. One of the major goals of standardized contracts was the reduction of time and transaction costs associated with negotiations. Second, it addressed the introduction of guidelines concerning grid connection of small scale renewables; Last, it established a standardized application form, as well as for progress reporting and monitoring (IEA, 2016).

Furthermore, the second revision modified the tariff and capacity thresholds, introducing two different rules between RE projects with small capacity, up to 10 MW, and projects with capacity above 10 MW. The Ministry of Energy set also a percentage cap cumulative capacity distribution system-wide generation different for each technology (IEA,2016; Ministry of Energy 2012). For large-scale projects, has been introduced a bidding process, enhancing competitiveness among project developers.

Here below are provided the respective tables representing the new capacity and technology-specific values revised in 2012.

Renewable energy projects connected to the grid up to 10 MW:

Source	**Minimum capacity (MW)**	**Maximum capacity (MW)**	**Tariff (USD/kWh)**
Wind	0.5	10	0.11
Small Hydro-power	N/A	0.5	0.105
	N/A	10	0.0815
Biomass	0.5	10	0.10
Biogas	0.2	10	0.10
Solar (on-grid)	0.5	10	0.12
Solar (off-grid)	0.5	10	0.20

Table 15. Created by the author. Data source: Ministry of Energy, 2012; USAID, 2015; IEA, 2016.

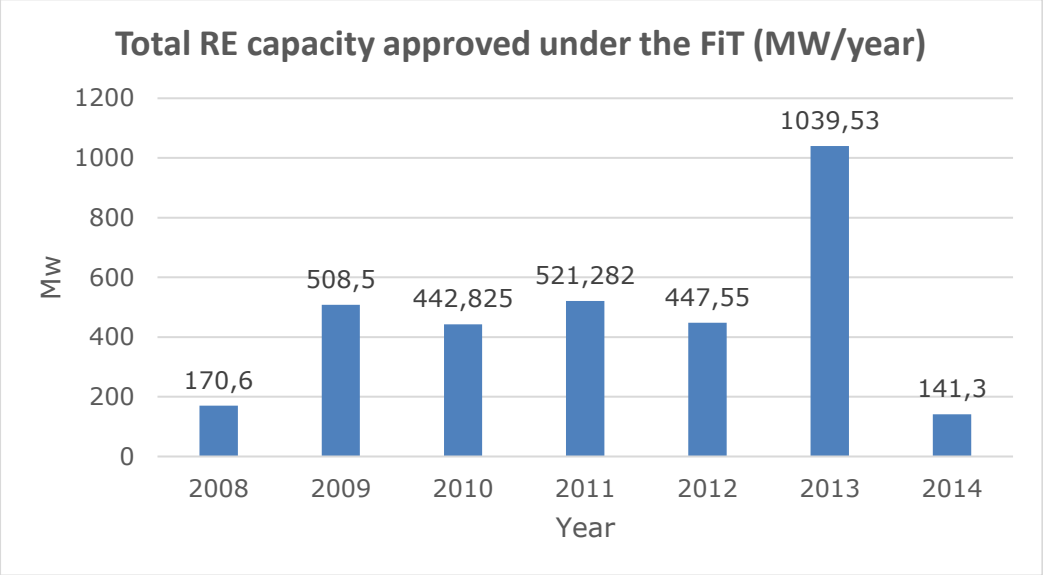
Renewable energy projects above 10 MW:

Source	**Minimum Capacity (MW)**	**Maximum capacity (MW)**	**Tariff (USD/kWh)**	**Maximum cumulative capacity (MW)**
Wind	10.1	50	0.11	500
Small Hydro-power	10.1	20	0.0825	200
Biomass	10.1	40	0.10	200
Geothermal	35	70	0.088	500

Solar (on-grid)	10.1	40	0.12	100

Table 16. Created by the author. Data source: Ministry of Energy, 2012; USAID, 2015; IEA, 2016.

Since the enactment of the FiT many small and large-scale projects have been approved by the Ministry of Energy. Considering the additional total installed capacity per year, the general trend shows a fluctuating pathway.



Graph 17. Total RE capacity approved under the FiT (MW/year). Created by the author. Data source: ERC, 2017.

During the first year of implementation of the policy (2008), a total of six EOIs have been approved under the FiT scheme, achieving an additional installed capacity of 170,6 MW. This increase was mainly driven by generation of two wind power projects of 60 MW installed capacity each. Three small-scale hydro-power projects (below 5 MW capacity) and the construction of a biomass power plant (40 MW) were also approved.

In 2009 have been approved 14 projects, reaching an expected total installed capacity of 508.5 MW. Again, a consistent part of the total installed capacity has been led by the implementation of wind power projects: In 2009 a total of 392 MW. However, as a German study observed, in 2013 only one private investment project was operating under the FiT, namely a small hydro power plant operated by KTDA 920kW (Ngang et al., 2013).

In January 2010, the policy has been revised introducing higher tariffs incentives for both firm and non-firm producers utilizing small hydro, wind and biomass. Wind power tariffs has been raised to from USD 0.09 in 2008, to UDS 0.12 per kWh; biomass tariffs have also increased to USD 0.08 per kWh and USD 0.06 per kWh for firm and non-firm, respectively. In 2010, has been approved a total expected installed capacity of 442.825 MW, spread on 14 projects. In 2011, 19 projects have been approved with a total additional installed capacity of 521.282 MW by wind, biomass and hydro power sources.

In the financial year 2011/2012 a total of 158 project applications have been received by the Energy Regulatory Commission, out of which 65% have been approved for a total of 102 renewable projects. Wind projects has the highest number of approvals, reaching a total of 42 projects out of 60 presented; mini-hydro projects also received a relatively high number of approvals, counting 32 approved projects in total (155 MW). Concerning power generation from biomass, 5 projects were presented

with an additional installed capacity of 222 MW: all the 5 projects received approval and an additional installed capacity of 222 MW. 44% of the proposed hydro-power projects were accepted (Energy Regulatory Commission, 2012).

	EOI presented		Approved		
Technology	**MW**	**Number**	**MW**	**Number**	**%**
Wind	3361	60	2292	42	68
Biomass	222	5	222	5	100
Hydro	303	50	155	32	44
Geothermal	70	1	0	0	0
Solar	1225	35	530	20	57
Biogas	59	5	49	2	40
Cogeneration	18	1	18	1	100
Sea Waves	100	1	100	1	100
Total	**5358**	**158**	**3366**	**102**	**62**

Table 17. Created by the author: Financial year 2011/2012 Source: Energy Regulatory Commission

Due to high transaction costs associated with the signing of PPAs, most of the additional capacity approved in the two years following the first FiT's revision, concerned large-scale projects developed by local or international investors (Ngang et al., 2013).

Between the financial years 2011/12 and 2012/13, the demand of electricity rose of 118 MW (from 1236 MW to 1354 MW), meaning an increase of 9.55%. Electricity generation has been increased of 5.44%, covering only part of the demand. Furthermore, the number of consumers connected to the grid has been increased of 14.3% compared to the previous year. The 70% of the national electricity in 2012/13 was generated by KenGen, whereas IPPs contributed to the 22%, generating a total effective capacity of 74.3 MW by renewable energy sources (e.g. Geothermal 48 MW; Bagasse cogeneration 26 MW and small-hydro 0.3 MW) and Emergency Power Producers (EEPs) only the 7%.

In the financial year 2012/2013 a total of 32 renewable projects received approvals from the Energy Regulatory Commission under the REFiT out of 69 EOI presented (ERC Annual Report 2012/2013). It can be noted that the number of solar power projects receiving approval has consistently increased compared to the previous financial year: this technology constituted the 50% of the total number of approved projects in 2012/2013. It was followed by mini-hydro projects (ERC Annual report 2012/2013)

	EOI presented		Approved		
Technology	**MW**	**Number**	**MW**	**Number**	**%**
Wind	N/A	N/A	N/A	N/A	N/A
Biomass	N/A	N/A	N/A	N/A	N/A
Mini hydro	N/A	N/A	N/A	N/A	28.125
Geothermal	N/A	N/A	N/A	N/A	N/A
Solar	N/A	N/A	N/A	N/A	50
Biogas	N/A	N/A	N/A	N/A	N/A
Cogeneration	N/A	N/A	N/A	N/A	N/A
Sea Waves	N/A	N/A	N/A	N/A	N/A
Total	**N/A**	**69**	**N/A**	**32**	**46.37**

Table 18. Created by the author: Financial year 2012/2013 –Source: Energy Regulatory Commission (Due to a clerical error the data were not correctly available on the website).

As stated above, at the end of the year 2012, the second revision introduced standardised Power Purchase Agreements and FIT Policy Implementation guidelines, as well as tariffs' changes to increase the attractiveness of the renewable private sector. In the year 2012, have been approved 15 projects, meaning an additional total installed capacity of 447.55 MW. The proposal of three off-grid solar projects have been accepted with an installed capacity below 1 MW.

Following this modification, in 2013 the highest number of projects and installed capacity has been reached, with a total of 47 projects and 999.53 MW, out of which 72% of the total installed capacity derived from private investments in solar (724.6 MW). Out of 40 solar projects (9 solar thermal power and 31 solar photovoltaic power) a total of 21 projects had an installed capacity above 10 MW. This was due to the fact that, for the first time, the FiT policy included incentives associated with larger solar projects (above 10 MW) and the relatively high tariff associated to their implementation of USD 0.12 per kWh. The implementation of 19 small solar projects (up to 10 MW) can be ascribed to the attractive tariff of USD 0.20 per kWh.

In 2013 a total of 43 projects were approved by the Commission for a total capacity of 669.43 MW. The highest additional capacity share was represented by solar, which accounted 82.85% of the total capacity; followed by small hydro projects accounting for 11.51%.

	Approved		
Technology	**MW**	**Number**	**% capacity**
Wind	0	0	0
Biomass/biogas	52	4	7.77
Hydro	0	0	0
Small hydro	77.83	20	11.51
Geothermal	15	1	2.24
Solar	554.6	18	82.85
Cogeneration	0	0	0
Sea Waves	0	0	0
Total	**669.43**	**43**	

Table 19. Created by the author: Year 2013. Source: Energy Regulatory Commission

In the year 2013/2014 a total of 25 projects have been approved under the REFiT. 44% of the total approval was concerned with the generation of electricity from mini-hydro technology projects. Also, solar power projects were successfully regarded, implying the 36% of the total additional installed capacity: all the 9 solar technology projects have been approved, reaching a capacity of 343 MW. During this period, only 3 wind projects have been presented and only two of them have been approved, with a total capacity of 140 MW. The total capacity approved in the years 2013/2014 has reached 586.48 MW out of 610.48 MW proposed, hence 96% of the EOI have been considered as conformed to the requirements established by the Ministry of Energy (ERC, Annual Report 2013/2014).

	EOI presented		**Approved**		
Technology	**MW**	**Number**	**MW**	**Number**	**%**
Wind	160	3	140	2	8
Biomass	3	1	3	1	4
Hydro	97.28	12	93.28	11	44
Small hydro	0	0	0	0	0

Geothermal	0	0	0	0	0
Solar	343	9	343	9	36
Biogas	7.2	2	7.2	2	8
Cogeneration	0	0	0	0	0
Sea Waves	0	0	0	0	0
Total	**610.48**	**27**	**586.48**	**25**	**96**

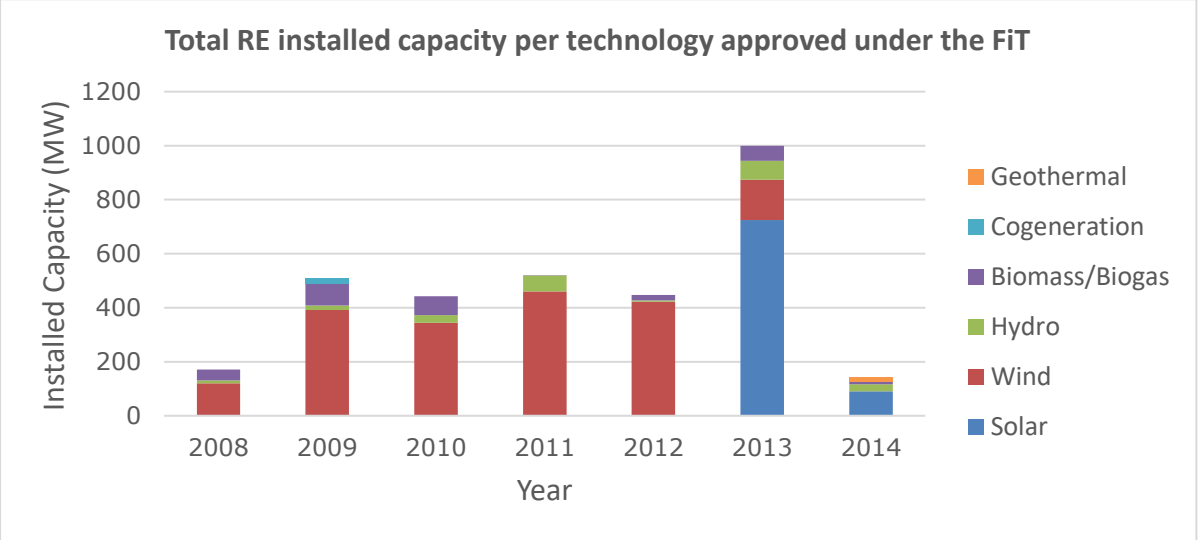
Table 20. Created by the author: Financial 2013/2014. Source: Energy Regulatory Commission

In the years 2014/2015 few EOIs were received by the designed authority compared to the previous years. A total of 23 projects were received and the same number have been approved by the Commission, meaning a total additional capacity of 423.5 MW. Small-hydro generation projects have reached the highest additional capacity (85.95 MW) spreads on 13 projects; only one wind power project has been presented and approved for a capacity of 50 MW. Whereas in 2014 only 15 have been implemented under the FiT with a modest total installed capacity of 141.3 MW.

	EOI presented		**Approved**		
Technology	**MW**	**Number**	**MW**	**Number**	**%**
Wind	50	1	50	1	11.8
Biomass		0	222	5	100
Hydro	0	0	0	0	0
Small hydro	85.95	13	85.95	13	20.3
Geothermal	0	0	0	0	0
Solar	120	3	120	3	28.4
Biogas	167.3	6	167.3	2	39.5
Cogeneration	0	0	0	0	0
Sea Waves	0	0	0	0	0
Total	**423.25**	**23**	**423.5**	**23**	**100**

Table 21. Created by the author: Financial year 2014/2015 Source: Energy Regulatory Commission.

The following graph shows the yearly total installed capacity per technology/year:



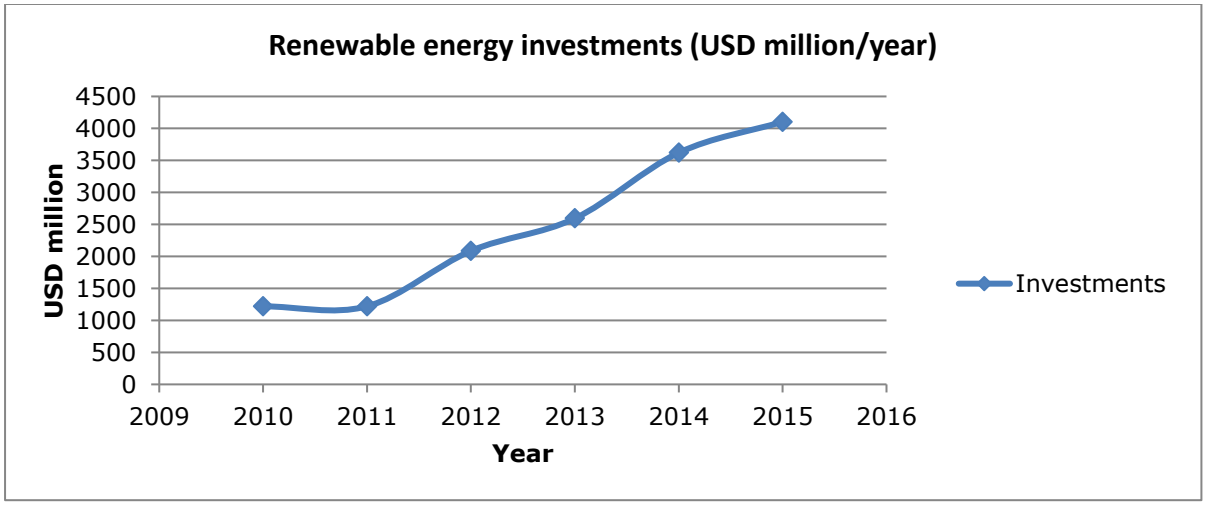
Graph 18. Total RE installed capacity per technology approved under the FiT (MW/year). Created by the author. Data source: ERC, 2017.

In general, it can be observed that the REFiT has facilitated medium/large RE investments, rather than small investments. The FiT had a positive role in attracting investments especially in solar and wind and has been more successful in Kenya rather in other many adjacent regions because of its historical market orientation (Interview 10, 2017). The table below shows the percentage of installed capacity approved under the FiT of projects above 10 MW. Since the first enactment of the policy programme, an average of 95.02 projects approved was above the 10 MW installed capacity.

Year	Number of project > 10 MW	Total installed capacity > 10	Total installed capacity	%
2008	3	161.6	170.6	94.72
2009	7	505.2	508.5	99.35
2010	10	434.825	442.825	98.19
2011	12	500	521.282	95.92
2012	8	444.7	447.55	99.36
2013	29	1034.53	1039.53	99.52
2014	4	110.3	141.3	78.06

Table 22. Created by the author. Data source: ERC, 2017.

The general trend of RET investments is observed to be significantly increased since the implementation of the second revision of Feed-in-tariff, in 2010. Around 1220.26 USD million have been invested in 2010 and 2011, experiencing a steady increase in the following years. It has been calculated a 0.41% growth rate of cumulative clean energy investments (Climatescope, 2016). The following graph depicts an estimation of the investments trends in RE technologies considered under the FiT: it includes investments in clean energy generation projects up to 50MW installed capacity.



Graph 18. Created by the author. Data source: Climatescope, 2016.

The introduction of the Feed-in-tariff overall benefitted all type of RE technologies, especially it has provided extra incentives for solar and wind private producers, since they have most of the time a cost-effective tariff and the utility has facilitated also the IPP, so makes very attractive from an institutional and policy perspective (Interview 10, 2017). The Lake Turkana, with a total expected installed capacity of 320MW, is the largest clean energy project that has been benefitted by the subsidy scheme of the FiT. Other projects that have been approved, are still in their early planning stages. Since the second revision of the policy, a handful of solar technology projects normally around 40MW installed capacity each, have been approved under a tariff of USD 0.12-kWh (Climatescope,

2016). The successful of the policy, can be highly ascribed to the time saving introduced by standardised PPA contracts.

Larger-scale projects have been observed to face more extensive planning process, thus, it can constitute one of the causes for developers to start targeting generation projects with limited Mw. The approval process for generation projects up to 1MW is normally less time-consuming (Climatescope, 2016). However, according to an expert under such incentivising programme, even the geothermal sector has been well developed with numerous business models that can, in the short-term, been adopted also by the private sector (e.g. bidding for well heads or expressing your interest in green field development) (Interview 8, 2017).

Despite the tangible advantages derived from this policy mechanism, there are a few drawbacks affecting the effectiveness of FiT both for investors and society, that may have constrained the presentation and/or approval of EOI from private investors. By analysing different FiT models and options applied worldwide, Couture et al. (2010) listed the disadvantages as following:

1. It is likely to upward pressures on electricity prices borne by consumers;
2. High up-front costs associated with renewable energy technology are not addressed;
3. Payments are set independently of market signals;
4. Market competition between project developers is likely to be abated;
5. The difficultness in allocating costs across ratepayer groups.

Especially high up-front costs in Kenya constitute a challenge for the achieving financial closure of RE projects; this has mainly been addressed by financial help received from the government, development agencies and multilateral development banks (Boampong and Phillips, 2016).

Project developers have been constrained by relatively high interest rate, preventing the possibility to undertake adequate feasibility studies prior the submission of the EOI. The policy does not consider such overall capital costs therefore limiting investment opportunities especially for SMEs and community projects (Ngang et al., 2013). Thus, one of the flaws of the FiT is that it does not encourage smaller producers for which loans' accessibility may result too low to establish projects with a minimum capacity of 0.5 MW. For example, household producers installing rooftop-solar panels are not able to gain advantage from the FiT scheme, constraining the possibility of having a community treatment investments in RE (Interview 6, 2017). Especially, poorer rural communities normally do not own appropriate financial resources and capabilities to undertake feasibility studies and to implement projects above the minimum capacity of 0.5 MW, because of the impossibility to bear up-front investment costs and high interests rate associated with loans. One of the major consequences, is that rural electrification is not appropriately addressed by this policy scheme, thus all the micro-grid and mini-grid projects are implemented beyond the Feed-in-tariff.

However, the Government attempted to address this issues by using international finances received from the Infrastructure Development Agency (IDA) for Kenya Electricity Expansion Planning (KEEP) to scale up the mini-grid capacity and to enhance technical feasibility of mini-scale projects. In 2014, the Government of Kenya presented an expression of interest for consultancy services to implement feasibility studies of private sector RE mini-grids to individuate technology opportunities for low-carbon private investments (Ministry of Energy and Petroleum, 2014). Hence, the GoK's strategy was to reduce the obstacles encountered by private investors, with initial support of the public sector: the

main purpose is to create windows of opportunities for mini-grid projects for financially constrained investors to implement necessary technical feasibility studies. On one hand, this would promote the diffusion of capabilities and know-how, allowing, in the future, to enhance the capacity of the private sector to proceed with decremented public financial and technical support.

Several project applications have also been held back due to obstacles associated with obtaining large plots of land (Climatescope, 2016). Land-related issues have not been tackled by policy or specific regulations so far, thus are expected to constitute a challenge for future projects.

Furthermore, the power demand growth is expected to slow down in the following years, thus constituting a limitation the need for energy generation *´The stamina and risk appetite required to overcome these challenges, combined with slowing power demand growth, casts a shadow on the more than 900MW of PV projects whose initial 'expression of interest' has been approved. ´* (Climatescope, 2016). To address this problem, the Government should strengthen policies and regulations addressing the favouring of generation from renewables to fossil fuels utilisation.

The number of approved projects has also been limited by the lack of technical expertise, preventing again pre-feasibility and feasibility studies necessary for to gain authorities' authorization (Ngang et al., 2013). Technicians in Kenya have constrained technical capabilities and know-how, thus relying on learning-by-doing approaches, limiting the possibilities of implementing RE projects. Also, the Ministry of Energy received some accuses concerning the favouring of projects implemented by government institutions, rather than independent private investors (Ngang et al., 2013)

Other criticisms towards the Kenyan REFiT scheme have been raised by investors and experts: First, incentives provided to the development of large-scale PV projects are quite ambiguous, since the established tariff of USD 0.12 per kWh was considered insufficient to achieve financially viability of projects. Such tariff is expected to provide only a nominal return to investors due to high up-front capital investments and high operational costs. However, the PV FiT has not considered to be reviewed, because of its high market-competitiveness expected to lead the diffusion of such technology (Willis, 2014).

Other criticisms came from the investors' front, concerned with the high interest rates and capital costs that was not addressed by the policy, making private investments less attractive and preventing financial closure.

Furthermore, the 70% of the costs of the FiT are borne by electricity consumers', causing a marginal increase of electricity, reaching already relatively high rates. The likelihood of a rebound effect in the short term, resulting from unaffordable electricity prices for most of the population, has been cause of major critics. However, in the medium-term, has been observed that the advantages associated with the reduction of technology and transaction costs borne by investors are likely to create economic surplus. This depends on the overall increase in installed capacity will reduce the likelihood of recurring to emergency thermal and hydro generation in dry seasons, reducing electricity costs. Therefore, despite the critics, private investments have not been limited, so far by such an issue.

5.4.4 **Regulations, 2012**

A wave of licensing schemes and regulations was implemented by the Ministry of Energy in 2012,

addressing technicians, contractors/vendors, auditors and audit firms concerned with specific renewable technologies. The Energy Regulatory Commission is the designed authority in charge of evaluating and taking decisions about the licensing.

A specific regulation was issued for both solar photovoltaic systems and SWH systems, concerning both contractors and technicians for both the technologies.

Moreover, the Commission oversees the evaluation of energy auditors and audit firms that, under the Energy Management regulation (2012) have are involved in the energy inspection of energy conservation and efficiently, by introducing energy audit for industrial, commercial and institutional consumers of energy. With the latter regulation, was introduced the requirement for mandatory official inspections, to be conducted every 3 years, for all designated facilities consuming more than 0.18 MW per year for industrial, commercial or institutional purpose. The article 106 of the Energy Act 2006, read '*The owner of a building designated under section 105, shall conserve energy, audit and analyse energy consumption in his building in accordance with the standards, criteria, and procedures as prescribed by regulations.*' This new regulative scheme has been implemented to tackle problems related with low uptake of energy efficiency and conservation and was expected to increase the diffusion of best practices concerning energy consumption.

Before 2012, a policy framework addressing the energy efficiency consumption was not contemplated. The introduction of energy audits regulation, therefore, implied the commitment of all type of consumers (industrial, institutional and commercial) to undertake efficient energy consumption pathways. On the other hand, the licenses required to carry out energy audits, tackled problem associated with lack of qualified and certified practitioners undertaking efficiency assessments and as well as project development and implementation (Energy Regulatory Commission, 2016).

After the introduction of the Regulations, 2012, during the financial year 2013/2014, the Commission received 1540 applications, out of which only 201 received the license to operate. Out of the 1540 applications received, 14.48% were presented from solar-water heating technicians; only 1.40% and 1.75% by, respectively, solar PV manufacturer and solar-water heating contractors, respectively. The higher percentage, 56.82%, was presented by solar PV technicians. Solar PV contractors and vendors submitted 15.32% of the total applications. 0.06% presented the demand for license exemptions for SWH systems. Energy auditors and energy audit firms presented respectively 1.23% and 8.90% of the total proposals.

In total, during the first financial year, only 13% of the total number applications has been licensed.

Applicants	**Number of application**	**% of total application**	**Number licenses issued**	**% of accepted application**
PV technicians	223	14.48	64	28.70
PV manufacturer	22	1.40	4	18.18
PV contractors/vendors	236	15.32	79	33.47
SWH technicians	875	56.82	10	1.14
SWH contractors	27	1.75	4	14.81
Energy auditors	19	1.23	28	147.37
Energy audit firms	137	8.90	12	8.76

Exemption SWH	1	0.06	0	0.00
Total	**1540**	**100**	**201**	

Table 23. Applications received in the financial year 2013/2014. Created by the author. Data source ERC Annual Report financial statement 2013/2014.

Solar photovoltaic applications scored the highest number of licenses issued, with 62 licensed auditors and technicians and 70 licensed audit firm contractors. During the financial year 2014/2014 no exemptions were provided. The lowest number of licenses issued associated with SWH systems was mainly ascribed by the Commission to the lack of capability of technicians in the country.

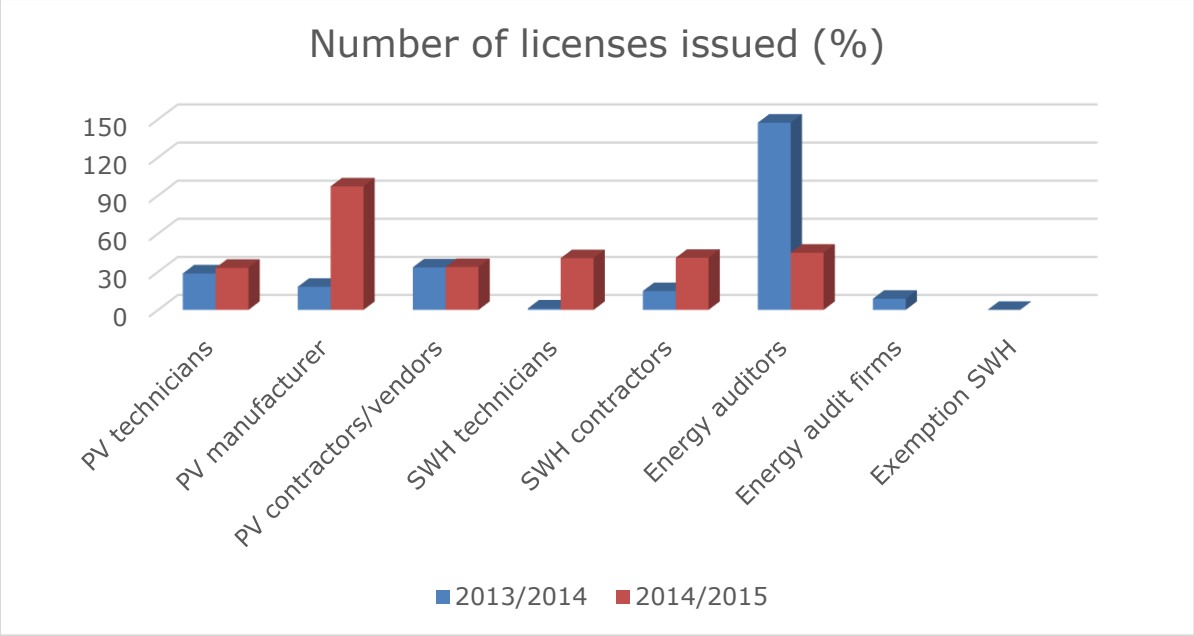
During the financial year 2014/2015 the solar photovoltaic sector received again the highest number of licenses issued: a total of 232 licenses for technicians and 248 licenses for PV contractors. A total of 47.32% of presented applications received the approval. Despite this, only 67% of the total technicians' applications were rejected by the Commission, whereas only 3% of the total applications received by technicians were rejected.

The time required from the Commission to elaborate the proposal was in average 29 days, with the higher number of days concerned with the applications proposed by Solar PV technicians. Concerning the regulations of energy auditors and audit firms: a total of 16 licenses for energy auditors and 9 licenses for audit firms.

Compared to the previous financial year (2013/2014) a higher number of SWH systems' technicians received a license's approval 33,7% of the total presented applications (58 licenses in total). SWH contractors received 11 new licenses (47% of total presented application).

Applicants	**Number of application**	**% of total application**	**Number licenses issued**	**% of accepted application**
PV technicians	700	57.60	232	33.14
PV contractors/vendors	255	21.02	248	97.25
SWH technicians	172	14.179	58	33.72
SWH contractors	27	2.241	11	40.74
Energy auditors	39	3.32	16	41.03
Energy audit firms	20	1.64	9	45.00
Total	**1213**	**100**	**574**	

Table 24. Applications received in the financial year 2014/2015. Created by the author. Data source ERC Annual Report financial statement 2014/2015.



Graph 19. Number of licenses issued. Created by the author. Data source: ERC Annual Report financial statement 2014/2015.

The enactment of such regulative system concerning technology systems and efficient energy management, have created an appropriate active space to operators in this technoogy field, inexistent before. Even if is still too early to define the effectiveness of such specific policies, it can be observed that the market space has been expanded in the financial year started in 2014, compared to the previous year. During the former year, only the 13% of the total applications has received the license, whereas in the financial year 2014/2015, 47% of the total applications has been accepted. A higher number of licenses issued, means higher likelihood of improving the general capability of the RE sector, by directly addressing the first and second-line operator (technicians, contractors and auditors). Besides creating an active and supportive playground to the development of low-carbon niche technology, the stretch-and-conform approach, also addressed problems related to the capability of the private sector.

6. Discussion

Having provided a descriptive understanding and triangulation of complex dynamics embedded within the Kenyan energy transition, this section presents an analytical reflection of the author on the overall findings.

This study posed a question on changes towards low-carbon economy observed in Kenya and the key factors that may have influenced them, thus explaining the emergence and the trajectory of energy transition looking at the macro, meso and micro level of socio-technical systems. A steady increase since 2006 has been observed looking at the trends associated with three dependent variables, namely: the total of energy policy changes, the energy RE electricity output (kWh) and the level of private investments in RE technology (USD). Through the investigation of associated independent variables, this dissertation attempted to explain how and why variations have occurred over the last decade.

Three main issues stand out from the conducted analysis depicting the analytical framework that has been discussed at the beginning of the dissertation:

1. The role of common global drivers and the way in which they are perceived and integrated within the socio-technical context of East-African countries.
2. The influence that endogenous governance reconfiguration, transferring power to the sub-national level, had on the RE electricity output.
3. The influence that stretch-and-transform strategy had on RET private investments through the creation of a more amenable environment for renewable technologies.

The first hypothesis shed light on the macro level of socio-technical systems, investigating the characteristics of a purposive transition to explain the overall increase in the number of energy policy changes. Findings showed that selective pressures exerted at the macro level have been received within the existing socio-political context and integrated through a co-operative approach. The Government interaction with other state and non-state actors has been crucial in the realisation of this transition. Incumbent regimes have their own resources, that may be adjusted or replaced during a transition process whether considered inadequate to manage an articulated response to selective pressures. The role of global climate goals has been investigated in previous literatures, looking at how the domestic policy outcome is shaped at national and sub-national levels (see Naess et al., 2015) and it has been embedded in discourse on how such pressures have influenced the pathway of domestic energy transition. Moreover, expert opinions converged on the idea that widespread sustainable worldviews influenced the depart from the incumbent regime, implying an overall transformation of tangible (e.g. institutions) and intangible factors (e.g. political beliefs, social values, etc.) that has been reflected by the national context that selection pressures entered. An attentive study of grey literature on the overarching international governance's network found out that the common diagnosis was the shortcoming of the Kenyan incumbent regime. Independent variables have been assessed to verify whether the resources where found externally or internally the existing regime: First, it has been observed that a total of nine new institutions tackling climate change and environmental governance issues have been created. These governmental bodies have been designated with the purpose of accelerating the integration of climate change issues into adaptation and mitigation goals with assigned tasks concerning the implementation of risk reduction strategies, mitigation actions, environmental issues management, meteorological analysis and energy market configurations. Also, the integration of climate change mitigation and adaptation goals into energy policy has required the preparation of official documents, such as Vision 2030, the Least Cost Power Development Plan (LCPDP), the National Energy Policy, the National Climate Change Response Strategy (NCCRS) and the Climate Change Action Plan (CCAP) based on a participatory approach among international and national stakeholders. The other independent variables were related to the country's capability associated with low-carbon resources, namely capital, knowledge and information access: it has been demonstrated that the financial aid received by international development agencies has been a key factor to the deployment of RE, as well as the international support to introduce knowledge and *know-how* related with the process of generation, distribution and utilization of clean energy solutions. Information access, has also been found to be absent within the existing regime. Hence, the diffusion of climate change awareness has been built *piece by piece* with the support of non-state actors and local climate change advocates. Therefore, Kenya's articulated responses to selective pressures have been mainly built upon capabilities available outside the regime.

The investigation of the independent variables associated with the *locus* of resources, showed that the Kenyan transition retraced the purposive transition's scheme, as described by Raven et al. (2015). It can explain the steady increase of the total number of energy policies designed by the newly established institutions, that has been observed over the last decay.

Resources	Localisation
Institutions	Mainly external the existing regime
Finances	Mainly external the existing regime
Knowledge and capability	Mainly external the existing regime
Information resource	Mainly external the existing regime

The second hypothesis brought about important insights concerning governmental agency associated with the coordination of selective pressures: changes of internal governance arrangements was necessary to enhance the policy-making process steering the shift from the incumbent regime. In this study, distribution of power has been taken as a key feature of the performance of governance in relation with variation of RE electricity output. Previous studies demonstrated that good governance has been found to be correlated with higher quality of electricity supply. Hence, this dissertation explored the inherent interrelation *landscape-regime*, looking at governance reconfigurations, where '*governance processes are considered as part of the overall analysis of factors constituting the regime*' (Smith et al., 2005).

The independent variables were associated with three key factors determining the achievement of good governance, namely public participation, transparency and corruption level. The developed narrative on devolution of power showed how the idea of reconfiguring the sphere of legitimacy of state actors came across with high expectation in citizen engagement, transparency enhancement and corruption reduction. Experts agreed on the overall enhancement of public participation, since the new governments have been brought closer to the citizens. However, the confidence of Kenyans with regards to public authorities' affairs and the trust placed in local governments has not achieved visible increased levels. The rating of performance to access to information has been found slightly lower when related to county governments; The rating of performance of anti-corruption measures traced the same pattern. Despite this, the perception of corruption among locals has been reduced nation-wide since 2013. These observations can be partly ascribed to the long-term process that is inherent to the eradication of these political issues. On the other hand, the level of public participation has been regarded to be significantly enhanced, shrinking the gap between local governments and citizens, involving an increased number of stakeholders in the policy-making processes and improving the governments' responsiveness to local needs.

Hence, the study showed positive insights supporting the achievement of a better governance has positively influenced the administration and utilisation of renewable energy resources. In fact, despite the recent occurrence of the process and some above-mentioned drawbacks associated with the newly created sub-national governments, expert opinions converged on the view that energy administration and planning have overall been enhanced by the shift of power. Experts opinions agreed that devolution supported the enhancement of electricity access nation-wide, explaining the increased level of RE electricity output observed since 2010.

Much can be done at empirical level to study the effects of devolution on renewable energy governance. An investigation at county level went beyond the purpose of this dissertation, due to the recent devolution pathway and the limited data availability concerning sub-national entities. Future researches may focus on empirical evidences at sub-national level to show what have been the local development of RE sources since the implementation of devolution and whether horizontal policy transfer is likely to occur.

The last hypothesis investigated **t**he emergence of low-carbon technology through a descriptive policy analysis based on the concepts of fit-and-conform and stretch-and-conform strategies. Despite the windows of opportunity for niche development opened by the destabilisation of the socio-technical regime, the market space was still barely developed to integrate clean technologies, thus hampering the depart from the incumbent regime. The regulative system based on mainstream technologies has for many years hampered the empowering of green niche innovations. The analysis brought about evidences that a fit-and-conform strategy has barely supported the low-carbon development. Hence, a radical reconfiguration of the mainstream environment through changes in the energy market regulative structure, has been necessary to enhance the competitiveness of new technologies.

The first independent variable was the number of policies associated to the stretch-and-conform strategy. A qualitative assessment showed that since 2007, several policies have specifically addressed the regulation of clean technologies, favouring the creation of an active market space for a low-carbon development. The number of projects accepted under the Feed-in-Tariff scheme has been investigated as independent variable, finding out that the total RE installed capacity approved by the Energy Regulatory Commission has been highly increased. The third independent variable was the number of licensed technicians issued under the Regulations of 2012. Due to the recent introduction of the photovoltaic and solar-water heating systems regulations the evaluation has been constrained by the lack of historical data, but it has been observed an increase in the number of licenses issued between the financial year 2013 and 2014.

Hence, the regulative system has been adapted to the new technologies, enabling them to compete with the mainstream technology that had led the energy sector until that moment. The active space opened to the operation of the RE private sector has been observed to increasingly enhance the number of investments in the renewable technologies. The RE installed capacity has been significantly increased after the introduction in 2008 of the Feed-in-Tariff programme and its following revisions.

Read in these terms, such consideration enables RET advocates to consider the enactment of such strategy, including donors' aid and engaging civic society actors to support the development of policy programmes, also drawn from developed countries' experiences (e.g. the Feed-in-tariff model) to facilitate the competition between innovative and mainstream technologies.

Figure 3 shows a representation of the transition pathway intended as complementary changes occurring at the three heuristic levels:

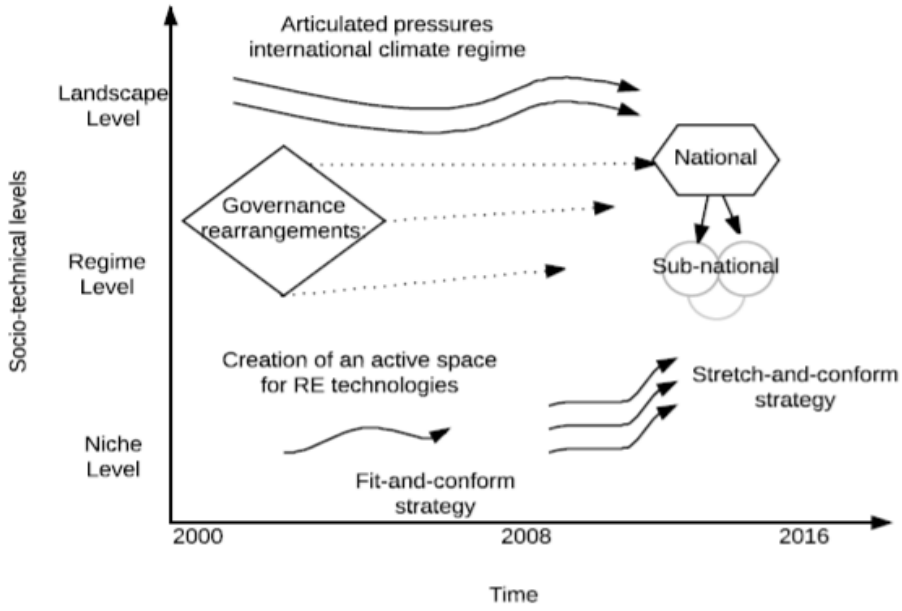


Figure 3. Created by the author.

The above-developed analytical framework can function as a framework for formulating short and long-term objectives and evaluating existing policies and governance arrangements. It can be a base to bring together state and non-state actors on the reflection on how effectively enact transition management, considering the comprehensive socio-political subsystem in question. In contrast to the often political-economy orientation utilised in preceding literatures, this study explored the occurrence of governance arrangements on which transitions develop.

Looking critically at the findings, attention can be focused on the inherent *intersectionality* existing among forces developed at the three heuristic levels. The multi-level perspective on socio-technical transitions allowed an analysis of changes occurring at different scales and it should be perceived as a partially open system where interchanging dynamics converge towards the same direction, passing from one dimension to another, bilaterally, in a continuous and incrementally influential manner. The concept of time was crucial in the depicted mosaic to explain the interrelation between international, governmental actors and technology advocates strategies. The influences exerted at the macro level from international visions have been crucial in causing a disruption of the cluster of actors, interests and institutions that would be otherwise stayed unchanged. Nevertheless, the impact that has been observed, highly depends on the timing in which pressures have been received: The current level of stability of the existing socio-technical regime is crucial. Hence, the precarious situation of the energy system in Kenya played a crucial role in determining the urge of achieving a long-term feasible stability, implying the need for a pro-active management of the adaptive response. An investigation of energy transitions creates an open space for discourses facilitating the understanding of bilateral and multilateral international development agencies on how providing target-specific aids and support tailored on specific socio-political contexts. The case of Kenya depicted an example of transition pathway in which the lack of internally endowed resources has had a positive influence on the shift from the incumbent regime, since it was combined with a high coordination, not only among state actors, but also between state actors and international actors. However, the achievement of such reformative configuration would have not been possible if the Government of Kenya would not have

showed a positive attitude towards political and social acceptance of supranational regimes, enabling the absorption of pressures from the 'outside', translated into governmental agency through a strong coordination between international and local actions, even if driven by different vested interests. Hence, in similar contexts, local governments and international agencies should be coordinated to efficiently support sustainable transitions, since most of the resources are found outside the incumbent regime.

The developed analytical framework utilised to study the effects of decentralisation of power to subnational governments, aiming at enhancing the national governance system, can be interpretive of which governmental and political transformation is likely to function as accelerator of energy transitions. In the case of Kenya, central government's vested interests are still regarded as a major concern in Kenya, that breeds corruption, thus hampering the effectiveness of policy programmes. Further recommendations concern major governmental efforts in public sensitisation, both at national and sub-national level, through implementation of information campaigns (Interview 4; Interview 8, 2017). Local governments shall focus on small-scale producers and effective local solutions, since national government are normally focused on the economic development of the country. Hence, recommendations prior the implementation of structural changes suggested the strengthen of the legislation on access to information, to enhance transparency, and accountability of local governments and to increase the participatory level of citizens. Expert interviewees agreed on the opinion that more finances at subnational level would be needed and that major independency on energy planning and administration should be devolved to local governments to enhance the energy transition towards RE.

Also, there are several policy and strategic governance decisions that are conflicting with the transition to sustainability. For example, the Government of Kenya has recently supported the exploitation of fossil fuel/oil discoveries in Turkana and is currently considering to develop nuclear power plant to increase the energy installed capacity. Hence, in the short-term, these decisions may slow down the pace of adoption of renewable resources. The Government of Kenya should state clearly its pathway towards RE. According to the analysis and interviewees' opinion, the regulative scheme adopted by Kenya may be further enhanced and adapted to the need of the private sector. For example, the adoption of auctioning policy (now under development in the country) may be an important tool to enhance the diffusion of solar and wind technology (Interview 8, 2017). Furthermore, the Government should tackle the problem related with land appropriation, that is regarded as hampering the development of private investments. Land rights issue has not been specifically tackled by regulative schemes, yet. Hence, the likelihood of raising discontents among indigenous people is increased by disputes concerning land rights. This issues is likely to constitute a big obstacle to both private and public investments in RE technology (Interview 4, 2017). Fit-and-conform strategy should be combined with stretch-and-transform strategy to enhance effectiveness: The tariff fixed by the Feed-in-Tariff scheme provides only a nominal return to (small) investors due to high up-front capital investments and high operational costs.

7. Conclusions

This dissertation shed light on changes and drivers of energy transition in East-African least developing countries that have recently experienced low-carbon transitions, led by important changes to conform to the international environmental regime. Researches in the field of environmental governance

become a cornerstone to deal with the complexity of the global energy transition: understanding key factors of low-carbon transitions, such as drivers, obstacles and pathways, is important to manage and enhance the worldwide low-carbon transition. The MLP lenses have been particularly useful to study the dynamics behind the transition to renewables: Such approach permitted a comprehensive investigation of the complexities surrounding the shift to the low-carbon socio-technical regime. The development of socio-political discourses on low-carbon developments, the restructuration of the national distribution of power and the emergence of renewable technologies have been structured within a unique multi-faceted system. The MLP approach made possible the dissection, at the three levels (micro, meso and macro) of the transition process. Criticism to the application of the multi-level perspective can be found in the construction of boundaries among the three heuristic levels. Researchers tend to be forced to look at landscape levels as inherently associated with international forces, whereas the regime and the niche levels are downscaled to a national perspective. This approach is likely to constrain the global context in which transition are conceived and developed. These boundaries become rather fuzzy, especially in the context of recent energy transitions occurring in developing countries: hence, the approach should overcome the distinction based upon international/national visions and focus more on existing differences between clusters of actors and institutions driven by similar interests and common political beliefs.

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