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Space and Energy Transitions in Sub-Saharan Africa: Understated Historical Connections

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Abstract

Sub-Saharan Africa is seeing an influx of international interest and investment in energy projects designed to address the energy poverty and climate agendas. Often missing from these energy initiatives is an acknowledgement that bringing about energy transitions will require more than just the creation of efficient energy markets and technological leapfrogging. This article explores how we may begin to add an historical dimension to the spatial analysis of contemporary energy systems in sub-Saharan Africa. Drawing on the seminal article by Bridge et al. (2013) on the spatial dimensions of energy transitions, on energy geographies literature and on various strands of social science research on Africa, the article examines the usefulness of a historical and spatial perspective to researching how energy systems in sub-Saharan Africa came to be the way they are today. This historical and spatial understanding of energy systems is necessary if we are to make sense of future energy transitions, yet the connections between past, present and future remain understated in current policy interventions.

Keywords

Sub-Saharan Africa

Energy geographies

Space

History

Path-dependency

1. Introduction

Sub-Saharan Africa is seeing an influx of international interest and investment in energy projects designed to address the energy poverty and climate agendas. A recent survey of fifty-eight initiatives covering various energy subsectors for Africa as a whole showed that investment had grown six-fold between 2003 and 2013, respectively from USD$750million to over USD$4.7billion (Quitzow et al., 2016). About seventy-nine percent of this investment was directed at sub-Saharan Africa, but even that figure was well below the estimated USD$55billion annual spend required to meet the target of universal access by 2030 (Africa Progress Panel, 2015). Unsurprisingly, most initiatives focus on how to facilitate the creation of energy markets and attract private sector investment (Quitzow et al., 2016). This approach mirrors attention to the fragmented governance landscape across Africa's energy sector (Bazilian et al., 2014; Cherp et al., 2011; Florini and Dubash, 2011; Florini and Sovacool, 2009). There are particular concerns with the ability of national governments to address, simultaneously, a low-carbon agenda and the needs of the 625 million people who lack access to electricity in sub-Saharan Africa (IEA, 2014). Despite the latest investments, the number of people without access seems to be rising – not decreasing – due to a combination of natural population growth, increase in energy exports, as well as an intensification in demand through urbanization (IEA, 2014). This reinforces the argument of various authors who think that addressing sub-Saharan Africa's energy future will require a joint consideration of Africa's ongoing 'urban revolution' (Parnell and Pieterse, 2014; Silver and Marvin, 2017).

Often missing from these energy initiatives is an acknowledgement that bringing about energy transitions will require more than just the creation of efficient energy markets and technological leapfrogging (Baptista and Plananska, 2017). While there are various ways of conceptualizing energy transitions (e.g. Bulkeley et al., 2014; Geels and Schot, 2007; Shove,

2010), it is now recognized that change in energy systems requires transformations in various ecological and social dimensions that underpin social life, especially in urban areas (Castán Broto, 2017; Goldthau and Sovacool, 2012; Hodson and Marvin, 2010; Urry, 2014). It requires confronting the obduracy of energy infrastructure (Hommels, 2005) and the path-dependencies historically embedded in them (Unruh, 2000). Path-dependencies have to be conceived in material terms and in relation to the various socio-technical arrangements that make up the broader energy system (e.g. technical expertise, resource extraction networks, regulations, finance, political and economic interests, or cultural practices). Finally, it requires addressing the spatial dimensions of energy systems in relation to the organization of social life; or, as Bridge et al. (2013, 331) put it, "developing new ways – and new geographies – of producing, living, and working with energy."

This article explores how we may begin to add an historical dimension to the spatial analysis of contemporary energy systems in sub-Saharan Africa. It examines the usefulness of an historical *and* spatial perspective to researching how energy systems in sub-Saharan Africa came to be the way they are today. This joint time-space understanding of energy systems is necessary if we are to make sense of future energy transitions (Mahoney, 2000; Unruh, 2000), yet the connections between past, present and future remain understated in current policy interventions. To this purpose, the next section introduces a brief overview of most recent energy geographies literature and their arguments for a spatial perspective on energy systems. The section points to the importance of drawing out the historical dimension in spatial analyses of energy transitions in sub-Saharan Africa. Using the six spatial dimensions outlined by the seminal work of Bridge et al. (2013), the following section explores how each dimension elicits specific investigations in the historical development of energy systems in sub-Saharan Africa. In particular, the section engages the energy geographies literature with other strands of social science literature on Africa. The

article concludes with a reflection on how an historical and spatial perspective could improve future energy initiatives for sub-Saharan Africa.

2. Space, path-dependency and energy transitions in sub-Saharan Africa

The relationship between energy and the way we organize social life is inherently spatial and time-sensitive, yet spatial and historical dimensions remain largely understated in the aforementioned energy initiatives for sub-Saharan Africa. In their seminal article on geographies of energy transition, Bridge et al. (2013, 331) outline how a transition to a low-carbon energy system is "fundamentally a *geographical process* that involves reconfiguring spatial patterns of economic and social activity" (italics in the original). They highlight three reasons why this is the case. Firstly, energy systems are embedded in space. This is notably the case of its physical infrastructure, but other components are also spatially distributed and often unevenly so. For example, there is a spatial concentration of engineers and technical staff with the knowledge of designing, managing or maintaining an electric grid in urban areas as compared to rural areas. This affects the prospects of implementation of energy transitions. Secondly, the spatiality of energy systems produces uneven patterns of economic and social life (Calvert, 2016; Castán Broto, 2017). Along similar lines, Huber (2015, 328) highlights that energy "underpins the basic aspects of social life – food, mobility, consumption, and the geographies of home and work." The differential availability of electricity, oil or charcoal to power these will significantly affect what kinds of economic activities (e.g. industry, services, farming) or social practices (e.g. using refrigerators, watching TV, powering mobile phones, building design standards) happen in different places. This has consequences not only for what kind of transition will take place, but also implies that different places will undergo different processes of transition over time. Finally, this unevenness can be found not just within one country, but also across

countries (more on this spatial 'scale' below) (Pasqualetti, 2011). As Bridge et al. (2013) allude to, differential access to oil, alongside variable economic power to acquire it and offset environmental costs, had much to do with the ability of some countries in the global North to support their economic development since the 19th century and participate actively in (and shape) globalization (see also Smil, 2000). Some authors would argue that many countries in Sub-Saharan Africa have participated in this geopolitical order largely as sites for resource extraction (Cooper, 2002; Ferguson, 2006). This places the sub-continent in distinctive spatial and political economy relationships with regards to energy systems. Energy projects that fail to acknowledge how various locales have inserted themselves into that geopolitical order can fall short of understanding the key drivers (or obstacles) to desired processes of energy transitions in sub-Saharan Africa. As a result, Bridge et al. (2013) suggest that we need to map out "changes in the spatial organisation of the energy system and economic activity more widely" (Bridge et al., 2013, 332). The authors propose we pay attention to six spatial dimensions that can better elucidate energy transitions as a geographical process: location; landscape; territoriality; spatial differentiation and uneven development; scaling; and spatial embeddedness and path dependency.

Moreover, Bridge et al. (2013) refer to various temporal dimensions through which these spatial dimensions can be examined, while highlighting that the future dimension has tended to dominate analyses of energy transitions. In this article, I would like to propose that a more explicit treatment of historical path-dependencies, technological lock-ins, and inertia is needed if we are to have a fuller understanding of contemporary energy systems in sub-Saharan Africa. Understood as a socio-technical system (Hughes, 1983), an established energy system developed as a result of the coevolution of ecological, social, and technological systems over time and across space (Castán Broto, 2017). The choice of technology and design of an energy system is greatly influenced by initial conditions and

events that lead to its adoption (Goldthau and Sovacool, 2012; Hughes, [1987] 2012; Mahoney, 2000). This would entail, for instance, issues around availability of fuels or production and distribution technology; contingent events leading to support for specific solutions (involving financiers, government policies, or others); and which individual costs individual users were willing to accept to participate in the system. Over time, as the system matured, it became reinforced by feedback loops that reinforced the connections between the system and other aspects of social life (e.g. distribution networks, the transport system, economic interests, governance apparatus). This is what is usually referred to as 'technological lock-in' (Unruh, 2000). The more intricate and complex the system, the greater its inertia to change (Goldthau and Sovacool, 2012). As we shall see below, such path-dependencies and inertia can be observed in the spatial embeddedness of energy systems.

Interrogating the historical dimensions of (socio-technical) energy systems across sub-Saharan Africa is important because it foregrounds how Africans have not been *energy-less*, nor have they been *without* energy systems. While Africa (and especially sub-Saharan Africa) is usually deemed energy poor – conceptualized as having limited access to modern energy services such as electricity – Africans have satisfied their energy needs with other forms of energy (usually deemed 'traditional'), often mixing different fuels to 'power' their livelihoods. From an historical point of view, the study of such energy systems in the postcolonial moment cannot be disentangled from the diverse colonial experiences of different countries and even various locations within those countries. There are ongoing debates about the nature of the colonial enterprise led by different European powers (Chabal, 2002; Cooper, 2002; Cooper and Stoler, 1997), but these have seldom addressed the issue of energy broadly conceived. Conversely, current energy initiatives rarely take into account the colonial and postcolonial path-dependencies and historical contingencies of

the energy systems they seek to transform (Quitzow et al., 2016). This article makes an argument for the importance of examining more explicitly the historical and spatial dimensions of contemporary energy systems in sub-Saharan Africa. To do so, the next section takes each one of Bridge et al.'s six spatial dimensions in turn and teases out ways of examining the historical dimensions in the study of energy systems across sub-Saharan Africa.

3. Spatial and historical dimensions in the development of energy systems in sub-Saharan Africa

3.1. Location: Context-specific energy patterns

The first spatial dimension identified by Bridge et al. (2013) concerns *location*, conceived in both absolute and relational terms. This means specifying the kinds of energy produced, distributed and consumed in various locales and by whom; investigating how these energy patterns and networks have evolved over time and in relation to a locale's specific context; specifying how different locales relate to each other (or not), with particular attention to their role in the global economy; and exploring how such relational interactions affect the socio-technical dimensions of the energy system and the prospects of energy transitions.

Analyses of energy transitions must begin with a grounded knowledge of what energy systems exist in the very locales where they will unfold and, even more importantly, how they have come to be what they are today. Yet, detailed and accurate descriptions of how energy systems evolved historically in various sub-Saharan countries are few and far between, usually single-country or single-region (or even single-city), and often focused on large infrastructures (e.g. dams) (Chikowero, 2007; Christie, 1984; Isaacman and Isaacman,

2013; Manafa, 1979; Olukoju, 2003; Phillip, 2005; van der Straeten, 2017; Wilson, 1967). Historical analyses face a shortage of reliable historical data, with some authors suggesting indirect forms of measurement (Coquery-Vidrovitch, 2003) or recourse to oral histories (Showers, 2011). Njoh (2016) recently reviewed electricity supply trends during the colonial period drawing on the United Nations Energy Statistics Yearbook, which was first published in 1952 with a review of world energy supplies for selected years between 1929 and 1950 (United Nations, 1952). While the country-aggregate electricity supply data is helpful, it is of limited value to understanding the spatial dimensions of energy systems of different locales on the ground. Learning about an energy system's relational dimensions of location in historical perspective will require piecing that puzzle through a combination of archival sources and oral histories, where possible.

This is particularly the case if, as noted before, we accept that one of the dominant energy systems in sub-Saharan Africa has been centered on charcoal, not electricity. Mavhunga (2013) provides a contemporary example of how this could be accomplished. He traces the flows between rural and urban areas in Mozambique that underpin an energy system centered on charcoal. His work shows the spatial embeddedness of charcoal in various socio-economic relations, exposing the mobilities of charcoal across various locales, ultimately highlighting the role that charcoal plays in Mozambique's social life.

3.2. Landscape: Socio-technical investigation of colonial energy systems

The second spatial dimension Bridge et al. (2013) identify is the energy *landscape*. This refers to the "constellation of activities and socio-technical linkages associated with energy capture, conversion, distribution and consumption" (Bridge et al., 2013, 335). In their view, 'landscapes' can be described for their material features, their symbolic (representational) power or the multifaceted cultural processes that originated them. Similarly, Castán Broto

(2017) has recently expanded on the idea of the 'energy landscape' as representing the spatial organization of energy systems produced by the co-constitution of social life, space and energy systems and practices (Crang and Thrift, 2000). For her, energy landscapes are not static or pre-determined; they have local expressions that are context-specific and historically contingent (Castán Broto, 2017). Both approaches identify not just the material components of an energy system (e.g. physical infrastructure, technological artifacts), but also the various actors with their diverse roles, cultures and practices (e.g. engineers, financiers, state regulators, users), who jointly co-produce every energy system.

Attention to the 'energy landscape' is fundamental to understanding the lineage of contemporary energy systems in sub-Saharan Africa, yet we know little about it. Historical studies of technology as a 'tool of empire' examine the role of guns, steamboats, quinine and various forces of communication and transportation, but make no mention to energy systems (Headrick, 1981, 2010). More recently, Hausman et al. (2008) conducted a detailed study of the history of corporate and financial endeavors leading global electrification between 1878 and 2007. Their work traces the various phases of expansion of electrification through the circulation of ideas, knowledge, technology and capital, involving a range of individuals, companies, imperial administrators, and banking institutions. In their nearly-500 page book, fewer than a dozen pages are dedicated to broad statements about Africa and specific African countries. This is not a criticism of the superb work conducted by Hausman et al., but instead a reflection of the dearth of data highlighted before.

Accounts of colonial 'energy landscapes' will need to delve into studies similar to those that examined Africa as the laboratory for European medicine, urban planning, and anthropological or government practices (e.g. Demissie, 2012; Njoh, 2008; Tilley, 2011).

Such research would highlight how flows of energy-related ideas, expertise and capital between colonies and metropoles came to shape what energy systems are in existence nowadays. Accounts of postcolonial 'energy landscapes' are equally needed. One theme that requires further study is a socio-technical analysis of attempts at liberalization of the energy sector in Africa. This can add detail to more economic and policy-oriented studies (Bhagavan, 1999; Turkson and Wohlgemuth, 2001; Mawejje et al., 2013).

At any rate, these various strands of research should aim to produce accounts not just of modern energy systems (e.g. electricity), but also of energy systems based on 'traditional' fuels such as charcoal. As noted before, charcoal remains dominant in the fuel mix of most African households, even in urban and wealthier areas (Brew-Hammond and Kemausuor, 2009; Sokona et al., 2012). It is common, in policy circles, to think about the eradication of energy poverty through a linear process of climbing up the 'energy ladder' from traditional to modern energy sources and services (Hosier and Dowd, 1987; Leach, 1992). More often than not, such thinking is rooted in a technocratic and economic understanding of technology substitution. A more detailed historical understanding of the 'energy landscape' that encompasses various fuels and the socio-technical dimensions of these will be better equipped to conceptualize effective energy transitions.

3.3. Territoriality: Energy politics in sub-Saharan Africa

The third spatial dimension outlined by Bridge et al. (2013) relates to the notion of *territoriality*, more specifically, the spatial organization and exercise of power over the energy system. The authors draw on a longstanding debate about the importance of territory and territoriality to the formation (and imagination) of the state, its borders and identity (Agnew, 1994; Agnew and Corbridge, 2002; Elden, 2007, 2010; Painter, 2010; Sassen, 2000). Applied to energy debates, the authors remind us that energy infrastructures have

played a significant role in processes of nation-building, modernization and development, as well as in the making of modern citizens (Bridge et al., 2013, 336). Energy has also played a key role in imaginations of sovereignty, or what Huber (2015, 330) calls the "modern geopolitical imagination of a world of independent states – conceptualized as individual actors – vying over scarce resources." Understanding how energy systems are territorialized through the engagement of a multitude of actors, Bridge et al. (2013, 336) claim, "draws attention to the different scales and arenas of political action that govern energy systems."

There is no shortage of studies in the social sciences about the relevance of energy, especially oil, to the politics of many African states (e.g. Anderson and Browne, 2011; MacLean et al., 2017; Oliveira, 2015; Reed, 2009; Watts, 2004). Studies of electrification in various African countries draw together the relevance of this form of energy to state formation, subject-making and cultural practices (e.g. Chikowero, 2007; Christie, 1984; Winther, 2008). However, joint attention to the spatial and political dimension of energy systems in sub-Saharan Africa is only recently gathering interest. One such area where research is expanding is the study of the politics of urbanization in African petro-states (e.g. Buire, 2014), but other works are focusing more specifically on the territorialities of contemporary energy transitions. For instance, McEwan (2017) examined how renewable energy transitions in South Africa are leading to the creation of new territories that engage spatial and political-administrative regimes of exception, "which allow political and economic actors to exercise authority and commercial power" (ibid., 1). On a different vein, the work of Baker (2015) on the reconfiguration of finance and investment in South Africa's renewables sector shows well "the complex interactions between national, international, public and private institutions" (ibid., 146). She discusses the role of 'black economic empowerment' in facilitating these investments, thus placing the politics of

energy transition squarely in the context of post-Apartheid state-building and subject-making. Another example that draws attention to the various territorialities of energy systems is the work of Power et al. (2016). They look at how Brazil, India and China have been influencing energy pathways in southern Africa through a variety of roles and interventions. While providing exciting insights into the current trends of energy transitions and their implications to the refashioning of new territorialities, these studies tend to focus on the contemporary moment. Historical studies that jointly examine spatial and political dimensions of energy systems in sub-Saharan Africa are few and far between, with the works of Showers (2011) and van der Straeten (2017) as notable exceptions.

There is significant scope for continuing developing these various lines of research having in mind future energy policies that are more attuned to the specificity of the local contexts they are inserted in. This would be a welcome corrective to the latest energy initiatives implemented in sub-Saharan Africa, which rarely draw on the wealth of information about the politics of energy in the respective countries. Instead, many initiatives adopt a technocratic tone to their interventions, dealing with spatial politics as a blank slate (Baptista and Plananska, 2017).

3.4. Spatial differentiation and uneven development: Convergence and divergence

Another dimension highlighted by Bridge et al. (2013) focuses on the *spatial differentiation* in energy systems. Spatial differentiation is implicit in the three dimensions examined so far, so the authors use this additional dimension to underscore how low-carbon energy transitions have the potential to create new winners and losers across space. Yet, such spatial differentiation and uneven development is the hallmark of energy systems across sub-Saharan Africa since colonial times. It is now widely established that electricity, water, sanitation and other networked infrastructures were used by colonial powers to

differentiate the spaces of settlers from those of indigenous peoples, in Africa as elsewhere (Baptista, 2015; Chikowero, 2007; Gandy, 2006; Kooy and Bakker, 2008; McFarlane, 2008; Phillip, 2005). In postcolonial contexts, spatial segregation through energy infrastructure seems to continue along class, ethnic, and political lines (McDonald, 2009).

Given the historical patterns embedded in contemporary energy systems and other economic assumptions about the roll-out of efficient electricity markets (e.g. cost-recovery), there is a certain dose of wishful thinking (if not utopia) in the goals of universal access to modern energy services by 2030. Rates of access to electricity vary substantially between urban and rural environments (although this also varies across countries) in sub-Saharan Africa. According to estimates by the World Bank for 2012, urban areas had, on average, a rate of connection of nearly 72% against a little over 15% in rural areas (The World Bank, 2016). Energy initiatives are thoroughly focused on narrowing this gap and many of their initiatives do focus on rural Africa (Quitzow et al., 2016). Yet, the initiatives tend to adopt what Bridge et al. (2013, 337) call the "implicit assumptions about spatial convergence" – i.e. that energy transitions will have the power to flatten the spatial unevenness of energy systems. In contrast, the work of Silver and Marvin (2017) highlights how urban transitions are infiltrated by contestation over infrastructure and service provision. Moreover, there is little reflection on what impacts other more recent policies have had on the evolution of sub-Saharan Africa's energy landscapes. While there have been some studies on the impacts of the energy sector liberalization policies introduced since the 1990s (e.g. Bhagavan, 1999; Turkson and Wohlgemuth, 2001; Mawejje et al., 2013), they have largely focused on the national level and ignored the spatial variations that may have taken place. Attention to how spatial differentiation and uneven development have been produced over time and became embedded in the materiality of energy systems

has the potential to temper some of the naïve optimism of recent interventions in sub-Saharan Africa, as well as to show potential avenues for effective action.

3.5. Scaling: The importance and specificities of the urban scale

Bridge et al. (2013, 338) use the notion of *scaling* (instead of 'scale') to denote the active production of "the [geographical] scale at which energy systems are organized and governed (…) as a product of economic and political decisions." Through this spatial dimension, they seek to highlight how energy policy is pervaded by specific assumptions about how things are done. For example, they note that energy policy is crafted usually at the national scale, by national governments, involving oligopolies that control centralized energy systems, which are in turn largely organized as on-grid systems. The authors argue that, "As an analytical lens, scaling can illuminate significant questions about who is affected, who has the capacity for action, and where the boundaries of responsibility lie" (Bridge et al., 2013, 338).

The latest energy initiatives implemented in sub-Saharan Africa take for granted the national scale as the locus of action (Baptista and Plananska, 2017). Their default assumption is that action towards a low-carbon, pro-poor energy transition is to be devised at the national level, through national governments, conceived as unitary entities. The prevalence of this 'territorial trap' (Agnew, 1994) is long known to shape international relations, and climate change policy is no stranger to it. However, there is increasing evidence that city governments are taking the lead with experimenting various pathways into energy transitions (Bulkeley et al., 2011; Castán Broto and Bulkeley, 2013). Rutherford and Jaglin (2015) suggest that thinking of the urban scale is not only relevant, but also necessary for successful energy transitions. They also contend that more than thinking along the scalar dimension, the 'urban' should also be conceptualized as a set of actors and

of sites and spaces engaged in the production, distribution and consumption of energy (Rutherford and Jaglin, 2015).

The urban dimension of energy transitions requires special attention in sub-Saharan Africa. Energy has been placed squarely at the center of the emergence of modern societies in the 'global North' due to its role in facilitating industrialization (and mass production) and consequent urbanization (and mass consumption). However, urbanization in Africa has proceeded without substantive industrialization (Fox, 2012; Potts, 2009). Colonial urban centers developed and operated as sites for the coordination of the extractive activity of European powers (Coquery-Vidrovitch, [1993] 2005; Freund, 2007; King, 1990). In the postcolonial period, many governments adopted an anti-urban, or pro-rural, approach to economic development, which was emphasized by the 'urban bias thesis' (Lipton, 1977). The missing link between industrialization and urbanization then shifts attention to other processes as drivers of urbanization: internal population growth, circular migration, improvements in health care and disease control, food security, or informality (Fox, 2012; Parnell and Pieterse, 2014). In a recent article, Silver and Marvin (2017) noted that the specificity of African urbanization was critical to our understanding of future energy systems. This article shares Silver and Marvin's view that it is necessary to place energy transitions in their specific (urban) context and to include a wider range of interests with capacity to act (not just national governments) (ibid.). These various aspects must be taken into account when considering the 'scaling' dimension of contemporary energy systems in sub-Saharan Africa.

3.6. Spatial embeddedness and historical path-dependency: Culture and materiality of energy consumption

The last spatial dimension that Bridge et al. (2013) deploy is the *spatial embeddedness and path dependency* (or lock-ins) of energy systems. They remind us that energy systems are more than just technological artifacts; energy systems are embedded in cultures of energy consumption, built into various aspects of our settlements (e.g. housing or transport, whether in the countryside or the most populous city), and the sunk cost of infrastructure capital investment. Attempts at effecting an energy transition will thus require not just a technological switch, but also a shift in those other spatial dimensions. However, these various forms of spatial embeddedness show great inertia to change (Hommels, 2005; Unruh, 2000).

In the same way as recent energy initiatives avoid engaging with local politics, they also tend to gloss over issues around the spatiality of energy consumption, cultural dimensions of energy or the materiality of energy systems (Barry, 2013; Shove and Walker, 2014; Strauss et al., 2013). Once again, the social sciences have much to offer energy policies seeking to engage with those various dimensions in sub-Saharan African contexts. Three examples should suffice to illustrate the point. Winther's (2008) ethnographic study of electrification in Zanzibar offers a compelling view of how electrification intersects with various social relations (including gender, age, political affiliations, and even certain spiritual cosmologies). She ties her investigation to the importance of electricity in establishing spaces (and imaginaries) of development and modernization in the island. Von Schnitzler's (2016) study of prepaid technologies for the provision of electricity and water in post-Apartheid South Africa point to the material terrain where the country's political transformation is produced. She traces how Apartheid-era moral economies and political subjectivities lingered in the deployment of prepayment for electricity and water, thus

becoming the target for heavy contestation and litigation by local residents and activists who objected to paying for the services provided. In my own work, I have looked at how historical patterns of nationalist politics, urbanization and segregation have shaped practices of prepaid electricity consumption in contemporary Maputo, Mozambique (e.g. Baptista, 2016). In contrast to von Schnitzler's findings for the South African case, I argue that the desire for accessing modern livelihoods powered by electricity seemingly lead Mozambicans to adopt prepayment technology without significant contestation to the inherent problems of self-disconnection. These studies highlight well how historical context and local politics matter. Moreover, while having these studies of contemporary energy practices is important, we are missing historical studies of energy practices in colonial and post-independence times. To my knowledge, we have yet to find social histories of energy practices for different African countries as those provided, for instance, by Nye (1990, 1997) for the United States.

When considering the path-dependencies embedded in the spatiality and materiality of contemporary energy systems we need to pay close attention to the dynamics of urbanization and suburbanization (Parnell and Pieterse, 2014) and the purported rise of the middle class across sub-Saharan Africa (Melber, 2016). There is an ongoing debate about what counts as middle class in different countries across the sub-continent (Thurlow et al., 2015), but the emergence of a grouping capable of (and aspiring to) all forms of conspicuous consumption will certainly drive up energy demand (IEA, 2014). Research on the ensuing patterns of urbanization and various social practices of consumption is gaining traction (e.g. Mabin et al., 2013; Mercer, 2014, 2016), but attention has yet to be placed on their entanglements with various dimensions of energy systems and their historical path-dependencies. In sum, various spatial and historical dimensions of energy systems and their interaction with context-specific issues of politics, culture and materiality are of essence to

understanding how energy systems in sub-Saharan Africa came to be the way they are today.

4. Conclusion and policy implications

This article sought to begin to tease out how to add spatial and historical dimensions to the examination of contemporary energy systems in sub-Saharan Africa. Drawing on the six spatial dimensions advanced by Bridge et al. (2013) for the analysis of energy transitions, the article pieced together various literatures from the social sciences to illustrate the usefulness of an historical *and* spatial perspective to researching how energy systems in sub-Saharan Africa came to be the way they are today. The article made the case that we need to know a lot more about various dimensions of contemporary energy systems: how urban energy systems were formed, operated, governed, contested and transformed; what kinds of energy systems powered colonial urban settlements and the localized colonial enterprises; how various modes of colonial statecraft harnessed energy to power social life, and the global connections across different places and spaces; how people conceptualized, used and related to various forms of energy and energy services, and the social practices (and livelihoods) these enabled. Ultimately, we need to establish more substantive accounts of how urban environments and energy systems have co-evolved, mutually shaping each other. These historical and spatial accounts should provide insights into the mechanisms and practices that underlie the path-dependencies that shape contemporary energy systems in the sub-continent. These insights are of utmost importance if we are to devise energy policies and interventions that are attuned to the realities of social life in sub-Saharan Africa. More importantly, learning about the specificities of various contexts and places in sub-Saharan Africa will be an invaluable contribution to critically evaluate how we have been theorizing energy transitions in general.

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