



Non-financial constraints to scaling-up small and medium-sized energy enterprises: Findings from field research in Ghana, Senegal, Tanzania and Zambia

Haselip, James Arthur; Desgain, Denis DR; Mackenzie, Gordon A.

Published in:
Energy Research & Social Science

Link to article, DOI:
[10.1016/j.erss.2014.12.016](https://doi.org/10.1016/j.erss.2014.12.016)

Publication date:
2015

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):

Haselip, J. A., Desgain, D. D. R., & Mackenzie, G. A. (2015). Non-financial constraints to scaling-up small and medium-sized energy enterprises: Findings from field research in Ghana, Senegal, Tanzania and Zambia. *Energy Research & Social Science*, 5, 78-89. DOI: 10.1016/j.erss.2014.12.016

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Non-Financial Constraints to Scaling-up Small and Medium-sized Energy Enterprises: Findings from field research in Ghana, Senegal, Tanzania and Zambia

James Haselip, Denis Desgain, Gordon Mackenzie

UNEP DTU Partnership, Department of Management Engineering, Danish Technical University, UN City,
Marmorvej 51, 2100 Copenhagen Ø, Denmark

Abstract

In the context of the 'decade for sustainable energy' (2014-2024) under the UN's Sustainable Energy for All initiative, this article presents findings from primary research conducted into the 'African Rural Energy Enterprise Development' (AREED) programme. AREED was a donor-backed effort to support small and medium-sized energy enterprises, implemented in five countries by United Nations Environmental Programme between 2002 and 2012, as a means to expand access to sustainable energy products and services in sub-Saharan Africa. While access to affordable finance was found to be the primary constraint to establishing and expanding local small and medium-sized energy businesses, a range of significant non-financial constraints were also identified. This article provides a critical evaluation of these non-financial constraints as they were encountered in Ghana, Senegal, Tanzania and Zambia, based on the findings of a wider study into the key outcomes of the AREED project. These barriers include the institutional frameworks, human capacities and social and cultural factors.

1. Introduction

Access to clean and modern energy technologies is widely regarded as a key issue worthy of targeted policy and financial support, especially in sub-Saharan Africa, the focus of this Special Issue, where there is still a strong reliance on traditional biomass (wood, charcoal, and animal dung) and kerosene fuel (Bazilian et al., 2012; Gujba et al., 2012, Hancock, 2015). In addition to the central importance of energy to economic growth and development, there are numerous co-benefits associated with the transition from traditional fuels, such as access to higher-quality

light and heat and reduced greenhouse gases, in-door air pollution and local environmental damage, including deforestation (Agbemabiase et al., 2012; Haines et al., 2007; Kaygusuz, 2012). Given the high proportion of rural households, poor infrastructure and the distances between smaller urban areas, energy markets in sub-Saharan Africa would appear to lend themselves to small and medium-sized business (SMEs) that can trade on local knowledge and networks, and are able and willing to pursue potentially lucrative but higher-risk business opportunities (LaRocco, 2003). While this is a contentious claim, worthy of rigorous investigation in itself, we do not question this assumption and rather work, *prima facie*, with the idea that energy SMEs have a valid role to play in delivering modern energy solutions to low-income populations in developing countries.

The lack of access to affordable finance is often cited as the most significant barrier to the establishment and expansion of SMEs in sub-Saharan Africa, especially for businesses operating in new or relatively unknown sectors, including energy products and services (Bhattacharyya, 2013; Haselip et al., 2013; Mehlwana, 2003). One of the main reasons for this is that formal financial institutions in sub-Saharan Africa are generally less willing to lend to SMEs due to the high risk of default, insufficient competition, poor guarantees and a lack of information about SME's ability to repay loans (Kauffmann, 2005; Haselip et al, 2013). Therefore the majority of donor-backed programmes and policies to support the development of SMEs in Africa have a focus on the financial aspects of their viability. In fact, while most of the academic papers and grey literature addressing barriers to SMEs development in Africa focus on these financial barriers, non-financial barriers are considered as important although less discussed in the literature. In general, non-financial barriers are those linked to the wider social, economic and policy environment that affects business operations. Therefore various studies consider the need to address non-financial barriers prior to, or in addition to, exploring financial constraints to SME development (IFC, 2010). Indeed that is the aim and purpose of this article, which draws upon the findings of a larger study, conducted in 2012-2013, entitled "Energy SMEs in sub-Saharan Africa: Outcomes, barriers and prospects in Ghana, Senegal, Tanzania and Zambia" (UNEP Risø, 2013).

In Section 2, we provide an overview of energy SMEs and the AREED project. Section 3 includes our research questions and the methodology used for this study. In Section 4, we provide some general and energy background on the four countries evaluated: Ghana, Senegal, Tanzania, and Zambia. We then look at the business models and institutional frameworks for each country (Section 5), followed by human capacity (Section 6) and social and cultural factors (Section 7). We conclude with recommendations and suggestions for future research.

2. Energy sector SMEs and the AREED project

The term ‘energy SME’ is widely used within the academic and development community, though it often goes undefined. The literature suggests that an energy SME is a business that ‘supplies energy-related products and services’ (Brew-Hammond, 2010; Karekezi, 2002; Prasad and Dieden, 2007). However, individual business activities vary and so these definitions are open to interpretation regarding what constitutes an energy product or service, including the extent to which these businesses focus on energy, in addition to other activities.

Donor-backed programmes to support SMEs in the energy sector have been developed by various international agencies, NGOs and not-for-profit organisations, including the World Bank’s Energy Sector Management Assistance Program (ESMAP) and the Global Village Energy Partnership (GVEP). The United Nations Environmental Programme’s (UNEP’s) African Rural Energy Enterprise Development (AREED) programme is another such programme. AREED ran for 10 years from 2002, with total donor funding in excess of \$10 million from various agencies, such as the United Nations Foundation and Swedish aid (SIDA), and was implemented in partnership with the US-based company E+Co. Under AREED, more than 50 businesses were awarded enterprise development support and start-up capital, mostly in the form of soft loans of up to \$150,000, across five countries in sub-Saharan Africa: Ghana, Mali, Senegal, Tanzania and Zambia. Businesses were selected from a long list of applicants, based on various criteria including commercial viability and quality of plans.

The question of defining energy SMEs is relevant to the analysis of programmes such as AREED since the qualifying criteria (not assessment criteria) was often vague or not stated. Indeed, in some cases, the specific businesses supported by AREED did not sell energy products or services

as their main activity, but rather were business with high levels of energy demand, and so were included on that basis. The intended outcomes of the AREED project were to 1) enhance the capacity of entrepreneurs to start and develop energy businesses, 2) improve the capacity of local NGO Partners to provide support to entrepreneurs, 3) develop strong partnerships with local financial institutions, and 4) improve the capacity of government officials and agencies to formulate and implement policies to support energy SMEs.

In their analysis of obstacles to the growth of new SMEs in South Africa, Olawale and Garwe (2010) identify the following categories of barriers: financial, market, management, and infrastructure. Financial and management components are considered as internal, i.e. factors that lie within a firm's environment that are largely controllable by the firm. The other components are external, i.e. systemic factors. Beyene (2002) proposes the following categorisation of barriers in addition to access to finance: policy and regulatory environment, infrastructure policy, technology, skills development and marketing. Meanwhile, Thiam (2007) categorizes the critical barriers as policy, finance, organization, culture, and information.

Common to all these studies is a clear identification of non-financial barriers to SMEs in developing countries. While these vary between authors, the main categories are 1) business and institutional frameworks 2) human capacities and 3) social and cultural factors. These are the categories that we use to discuss our findings. They cover political instability, bureaucracy, insufficient legal frameworks, poor market infrastructure, market control by incumbents and low levels of investment in research and development. They also cover issues of information and technical capacity-related barriers such as the lack of consumer awareness, poor availability of technical data, a dearth of professional institutions and a scarcity of skills and appropriate training (GNESD, 2007; Gboney, 2009; UNIDO, 2009; Kennedy and Basu, 2013).

As such, this article relates to the issue of energy market reforms in developing countries promoted by multilateral agencies, which, until recently, have done little to incentivise the provision of energy services to the poor or reduce overall rates of energy poverty, especially in sub-Saharan Africa (Bazilian et al., 2014). Therefore, by discussing the role and importance of energy SMEs, and the non-financial barriers to their development, we contribute to wider

debates about energy governance and infrastructure to address energy poverty, which has received relatively little academic attention (Goldthau, 2014 and Bazilian et al., 2014).

3. Research questions and methodology

The research summarised in this article draws on a larger study that focused mostly on the AREED project countries, although it was not an evaluation of AREED. A ‘terminal evaluation’ of the AREED I programme was carried out by N’Guessan (2009) and similar evaluations have been done for other programmes. As such, the aim of this research was to go further than documenting the extent to which various projects and programmes aimed at supporting energy SMEs have achieved their stated objectives. Rather, the research aimed to step back and ask broader questions of what difference have these programmes made, and what barriers did they face? As such, an investigation into the non-financial constraints to the establishment and scaling up of energy SMEs was part of the focus of this wider study.

For this study, we used a qualitative methodology based on a combination of ‘outcome harvesting’ (Wilson-Grau and Britt, 2012) and semi-structured interviews with targeted individuals involved with these programmes and projects, and /or knowledgeable about energy SMEs in Africa. Desk-based preparations for this wider study began in June 2012. Primary field research was conducted in Ghana, Senegal, Tanzania, and Zambia¹ between 10 September and 5 October 2012 with 5 days’ work in each country. The research aimed at answering the following questions:

1. To what extent have specific businesses demonstrated that energy SMEs are a viable means to provide scalable access to modern energy sources?
2. What are the key factors that have determined the success or failure of specific energy SMEs in the identified countries?

¹ Mali, the 5th country in the AREED project, was omitted due to security concerns regarding political developments, which deteriorated in the second half of 2012.

3. What are the main, persistent, barriers facing entrepreneurs when setting up, operating and expanding energy SMEs in the identified countries?

Answers to these three questions offer insights for national policy makers and donor agencies charged with designing programmes to promote energy SMEs in sub-Saharan Africa. To address questions two and three, it was also necessary to document and analyse the market and regulatory conditions, e.g. the legislative and institutional frameworks in place in each country to support the establishment and operation of energy SMEs. These country-specific conditions can be viewed as an ‘enabling framework’ that can, to a greater or lesser extent, encourage the establishment of energy SMEs and the diffusion of sustainable technologies.

To help answer the research questions and to sharpen the focus of the in-country interviews, a one-day workshop was held in the targeted AREED project countries where the technique of ‘outcome harvesting’ was adapted and applied. (See Appendix for a list of all participants.) During the workshops, four to five specific energy SMEs (whose performance here is treated as ‘outcomes’) were described by the workshop participants who worked in groups. The participants are defined here as the ‘change agents’, i.e. those that sought to affect change with regard to energy SMEs, which included the entrepreneurs themselves, government officials, financial institutions and NGOs. The second task at the workshops was for the change agents to agree upon an account of the plausible contributions made by various individuals and organizations (and other, external, contributing factors) to the identified businesses. The use of outcome harvesting was adapted slightly as it was conducted ‘by consensus’, as opposed to in-depth investigation with primary change agents, largely due to practical constraints faced by the researchers. This adaptation has some limitations: under ‘standard’ outcome harvesting, the contributions are focused on one organisation for the sake of understanding the activities that work well, and those that work less well (and why), as a tool for self-improvement. For this study, the application of outcome harvesting by consensus was a tool to gather key information on the outcome-contribution relationship at a broader level, moving away from a project or programme-specific focus, to one where everyone involved can build a clearer picture of the effectiveness of energy SMEs per se, and of the relative importance of the various means available to promote them.

While the workshops aimed to obtain answers related to project outcomes, a total of 34 semi-structured interviews were conducted with various ‘change agents’ in order to expand upon the issues raised in the country workshops (see section 10 below for a list of interviews conducted for this research). Interviews were organised through local partner organisations, though conducted by the authors in English and French in the case of Senegal. Questions were drafted based on the issues identified during the desk study, and were refined following the workshops to better reflect on the particular issues in each country. However, generally speaking, the interviews focussed more on country-specific conditions including the enabling frameworks that can, to a greater or lesser extent, encourage the establishment of energy SMEs and the diffusion of sustainable energy technologies. As such, the findings discussed in this article are drawn mostly from the interview data, in addition to secondary sources of published and ‘grey’ literature.

4. Energy backgrounds and country contexts

According to the World Bank, Ghana, Senegal and Zambia are lower-middle-income economies while Tanzania is a low-income country. In terms of primary energy supply, the four countries rely heavily on biomass fuel for their cooking and heating energy needs, mostly in the form of wood fuel and charcoal, in both rural and urban households. See the

Electricity is a key driver for all four countries’ continued economic growth. The electrification rates range from high for Ghana (72%) to very low for Tanzania and Zambia (24% and 26% respectively). Even if the energy context varies from one country to another, all four face similar challenges regarding electricity supply and quality. Senegal is characterized by an extreme dependence on imported fossil fuels, making it very vulnerable to increases in the global price of oil products. Ghana, Tanzania and Zambia rely heavily on hydropower, making these countries vulnerable during droughts. All these countries face problems in terms of growing electricity demand and are affected by load shedding, power outages, and poor quality electricity with fluctuations in voltage and frequency. In Ghana, Senegal, Tanzania and Zambia, a national

energy policy has been approved by the government, which places a strong emphasis on developing new renewable resources.

Table 1: Summary of key energy data for Ghana, Senegal, Tanzania and Zambia

| | Ghana | Senegal | Tanzania | Zambia |
|--|--|--|--|---|
| Total population (in millions) | 25.5 | 13.1 | 47.7 | 13.9 |
| Electrification rate | 72% overall 90% urban 52% rural | 55% overall 90% urban 28% rural | 24% overall 71% urban 7% rural | 26% overall 45% urban 14% rural |
| Net installed capacity of electric power plants | 2,170 MW (1180 MW hydro) | 625 MW | 1008 MW (562 MW hydro) | 2009 MW (1916 MW hydro) |
| Primary energy supply mix (petajoule), for all states renewables are mainly traditional biomass | Total Primary Energy Supply: 386.9 PJ Renewables: 76.2% | Total Primary Energy Supply: 158.4 PJ Renewables: 54.8% | Total Primary Energy Supply: 821.3 PJ Renewables: 88.9% | Total Primary Energy Supply: 328.9 PJ Renewables: 92.2 % |
| Energy use per capita (kg of oil equivalent) | 425 | 264 | 448 | 621 |
| Percentage of the population that relies on solid fuels as the primary source of domestic energy for cooking | 84% | 56% | 96% | 83% |

Sources: (UNFPA 2012; IEA, Africa Energy Outlook 2014; electricity database; electricity access in Africa 2012; IRENA, 2009; World Bank, 2011; World Health Organization, 2012; Global Health Observatory Data Repository, 2012; United Nations data, 2010)

5. Business models and institutional frameworks

Specific national circumstances and external effects may constitute barriers to establishing viable SMEs. In this section, we discuss some the contextual factors and institutional frameworks that have been found to influence the establishment and the business models of energy SMEs in the four countries.

5.1 Ghana

In Ghana, we identified three main critical factors that can seriously affect the potential for successful clean energy SMEs: expectation of forthcoming grid connection, association with a large corporate player and the existence of relevant trade organisations. In spite of the country's relatively high electrification rate (see table 1), Ghana was chosen as a pilot country for the International Finance Corporation (IFC) "Lighting Africa" project that promotes the use of mainly off-grid solar technologies. The justification, as expressed by the project's Albert Eliason, is that at least 13% of the Ghanaian population is expected to remain unconnected to the grid until 2020. Despite the large number of SMEs operating in the market for solar photovoltaic (PV) technologies (including solar home systems (SHS) and solar lamps), solar PV technology has witnessed less growth than other "cleaner energy" technologies, like efficient cook stoves and Liquid Petroleum Gas (LPG). This is widely attributed to reduced willingness to pay for SHS, due to government's relative success in providing grid-supplied electricity, even in some rural areas. However, there remains a high demand for SHS for back-up purposes, as opposed to a primary source of energy, because of frequent grid-power outages. A specific challenge for many solar businesses in Ghana is that their business plans are undermined by inconsistent or unpredictable investments in grid electrification, i.e. certain areas are prioritised ahead of official plans. Nonetheless, the Ministry of Energy has mapped its electrification plans, for example identifying which areas are unlikely to get electrified in the next 10 years, thus identifying the natural domain of SMEs to supply off-grid solutions.

Eliason argued that a key to SMEs playing a significant role in the diffusion of clean, modern, energy technologies is to involve a large corporate player to provide a mature network and platform on which the SMEs can retail their goods. He pointed out that this model requires a complex business management system in place to support SMEs, to make sure they are fully stocked and remain profitable. In turn this would increase the SME's credibility with the banks, stimulating a virtuous circle of growth for energy SMEs. However, the model remains untested and, though technically possible, there are considerable organisational challenges such as how to convince a big corporate player to work with smaller local businesses and how to equip the SMEs with relevant skills. Eliason provided an example from Lighting Africa, where an attempt

was made to involve GOIL (Ghana Oil: a major oil and gas company with a large network of refilling station) in the distribution of solar lamps but the company declined, due to past negative experience with poor-quality solar installations. This issue highlights the importance of technology reputations, which is a particular concern for large corporations.

Compared to either Zambia or Tanzania there are more, and better organised, renewable energy technology industry trade associations in Ghana. Nonetheless, various stakeholders argued that more needs to be done to organise and represent clean and renewable energy technology businesses, especially with regard to lobbying the government for favourable tax reforms and policy support. While the Solar Industry Trade Association is regarded by many as a good start, there is a perceived need for a nationwide umbrella association of renewable energy businesses, but, beyond rhetorical support, there is no concrete evidence that this idea is being developed.

5.2 Senegal

The Senegalese government has taken measures to encourage the development of SMEs and has made the development of renewable energy one of its priorities. In 2003, the government adopted a National Strategy for the Development of Renewable Energies for Poverty Alleviation, integrating renewable energy into other development policies, with the specific target of a minimum 15% renewable-based electricity production by 2025. However, SMEs in general are still hindered by many institutional difficulties which act as a brake on their development and evolution.

The Federation of Enterprises in the Electricity sector (Fédération des entreprises du Sénégal dans l'électricité – FESELEC) comprises Senegalese and foreign companies working in the electricity sector, with groups representing engineering, distributors and installation companies. According to the president of FESELEC, Mor Kassé, the Federation focusses on national environmental concerns, maintaining high quality energy supply at minimum cost, ensuring access to electricity services and decreasing the energy price volatilities. Given this remit, FESELEC is unique in Senegal, and there are no other organisations that group energy SMEs together. Furthermore, contact between SMEs addressing the same kind of technology is very

limited in Senegal where companies tend to operate in isolation from each other, to the detriment of the sector as a whole.

At a more general level, there are many institutions dedicated to the development of SMEs in Senegal. The Ministry of Trade, Industry and Crafts includes the department of Small and Medium Enterprises addressing specifically the issue of SMEs. The Agency for the Development and Support of SMEs (ADEPME) also plays a key role by providing advice to SMEs in terms of management, strategies and market analysis. However, it is understood that while these institutions consider energy SMEs as just a subset of SMEs, they are usually unfamiliar with the specifics of the energy market, its structural dynamics and the relevance of other government policies. Therefore, according to most of the entrepreneurs consulted, the services provided by these institutions do not always match the special features and needs of energy SMEs. In addition there is a clear lack of knowledge by entrepreneurs on the services provided by the institutions, and so potentially useful contact and collaboration often goes unrealised. Furthermore, there are no structures in place to promote a dialogue between the institutions bringing the services and the entrepreneurs of SMEs. Consequently there is no flow of communication between parties and it is difficult, according to various individuals interviewed for this research, to convey information and expectations from one side to the other side. Government representatives explained that they expect the entrepreneurs to approach them with the aim of clarifying their expectations, while the entrepreneurs expect the government to take active decisions and leadership to support the development of SMEs. According to Louis Seck, ex-Minister of Renewable Energies, “the State put the general framework in place; then it is the responsibility of the private sector to approach the State”.

There are also a number of institutions and national programmes dedicated to the development of renewable energy, notably the Centre for Studies and Research into Renewable Energy (CERER) at the University of Dakar and the National Program on Biogas (Programme National de Biogaz du Senegal) started in 2010. There are many examples of positive collaboration between SMEs and these institutions and programmes or with other scientific institutions. For example, the technical staff of the ABS Group (Africa Building Services Group, an SME manufacturer of bio digesters) has been trained by the National Program on Biogas and SAEB developed a

partnership with the Institute for Agronomic Research in Senegal to conduct trials on Jatropha seeds. However, these institutions and programs usually provide technical support and do not address either the policy or regulatory frameworks, or the management aspects of SMEs.

More broadly-focused agencies such as the Senegalese Agency for Rural Electrification (ASER) and the Committee for Regulation of the Electricity Sector (CRSE) address renewable energy as a central part of their remit. Ousmane Fall Sarr, head of the Studies and Information System Unit at ASER, considers that energy SMEs have a key role to play in the national programme of rural electrification and that this programme must facilitate the emergence of SMEs compared to larger companies. In this sense ASER encourages the participation of energy SMEs in the awarding and management of the grid concessions. However, Fall Sarr explained that the SME entrepreneurs have a general lack of technical capacity. On this issue, FESELEC confirms that the state encourages local entrepreneurs to become concessionaires and that there is a preference for the Senegalese companies within the call for tenders. ASER also promotes the participation of energy SMEs through local development initiatives, namely the Rural Electrification Local Initiative (ERIL). However, in these cases FESELEC points out that ASER launches projects and looks for implementing entities to execute the projects. In this context “SMEs are only service providers for ASER”.

In conclusion, institutions covering SMEs and energy respectively are well developed in Senegal, at least compared to the other AREED countries. However, challenges occur at the level of communication and synergies between these institutions. Thus there are entities working to promote SMEs but that they are not familiar with the energy or renewable energy sector. On the other side, there are entities addressing the technical aspects of the energy or renewable energy issues who are not familiar with the business challenges facing SME development. In this sense, there is an apparent need to establish an intersectoral dialogue to bridge this gap. Most stakeholders interviewed for this research identified the Ministry of Energy as the best institution for initiating such a dialogue and in promoting the development of energy SMEs more generally. There is also a need to develop the communication between research centres and government ministries, to feed technical knowledge into evidence-based policy making.

5.3 Tanzania

In Tanzania, there is a relatively high degree of organisation between energy SMEs compared with some of the other partner countries, such as Zambia. Companies meet to discuss issues of common interest through the Tanzania Renewable Energy Association (TAREA) (previously known as TASEA - Tanzania Solar Energy Association), which in turn has formal connections with the Rural Energy Agency. The Rural Energy Agency has significant resources to finance grid and off-grid access to electricity, as well as the promotion of efficient cooking fuels and stoves. TAREA is the main organisation that brings together and represents the renewable energy sector in Tanzania, acting as both a trade association and government lobby group. One of TAREA's main objectives is to "promote the local manufacture of Renewable Energy products and enterprise development in the Renewable Energy sector", thus recognising a central role for SMEs. Matthew Matimbwi from TAREA highlighted the importance of energy SMEs in Tanzania, stating that "due to the low rate of access to modern energy technologies, especially in rural areas, SMEs work to disseminate technologies. There are a lot of rural areas that need energy service but lack the supply chain. SMEs are the tools to disseminate the energy services in the rural areas. A study that was concluded in November 2011 by the Rural Energy Agency shows how SMEs have contributed to the increase of access to electricity in rural Tanzania from 2% to 6%."

Related to the topic of renewable energy technology sector-specific associations there exists, aside from TAREA, a "clean cookstoves and fuel alliance of Tanzania" forum which brings together key stakeholders to discuss the promotion of these technologies. However, this alliance is not a trade association *per se*, and although they have been encouraging efficient use of charcoal and technologies to replace charcoal, their impact to date is regarded as marginal. Some observers argue that such broad stakeholder fora, often the outcome of NGO programmes, are useful for communicating ideas and arguments but tend not to produce concrete direction for the commercial benefit of energy SMEs. Indeed, in cases where NGOs themselves attempt to set up energy SMEs, either commercial or community-owned enterprises, results have been variable. On this issue Oscar Lema, Managing Director of Alternative Energy Tanzania stated, unambiguously, that "NGOs are unable to manage businesses".

During the stakeholder workshop organised for this research, the problem of ‘club proliferation’ was raised, whereby too many energy and development related committees, groups and associations operate in Tanzania, duplicating efforts, wasting limited resources, diverting attention from business activities. This is in contrast to the situation in Zambia, for example, where there is a lack of strong communication and coordination between energy SMEs. Nevertheless, stakeholders from the finance sector in Tanzania, including Joseph Ndunguru of Twiga Bank, generally agree on the need for a knowledge-sharing platform for the energy finance community in Africa.

In addition to the non-market institutions that serve to help or hinder the development and commercial success of energy SMEs in Tanzania, there are some structural, market, challenges facing the energy SME sector in Tanzania that can be broadly related to the ‘institutional framework’. Mussa Mzumbe from RESCO stated that these challenges include the cost of marketing, with the cost of media advertising, as well as face-to-face promotional work, greatly diminishing profits. Mzumbe also maintains that commercial success in the solar PV market is dependent upon having a strong rural distribution network, which is time consuming and expensive to build up.

5.4 Zambia

In Zambia the general message is one of lack of communication and coordination with government and between the different active and potential energy SMEs. Although much of this is due to a shortage of human capacity, covered in the next section, the institutional dimension is crucial, where the lack of communication and cross-fertilisation between potential actors and entrepreneurs hampers the growth and success of initiatives.

There are many ideas and numerous activities going on to develop and diffuse new energy technologies in Zambia. The weakness appears to be a lack of awareness and coordination between the individuals and organisations within the energy SME sector, and there is some degree of duplication of efforts and isolation of activities where more cooperation and

coordination could be beneficial to the sector as a whole. The situation is exacerbated by an absence of renewable energy trade associations in Zambia, apart from biofuels, and a low level of contact between small businesses and the Department of Energy, while the Rural Electrification Authority is mostly focussed on grid-based electrification. According to most interviewees, this lack of coordination can be attributed to inadequate human and institutional capacity in government.

The main issues raised at the Lusaka workshop, and during subsequent interviews, concerned the lack of coordinated or centralised marketing for specific energy technologies; a general lack of information for entrepreneurs regarding the energy sector; the need for SME incubators; follow-up support for energy SMEs to improve chances of commercial success. In response to a discussion of these issues, the workshop participants agreed that a high-level energy ‘taskforce’, with strong political leadership at the highest levels, should be set up in Zambia to identify the organisational gaps in the energy SME sector. As well as galvanising support for a clear national energy SME agenda, such a taskforce should conduct a market mapping of who should be doing what, in order to streamline current activities. Participants also agreed that government-sponsored courses for entrepreneurs on management skills, book-keeping and business planning would help fill an important capacity gap, similar to what was provided under the AREED project for selected entrepreneurs. However, such open discussions can quickly descend into a ‘wish list’ of capacity needs, where it is all too easy to state that "it’s the government’s responsibility" to provide these services when, in reality, the government itself may lack the necessary human capacity and organisational capacities. This dynamic brings to light a deeper, intractable, development dilemma the implications of which are far wider than just the energy sector.

At the Department of Energy (DoE), Charles Mulenga (then Assistant Director) indicated a ‘general lack of awareness’ in the country regarding business opportunities in the energy sectors. He went on to recognise the valuable contribution that SMEs could make to increasing energy access, but stated that the DoE would welcome the formation of trade associations. This reflected a DoE preference for working with umbrella organisations rather than individual businesses that would tend to lobby for their own, narrow, interests.

Only one energy SME association existed at the time of the study, the Biofuels Association of Zambia (BAZ). Suggestions for improving the biofuel market in Zambia have been presented to the DoE by the BAZ; the proposals were being assessed. While the DoE is interested in setting a price for biofuels, agreement had not yet been reached with Zambian producers with regard to production costs, resulting in a deadlock. With regard to promoting energy SMEs, the DoE hosts an “Energy Sector Activity Group” including a renewable energy sub-sector to discuss market opportunity issues. The DoE also hosts an ‘Energy Week’ and trade fairs at which energy technologies are demonstrated, joining forces with other organisation such as WASAZA which promote the use of biogas digesters. However, it was clear from discussions with a number of energy SMEs that the level of sector coordination for energy SMEs is very low, and in the case of solar energy, there is no representation.

In general, as expressed by Charles Mulenga, DoE sees its role in supporting SMEs as one of responding to the needs of business, and they are waiting for businesses to take the initiative. DoE would then decide on an appropriate action for support. On the other hand, many of the entrepreneurs interviewed claimed that they were waiting for government to take decisions that help support various energy markets, revealing a fundamental organisational capacity gap and a difference in expectations.

5.5 Summary of findings on business models and institutional frameworks

The overall theme that emerges from the four countries concerns the challenge of coordinating efforts to promote energy SMEs. This overall challenge can be divided into two sub-themes, which can be characterised as structural challenges and communication challenges. The structural challenges present the dominant barrier to the establishment and scaling up of energy SMEs in Ghana and Senegal, where, for example, there is a reluctance of larger corporate players to collaborate with SMEs and where trade associations for energy SMEs are either weak or non-existent. Communication challenges were encountered in all countries, where there was minimal evidence of ongoing communication and collaboration between state, NGO and private entities working to promote energy SMEs, thus undermining sector-wide progress. The notable

exception appears to be in Tanzania, where communication and collaboration has led to ‘club proliferation’ which creates its own inefficiencies of duplicated efforts and over-emphasis on non-business issues, typified by the ‘NGO-ization’ of energy SMEs.

6. Human capacity

6.1 Ghana

A key factor in determining the success or failure of energy SMEs, as highlighted by Frank Atta-Owusu (former AREED programme officer at the Ghanaian partner centre KITE), is the presence of business skills and motivation of individual entrepreneurs. Atta-Owusu illustrated the point with reference to the experience of Toyola, a successful cookstove manufacturer, explaining that the entrepreneur in this case had a clear idea of what he wanted to do, and was willing to take risks. In this sense, Atta-Owusu emphasised that entrepreneurs must be actively involved in pushing the market for their products in order for the SME to succeed. This reiterates the importance of basic human capacity as a key success factor for energy SMEs. In the area of efficient cookstoves there has been a great number and variety of projects and programmes in Africa aimed to promoting this technology, through different means, and is a fascinating area of study. See, for example, Lambe et al. (2015) for a critique of the role of carbon finance in helping to transform household energy markets, which focuses on cookstove projects and programs in Kenya.

KITE focused its efforts on assessing the experience, skills and motivation of individual entrepreneurs in addition to the energy market or technology they wanted to pursue. As such, KITE was not only keen to support entrepreneurs that expressed a genuine interest in working and remaining in the energy sector in the longer term, but also considered the background and qualifications of the individuals, with regard to existing and potential business and administration skills. By comparison, from conversations with staff at the AREED partner organisations in Tanzania (TaTEDO) and Zambia (CEEEZ), where many of the AREED-supported business ultimately failed, the selection criteria focussed more on the quality or

originality of the business *idea*, than the individual behind it and his or her business and administrative skills.

6.2 Senegal

As in other AREED countries, the Senegalese energy SME sector has attracted a number of technology ‘enthusiasts’. Most of them have a scientific background (engineers or bio-engineers) and have often completed part of their academic studies (Master, PhD) outside of Senegal. It is common for these entrepreneurs to be driven by an interest to develop a specific technology, as opposed to being primarily motivated by business interests. These entrepreneurs may be able to identify a market opportunity and have relevant ideas on how to supply this market, yet they may lack strong business management skills. This echoes, to a great extent, the findings in the other countries, in particular Tanzania and Zambia.

In addition, the interviewees in Senegal drew attention to the lack of technically skilled people to operate the new technologies or to ensure their instalment and maintenance. This issue was perceived as a barrier that hinders the diffusion of the technologies and thus the expansion of the SMEs. (For a discussion of the limitations of renewable energy PhD programs in Africa, see Colenbrander et al., in this Special Issue.) As such Ousmane Fall Sarr from ASER stated that there remains a lack of technical skills in Senegal and mentioned the need to develop more programmes to train technical experts on new technologies, and to develop a partnership with the ministry in charge of education to include vocational training on renewable technologies such as solar energy and wind power.

6.3 Tanzania

In Tanzania, inadequate human capacity was identified in the finance sector which lacks knowledge of energy SMEs, and in potential SMEs lacking business, administrative and marketing skills. On the other hand, technical skills related to clean energy technologies appear to be in good supply.

Lutengano Mwakaheya, Director of the Rural Energy Agency, questioned the level of technical know-how in the Tanzanian banking sector to enable them to assess renewable energy projects, attributing this as a reason for high risk premiums on loans. This was indeed one of the justifications for designing a project like AREED in the first case, arguing that the demonstration effect and experience would sensitise banks to the viability of energy SME projects and provide bank staff with relevant knowledge. The Rural Energy Agency's technical assistance to SMEs is provided by contracting local consultants and their support programmes are advertised in newspapers, to which they receive hundreds of applicants every year, indeed more than they can support, according to Mwakaheya. Similar shortcomings with regard to human capacity on the part of financing institutions were raised by stakeholders, both at the national workshop and in follow-up interviews.

The director of the Tanzanian AREED partner centre TaTEDO, Estomih Sawe, referred to generally weak business skills, especially for marketing and packaging products, with appropriate pricing. He argued, however, that over the last decade Tanzania has seen the development of significantly more technical capacity to install, repair and maintain more complex RETs, such as solar home systems and mini wind power, leading to the reduction of technical barriers to implementing these technologies. Sawe maintained that this technical capacity had been built largely by the market itself, with the help of technical organisations like TaTEDO, the University of Dar es Salaam and some specific donor-backed energy projects that have been designed specifically to build local technical capacity.

The low level of business skills among potential entrepreneurs was also highlighted by Aluti Myenza, a Trainer and Consultant at the Institute of Management and Entrepreneurship Development, Dar es Salaam. Myenza sees a big challenge in Tanzania with regard to the human capacity of SMEs, and attributes the lack of business skills in Tanzania to broader cultural issues which are discussed in section 7.

6.4 Zambia

The Technology Development Advisory Unity (TDAU), a semi-autonomous, non-profit, organisation associated with the Engineering Department at the University of Zambia, is a key player linking SMEs to research and development. Set up in 1975, TDAU conducts research and development across various programmes, including renewable energy, water, construction, food processing and agriculture. Mulambwa Imasiku, the director of TDAU, defined the organisation as a key “agent” in the technology-transfer chain, whereby they package and register their technologies with patents, charging a fee to those using them. With regard to SMEs, TDAU contacts relevant businesses to inform them about a new technology, but also responds to requests for advice and consultancy. Imasiku argues that intellectual property is not respected in Zambia and widespread copying exists, which limits the incentives for private sector innovation.

TDAU stated an interest in developing sawdust-briquetting technology and a technical support agreement has been signed with a Tanzanian organisation, to this end. Imasiku sees a potential to deliver sawdust briquettes via SMEs, and that all the necessary factors are in place in Zambia to promote this technology, with their aim to support the development and uptake of small-scale ‘pelleting’ technology. However, given the extent of knowledge and discussions held elsewhere with entrepreneurs including RASMA and Dread Works as well as the NTBC, it is unclear why this technology is not already in common use. On this point Imasiku argued that entrepreneurs in Zambia are not aware of energy issues, that they’d prefer to make money with other businesses, mainly retailing, and so “...it’s left to the intellectuals and fanatics to look at energy technologies”. Imasiku added that TDAU is not business-minded and the intellectuals that take an interest in energy issues are mostly unwilling to take entrepreneurial risks and so TDAU *does not* function as an incubator for energy entrepreneurs, per se. This dynamic reveals one of the dominant issues voiced by various energy SME stakeholders in Zambia, where there are poor linkages between the SMEs and technical support organisations.

6.5 Summary of findings on human capacity

The issue of human capacity, i.e. the knowledge, skills and ‘know how’ necessary to design, set up and manage an energy SME draws upon far wider challenges and barriers faced by most donor-backed development projects in Africa. However, the particularities of the energy sector,

as encountered in this study, reveal an overarching theme that has often stood to limit the commercial success of energy SMEs, namely the tendency to attract energy ‘enthusiasts’ over more dispassionate motivations of sector-neutral entrepreneurs. Although there’s a clear positive relationship between enthusiasm and commercial success, there were repeated cases of failed or struggling businesses explained by the fact that the entrepreneur was more driven by a desire to push a particular technology, rather than by a motivation to make money and/or to adapt their businesses, when necessary, to fit market conditions and consumer demand. To some extent this reflects the selection process used in the AREED programme, but also, especially in Tanzania and Zambia, it reflects the generally low levels of business skills and capacities encountered at the level of SMEs, including basic accountancy and management skills.

7. Social and cultural factors

7.1 Ghana

Two particular socio-cultural factors were evident from the consultations in Ghana: (1) the attitude to self-reliance vs. assistance from government, and (2) a tendency to avoid banks for borrowing money. Several stakeholders in Ghana referred to a ‘dependency syndrome’ among SMEs, although the true extent to which this attitude dominates the SME sector is unknown. It was, for example, not obvious among the entrepreneurs we interviewed. A vocal exception was Omane Frimpong from Wilkins Engineering who argued for the need for more commitment on behalf of the entrepreneurs, and emphasising that perseverance and unwillingness to fail are the keys to entrepreneurial success. His statement “Africa is poor because we lack vision” could easily be misconstrued or taken out of context, and indeed for this research its value provides little analytical insight itself, though his comment is notable for the strength of the assertion.

In common with many energy SME entrepreneurs interviewed in the other countries, most of the Ghanaian entrepreneurs explained that they avoid borrowing from commercial banks, preferring instead to self-finance their businesses through savings and/or from informal borrowing from family and friends. Once such businesses are established and require working capital to finance specific projects, these entrepreneurs often prefer to operate on trust, using a mix of self-finance and client-finance. Boniface Taylor, for example, claimed to have never considered going to a bank, due to the high interest rates, and explained that “it depends on the project, but in most

cases I pre-finance [the work] with the little I have. But if it is huge and will demand more than what I have, then I come to an agreement with the client who pays a certain percentage and then we take the rest of the money after completion. It has to do with trust...but I personally always prefer to pre-finance if I can...” Insights such as these highlight the reality of the cost of commercial financing in sub-Saharan Africa, and how this reality in-turn shapes entrepreneurial attitudes, preferences and business strategies. In the case of Windfield Engineering, Taylor explained that his aim was to expand the business, especially into the solar water heater market, though not by borrowing from the banks. The financing and operating model described by Taylor, however, while internally rational, limits SMEs to operating on a contract-to-contract basis, thus restricting the scope for expanding their businesses.

7.2 Senegal

The main social or cultural issue raised by stakeholders in Senegal was the need to convince household consumers of the benefits of new energy technologies. This factor can most easily be observed with regard to the high capital cost of renewable energy technologies vs. fossil fuel costs. It is an open question whether this is a “true” cultural barrier, rather than a financial barrier that hinders consumers from investing in the short or medium terms to purchase these technologies. However, the need to further inform the population on the benefits of renewable energy technologies was an issue widely mentioned by stakeholders. It is also worth mentioning that the lack of ‘entrepreneurialism’ was *not* identified as a barrier to the development of SMEs in Senegal. This contrasts with the findings from Zambia, Tanzania and (to a lesser extent) Ghana.

7.3 Tanzania

Our interviews with Tanzanian stakeholders revealed a perception that the banks make high demands for collateral from entrepreneurs who lack formal land titles or documents that prove ownership of assets. In contrast, Lutengano Mwakaheya of the Rural Energy Agency stated that “...in fact, the bank of Tanzania has facilities to provide collateral to renewables, so companies can borrow money here...the problem is that they [the entrepreneurs] want free money!”

On the demand-side, Mussa Mzumbe from the enterprise RESCO argued that rural businesses tend not to think about, or value, the longer-term benefits of solar systems in relation to the fuel costs of diesel generators, i.e. that they seek fast returns on investment. The difficulty that energy SMEs face in convincing potential consumers to see the medium to longer-term benefits of investing in efficient stoves and RETs is not unique to Tanzania. Indeed there is a dynamic common to all the AREED countries where low and precarious income levels tend to skew household purchasing decisions in favour of low-cost capital goods, at the expense of longer-term benefits through fuel-saving.

On the topic of the public procurement process in Tanzania, Gabriel Landa of the Tanzania Private Sector Foundation (TPSF) argued that the high level of paperwork involved puts off smaller SMEs with limited administrative capacities. In addition, government normally advertises its tenders only in newspapers and in government offices, thus restricting exposure to a smaller group of entrepreneurs, mostly based in Dar es Salaam. Landa also elaborated on the “vicious circle” that affects SMEs in Tanzania whereby public contracts issued through the competitive tending process are only open to businesses that are formally registered, with a track record, stating that “I think the government doesn’t realise that the private sector is very important, that they don’t understand that it is business that drives the economy”. On developing local manufacturing capacity, Landa argued that the government is able to support this sector, stating that “...the government is the one that can engineer this thing...even if they don’t want to put on some import restrictions, they can lay the foundations in the country to attract people to make business here...”. Asked why he thought the SME sector is not growing strongly in Tanzania, he pointed to the government: “...you know, it is very easy to transform the economy of this country...that the energy SMEs aren’t growing in Tanzania, it’s because of the lack of political will.” This line of argument, whereby observers place an emphasis on the role and responsibility of government to ‘affect change’ was prevalent among the stakeholders consulted for this research. Such argumentation is symptomatic of the deferral of responsibility, which was also strongly observed in Zambia, and can aptly be considered one of the main socio-cultural tendencies among energy SME stakeholders.

7.4 Zambia

Two important social and cultural issues were referred to repeatedly by the stakeholders questioned. On the supply side, the main issue is one of weak ‘entrepreneurialism’, i.e. the apparent lack of a strong, dynamic business culture where ideas and plans are effectively and efficiently converted into reality. When asked why he thought Zambia has a relatively poor record on entrepreneurship in the energy sector, Mukombo Tambatamba, director of the National technology Business Centre (NTBC), stated “from our own experience we need them [entrepreneurs]...but we are very bad entrepreneurs, generally. I think it also relates to our culture, yes. So you need to constantly be mentoring them, teaching them, checking on them.” However, ‘entrepreneurialism’ should not be confused with enthusiasm or passion, of which there is plenty among individuals working in Zambia’s energy technology development research. Rather, entrepreneurialism involves the ability to spot commercial opportunities and pursue them in a clear, structured manner, thus being something that incorporates human and organisational capacities. Although it was not the main focus of questioning, some interviewees volunteered to explain why they thought Zambia lacks a strong entrepreneurial spirit, the most common argument being the ‘hangover’ of decades of state-led and planned economy.

On the demand side, the main social or cultural issue raised by stakeholders was the need to convince household consumers and small businesses of the benefits of new energy technologies. This issue is most easily observed with the uptake of new, more efficient, cookstoves, especially with regard to the high capital cost vs. fuel savings, where there appears to be a non-saving culture, combined with a mentality that results in consumers accepting high discount rates on energy-related expenditure. Rashid Phiri of RASMA Engineering summed up the challenge by stating that “it is difficult to convince people that if they spend more money today on something, that it will benefit them in the future...”. While the prospect of long payback periods is also a barrier faced by many renewable energy technologies in developed countries, the challenge of convincing consumers to buy efficient stoves is strong in Zambia where an \$8 stove provides a payback time of less than 3 months for a typical family of four. However, there are other ‘cultural barriers’ that may be more universal to the uptake of new energy technologies, for example efforts to convince rural consumers of the benefits of a human waste biomass digester, which has been largely unsuccessful in Zambia.

7.5 Summary of findings on social and cultural factors

This issues raised in this section relate strongly to those discussed under human capacity, as indeed the two sets of issues are highly connected, especially in the context of entrepreneurialism. The heading of ‘social and cultural factors’ is almost meaninglessly broad for a study of this size; however, it encompasses issues that were repeatedly raised by country stakeholders and often named as such. Here, the strongest theme to emerge was the lack of a strong entrepreneurial culture, especially in Tanzania and Zambia where (coincidentally or not) there are strong histories of socialism or State-led economic planning and development. The notable exception to this was in Senegal where AREED operated within a strong entrepreneurial culture and also, to a lesser extent, in Ghana. Another theme to emerge concerns the attitude of local entrepreneurs towards AREED as an international, donor-backed programme. Specifically, the observation that it was attracting individuals who were unwilling (as opposed to simply unable) to borrow from banks to finance their SMEs, thus creating or encouraging a ‘dependency syndrome’ where entrepreneurs target or depend upon such programmes to support their business ideas. While this issue raises interesting questions about signals, incentives and the boundaries of entrepreneurialism, it was not something widely referred to and would require further research to establish the degree to which it is, in fact, a real issue and also the extent to which this can be attributed to wider cultural settings.

8. Conclusions, recommendations and future research

This article has presented some of the findings of a larger study into the experience of energy SMEs in four of the five AREED project countries: Ghana, Senegal, Tanzania and Zambia. Our focus has been a discussion of the key non-financial constraints to the establishment and scaling up of energy SMEs, complementing previous publications that focused on the financial barriers. In line with available literature on the relevant non-financial barriers to SMEs in developing countries, we categorised our analysis into three sections: business and institutional frameworks, human capacities, and social and cultural factors. This has enabled a discussion of various organisational and intangible aspects that were raised by stakeholders within the study countries, which influence the outcome of efforts to support energy SMEs.

While the presence and degree of importance of specific issues varies between countries, it is apparent that there are numerous non-financial factors that have a powerful effect on the implementation of any given plan, policy or business activity. The majority of published analyses focus on the market and regulatory conditions, e.g. the legislative frameworks in place in each country to support the establishment and operation of energy SMEs. These country-specific conditions are often collectively referred to as the ‘enabling framework’ that can, to a greater or lesser extent, encourage the establishment of energy SMEs and the diffusion of sustainable technologies. However, few studies have focused explicitly on human capacities and social or cultural factors, since these are harder to document and/or verify. Furthermore, it is difficult to translate them into recommendations and concrete interventions for national policy makers and donor agencies charged with designing programmes to promote energy SMEs in sub-Saharan Africa, by virtue of referring to wider social and cultural ‘settings’ that are linked to overall levels of education and development. That does not, however, mean they are insignificant or unworthy of critical attention, and are themselves important elements of the broader enabling framework. These barriers include, *inter alia*, weak entrepreneurial cultures; an SME ‘dependency syndrome’ perpetuated by grant-based support from governments and donor agencies; persistent shortcomings in business skills capacity; lack of clearly defined markets; and demand-side barriers to purchase relatively high capital-intense energy products.

Another key finding, following at least a decade of targeted support to energy SMEs, is the predominant focus on an SME’s bottom-line, on behalf of programmes to deliver enterprise development support, donor and government policies. This reveals a myopic emphasis on profit as the greatest force for good, often at the expense of strategic, coordinated investment in local human and manufacturing production capacity which could have more valuable development implications. The primacy of government and donor prioritisation of ‘private profitability at all costs’ would appear to miss an opportunity, especially in cases where local resources and skills are available for the manufacture of low-tech products that are otherwise imported. However, this observation comes up against the previously-identified dilemma regarding the evident difficulty that governments have in shaping the enabling framework for a specific sector or market, which is understood to be a key requisite for success. When considering ‘what has changed’, it is necessary to reflect upon the context in which energy SMEs operate, i.e. to ask

whether the SME model continues, in theory and in practice, to be an appropriate means of supplying modern, clean and sustainable energy. For example, in the case of Ghana, a country with relatively high levels of grid electrification and rising incomes, it is apparent that the energy sector is changing. There is a greater need for larger MW-scale energy solutions and mini-grids, which in the foreseeable future is likely to render obsolete the kind of technologies typically supplied by SMEs, such as solar lanterns.

In three of the four study countries (Senegal was the exception) a wide-ranging debate over the relevant barriers and solutions was conducted at the workshops. Through open discussion on what actions could/would serve to benefit the country’s energy SME sector, various needs and recommendations were agreed upon. These are summarized in Table 2 .

Table 2: Recommendations based on in-country workshops

| | Ghana | Tanzania | Zambia |
|---|--|--|---|
| 1 | The establishment of clear policy goals through a transparent stakeholder engagement process, thus minimising political risk, especially with regard to the continuity of the national electrification planning. The same should be done for cook stoves and LPG and CNG for the transport sector. | To reform the Banking and Finance Act of 1991 to create terms and conditions that are favourable to SMEs and allow more flexibility of banks to lend to SMEs, taking into account the importance of business track records and not such strict demands for collateral and / or high interest rates. This job should be led by the Ministry of Industry and Trade, with an important role for the TPSF and the Dar es Salaam University Entrepreneurship Centre, acting as a lobby group. | An energy task force to coordinate energy policy implementation |
| 2 | Government to define clearly where energy SMEs can and should operate, based on informed planning, in order to improve market stability for investors | The REA should encourage the private sector in the provision of energy to rural energy sector, however the REA needs to reform the subsidises it provides to SMEs so they can sell their systems directly to customers, and not only through public tendering which is | Formation of business associations to represent energy SMEs |

| | | | |
|---|---|---|---|
| | | limited in scope. | |
| 3 | Legislation and regulations to ensure quality control for energy products, including solar products, to be defined and pushed for by trade associations. Also to introduce a clear system of product certification and standardisation. | Businesses need to keep records of their transactions and conduct in a formalised manner, as much as possible, including greater documentation of resources and asset ownership that would improve the chances of securing finance. The introduction of national ID cards should improve formalisation and improve access to financing. | SME business incubators and/or the institutionalisation of business support and capacity building for SMEs |
| 4 | National renewable energy resource assessments at the local level to inform project appraisals and financial risk assessments | 'After care training' (follow-up on training) should be provided by the training organisations, through use of role models and highlighting successes. | Improved awareness at the community and individual levels to empower rural consumers to identify energy business opportunities. This should be responsibility of the energy task force and /or pro-business NGOs like IDE |
| 5 | Back high-profile RET projects (for example solar lighting for public space) that demonstrate their effectiveness to achieve public buy-in | Government should establish local level representation for SMEs, down from the central government level. There is no representation at the local level to engage with SMEs, especially in the energy sector (apart from electricity, i.e. TANESCO). | Improved communication, awareness and clarity on market incentives and energy prices in Zambia |
| 6 | Targeted government support to create warehouses for sustainable energy technologies that can supply local businesses | To streamline and harmonise SME associations activities and goals | Spreading of financial risks through sector-specific funds financed by various banks, organised through business associations. This would, in turn, lower interest rates and relax repayment terms. |
| 7 | Improved communication of government actions and taxation for product imports, with tax breaks for quality-approved | To appoint a dedicated desk officer for supporting SMEs in the different ministries | |

| | | |
|-------------------------|--|--|
| products (see point #3) | | |
|-------------------------|--|--|

While this research found a number of important non-financial barriers to the success of SMEs in energy, the findings presented are largely indicative and serve to highlight the key issues and areas worthy of greater attention. As compared to the amount of work published on the significance of differing business models and institutional frameworks for SMEs in developing countries, there is relatively little academic literature that explicitly focuses on the role and importance of human capacity, social and cultural factors for energy sector development. While these are the least tangible factors that influence the outcomes of business operations, and perhaps for that reason have been largely overlooked, we obtained insights into the significance of these issues, which are both broad and deep. As such, conducting a comprehensive and meaningful study into the human capacity, social and cultural factors would require the development and application of an analytical framework to a substantial body of empirical data, sufficient to occupy an entire PhD project. Such research could make a fundamental contribution the expanding social science literature on energy policy, especially in developing countries.

It is also useful to briefly reflect upon the methodology used for this research, both for the sake of evaluating the findings and for the benefit of future research. A qualitative approach, based on the ‘outcome harvesting’ methodology, was chosen because it enabled a detailed identification of the key contributing factors in the outcomes of specific energy SMEs. In this context we understand ‘contributions’ as feasible claims made by stakeholders in influencing, to a greater or lesser extent, the identified outcome. As such, these are essentially stories told by individuals about what happened and ‘who did what’ and so cannot be measured, documented or understood by quantitative methods. However, in order to ensure that the outcome harvesting methodology is applied as scientifically as possible, it has to be conducted under similar conditions, and consistently. As is often the case with social science research, this raises issues of time constraints and logistical challenges that can undermine a full and honest application of the methodology. This finding serves to highlight the need, especially when investigating the deeper issues of human capacities and socio-cultural dynamics, to conduct in-depth field research based on a mix of primary data collection methods, principally observation and interviews that can take weeks, if not months, to conduct properly.

9. Acknowledgements

This article is based on a larger research project on energy SMEs in Africa, conducted by the same authors, which benefited from critical feedback provided by Nancy Serenje (CEEEZ, Zambia), Lilian Njuu (TaTEDO, Tanzania), Ishmael Edjekumhene, (KITE, Ghana), Secou Sarr, (ENDA, Senegal), Lawrence Agbemabiese (University of Delaware) and Eric Usher (UNEP). The authors are grateful for two anonymous reviewers and to the special issue editor Kathleen Hancock for her constructive comments, good will and seemingly endless patience.

Appendix: Interviews conducted for this research (Sept-Oct 2012)

| | Name | Position | Organisation | Place | Date |
|----|--------------------|--|---|-----------------------------------|------------|
| 1 | S Chiluba | Farmer | Farmer | Shimabala, Kafue District, Zambia | 12-09-2012 |
| 2 | E Ngulube | Farmer | Farmer | Shimabala, Kafue District, Zambia | 12-09-2012 |
| 3 | Rashid Phiri | Entrepreneur | Rasma Engineering | Lusaka, Zambia | 12-09-2012 |
| 4 | Mulambwa Imasiku | Director | TDAU (Technology Development Advisory Unity - University of Zambia) | Lusaka, Zambia | 12-09-2012 |
| 5 | Mukombo Tambatamba | Director | National Technology Business Centre | Lusaka, Zambia | 13-09-2012 |
| 6 | Hector Banda | Chairman | Sylva Catering | Lusaka, Zambia | 13-09-2012 |
| 7 | Bernard Lusale | Financial Services Programme Coordinator | Micro Bankers Trust | Lusaka, Zambia | 13-09-2012 |
| 8 | Chilumba Ngosa | Managing Director | CLEF Africa Energy Ltd. | Lusaka, Zambia | 13-09-2012 |
| 9 | Kaila Geoffrey | Managing Director | Muhanya Solar Ltd | Lusaka, Zambia | 13-09-2012 |
| 10 | Charles Mulenga | Assistant Director | Department of Energy | Lusaka, Zambia | 14-09-2012 |
| 11 | Kenneth Chelemu | Technical Director | International Development Enterprises (IDE) | Lusaka, Zambia | 14-09-2012 |

| | | | | | |
|----|----------------------|----------------------------|--|-------------------------|------------|
| 12 | Estomih Sawe | Director | Tanzania Traditional Energy Development and Environment (TaTEDO) | Dar es Salaam, Tanzania | 18-09-2012 |
| 13 | Mussa Mzumbe | Managing Director | RESCO | Dar es Salaam, Tanzania | 19-09-2012 |
| 14 | S. J. Mwambije | Director | ENVOTEC Service Ltd | Dar es Salaam, Tanzania | 19-09-2012 |
| 15 | Lutengano Mwakahesya | Director General | Rural Energy Agency | Dar es Salaam, Tanzania | 19-09-2012 |
| 16 | Joseph Ndunguru | Head of Investment-Banking | Twiga Bancorp Limited | Dar es Salaam, Tanzania | 20-09-2012 |
| 17 | Gabriel Landa | Funds Manager | Tanzania Private Sector Foundation (TPSF) | Dar es Salaam, Tanzania | 20-09-2012 |
| 18 | Filbert Shoo | Manager | Sustainable Energy Enterprise Company (SEECO) | Dar es Salaam, Tanzania | 20-09-2012 |
| 19 | Oscar Lema | Managing Director | Alternative Energy Tanzania Ltd | Kibaha, Tanzania | 21-09-2012 |
| 20 | Aluti Myenza | Trainer / Consultant | Institute of Management and Entrepreneurship Development | Dar es Salaam, Tanzania | 21-09-2012 |
| 21 | Albert Kwaw Eliason | Country Manager | International Finance Corporation / Lighting Africa | Accra, Ghana | 24-09-2012 |
| 22 | Boniface Taylor | Technical Director | Windfield Engineering | Accra, Ghana | 26-09-2012 |
| 23 | Omane Frimpong | CEO | Wilkin Engineering | Accra, Ghana | 26-09-2012 |
| 24 | Frank Atta-Owusu | Services Manager | Samsung | Accra, Ghana | 27-09-2012 |
| 25 | Kofi Duose | Operations Manager | Anasset LPG | Accra, Ghana | 27-09-2012 |
| 26 | Clara Koranteng | Owner | M38 LPG | Accra, Ghana | 27-09-2012 |
| 27 | William Aye-Addo | Managing Director | Syscom Energy Ltd | Tema, Ghana | 27-09-2012 |
| 28 | Moustapha Ndiaye | Head of admin and finance | Fondation Sen'Finances | Dakar, Senegal | 03-10-2012 |
| 29 | Issa Diop | Head of Investment | Banque Regionale du Solidarité | Dakar, Senegal | 03-10-2012 |
| 30 | Mor Kassé | Deputy Director | African Electric Manufactures | Dakar, | 03-10- |

| | | | | | |
|----|--------------------|---|---|----------------|------------|
| | | General | | Senegal | 2012 |
| 31 | Luis Seck | Ex-Minister of Renewable Energy (2010-12) | Ephata Global Energie et Environnement Consulting | Dakar, Senegal | 04-10-2012 |
| 32 | Ousmane Fall Sarr | Head of Studies and Information System Unit | ASER | Dakar, Senegal | 04-10-2012 |
| 33 | Aliou Lo | Director | Lobbougas | Dakar, Senegal | 04-10-2012 |
| 34 | Mamadou Saliou Sow | Director General | SPEC (Sustainable Power Electric Company) | Dakar, Senegal | 05-10-2012 |
| 35 | Bamba Fall | ESME (Energy SMEs) West Africa Manager | GVEP International | Dakar, Senegal | 05-10-2012 |

10. References

Agbemabiase, L., Nkomo, J., and Sokona, Y. (2012) *Enabling innovations in energy access: An African perspective*. Energy Policy, Vol. 47 (1) pp. 38–47

Bhattacharyya, S. (2013) *Financing energy access and off-grid electrification: A review of status, options and challenges*. Renewable and Sustainable Energy Reviews, Vol. 20, pp. 462-472

Bazilian, M., Nakhooda, S. and Van de Graaf, T. (2014) *Energy governance and poverty*. Energy Research & Social Science, Vol. 1, pp. 217–225

Bazilian, M., Nussbaumer, P., Eibs-Singer, C., Brew-Hammond, A., Modi, V., Sovacool, B., Ramana, V., and Aqrabi, P. (2012) *Improving Access to Modern Energy Services: Insights from Case Studies*. Electricity Journal, Vol. 25 (1) pp. 93-114

Beyene, A. (2002) *Enhancing the competitiveness and productivity of small and medium scale enterprises in Africa*. Africa Development, Vol. 27 (3) pp.130-156.

Brew Hammond, A. (2010) *Energy access in Africa: Challenges ahead*. Energy policy, Vol. 38 (5) pp. 2291-2301

CDKN (2012) *Achieving development goals with renewable energy – the case of Tanzania* <http://cdkn.org/resource/renewable-energy-tanzania/>

Colenbrander, et al. (2015) *Renewable Energy Doctoral Programs in sub-Saharan Africa: a preliminary assessment of common capacity deficits and identification of capacity-building strategies*. Energy Research and Social Science vol. 5.

Denton, F. (2006) *AREED Policy Review, Analysis of Policies and Institutions and Linkages with Energy SME Development*, UNEP Risø Centre, Risø National Laboratory, Denmark

E8-GEF-UNDESA (2010) *Financing Sustainable Electrification: Country Action Plan for Zambia*. Africa Dialogues, Nairobi, Kenya, April 13-15, 2010 www.globalelectricity.org/upload/File/Projects/Financing%20Electrification%20HCB%20-%20Nairobi/Zambia.pdf

Gboney, W. (2009) *Promoting Technology Transfer and Deployment for Renewable Energy and Energy Efficiency in Ghana* in *Climate Strategies* Sep. 2009

GNESD (2007) *Renewable Energy Technologies and Poverty Alleviation: Overcoming Barriers and Unlocking Potentials*. <https://cleanenergysolutions.org/content/renewable-energy-technologies-and-poverty-alleviation-overcoming-barriers-and-unlocking-pote>

Goldthau, A. (2014) *Rethinking the governance of energy infrastructure: Scale, decentralization and polycentrism*. *Energy Research and Social Science*, Vol 1, pp. 134-140

Gujba, H., Thorne, S., Mulugetta, Y. Rai, K., and Sokona, Y. (2012) *Financing low carbon energy access in Africa*. *Energy Policy*, Vol. 47 (1) pp. 71–78

Haines, A., Smith, K., Anderson, D., Epstein, P., McMichael, A., Roberts, I., Wilkinson, P., Woodcock, J., and Woods, J. (2007) *Policies for accelerating access to clean energy, improving health, advancing development, and mitigating climate change*. *The Lancet*, Vol. 370 (9594), pp. 1264–1281

Hancock, K. (2015) *Renewable Energy in Sub-Saharan Africa: Contributions from the Social Sciences*. *Research and Social Science* vol. 5.

Haselip, J., Desgain, D. and Mackenzie, G. (2013) *Financing energy SMEs in Ghana and Senegal: outcomes, barriers and prospects*. *Energy Policy*, Vol. 65 (1) pp. 369–376

Haselip, J., Desgain, D. and Mackenzie, G. (2013) *Energy SMEs in sub-Saharan Africa: Outcomes, barriers and prospects in Ghana, Senegal, Tanzania and Zambia*. UNEP Risø Centre, Denmark.

IEA (2011) *WEO-2011 new Electricity access Database - World Energy Outlook* www.worldenergyoutlook.org/media/weowebiste/energydevelopment/WEO2011_new_Electricity_access_Database.xls

IEA (2014). *World Energy Outlook. Electricity database; electricity access in Africa 2012*. <http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/>

IFC (2010) *Scaling-Up SME Access to Financial Services in the Developing World*. www.ifc.org/wps/wcm/connect/bd1b060049585ef29e5abf19583b6d16/ScalingUp.pdf?MOD=AJPERES

IRENA (2009). *IRENA Renewable Energy Country Profiles*. <http://www.irena.org/remaps/africamap.aspx>

IRENA (2012) *Country Case Study: Renewables Readiness Assessment, Senegal, Preliminary Findings*. www.irena.org/DocumentDownloads/Publications/IRENA%20Senegal%20RRA.pdf

Kauffmann, C. (2005) *Financing SMEs in Africa* in OECD Development Centre - Policy Insights No. 7, May 2005

Karekezi, S. (2002) *Renewable energy strategies for rural Africa: is a PV-led renewable energy strategy the right approach for providing modern energy to the rural poor of sub-Saharan Africa?* Energy policy, Vol.30 (12) pp. 1071-1086

Kaygusuz, K. (2012) *Energy for sustainable development: A case of developing countries*. Renewable and Sustainable Energy Reviews, Vol. 16 (2), pp. 1116–1126

Kennedy, M and Basu, B. (2013) *Overcoming Barriers to Low Carbon Technology Transfer and Deployment: An Exploration of the Impact of Projects in Developing and Emerging Economies*. Renewable and Sustainable Energy Reviews, Vol. 26, pp. 685–693

Lambe, F., Jürisoo, M., Lee, C. and Johnson, O. (2015) *Can carbon finance help transform household energy markets?: A review of cookstove projects and programs in Kenya*. Energy Research and Social Science vol. 5.

LaRocco, P. (2003) *A business model for clean-energy SMEs: Small companies' role in eradicating energy waste and energy poverty*. Industry and Environment, Vol. 26 (4) pp. 20-23

Mehlwana, M. (2003) “*African Rural Energy Enterprise Development (AREED) A mid-term review of programme design and implementation strategy*”, Final Report, Minerals and Energy Policy Centre, Randburg, South Africa.

Olawale, F. and Garwe, D. (2010) *Obstacles to the growth of new SMEs in South Africa: A principal component analysis approach*. African Journal of Business Management, Vol. 4 (5), pp.729-738.

Prasad, G and Dieden, S. (2007) *Does access to electricity enable the uptake of small and medium enterprises in South Africa?* www.erc.uct.ac.za/Research/publications/07Prasad-Dieden%20SMMEs.pdf

REEGLE (2013) REEEP policy database www.reegle.info/policy-and-regulatory-overviews/GH

Thiam, I. (2007) *Unlocking the Potential of Small and Medium sized Enterprises In West Africa: A Path for Reform and Action* <http://dspace.mit.edu/bitstream/handle/1721.1/39534/173994446.pdf?sequence=1>

UNIDO (2009) *Scaling Up Renewable Energy in Africa*. [www.unido.org/fileadmin/user_media/Services/Energy and Climate Change/Renewable Energy/Publications/Scaling%20Up%20web.pdf](http://www.unido.org/fileadmin/user_media/Services/Energy_and_Climate_Change/Renewable_Energy/Publications/Scaling%20Up%20web.pdf)

UNFPA (2012). *By choice, not by chance: Family planning, human rights and development in State of world population*. http://www.unfpa.org/sites/default/files/pub-pdf/EN_SWOP2012_Report.pdf

United Nations Data (2010). *Electricity, net installed capacity of electric power plants*. <http://data.un.org/Data.aspx?d=EDATA&f=cmID:EC;trID:133>

Wilson-Grau, R. and Britt, H. (2012) *Outcome Harvesting*. Ford Foundation. www.outcomemapping.ca/resource/resource.php?id=374

World Bank (2011) The World Bank data. <http://data.worldbank.org/country>

World Health Organization (2012) *Global Health Observatory Data Repository*. <http://apps.who.int/gho/data/?theme=main>

World Bank (2011) *Republic of Zambia: The Sixth National Development Plan (2011-2015)*. http://siteresources.worldbank.org/INTZAMBIA/Resources/SNDP_Final_Draft_20_01_2011.pdf