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GREEN POWER FOR AFRICA: OVERCOMING THE MAIN CONSTRAINTS

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The Political Economy of Investment in Renewable Electricity in Kenya

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Abstract Kenya has been hailed as a successful sub-Saharan African country in attracting private investment for renewable energy. However, energy poverty remains very high, with connectivity rates lower than the average for sub-Saharan Africa and poor quality of supply for those connected. Several constraints persist to achieve universal access to clean and affordable electricity: high system costs, including a deficient transmission and distribution infrastructure; low rural demand and inadequate planning to meet it; and local opposition to large renewable infrastructure. This article considers the political economy of these constraints, explaining how they arose, which policies can address them and which actors back or oppose these policies. The overarching message is that a prominent state role is required to fund the network components of the electricity system and to reach the less profitable segments of society, namely the rural poor. However, this clashes with a dominant private sector-led narrative in the international development community.

Keywords: renewable energy, political economy, Kenya, electricity, sub-Saharan Africa, investment, constraints.

1 Introduction

Kenya is one of the African countries with the largest share of renewables in its generation mix. In 2015, renewables supplied over 70 per cent of electricity, mainly from hydropower and geothermal plants. Hydropower was the dominant source in the past, like in many other African countries, but the government sought to diversify supply to improve energy security. Geothermal was the preferred technology, because it could generate large quantities of least-cost base load electricity, which is the type of electricity that is available all the time to meet minimum demand. To harness their vast geothermal resources located along the Rift Valley, Kenya put in place a long-term geothermal development programme, largely supported by international donors through technical assistance and concessional finance. Kenya has subsequently become the largest producer of geothermal energy in Africa. Wind has also played an increasing role in the generation basket, and the country will soon boast the largest

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wind power plant in Africa, with the 310MW Lake Turkana wind farm currently under construction.

Despite a good track record in attracting private investment for renewable energy generation, some problems still persist, which prevent the goal of achieving universal access to clean, reliable, and affordable energy in Kenya. Connectivity rates remain lower than the sub-Saharan African average, and reliability is low for those connected outside of the cities, mainly as a result of an insufficient transmission and distribution network.

Many constraints prevail to increase investment in renewable energy that improves access to affordable, clean, and reliable electricity in Kenya, but some are more important than others. In a separate publication (Pueyo *et al.* 2017), we applied the new Green Investment Diagnostics methodology to identify the most binding constraints that if tackled could deliver the biggest 'bang for the buck' of the policymaker. We followed a systematic approach using a decision tree analysis drawing from the original growth diagnostics approach (Hausmann, Rodrik and Velasco 2004) and building evidence through the collection of indicators and interviews with key stakeholders from the government, project developers, technical advisers, sectoral associations, and financial institutions. Three key constraints preventing further investment in renewables came up strongly from our analysis: low demand and inability to pay in rural areas; high system costs due to a lack of networking infrastructure and an inflexible generation mix; and serious problems of social acceptance and access to land.

Identifying the most important constraints is essential, but not sufficient. To have their predicted effect, policies need to be implemented, and this is not a technical question, but a matter of political economy. Our political economy analysis looks at the underlying interests behind each constraint, the most promising policies to address them, and the actors who may block or support suitable policies. For our analysis we interviewed ten key stakeholders from the Kenyan energy sector.[1] We posed two questions: how did each of our identified constraints come to be? And who is driving or opposing policies to address it? The political economy analysis of constraints to RE investment required first a record of the policies that exist, and the development of an inventory of stakeholders or actors who have an influence on the targets and policies to improve the investment environment for renewable energy.

These are included in Section 2. Sections 3, 4, and 5 analyse each of the key constraints to investment in Kenya and the related policies that could solve them. Section 6 concludes with a discussion of the actors that support or oppose the policies required and the political alliances that could solve the impasse.

2 Policy and stakeholder mapping for renewable energy in Kenya

The key policy documents for Kenya's energy sector are the Sessional Paper No. 4 of 2004 (Government of Kenya 2004) and the

Energy Act No. 12 of 2006. They set up the institutional framework of the power sector after a process of liberalisation that started in the mid-1990s. These have been recently reviewed through the Energy Bill 2015, to align them to the national development strategy set out in Vision 2030 (Government of Kenya 2007) and the new Constitution of 2010, which established a devolved government system.

The 2006 Energy Act succeeded the Electric Power Act No. 11 of 1997. It provided for the establishment of a number of unbundled organisations evolving from the previous centralised, vertically integrated state utility. The public utility Kengen jointly with private independent power producers (IPPs) would undertake generation, whereas the natural monopolies of transmission and distribution would be separated into two state-owned enterprises: the transmission company KETRACO and the distribution company Kenya Power. While KETRACO is fully owned by the Government of Kenya, Kenya Power is listed on the Nairobi Stock Exchange, with the government holding 50.1 per cent of shares. The 2006 Energy Act also established the Rural Electrification Agency (REA), the Geothermal Development Corporation (GDC), the independent regulator Energy Regulatory Commission (ERC) and the Energy Tribunal that would hear appeals from decisions of the ERC. The GDC is fully owned by the state, and carries geothermal exploration, drilling, and sale of steam to generators. The REA implements the (subsidised) rural electrification programme. At the top of this institutional framework, the Ministry of Energy and Petroleum (MoEP) defines energy policy and is responsible for overall planning.

The Energy Bill 2015 considers new challenges and opportunities for the energy sector, arising from the discovery of domestic fossil fuels and the political decentralisation of the country. The new Energy Bill defines the distribution of functions between national and county governments. Functions of county governments include the development of a county energy plan; the provision of land and rights of way for energy infrastructure; the facilitation of energy demand by planning for industrial parks and other energy-consuming activities; and the enforcement provisions for efficient use of energy and its conservation.

Other policies and regulations relevant for the renewable energy sector include the Least Cost Power Development Plans (LCPDPs), the Feed-in Tariff (FiT) policy and the Energy Local Content Regulations. The LCPDPs are prepared by the MoEP through inter-ministerial and industry consultations and with support from international consultancies. They include electricity demand forecasts, an assessment of energy resources, and expansion plans for generation and transmission capacity. They provide recommendations on a range of investment options, mainly taking into account their cost through the life cycle of projects, measured through the levelised cost of electricity (LCOE).

The Government of Kenya introduced feed-in tariffs in 2008 (revised in 2010 and 2012) to promote private investment in renewable energy by

providing a secure long-term price and guaranteed access to the grid. The tariffs apply to grid-connected plants and are valid for a 20-year period from the beginning of the power purchasing agreement (PPA), with approval of the PPAs granted by the ERC. The FiT policy provides electricity purchase guarantees by the main power utility KPLC and includes all power generation categories.

The 2014 Energy Local Content Regulations require that companies operating in the energy sector submit a local content plan when applying for a licence. The local content plan would need to give first consideration to Kenyan services, products, and employees and commit to train Kenyans on the job. They also set minimum local content requirements for energy operations in the country, with levels increasing from the start of the project to 75 per cent of the duration of the project to reach 80 per cent of goods and services, 70–80 per cent of management and technical core staff, and 100 per cent of other staff.

We now discuss the roles of different stakeholders in the power sector. In addition to the national government stakeholders mentioned when describing the 2006 Energy Act, international governments, operating through their development agencies, play a significant role in Kenya's power sector. Donors are responsible for funding a large share of generation, transmission, and distribution infrastructure and are able to influence energy policy through their technical advisers and the conditions set for concessional finance. The MoEP chairs a donor coordination group to define support priorities. Some examples of contributions by donors to Kenya's energy sector are as follows (Tierney *et al.* 2011):

- The World Bank funded the Energy Sector Reform in 1997 and more recently the Kenya Electricity Expansion Project that includes projects in generation, transmission, and distribution.
- Japan has funded several power generation plants, including hydropower, diesel generation, and geothermal.
- France has funded transmission lines between Mombasa and Nairobi and grid extension in rural areas.
- Germany has provided equipment for the Olkaria geothermal power plant.
- Spain has funded a 430km transmission line for the Lake Turkana wind power plant, as well as rural electrification projects.
- The United Kingdom (through the Commonwealth Development Corporation) funded a share of the thermal Tsavo power plant and, lately through the Department for International Development (DFID), has provided funds for project preparation of green mini-grids and leveraging private investment.
- The African Development Bank (AfDB) has funded a transmission system improvement project as well as regional interconnections with Uganda and Ethiopia.

Table 1 **Kenya renewable energy sector stakeholders map**

Stakeholder/arenas	International	National	Local/county
Government	World Bank African Development Bank (AfDB) East Africa Power Pool (EAPP) Japan International Cooperation Agency (JICA) Department for International Development of the UK (DFID) Danish International Development Agency (DANIDA) US Agency for International Development (USAID) French Development Agency (AFD) European Commission International Cooperation and Development (DG DEVCO) Power Africa European Investment Bank (EIB)	Ministry of Energy and Petroleum (MoEP) Ministry of Environment and Mineral Resources (MoENR) The National Treasury (TNT) Ministry of Devolution and Planning (MoDP) Ministry of Water and Irrigation (MoWI) Rural Electrification Agency (REA) Energy Regulatory Commission (ERC) Kenya Investment Authority (KENINVEST)	County government County ministries of energy
Business (both private and state-owned)	Commercial banks Equity investors (i.e. Aldwych International) International IPPs (i.e. Lake Turkana Wind Power, Thika, Rabai, Orpower, Tsavo) Engineering, procurement, and construction (EPC) contractors RE technology manufacturers Private mini-grid developers (e.g. Powerhive, Powergen, SteamaCo) Private sellers of solar home systems (SHS) (e.g. BBOX, M-KOPA)	KENGEN KETRACO GDC Kenya Power KEREA KAM KEPSA Local equity investors Local IPPs Kenya Bankers' Association	
Civil society	WWF CAFOD Practical Action International universities	Nature Kenya Consumer Federation of Kenya (COFEK) National education institutions (e.g. Stanmore University, University of Nairobi) Residential consumers	Agricultural cooperatives Pastoral groups Women's groups Youth groups

Source Authors' own.

The private sector is another important player in Kenya's power sector. As of May 2016, there were 11 IPPs in Kenya, including Iberafrica, Tsavo, OrPower 4, Rabai, Thika, Imenti, Power Technology Solutions, Gulf, Triumph, Mumias, and Aggreko (as emergency power producer). Collectively, they accounted for about one third of the country's installed capacity, predominantly from thermal but also from renewable sources: geothermal, small hydro and bagasse. Further IPP generation projects are in the pipeline, most notably in the wind sector. IPPs are dominated by foreign investors, due to a lack of domestic equity for large infrastructure projects (Pueyo *et al.* 2017). At a smaller scale, several private companies operate in the off-grid market, either selling solar products (solar home systems or solar lanterns) or setting up mini-grids. Kenya is in fact the African country with the largest number of solar home systems installed as well as the largest number of enterprises providing 'pay-as-you-go' solar power (REN21 2016).

The local private sector in the renewable energy sector is represented by the Kenya Private Sector Alliance (KEPSA), the Kenya Association of Manufacturers (KAM), and the Kenya Renewable Energy Association (KEREA). Whereas KEREA mainly represents the small-scale solar industry, KEPSA and KAM represent a broader range of larger and more powerful businesses. Contradictions arise in these groups between businesses involved in the RE generation sector, seeking higher tariffs for renewable energy, and businesses as electricity consumers putting pressure on the government to further reduce electricity prices (Newell *et al.* 2014).

The Kenyan electricity system is skewed towards industrial and urban consumers. Large commercial and industrial customers represent 54 per cent of the national electricity sales but only 0.1 per cent of the total connections. On the other side, domestic consumers represent 90 per cent of the connections but only 25 per cent of the sales of electricity. Geographically, 52 per cent of electricity sales are in the Nairobi area (Kenya Power 2014). Industrial and urban consumers are therefore the most powerful actors in pressuring the government to keep electricity tariffs low.

Finally, civil society is highly influential in Kenya and is considered one of 'Africa's bravest and most vocal', contributing for example to facilitating justice and peaceful coexistence after the 2007–08 post-election violence (Allison 2016). Numerous non-governmental organisations (NGOs) operate in the country, pursuing environmental protection and poverty reduction. National and international universities are also involved in the renewable energy (RE) sector as developers of off-grid generation projects. All these stakeholders are presented in Table 1, classified according to their sector (public, private, civil society) and geographic reach (national, international, local).

3 Low rural demand and inappropriate planning

3.1 Constraints

In this section, we look more in depth at one of the key constraints to further investment in renewables in Kenya identified in Pueyo *et al.* (2017).

It refers to low rural demand and an inadequate rural electrification model that favours grid extension and large centralised generation.

Low levels of demand are due to high poverty rates (higher than the average in sub-Saharan Africa) and a lack of productive uses. According to data from a private company operating mini-grids in the country, the average monthly electricity consumption of their rural consumers is just 5KWh, compared to more than 200KWh in Nairobi. Most households do not have sufficient disposable income to acquire modern electrical appliances and use electricity for basic lighting and powering radios and TVs.[2]

The political origins of rural poverty draw on one side from marginalisation, or skewed allocation of resources for development. In Kenya, the regions with political representation in government tend to draw more economic benefits as they are prioritised for development plans. Development efforts have been concentrated in the past in the capital cities and a number of larger towns following closely the Mombasa–Kisumu railway network and its branches. Kenya's grid extension map is a clear pointer of how resources have been allocated historically. On the other side, Kenya's rural lands are generally unproductive, with some 80 per cent of the territory considered arid or semi-arid and few mineral deposits (Barnett 2016). Traditionally, these unproductive regions have been treated with less priority by the political class.

The political preference for a rural electrification model based on centralised power generation and grid extension arises as Kenyan politicians do not consider decentralised solar power as 'total electricity',[3] due to its lower capacity as compared to grid power. Several rural household surveys in Africa also show a higher willingness to pay for grid electricity than for off-grid solutions, even when consumption levels are low (Peters and Sievert 2016). Accordingly, the current president has supported wholeheartedly the development of large-scale geothermal power, as it can provide baseload power at very low costs. This allocation of priorities has displaced funds for other renewable energy technologies, especially as donors seek to be aligned with the country's development strategy.

Customers served by Kenya Power through the grid or mini-grids benefit from cross-subsidies for consumption tariffs, but must still pay a high fee to cover the costs of connection. This keeps connection rates low even for those households within reach of the grid (Lee *et al.* 2016). Grid extension to rural areas that are not able to pay for it places a heavy financial burden on Kenya's distribution utility and creates tension between the goals of universal access to electricity and financial sustainability of the power supply system.

Private off-grid alternatives providing solar home systems or solar lanterns through pay-as-you-go business models have been very successful in addressing upfront capital barriers. In this case, power suppliers also become financiers of the final consumers through a model

in which they pay for the capital cost of systems and customers pay back in instalments. Access to working capital is then essential for suppliers, but it is expensive and hard to get in risky markets, which inevitably increases the price for final consumers.

Solar mini-grids with higher installed capacities allow a wider diversity of electricity uses, comparable to those provided by the national grid. However, when they are not subsidised, they are considered too expensive for most of the rural population and can only target relatively wealthy households and commercial establishments (Carbon Africa *et al.* 2015). Besides, they confront the risk of being crowded out by the cheaper tariffs of the national grid if it reaches a village before mini-grid operators are able to get a return on their investment. There has been a lot of uncertainty about when the grid would be expected to arrive to different regions in Kenya and what would be the fate of private mini-grids.

3.2 Policies to address low demand constraints

Three policies could contribute to address the mismatch between low electricity demand in rural areas and a rural electrification model based on grid extension, which requires a minimum consumption to be financially sustainable:

1 Increasing rural demand through integrated development programmes that enhance the productive potential of rural areas;

2 Adapting supply alternatives to the low rural demand through integrated planning of grid extension and off-grid solutions;

3 Increasing the ability to pay of poor rural consumers through subsidies.

First, we discuss development programmes to increase demand for electricity ahead or in parallel to electrification. The imbalance between urban and rural areas has long been recognised in Kenya. The development plan of 1965–70 targeted sectoral development in rural areas to address this problem. However, redistribution goals were not realised as interventions targeted the areas with the best productive potential. The more recent Vision 2030 is currently implementing Medium Term Plan II (2013 to 2017) in order to deliver accelerated and inclusive economic growth, higher living standards, better education and health care, increased job creation especially for the youth, commercialised agriculture, an improved manufacturing sector, and more diversified exports (Government of Kenya 2007).

Secondly, on integrated planning, the current generation and transmission master plan (2015–35) highlights the importance of off-grid electrification in rural areas to supplement the national grid while progressing towards universal electrification (Lahmeyer International 2016). Several donor initiatives also point at the increasing importance of mini-grids for electrification, such as the proposed World Bank Kenya Off-Grid Solar Access for Underserved Communities, or DFID's green mini-grids facility. The MoEP has commissioned a study to inform

mini-grid regulations and business models for the private sector. This study develops a clear framework for the obligations of Kenya Power when the grid reaches a village with a private mini-grid.[4] The ministry is also developing a national electrification strategy where geo-spatial mapping will be used to inform areas, resources, and strategies for electrification by grid, mini-grid, and any other distributed energy. An additional trend towards planning from the bottom-up comes from the 2015 Energy Bill that requires each county to draw up its energy plan. This will require closer collaboration between national and county governments, as well as capacity building at the county level. However, some stakeholders are critical of the benefits of devolution for energy planning, citing that it creates a new layer of transaction costs for investors and can further delay projects due to competition for political power between Members of Parliament (MPs) and county governments.[5]

Thirdly, on the introduction of subsidies for poor consumers, there are three types of subsidies commonly used to address the electrification gap: subsidies to cover capital costs of grid extension or off-grid systems; subsidies to cover connection costs; and cross-subsidies, where lower tariffs for some particular types of consumers are financed by increasing charges to other customers or regions (World Bank 2010). Kenya is currently using all three types. The capital costs of grid extension are usually financed with donor grants or concessional loans. Several programmes are in place to cover or finance the connection costs of the poor. For example, the Last Mile Connectivity project, jointly funded by the World Bank, subsidises connections for households within reach of the grid, mainly in urban slums. Kenya Power also provides credit to potential customers who require financing to pay for their connection fees. Cross-subsidies are in place through a lifeline tariff for low consumption households of up to 50KWh per month, and a uniform tariff policy through which urban consumers effectively subsidise the more expensive to reach rural consumers. However, given the very low rural electrification rate, the scale of this transfer is very low. Cross-subsidies have in fact proved to be very effective in financing rural electrification in middle-income countries that had reached a critical mass of urban connections. However, in much of sub-Saharan Africa, and Kenya in particular, providing rural access through cross-subsidies would involve highly contested price increases for urban and industrial consumers.

Donors are increasingly supporting the idea of a market-led, unsubsidised market for solar photovoltaic (PV) and this seems corroborated by the success of the Kenyan solar PV market. However, this 'unsubsidised' market has relied heavily on donor support to provide seed capital for private entrepreneurs, to enable learning and to create markets (Ockwell and Byrne 2016). This private sector-led narrative has 'ironically been a powerful tool to attract resources from donors to subsidise development that has supported the activities of private sector actors' (*ibid.*: 73).

We find, therefore, that both the subsidies-led and market-led approaches for the provision of electricity to the poor in Kenya depend heavily on

donor support. However, the dominance of one model over the other results in a very different distribution of benefits. Subsidy-based approaches confer more power to the national utility and hence are prone to lobbying and rent-seeking. Profit-driven approaches could give opportunities for certain actors to gain excessive rents at the expense of the poorest. This is already the case in Kenya, where some rural consumers can pay ten times the national tariff for electricity supplied by private mini-grids (Pueyo 2015).

4 High system costs

4.1 Constraints

The second constraint we look at in more detail refers to high system costs, due to transmission and distribution infrastructure needs and to the balancing costs of intermittent renewables. Kenya has long suffered from a weak power transmission and distribution infrastructure, due to insufficient investments in upgrading the system (Sessional Paper 4 on Energy 2004, Government of Kenya 2004). A large share of system losses, outages, and voltage fluctuations are due to the poor state of the distribution network (Parsons Brinckerhoff 2013). Besides, Kenya's electrical network faces new challenges, including the long distance between some renewable energy generation resources and demand centres; the goal of universal electrification; and the growing share of intermittent generation, mainly from wind power plants (Lahmeyer International 2016). All these are likely to increase costs for final consumers.

We discuss firstly the need to invest in transmission and distribution infrastructure. The responsibility for developing the national grid lies with the government. Investment needs are detailed in a 20-year Power Generation and Distribution Master Plan, which is periodically updated. The power evacuation plans are informed by the Least Cost Power Development Plan (LCPDP) which defines the generation projects using a long-term trajectory.

After years of neglect, Kenya's grid is currently undergoing a major expansion, driven by demand growth and the increasing importance of energy for international donors. Funding for new transmission and distribution capacity comes from three sources: retained earnings of the transmission and distribution utilities; the national budget; and long-term loans at concessional rates, mainly from international development banks.

Transmission and distribution charges are calculated and approved by the ERC on the basis of performance targets (2004 Sessional Paper on Energy, Government of Kenya 2004). However, most transmission projects utilise treasury and external funding, with only one transmission line funded internally by KETRACO.[6] The government's funding of transmission projects usually focus on local costs, such as the acquisition of wayleaves (right of way for transmission lines), land for substations, and consultancy costs, whereas external partners fund infrastructure costs. The national budget has traditionally marginalised investments in

the country's electricity network, as opposed to other, more visible items in the infrastructure budget line, mainly roads.[7] However, the grid is receiving increased internal and external political support. For example, the African Development Bank (AfDB), the French Development Agency (AFD) and the European Investment Bank (EIB) are behind the Last Mile Connectivity Project. The World Bank has financed an informal settlements electrification programme and the Kenya Electricity Modernisation Project (jointly with AFD), that improved the efficiency of the distribution network. Other donors, particularly the UK, are increasingly focusing their support on private sector-led off-grid alternatives.

The second element increasing system costs is the increased penetration of variable renewables, mainly wind. However, another article in this *IDS Bulletin*, by Edwards, Dent and Wade, demonstrates that the large wind projects currently being built in Kenya are likely to contribute significantly to generation adequacy of the system, thanks to the complementarity between the wind resource and demand, and between wind and hydro resources. In any case, large-scale, remote intermittent renewable generation can carry significant risks for the country, as exemplified by the 310MW Lake Turkana Wind Power (LTWP) plant. Two particular clauses in the PPA signed in August 2014 between the project owners and the off-taker, Kenya Power,[8] place a strong burden on the Kenyan counterparty. First, a monthly fine to be paid to the owners of the project in case transmission lines are not completed in time (*Standard Digital* 2017). Second, a 'take-or-pay' clause committing Kenya Power to purchase all the power generated by the wind power plant. This is problematic because wind power may be generated at times when demand in Kenya is low (e.g. at night) and when there is not enough transmission capacity. To honour this clause, Kenya Power has ring-fenced an account funded through higher power bills for consumers. This account, managed by the Treasury and the ERC, is considered crucial for maintaining Kenya's profile as a renewable investment destination (*Business Daily* 2017).

The transmission line for the LTWP is now years late, after severe delays to ensure wayleaves and financial problems of the EPC contractor (*ESI Africa* 2017). The government therefore faces the prospect of having to pay a large fine to the project owners. Whereas PPAs aim at placing the risk on the counterparty more able to deal with it, it is questionable that a country with high levels of poverty and very low electrification rates should transfer to consumers the cost of a risky private investment decision.

4.2 Policies to address high system costs

Several policies and measures could address the system constraints previously identified:

- Prioritise transmission and distribution infrastructure in the national budget, to address chronic underinvestment;

- Consider transmission and distribution (T&D) risks in new RE contracts, to limit the exposure of the national utility to these risks;
- Introduce flexibility in the system, to address the intermittency of wind and solar generation;
- Increase capabilities to manage the increasing shares of intermittent generation in the system.

The first measure proposed involves prioritising transmission and distribution infrastructure over other infrastructure-related projects. Our interview with a representative from KETRACO reveals that the background of key officials at the MoEP has an influence on the types of energy infrastructure that get prioritised. For example, the appointment of a Principal Secretary (PS) at the MoEP with an engineering background has played a part in recent increased investments in the transmission grid as compared to the previous PS, who was an economist.[9] KETRACO assesses the grid reinforcements that are required and prepares a concept note channelled via the MoEP for cabinet approval, after which development funding is sought alongside treasury funding. The PS then acts as the gatekeeper for all investment demands of the state energy agencies.[10]

The second measure proposed requires that the selection of sites for the location of renewable energy generation takes into account the risks related to T&D infrastructure. For example, transmission charges to generators should be location-specific, instead of the typical uniform rate to all network users. Locational transmission charges send the right economic signals to the market players, enabling the market to operate properly with respect to losses and possible grid connection as well as in the long term, encouraging future players to choose their locations accordingly. Nodal prices, defined as the price paid or received for the energy consumed or generated by a growth in demand, are commonly used in South American countries with long transmission distances such as Chile, Argentina, and Peru. Single pricing is the most commonly used approach in the world, but it is inefficient when the location of power generation plants has a significant impact on network costs, like in the case of renewable megaprojects located far from demand (Pérez-Arriaga 2013).

The government could also de-risk sites before power generation plants are procured, by building transmission lines before the plants are built. In this case, a centralised generation and transmission plan would define the optimal siting of generation plants taking into account the transmission costs. The selected sites would then be opened to public tender or renewable energy auctions, once the transmission infrastructure is in place. This would delay cost recovery for transmission infrastructure, which could be addressed through grace periods in the financing conditions of external donors. Some additional policies could be used to incentivise investors to site at convenient places from the transmission network viewpoint.

The third measure involves introducing further flexibility to the Kenyan system by, for example, increasing reserve capacity from hydro, gas, medium speed diesel, or flexible interconnections with neighbouring countries. A flexible interconnection with Ethiopia providing access to their large hydropower generation would be a low-cost, low-carbon option to provide flexibility to the Kenyan system. However, dependence on electricity generated in another country has political implications, 'providing one country with political power over another, involving countries in each other's internal affairs, creating opportunities for corruption, creating political costs in protecting the line, and creating political costs in the process of tariff rationalisation' (Barnett 2014: 19).

The final measure proposed involves capacity building for the system operator to be able to balance a system with a high penetration of renewables. Some programmes are in place to deal with this, such as Power Africa's Grid Management Support Programme (GMSP).[11] The government has also agreed on local content regulations for energy projects to enhance local capabilities. However, a key element is learning-by-doing, which requires time and the gradual building of renewable energy capacity. The sudden increase in intermittent generation from nearly negligible to around 15 per cent of capacity with the LTWP project will make this hard for the Kenyan system operator.

5 Social acceptance and access to land

5.1 Constraints

We finally focus on social acceptance issues, as they have proved to be the most important stumbling block for several renewable energy projects. For example, Olkaria geothermal plants faced court cases and had to disburse significant amounts in resettlement programmes for the local population. Kinangop wind power plant, which would have been the first private wind power plant using FiT had to be abandoned after local protests caused serious disruptions. The LTWP has also faced a court case about illegal land acquisition and has experienced significant delays due to the difficulty in obtaining wayleaves for a transmission line. The delay may be costly for the Kenyan government, as it is liable to compensate developers for the power they cannot sell once the plant is ready to start operations.

Social acceptance is intrinsically related to access to land, as the local population contests the right of private and government developers to use the land where they live or work. Issues of compensation and consultation are further complicated when the current users of the land do not hold formal titles, as is often the case in Kenya. The lack of clarity over land rights also creates the possibility of rent-seeking from local communities seeking compensation for land not used by them.

Previous research suggests that communities are more favourable to projects when they are given full information about their costs and benefits, when benefit-sharing mechanisms are in place, and when they are involved in consultation and decision-making (Wüstenhagen, Wolsink and Bürer 2007).

Our research in Kenya shows that the underlying causes for the problems of social acceptance and access to land are:

- Lack of clarity about land value, land property rights, and the land acquisition process;
- Imbalance between the costs and benefits for local communities (where infrastructure is located), urban residents (getting the service), and investors (profiting from it);
- Lack of clarity about consultation and compensation processes;
- Interference of local politicians seeking political or financial gain from the projects.

We discuss each of these causes in more detail, starting with access to land. There are three land ownership categories in Kenya: private land, public land, and community land.[12] Community land poses the greatest challenge for land acquisition, because it is not clear who holds rights over it. Public land on the other hand is not readily available and is often governed under conservation and environmental legislation that limits its development. There are also limitations to purchase private land, as foreign companies are not allowed to buy agricultural land in Kenya. Private investors can get around this limitation by forming a joint company with locals, but this introduces additional risks.[13] Generally, purchasing land is much harder than gaining the right to use the land for a defined purpose and timeframe through a leasing contract.[14]

The process of accessing land is mainly guided by the Constitution and the Land Act 2012. After the new 2010 Constitution, the devolved government holds public land in trust on behalf of the residents, and the national utilities have to apply to the National Land Commission for approval of valuation of land as quoted in the Land Act 2012. Such valuation is advertised for any public objections and if protested, may lead the process into re-valuation.[15] By introducing a new layer of government for land acquisition transactions, the Constitution has increased transaction costs and timeframes for project development and implementation.[16] An additional problem related to land acquisition comes from the lack of protection against speculation with land prices. When landowners and communities realise that the land is sought for use in electricity generation, prices escalate. Middlemen and political brokers insist on negotiating the price with land buyers and can use a number of tactics to increase the price, such as encouraging locals to settle in the proposed sites before or even after the transaction is completed, and demanding compensation.[17] Land cartels are also a known phenomenon, where landowners collude to increase prices for wayleaves and generation project sites.[18]

The second issue is the imbalance between the costs for local communities where infrastructures are placed and the benefits for the population getting electricity. Project developers may put in place social responsibility programmes including schools, new houses, or other social

services, or also give monetary compensation, but demands from local communities often exceed what project developers are ready to offer.[19] Another source of grievance is the arrival of outsiders to work on the projects and the lack of jobs for the local population. In this respect, project developers claim that locals lack the necessary qualifications to carry out the job to an acceptable standard.[20]

The third issue is the lack of clear consultation and compensation guidelines. Project developers find it difficult to engage meaningfully with communities. They often struggle to differentiate legitimate from illegitimate demands for compensation and there has been no guidance on the acceptable level of this compensation. Speculation, encroachment, and settlement on lands demarcated for energy projects can sharply increase the cost of compensation for land since the origination of the project.[21] Several interviewees indicated that early consultations with local project stakeholders are a key element of success. When local communities and politicians are given the chance to provide inputs to the design of the project they are more likely to accept it later on. The LTWP provides an example of successful early consultation with environmentalists and the local population, which led to a change of location from close to Lake Turkana to Marsabit, to minimise damage to local birds.[22] On the other hand, environmentalists were not successful in deterring geothermal exploration around Hells Gate National Park, host to globally endangered species.

The final issue is the involvement of local politicians for political or financial gain from RE projects. The 2010 Constitution has introduced a new layer of political competition, and many expectations from locals about what the county administration can achieve for them. For example, with devolution came expectations that counties would get free electricity for their citizens.[23] The county administration can demand this, as well as jobs or shares in RE companies, and influence the acceptability of a project by locals if these are not granted.[24] The fate of Kinangop reflects the consequences of partnering with the 'wrong' politicians. In this case, project developers partnered with an ex-MP, who was a competitor of the local MP. Fearing that the success of the project would be a political gain for his competitor, the local MP mobilised community members to demonstrate against the project. Fake claims were spread about the project, including links between wind energy and infertility and unbearable noise levels. Demands for compensation and protests escalated until the project had to be abandoned. Kinangop is now seeking compensation from the government for the costs it incurred in project preparation.

5.2 Policies to address social opposition

The four constraints described previously can be addressed through four types of policies. First, land use policies that clarify who holds property rights for the land and who can purchase it; second, clear consultation and compensation guidelines that reduce uncertainty for both investors and communities; third, active participation of communities in

management processes; and finally, anti-corruption measures to limit the opportunities for politicians to gain personally from projects.

Firstly, Kenya has traditionally operated without a clearly defined land use policy, with many uncoordinated institutions and pieces of legislation dealing with land use management. The government is currently developing a draft national land use policy that sets a common framework for the optimal utilisation of land resources, taking into account the goals of productivity and sustainability. Additionally, to reduce uncertainty around communal land, the recent Community Land Act 2016 provides for recognition and protection of community land rights. It requires that community lands are mapped, planned, and registered, making it simple for communities to apply for formal land titles without having to register as a legal entity. It also sets that all members of the community are allowed to benefit from it and that decision-making power with regard to the land is vested in a community assembly. County governments will hold in trust all unregistered community land on behalf of the respective communities. There are, however, two key challenges with this legislation: first, the low quorum required for decision-making in communities could be abused by elites and marginalise a large section of those communities. Second, the law is not clear on how to fairly allocate rights over land used by several communities.

Secondly, progress is also being made with regard to clearer consultation guidelines. County public participation guidelines initiated by the Ministry of Devolution and Planning inform public participation practice in county governments, in line with the County Government Act 2012. They set the approach to actively engage the public in policymaking, planning, budgeting, implementation, monitoring, and evaluation. However, these do not contemplate consultations by private investors. Private investors often follow international standards of social consultation that require free, prior, and informed consent (FPIC) from indigenous communities. The most widely followed standards are set by the International Financial Corporation (IFC) and the Equator Principles[25] and are required by multilateral development banks and export credit agencies as a precondition for funding.

Two recent policies aim at providing further clarity on compensation and land prices. The Amended 2016 Land Act introduces a bill that sets a cap on compensations required for the use of land for public purposes and limits the power held by property owners in this respect. The amendment also prohibits unlawful occupation of private, community, or public land and sets a procedure for eviction. On the other hand, the National Land Value Index (amendment) Bill 2016 seeks to create a national reference point for land values, which would help the government, investors, and landowners negotiate compensation and resist speculation. The bill also proposes that once land is officially taken and funds committed by the National Land Commission, development cannot be stopped by any court. Landowners can receive a monetary compensation, land swaps, or government bonds in return.

The previously mentioned local content regulations seek further community involvement, requiring that energy projects employ and train national Kenyans. However, there are no requirements that beneficiaries are from the local communities where the projects are located.

In spite of these recent developments, Kenya still lacks an explicit policy framework that details benefit-sharing mechanisms (BSMs) and community participation in management processes, both considered essential in the literature on the social acceptance of renewables (Hammami, Chtourou and Triki 2015). Compensation for communities should be based on independent analyses showing the distribution of costs and benefits among the different interest groups. Some frequently used BSMs include sharing revenues with the local community, creating local jobs, preferential electricity tariffs, building roads, or investing in other public services such as schools or health centres. Some of these activities are carried *ad hoc* by energy projects, but without following a systematic approach. On the other hand, community participation needs to take place from the project conception and all the way through its operation, using transparent and participatory processes (*ibid.*; Shinke and Klawitter 2015).

6 Discussion: the politics of removing constraints to investment in renewable energy

Kenya has been hailed as one of the most successful African countries in attracting renewable energy investment. However, many barriers persist that endanger the goal of universal access to clean, reliable, and affordable energy by 2030. Three particular constraints stand out: the inadequacy of generation, transmission, and distribution planning practices for the low rural demand; the high system costs; and strong social opposition to large-scale infrastructure, including renewable energy. The first two problems are shared in many other African countries and the last one is particularly acute in Kenya. This article has tried to better understand the factors that underlie these three constraints by looking at how they emerged, and what are the policies that can address them. In this section, we discuss the actors that could drive or oppose the implementation of these policies and we conclude by underscoring the role of the state.

At the heart of Kenya's problems there is a large pool of unmet needs and competition for scarce resources dominated by the ruling elite. As noted in Ng'ethe, Katumanga and Williams, '[T]he elite have generally opposed pro-poor change where this threatens their interests and sources of patronage' (2004: 4). However, '[I]n the past, reforms have usually occurred when the elite has come under sustained pressure from interest groups' (as cited in Barnett 2016: session 5, page 3). Whereas the supply of electricity has traditionally focused on large industrial customers and the urban population, increased pressure to provide access for all is now coming jointly from the international development community and the local devolved government. International donors provide finance and technical assistance, while local governments seek

to provide basic services to their population and can contribute to the social acceptance of infrastructure projects. Between these two actors there are two powerful national institutions acting as gatekeepers for the allocation of funding priorities: the National Treasury and the MoEP.

International development institutions seek poverty eradication and increasing convergence with the welfare levels of developed countries, while keeping developing countries' debt under control. They increasingly follow a private sector-led narrative, where funds are provided strategically to mobilise a larger share of private finance (Pueyo, Orraca and Godfrey-Woods 2015). There is still a general perception of state-owned enterprises as being inefficient and corrupt, whereas private entrepreneurs represent efficiency through their profit-seeking behaviour and competition. Under this profit-driven approach, natural monopolies such as the network components of the electricity system, and non-profitable segments such as rural electrification often fall between the cracks.

The National Treasury and the MoEP of Kenya are driven by a growth imperative. They support investment in least-cost generation and increased energy efficiency, as these contribute to the ambitious economic growth targets set up in the Vision 2030 strategy. The least-cost narrative is very much influenced by large industry, which is the main electricity consumer.

The devolved governments, on the other hand, seek to transfer central funds to their localities, to improve development outcomes of their often-neglected communities. They are likely to oppose large infrastructure projects geared towards urban areas when their counties bear the costs but reap none of the benefits. Civil society seeks equal access to energy services, and compensation for the economic, social, or environmental costs of large infrastructure located in their native land.

The different interests of these actors can align in some specific policies. For example, policies to increase the productivity of rural areas heavily dependent on agriculture could increase rural incomes and therefore the ability to pay for electricity connections and consumption. At the same time, energy interventions could contribute to increase rural productivity through, for example, irrigation systems, and the mechanisation of agriculture, the development of agricultural processing, and other non-farm activities. A larger rural demand would improve the financial viability of public grid extension programmes or private mini-grids and reduce the cost per unit of electricity for all rural consumers. Such an approach requires close collaboration between energy planners making decisions about the most appropriate energy supply technology, and rural development planners influencing the size and composition of the rural demand. The dialogue between supply and demand should reflect on bottom-up rural electrification plans that take into account the location of customers and their current and prospective demand on the basis of realistic development opportunities. Kenya is taking steps in that direction through the increased role of the

devolved government in energy planning and new rural electrification planning initiatives using geographic information.

In other cases, actors' interests clash; for example, when final consumers are asked to pay for the risks taken by private developers (like the LTWP) or for the cost of rural electrification through new items in their electricity bill. In the first case, support follows the narrative that Kenya needs to maintain its status as a desirable destination for private sector investment by keeping risks low for investors. The second case follows an energy justice narrative, where the poorer should not be made to pay more for basic services than the wealthier, even if they are more expensive to reach. The interests of local communities and large industrial and urban consumers also clash when large renewable energy infrastructure located in rural areas feeds power directly to the transmission system heading to Nairobi.

The international development community is trying to make the narratives of energy justice and private sector-led development converge through the promotion of private mini-grids. For example, the DFID-funded Green Mini-Grid Facility (GMF) was announced in March 2017 to provide investment grants and technical assistance to leverage private investment in mini-grids in Kenya. It is certainly an attractive narrative that private entrepreneurs could target the poorest populations by offering them an affordable service that they are able to pay for. However, the prices that these mini-grids can achieve are still significantly higher than those paid by those connected to the national grid and are only affordable to a small share of the rural population (Carbon Africa *et al.* 2015). The cost of finance faced by small entrepreneurs is also much higher than that enjoyed by state-owned enterprises, and economies of scale will not materialise without common standards for grid compatibility of mini-grids.

To conclude, Kenya's goal of sustainable electricity for all requires a set of actors with conflicting interests to align their position. Donors' pressure towards decentralised, private sector-led electrification needs to align with the national government's preference towards large-scale, centralised generation, as this could generate the funds required to cross-subsidise poor and remote consumers. The dichotomy between private versus public-led electrification also needs to be solved. Private developers selling to the grid require access to the network elements of the system. On the other hand, private off-grid supply could be easily crowded out by the national grid offering electricity at a fraction of the price.

A fine balance is hence required to maintain the remarkable (and recent) financial sustainability of the Kenyan power sector. The independence of the regulator and the national distribution company are key to achieve this. The state and international donors have a crucial role in allocating funds to members of society less able to afford the full cost of electricity and to the natural monopolies of transmission and distribution. Public actors should also support structural transformation, increasing the

productivity of the agricultural sector until rural areas are able to pay for the full cost of electrification. While demand remains low in rural areas, the private sector will keep focusing on the most profitable segments of the market, whether large-scale generation to supply industry and urban households connected to the grid, or small-scale solutions for rural consumers that can pay for them. Even if technological progress has improved affordability of small-scale solar solutions for an increasing number of rural consumers, public subsidies still have an important role to play for universal access to become a reality in Kenya.

Notes

1 Including two representatives from private off-grid generation developers (Powergen and Powerhive); the national transmission utility (KETRACO); one donor (Power Africa); civil society (Nature Kenya, Strathmore University); the energy regulator ERC; the Ministry of Land; an independent power producer (IPP) (Kenya Tea Development Authority – Power); and the National Environment Management Authority.
2 Interview with Powerhive, 2016.
3 Interview with ERC, 2016.
4 www.eca-uk.com/2017/01/04/kenya-mini-grid-regulatory-framework-development/.
5 Interviews with donor representative and with Ministry of Planning, 2016.
6 Interview with KETRACO, 2016.
7 Interview with Power Africa, 2016.
8 The off-taker is the counterparty in the PPA purchasing all the power from the plant.
9 Interview with KETRACO, 2016.
10 Interview with KETRACO, 2016.
11 Interview with Power Africa, 2016.
12 Interview with the Ministry of Planning, 2016.
13 Interview with Powerhive, 2016.
14 Interview with the Ministry of Planning, 2016.
15 Interview with KETRACO, 2016.
16 Interview with KETRACO, 2016.
17 Interview with Powerhive, 2016. This problem was also detailed in interviews with an international EPC contractor as detailed in Pueyo *et al.* (2017).
18 Interview with Energy Regulatory Commission, 2016.
19 Interview with National Environmental Management Agency, 2016.
20 Interview with KETRACO, 2016.
21 Interviews with ERC and KETRACO, 2016.
22 Interview with Nature Kenya, 2016.
23 Interview with KETRACO, 2016.
24 Interview with ERC, 2016.
25 The Equator Principles are a risk management framework adopted by financial institutions to assess and manage the environmental and social risks of projects. See www.equator-principles.com.

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