Prepaid Electricity in Maputo, Mozambique: Challenges for African Urban Planning

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1. Introduction

Infrastructure has been an integral part of planning's modernizing ideal (Boyer, 1983; Kaika and Swyngedouw, 2000; Graham and Marvin, 2001). This relationship has been particularly contentious in the fragmented landscapes of colonial and post-colonial cities (cf. Kooy and Bakker, 2008). In Sub-Saharan Africa alone, land use planning regulations and urban projects actively shaped the dual urban form of many colonial cities, whereby segregation along racial lines dictated the provision of infrastructure and access to utility services. Post-colonial planning has moved seemingly little in the direction of redressing these imbalances, as shown by the enduring infrastructure deficit or policymakers' unwillingness to acknowledge the pervasiveness of 'slum urbanism' (Pieterse, 2011).

The expansion of prepaid utility services in Sub-Saharan Africa offers an opportunity to examine the intersections between infrastructure and urban planning in post-colonial contexts. Within the progressive and inclusive ideals of urban planning developed post-WWII, it became standard practice to roll-out utilities with recourse to post-payment, whereby clients pay for the utility after having consumed it. This standard practice presupposed a specific relationship between the state (i.e. the service provider) and citizens (i.e. service consumers). On the one hand, the state was responsible for providing universal and good-quality utility services in appropriately planned urban areas. On the other hand, citizens would fulfill their obligation to pay promptly and to refrain from utility theft or infrastructure tampering (Guy et al., 2001). It is reasonably fair to say that post-payment remained the standard practice even when commodification and privatization of the water and electricity sectors expanded from the late 1970s onwards. The deployment of prepaid utilities turns this logic somewhat on its head, for it requires that consumers acquire an amount of the utility before using it. Where electricity blackouts or water supply cuts are common, as in many African countries, prepayment holds the promise of future consumption, but not the certainty of utility security. Moreover, where household incomes are meager, prepayment implies a form of disciplined consumption among the urban poor, which has been lauded by some but heavily criticized by others (cf. Baptista, 2013).

While these aspects of prepayment are deeply entangled with underlying assumptions about urban planning, there has been little reflection about how prepayment is reframing the role of infrastructures in ordering space and socializing individuals into a specific political-spatial order. Following Akrich (1992), if technology is invested with a particular sociality and politics about who its users are and how they are governed, then the implementation of prepaid technologies have the potential to reframe the subjectivities, the underlying logic, and the techniques of government imbued in urban planning. Understanding the processes through which that reframing may be happening due to prepaid utilities offers insight into the post-colonial urban condition in Sub-Saharan Africa, especially in relation to the interactions between urban poverty, infrastructure and urban planning.

This chapter discusses the challenges that prepayment poses to post-colonial urban planning in Sub-Saharan Africa by examining how the universalization of prepaid electricity reflects the nature of urbanization in Maputo, Mozambique. The largest city and the political-economic hub of Mozambique, Maputo's urban and infrastructural development followed a trajectory similar to that of other African cities. Urbanization unfolded along racial lines since colonial times with startling infrastructural differences between the *European* 'city' and the *Indigenous* 'suburbs'. Prepaid electricity was first introduced in the Maputo area in 1995 as a means to recover unpaid consumption, either due to energy theft or debt. The success of the initiative led the state-owned electricity company EDM, *Electricidade de Mozambique*, to universalize prepayment in Maputo and the whole country.[1] By 2013, prepayment was the standard way of consuming electricity in Maputo, where nearly all households were connected to the grid. EDM drove this process largely without the involvement of Maputo City Council and unconnected to a clear form of planned urban development. Instead, the company responded to growing electricity demand by individual households striving to improve their livelihoods and access a specific modern way of life in the context of much uncertainty and urban poverty. As a result, the electrification of Maputo and widespread use of prepayment mirror the nature of the urban condition and of the urbanization processes on-going in Mozambique in post-colonial times. Methodologically, this chapter is based on fieldwork conducted in 2013 and 2014 involving thirty households and fifteen points of sale in the peri-urban areas of Maputo, observation of the everyday activities of EDM's technical staff, semi-structured interviews with key-informants and archival research.

Findings from the Maputo case suggest prepayment reframes core aspects of the urban planning ideal in two ways. First, prepayment constitutes the acceptance of poverty as the defining characteristic of the urban condition in Sub-Saharan Africa, thus challenging planning's progressive and inclusive ideals. Second, prepayment contributes to reframe what constitutes the acceptable standard of service underpinning planning's ideal, allowing citizens to access the livelihoods they aspire too without significant improvement of the city's overall urban condition. As a result, prepayment contributes to decouple the provision of a utility service from the spatial order promised by urban planning, as it facilitates access to utilities even when planning remains ineffectual. If progressive and inclusive ideals of planning are to shape the future of African urbanism, then the theory and practice of urban planning should reconcile itself with the persisting trend towards the adoption of prepayment to expand the roll-out of electricity in Sub-Saharan Africa. This pragmatic stance does not have to turn a blind-eye to the inequality and unevenness of urban infrastructure development in African cities. Instead, it can reflect on how electrification through prepayment responds to the specificities of African cities and the aspirations of its urban dwellers.

The chapter is organized in three sections. The first section engages with ongoing discussions about the role of infrastructure and urban planning in shaping urbanization in African cities, including an incursion into debates about utility prepayment. The second section provides a historical overview of Maputo's dual urbanization and its electrification since colonial times, identifying extant dimensions of the city's urban condition. The third section examines the ways in which prepayment reframes core aspects of the planning ideal through the acceptance of poverty and a reconsideration of standard levels of service. The chapter concludes with remarks on how prepayment challenges the future of African urban planning.

[1] Mozambique's prepaid electricity system is known locally as *Credelec*.

2. African Urban Planning Challenges: Urbanization, Infrastructures and Prepayment

As policymakers and international investors swing the pendulum of the 'Africa talk' (Ferguson, 2006) from a continent in 'crisis' to the 'rebirth' of Africa, the 'awakened giant',[2] the prospect of transforming the urban condition in African cities hinges upon the challenges of infrastructure provision. According to a 2010 World Bank report, addressing the infrastructure needs of Sub-Saharan Africa requires an annual investment of about USD$93 billion, two-thirds of which for capital investments alone (Foster and Briceño-Garmendia, 2010). The energy sector figures prominently in the calculations, with about forty percent of the overall investment needs. Whether such investments will result in universal and ubiquitous utility access by the majority of African urban dwellers or whether utilities will remain fragmented and serve mostly wealthier or extractive enclaves remains to be seen.

In fact, some urban scholars have been questioning whether the optimism poured into new urban plans for African cities amounts to little more than 'urban fantasies' (Watson, 2013), where the poor continue to be excluded from access to premium spaces and utilities. The sense of *déjà vu* is ever present. Many authors have discussed extensively how colonial powers used urban planning to order, control and discipline the 'primitive' *Other*, both discursively and materially (Mitchell, 1988; Cooper and Stoler, 1997; Scott, 1998; Gandy, 2008). As Kooy and Bakker (2008) note, colonial governments often used networked infrastructures to reinforce relations of rule and social differentiation through processes of segregation and exclusion. The promise of universal and integrated provision of basic utility services seldom materialized beyond the spaces dedicated to the colonizers and the ruling elites (cf. Coutard, 2008; McFarlane and Rutherford, 2008). Post-colonial urban planning and infrastructure provision has deviated seemingly little from this colonial ethos of effacing the 'spatial pathologies' (Kamete and Lindell, 2010; Kamete, 2013) and providing for 'splintered' utility networks (Gandy, 2006; McFarlane, 2008).

Yet, urban planning remains beset by the repercussions of its unfulfilled promises in the post-colonial moment (Silva, 2012). Nowhere is it more visible than in the infrastructure 'crisis' of Sub-Saharan Africa (Chitonge, 2014). Because utilities are seen as fundamental aspects of planned urbanization, their absence is readily associated with unplanned growth and a lack of modernity – their shortage or state of disrepair revealing how the African city is not quite yet modern (Baptista, 2012).[3] While scholars have scrutinized thoroughly the problems of planning's promises (cf. Gunder and Hillier, 2009; Abram and Weszkalnys, 2011), it continues to command the hearts and minds of practitioners and policymakers the world over. As Pieterse (2010, 2011) suggested, the failure to acknowledge 'slum urbanism' as the reality of African cities has contributed to a policy vacuum where unregulated urban growth and uneven development have thrived. This is why many scholars have been arguing for a decentered approach to theorizing the dynamic nature of African urbanization and urban life in ways that acknowledge its richness and multiple specificities beyond developmentalist or dystopian accounts (Simone, 2004a; Simone and Abouhani, 2005; Harrison, 2006; Robinson, 2006; Watson, 2009; Myers, 2011; Parnell and Robinson, 2012; Pieterse and Simone, 2013; Parnell and Pieterse, 2014). In tandem with this view, African planning schools are now

[2] Wording used in a three-part article published on 29 November 2013 in the *DER SPIEGLE International Online* entitled "A Giant Awakens: Inside Africa's Economic Upsurge." Similarly, the McKinsey Global Institute penned a report in 2010 entitled *Lions on the move: the progress and potential of African economies* and, in 2011, the UNDP announced *The African Moment: On the Brink of a Development Breakthrough*.

[3] On its own, energy was equated early on with cultural and social evolution and civilization (White, 1943).

seeking to educate a new cadre of professionals attuned to pro-poor approaches that tackle the complex nature of urbanization across the African continent (Watson and Odendaal, 2012).

However, for many progressive-minded planners, it remains difficult to acknowledge the historical failure and impracticality of universal and affordable utility services in Sub-Saharan Africa, including their underlying unsustainable nature (Swilling, 2013). It seems equally difficult to reconsider what is the 'acceptable' standard of service for the 'good city' in face of entrenched views of inclusiveness and rights to the city (Holston and Appadurai, 1996; Parnell and Pieterse, 2010). This normative stance seemingly overlooks that perceptions of what is an 'acceptable' standard depends on how people value and appropriate the utility materially, socially and culturally (Winther, 2008; Strauss et al., 2013), including the sense of comfort and status derived from its use (Shove, 2003). In the case of electricity, this socially constructed view is of greater relevance, because "people do not consume energy *per se*, but rather the things energy makes possible, such as light, clean clothes, travel, refrigeration and so on" (Wilhite, 2005, pp.2). For that reason, understanding the wider relevance of utilities to urban livelihoods requires that we examine how access, supply and consumption are intertwined with a set of meanings, social relations, and technologies in specific institutional contexts and through localized practices.

A case in point is the rollout of prepaid utility services gaining traction across the global South, especially in Sub-Saharan Africa. In the case of electricity, an eclectic group of specialists related with energy provision see this turn to prepayment as instrumental in reducing energy poverty in contexts of weak governments, scant infrastructure planning, unclear land tenure, and persistent poverty (Estache et al., 2002; Tewari and Shah, 2003; Casarin and Nicollier, 2008). They argue that prepayment facilitates the expansion of access to utilities in low-income areas, empowers customers (especially the poor), and generates revenue to service providers without which it would be difficult to introduce much needed infrastructure reforms. Urban scholars have criticized this favorable outlook of prepayment and its associated narrative of empowerment, pointing to how prepayment of electricity and water services seemingly benefits service providers alone (McDonald and Ruiters, 2005; Schnitzler, 2008; McDonald, 2009). They highlight how prepayment is particularly forceful with the poor, imposing a discipline and calculability of consumption that is both unwanted and unjust. They are critical of how prepayment allows the state to exert structural violence from a distance through self-disconnections. I have argued elsewhere (Baptista, 2013) that both readings of prepayment of utility services may be overly focused on the technology's economic aspects, while missing an opportunity to reflect on how prepayment facilitates forms of sociability and social ordering that are also political, familial and technological. While prepayment does discipline consumption, it also enables the autonomy and reliability desired by many poor households to whom unpredictability is the hallmark of all forms of social relations (e.g. employment, tenure security, police, healthcare, environmental risk) (cf. Collins et al., 2009). Prepayment of utility services facilitates their inclusion, albeit fragile and temporary, in the 'modern' urban life they conceive for themselves.

In sum, if we are to take up the challenge of acknowledging 'slum urbanism' and its infrastructural deficits as underlying conditions of Sub-Saharan African cities, then investigating the connections between prepaid utilities and the aspirations for urbanity in poorly resourced urban environments offers insights into how urban planning can rework some of its impractical normative ideals.

3. Case Study: Maputo, Mozambique

3.1. Maputo's dual city

The specificities of the urban condition in Maputo date back to the colonial period, as in many other African countries. Over time, an intricate combination of property and land laws, building codes and labor laws excluded Africans from enjoying full land rights, occupying property in the city center, and circulating freely about the city of Lourenço Marques, Maputo's colonial designation. The Portuguese first excluded Africans from legally owning property in Mozambique in 1869 by establishing a legal separation between the Europeans, who would be governed by civil law, and the non-European (Africans, Asians, Arabs), who would be governed by customary law.[4] This meant that non-Europeans were allowed the collective use of land as regulated by traditional chiefs, but not land ownership, a privilege reserved to Europeans only. However, following the Berlin Conference (1884-1885) and the British Ultimatum (1890), the Portuguese sought to retain control over land use as a means of keeping effective occupation of Mozambican territories (Direito, 2013). In practice, the colonial administration showed little ability to control indiscriminate overtaking of the best lands by Europeans and the pushing out of Africans into marginal lands (Rita-Ferreira, 1968; Zamparoni, 1998; Direito, 2013). This practice continued even after the creation of land reserves for the 'indigenous' population in 1918,[5] reinforced by building codes that prohibited the use of flammable materials in the city center, such as the reed used in traditional huts (Rita-Ferreira, 1968). Mobility of Africans was also restricted, especially between rural and urban areas, as the Portuguese tried to boost economic productivity through forced labor and taxation (O'Laughlin, 2000; Domingos, 2013). Later on, and until the end of colonialism in 1975, individual ID cards or passbooks were used also to restrict the movement of Africans to the districts where they lived or worked (O'Laughlin, 2000; Domingos, 2013).

As a result of these policies, Lourenço Marques developed as a dual city with stark physical, infrastructural and racial differences: on the one hand, the 'city of cement' (*cidade de cimento*), the 'city' planned and built to European standards; and, on the other hand, the 'suburbs' (*caniço*), where the vast majority of Africans resided in makeshift dwellings in unplanned areas surrounding the 'city' (Jenkins, 2000, 2013). This spatial segregation began taking shape in the 1920s, as colonial settlers unofficially subdivided their properties in the 'suburbs' to rent out to African laborers, with no tenure security (Jenkins, 2013). This trend further intensified in the 1940s and 1950s with the location of processing and manufacturing industries in the area and the corresponding population boom.[6] Over time, this lucrative private land market proliferated unrestrained, as the colonial authorities remained unwilling to regulate urban development and provide basic utility services to the 'suburbs'. Municipal authorities made only timid attempts at addressing the infrastructure gap in the 'suburbs' through plans for the provision of affordable housing for African *assimilados*[7] in the outskirts of the 'city' (Rita-Ferreira, 1968). The planning initiatives undertaken by the authorities until Independence retained a 'blueprint' approach to what the city 'ought to be', constrained by

[4] Decree of 18 November 1869, extending the 1867 Civil Code to the 'overseas provinces' (*Diário do Govêrno n.º 265, 20 November 1869*, pp.579-580). See Meneses (2010) for a further discussion of the legal construction and separation between Europeans and non-Europeans.
[5] Decree 3983 of 16 March 1918 (*Diário do Govêrno n.º 62 (I-Série), 27 March 1918*, pp.253-281).
[6] Africans amounted to three-quarters of Lourenço Marques' 90,000 inhabitants in 1950 (Jenkins, 2013, pp.85).
[7] The *assimilado* referred to a small minority of Africans that acquired Portuguese citizenship after proving they had 'assimilated' adequate levels of education and civilized habits (see Meneses, 2010).

modernist views of spatial order, on the one hand, and the unwillingness to recognize the permanent occupation of the 'suburbs', on the other hand (Jenkins, 2013). After Independence, the government determined the nationalization of all the housing abandoned by the settler population and its allocation to Mozambican families. This housing was privatized and sold below market value later in 1992, stimulating a market dynamics that remained largely outside of state control (Jenkins, 2013). Over time, government-led interventions upgraded physical and infrastructural conditions in some settlements in the 'suburbs', usually rolled out with the support of international agencies (e.g. UN, World Bank, Cities Alliance). However, the bulk of the 'upgrading' has been done by urban dwellers themselves, in what they see as an long-term process of home-making for their families, with little intervention of the Maputo City Council or the central government (Bénard da Costa and Biza, 2012).

Post-Independence urban planning and land laws remained equally oblivious and accepting of the planning and infrastructural differences between the 'city' and the 'suburbs'. Officially, land became the property of the Mozambican State, with individuals allowed land use rights only, but no exchange, renting, or mortgage rights.[8] In large cities like Maputo, City Councils were made responsible for granting land use titles, but the process is so complex and bureaucratic that most land continues to be transacted privately and allocated unofficially by local representatives of the central government, a practice that reinforces existing spatial inequalities (Raimundo and Raimundo, 2012). The latest developments in terms of land and planning laws – the 2006 Urban Land Regulation – further entrenched representations of 'the good city' and the 'promises' of planning that are deeply unconnected to the urban condition of Maputo and the challenges the city faces at the infrastructural level. As an example, individuals can acquire land use titles only for plots that have been previously planned and developed with infrastructures and amenities (i.e. roads, electricity, water, sewage, storm water drainage, telecommunications and green areas). The modernist gesture entailed in this latest legal instalment further distances planning, conceptually if not practically, from having any significant impact on shaping the future of Mozambican cities. Instead, it reinforces the 'non-planning' strategies (Kamete and Lindell, 2010) and the 'inverse governmentality' (Nielsen, 2011) that characterizes contemporary urban production in Maputo.

Nowadays, about ninety-percent of the population lives in the 'suburbs' of Maputo, with socio-spatial distinctions occurring now more along income than racial lines (Andersen, 2012). While residents of the 'suburbs' perceive a difference in terms of physical order when compared to the 'city', they feel no less urban dwellers themselves (Bénard da Costa and Biza, 2012). Being able to access utility services such as electricity is an integral part of that urban way of life and the on-going commitment to improving livelihood conditions.

3.2. Maputo's difficult electrification

The grid rollout and supply of electricity to Lourenço Marques/Maputo has been an enduring problem, irrespective of the spatial fragmentation along racial or income lines. Financial constraints and profit-driven concessions troubled the provision of public lighting from the outset. Until 1898, the streets of the small urban core of Lourenço Marques were lit by kerosene lamps and some gas lighting, but these would remain off on full moon nights, or in smaller streets, due to budgetary savings imposed by the colonial administration (Dava and Tamele, 2011). After 1898, the city's urban core was serviced with electricity generated by

[8] 1979 Land Law (Lei de Terras, Lei n.º 6/79, 3 July 1979), revised in 1997 (Lei n.º 19/97, 1 October 1997).

steam engines and, from 1903 onwards, by a thermal power station (Dava and Tamele, 2011). The colonial administration granted the electricity service concession to a succession of foreign private companies until 1947, but these exploited the network for profit and delivered a deficient service (Agência Geral do Ultramar, 1958). As a result, the colonial administration municipalized electricity supply and returned power generation to the hands of the colonial administration (Agência Geral do Ultramar, 1958; Dava and Tamele, 2011).[9] Despite efforts to improve generation, with the construction of a new thermal power station, and the improvement of "the disastrous state of repair of the distribution grid" (Agência Geral do Ultramar, 1958, pp.86-87), the municipal utility company struggled financially to supply the growing demand driven by the industry and the population boom alluded to earlier (Dava and Tamele, 2011). The service remained unreliable, leading to the proliferation of smaller private electricity operators during the 1950s (Arthur, 2009). Throughout this time the population of the 'suburbs' continued to struggle to access and consume electricity, resorting mostly to firewood, charcoal, candles, and kerosene lamps as energy sources for cooking and lighting (Rita-Ferreira, 1968; Mavhunga, 2013).

Plans for tapping into the vast hydropower potential of Mozambique began developing in the 1960s, with a view to generating revenues from energy export to South Africa and meeting a secure electricity supply to the South of Mozambique and Lourenço Marques in particular (Isaacman and Sneddon, 2003; Patrício, 2010). This plan only came into fruition shortly after Independence, when Maputo started being serviced by the Hydroelectric of Cahora Bassa (HCB), a private company jointly owned by the Portuguese and the Mozambican governments, and the country's largest power generation plant to date.[10] However, most of the electricity produce at HCB was destined for export to South Africa (as still is today), with only a small part retained for internal consumption, most of which in Maputo itself.[11]

After Independence, the Mozambican government opted for the centralization of electricity generation and supply in the state-owned company EDM.[12] The government saw in the utility company a strong political-economic contribution to the development of national sovereignty along Socialist lines.[13] In spite of the strong political backing, which included a policy of tariff subsidies, EDM faced many difficulties in the intervening period, with substantial shortages of equipment, diminished technical and operational capacity, and theft of cabling and electricity (Dava and Tamele, 2011). Moreover, sabotage of roads and transmission lines by guerrillas during the Mozambican Civil War cut HCB electricity supply between 1981 and 1997. This contributed to constant power outages and fuel shortages in Maputo (UNDP and The World Bank, 1987; Arthur, 2009) and forced EDM to buy electricity from South Africa at higher prices than HCB electricity. This situation was economically demanding for EDM, thus triggering the deployment of prepayment as examined below.

[9] The new municipal utility company was SMAE, *Serviços Muncipais de Água e Electricidade*. The state-owned company responsible for energy generation was SONEFE, *Sociedade Nacional de Estudos e Financiamento de Empreendimentos Ultramarinos*.

[10] Mozambique became the majority shareholder of HCB in 2007.

[11] The electricity export agreement has been reviewed periodically since Independence, but there are ongoing discussions regarding the fairness of what is available for internal consumption (Isaacmand and Sneddon, 2003).

[12] Created in 1977, EDM centralized the different municipal companies operating in the country prior to 1975.

[13] An informant involved in energy policy at ministerial level since Independence reminded me of Lenin's view that "Communism is Soviet power plus the electrification of the whole country, since industry cannot be developed without electrification" ("Our Foreign and Domestic Position and Party Tasks," Speech Delivered to the Moscow Gubernia Conference of the Russian Communist Party (Bolsheviks) on 21 November 1920; available online at http://www.marxists.org/archive/lenin/works/1920/nov/ 21.htm, accessed on 2 April 2013).

EDM has continued to play a fundamental role in the electrification of Mozambique through the upgrade of the colonial grid and the expansion of the grid to peri-urban and rural areas. Many commentators point to the technical unsustainability of this expansion, noting how the government uses energy infrastructure to mobilize popular allegiance. Yet, the grid expansion into the 'suburbs' of Maputo has followed demand from urban dwellers themselves, as they go about improving their home spaces. This happened with little involvement of the City Council and its planning department: even though half of Maputo's urban areas are categorized as unplanned (Jenkins, 2012, pp.108), there is near universal access to electricity.

Currently, there are only occasional reports of blackouts in Maputo, but this situation may be about to change. With growing demand, there is not enough electricity to go around. HCB is currently operating near capacity, and while the share retained for internal consumption increased significantly lately, it only covers about eighty-eight percent of the energy needs of Mozambique (EDM, 2010). EDM is attempting to diversify sources of energy production, but it is financially constrained to generate more electricity on its own. There is an ongoing anxiety about the country's energy sovereignty and, as a result, the Mozambican government set out an ambitious mega-projects plan for energy generation and transmission worth over USD$9 billion, despite donors' concerns with future debt sustainability.[14]

In this context, EDM developed an overarching view of electricity as a scarce and expensive resource that must be managed wisely – and certainly not to be consumed freely without charge. In a country where over half the population lives under the poverty line (van den Boom, 2011), this is a difficult mission to achieve, with potential political consequences.

4. Prepayment and the challenges to urban planning ideals

4.1. The acceptance of poverty

Urban poverty – how to define and measure it, its causes and consequences – is a topic of extensive debate in urban and development circles (cf. Mitlin and Satterthwaite, 2013). Following these, I draw here on a broad view of poverty as the condition of lacking the resources to meet human needs. As such, prepayment constitutes an acceptance of poverty in two interrelated ways: infrastructure-related poverty and income-related poverty.

In simple terms, the infrastructure poverty relates to the poor state of repair of the electricity network system in Maputo, the scarcity of energy available for distribution and the limited financial capacity to invest in system upgrading and new generation plants. As noted at the end of the previous section, this created a culture within EDM that puts a high price on energy security. EDM staff conceives energy security in a complex way – in economic, physical and symbolic terms: it involves a constant preoccupation with the minimization of operational costs, the reduction of technical loses and a determination to curtail energy waste and theft by the 'uneducated' or 'uncivil' consumers.[15]

[14] The main projects are the expansion of HCB, the Mphanda Nkuwa hydropower plant on the Zambezi river, smaller hydropower stations, natural gas- and coal-powered stations, and the new energy transmission line connecting the Zambezi to Maputo (CESUL) (*MacauHub*, "Mozambique: Mozambican energy projects cost US$9 billion," available at http://www.macauhub.com.mo/en/2009/03/17/6733/, accessed on 8 May 2013).

[15] This is how EDM represents its clients. Unfortunately, there is no space here to discuss the politics of this representation.

The deployment of prepaid electricity in Mozambique in 1995 reflects these conceptions along with the acknowledgement of widespread income poverty. In the post-civil war context of high-inflation and economic hardship, the Mozambican population had very limited capacity to pay for utilities like water and electricity. Energy theft was thus the way of accessing better livelihoods for many poor households.[16] EDM's relatively long and inefficient billing cycle created intense conflicts with clients due to incorrect consumption estimates and disconnections following prolonged debt, not just of individual households but also of public services and institutions. These conflicts often ended with retaliation against EDM workers, but could also emerge as a result of EDM workers seeking continued undue compensation from clients to turn a blind-eye on energy theft. This situation made it difficult for the company to generate the revenue necessary to match the cost of electricity acquired from South Africa. Prepayment became a reasonable technical solution for this cash-flow problem and a more politically palatable option than imposing higher electricity tariffs on a largely poor population in the post-war context. To policymakers, it was seemingly socially acceptable to demand from citizens that they paid for electricity consumed, to recover outstanding electricity debts, and to curtail energy theft.[17]

Prepayment was first introduced with a pilot project of five hundred households with long-standing debt in Matola, a neighbor urban area of Maputo. The new prepaid system was so successful in recovering debt that EDM decided to generalize prepayment as the default payment method for all households and small businesses in Maputo and the country as a whole.[18] This has been a slow but steady process, dependent on securing investments from the government, international aid agencies and foreign banks, not only for the replacement of old conventional meters for prepaid ones, but also for improving the obsolete physical infrastructure of the grid and expanding it to Maputo's 'suburbs'. According to statistics provided by EDM, the adoption of prepayment in Maputo increased from sixty-five to ninety percent of clients between 2008 and 2013, with a corresponding increase of the number of connections from sixty-eight to ninety-seven percent of the population in the same period.[19] However, the number of connections must be read carefully, for even though a household may have an electricity connection, it may not be able to sustain its regular use and/or continue to resort to fuel mixing (Atanassov et al., 2012). This is particularly the case in the 'suburbs' of Maputo, where nearly half of the households are classified as poor or very poor (Andersen, 2012).

While there is much discussion in the literature about the unwanted and unjust discipline imposed by prepayment on the urban poor, the prepaid system seems to be widely accepted by the population of the 'suburbs' and 'city' of Maputo (Baptista, 2013). When their households were serviced by conventional meters, many urban dwellers lived with the

[16] In 1995, nearly sixteen percent of the electricity available for consumption was accounted as non-technical losses (i.e. pilfered electricity) (UNDP and The World Bank, 1996, pp.34).

[17] It is helpful here to make a connection to the views on citizenship and the construction of a modern *homem novo* (the new man) created by the Socialist government after Independence and how this representation of the Mozambican citizen evolved over time (Macamo, 2003; Sumich, 2008).

[18] To be precise, EDM's policy is to extend the use of prepaid meters to all low-voltage small clients. This includes all households, small businesses and services, and farmers. Low-voltage large clients, such as hospitals, large schools or large supermarkets, will continue to be serviced with a conventional meter for technical reasons.

[19] Data provided by EDM during fieldwork in March 2014. The number of connections must be read with some caution, because EDM uses population data from the national census and an estimate of 4.5 people per household to calculate how many people are served by an electricity connection. The number of prepaid connections is more reliable, because it accounts for how many of EDM's clients are on a prepaid meter.

permanent uncertainty of having to pay for unexpected sums of electricity consumption. The relationships with EDM were strained due to the use of billing estimates. Many people likened the company to a 'thief' – charging for more electricity than what had been possibly consumed. The introduction of prepayment was not desired by many households at first. With time, urban dwellers came to appreciate the sense of autonomy and control over spending and consumption that prepayment afforded them. People no longer had to deal with EDM to know how much they would be paying for electricity. They could also avoid debt, a much welcomed feat among poor urban dwellers. Households often buy electricity on a daily basis according to what they manage to eke out of everyday income-generating activities. This gives them a sense of empowerment, even if consumption is disciplined and judicious (see next). This is not surprising if, as Collins et al. (2009) note, being able to manage uncertainty and avoid debt is a much valued aspect of the livelihood of the urban poor.

4.2. Reframing 'acceptable' service

As noted earlier, the electrification of Maputo's 'suburbs' came mainly as a response to demand by individual households striving to improve their livelihoods and access a specific modern way of life in the context of much uncertainty and urban poverty. The history of each household will certainly vary, but there are a few common traits. Often times, it took a household several years to save enough money for fitting an electrical installation in the home and then to pay EDM for the installation fee. Saving involved different members of the household, as well as family, friends and borrowing groups (Bénard da Costa and Biza, 2012). If the household was located in an area where EDM had little coverage, then it was common for three or four families to pool resources together to pay for a new electrical pole to be installed close to their plots. Urban dwellers seemed to expect little from the municipality or the central government, except in certain (almost performative) junctions when local representatives of the state apparatus had to provide proof of residency, as required by EDM. In practice, this meant that households were actively engaged in the expansion of the electricity grid in Maputo.

Hence, the 'acceptable' standard of service envisioned by the ideal of urban planning, whereby a city (or a developer) lays down the utility network in advance of urban expansion, has not been an expectation of Maputo's urban dwellers. Because they see electricity as an inevitable and essential requirement of modern life, urban dwellers find themselves in the situation of having to address the shortcomings of both the state apparatus and the electricity provider. By relying on solidarity networks and individual endeavor, urban dwellers *are* the infrastructure, following Simone (2004b), that made possible the electrification of Maputo.

Moreover, prepayment has played a crucial role in reframing the 'acceptable' standard of service by facilitating convenient and familiar practices of consumption among Maputo's households. The meter technology, visually displaying outstanding electricity units, facilitates a practical understanding of which appliances consume what electricity and how long will it be until the household runs out of electricity. For households with an unstable source of income, the possibility of buying small increments of electricity credit fits conveniently with the familiar routines for acquiring essential goods like bread or charcoal on a daily basis. Prepayment enables people to exercise a form of 'disciplined autonomy' in their consumption of electricity, as members of the household selectively manage how they want to use the electricity they can afford. For instance, many households may often forsake having a refrigerator or the lights on, if that means they can spend more time watching TV. What

people use electricity for is as much a reflection of their basic needs and disposable income, as it is of their social aspirations for a better, more dignified livelihood. As noted earlier, prepayment provides Maputo's urban dwellers this sense of empowerment not *despite* but *because* they are painfully aware of their condition as urban poor in the context of pervasive uncertainty and inequality.

In sum, prepayment reframes urban planning's 'acceptable' standards of service in Maputo by embedding poverty in different socio-technical dimensions of the city's electricity network and everyday energy consumption practices. Prepayment enables urban dwellers to access a livelihood they desire without significant improvement of the city's overall urban condition.

5. Conclusion

This chapter examined the case study of prepaid electricity in Maputo, Mozambique as an opportunity to reflect on the challenges of infrastructural provision and urban planning in post-colonial African cities. The chapter provided a brief overview of the history of urbanization and electrification in Maputo and highlighted the disconnection between urban development, infrastructure provision and urban planning that remains today. Moreover, it illustrated how the universal deployment of prepayment in Maputo came to mirror the pervasive poverty of the networked system itself and the population in general. The chapter further examined how prepayment fits conveniently with familiar everyday practices of consumption, especially among poor households, thus contributing to reframing what urban dwellers perceive as 'acceptable' standard of utility service. Overall, the case of the universalization of prepaid electricity in Maputo highlights how this technology acknowledges 'slum urbanism' as the city's underlying urban condition.

Coming to terms with the work prepayment is doing, as a technology, in shaping urbanization in cities like Maputo does not intend to gloss over the challenging urban conditions of African urban dwellers. Nor does it dismiss the role that planning can play in addressing those conditions. In fact, if prepayment seems to allow the urban poor to access a desired livelihood, it does very little to address the structural inequality that forces them into the 'disciplined autonomy' they feel so empowered by. Instead, examining the work prepayment is doing in cities and for citizens in Sub-Saharan Africa allows us to shed light into the ambiguous relationship that infrastructure and urban planning are playing in the post-colonial moment.

Acknowledgments
This chapter is based on fieldwork research funded by a grant from the John Fell Fund, University of Oxford, UK. This fieldwork was possible due to the generosity of several people: the residents of different neighborhoods of Maputo, who agreed to share their everyday electricity practices using a prepaid meter; the staff at Mozambique's electricity company, EDM, *Electricidade de Moçambique*, who provided valuable insight into the daily operations of prepayment, especially Amilton Alissone; Pedro Coimbra, for helping navigate local institutions; Luís Lage and Paul Jenkins, members of the Home Space project team, for sharing project records and exchanging ideas about urbanization in Maputo; Sr. Manhiça, who jovially and patiently took me to and through every neighborhood of Maputo; and last, but not least, Aires Novela, my field assistant whose constant support made the work in different neighborhoods easy and most enjoyable.

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