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Insights into Social and Institutional Innovations for Enhancing Energy Decentralisation and Climate Change Mitigation in Developing Countries

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Abstract

The Sustainable Development Goals (SDGs) require state and non-state actors to reduce the vulnerability of communities to climate related extreme events, and other economic, social and environmental shocks; and for universal access to modern energy by 2030. Achieving this will require implementing new radical approaches to accelerate decentralised energy services provision. Through an analysis of data from various research articles, policy briefs and project reports, the paper discovered that polycentric governance systems can enhance Africa's renewable energy institutional capacity and create new social systems to facilitate successful climate change mitigation and energy transitions for universal energy access. Moreover, despite the presence of various climate finance mechanisms to promote transitions towards low carbon development, in the absence of restrictive supply-side policy instruments targeting fossil fuels, Africa will be locked-in fossil fuel energy supply systems rather than leapfrogging directly from little or no energy infrastructure to low carbon energy supply systems.

Keywords: Climate Compatible Development (CCD); Climate Finance; Entrepreneurship; Mini-grid; Polycentric Governance; Sub-Saharan Africa (SSA); Sustainable Development Goals (SDGs); Sustainable Energy for All (SE4All); Renewable Energy; Rural Electrification; Social Innovation.

1 Introduction

The provision of modern and affordable energy is highly regarded as an important factor to stimulate industrial development and economic growth, and ultimately reduce poverty in developing countries (IEA, 2016; Terrapon-Pfaff et al., 2014). Although modern energy services cannot be clearly defined, modern energy services contrast with traditional energy services such as those derived from burning biomass in open fires, in that they tend to combine the energy carriers and associated technologies, together with the benefits to users that these afford (Watson et al., 2012). Examples of modern energy services among others include electricity from solar home systems for lighting, natural gas burned in modern stoves for cooking and petroleum based engines for motive power to enable agro-processing (ibid). Consequently, in countries where the availability of modern energy is limited or where modern energy is economically unaffordable for industries and the whole society in general, economic development is seriously impaired (Wolde-Rufael, 2009; Kebede et al., 2010). Not surprisingly, Sustainable Development Goal 7 (SDG 7) as an acknowledgement that the availability of modern energy is not only considered as a pre-requisite for economic growth but also for social prosperity and human development, aims to ensure that the World attains universal access to affordable, reliable and modern energy services by 2030 (AfDB, 2013; UN, 2015a).

Sub-Saharan Africa (SSA) possesses significant amounts of both renewable and non-renewable energy resources. However, the region is noted to lag in comparison to other regions in its ambitions to achieve universal access to modern energy and electricity. This follows that the electrification rate for SSA is 43%, in comparison to 86% for Southern Asia and 99% for North Africa (Hancock, 2015; AfDB, 2016a; UN, 2018a). Consequently, the low access to modern energy in SSA has been called a crisis (Lucas et al., 2017), and this crisis has the potential to make the SDGs unattainable in the region. While the energy resources are not distributed uniformly in SSA, their abundance is somewhat maintained by compensating a regional deficiency in some type of resource with abundance of some other (Lior, 2012). Therefore, improving the accessibility and affordability of modern energy services requires the mobilisation of an array of actors at cross-sectoral levels in-order to develop effective institutions and implement innovative policy frameworks in a context specific environment to enable each country (or sub-region) to chart its own energy transition pathway into the future (Sokona et al., 2012).

Even though the global ambition on energy access as presented in SDG 7 is for all countries to reach universal access to modern energy services by 2030, some projections points out that universal electrification can be achieved by 2050 by countries with at-least 60% current electrification and that countries below this level can achieve at-least 80% electrification by 2050 (Sanoh et al., 2014). Consequently, the prospects of many SSA countries to achieve SDG 7 are grim since the electrification rate for SSA is only 43%. Nevertheless, there are still prospects to accelerate the rate and pace to which electrification is undertaken in the region as there are no fundamental technical obstacles preventing enhanced energy access/universal energy access, but rather a lack of effective institutions, good business models, transparent governance, and appropriate legal and regulatory frameworks to ensure that enhanced energy access/universal energy access can be attained by all countries (Bazilian et al., 2012). With the aforementioned factors in mind, it may be argued that there is a need for more research and practice on the institutional arrangements and business models that can improve the deployment of renewable energy especially in the socio-economic context of SSA.

Elinor Ostrom (2010), who won the 2009 Nobel Prize in Economic Sciences, suggested that climate change was a complex multi-level problem that would adequately be addressed by complex multi-level systems such as polycentric governance systems. Similarly, facilitating energy access through grid and off-grid/decentralised renewable energy technologies is a complex problem as deployment is constrained by social and economic issues such as poverty, lack of political will and wrong approaches in addressing the energy problem (Gamula et al., 2013; Chirambo, 2014; Jamasb et al., 2018). Since addressing climate change and energy insecurity are both complex problems, yet have synergies in that improving renewable energy deployment can promote climate change mitigation, there could be merits in determining governance systems that can effectively improve renewable energy deployment and climate change mitigation simultaneously. Some previous studies on climate change governance and renewable energy deployment include Akuru et al. (2017) who analysed how Nigeria could achieve a 100% renewable energy target. In their analysis, Akuru et al. (2017) asserted that since the Nigerian government was backsliding in adopting renewable energy technologies, it would be easier for non-state actors to drive the transition towards 100% renewable energy supply rather than to continue to depend on the government as the driver for renewable energy transitions. Bazilian et al. (2014) analysed the link between energy governance and poverty and highlighted that most studies in the energy sector have restricted their focus to energy supply security and environmental sustainability hence creating knowledge gaps on the links between energy governance and poverty at various levels. The analysis by Elum and Momodu (2017) on climate change mitigation and renewable energy deployment for sustainable development concluded that social and political obstacles were the most significant roadblocks towards rapid implementation of a green economy through the deployment of renewable energy. Despite all this research, there are still knowledge gaps on viable business models and institutional arrangements that can enable countries in SSA to significantly accelerate their deployment of renewable energy deployment whilst improving their capacities for enhanced climate change mitigation and resilience. Consequently, this exploratory study aims to explore the governance and institutional constraints and opportunities for non-state actors to contribute towards the accelerated deployment of renewable energy technologies and enhanced climate change resilience in SSA. To achieve its aim, the paper analysed data from various research articles, academic literature, policy briefs, and project reports focusing on renewable energy deployment, climate risk management and poverty reduction.

The paper is organised as follows: section two provides an analysis of the benefits of enhancing the deployment of renewable energy decentralised energy systems in SSA. Section three explores innovative partnerships that can be pursued in-order for the energy sector to contribute towards Climate Compatible Development (CCD), and this is then followed by an analysis of the roles of specialised financial intermediary companies and microfinance institutions in promoting CCD (section four). Section five follows with a discussion focusing on how existing inertias towards the deployment of renewable energy technologies can make SSA to miss out on leapfrogging into low carbon climate resilient energy infrastructure regardless of the declining costs of renewable energy technologies. The paper then concludes in section six by highlighting how an integrated approach focusing on new innovations in the mobilisation and disbursement of renewable energy financing and the deployment of decentralised energy systems can ensure that renewable energy climate finance projects do not perpetuate a bias towards urban electrification as this perpetuates inequality and constrains rural development.

2 A Case for Accelerated Renewable Energy Decentralisation

SDG 10 has a goal related to reducing persisting and emerging inequalities in incomes and access to services across and within countries. In the context of electricity and modern energy services, access to affordable electricity and modern energy services is considered as one of the foremost factors contributing to the disparity between developed and developing nations (Suberu et al., 2013). As it stands, the inequitable access to modern energy is manifested in SSAs low access to electricity and the disparity in energy access rates between urban areas and rural areas. Additionally, Least Developed Countries (LDCs) face the biggest challenges in providing schools with basic infrastructure as it was noted that in 2016, only 34% of primary schools in LDCs had electricity; and in SSA only 37% of primary schools, 52% of lower secondary schools and 55% of upper secondary schools have access to electricity (UN, 2018b). Unfortunately, these instances of inequitable access to electricity and modern energy services are occurring despite the presence of an international climate change policy regime to promote climate change mitigation and an international energy investment policy regime for energy security and enhanced renewable energy deployment (i.e. international renewable energy deployment programmes such as Power Africa, Sustainable Energy for All (SE4All), etc.) (IEA, 2016). Arguably, there is a need to develop new innovative strategies to intensify the rates to which renewable energy technologies are deployed so that developing countries such as those in SSA can be put on an accelerated trajectory towards economic development.

Some estimates point out that Africa requires investments of approximately US$41 billion to US$55 billion annually until 2030 to ensure that universal access can be attained; however the current spending amounts to approximately US$8 billion annually (Johnson et al., 2017; Schwerhoff and Sy, 2017). Africa therefore needs to significantly improve the mobilisation of finances for energy sector investments. Arguably, integrating the objectives of SDG7 and SDG 10 will therefore require the mobilisation and blending of revenues from various public and private sources and the deployment of new energy supply systems that can overcome the issues that have engendered low electricity access rates. In the case of SSA, a plausible strategy that can aid the region to substantially improve its energy access rates whilst reducing inequality would encompass the simultaneous prioritisation of rural development and renewable energy rural electrification through decentralised energy systems. As it stands, the urban-rural divide in access to electricity in Africa is as high as 450% (69% urban compared to 15% rural access) (AfDB, 2016b). Moreover, such a scenario might not necessarily change as between 2010-2012 the electricity access in SSA rose from 32% to 35%, however the increases were concentrated in urban areas where energy access growth exceeded population increase by 25 million, while in rural areas it fell short by 23 million (AfDB, 2016a). This scenario of a preference to increasing energy access in urban areas can be anticipated to persist since energy sector reforms have largely focused on unbundling the power-generation segment, hence energy generation has benefited from considerable investment, while transmission and distribution are largely still under the control of government entities and have remained largely underdeveloped (APP, 2017), and this might lead to a slow connection of un-electrified rural areas to the power grid. In this regard, comparisons can be made to the electrification scenario in Zambia where although for many years the installed capacity was significantly higher than the demand, the excess generating capacity could not be exploited to supply rural areas due to challenges in energy distribution and transmission (Haanyika, 2008).

There are three principal options for providing new connections to currently un-electrified populations in Africa, namely: i) extension of the national grid; ii) installation of separate mini-grids to operate independently from the main grid; and iii) installation of stand-alone generating systems that supply individual consumers (AfDB, 2016b). In the case of SSA, anecdotal evidence suggests that there is a preference towards national grid extension rather than the deployment of mini-grids. This is the case even though most of Africa's population lives in rural areas and if the numbers of people with access to energy were given greater weight, decentralised energy programmes could gain greater investment and provide poor communities with access to energy faster that centralised grid systems (Soanes et al., 2017). Moreover, decentralised energy systems and mini-grids are often cheaper and quicker to deploy than large centralised infrastructure, which requires much greater investment costs and regulatory approvals (Kaijage et al., 2017). However, decentralised energy systems are not used extensively in SSA's energy sector because the investment strategies of many financing mechanisms prioritise large-scale results based on the tonnes of carbon offset and the mobilisation of private co-finance; and traditional financing intermediaries, such as Multilateral Development Banks (MDBs), are less able to finance small-scale projects directly, given the higher transaction costs (Soanes et al., 2017). Consequently, in countries like Tanzania, between 2009/10 and 2016/17 the government of Tanzania allocated nearly US$2 billion to energy access, of which only US$40 million – or 2% – was targeted to off-grid energy projects (Kaijage et al., 2017).

It has been argued that the challenges to enhanced deployment of mini-grids and decentralised electrification in SSA might be overcome should researchers, consultants and their funders expand and make accessible literature focusing specifically on Clean Energy Mini-Grids (CEMGs); and should international and national development institutions design more programmes specifically targeting mini-grids in SSA and not rural electrification as a whole (Contejean and Verin, 2017). However; when consideration is made to the aforementioned energy infrastructure financing gaps; it might be argued that accelerating the deployment of mini-grids and decentralised electrification in SSA might be achieved through the development of new modalities for funding, piloting and promoting decentralised renewable energy capacity building and infrastructure development. Arguably, this could be achieved by improving the mobilisation and utilisation of carbon credits for mini-grid programmes. From a theoretical perspective, SSA has a greenhouse gas mitigation potential of 740.7 million tonnes of CO_2eq annually, and this could attract US$158 billion of total investment to the region and could generate US$7.5 billion of carbon revenue annually at an assumed carbon price of US$10/t$CO_2$ (Timilsina et al., 2010). More importantly, such carbon mitigation projects could add 149 Gigawatts (GW) of clean electricity generation capacity, which is more than twice the region's current total electricity generation capacity of 68,675 Megawatts (MW) (Timilsina et al., 2010). Whilst such assessments are theoretical, meaning that the actual mitigation levels, potential revenues and generation capacity might be lower than stated due to the performance and capabilities of various technologies, and prevailing carbon prices, the assessments are still imperative as they help to highlight that SSA has great potential to utilise market based instruments to complement non-market approaches to sustainable development as stipulated in Article 6 of the Paris Agreement (UN, 2015b). More importantly, the price of carbon credits/carbon offsets is on the rise and reached US$21.00 per tonne in 2018, which was triple the level in 2017 and a 10-year high (Vaughan, 2018). This development provides renewed hope and confidence that carbon offsetting could be a significant source of climate finance and alternative revenue stream for financing environmental programmes. It is therefore plausible that creating synergies between SDG 7 and SDG 10 could be enhanced if African policymakers consider setting up Funds or new funding mechanisms that can aggregate money from carbon markets and subsequently direct those monies towards efforts and initiatives promoting decentralised energy systems and mini-grids acceleration.

3 Post 2015 Energy Transition Opportunities for Climate Compatible Development (CCD)

CCD is defined as development that minimises the harm caused by climate impacts, while maximising the many human development opportunities presented by a low emissions, more resilient future (Mitchell and Maxwell, 2010). Renewable energy technologies therefore posses significant potential to contribute towards CCD activities due to their impact in promoting climate change mitigation, facilitating rural development and enabling developing nations to industrialise. The renewable energy sector has experienced significant transformations in particular with regard to the drop in costs for renewable energy technologies. For example, the costs of renewable energy technologies are decreasing to the extent that the average cost of solar photovoltaic modules fell by nearly 80% between 2009 and 2014, while wind turbine average costs declined by nearly 33% over the same period (Griffiths, 2017). However, whilst the decreasing costs of renewable energy technologies can be considered as a welcome development with significant potential to improve the deployment of renewable energy in the World, there are still some political, economic and institutional factors that are constraining the deployment of renewable energy technologies in different countries. For example, cultural factors such as gender dynamics, local power structures and socio-economic realities of poor communities are noted to also play a significant influence in determining the rates of diffusion of renewable energy technologies in different communities (Watson et al., 2012). Similarly, technological innovation by itself should not also be considered as a sufficient tool to address climate change challenges, but bottom-up solutions through the actions of academia, policy and businesses should be considered as a means to provide long term solutions to address climate change challenges (Villacis, 2017). With the aforementioned factors in mind, it can therefore be argued that since institutional factors potentially have a significant bearing on the pace to which CCD can occur regardless of the cost and availability of technologies in a community, policies on energy transitions in SSA should incorporate arrangements on how the marginalised sectors of communities (e.g. women, poor people, etc.) will be empowered to be active participants rather than mere recipients of energy programmes.

An assessment by FSH (2015) revealed that whilst the previous decades were characterised by intense technology innovation, the next decades will be characterised by innovations in new business models such as business models to shift supply-driven energy models to more customer-centric and technology enabled business models. On the other hand, there are assertions that duplicating the energy infrastructure models of developed countries will not be sufficient to meet the needs of poor consumers, and developed economies no longer face energy access issues, such as those seen in SSA or Southeast Asia, hence developed country innovation capabilities might not be sufficient to address sustainable energy access issues for the developing world (Tawney et al., 2015). Moreover, while energy innovation for climate mitigation suffers from insufficient policy attention, even less attention has been given to energy innovation for energy access for the poor (ibid). Cumulatively, these issues highlight that South-South Climate Cooperation could have a greater chance of addressing the energy needs of the poor people, than the prevalent status quo which has got a greater bearing on North-South capacity building and technology transfer modalities.

Even though SSA has vast renewable energy resources, numerous policies to support renewable energy investment and many pledges and programmes by donors and international financiers, the region still suffers from renewable energy underinvestment and erratic power supply, arguably highlighting that current actions are not targeting the most binding constraints on investment and renewable energy infrastructure development (Pueyo, 2018). From one perspective, it might be argued that renewable energy deployment in the Global South has been constrained due to the dependence on Non-Governmental Organisation (NGO)-Led and State-Led renewable energy deployment models (Gabriel et al., 2016; Amankwah-Amoah, 2015) which has led to national governments and NGOs becoming energy service providers rather than facilitators of collective action and empowerment (Ahlborga and Sjöstedt, 2015). Consequently, NGOs and national governments have failed to promote qualitative change in the energy sectors (ibid). Following on from these observations, it has been argued that new renewable energy policies in the Global South should now aim to provide enabling environments which can cultivate entrepreneurs in the renewable energy sector; and progressive renewable energy policies should target the enhancement of innovation capabilities of entrepreneurs, with a particular focus on organisational capital and networks of firms and other actors (Tawney et al., 2015). This arguably means that the new Global South renewable energy strategies, policies and governance structures will now have to incorporate social innovation and polycentric governance as a means for augmenting decentralised energy services business models.

Social innovations can be defined as new solutions to social challenges that have the intent and effect of equality, justice and empowerment and/or new social practices, comprising of new ideas, models, rules, social relations and/or services (Villacis, 2017). On the other hand, governance arrangements that can facilitate low carbon transitions need to be polycentric in-order to permit contextualization, experimentation and innovation (Goldthau, 2014). The concept of polycentric governance encompasses multiple nodes of authority involving diverse actors in partially overlapping and non-hierarchical regimes, rather than the traditional paradigm of governance using hierarchical regimes through central government and local government structures (Bazilian et al., 2014). In the renewable energy sector, various business models attempt to integrate social dynamics with the deployment of renewable energy technologies hence these business models may be considered as social innovations. For example, communities can organise themselves as renewable energy cooperatives (RECs) to provide bottom-up and collective solutions to their local needs and global environmental issues. Through RECs, communities are able to establish legal entities and organisational structures that can develop and invest in renewable energy projects (Villacis, 2017). Similarly, poor and vulnerable community members need to have an ongoing voice in the planning and implementation of community projects (Chu et al., 2016). This has therefore led to the development of partnerships or hybrid models such as public private community partnerships (PPCPs) – involving communities as crucial partners with a strong mandate and shared ownership (Ahlborga and Sjöstedt, 2015), as opposed to conventional public private partnerships (PPPs) which are designed to enable private sector entities to supplement public sector funding and public services provision.

Another innovative model that promotes unique partnerships and engagements between the private sector and local communities whilst also prioritising the needs of both renewable energy developers and rural communities/farmers is the co-location of farm lands and solar parks. In most cases, the development of solar parks and farming are undertaken as separate entities with limited potential for synergies. On co-location schemes, where existing farming land (i.e. land growing wheat, rice, etc.) is co-located with solar photovoltaic generation, it is possible to promote energy security and climate change mitigation whilst facilitating climate change adaptation as farming communities are now provided with new revenue streams from the solar developers and energy generation. For example, the Nyngan Solar Power Plant in central west Australia is sited on a 250 hectare farm, and due to its co-location strategy, the farm produces 102MW of power whilst producing 3-4 tonnes of wheat per hectare (Guerin, 2017). On a smaller scale, the Korea South-East Power Co. installed solar panels on a 6,600m^2 rice paddy in Goseong (South Korea) (Kwang-tae, 2017). Accordingly, this 100 kilowatt solar facility generates up to 400kwh of electricity a day which is sold to the national grid hence allowing farmers to earn a double income through rice growing and the sale of electricity to the national grid (ibid). Another additional benefit to the community is that it can also allow the community to forgo the need to create new lands for renewable energy power generation and/or allow the community to forgo the need for agricultural land expansion as revenues from the electricity sales would compensate for the need to increase cropping land for additional revenues. These two co-location examples illustrate emerging forms of community focused bottom-up solutions for enhancing energy access, and how there is now merit in forging collaborations between farmers/agricultural communities and renewable energy project developers in-order to simultaneously achieve the aspirations of SDG 7 and SDG 10.

On another note, facilitating entrepreneurship has been touted as an important vehicle for promoting energy access for sustainable development in developing countries. This can be attributed to realisations that developing countries have among the world's highest entrepreneurship rates and that infrastructure and other support mechanisms for start-up firms in developing countries is improving (Gabriel et al., 2016). This therefore means that the potential to successfully develop and implement co-location renewable energy deployment strategies in the African context could arguably also be increasing. This follows that it can be hypothesised that since the institutional framework to support entrepreneurship and capacity building for energy project developers/energy entrepreneurs and agri-entrepreneurs is getting established, there could be more willingness for energy project developers/energy entrepreneurs and agri-entrepreneurs to try to exploit the emerging opportunities arising from co-location renewable energy deployment strategies and forge new relationships and partnerships along these new opportunities.

4.0 Financial Innovations for Climate Compatible Development (CCD)

4.1 Emerging Financial Intermediaries for Renewable Energy Deployment

A discussion about energy access and renewable energy deployment is arguably incomplete, at least in the case of SSA, when the issue of renewable energy finance is omitted. Financial constraints are noted to persist on the demand side and supply side of renewable energy transitions thereby affecting both the consumers and project developers. Some of factors causing financial constraints include unreliable or nonexistent government subsidies; dependency on donor support; and lack of working capital and financing options for investors and utilities, even where there appears to be high willingness to pay for electricity (Watson et al., 2012; ARE, 2017; Pueyo, 2018) On the other hand, limited capacity, weak institutions, and a lack of clear frameworks constrain efforts to improve access to climate finance in Africa (Adenle et al., 2017); and many financial intermediaries have problems in understanding the risks and financial structures of different types of climate finance projects and climate-relevant projects hence are unable to produce risk-adjusted returns of climate change related projects (Abramskiehn et al., 2017). Since these aforementioned challenges are more severe and more challenging in developing countries (Lucas et al., 2017), it can therefore be concluded that SSA's paradigms towards decarbonisation need to incorporate the development of peculiar and context specific financial products and mechanisms that can specifically support renewable energy deployment and climate change mitigation.

Research by Clark et al. (2018) highlighted that there are disconnects between global ambitions (on climate change and sustainable development) and financial realities, and that the mechanisms by which such commitments can be fulfilled will likely require transformations across policies, economies, mindsets, approaches and accountabilities. For example, in the current status quo where significant amounts of climate finance for mitigation are disbursed through MDBs, it has been noted that insufficient amounts of climate or development finance are reaching local level actors as it was reported that between 2003 and 2016 the approximate amount of climate finance from international, regional and national climate funds channelled to local climate activities was below 10% (US$1.5 billion) (Soanes et al., 2017). Therefore, it can be argued that for CCD to occur, global policy makers do not only have to focus on creating new climate finance institutions, as the case has been with the creation of the Green Climate Fund to specifically help developing countries with financing climate change programmes (Afful-Koomson, 2015), but equally more attention also needs to be provided to developing innovative financial services providers and collaborative partnerships involving financial institutions and other non-state actors. This can arguably help to improve bottom-up approaches for climate change mitigation and renewable energy deployment.

The lack of access to finance for renewable energy deployment can also partly be attributed to commercial banks and other lending institutions shunning the funding of decentralised energy access because of a lack of relevant instruments, such as risk guarantees for lenders, and relevant credit lines (Kaijage, 2017; AfDB, 2016b). However, whilst the lack of interest of banks to promote renewable energy deployment was viewed as a drawback, there are currently other non-state actors, such as specialised intermediary investment companies that are considering this financing gap as an opportunity for promoting socio-economic development by providing capital to renewable energy sector enterprises (Kaijage 2017; Gilpin, 2015). For example, Sunfunder is a San Francisco based organisation that mobilises financial resources from Development Financing Institutions (DFIs) and the private sector, and makes it available to off-grid/decentralised energy companies in the developing world on relatively affordable terms (Kaijage, 2017). The business model for Sunfunder principally entails the company connecting investors to high-impact solar projects that improve the lives of low-income communities in Africa, Asia and Latin America. Sunfunder is reported to have improved access to energy to over 2.7 million people by providing investments of over US$20 million to enterprises related to solar lighting, phone charging, micro-grids and commercial solar projects (Sunfunder, 2017). The aspects that make entrepreneurs and social enterprises to thrive and scale-up include innovation, sourcing financial capital, building out their supply chain and ensuring on-going media coverage (Walske and Tyson, 2015). Arguably, with the advent of these emerging financial resources from specialised financial intermediary companies complementing or competing with banks to provide financial services, there are improved prospects for entrepreneurs in the energy sector to access affordable finance and promote renewable energy deployment in nascent markets.

4.2 Microfinance for Polycentric Governance and Climate Compatible Development (CCD)

Microfinance has been highlighted as a socio-economic development and climate change resilience building strategy for developing countries because it has varied roles in society such as potentially helping communities to reduce poverty, improve the social and economic situation of women and facilitate income increases through the diversification of sources of income (Shi et al., 2016; Linnerooth-Bayer and Hochrainer-Stigler, 2015; Budiman et al., 2016; Chirambo, 2017). Other benefits of microfinance to households and communities include the potential to contribute to an accumulation of assets; potential to reduce vulnerability due to illness, drought and crop failures; and it may also contribute to better education, health and housing of the borrowers (Hermes et al., 2011). In other cases, microfinance is considered as a strategy for creating jobs and reducing unemployment since it enables credit constrained micro-enterprises and under-served entrepreneurs to access loans to expand their businesses (Erhardt, 2017). Equally important are the assertions that when comparisons between lending from microfinance institutions and traditional banks are undertaken, bank loans are noted not to increase economic growth but increase investments whilst microfinance loans are shown to increase economic growth because microfinance loans may augment growth in other ways other than by increasing physical capital (Donou-Adonsoua and Sylwester, 2017). Lastly, in addition to reducing the vulnerabilities of communities to climate change, microfinance modalities can also be suitable mechanisms for supporting Target 1.4 of the

SDGs which suggests that by 2030 all men and women, in particular the poor and the vulnerable, should have equal rights to economic resources, appropriate new technology and financial services, including microfinance (UN, 2015a). Arguably, the impact and roles of microfinance in socio-economic development activities can be augmented by utilising microfinance to also support bottom-up approaches for enhancing climate change resilience and renewable energy deployment.

Effective strategies for adapting to climate change encompass various behavioural adjustments that households and institutions make (including practices, processes, legislation, regulations and incentives) to mandate or facilitate changes in socio-economic systems aimed at reducing vulnerability to climatic variability and change (Eriksen et al., 2011). This therefore means that in instances where non-state actors such as microfinance institutions modify their business models, programmes, products and services in-order to reduce their risks because of climate change or to embrace new opportunities arising from climate change, they will not only be demonstrating an adaptation to climate change, but they could also be fostering CCD. In her analysis, Elinor Ostrom argued that polycentric governance approaches provided dynamic mechanisms which could allow the experimentation of policies and governance strategies at multiple levels, leading to the development of methods for assessing the benefits and costs of particular strategies adopted in one type of ecosystem to be compared to results obtained in other ecosystems (Ostrom 2008; 2009; 2010). Through the application of the concepts of polycentric governance approaches, microfinance institutions can also have a significant role in promoting off-grid renewable energy deployment, and climate change mitigation and adaptation. As illustrated on Figure 1, the Microfinance Beneficiary Led Development Framework (M-BLDF) is a polycentric climate change governance approach aimed at enabling microfinance institutions to take an active role in addressing climate change challenges at local level. Beneficiary Led Aid (BLA) paradigms are processes through which aid and assistance programmes are determined and materially designed by those at which they are aimed at benefiting hence they can be successful in addressing some development problems as they provide "real" engagement with the beneficiaries and enable the beneficiaries to be entrusted by donors and agencies to make decisions, rather than simply offering input (Flint and zu Natrup, 2014). The M-BLDF is therefore a framework that principally aims at providing microfinance services and products that are in keeping with the needs and capacity gaps of the beneficiaries and local contexts. For example, the M-BLDF was applied in the Beneficiary-Led Climate Change Resilience Building Programme (BLCCRBP) in Malawi (SOO, 2017). In this Programme, it was envisaged that the M-BLDF would enable a NGO to provide financial and technical support to various communities to enable them to identify their climate change vulnerabilities and then decide how best the various communities and beneficiaries would be able to address these issues. Such a bottom-up approach could potentially be more effective than hierarchical arranged or top-down managed microfinance institutions at promoting decentralised energy technologies and supporting subnational governments in their climate change ambitions since both strategic and operational interventions are planned and coordinated at local level. This therefore enables the different branches or offices of the microfinance institution to align available capacity resources and endowments with what the stakeholders and subnational governments in different localities require.

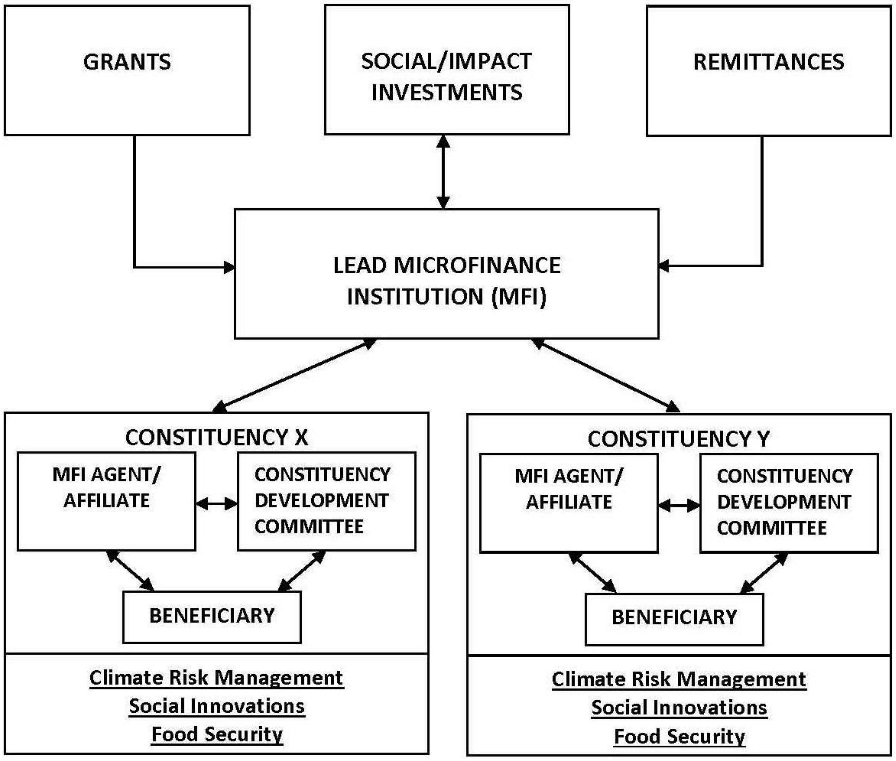

Figure 1. Microfinance-Beneficiary Led Development Framework (M-BLDF).

Source: Author

With reference to the analysis provided above, it is evident that there are now new renewable energy financing and investment opportunities through specialised financial intermediary companies, and also through established financial service providers such as microfinance institutions that can adapt their business models in-order to facilitate the promotion of renewable energy deployment and climate change mitigation. What is arguably missing or where more coordination and emphasis should now be directed towards is in building the capacity of Financial Regulators to understand the renewable energy financing challenges, and the numerous ways to which specialised financial intermediary companies and microfinance institutions can address these challenges. Reference can be made to the case of the diffusion and adoption of mobile money/mobile payments technology in the Global South. For example, research by Suárez (2016) indicated that regardless of mobile money/mobile payments technology being available globally and having the potential to improve socio-economic livelihoods, its adoption and diffusion in different countries has been varied. In the case of Kenya and Mexico, it was noted that a significantly higher proportion of the population in Kenya than in Mexico used mobile money/mobile payments technology because Kenya's regulatory model and regulatory regime for mobile money/mobile payments technology was influenced less by regulatory capture than Mexico's regulatory model and regulatory regime. Similarly, whilst specialised financial intermediary companies can potentially reduce the funding gaps for renewable energy projects and support entrepreneurs in African communities to develop viable renewable energy projects, their full potential can arguably only be permissible where regulatory regimes are formulated to limit the potential of regulatory capture from existing industry players such as banks. More importantly, in the case where the regulations do not place onerous barriers and restrictions to enable local and international specialised financial intermediary companies to easily collaborate with local microfinance institutions, it might be easier for both project developers and households to access the financing that they need for their purposes at affordable rates and flexible terms, circumventing the need to restructure banks and banking systems as advocated by some institutions such as the United Nations Environment Programme (UNEP) (UNEP, 2016) and the Africa Progress Panel (APP) (APP, 2014).

5 Discussion

The development and transfer of clean energy technologies to achieve universal energy access is challenging due to the inherent complexities of the energy sector, weaknesses in energy governance and inappropriate financial systems in developing economies, hence innovation is an essential part of successfully addressing these difficulties (Tawney et al., 2013). As it stands, the World is in a dire circumstance as the rate of global progress on the achievement of both the Paris Agreement and SDGs is not keeping pace with the ambitions of both agendas, and therefore there is a need for immediate and accelerated action by countries and stakeholders at all levels (UN, 2018b). Additionally, there are renewed calls from the Global North that since greenhouse gas emissions from the Global South are now greater than those of the Global North, Global South countries should take on a greater responsibility to deploy renewable energy technologies and help mitigate climate change (Butera et al., 2016). On the other hand, various commentators think that Global South countries have a significant potential to leapfrog from little or no energy infrastructure directly to low carbon systems without having to invest in fossil fuel infrastructure that is widely believed to have adverse effects on human health, and increases global greenhouse gas emission rates. Through leapfrogging, Global South countries can acquire and develop the necessary technical and managerial know-how, and technologies to circumvent the resource-intensive and expensive form of economic development by skipping to the most advanced technologies available, rather than following the same destructive path of conventional energy development that was forged by Global North countries (Amankwah-Amoah, 2015). However, in-order for such an energy transition to occur, and for the Global South to leapfrog directly to clean technologies and infrastructure, there will be a need for Global South countries to change their energy infrastructure paradigms, socio-economic institutions, actors and social norms, and unfortunately this may produce inertia against change (Goldthau, 2014). Additionally, in many developing countries, the current fossil fuel-dominated systems act as a hindering force with respect to the uptake of renewable energy technologies (Gabriel et al., 2016). For example, whilst many African countries are in support of improving climate change mitigation as evidenced from their timely submissions of Nationally Determined Contributions (NDCs) to support the implementation of the Paris Agreement, paradoxically, some African countries are noted to be increasing their use and extraction of fossil fuels. Reference can be made to the NDC of Malawi and

Mozambique. In the case of Malawi, their NDC stipulates new investments in coal power plants for the first time in their energy supply system and consequently this will lead to a 38% increase in total annual greenhouse gas emissions between 2015 and 2040, and energy sector contributions as a proportion of total country greenhouse gas emissions to rise from 4% to 17% within this time frame (GoMa, 2015). In the case of Mozambique (GoMo, 2015), their NDC does not include any measures to restrict the upstream supply of fossil fuels even though restrictive supply-side policy instruments (targeting fossil fuels) have numerous economic and political advantages over otherwise similar restrictive demand-side instruments (targeting greenhouse gases) (Green and Denniss, 2018). At the global level, carbon industries seemingly have preferential fiscal treatment as there is no price on polluting the atmosphere to steer investments to renewable energy technologies (i.e. only 13% of global emissions are subject to carbon pricing and in general terms every tonne of CO_2 is subsidised by an average US$ 150.00) (Bak et al., 2017). Consequently, fossil fuel subsidies are noted to create a perverse incentive for carbon-intensive investments and favour investments in high-carbon infrastructure whilst dis-incentivising low carbon investments (Bak et al., 2017). Arguably, these factors therefore highlight that in the absence of improved efforts to engage SSA stakeholders to devise policies and actions aimed at limiting fossil fuel extraction and supply, many countries in SSA will still be at risk of being locked-in fossil fuel energy supply systems regardless of the possibilities to leapfrog directly to low carbon energy supply systems.

In what might seem as an irony, there are many developing countries calling for developed countries to provide more financial and technical resources towards different climate finance mechanisms (Bird et al., 2016; Ha et al., 2016) and yet some anecdotal evidence also suggests that some developing countries have an inertia against transitioning their energy supply systems from fossil-fuel based systems towards renewable energy based systems since such countries have planned new investments in new fossil-fuel based energy systems. There are arguably many merits for both resource rich and non-resource rich SSA countries to hastily transition to renewable energy supply systems. In the case of non-resource rich countries that import fossil fuels, it can be argued that such countries can experience fiscal deficits when fossil fuel prices increase and subsequently push up the import costs and retail prices of energy. For resource rich countries that export fossil fuels, it can be argued that global oil price fluctuations can trigger fiscal deficits and exchange rate instability as the countries' sources of revenues are adversely impaired (Power Africa, 2016). Added to this, Africa is experiencing a youth unemployment crisis with some figures showing that 10 million young Africans enter the continent's workforce annually since Africa is the fastest growing continent in the world (AGRA, 2015), and yet investments in renewable energy can partly address the youth unemployment crisis. For example, renewable energy deployment can be a strategy for reducing youth unemployment since as compared to fossil-fuel power plants, renewable energy generates more jobs per unit of installed capacity, per unit of power generated and per dollar invested (Müller et al., 2011). Additionally, accelerating efforts to achieve the SDGs can also address unemployment challenges as the economic reward from delivering solutions to the SDGs could be worth at least US$12 trillion each year in market opportunities and generate up to 380 million new jobs by 2030 (Pedersen, 2018). Arguably, a factor that can be contributing towards the inertia against increased renewable energy investments could be that the economic benefits of investing in renewable energy technologies are not well articulated or understood by African policy makers due to the association of renewable energy investment with environmental objectives only, and the common framing of climate change mitigation as an environmental issue rather than framing climate change/renewable energy deployment as an economic issue (linking climate change with national economic performance) and/or a public health issue (emphasising potential health benefits of emissions reductions) (Wibeck, 2014; Nisbet, 2009). Arguably, with the integration of entrepreneurship in the delivery of energy services (entrepreneurship-led energy access models), more decentralised energy supply systems and more bottom-up energy supply systems arising from social and institutional innovations in communities, the (socio and economic) value of renewable energy systems at both the micro-economic and macro-economic levels might become more evident. Additionally, once the (socio and economic) value of renewable energy systems become more evident, the probabilities of African energy systems leapfrogging towards renewable energy based infrastructure could increase as there would be a reduction to the current inertia against transitions towards renewable energy development since decentralised renewable energy systems would be creating more direct socio-economic opportunities and direct energy sector jobs for marginalised communities.

6 Conclusion

Most of the discussions on renewable energy and the SDGs in the African context have focused on how SDG 7 can augment the aspirations of SDG 13 by promoting climate change mitigation measures such as the deployment of renewable energy technologies. In this paper, an analysis was done regarding the synergies between SDG 7 and SDG 13, and also on which innovations can enable SDG 7 programmes to support global ambitions to reduce inequality within and across countries, and hence facilitate the attainment of SDG 10. In this analysis, it was highlighted that in the absence of novel business models, novel finance instruments and new organisational networks; unequal access to energy will be engendered since most private investments are in energy generation, with the mandate for transmission and distribution infrastructure principally still being the responsibility of underfunded government agencies. Added to this, the need to compliment the decreasing costs of renewable energy technologies with new institutional innovations to promote bottom-up energy services was provided. Consequently, it was suggested that a focus on the mobilisation of financial resources in-order to acquire new renewable energy technologies alone would not simultaneously support the attainment of SDG 7, 10 and 13. However, simultaneously attaining SDG 7, 10 and 13 could possibly be achieved by developing policies and pursuing integrated approaches that have a focus on promoting decentralised energy systems, promoting entrepreneurship in the delivery of energy services and improving the regulation of national financial sectors in-order to create an enabling environment devoid of regulatory capture so that specialised financial intermediary companies and microfinance institutions may provide bespoke energy financing products and services.

Even in circumstances where the costs of renewable energy technologies continue to decline, and new institutional frameworks and collaborations to promote new paradigms for renewable energy decentralised systems are put in place, many countries in SSA might still miss the opportunities to leapfrog directly to low carbon societies due to an inertia against transitions to renewable energy based energy supply systems. Consequently, an area for further study could be to determine the policy aspects that can enable the emerging South-South Cooperation modalities and South-South Climate Finance modalities to promote renewable energy entrepreneurship in SSA and support the development of restrictive supply-side policy instruments which can limit the extraction of fossil fuels with little or no adverse impacts on the socio-economic development prospects of SSA countries. With new knowledge in these two areas, it could be anticipated that the impact to which climate finance could have on energy deployment would be increased as the operational models for emerging South-South Cooperation modalities and South-South Climate Finance modalities would subsequently not incorporate the aspects that have engendered the inequitable access to climate finance for climate change mitigation.

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