

**Electricity Supply in Khartoum: the planned, the delivered, the experienced**

**Razaz Hassan Basheir Hassan**

**HSSRAZ005**

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**Supervisor: Dr. Anna Selmeczi**

**African Centre for Cities**

**Environmental and Geographical Sciences**

**University of Cape Town**

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## Abstract

As the first step in rethinking infrastructure configurations and their alternatives, this thesis aims at looking into the existing policy framework that governs electricity supply in Khartoum, its implementation and how it's experienced by Khartoum's residents. By zooming into one locality in Khartoum, the "Eastern Nile Locality", the research has attempted to analyse the ways with which the limited electricity infrastructure is planned and allocated through its translation into policy frameworks in neighbouring areas falling under different zoning classification that correspond to their residents' income brackets. Review of the policy framework was conducted firstly, using a mix of desktop research and interviews with officials from the relevant institutions, investigating the key guidelines that govern electricity distribution across the various residential zones in terms of no/access to the grid, tariff regimes, contractual arrangements, alternative configurations and so on. The second part of the research was using ethnographic research methodologies to examine users' experience of electricity supply in its material and non-material dimensions.

The studied cases revealed three main user categories; firstly, those grid-connected via the standard producers set by the Electricity Distribution Company. The second are those grid-connected via emerging models that could be classified as micro-financed co-production grid-connection. The third are those who remain off-grid and follow alternative routes. These varying regimes of service delivery are experienced by Khartoum residents on multiple levels, the most significant of which are firstly linked to users' experience of electricity as an unrivalled energy form that could be converted into a multiplicity of other forms, or its functional dimension as a modern technology that dis/enables greater space-time manipulation. Secondly, its more symbolic or representational aspects and their translation into social codes that define modern citizens and modernized states. Lastly, users' experience has pointed to the close link that the users make between electricity and the different relations that they form in their endeavors to access power services as in the different set of financial, legal, institutional and social relations and their implications in shaping subjectivities and articulating political positions.

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## List of Abbreviations

CBoS: Central Bank of Sudan

IDP: Internal Displaced Persons

IRENA: International Renewable Energy Agency

MoFEP: Ministry of Finance and Economic Planning

MoWRIE: Ministry of Water Resources, Irrigation and Electricity

RE: Renewable Energy

SEDC: Sudanese Electricity Distribution Company

SSA: Sub-Saharan Africa

STEC: Sudanese Electricity Transmission Company

WB: World Bank

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## Dedication

To the great women in my life; Faiza and Rabab.

# Chapter 1 - Introduction

## 1.1. Context

Since its foundation as the capital of Sudan in 1830 under the Turko-Egyptian occupation (Abu Salim, 1979: 26), Greater Khartoum has always been the most important region that concentrates economic and political power in Sudan (Denis 2005:4). However, the post-independence Sudan, once the biggest country in Africa, has been in a continuous state of turmoil due to a combination of socio-political tensions and ecological pressures (Suliman, 2006) which manifested in decades-long civil wars, droughts, cyclical military coups and more recently the splitting of the country into Sudan and South Sudan, with its dire economic consequences on both sides. Sudan's loss of 75% of oil revenues following this secession in 2011 (OECD,2012:2) was particularly consequential to its rapidly growing capital whose whole economy was booming in the 2000s thanks to petrodollars invested in non-productive real estates and other services (Choplin and Frank, 2010:194). All this has left the country and its capital today in a state of accelerated economic decline, brain-drain of professionals, rural-urban exodus of economic migrants and Internal Displaced Persons (IDPs) bringing the urbanization rate to 3.2% per year (UN-Habitat, 2019:5).

Such accelerated urban growth is not an exception for the Sub-Saharan African region where the current proportion of 40% urban population will hit the 50% by 2030 (UN-Habitat, 2020) and whose implications are particularly determinate for service delivery and its infrastructure. However, the Northern conception of the networked city (Graham and Marvin, 2001:10) that characterized the development of early modern European metropolises has come to define modern planning practices and infrastructural configurations through their translation into technical disciplines and formal institutions (Picon,2018:4). Such configurations are questioned today in the Southern context, not only due to the different forms of historical injustices associated with its introduction into the colonies (Graham and Marvin, 2001:82), but also the ever widening supply deficit urges for a critical and radical examination of these configurations

(Jaglin, 2014; Hyman and Edgar Pieterse, 2017; Simone and Pieterse 2017; Lawhon et al., 2018; Cirolia 2020:)

Key issues of electricity supply in SSA are electrification and supply reliability. Today, official electrification rates in Sudan are at 32% with 60% of supply concentrated in the capital (The World Bank, 2019:22). With only ten years left for achieving the ambitious target of universal electrification rate by 2031 that was pledged in 2012 (Ministry of Water Resources and electricity, 2012:30), challenges for the electricity sector are nothing but multiplying. The increasing population in general and urban in particular is exacerbated by the rising demand per capita (The World Bank, 2019:17) and requires substantial additional generation capacity. But securing the initial investment costs for new power plants, often doesn't mean a sustainable flow of operation costs could be secured amidst the highly inflationary national macroeconomics that weigh on both the supplying and consuming sides (ibid:25). Consumers' low affordability on its turn translates into low electricity tariffs and low grid-connection uptake that halts grid extension and limits the sector's capacity for self-finance (Blimpo and Cosgrove-Davies, 2019, 61).

Amongst the three main stages of grid-based electricity supply; generation, transmission and distribution, the localized scope of the latter makes it intertwined with broader urban issues. Technically speaking, "Distribution" is the stage in which transformers step down High Voltage electricity, travelling through transmission lines from generation centers to consumption centers, to end users' voltage levels (Medium and Low Voltage) (Kaplan, 2009:2). From a governance point of view, Sudan's largely centralized institutional configuration places the Sudanese Electricity Distribution Company (SEDC) as the last level of supply governance (State level). In addition to the Medium Voltage (MV) and Low Voltage (LV) substations, SEDC's main scope covers all the neighborhood-scale electrical components, as well as managing customers' services such as connection application, electricity sales and billing (Ministry of Water Resources and electricity, 2012:27). Despite the existing guidelines governing the relation between SEDC and the other institutions managing the neighborhood scale affairs such as the Ministry of

Physical Planning, the localities, etc., electricity supply is affected by the different urban challenges that these institutions are faced with.

Urban issues of informality, urban sprawl, poorly-executed public housing schemes, spatial fragmentation, precarious livelihood, emerging neo-liberal patterns of development and poor urban governance (UN-Habitat, 2019; Hamid and Elhassan, 2014; Osman, 2017; Choplin and Frank, 2010; Pauntlino et al., 2001), are complicating the question of electricity supply in Khartoum and pointing to the need for a more holistic approach for thinking service delivery.

## **1.2. Research objectives**

As the first step in rethinking infrastructure configurations and their alternatives, this thesis aims at looking into the existing policy framework that governs electricity distribution in Khartoum, its implementation and how it's experienced by Khartoum's residents. In addition to the materiality and functionality of electricity infrastructure, the research examines electricity supply configurations in light of a few themes that are deemed relevant to the Sudanese context and that a substantial number of scholars have been discussing. These are the links of urban infrastructure to the fragmented nature of Southern cities (Graham and Marvin, 2001, Balbo, 1993), the commodification and fetishization of nature through technological systems and their embedded power relations (Swyngedouw, 1996; Kaika and Swyngedouw, 2000), and the representations and social imaginaries of infrastructure (Picon, 2018). As well as aspects of infrastructure as a vehicle of political power as in Von Schnitzler's (2016) analysis of democracy, citizenship and infrastructure. Examining issues of service delivery in Khartoum also requires the understanding of the heterogeneity of infrastructural configurations argued for by Lawhon et al. (2018), Jaglin (2014) and Simone (2011). Contextualizing these readings of infrastructure entails an engagement with the larger patterns that have been playing out in postcolonial cities as addressed by Mamdani (1996), Mbembe (2001) and Simone (2004, 2011). As well as engaging with the limited literature on the social and political realities of Khartoum city, drawing on the

work of scholars such as Abu Salim (1979), Seid Ahmad (2000), Simone (1994), Lavergne (1999), Denis (2006), Hassan et al. (a)(b) (2017) and Choplin and Frank (2010).

Informed by this literature, and with the objective of understanding how the local government is making decisions regarding the allocation of limited infrastructural resources, the policy framework of electricity distribution in Khartoum was investigated using the Eastern Nile locality as a case study. Using a mix of research methodologies, the focus of empirical research was covering the official policy framework that governs electricity distribution to different residential zones in the locality, as well as the residents' experience of these policies.

### **1.3. Methodology**

Two main research methods were employed in this thesis, namely, policy research and ethnographic research.

#### **Policy research**

The policy framework governing electricity distribution in Eastern Nile was examined using desktop research and structured interviews with institutional officials. The aim was to understand the broader institutional framework governing electricity supply in general and electricity distribution in particular. Key questions were centered around the guidelines on which electricity distribution is planned and managed across the various residential zones in terms of grid connection, tariff regimes, load shedding, distribution outlet, current and future priorities and so on.

#### **Ethnographic research**

Ethnographic research was used to explore the second part of the research that explores residential users' experiences of electricity (non)supply. Residents from different parts of the studied locality were interviewed to understand their experience of electricity supply in both its material and non-material aspects. A mix of structured interviews and participant observation

were used to capture the objective aspects of the experience such as grid access status and incurred costs. As well as the more subjective elements of the experience such as representations and values shaping the electricity supply.

A general schema for electricity supply in Khartoum was established from a total of twelve interviews: five officials and seven households from Eastern Nile locality. Existing configurations for electricity supply have determined the selection of the studied cases in order to cover a significant range of alternatives. The studied areas could be classified into three main categories: grid-connected-standard procedure, grid-connected-co-production and off-grid.

#### **1.4. Significance**

After examining the context and the rationale behind this research, its significance can be summarized in three main points. First and foremost, this research is to be viewed as part of a personal and long-term project that aims to contribute to the persisting research question of rethinking alternative infrastructure for Southern cities. Secondly, using methods of policy research evaluation has primarily the objective of understanding the existing policy framework and identifying areas of improvement and intervention. Because a well-conducted analysis of the policy framework and its execution can be valuable for future policy reforms, especially at this moment of political and institutional transition in Sudan. Finally, information collected for this study will also be a positive contribution to the scant empirical data available on Khartoum in general and infrastructure in particular.

## **Chapter 2 - Literature review**

### **2.1. Introduction**

This chapter will cover the key themes that this study is attempting to deal with through the understanding of the historical, spatial and conceptual contexts according to which urban infrastructure was conceived and evolved. The first part will start by discussing the emergence of the networked infrastructure in the global North before moving to contrast these modes of development with their Southern counterparts during both the colonial and post-colonial periods. The second section will zoom into the institutional aspects of urban infrastructure. While in the third section, the focus will shift to the receiving side of infrastructure to discuss some key elements of the lived experience of infrastructure users.

### **2.2. Networked infrastructure**

#### **2.2.1. Networked infrastructure in Northern cities**

Graham and Marvin (2001:10) explain how the development of networked infrastructure in Northern cities could be considered as the "key physical and technological asset of modern cities" in the way they define and control urban life, characterized by its ever-increasing degrees of movement and exchange. The roll out of these networked infrastructures was pursued, according to (Lawhon et al., 2018:722), with an assumption of their universality and availability for all urban dwellers. This systematized mediation of exchange over distance, which Graham and Marvin (ibid) call "socio-technical process", shapes "economic, social, geographical, environmental and cultural change in cities". Kaika and Swyngedouw (2000:121, 125) describe how in early modernity of the mid-19th century, urban networks were the "iconic embodiment" of social progress, where betterment of cities through technical interventions was perceived as what will inevitably result in freedom, equality and will "automatically" create a better world. While the integration of the various infrastructural networks was ensured through the

establishment of a whole set of professional disciplines such as administrators, planners, engineers and so on (Picon,2018:4).

Larkin (2013:329) distinguishes infrastructures from technologies by the fact that the former are “objects that create the grounds on which other objects operate”. In this vein, electricity infrastructure could be viewed as the most notable embodiment of this function as the infrastructure on which historically most of other infrastructures depended; electric trams, water pumping and recently the whole ICT infrastructure. Boyer (2015, 532) describes electricity as the “foundational apparatus” of the modern experience since the nineteenth century.

However, the deployment and evolution of networked urban infrastructure in the global South followed a different trajectory in these parts of the world. The next sections will give a brief overview of the major aspects along which networked infrastructure was imported into the colonies and post-independence cities.

### **2.2.2. Infrastructure in colonial cities**

Infrastructure in the colonies served mainly the purpose of managing exports, setting the needed environment to exercise control over the populations, as well as meeting the needs of “metropolitan and local elites”, while the full extension to the native population remained a promise never met (Graham and Marvin, 2001:82). Balbo (1993:25) explains that such a fragmented manner of urban development in the colonies was not only for sanitary, social or cultural reasons, they were also spatial expressions of power embodied in modern services and infrastructure. The duality of the colonial logic that distinguishes between the Europeans and the natives diverged the infrastructural ideal from its universality.

Khartoum’s first encounter with modern urban infrastructure was during the Turko-Egyptian occupation when the Sultan was highly fascinated with Western modes of urban development, sending engineers and skilled labour from Egypt to contribute to train local people on different technical and crafts skills (Abu Salim, 1979:42). However, the Anglo-Egyptian colonization was

the longest and left more persisting traces in the country's capital in particular with the introduction of paved roads, bridges, piped water, electric trams and the national railway system. For instance, streetlighting was introduced in 1900 to light the key streets in the colonial part of the city using oil lamps. But their high operation costs prompted the shift to electricity supplied by an old generator that wasn't in a perfect state, however, as Abu Salim (1979:152) states "[p]eople were still happy with their share of the blessings of civilisation and signs of progress".

The unequal natures of these infrastructures were unmistakable. The map of the colonial railway is the trajectory that cattle and so-called cash crops follow, linking production centres in Kurdufan, Al Jazeera, Al Gadarif and Algash region to markets via Port Sudan and Egypt (Al Gadal:2002:262-266), leaving 20% of the country's area in the arid and less profitable regions of Dar Fur without a single station. Moreover, the hard-to-cross intersections of Khartoum seem to be at odds with sound streets planning. These diagonal intersections were not just an evocation of the Union Jack of the British flag, but mainly an additional defence layer against any anti-colonial moves through the creation of shortcuts between key military spots in the city (Lavergne, 1999:153). Osman (2017:8) critiques the inherited basis of Khartoum planning that classifies neighbourhoods into classes. Originally, the large and well-located 1<sup>st</sup> class plots in the vicinity of the Blue Nile were occupied by the English colonizers. In contrast, 4<sup>th</sup> class plots sizes in El Deuim, the first planned neighbourhood by the colonial power for local working class, didn't exceed the 200m<sup>2</sup> and lacked access to decent basic services (Babiker, 1998:95).



Figure 2.1. City tram linking Khartoum-Omdurman.

(Source: Authors' Archive -Hassan et al. 2017)

Balbo (1993:29) argues that this dualist approach to city planning was inherited by independent states and still persists, though for reasons more linked to the inability of national states to follow practices of master planning due to, inter alia, rapid urbanization and meagre public resources.

### 2.2.3. Infrastructure in postcolonial cities

Independent states have inherited the colonial cities with their metropolis-dependent technologies and spatially fragmented nature. Von Schnitzler (20016:16) describes large technical systems as being both “tools and symbols of modernizing state projects”. However, modernization projects of the nascent independent states were faced by a myriad of technical, financial and institutional challenges (Graham and Marvin, 2001:84).

The conventional centralized and networked configuration of electricity infrastructure being significantly complex in its employment of larger set of sub-systems, their synchronization and the multiplicity of actors involved (Kessides,2004:133), continues to pose a big challenge for Southern parts of the world and Sub-Saharan Africa (SSA) in particular. Overall, the average access to electricity in SSA is at 48% in 2018 (The World Bank Data n.d.) In Sudan, electrification rate is at 32% (The World Bank, 2019:22), a challenge exacerbated by the low density, mainly of the rural population, inflating costs of transmission and distribution grids' extension (Ministry of Water resources and Electricity, 2012:2). Urban electrification rates are relatively higher at 60% (The World Bank, 2019:22); however, urban users are faced with a different set of long-standing issues such as the rapidly growing population and its correlation to electricity demand as well as supply unreliability (Ministry of Water Resources and Electricity, 2012:2-3).

Issues of electricity supply also intersect with other urban challenges. The widespread informal settlements that amount to 53% of urban dwelling (The World Bank Database, n.d.) in SSA and more than 50% in Khartoum (Omer, 2018), leaves the majority of the urban population with limited to non-existing supply arrangements. The impermanent nature of these informal settlements makes investments on their infrastructure not amongst the state priorities, also, the low payment capacity of informal residents makes infrastructural projects in most cases unbankable (Simone and Pieterse, 2017:40). Simone and Pieterse (ibid: 38) explain how service delivery in these areas depend on makeshift arrangements of hybrid solutions combining available formal delivery mechanisms with informal ones, legal or illegal. Brown and Stigge (2017:157) demonstrate that a total of 150,000 illegal grid users in Casablanca's (Morocco) informal settlements were costing the utility company 1.4 million euros per year. Poorly implemented public housing initiatives can also lead to the development of mal-serviced neighbourhoods. Hamid and Elhassan (2014:191) found that only 60% of their surveyed beneficiaries of public housing had access to housing units or plots with electricity supply in place.

Spatial fragmentation, either inherited from the colonial regimes or a product of emerging neoliberal development patterns, is another factor in this service delivery conundrum. For

instance, the zoning system inherited from colonial administration in Khartoum still groups affluent residents in the same neighbourhoods (Osman, 2017:8), what results over time in areas with better communal infrastructure e.g., a more extended distribution grid. Furthermore, systematic anti-urbanization policies can add to the crisis. Hyman and Pieterse (2017:429) explain that the decades-long anti-migration policies of African governments were coupled with “underinvestment” in informal areas. Bakker and Kooy (2008:1896) investigates how the colonial water system of Jakarta (Indonesia) has continued to prioritize water supply to the elite residents of the postcolonial city, excluding the poor on the peripheries in an attempt to curb rural-urban immigration, resulting in a rate of municipal water connection of 36% to urban households and only of 16% to the urban poor.

Different reasons are behind these infrastructural challenges. Finance deficit is amongst the key reasons; Foster and Briceno-Garmendia (2010, cited in Hyman and Pieterse, 2017:435) estimate that US\$93 billion was needed annually to fill the finance gap for the 2010-2020 decade. According to the World Bank (2019:33), the total cost associated with the 2018-2023 government plans for the Sudanese electricity sector in terms of the total cost implications of an additional generation capacity and its operation fuel will amount to US\$2.7 billion in 2023, or approximately a 50% increase compared to its current full costs in U.S. dollars, or more than 700% costs increase in Sudanese pound, due to the soaring inflation rates. However, Cirolia (2020:2) argues that estimations for financial resources for the African service delivery gaps vary considerably according to “metrics, assumptions and even the definition of Africa used”.

The lack of financial or technical capacities has served and continues to serve as a pretext for perpetuating the dependency on international firms for construction, operation and maintenance of infrastructure. Graham and Marvin (2001:84-87) show how the various modernizing and developmental prescriptions for the independent states, with the central place given to urban growth and its associated infrastructural imperatives, were mostly serving the local elites and maintaining the links with the original supplying and developing firms for technical support and supply of spare parts. A notable example of these dynamics is Merwe dam, the controversial and highly celebrated achievement of the Sudanese Islamist government which

was inaugurated in 2009 to double the installed generation capacity of the country to the current 3.5 GW (Sudanese Hydrogeneration Company n.d.). Where both old colonial power and new international players joined forces; with the German Lamhayer conducting the initial and widely debated environmental assessment and serving as the main consultant for construction works, French Alstom building the 10 turbines, Chinese Sinohydro and CMMD providing technical support and carrying out construction works respectively. As for finance, half of the total cost was paid by the Sudanese government's oil revenues, while the other half was mainly coming from the Chinese government and Gulf countries' funds (Requejo-Castro et al., 2018:12).

Governance has also been usually identified as a major block for infrastructure development in SSA; this will be discussed in more detail in the next section. Below, I give a brief overview of the governance and institutional aspects of urban infrastructure, the key paradigms that have been shaping them and their critiques, as well as exploring some debates on alternative arrangements for service delivery.

## **2.3. Governance and institutional configurations**

### **2.3.1. Electricity governance: from state monopoly to unbundling**

Borras (2012:412) argues that the multiplication of institutional configurations along which science and technology applications, with their diverse socio-economic interactions, are organized has shifted the lens through which they are examined from government to governance. Risse (2012:643) defines governance as "the various institutionalized modes of social coordination to produce and implement collectively binding rules, or to provide collective goods." Though the technically rigid nature of electricity supply has limited changes in its technical configurations (Kessides,2004:131), their governance has witnessed significant transformations, with major differences characterising the governance of electricity supply in Northern cities compared to Southern ones.

In its early days, electricity in Western countries was supplied through local utilities where the power is produced and consumed locally; policies guiding the interconnection of these local units, that later became the “national grids” (Kessides,2004:131), took place in the United Kingdom and France only in the 1930s. Technically speaking, centralized electricity grid is divided into three main stages as shown in fig.2. Firstly, electricity “generation”, where primary energy sources such as coal, natural gas and hydropower are converted into electricity. “Transmission” comes second, as transformers step up the generated electricity to High Voltage (HV) levels to be sent via transmission lines from production to consumption centres. The final stage is “Distribution”; where transformers step down the HV electricity in the distribution sub-stations to Medium Voltage (MV) and Low Voltage (LV) levels, the latter is what is injected into end users’ systems (Kaplan, 2009:2).

Up to the 1980s most national grids were managed in what is known as “vertical integration” where states or local municipalities monopolistically own and operate the three stages of power supply (Kessides,2004:128). Motivated by an abundance of available generation capacity, opening of electricity markets in Europe and North America for competition was actively pursued after the 1970s. While specificities of transmission and distribution networks made them into “natural monopoly” (ibid:133). In Europe, the “unbundling” of the national grid was gradually adopted, before a total liberalization framework was passed by the European Union in 1998 (Kessides,2004:131).

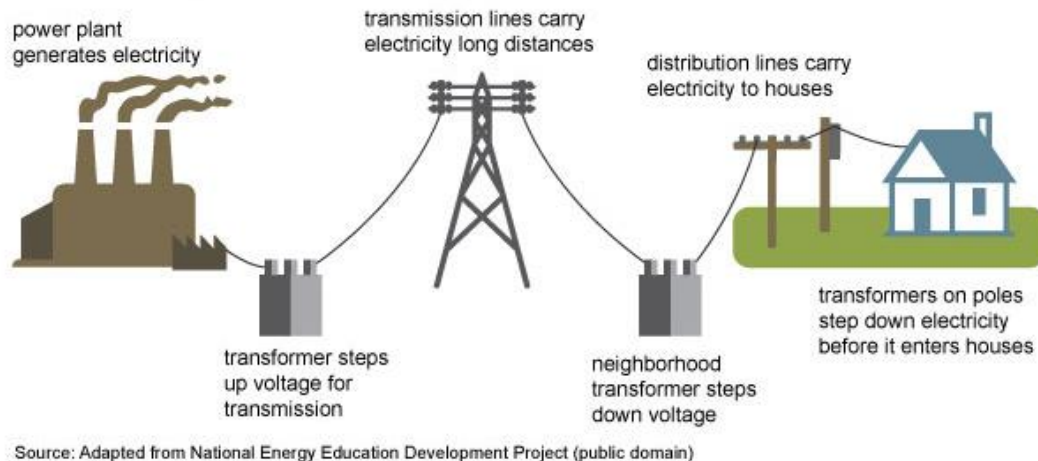


Figure 2.2. Electricity grid configuration

(Source: U.S. Energy Information Administration EIA

<https://www.eia.gov/energyexplained/electricity/delivery-to-consumers.php>)

State monopoly was the mode according to which electrical supply was also managed in colonial cities and continued by the post-independence national states. However, the “poor operating and financial performance” of these national grids has prompted a shift towards unbundling of (Kessides, 2004:135). According to Graham and Marvin (2001:99) the magical recipe of unbundling has been prescribed to developing countries, where sector reforms were mostly pursued either within a highly rigid framework of “structural adjustment” programs that provide funds under conditions such as privatization of public utilities or just as a recommendation that defines countries attractiveness for foreign investors. The stage of economic growth through which many developing countries are currently undergoing is believed to sustain a rapid increase in electricity demand, leaving little options to fill the already existing investment gaps other than through the involvement of the private sector (Kessides, 2004:136).

Nevertheless, these reforms have renewed the heavy reliance on old and new colonial institutions in the last decade. With Africa being the “last frontier of capitalism” (Mbembe, 2016), traditional Western firms as well as emerging Asian ones have been racing to secure new territories. Within the framework of the Sustainable Development Goals (SDG), and to achieve

the targeted 100% electrification rates by 2030, private finance for SSA's electricity sector has increased from an average of US\$6 million in 2006 to US\$3 billion in 2016 (Trotter and Abdullah, 2018: 140). Development aid is now directed to provide cheap finance for private actors from donors' countries, for instance, 90% of the U.S.-led Power Africa, the biggest initiative for the electrification of SSA, is channelled to American government agencies and private investors (ibid).

In Sudan, the National Electricity Corporation (NEC) was fully unbundled in 2010, with the formation of five new companies instead (The World Bank, 2019:13). The World Bank report (ibid:14) qualifies this reform initiative to be of limited success due to the lack of financial autonomy of the newly formed entities and their continuing reliance on centralized decision making by the Ministry of Finance. This reform has also opened the sector for privatization, however, the lack of a clear and robust guiding framework, coupled with the low financial incentives in a highly subsidized market have limited the flow of private investments (ibid:14). Notwithstanding, Lowndes (2009:9) stresses the importance of not looking only to institutional architectures apart from their institutional environment and the involved institutional actors.

The institutional environment in Sudan, just as in many post-colonial contexts, could be read as an instance of what Risse (2012:648) labels as "limited statehood", where state agents mismanage public resources while their roles are fulfilled through alternative actors. Mbembe (2001:43, 50) describes the ways with which the absolute power of the "postcolonial potentate" manifest in the solid networks that link "holders of administrative and political power and international middlemen" with "indigenous merchants, businessmen, money-lenders, and traffickers in smuggling and speculation". Mamdani (1996) argues that such dynamics of state fluidity in Sudan persists from the colonial era where the system of indirect rule has set the scene for a "decentralized despotism". Whereas colonial urban centres are subjected to the modern rule of law and governance principles of the modern nation-state, customary, traditional or religious laws were adopted in the rural or native areas (ibid:26). These differentiated regimes of governing with the steady accumulation of privileges along ethnic lines in particular (ibid:20) have lasting spatial and institutional implications for the postcolonial city. As formal institutions

are designed to cater for those who are officially counted and financially sound to be deemed citizens of the modern nations-state, the multiple divergences from these norms confines their subjects to different institutional realms. Pauntlino et al. (2001:12) demonstrate how IDP areas and informal settlements in Khartoum's peripheries, with their implicit, yet prevalent ethnic demarcations, rely on makeshift arrangements for service delivery which are mostly managed by "Native Administrators" or "Popular Committees".

Such heterogenous arrangements of service delivery, as Cirolia (2020:6) points out, are not to be discarded if sustainable and context-sensitive modes of service delivery are to be achieved. An overview of these alternative configurations and the debates that surround them will be outlined in the next section.

### **2.3.2. Alternative configurations**

Nader (2010:241 cited in Boyer, 2015, 314) finds that policy frameworks guiding energy applications disregard the wide range of potential alternatives, what she explains by the fear that new energy choices can remarkably change the dominant lifestyle. Boyer (2015, 311) points to the prevalent resistance to change that social systems exhibit once optimized for certain energy regimes. This limited change in the configurations of electricity infrastructure also exemplifies what Borrás (2012:409) describes as the lack of balance between benefiting from the "positive network externalities" embedded in the economy of scale and the lock-in into suboptimal technical or economic configurations. Cirolia (2020:6) justifies this reluctance to acknowledge existing and potential alternative modes of service delivery to their characterization as "unmodern" with unpredictable investments risks that both national states and financial institutions struggle "to fit in their plans, projections, and portfolios".

Simone (2011:359) points to this rising consciousness of Southern urban dwellers of their indiscernibility as "subject or citizens" and the improvised ways with which this is surmounted. Using the example of the dramatically growing Kinshasa, he argues how its annual budget will never respond to the growing demands for public services and "personal efforts is almost alone

the vehicle to survival". Lawhon et al. (2018:721-722) also claim that possibilities of universal access to the conventional networked infrastructure in the South is becoming more and more questionable. They argue that a more contextualized approach to infrastructure development is required, where local specificities are taken into account and the conventional dichotomies of formal/informal are abandoned, leaving a space for what they term "Heterogeneous Infrastructure Configurations (HICs)". Furthermore, Jaglin (2014:436) urges for the recognition of this heterogeneity of configurations of service delivery by employing the concept of "socio-technical dispositif". Where a dispositif is constituted of a combination of different "actors, tools, knowledge and values" in a "situated" space and institutional environment (ibid). Simone and Pieterse (2017:49) introduce the concept of the "adaptive city" that promotes the adaptation of technological disruptions especially in low-cost ICTs to the local context in a way that can improve livelihood and redefine power relations.

This acknowledgement of the heterogeneity of urban infrastructure is indispensable for rethinking our Southern cities, for this monolithic approach to urban development is not value neutral. Graham and Marvin (2001:412) argue that modes of representations of urban landscapes with Cartesian mapping and coherent urban spaces fulfil the spatio-temporal needs of the "articulate and powerful groups". The perception of any infrastructural configurations that don't match the modern networked ideal as "backward" is a discourse that has been instrumentalized since the colonial era to exercise power (Yeoh, 1996, 28, cited in Graham and Marvin, 2001:83). Yet, this dichotomy of modern/backward still dominates the imaginary of postcolonial dwellers. An imaginary that De Boeck (2012:325) reflects a glimpse of in his story about the farmers in Kinshasa, who risk being displaced by the construction of a new mega-project, but still found it "beautiful" as it will make theirs a proper modern city.

Amidst this infrastructural fundamentalism, a few new modes of service delivery are emerging, such as co-production as a governance framework and microfinance of social projects. Due to their relevance to the research case studies, these two themes will be briefly treated in the next sections.

## Co-production of service delivery

Co-production is a loosely defined concept and can refer to more than one governance configuration as Sorentino et al. (2018:277) point out. However, the common characteristic of co-produced projects is the involvement of “lay actors” from community members alongside the state actors at one or another phase of the service delivery process (ibid:280). As a governance model for service delivery, Co-production was introduced since the 1960s to promote the involvement of citizens in the supply and management of public services in America (Pestoff et al., 2006:593), yet, it has only made it to development debates in the Southern context in the 1990s (Mitlin and Bartlett, 2018:355).

Several reasons are behind the promotion of co-production as a governance model. Firstly, its potential in reducing the burden on the already meagre state resources in the South (Mitlin and Bartlett, 2018:355), as communities’ social capital could be harnessed at different levels ranging from financial contribution such as through saving groups or contribution of time or labour of community members in the project execution. Secondly, as many authors (ibid:356) argue for co-production as a process where engagement results in contention and eventually subversion of established power dynamics in the specific context through the active engagement of marginalized citizens what can contribute to capacity building, boosting of organizational skills and strengthening of their sense of citizenship and agency. Moreover, opening up participation in service delivery to multiple actors has the potential of coming up with economic innovations in these services (Pestoff et al.,2006:592).

Mitlin and Bartlett (2018:355) explain how promotion of co-production as a governance model is debated in the global South. The reason is that while co-production can be beneficial in improving service delivery in a context of meagre public resources, it can also lead to a situation where states “pass on responsibilities”, further reinforcing neoliberal practices.

## **Micro-finance**

Microfinance, pioneered by the Bengali Grameen Bank in the 1970s, was adopted by the international development institutions since the mid-1990s with a particular focus on the Asian and Latin American poor communities (Roy, 2010: 3,5). Gradually, development funds were directed to the creation of financial markets for the poor through the funding of providers of different financial services such as saving groups and Microfinance Institutions (MFIs). Social capital is the main basis on which the high risk, which is traditionally associated with the poor and limited their access to financial resources, is mitigated in microfinance applications (ibid:66).

In Sudan, according to their website (MFU n.d.), the Microfinance Unit (MFU) at the Central Bank of Sudan (CBoS) was established in 2007. Its core mandate is to establish the country's framework for microfinance as well as to provide financial resources and capacity building to the different stakeholders, in particular to Microfinance Institutions (MFIs). MFIs scope is not only to provide finance for entrepreneurial endeavours, but also to finance community projects of social services such as the notable urban electrification projects (ibid).

Microfinance has been praised as an instrument of “democratization of development” and “democratization of capital” that creates pro-poor markets (Roy, 2010:23). On the other hand, microfinance was perceived as a “depoliticization of development” (Harriss 2001: 2, cited in Roy, 2010:68) in the way it throws the poor into the market dynamics without addressing the political and social roots of poverty.

## **2.4. The lived experience**

### **2.4.1. Functionality of electricity infrastructure: backward households versus “Electric housewifery”**

Energy in its classic definition is the capacity for doing work (Britannica, 2020) and electricity as an energy form is considered “unrivalled for many uses” (Britannica, 2019) given the multiplicity of forms that it can be converted into e.g., movement in fans and motors, heat in stoves, cold in

air conditioners, etc. Kaika and Swyngedouw (2000:125) view science and technology as the means through which humans have been “breaking chains of slavery to nature and to other human beings” in possessing the power to control and redirect natural phenomena. Since their large-scale roll out in the 19<sup>th</sup> century, technological advancements in general and electricity in particular have been “means of dominating nature and a means of defining it” (Kirsch: 1995:535), which was reflected in the ways with which they defined the daily experience of city life.

Space and time, the key dimensions that “bracket human experience” (Kirsch: 1995:532) have been dramatically transformed by new inventions. Schivelbusch (1995, 137-140) explains how the widespread usage of electric lights has eliminated the conventional demarcations between day and night by reducing security risks at night, introducing new entertainment possibilities and allowing greater flexibility with both professional and personal activities. As a wide range of house appliances that were made available in Europe and the U.S., such as washing machines and vacuum cleaners that saved enormous time, “electric housewifery” (Pursell, 1999:6) emerged as pathway to “a more comfortable, more modern” domestic life (ibid:56). Access to these electric appliances was not only a result of electrification, but also a driving force that justified for many households, rural ones in particular, opting for grid connection whose benefits were not completely clear in its early days (Collaborative Research Group on Gender and Energy (CRGGE), n.d.:33). Moreover, efficient control of temperature extended the range of spatial occupation, with life in desertic cities like those in the Gulf countries being highly dependent on air-conditioning for indoor spaces (Al-Asad, 2008:27). It is in this “manipulation of space as well as time”, Denis (n.d.) argues, that “technological, political and socio-cultural changes” were manifested.

In the Southern context, the heterogenous configurations (Lawhon et al. 2018:722) with which the urban population access technology and infrastructure engender a different urban experience. If technology has become the “organizational principle to everyday life” as Kirsch (1995:541) argues, then everyday life of Southern urban dwellers is organized and experienced in ways as multiple as the modes with which they access urban technologies. When cooking time

for an off-grid household is double or even triple than that of its grid-connected counterpart, then these are two different relations to time in the same city. Or when moving between two points in the city using a private car compared to queueing for unscheduled public transport, then these are two different relations to urban space. The “synchronisation of activities” (Parker,2004:14) that pocket watch technologies made possible in a context of scheduled and predictable services in Northern cities couldn’t be replicated within the Southern context where “access to services hinges on one’s prognostication skills” (Trovalla & Trovalla, 2015:332). Such a state of generalized unpredictability in which the majority lives (Simone, 2004:409) gives birth to a multitude of practices to maintain a certain quotidian rhythm. This can range from the resourceful devising of makeshift modes to service delivery (Lawhon et al. 2018:722), to the complex and highly contingent social networks that engenders some sense of regularity that Simone (2004:407-408) eloquently expresses in “people as infrastructure”. Otherworldly solicitations are also on the rise; in Khartoum, a total resignation to religious fatalism is unmistakable (Simone, 1994, 124) where time-space coordinates are within God’s domain.

However, the recognized time-space remains that of the “articulate and powerful groups”, as Graham and Marvin (2001:412) put it, for their spatio-temporal needs are what define the modes of representations of urban landscapes. The lived experience of the representational dimensions of electricity infrastructure is the topic of the next section.

#### **2.4.2. Associational experience: representation of electricity: the modern and the backward**

Swyngedouw (1996:9) claims that the socio-natural processes of city production are themselves framed in a “representational discourse” that dictates the particular fashion in which these same processes of nature/city production take shape. For long time, urbanization was the force to which all “economic and political modernization” was attributed (Parker, 2004:13). Kirsch (1995:540) argues that “revolutionary technologies” such as electricity presented an important link in “the modernization of progressive society”, while Von Schnitzler (2009:9) describes infrastructures as “central to the constitution of modernity”. Such an association of

infrastructure with modernity, progress or a better world was translated, according to Kaika and Swyngedouw (2000:130), into a sort of fetishization of these technical objects in their early days, turning them into “objects of desire” irrespective of their functional utility.

Infrastructural objects are not neutral functional objects, rather, they have been organizing “socialities, subjectivities, and affective capacities” (Von Schnitzler, 2009:9). For instance, Pursell (1999, 13) states that electrification in the 20<sup>th</sup> century U.K. was perceived not only as a manifestation of progress but as its driving force, where “modern electric homes” were praised for their “beauty, utility and ease of operation” (ibid:10). This “domestication of modernity” (ibid:3) and the gradual normalization of electricity have shifted the lens from its iconic symbolism of progress to a “necessity for decent homes” (ibid:65). Such new codes of decency and social norms have come to redefine social life and its class and gender relations; Kaika and Swyngedouw (2000:126) detail how domestic supply of piped water created a stark distinction between the “sanitized and deodorized urban bodies” and the “smelly peasants and sweaty proletariat”. Postcolonial cities have subscribed on their turn to some of these norms; Ross (2005:643) points to the strong association that was made in a Capetonian informal settlement between decency, “proper urban and modern living” and ownership of electric appliances.

These new social codes were just a small part of a wider processes of “social engineering” that have been accompanying both “modernization and developmentalism” as Mbembe (2001:7) posits. Modern citizenship entailed a set of expectations on the side of the citizen as well as on the side of the state. One’s relationship to the state was defined by a number of “assumptions about the kinds of behaviours, dispositions, habits and virtue” (Burchell, 1995:449, cited in Von Schnitzler, 2009: 19). While expectations from the postcolonial states to drive their nations into the age of progress and modernity found its best expression in big infrastructural projects that were both “tools and symbols of modernizing state projects” (Von Schnitzler, 20016:16).

The idea that connection to a network is both “an icon and expression of progress” (Kaika and Swyngedouw, 2000:125) was best exemplified by the Sudanese Merwe hydroelectric dam. Mahmoud and Verhoeven (2016:183) in their distinction between nation building and State building, explain how the construction of Merwe dam has served the crisis-ridden Sudanese

regime in consolidating both. On the one hand, the Islamist regime’s early socio-economic agenda embodied in Al-Mashro’ Al-Hadari or “the civilising mission” (Simone, 1994:144) in which “scientific expertise and personal piety elevates the people to a higher level of civilisation and a new moral order” (Mahmoud and Verhoeven, 2016:197) was rekindled by petrodollars-financed mega projects which were expected to function as a basis for a shared national identity as well. On the other, state power was reaffirmed through the propaganda machine that accompanied the project, reinforcing the regime’s “militarist identity” by depicting the electrifying, read illuminating, project as “a conflict between light and darkness” (ibid:195). The ‘light’ of the Islamic developmentalist state was pitted against the ‘darkness’ of Darfuri rebel groups who were portrayed to be targeting the dam body and the nation it represents (ibid:196). Ironically, the solidity of such a nationalist narrative was not questioned by the heavy involvement of international stakeholders in the project finance and construction detailed by Requejo-Castro et al. (2018:12).



Figure 2.3. Cover of Sad Merwe (Merwe Dam) magazine

The Right-hand side photo shows the ousted president Omar Al Bashir with the caption quoting his phrase at the inauguration of Al Roseirs dam project heightening saying: “Today we can proclaim our independence” (Source: Mahmoud and Verhoeven 2016).

National celebrations of the iconic dimension of infrastructure in Sudan as in many postcolonial states were not enough to mask the actual failure of the postcolonial states to actually ameliorate the lives of its population. Such a fragmented mode of nation-state building has been manifesting in the multiplication of alternative routes pursued by postcolonial subjects towards their material reproduction mentioned earlier and their corollary set of relations. The lived experience of these varying modes of access to services and the relational dimensions they engender are the topic of the next section.

#### **2.4.3. The relational experience of accessing urban infrastructure:**

As Kirsch (1995:532) posits that social relations shape and are shaped by technology, thus, the mode with which certain services are accessed defines the set of relations that one has with both official and nonofficial service providers and the subjectivities they give rise to. Von Schnitzler (20016:9) characterizes infrastructure as a location of “affective and embodied forms of political subjectivity” or what is known as techno-politics. She (ibid:10) summarizes the concept of techno-politics elaborated by different scholars as the ways with which political actions are “embedded within technical forms” and the ways technical forms shape the “political question” (ibid:10).

“Equality and freedom” were the promise of Western modernity as the definite outcome of the continuous and rational amelioration of the urban reality (Kaika and Swyngedouw, 2000:129). However, Selmeczi (2009:8) argues that such a discourse of a better life is only possible through a totalizing logic that claims to grasp the social reality in its entirety, and towards which a whole set of disciplines and professions was necessary, such as statistics and economics, creating the age of what philosopher Michel Foucault calls “biopower”. Kaika and Swyngedouw’s (2000:129) description of how engineers in their mastering of water networks were perceived as equally capable of intervening in issues of epidemics and sanitation as medical officers, point to this logic of governing bodies and their biological processes through technical networks. Graham (2010:1) describes how urban systems of water, sewerage and waste management are linking human

metabolism with the “broader metabolic processes” deployed in the name of maintaining the public health.

Thus, and as Selmeczi (2009:4) describes how certain phenomenon can be naturalized through the refocusing of the political on the biological, naturalization of current configurations of networked infrastructure could be explained. Electricity, and energy infrastructure in general, as vehicles of power have been usefully addressed by Boyer (2014) in the concept of “energopower”. Boyer (2014:325) proposes the concept of “energopower” to convey the historical specificity where modern political power has been finding an expression in the “twin analytics of electricity and fuel” as ubiquitous “modalities of biopower” (ibid:309). He (ibid:323) argues that concepts of energopower and energopolitics attempt to express the “increasing recognition that conditions of life today are increasingly and unstably intertwined with particular infrastructures, magnitudes, and habits of using electricity”. With electricity’s grid-based and centralized nature serving to consolidate this power (ibid:328). In his view (ibid: 327), energopower is an enabler of biopower, either in the way with which it provides material basis for “biopolitical edifices” such as in construction and operation of hospitals and schools, or through providing institutional basis for “biopolitical missions” such as development initiatives.

Denis (n.d.) argues that manifestations of modernity “had different implications for different groups”. Such promises of equality were not on the agenda for Southern cities since their inception. Balbo (1993:29) explains that the colonial dualist approach to urban governance that distinguished between the elite and the rest of the population, was ascribing the status of “citizenship” to a selected minority of urban dwellers. Different contexts required different colonial apparatuses for such a bifurcated mode of governance. Mamdani (1996:18, 48) details how the distinction between “citizen and subject” was rooted in colonial rule, with the British system of direct/indirect rule in Sudan bestowing civil and citizenry rights to the directly ruled urban elite. This official recognition endows its subjects with various privileges; for instance, the articulation of formal policies of service delivery to match the profiles of these users, such as the requirements for Khartoum public housing applications that presume formal and statistically

surveyed individuals or a certain degree of institutional literacy to navigate the labyrinthian application procedures (Boabt Al Egtisad Al Sudani, n.d.).

The relative autonomy that those living off the radar of the formal statistical and biopolitical apparatuses enjoy does not only mean their deprivation of basic citizenship rights but could also result in their subjection to different and less structured forms of power. The “decentralized despotism” mentioned earlier (Mamdani, 1996:26) that characterized the British indirect rule in rural Sudan could be traced today in a myriad of spaces and forms in Khartoum, the historical site of modern civil power itself. The demographic explosion of the city has brought an amalgam of rural population that was historically excluded from the urban civility and subjected it to a mix of old and new, formal and informal modes of “decentralized despotism”. “Native administrations”, maintaining the same colonial designation and its characteristic logic of “lack of clarity over functions and budgets” (Pauntlino et al., 2011:12-13) have followed IDPs and economic migrants to the city and served to fill the official administrative void in some of Khartoum’s peripheries. Other marginalized areas were left in the hands of “Popular committees” the smallest formal administrative units which were extending the interests of the Islamist regime in both surveillance and allocation of privileges to its grassroots affiliates (Choplin, 2006:31). Though the role of NGOs has been relatively marginal in Sudan due to the decades-long American sanctions that excluded the country from the map of international aid (BBC News, 2018), some of them managed to establish a strong foothold, those religious-based in particular. Simone (1994:110) highlights the way with which the regime-sponsored Islamic organizations were disseminating their Islamization agenda through the provision of administrative and basic services in Khartoum’s informal areas.

The private sector is another player in this heterogeneous relations of service delivery in postcolonial cities. In addition to the rapid privatization of conventional urban infrastructure, new and innovative modes of energy supply in Sub-Saharan Africa have been largely led by private players such as the introduction of solar home systems and micro-grids in West Africa (McKibben, 2017:1). Moreover, public and donor finance earmarked for social development for

the poor such as electrification projects have been increasingly channelled through private microfinance institutions (MFIs) in Sudan (MFU n.d.).

This privatization and “depoliticization of development” (Roy, 2010:68) is not only increasing the vulnerability of the already vulnerable by throwing them into the arms of the free market and its “predatory trade in debt” (Roy:2012:106), but also “the shift to a market economy required the suspension of individuals’ roles in politics and as citizens” as Mbembe (2001:74) argues.

To complement this entangled web of service delivery relational experiences, Simone’s (2004:407) notion of “people as infrastructure” hints to both a mode of service delivery and its relational implications, which he (ibid:408) describes as a “social infrastructure” in which transactions between city residents are characterized by a multitude of “reciprocal efforts” which “are radically open, flexible, and provisional”. In the same vein, Mbembe (2001:54) points to the importance of such social relations in demonstrating how the civil rights of “what passed for citizenship” in the postcolony are fulfilled by “the family, the lineage, the kin, and perhaps the religious brotherhood”.

Though this state of “fragmented identities” experienced by the postcolonial subjects can engender what Mbembe (2001:111) qualifies as “disempowerment for both ruled and rulers”, access to technology can also serve as a medium for channelling social agencies and contestations (Krisch, 1994:535). The politics of urban infrastructure is more visible in the case of the nascent democracy in South Africa, where the equal right to live in the city didn’t imply equal rights to access its infrastructure. Von Schnitzler (2016:24) states that many social movements and community groups in South Africa have been mobilizing around issues of service delivery and basic infrastructure since the end of the 1990s. Accounts of one of these movements, Abahlali baseMjondolo, analysed by Selmeczi (2014), show how the movement expresses its political literacy by articulating clear demands for both hard and soft infrastructure in the city such as water, electricity, housing and education (Selmeczi, 2014:242). Local experiences of these movements have also served to create “transnational networks of solidarity” between the urban poor, such as Slum Dwellers International which have contributed significantly to the

channelling of financial resources and dissemination of alternative practices around delivery of urban services (Silver and Marvin, 2017: 856).

## **Chapter 3 - The empirical context**

Greater Khartoum is the tripartite capital of Sudan, made of three cities divided by the two Niles; Khartoum City, Omdurman and Khartoum North (Bahry) (Abu Salim, 1979:6). Khartoum city is the most important one as it houses the main governmental and commercial centres, including the presidential palace that dates back to the Turko-Egyptian occupation (1821-1885). Khartoum has always been the most important city in modern Sudan whose administrative and social history have a considerable effect on its current modes of development. The following sections will be highlighting key historical and demographic patterns since the establishment of Khartoum up to this day.

### **3.1. Khartoum history**

#### **3.1.1. Turko-Egyptian Khartoum: 1821-1885**

Except for its central location at the confluence of the three rivers; the Blue, the White and the main Nile, Khartoum's low and flood-prone topography (Seid Ahmad, 2000: 298) didn't seem to be particularly attractive for the local populations. Before the Turko-Egyptian occupiers moved their base to Khartoum city in 1830 (Abu Salim, 1979: 26), few settlements were found around the area and dates back to the 16<sup>th</sup> century (ibid:12). The occupation government has worked hard to develop Khartoum into a modern city. Despite the fact that the city establishment did not follow a master plan, the government has set regulations for streets and buildings layouts and encouraged the residents to use construction materials of higher quality (Abu Sali , 1979: 57). Initially, the city lacked the facilities for producing advanced construction materials and relied on the ruins of the old Christian kingdom in Soba to the South of the city (Seid Ahma , 2000: 107).

Providing gold and strong men for the Egyptian empire being the main aim for invading Sudan, Khartoum was pivotal in enabling this mission (Seid Ahmad, 2000: 298). Its position as the centre through which the country's resources could be channelled to Egypt first, has defined the logic of its development (ibid:180). In addition to the occupying powers, the government was particularly

welcoming of European traders and explorers, especially during the heydays of the slave and ivory trade from South Sudan (ibid: 196).

Khartoum's status as the country's capital was interrupted for just over a decade after the victory of the Sudanese revolution (Mahadist movement) that regained the country in 1885 (Seid Ahmad, 2000: 440). During that period, the capital was moved across the White Nile to Omdurman before it returned again to Khartoum by the Anglo-Egyptian occupiers (ibid).



Figure 3.1. The confluence of the two Niles

(Source: Aramco World Magazine April 2018)

### 3.1.2. Anglo-Egyptian Khartoum: 1898-1956

After the Anglo-Egyptian army defeated the Mahadists in 1899, the re-establishment of Khartoum was amongst the first missions to be undertaken (Abu Salim, 1979: 133). For the British, rebuilding Khartoum has a significant symbolic value, as this was where the Mahadist

beheaded General Gorodn, the popular British General who was sent to save the Turko-Egyptian reign over the country (Seid Ahmad, 2000: 409). The failure of the British government to save one of its colonial heroes stirred great anger back home and made the reestablishment of Khartoum a patriotic mission.

Lord Kitchener, the highest army commander leading the occupying army, being himself a survey engineer, guided the drafting of the first plan of the colonial capital according to Abu Salim (1979: 135). Having the threat of the Mahadist in the back of his mind, Kitchener's plan was designed mainly to serve defence purposes rather than civilian or circulation ones (Lavergne, 1999:153). But as Hamid and Bahreldin, (2014:41) explain, this was shortly updated by the more extended plan of McLean in 1910. Though the old presidential palace and a few locations from the Turko-Egyptian occupation were preserved, the aim was to build a European-style modern city (Abu Salim, 1979: 135).

The core city was to house the government buildings, the residential units of the British, Egyptian, the diverse European and middle Eastern communities as well as the emerging Sudanese elite (Abu Salim, 1979: 136-141). Furthermore, the plan contained dedicated commercial and industrial areas, as well as new, old and relocated native settlements in the peripheries (ibid). Hamid and Bahreldin (2014:42) point to the fact that the colonial plan was only covering Khartoum city with no consideration for the native areas in Omdurman and Khartoum North across the White and the Blue Nile respectively. Once the ruins of the old city were managed and the land disputes linked to the old inhabitants were resolved, the city development proceeded rapidly (Abu Salim, 1979: 139). By 1904 paved roads were linking parts of the city, electricity supply was introduced in 1907, the Khartoum-Khartoum North bridge opened in 1909 and the Khartoum-Omdurman bridge in 1928 (ibid:140,151,190).

After Sudan's independence in 1956, Khartoum retained its position as the country's capital and the post-colonial city has been managed by the new ruling elite according more or less to the same spatial and administrative logics since.

### 3.1.3. Contemporary Khartoum

#### Administrative and economic dynamics

Despite the popular uprising that led to the termination of the 30-year Islamist reign over the country in 2019 and mandated a transitional government up to 2022, governance and administrative structures of the country and its capital remain largely untouched. Sudan's federal system divides the country into eighteen states, with Greater Khartoum serving as the capital, with a population of more than seven million inhabitants (Central Bureau of Statistics 2018, cited in Steel et al. 2019:2) and a population that almost doubles every ten years (Denis, 2005:4). The tripartite city is further divided into seven main administrative units known as localities (South Sudan Centre for Census, Statistics and Evaluation, 2009). The ex-regime's "Popular Committees" used to be the smallest administrative units on a neighbourhood level and has mainly served political and intelligence ends (Choplin, 2006:31). These are now replaced by the nascent "Committees of Services and Change" born from the "Resistance Committees", the organizations behind the victory of the 2018-19 uprising (Interview-Eastern Nile locality Centre for Information, March 2021).

According to Hamid and Bahreldin (2014:43-47), after the McLean Plan 1910, four master plans were prepared to account for the city expansion; the Greek Doxiadis 1958, the Italian MEFIT 1974, Doxiadis and Abdelmoneim Mustafa 1991 and the ongoing MEFIT and CENTECS Khartoum Regional Development Plan (KPP5) 2008-2033. While the post-independence plans differed in scope, advantages and disadvantages, they all failed to materialize mainly due to financial constraints, lack of political will or implementation capacity (ibid). Informal patterns of development have also resulted in the growth of unplanned areas or led to the reformulation of formal plans. For instance, the Doxiadis 1958 green belt area to the south of Khartoum city that was supposed to protect the city from its famous sandstorms and curb desertification, has been gradually occupied by informal settlers and was later formalized (ibid:43).

The city sprawling along both formal and informal routes is the development pattern that started since the 1970s and continues today, with remote, poorly serviced and marginalized

neighbourhoods multiplying (Lavergne, 1999:154). Responses to informality have varied over the decades between eviction, relocation or incorporation, but the ex-regime’s response in the 1990s was amongst the most violent and long-lasting discriminatory policies which stirred local and international fury (ibid:156). Hundreds of thousands of relocated IDPs, mainly from South Sudan and the Nuba mountains have died in the deserts and hardy accessible areas in Omdurman (ibid). City sprawling is accelerated also by the successive horizontal public housing schemes (Hamid and Elhassan, 2014:186) and upper market projects that were promoting – with limited success – a “peri-urban” mode of development (Steel et al. 2019:8).

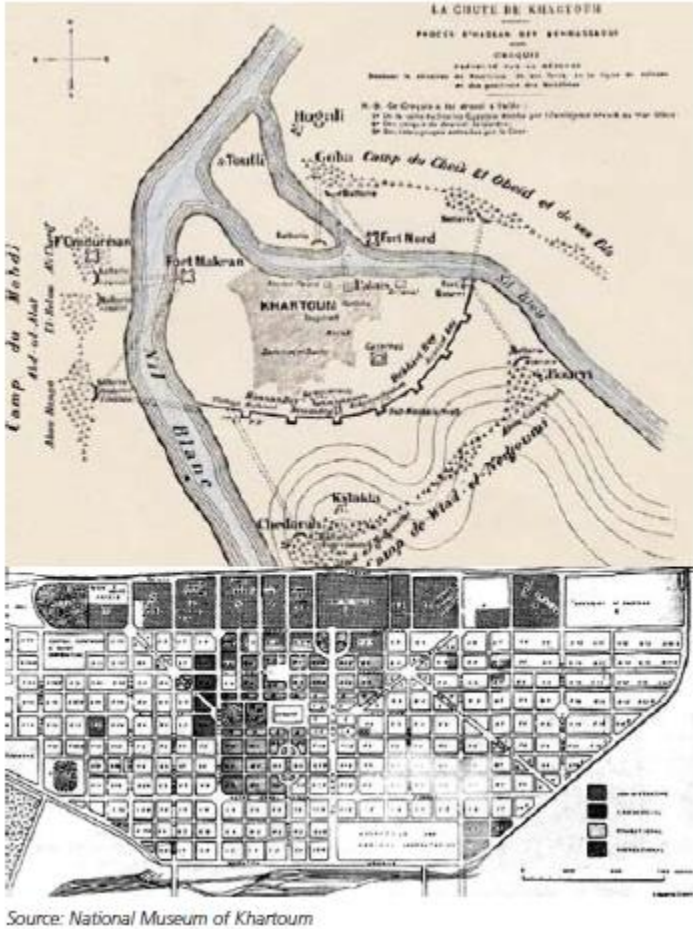


Figure 3.2. The McLean Plan of 1910

(Source: UN-Habitat 2009)

Khartoum neighbourhoods have inherited the British system that was categorizing the city into four zones; first, second, third and fourth class areas as Osman (2017:8) explains. With the first class category being reserved for the most affluent areas, implying higher building standards as well as services tariffs. Osman (ibid) argues that this class-based categorization has been serving as the basis for social segregation and the stigmatization of certain neighbourhoods or construction methods.

Denis (2005:4) details how Khartoum has historically been and remains the most important city in Sudan that controls political and economic power and concentrates most of the country's infrastructure, services and skills. The economic boom that has followed oil production in Sudan after 2000 was translated into rapid development in both public infrastructures e.g. roads and bridges, as well as real estate (Choplin and Frank, 2010:194). Yet as Pantuliano et al. (2011:3) explain, this has never really trickled down to the most disadvantaged segments of the city. Moreover, this transformation of the cityscape was more driven by market forces and developers than being an outcome of clearly defined urban planning (Hassan et al., 2017b:146). With the secession of South Sudan in 2011, the North was deprived of 75% of its oil revenues and the overall economic situation has dramatically worsened, brain-draining the country and its hub of professionals and driving more economic migrants to the capital (ibid).

### **Demographics and population Dynamics:**

This relatively lengthy discussion of the historical and current social dynamics is paramount in understanding contemporary urban Khartoum. The etymology of the name of Khartoum itself is a reminder of the controversy of the city's identity. The word "Khartoum" in Arabic means the elephant trunk and a popular interpretation is that the confluence of the two Niles resembles that trunk, hence the name. Another version to which historians ascribe more credibility is the Dinka (Southern Nilotic tribes) origins of the word where "Khartoum" means the confluence of water bodies (Seid Ahmad, 2000: 87).

Sudan, a country of around 582 ethnic groups and 110 languages (Hale, 2009:1), with several groups classified as indigenous to the area, who were gradually joined by migrants from different parts of the region. This population diversity has been transposed into the city's spatial order, but as Lavergne (1999:163) puts it, "Khartoum has always been an agglomeration of very different worlds that live in proximity but never mix"<sup>1</sup>.

The first line along which Sudan demographic history could be understood is across the North-South division. With the desertic Northern parts along the main Nile River used to be home to the Nubian civilisations that flourished more than three thousand years before the Christian era and up to the fall of Soba in 1504, and who adopted both paganism and Orthodox Christianity (Seid Ahmad, 2000: 13-27). A crucial moment in demographic trends in these areas was the signing of the "Bagt" agreement in the seventh century with the conquering Muslims that triggered a gradual Arabisation of the Northern regions of the country. With some scholars argue that this Arabisation process was due to a massive Arab migration into the Northern and Eastern parts of Sudan through the borders with Muslim Egypt and across the Red Sea from the Arabic peninsula (ibid). Whereas more recent studies are claiming that this Arab influence was mainly cultural, as Islam and Arabic language have spread over the years with religious men (Sheikhs) (W ma khofay Aazam, 2017). But what is well documented is that these Sheikhs have gained a favourable position by the eighteenth century, and established the new social order where lineage certificates were issued confirming tribal decent from the prophet Muhammad, re-ordered tribal hierarchies and the dominant cultural norms up to this day according to Spaulding (2010 :185-222).

Southern Sudan on the other hand (an independent country since 2011), with its tropical and dense forests, the unnavigable White Nile swamps, African lineages and pagan traditions, has remained with little contact with the outside world for long time (Niblock, 1987:149). Except for the expeditions which were intensifying over the centuries hunting after slaves in particular,

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<sup>1</sup> "Original in French : Khartoum a toujours été une agglomération ou des mondes très différents se côtoyaient sans se mélanger" (the author's translation).

ivory and other tropical resources, and in which Northerners played the mediators' role channelling these goods into international and local markets. This historical pattern between enslaved communities and slave traders coupled with the Christianisation of the South under the British, served as basis for decades-long "racial antagonism" (ibid) that has paved the way to the division of the country in 2011. The amassed social and economic power of the North didn't lack pretexts to justify its domination even after slavery abolition exemplified in the recent religious fanaticism of the Islamic government (Lavergne, 1999:162). Between these two ends of the spectrum of an Arabized North and an African South, lie a myriad of populations, particularly in the intermediate regions in Western and South-Eastern Sudan.

When the Turko-Egyptian government took Khartoum as their capital, it was mainly inhabited by Northern communities, in particular by the Mahas of Northern Sudan who first settled around the Blue Nile. Most of these settlements were growing around Sufi Sheikhs (religious men in Islamic tradition) who used to teach, preach and famous for having spiritual powers (Seid Ahmad, 2000: 409). This historical precedence of Northerners in the area accelerated their integration into the modern city during the two foreign occupations (Abu Salim, 1979: 193). Lavergne (1999:152) argues that the existing social networks of Northerners have further encouraged their migration to the post-independence city and made them reap the early comers' benefits.

Denis (2005:17) describes the massive migration to the capital following the intensification of civil war in South Sudan and the drought in Western Sudan during the 1980s, particularly towards its peripheral areas such as Eastern Nile locality. This pattern has intensified after the eruption of war in Darfur in western Sudan in 2003 and the civil war in the newly independent South Sudan in 2013 (ref). In addition to these migrations, Sudan is host to more than one million refugees according to UN-Habitat (2020:5), who come from neighbouring countries such as Eritrea, Ethiopia and Tchad, many of whom end up in the fringes of the capital (Choplin, 2006: 89). This, combined with the continuous economic in-migration from other regions, such as that of peasants who lost their sources of livelihood due to the rapid mechanization of agriculture

(Lavergne, 1999:155) has made Khartoum – especially its peripheral areas – into one of the densest cities in the region in terms of inhabitants per built-up area (Denis, 2005:9,10).

Moreover, settling in the city in general has a strong ethnic dimension to it, as newcomers rely on relatives as entry point to the city (Pantuliano et al., 2011:3). This ethnically defined entry to the city, takes the form of a domination by Northern Sudanese on landownership and occupation of strategic locations in the city as Denis (2005:24) explains. At the same time, IDPs from war-torn South and Western Sudan are concentrated in areas designated for IDPs or other unofficial forms of occupation at the peripheries of the city, with the study area being one of these unofficial IDPs areas according to Pantuliano et al. (2011:3).

### **3.2. Electricity supply in Khartoum**

The Sudanese capital is not different from many postcolonial cities when it comes to its infrastructure in general and electricity supply in particular. Only around 32% of the Sudanese population have access to electricity supplied by two interconnected national grids (Choplin and Frank, 2005:193), with frequent supply interruption within the grid-connected areas (Berry, 2015:193). A significant outcome of the oil revenues was the construction of Merwe hydroelectric dam in 2009 that almost doubled the country's installed capacity to the current 3.5 GW (ibid). This controversial project, in its displacement of whole communities, was an emblematic example of the usage of infrastructural projects for ideological ends in the way it was used by the Islamic government at the time to reinforce its power (Verhoeven, 2015:9).

Choplin and Frank (2005:193) point to the clear focus on supplying Khartoum when it comes to electricity, and which is quite visible on the map of the transmission network below (Fig.1) with the disproportional MV lines (distribution lines) around the Northern parts of the Nile basin in general and Greater Khartoum in particular. The sector guiding framework (Ministry of Water Resources and Electricity, 2012:29) points to the fact that two third of the electricity generated is consumed in Khartoum.

Demand has been growing considerably over the past ten years at an average rate of 12% per year (The World Bank, 2019:16), mainly due to the increased consumption per capita and the rapid demographic growth to a lesser extent. The latter has also been offsetting the marginal increase in supply. In addition to the huge gap in financial resources that the sector suffers, governance has played an unmistakable role in steering it. The next sections will briefly explain the larger framework governing the electricity supply, before zooming into the distribution process and the major aspects that shape its operation.

### **3.2.1. Institutional framework**

Governance of electricity supply has undergone major shifts since the early 2000s. As it was the case in most countries around the world, privatization and unbundling were systematically prescribed for handling issues of inefficiencies since the 1990s according to the World Bank (Kessides,2004:35). Normally, unbundling has the objective of separating the historically vertically integrated state monopoly over the three main components of electricity supply; production (generation facilities), transmission from production sites to consumption sites, and distribution to end consumers (ibid:36).

The unbundling of the National Electricity Corporation (NEC) was fully implemented in 2010, with the formation of five new companies instead; two for generation both thermal and hydroelectric, one for transmission, one for distribution and a dedicated one for Merwe dam which was dissolved later. These companies are all managed by the Sudanese Electricity Holding Company (SEHC) and they were all under the Ministry of Water Resources, Irrigation and Electricity (MoWRIE). Recently, the sector's responsibility was transferred to the Ministry of Energy and Mining by the new transitional government in 2019.

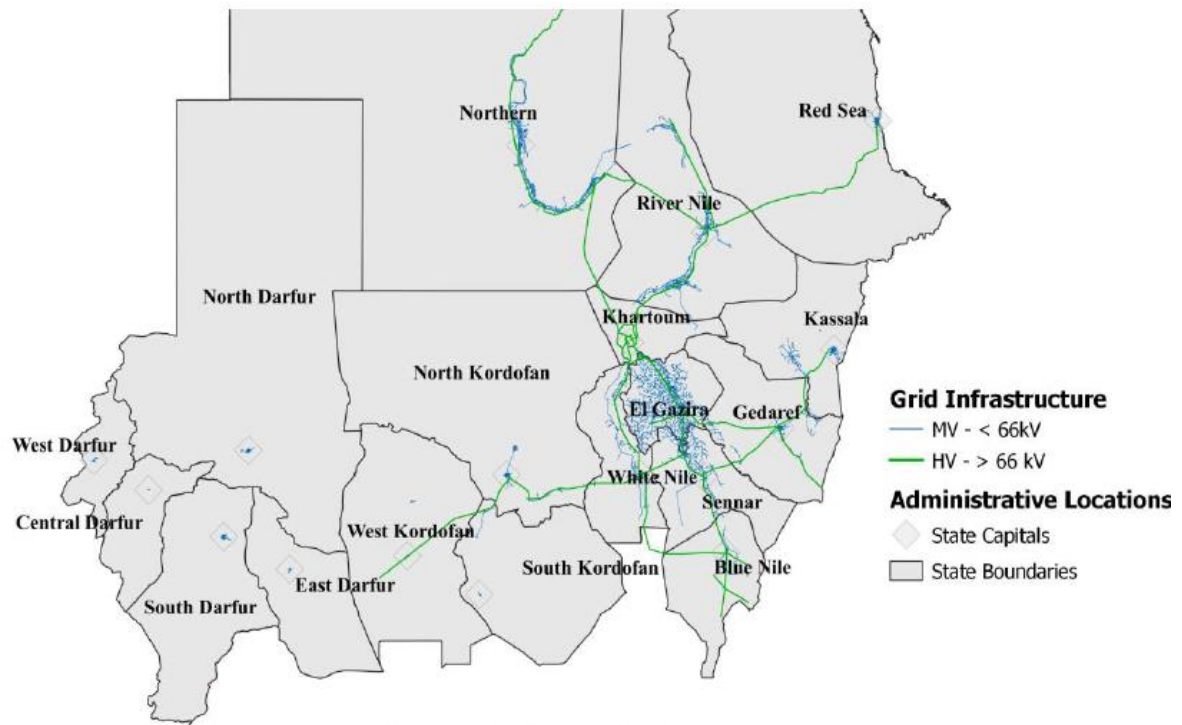


Figure 3.3. High-voltage and Medium-voltage Network in Sudan

(Source: World Bank report 2019)

The overall deterioration of the Sudanese economy after the secession of South Sudan in 2011 (OECD,2012:2) had a remarkable impact on all key sectors. In an interview with Yosif, a telecommunication engineer at the Sudanese Electricity Distribution Company (SEDC) (SEDC office, August 2020), he explains that the additional capacity from Merwe dam has significantly stabilized the power supply after 2009 and eliminated the need for the usual 7-8 hours of load shedding, particularly in the capital. But load shedding has resumed after 2015 with the increasing demand not being matched by additional supply or adequate system maintenance. Yosif claims that in addition to the lack of finance, the unbundling of the NEC has actually worsened the sector performance.

The expected increase in management efficiency associated with unbundling was hindered by the lack of financial autonomy of these different companies according to a report by the World

Bank, (2019:14). The report explains how annual budgets are determined by the Ministry of Finance and Economic Planning (MoFEP), while planning and investment decisions are taken by MoWRIE and SEHC with significant overlaps. Therefore, the sector has fallen prey to “a dilution of responsibility and accountability, unpredictability of decisions, and a decreased level of commitment in technical departments” (ibid). Yosif also points to the systematic empowerment of the old regime affiliates in the sector, especially those involved with the Merwe dam, on the expense of those who are more professionally qualified and the resulting internal disputes. Before the unbundling, NEC, just like any other vital institution in the country, was also directed by the regime affiliates but with the centralized decision making playing out differently.

Awad Makawi, who was heading NEC for more than a decade, has worked hard towards establishing a solid entity, and he was known for conducting major reforms in the sector. He was supported by generous budgets of the oil era that Y explains saying:

*Y: Until 2010 and 2011, just before the secession of South Sudan things were different. When we joined in 2012, they were telling us stories about how well they were paid, even technicians were able to build their own houses, buy cars and live in great conditions. At that time the exchange rate against the dollar was good, one dollar was for two SDGs, so their salaries in US Dollars were almost two thousand dollars. They would earn this money sometimes five or six times a month, because there were bonuses for everything.*

*R: yeah, I remember at that time appointments were highly competitive.*

*Y: yes, it was something we planned for, we wanted to get ready for their recruitment exams. Everyone was doing very well there; they were even sent to trainings and higher studies in Europe. But the bad thing that happened after the unbundling is that they lost all those people on whom the corporation has invested. They offered a poorly thought early retirement plan that highly qualified employees have opted for.*

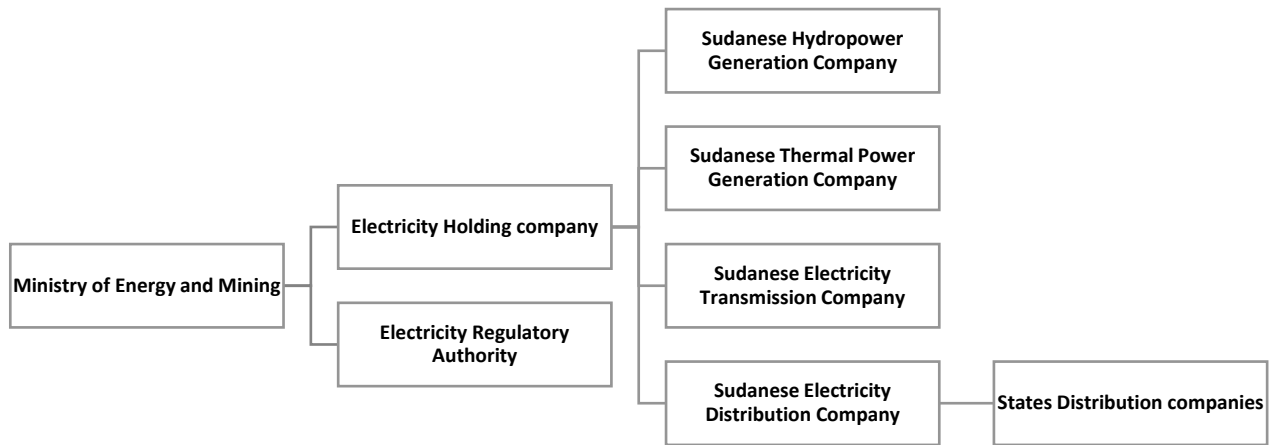


Figure 3.4. The institutional framework for the electricity sector in Sudan

(Information source: SEDC interviews. Graph: the author).

Opening the sector for private investors is one of the key justifications given to unbundling, as it allows greater segmentation that accommodates a heterogeneity of actors and opens the door for competition (Graham and Marvin 2001:141). But the NEC unbundling was carried out in a way that a detailed framework for how to engage with private investors was not in place, and only a generic legal framework that allows their participation in the three core phases of supply exists (The World Bank, 2019:28).

### 3.2.2 The Sudanese Electricity Distribution Company (SEDC)

Electricity on a State level is supplied and managed through the distribution company. The company's main scope is the Medium Voltage (MV) and Low Voltage (LV) substations and their associated electric lines and poles. As well as all the components for customers' connection such as control panels and the pre-paid meters. SEDC also manages the customers' services and deals

directly with them, handling new connection applications, sales of pre-paid electricity (in addition to other private or online outlets) and emergencies.

Electricity companies including SEDC are guided by multiple frameworks; the '2015–2020 Power Sector Development Framework' outlines the sector's priority investments and is based on the more comprehensive framework 'Long and medium term power system plans for 2012–2031' that was prepared in 2012. The framework document sets very ambitious targets for the sector to achieve by 2031, amongst which is the 80% electrification rate target (Ministry of water resources and electricity, 2012:30). However, this framework is of little relevance to the current status of the sector for several reasons. Firstly, future demand projections were higher than the actual trends, and many of the planned assets didn't materialize within the set framework (The World Bank, 2019:15).

### **3.2.3. Billing and tariff regime**

Makawi was the one to introduce the pre-paid metering system at the beginning of the 2000s aiming to reduce electricity demand through users' self-control as he stated (IOL Business Report, 2004). Sudan has the lowest cost per electricity unit (\$/kWh) in Sub-Saharan Africa (The World Bank, 2019:25). While the average tariff nominally increased by 80% between 2015 and 2018, it has actually decreased by 30% over the same period when adjusted for domestic inflation (ibid). The system follows an incremental tariff regime, where the cost per kWh increases with consumption. However, prices across the different segments remain fairly cheap compared to other living costs, hence encouraging wasteful consumption patterns.

Current tariffs<sup>2</sup> are problematic and one of the main reasons for the sector collapse. Yosif explains that these set prices, as shown in Fig. 3.5, were meant to cover the actual electricity cost but the depreciating currency against the US dollars has resulted in such a highly subsidized sector. Today, the sector is unable to cover its own operation costs and it is becoming a burden

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<sup>2</sup> These tariffs were increased in January 2021 which was during the writing of the thesis.

on the ministry of finance. Low tariffs are also hindering the involvement of the private sector desperately needed for finance. Moreover, users with high purchasing power for electric appliances abuse these subsidies while those with lower income brackets rarely exceed the first segment of 200kWh/month. Air-conditioners are the biggest energy consumers, especially in summer when consumption is double of that in winter, as consumers still rely on old and energy consuming technologies. Plans to reform prices for several subsidised items are currently discussed, with an announced increase of 41% for electricity tariff (Al Sudani, 2020).

No.	Sector/Consumption kWh	SDG/kWh (2018)	US\$/kWh (US\$1 = SDG 47.6)
1	<b>Domestic tariff</b>		
	From 1 to 200	0.15	0.003
	From 201 to 400	0.26	0.005
	From 401 to 600	0.32	0.007
	From 601 to 800	0.52	0.011
	From 801 to 1,500	0.85	0.018
	Above 1,500	1.60	0.034
2	<b>Agricultural tariff</b>		
	Up to 50 HP, National and Research and Training Projects	0.16	0.003
	More than 50 HP	1.60	0.034
3	<b>Industrial tariff</b>		
	Medicine industries	0.18	0.004
	Other industries	1.60	0.034
	Cold stores and ice		
	• From 1 to 400	0.34	0.007
• More than 400	0.85	0.018	
4	<b>Commercial tariff</b>		
	From 0 to 200	0.34	0.007
	From 201 to 300	0.85	0.018
	From 301 to 400	1.00	0.021
	More than 400	1.60	0.034
5	<b>Service tariff</b>		
	Water works and holy places	0.33	0.007
6	<b>Schools</b>		
	Government schools	0.33	0.007
	Private student hostels	0.33	0.007
7	<b>Private hospitals and universities</b>	0.75	0.016
8	<b>Government</b>		
	Government departments	0.70	0.016
9	<b>Tourism (hotels)</b>	0.85	0.018
10	<b>Communications companies, embassies, and organizations</b>	1.60	0.034

Figure 3.5. The tariffs structure up to January 2021

(Source: World Bank report 2019)

### 3.2.4. New connections:

For a new user to access the grid, a connection application has to be submitted to the closest SEDC office, along with supporting documents, namely an I.D and the title deed. Based on information provided by the applicant regarding the expected electric demand (maximum load) and a site visit by SEDC teams, connection fees are determined. Clients are expected to pay for all the connection costs. These costs can go as low as to cover connection materials to the pole by the house gate or as high as covering the addition of a new substation and few kilometres of grid extension.

Areas which are not falling within the grid coverage have to follow alternative routes.

*R: What I understood from the medium-long term plan document is that they are keeping in mind the fact of the increase in number of users and their demand and that there are plans to add new distribution and transmission sub-stations, so all that didn't happen?*

*Y: no, it happened, especially the distribution ones as they were linked to elections. When they wanted to recruit people for elections, they would connect the area without proper studies. There are well known stories about areas that were connected without compliance with technical specifications just because one of the politicians said Abu Delig for example should be supplied. Let's say a 33 kV transmission line whose length shouldn't exceed 33 km, they would extend it for 36 km, then users can have 160-170 V (rather than 220V).*

Nevertheless, many areas remain unconnected but different community efforts were carried out. For instance, when a considerable number of people move into an off-grid area, they share the cost and make the full payment. Some of them also resort to micro-finance institutions as will be detailed in the next chapter.

### 3.2.5. Supply chain of connection components

The American sanctions imposed on the country since 1997 that were partially lifted in 2017 (The Washington Post, 2017) had the advantage of limiting the involvement of foreign industries and suppliers in the country and encouraging greater local production and capacity building. Maaz (SEDC Projects and Planning, September 2020) explained the sector's extent of localization. Prepaid meters, small- to medium size transformers, connection wires and poles are all manufactured either by local industries or jointly owned businesses, mostly with Chinese, Turkish or Egyptian partners.

## Chapter 4 - The case studies

The chapter will start by introducing the main study area, Eastern Nile locality before moving to a detailed description of each category providing brief context about the area, the policy framework for electricity supply in place and the lived experiences of these policies.

### 4.1 Eastern Nile locality

The three towns that make up Greater Khartoum are divided into seven localities, with the studied cases being all situated within Eastern Nile (Sharg Al Neil) locality at the eastern side of the Blue Nile. It is one of the most densely populated localities in the city being home for more than one million<sup>3</sup> people. Administratively, Eastern Nile locality is divided into “rural” and “urban” divisions, as it is a transitional zone between rural and urban areas, with some of its rural parts being gradually incorporated into the tissue of the city per the UN-Habitat (2009:20) report. Fig.4.1. shows the sixteen administrative units into which the locality is divided. This map was provided by the head of the Information Centre in the main locality office, however, he emphasized how these sub-divisions have been constantly changing (Interview-Eastern Nile locality Centre for Information, March 2020).

The neighbourhoods making up the locality have completely different, sometimes contrasting histories. In addition to its fertility, Eastern Nile is bordered by four different regions, which have made it into an attractive destination for people from different parts of the country since early times. With some areas date back to the times of Nubian kingdoms such as the Christian Soba (Seid Ahmad, 2000: 20), the early settlements from around the fifteenth and sixteenth centuries around Sufi sheikhs in Al Ailafon (Seid Ahmad, 2000: 78) and El Haj Yousif (Al Zubair, 2012:29). Or the more recent developments with public housing schemes for civil servants from the 1970s,

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<sup>3</sup> From unpublished statistical estimations conducted by the Sudanese Statistical Society (SSS) in 2019.

the relocation areas for informal settlements and Internally Displaced People (IDPs) camps from the 1990s (Bannaga,1996:71), or the most recent 1<sup>st</sup> class neighbourhoods planned after the new bridge in 2006.



Figure 4.1. Eastern Nile in Greater Khartoum

(Source: Google maps September 2021)

Such varying histories and demographics imply also a diversity of economic and social dynamics. With some parts remain in their traditional peasant lifestyle supplying the city with dairy products, animal fodder and agricultural produce (Bannaga,1996:72). While the areas by the riverbank being the source of fired clay bricks since Turko-Egyptian times up to this day (Seid Ahmad, 2000: 119). Historically, Eastern Nile is home for a wide base of industrial workers commuting to what Bannaga (1996:71) labels as the city’s “main industrial centre” in neighbouring Khartoum North, as well as for working-class residents from the lower ranks of civil

servants (Pantuliano et al., 2011:40). In turn, the huge number of displaced and vulnerable migrants constitute a reserve for informal jobs and daily laborers working in unskilled jobs such as construction works, domestic works, street vendors and other precarious occupations (Pantuliano et al., 2011:15).

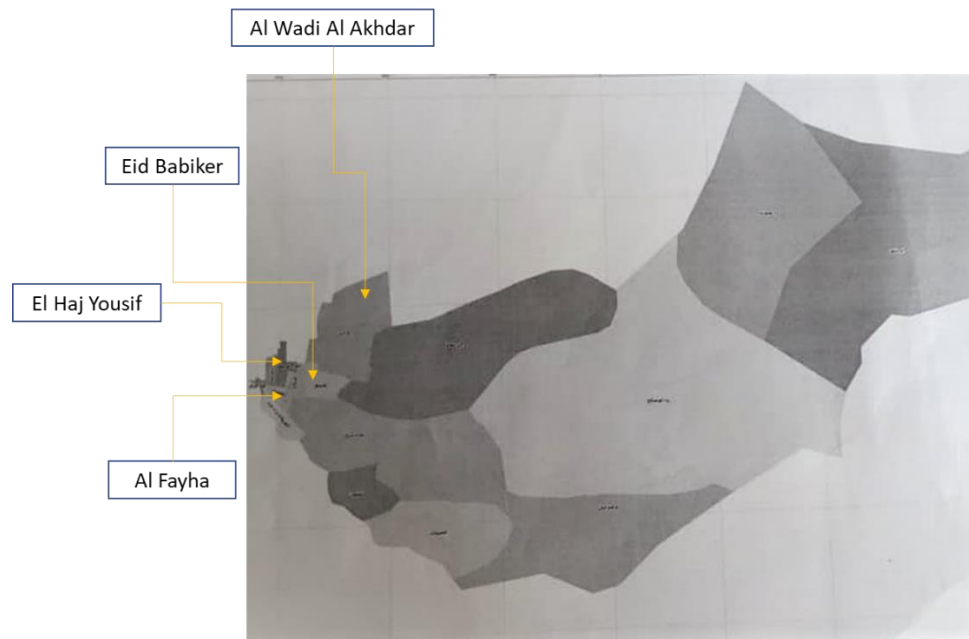


Figure 4.2 Administrative divisions of Eastern Nile locality

(Source: Information Centre-Locality Head office)

This study has attempted to cover areas as diverse as possible in terms of socio-economic status as well as access to services. The focus of the study being to understand the policy frameworks that the city is adopting for the different contexts, criteria for household's selection was mainly based on their status in terms of access to electricity. Accordingly, three main categories have been identified; conventional grid-connection, off-grid and new model grid-connection (here referred to as co-produced grid-connection). The cases are from four administrative units out of the sixteen units that make up the locality; El Haj Yousif, Al Fayhaa, Eid Babiker and Al Wadi Al

Akhdar. For each category a brief explanation of the area's context, electricity policy framework and the residents' lived experience of these policies are laid out below.

## **4.2. Grid-connected: standard procedure**

This is the conventional way through which formally planned households access electricity. Where house owners or their representative follow SEDC connection application procedures for defined connection fees. The majority of neighbourhoods within the locality fall within this category. Several interviews were conducted with residents from this category, four of which will be discussed in the following sections. The four participants reside in neighbourhoods that fall within two distinct administrative units, El Haj Yousif and Al Fayhaa.

### **4..2.1. The studied area**

For El Haj Yousif residents – or other Eastern Nile areas – Kober bridge (officially; the Armed Forces bridge) across the Blue Nile was the main link to Khartoum city. The road to this bridge was the main feeder of the whole locality that branches at different points. The branch leading to El Haj Yousif was known as Kassala road as it was the travelling route to the eastern parts of the country where Kassala town is. Today, only old residents can recognize this name, new residents didn't give it a new name and they usually describe it instead saying the main road, El Haj Yousif road or refer to one of its landmarks. All of El Haj Yousif area lays to the North of Kassala road while the decades-long vacant area to its South have recently emerged into the concrete jungle of Al Fayhaa.

According to Al Zubair (2012:29), El Haj Yousif was firstly inhabited as early as 1788 by the religious Sheikh El Haj Yousif – hence the name – and his followers, living mainly on pastoral activities. The first formal planning of the area has only taken place at the end of the 1960s, when some of the vacant land east to the early settlements was allocated as part of Sites-and-Services public housing scheme for civil servants (ibid). It has been zoned as 3rd class -later

changed to 2nd class- whose residents could be classified as middle-class (Pantuliano et al., 2011:40), and known commonly as “Al Imtidad” (the extension).

According to Denis (2005:9-10), El Haj Yousif is one of the densest areas in Khartoum in terms of inhabitants per built-up area estimated at 30,000 inhabitants/km<sup>2</sup>. This was a result of two parallel processes that taken place further east of Al Imtidad. The first was the planned relocation at the end of the 1980s of informal residents from the more strategic locations in Khartoum North into Sites-and-Services plots of 200m<sup>2</sup> known as “Dar Al Salam” (Land of peace), according to Al Zubair (2012:17). While the second was the gradual sprawl of informal settlements around this planned neighbourhood (ibid). Both the formal and the informal parts of this area are mostly occupied by IDPs, estimated at 90,000 in 2004 (Pantuliano et al., 2011:5).

One of the achievements of the oil boom in the 2000s was the opening of Al Mansheiya bridge in 2006 connecting this Eastern side of the Blue Nile to Khartoum city. The new bridge has shortened the distance to Khartoum city from between 17-20 km to below 10 km at the nearest locations to the bridge. “Al Fayha” (vast and open landscape) falls in the middle between these areas adjacent to the new bridge and the old parts of El Haj Yousif and was zoned as 1<sup>st</sup> class.

#### **4.2.2. Policy framework for electricity supply**

The distribution network has been extended to almost all the neighbourhoods falling within this area at different points in time. The policy framework that applies to these areas is more or less the standard framework put in place by SEDC for power supply in terms of connection procedures, contractual agreement, supplied capacities, billing, emergency response and so on.

Information about these standard connections were mostly provided by Maaz (Interview-SEDC Projects and Planning, September 2020), however, access to maps showing the spatial layout of the distribution grid was denied. Fig 4.2 below details the steps which are followed from both

the future customer and the SEDC office sides. While this procedure supposedly applies to all interested customers, the major difference is with step (3), as the estimation of connection costs will depend mainly on the distance from the existing SEDC infrastructure in the area i.e., the nearest sub-stations and the nearest distribution panel (the poles and wires extended to the customers streets). While there is no difference in monthly charges, fixed or variables between the different residential classes, customers from different classes pay different connection costs. With first class areas paying the highest cost due to the fact that these areas require larger transformers capacities to meet the relatively higher demand. If an area exceeds the load range that corresponds to its class, the whole area's classification could be changed to match its load levels. For instance, several areas in El Haj Yousif were initially classified as 3<sup>rd</sup> class areas but recently changed to 2<sup>nd</sup> class due to frequent complains about unstable power supply that necessitated the increase of the installed sub-stations capacities.

SEDC policies don't make a clear distinction between formal and informal areas; their response to a connection application depends mainly on receiving the connection fees. Even though a copy of the title deed and the official plan of the building/area are the main required documents to be submitted with a connection application, they do also accept other proof of land ownership such as Heyaza (traditional land tenure system). Common practices of electricity theft in informal areas through direct connection to distribution wires is one of the biggest challenges for SEDC and why the company don't hesitate in connecting these areas regardless to their tenure status. A new wiring technology is now used where the old three lines are all inserted together into one big case/cover, thus preventing electricity theft via connections to single lines.

Almost all residential users now use pre-paid meters for fees payment, where electricity units are sold at SEDC offices, shops equipped with SEDC sale machines as well as online from different banking and mobile money applications. The efficiency of pre-payment system has led Khartoum State Water Corporation to partner with SEDC to collect the fixed monthly water fees

with the electricity ones, which means that users need to settle their monthly fixed fees before any pre-paid electricity units could be purchased.

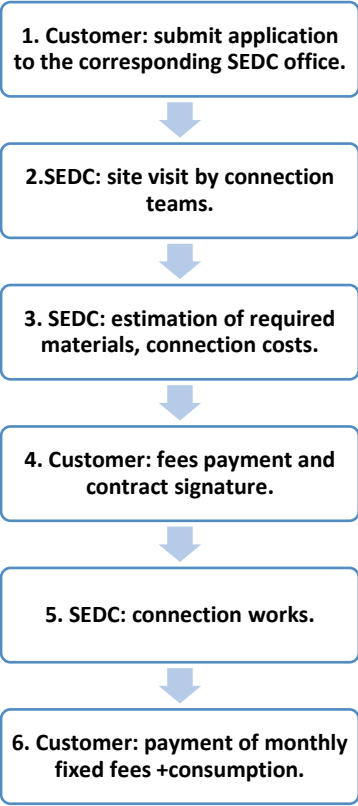


Figure 4.3. SEDC Standard Connection procedure

4.2.3. The lived experience

Four individuals from the grid-connected category were interviewed, Fatma, 66, and her daughter Asha, 37, were interviewed together, they who both live in 1<sup>st</sup> class Al Fayhaa for almost fifteen years, though in different houses. Ismail, 59-year-old male, lives in 2<sup>nd</sup> class El Haj Yousif-Al Radmia. And Asma, 31 female lives in 3<sup>rd</sup> class El Haj Yousif-Al Mozdifa.

Cooling and air-conditioning are the major concerns for electricity users particularly in summer when the country's consumption doubles that of winter per the World Bank (2019:17) report. Except for Ismail whose main issue with electricity outage is his wife's diabetes medication, all the interviewees expressed how cooling is their biggest challenge. Traditionally, as Al Mugabli (2015:4) states, yards are main part of Sudanese houses, which are used to make shaded open areas to spend the hot summer afternoons and big yards for sleeping at night, but this has been changing in recent years, disappearing from the houses of all my grid-connected interviewees. All the interviewees across their income brackets, spend all their time indoor using fans, water air-coolers or the power-consuming refrigerant air-conditioners (AC). Different reasons have led people to change their lifestyle, from the ever-decreasing unit sizes in Khartoum, whether due to the growing practice of dividing units into two or more divisions for rent, or the shift towards vertical units with small apartments, characteristic of younger families.

Asha lives in one of those apartments in 1<sup>st</sup> class Al Fayhaa with her husband and three children. Other than two small balconies which are not prepared for spending long hours, her small apartment has no open spaces. They used to experience extreme power outages in the summer of 2019 that she was spending the whole day from morning to dawn in her mother's house for six months, three days a week. Asma, lives in 3<sup>rd</sup> class El Haj Yousif-Al Mozdifa with two children, has the advantage of having a rooftop in their single-storey house on half plot of land. But she can only use it when her husband is not travelling (he works in another town) as she is scared to sleep outside with her children on their own. While Ismail owns a three-storey house in 2<sup>nd</sup> class El Haj Yousif-Al Radmia, with his family, they occupy the ground level with yards on three sides that they never use. The fact that the upper flats are rented by strangers makes it almost impossible for them, for their women in particular, to stay in the yard in house garments according to a mix of religion and customs imperatives.

For the four interviewees, electricity cost made up between 1-2% of their monthly income. Except for Asma, they all think that they can afford to pay more, with Ismail claiming that he can even pay the double in exchange of a more stable supply. Asma thinks that anything more than the 150 SDG they are currently spending will be too much for them. But she is quite eager to find

a way to invest in self-generation such as in a solar system, to become independent as they used to live in western Darfur. Unlike Asha and Ismail who perceive this as the government responsibility and prefer a more specialized approach to these questions. However, they all agreed that pre-paid meters are better than the old post-paid meters as it allows for transparency, monitoring or control over one's consumption. While Asma acknowledges these advantages, she views it as a disadvantage not to be able to manipulate the meters anymore.

### **4.3. Grid-connected: co-production**

As a response to the increasing pressure on the distribution company in connecting the sprawling Khartoum, a different approach involving a wider range of stakeholders was introduced. The details of this model are the topic of the following section.

#### **4.3.1. The studied area: Tawidat Eid Babiker**

Tawidat Eid Babiker (Al Tawidat will be used here for abbreviation) is a 3<sup>rd</sup> class area at around 23 Km away from Khartoum centre and started as a relocation for residents from informal areas across Khartoum in the beginning of the 2000s to this extension area of the old village of Eid Babiker. Al Tawidat represents a sharp contrast to its host community of Eid Babiker; where the disparate populations of IDPs and economic migrants, mainly from western Sudan, were brought next to the old traditional and relatively homogeneous Arab village. The village of Eid Babiker lays on the rural-urban frontier of the city, while slowly urbanizing, is still maintaining a strong traditional lifestyle in terms of social and economic activities (Abdallah,2010:81). Where kinship determines most of these activities; for instance, almost all of the pastoral activities for which the area is well known, as it is one amongst the main suppliers of milk in the city, are managed within the families, some of whom are extremely wealthy. (ibid:104).

In contrast, Al Tawidat as an emerging area mainly of previously informal urbanites is home to a diverse population that occupies mostly informal jobs. Moreover, the planning and gradual

access to electricity has significantly increased the land value to more than threefold (Interview-Hamid, January 2020), attracting new residents who are relatively better off.

To get there, one needs to take the ring road that encircles the city and mostly used by delivery trucks. The roadsides are punctuated by men in Jalabiya and Sediri (traditional men outfit) selling sheep, animal fodder or other farm products. A long irrigation channel lies at the entrance of the area; surrounded by medium-height grass that further reinforces the country-side character of the place.

The paved road naturally blends with the dirt road on the sides putting people, cars, donkey carts and public transport on the same lane and pace. However, the road quality is remarkably much better than the down-town roads and big feeders with less potholes and gentler traffic. Huge steel pipes are laid on one side of the road. Later, I was informed that they have been there for years giving the residents the hope of being connected to the water network soon. Today, they buy water from donkey carts for 30 SDG for the barrel or an equivalent of 900 SDG a month, while network-connected houses pay between 60 to 150 SDG per month according to neighbourhood class.

The area is planned into seven blocks, with all of them still lacking access to piped water supply and rely on costly, dangerous and unreliable alternatives. While six of them have gained access to the electricity grid in recent years, mostly according to the micro-financed model which will be explained in the next section.

#### **4.3.2 Policy framework of electricity supply**

The model shown in Fig.4.3. below has been recently rolled out and coordinated by the Sudanese Electricity Distribution Company (SEDC) in partnership with the Ministry of Finance and Economic Planning (MoFEP) and the Central Bank of Sudan (CBoS). The Ministry of Finance makes financial resources available for micro-finance institutions to invest in social projects such as access to public services and agriculture. In this case, the financing institution is Irada

(Determination) which is a subsidiary of Bank of Khartoum, one of the biggest banks in the country. Irada finances, manages the projects execution and serves as the point of contact between the different stakeholders. Preliminary information about this project were obtained from an interview with the project manager from Irada. She preferred to keep the interview unrecorded and offered instead to share all the project documents, which she did. She also set up an interview for me with Y, from the community side of the project.

On the users’ side, the beneficiary community is requested to form a representing body i.e. a cooperative with which Irada enters into a partnership governed by a contractual agreement. Mishka (Lamp) is the cooperative formed by Al Tawidat residents, from around eighty community members. The cooperative manages the community side of the process by collecting residents’ data, coordinating connection works and ensuring residents compliance with payment terms. As The cooperative is legally liable to the bank, its representing members take all the associated risks such as non-payment of individual users, which is not uncommon.

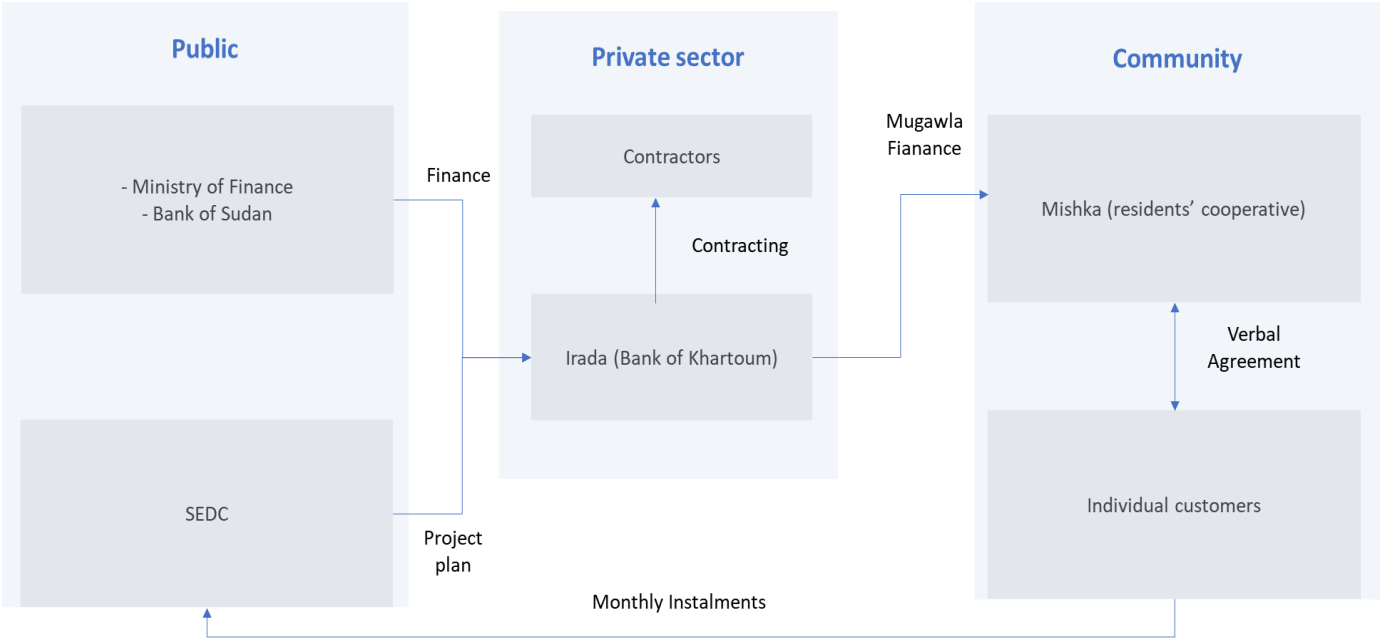


Figure 4.4. The co-production governance model (graphic by the author)

The model followed to gain access to electricity in this area could be categorized as co-production of public services. Co-production is a loosely defined concept and can refer to more than one governance configuration as Sorentino et al. (2018:277) point out. However, the common characteristic of co-produced projects is the involvement of “lay actors” from community members alongside the state actors at one or another stage of the service delivery process (ibid:280).

The contractual agreement between the cooperative and the micro-finance company is an Islamic finance model called *Mugawla* (contracting) which is a “contract in which a party undertakes to produce a specific thing which is possible to be made according to certain agreed-upon specifications at a determined price and for a fixed date of delivery”. In other words, the finance company doesn’t lend money, but delivers a turn-key project to the community. Irada appointed specialized contractors from SEDC list of qualified contractors to perform the connection works. Except for the pre-paid meters installation which was the responsibility of SEDC and which they failed to deliver on time. Consequently, the cooperative resorted to an improvised solution where they hired an external contractor to do it and charged beneficiaries around 50 SDG for that.

The table in Fig. 4.4. provides the financial details of the project that provides 1053 beneficiaries with around 6 850 SDG each, and for which a monthly instalment of just above 200 SDG is to be paid over five years. With an interest rate of 12%, more than 40% of the total amount that the beneficiaries have to pay is actually a profit margin for the micro-finance company. The project manager explained that this high interest rate is due to the high risk associated with this kind of projects.

The huge success associated with pre-paid meters in improving payment collection has led SEDC to try to capitalize on this system and its user’s database. In this project, monthly instalments are linked to the beneficiary’s meter in SEDC’s system, where the 200 SDG instalment is automatically deducted each month when the user buys electricity. In other words, without instalment payment, no electricity units.

While the relation between the cooperative and the beneficiaries is not governed by a written agreement and relies on verbal commitment solely. The cooperative representatives' tactics to ensure timely payments range from peer-pressure to threats of meters disconnection.

Item	Value
<b>Bank finance terms</b>	
Finance period (Months)	60.00
Bank profit margin (%)	12.00
Grace period (Months)	4.00
<b>Finance amount</b>	
Number of beneficiaries (households)	1,053.00
<b>Finance per household (SDG)</b>	<b>6,650.00</b>
<b>Bank profit (SDG)</b>	<b>4,110.00</b>
<b>Total liability per Household (SDG)</b>	<b>10,960.00</b>
<b>Monthly instalment per household (SDG)</b>	<b>196.00</b>

Figure 4.5. Financial details of Al Tawidat project

### 4.3.3. The lived experience

As the literature about the area is almost non-existing due to its recent development, most of the information about it is based on the inputs from my two interviewees; Yahya, the cooperative director and Hamid, the head of the household where we held the meeting. Hamid also gave valuable inputs about his experience as a beneficiary of this project.

When I drove into the area, Yahya, the cooperative director was waiting for me by the mosque, accompanied by Hamid. Yahya was wearing Badla Eshtrakia (Socialist Suit), the suit associated with the toppled regime affiliates. Though they didn't mention it, a recorded community meeting (East Nile, 2015) points to the fact that Yahya was the head of the ex-regime's popular committee before they were dissolved.

Amongst the 1053 beneficiaries, 63 have been defaulting on monthly instalments. This default has resulted in the imprisonment of Yahya and two other cooperative members for two months. Yahya and Hamid both think that this was the beneficiaries' fault:

*Y: the only problem with the project is that we left things spontaneous. Except for the delay with the pre-paid meters and the connections, we can't deny that it was a very successful project. You would find that some people have their meters installed but they are not paying, and that was our mistake because we didn't get people to give us more guarantees, we just worked spontaneously. From the beginning we should have made them write some acknowledgement.*

In general, my interviewees share a very positive stance towards the project and the financing company. There are multiple reasons for that; firstly, the increase in the land value that they gained after accessing the grid. Secondly, they think that the monthly instalment of 200SDG is quite affordable that a daily worker can easily earn in one day. The cost is also more reasonable compared to the other alternatives they used to opt for. For example, Hamid was paying 100 SDG to connect to a diesel generator from 6pm to 12 am with which he was able to light only two lamps with a very low lighting quality.

#### **4.4. Off-grid: Al Wadi Al Akhdar**

This category covers households who are either residing outside the coverage of the distribution network or who are unable to pay for the connection fees and remain without electricity. The studied case is from the public housing scheme block in Al Wadi Al Akhdar which has been recently tied to the national grid. However, the interviewed household, a renting South Sudanese refugee family, remains without electricity supply due to unclarity surrounding the progress of connection works.

##### **4.4.1. The studied area: Al Wadi Al Akhdar**

Al Wadi Al Akhdar (the green valley) is a residential plan of 120 000 plots that was launched in the early 2000s, it's around 30 km from Khartoum centre (Altayeb 2018). The area lays at the periphery of the Eastern Nile locality, closer to its rural parts. Different categories were targeted with this scheme; 15 000-20 000 plots were marketed for Sudanese expatriates, mainly in the

gulf countries (ibid). Also, the area is divided into blocks, with four blocks to be developed within the housing scheme framework (ibid). Despite the big accompanying marketing campaign (SudaniNet, 2018), especially among expatriates, most parts of the area still lack access to basic services. This has led to the majority of the plots remaining undeveloped, illegally occupied or vacant as in the case of the housing scheme blocks.

Block 15 is a 3<sup>rd</sup> class area and it is one of the housing scheme blocks. According to my interviewee, Suad, the area is around five-year-old, yet public services are unavailable or unreliable. This has discouraged house owners from moving in. These issues are characteristic of Khartoum's successive housing schemes, what will be explained briefly in the next section.

#### **4.4.2 Policy framework of electricity supply**

According to Maaz (SEDC Projects and Planning, September 2020), electricity supply to this block falls under the responsibility of Khartoum State Housing and Development Fund (KSHDF) as it is the developer of all the public housing schemes in Khartoum. But access to services have been one of the main points that influences decisions on public housing and its provision models.

#### **Khartoum Popular Housing scheme (Sakn Shaabi)**

The shift in Greater Khartoum's housing policy from site-and-services, prevalent since the 1970s, to core-housing units came as a response to the issues associated with the former. Osman (2010:9, cited in Hamid and Elhassan, 2014:188) demonstrates that only 34% of the sites-and-services plots allocated between 1956-2007 were developed. Main reasons for that were the high construction costs that prohibited many beneficiaries from developing their plots on one hand and the state's failure to achieve its commitment of service delivery on the other. This way, incremental core-housing schemes offered a relevant solution to construction cost challenges, while delivery of services still remains a barrier to effective housing supply.

As described by CAHF (2018:152), Khartoum State Housing and Development Fund (KSHDF) was launched in early 2001 to provide housing units under three cross-subsidising categories; Luxury

units (villas and apartments), Economic Housing and Popular Housing (Sakn Shaabi). The Popular Housing category applies a points-based eligibility approach for awarding core-housing units within greater Khartoum. Each unit is of 250-350 m<sup>2</sup> with boundary walls, one room, a kitchen and a pit latrine (Hamid and Elhassan, 2014:189). The units are delivered to eligible families at varying monthly instalments, with 130 000 units in total delivered by the end of 2019 (Akhr Lahza, 2019 ). The horizontal expansion of these units led to the creation of low-density and remotely located areas. Consequently, this has posed multiple financial challenges for the extension of service delivery networks.

Constrained beneficiaries move into these poorly serviced core-housing units and resort to makeshift arrangements to access services. While those with better alternatives leave them unoccupied or rent them out, like Suad's house owner. In Suad's street, only two houses are occupied, while doors and windows of all the vacant houses were stolen. This low occupancy rate puts into question the eligibility criteria for this housing scheme. The fact that key eligibility criteria are limited to the applicants being born or living in Khartoum for the past 10 years without owning any property, with no threshold specified for applicants' income level (Boabt Al Egtisad Al Sudani, n.d.) seem to favour those with better access to information and resources (lengthy application procedures and relatively high fees) and less urgency.

#### **4.4.3. The lived experience:**

Until the secession of South Sudan in 2011, most South Sudanese people have lived in precarious conditions on the margins of Khartoum what was expressed with the 98.8% voting for independence in 2011 referendum (France24, 2020). Today, South Sudanese were pushed to Khartoum again by civil war, but this time their "refugee" status makes everything even more precarious for them.

Suad is the head of her family and lives in this house with her kids and members of the extended family since February 2019. When she firstly moved to the area, she had different expectations of the status of service delivery in the area:

*S: I came here and I asked, the owner asked me how am I going to stay here without electricity, there is water but there is no electricity. I said it is fine, electricity is not as important as water, then we moved here, then they started connection works.*

Grid connection works started but water supply to the area has stopped since May 2019 and she doesn't know why. She thinks that it might be due to a broken line, but she is not sure. Al Wadi Al Akhdar electric distribution substation is less than a kilometre away from Suad's house. One year ago, connection works were initiated, with poles and wires already in place but it's unclear why they are not activated through the installation of the other necessary components such as transformers, connection points and pre-paid meters;

*S: So I told the house owner when he came here, I asked him to go to their agent and get more information about connection.*

*R: he didn't tell you what it requires?*

*S: no*

*R: maybe you need to submit a connection application and pay some fees before they tie you to the grid and install the meters*

*S: I am not sure; it is all in the hands of the house owner.*

*R: this might be an issue, because he might ask you to pay.*

*S: I am not sure if he will pay or if he will ask us to.*

*R: do you think he will increase the rent?*

*S: I don't know, we are living with the unknown.*

In general, Suad has very limited information about public issues and service delivery arrangements in the area. This could be due in part to the difficulty of integration within the

sparsely populated surrounding areas, which are more ethnically homogenous with predominantly indigenous Arab tribes such as Al Batahin. Her status as a non-citizen as well as the historical discrimination against South Sudanese are probably other factors in this lack of both information and integration.

While Suad and her family seemed to enjoy a relatively good status in terms of access to education, work opportunities and financial resources compared to millions of South Sudanese refugees cramped in camps, they seemed unaware of their basic rights as legal residents or as political subjects.



Figure 4.6. Al Wadi Al Akhdar- The public Housing scheme in Block 15

## **Chapter 5 - Analysis and discussion**

This chapter will firstly deal with analyzing the different studied cases in terms of the official policies governing electricity supply for each category amongst the off-grid users (Al Wadi Al Akhdar), grid-connected through the standardized connection procedure (El Haj Yousif and Al Fayhaa) or the newly emerging connection frameworks coupled with micro-finance (Tawidat Eid Babiker). Analysis of the more subjective aspects of these policies and their implications to the life of their respective receivers will be the focus of the second part.

### **5.1. Policy review**

#### **5.1.1 Grid-connected or off-grid**

To understand why the current distribution policies result in some residents enjoying access to the national grid and some not accessing what is commonly believed to be a “public” utility, comparing first-class Al Fayhaa and 3<sup>rd</sup> class Al Tawidat is insightful. Other than the fact that they are part of the same locality and that the development of both areas started in the early 2000s, their development trajectories are completely different and sometimes even opposing. The ability of Al Fayhaa residents to self-finance grid-connection has extended the reach of distribution infrastructure in the area, increased its land value and attracted even better off residents, further extending its grid. While Al Tawidat as a relocation area for previously informal residents that the mayor (Al Moatamad) of Eastern Nile locality was telling that “he” doesn’t have money to connect them to the grid and asking them to be grateful for owning land plots in Khartoum (East Nile, 2015). Hence, the only option left for the relocated precarious residents is to self-finance their own access to the grid, which they failed to do for more than a decade.

As the sector context in Sudan is similar to many in Sub-Saharan Africa where “the wholesale cost of electricity is high; the regulated retail tariffs are low; and the typical residential user’s consumption is low” (Blimpo and Cosgrove-Davies, 2019, 71), distribution companies lack any

incentives to fully or partially contribute to new users' connection. The high cost for extending the distribution grid, combined with the high tariff subsidies in Sudan make public investments on grid-connection a huge financial loss for the state. Therefore, SEDC is transferring the full cost of new connections to end users whether it is the final tie-in to the LV network or the full cost of extending the MV network for new areas, consequently self-financing becomes prohibitive for the majority of low-income residents.

Blimpo and Cosgrove-Davies (ibid, 74) indicates that from a financial point of view, an optimization between electricity tariffs and connection fees should be reached; that is to say in a context of "a higher regulated electricity price, the optimal connection charge is lower" and vice versa. However, lowering connection costs by charging higher electricity prices is not feasible in the near future, as despite the considerable increase in electricity prices announced recently, they are still far below the actual generation costs. This is due to the high reliance on imported fuel for thermal generation in a context of a constantly depreciating local currency against the US Dollars needed for imports.

These dynamics make the current model for SEDC not working for the majority of the urban population. The model's failure is not only due to issues linked to the electricity sector on its own, wider urban planning issues are also in play. Concentrating all residents with higher affordability rates in the same neighborhood result in the current counter-intuitive status as in Eastern Nile locality. For instance, when Asha was moving to her newly finished apartment in 1<sup>st</sup> class Al Fayhaa, she was required to pay to tie-in the distribution pole by her doorstep, while she could have afforded more. Unlike Hamid whose whole neighborhood couldn't afford the procurement of the completely non-existent distribution infrastructure in Al Tawidat. This pattern makes it a worthy endeavour to assess the possibility of shifting from the colonial zoning system to mixed-income neighborhoods as an option for lowering connection costs for the poor.

Moreover, creating areas with different types of users such as residential and light industries could create beneficial synergies for the sector and end users. Newer technologies have transformed the traditional image of the "dirty and noisy" industry (Howells and Openshaw, n.d.) for many applications with developments such as London's Wick Lane successfully experimenting

with such unconventional mixed-use in 2017. In Khartoum, SEDC currently prioritizes residential areas over industrial areas when it comes to load shedding (Interview-SEDC Projects and Planning, September 2020) as the latter are concentrating a big number of significantly high-demand users. That, in turn, leads many industrial consumers to rely on self-generation, mostly from costly diesel generators. Rethinking zoning practices to place small number of light industrial users with their relatively high demand and high affordability for distribution infrastructure next to public housing schemes with low demand and low affordability for services as Suad from Al Wadi Al Akhdar, could create more balanced distribution networks.

Whereas SEDC currently doesn't invest in new connections, it has a budget for reinforcing the existing network such as adding additional transformers for areas with an increasing demand. In other words, grid-connected users are not only benefitting from the subsidies they receive even for their inefficient electricity usage, but also the SEDC is directing its investment priorities to accommodate this steadily rising demand rather than connecting off-grid users. The general bias towards the middle-class consumer base was also clearly visible in the current tariff reforms.

Firstly, the new tariff structure copy-pasted the WB advice on reducing the 200kWh/month lifeline quota to 100kWh/month (The World Bank, 2019:37), which is below what is actually recorded as the average consumption of the poorest consumers' quintile of around 177 kWh/month (ibid:46) and increases the cost for this same quintile by almost fivefolds. Similarly, those consuming up to 400kWh and 600kWh (600kwh being the supposedly new ceiling for subsidy) saw their cost rising by slightly above fivefolds despite their higher affordability. In other words, if we think about patterns of electricity consumption as an indicator for income level, we can easily see that those belonging to the first quintiles (177kWh/month) are the ones with very limited access to electric appliances, low affordability, hence they are the most vulnerable to afford a fivefold increase. Whereas 2<sup>nd</sup> and 3<sup>rd</sup> middle-class segments, whose consumption is mainly driven by inefficient electricity usage, airconditioning in particular, not only can afford more but they also have a larger room for electricity savings by the application of more energy efficient construction materials and appliances.

Wider institutional issues add to the inefficiency of the distribution company; Maaz (Interview-SEDC Projects and Planning, September 2020) explains that tariff increase will not automatically lead to the sector's reform as, on the one hand, decision-making regarding annual budgets for all electricity companies is subject to the approval of the Ministry of Finance (MoF). On the other, due to the technical nature of centralized grids, a significant interdependence exists between the separate companies:

*R: usually, finance is the main problem?*

*M: yes, even when we at SEDC manage to solve our problems, if the transmission people are not sorted, we can't proceed neither. Same for the dependency of the transmission company on the generation side, as there are places which can't support further load. For example, in the Red Sea, we had big problem two years ago that their self-generation was not enough and the transmission station supplying them was not enough either because of the rapid development. Then they have to add additional generation station.*

The importance of a wider coordination between the public, private and community actors to tackle the complexity of grid connection issues was acknowledged and expressed in initiatives such as the micro-financed grid-connection project in Al Tawidat. The next section will discuss some of the key issues with this project.

### **5.1.2. Alternative configurations: Micro-financed co-production**

While the involvement of "lay actors" is what characterizes co-produced projects, the involvement of these lay actors can take different forms and level of involvement (Sorrentino et al. (2018:280). Such a multiplicity of configurations can make the setting of proven and well-established procedures a real challenge for all the parties involved in general and the weakest chains in particular, as it was the case of the cooperative members in Al Tawidat.

### **Defining roles, duties and liabilities:**

Ostrom (1996, cited in Sicilia, et al. 2015:14) emphasizes the importance of developing a “social infrastructure” to resolve conflicts between different stakeholders as a key organizational condition in co-produced projects. In Al Tawidat project, the only clearly defined liability is that of the cooperative towards the micro-finance institution (MFI) in case of a default on the beneficiaries’ payment of a certain threshold. That was also the one aspect the MFI was strict in following, by sending the three cooperative representatives to jail for two months. Other than that, the absence of defined mechanisms on all aspects has made conflict resolution between the different actors in Al Tawidat a question of power dynamics.

*R: who launched the tender? You yourself?*

*Y: yeah, we had no other option, so we had to do it ourselves, but it went well. We give them like 25-30, 40 SDG, they install them and we agreed with Yasir and they installed them.*

*R: wait wait, I didn’t really understand this. So with regards to the meters, what happened, you had a contract with a company or what?*

*Y; yes, yes, it was a small company, we would charge the house owner directly not more than 50 SDG and it went well. So, yes, the meters’ installation was a problem.*

SEDC has failed to deliver and install the pre-paid meters, which led the cooperative to hire an external contractor to do it and charged beneficiaries around 50 SDG for that. This improvised response for a negligible cost was successful in managing the bottleneck of the meters’ installation and moved the connection works forward, yet it points to the shortcomings of the project design. It shows on one hand the nature of the power dynamics between the micro-finance agency and the cooperative. For Irada has taken advantage of the desperate need for electric power in which the community lives to pass on some of its duties in contracting and managing all installation works directly or through SEDC. At the same time, the lack of clear contractual agreement between the cooperative and the primary beneficiaries has made imposition of such ad hoc charges possible.

Furthermore, this lack of defined contractual terms with the community, penalties in particular, was misused by the community as well. Beneficiaries have come up with ways to get around the linking of monthly instalment to purchase or electricity units by extending a cable between two adjacent houses and splitting the monthly costs. Social pressure was not effective to sustain beneficiaries' compliance with instalments payment either. In many cases, residents who don't own the house because they are renting it or it is provided by a family member refused to pay the connection instalments.

*H: for example, you take this guy Nile, he owns the house but his sister and her daughter are staying in the house for the past ten years and he is saying that his sister will pay for the electricity, but she didn't want to pay at all. We had a dispute with him, and we issued him a warning (here is the warning), but eventually they didn't pay.*

*Y: do you know if they are connecting to their neighbors?*

*H: no, no, they are not. You see this people, since May 2018, they are not paying, they owe us 4900SDG. Her brother is giving her the house for free, and she is expecting that her brother is paying but he is not. We told her that we are going to expropriate the meter, but they said no you can't take it.*

An advantage that is often associated with co-production is the room for local communities to be more engaged in the execution phase, which can have positive outcomes in terms of building their technical, organizational and political knowledge (Mitlin and Bartlett, 2018:356). But Al Tawidat project has limited the role of the community to legal representation and administrative tasks fulfilled by a small number of cooperative members without contributing to any capacity building. The contractual agreement between the cooperative and the micro-finance company is an Islamic finance model called Mugawla (contracting) where the finance company doesn't lend money but delivers a turn-key project to the community. Therefore, this project gave little window for the community to intervene in the work implementation.

## Today's solutions, tomorrow's problems

Mitlin and Bartlett (2018:355) explain that the promotion of co-production as a governance model is debated in the global South. The reason is that while co-production can be beneficial in improving service delivery in a context of meagre public resources, it can also lead to a situation where states “pass on responsibilities”, further reinforcing neoliberal practices on the long run. These two dynamics are both quite visible in the case of Al Tawidat.

The area has remained without access to electricity for more than fifteen years and still remains without water with residents resorting to costly, dangerous and unreliable alternatives. For example, Hamid was paying 100 SDG to connect to a diesel generator from 6pm to 12 am with which he was able to light only two lamps with a very low lighting quality. This makes of Al Tawidat project a huge success in ameliorating residents' life quality and increasing land value in the area, which explains the enormous sense of gratitude the interviewees were expressing towards the micro-finance company. This deprivation of basic services that has always been justified by the lack of finance confirms how the joint effort by the public, private and community institutions can solve in a short time year-long problems. However, when this case is viewed within the larger context and in comparison to other surrounding areas, neoliberal patterns of exploitation of the most vulnerable are unmistakable.

For during the previous regime's days, SEDC had a budget for reinforcement and extension of the local grid whose allocation has been subject to political agenda (e.g., elections), or the corruption of SEDC employees themselves in some cases (Interview-SEDC office, August 2020). Prioritization of newer but more affluent areas also points to the influence of real estate agents on decision making (ibid). Therefore, this model of service delivery seems to perpetuate the state's overlooking of disadvantaged communities in the way it leaves them in the hands of the private sector and influential local elite. The long years of deprivation of public services distort the communities' perception of equitable service provision as a state duty, which in turn makes of the involvement of micro-finance providers an act of benevolence not a “depoliticization of development” (Harriss 2001: 2, cited in Roy, 2010:68).

Furthermore, cases of non-payment also raise the question of affordability. The two interviewees claim that this monthly sum should be easily affordable for almost everyone in the area, yet the total number of defaulting users from the two blocks is at 98 users. They think that this non-payment is not linked to affordability as much as to *momatla* (can be loosely translated to the act of delaying things out of reluctance to do them for justified or unjustified reasons). Political affiliations could be another reason for creating divisions that render the social pressure system inefficient. Yahya was heading the area's "Popular committee", which is the last administrative level in the previous regime's era. One of the key functions of these committees is to empower the regime's party members through their appointment in leadership roles that can make some people reluctant to collaborate with them.

Tracking the finance flow for this project shows how public money is channeled from the central bank and the ministry of finance to the private sector embodied in the MFI, the subsidiary of Khartoum Bank which is the biggest private bank. Redirecting this money through public channels that works towards covering its operational costs and not profit making could have lowered the 12% interest rate charged to the beneficiaries for their classification as high-risk customers.

Broadly, then, financial constraints combined with the lack of flexibility of conventional technical and institutional configurations keep increasing the gap between official targets and the reality of electricity provision. How these different aspects of the supply conundrum are experienced by the locality residents will be discussed in the next section.

## **5.2. The lived experience**

Analysis of the conducted interviews have highlighted some of the significant features that characterize the ways with which electricity users conceive of their experience of electricity supply (or non-supply). These lived experiences could be understood along three main lines. The first is linked to users' experience of electricity as an unrivalled energy form that could be converted into a multiplicity of other forms, or its functional dimension as a modern technology

that dis/enables greater space-time manipulation. The second is concerned with the more symbolic or representational dimensions of the experience. Lastly, there is the relational experience of electricity supply, manifested in the close link that the users make between electricity and the different relations that they form in their endeavors to access power services as in the different set of financial, legal, institutional and social relations that vary according to the mode of access. Each of the three dimensions of the experience will be further discussed in the next sections.

### **5.2.1. The functional experience of electricity supply**

The need for space-time manipulation in order to live an urban mode of life with its “accelerated, extended, and intensified intersections of bodies, landscapes, objects, and technologies” (Simone, 2004, 408) was expressed in the varying levels of dependence on technology in general and electric appliances in particular by the interviewees across their different categories. Better off households demonstrated higher dependence on availability of power and several electric appliances. Their adoption of modern and urban ways of living automatically subjects them to certain space-time constraints that they can’t surmount without a constant resort to technological means. For instance, Asha, the upper middle-class, nine to five employee, wakes up before sunrise every weekday to prepare the morning tea and the lunch boxes for the whole family and get herself and the three kids ready. Achieving this in around two hours requires a considerable reliance on technology to get things done efficiently and timeously; the water kettle, the microwave, the stove, the chips fryer, the blender, the iron, the water pump for the extremely unreliable water supply and so on. After that she disappears in the office for the whole day and comes back home to proceed with her housewifery obligations where her recently acquired gender role as an income earner couldn’t question the validity of the deeply entrenched older roles.

Asha’s gendered experience could be contrasted by Ismail’s nostalgia to the daily cooked meals of pre-electrification days that he thinks were fresher and healthier, but its relatively higher cost

was his main concern and not the drudgery experienced by his mother or sisters. The ostensible equality gained by women in Sudan through equal access rights to education and job markets couldn't make it home in terms of housework. "Electric housewifery" (Pursell, 1999:6) in this context could be viewed as a means to reduce the domestic burdens on women, however, their freed-up time and energy are channeled to other family obligations such as contribution to family income.

In addition to time constraints, modern building techniques in Sudan require higher capabilities for space control in terms of cooling and ventilation. Asha's family is spatially constrained in their small apartment where they rely on three Air Conditioners (AC) whose high power consumption and growing usage is undermining the whole sector's reliability. Asma's apartment is also dependent on space cooling; however, their relatively modest budget restricts them to Evaporative Coolers (EV) which are cheaper to buy and operate. One of the positive aspects of the horizontal nature of the Public Housing scheme is that it is still taking into consideration the incorporation of big yards in the core housing units such as that of Suad. Though Suad lacks access to any cooling or ventilation appliances, she didn't seem to particularly struggle, but as a mother she has other and more urgent priorities:

*R: if I supply you with electricity and asked you to choose one thing to operate, what will it be?*

*S: the problem is that I have children at home who go to school and who need to do their homework.*

*R: so, you need lights?*

*S: yes lights, and T.V as well so they don't roam around. And a fridge for the food.*

On the other hand, when the recently connected Hamid was asked about the difference that electricity made in his life, he speaks of a different priority:

*R: what was the biggest difference for you compared to the time when you were using diesel generators?*

*H: the biggest difference is that it has increased the value of this area.*

*R: have you benefited directly from this price increase?*

*H: yes, the land was at 150K SDG and now it is more than 400K SDG ....*

Amongst this group of interviewees, the gendered experience of electricity access was particularly present. On one hand, women have put strong emphasis on comfort and the sense of regularity offered by lighting, fridges, ACs, stoves, etc. While for men, the accent was put on aspects related to budget, land value or the different financial implications of no/access to electricity or electrical appliances. But this is not necessarily due to the fact that women are not sharing the financial burden as much as men are not sharing the daily drudgery that new technologies have not necessarily reduced (perhaps they even exacerbated them). The image of the relaxed grandmothers cooking and washing dishes sitting on their banbars (tiny stools), taking as much time as they need, could be contrasted to the hustling of working mothers under the pressure of being financially independent while fulfilling their traditional roles of being the perfect mother and the guardian of a clean, decent and modern household.

### **5.2.2. The representational experience of electricity supply**

Most of the interviewees pointed to their preference of what is associated with modern or contemporary lifestyle in their implicit choices of building techniques and technologies, even when they are not compatible with the country's weather or available infrastructure. EVs, in addition to being not as sophisticated as ACs in terms of cooling quality or variability, are perceived as backward and unsuitable for modern houses. For Asha's lifestyle, not living in a modern apartment or using EVs are not even options to consider. Ismail aspired to have more

ACs but their electricity consumption is prohibitive for him, hence the only one they own is in their sons' room. For Asma, the ambitious newcomer to the city who is developing her small business, her irregular income flow can allow her to make occasional big investments such as buying an automatic washing machine but has lower affordability for ACs operation costs, which is why she relies on EVs, albeit reluctantly.

Despite the value-driven nature of all these choices, Ismail was the only one to explicitly share associations of city life with being modern or civilized. However, he attempts to negate what seems like a common wisdom that possessing certain technologies or appearance can make someone more "civilized" or a "city person":

*I: why do you think I mentioned Al shigla and Ed babiker? Because the person who comes from conflict zone, needs rehabilitation and the person who has starved outside the capital, needs rehabilitation. What do you think culture is all about? Is it about having a phone, tucking one's shirt and wearing a tie? Do you think that is all, now you are civilized, now you are a city person? No, you are not a city person. These things don't make you a city person. A city person is someone that you recognize the moment you sit with and the person who is coming from outside, from Rejl alfola (derogatory name for remote areas) you will also recognize. For example, if you want to go and wash your hands, he will just come and pass under your arms and wash before you. All these things are linked together, the water, the electricity, Al Shigla, everything.*

Ismail was also more explicit in making the link between city life, access to services and living under modern state. He holds a stance, which many early dwellers of Khartoum share, that post-independence years were better, governments were still able to follow proper managerial and technical procedures before they were hindered by migrants and IDPs:

*I: We used to have perfect services. But then you had all these people from Carton Kassala<sup>4</sup> and Tawidat Ed Babiker who arrived due to displacement. Before you had everything documented,*

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<sup>4</sup> Carton Kassala: this is an old informal area in El Haj Yousif which is now upgraded, it was mainly inhabited by displaced people from South Sudan. Its houses were built from cardboard.

*how many houses per block, average number per house, you will have even the medication from the ministry of health coming according to these numbers. And the kind of diseases you have, they will know them. In general people didn't get sick, even death, it was less than now. In the past we didn't have all this death, now I would go to 2-3 funerals every week.*

Such statements, which are widely circulating, are a product of the powerful discourse propagated by the previous regime in vilifying populations from conflict zones who dared to arm themselves against the historical North-centrism of the Sudanese state. The result is a broadly shared compartmentalized view that associates the hindering of the city's modernization with the displaced populations and their backward practices, while avoiding the larger structural issues of state failure that maintains their "backwardness" or turn them into displaced people at the first place. Hence, they end up vilified for their struggle and stigmatized for their ensuing poverty and marginality as a city precariat.

### **5.2.3. Relational experience of electricity supply**

Asking Ismail about his view on the power supply problem and its causes, he answered:

*I: I think their calculation is not right. If everything is linked in a central system, then they will get it right. If I know how many households I have, what is the average consumption per house, how much energy do I need, then I wouldn't have a problem. It is just because you don't have statistics, and this brings us back to informality.*

Ismail who grew up benefitting from the privileges of the Northern middle-class who were amongst the first comers to postcolonial Khartoum, as his father was occupying a civil service position in the 1970s, takes State-provided services for granted. For him, modernity's promise of equal access to urban infrastructure (Kaika and Swyngedouw, 2000:129) is not fulfilled for mere technical reasons. The statistical machine of the state is hampered by the irrationality of informal modes of city dwelling. Aspirations of many Khartoum residents for the perfectly integrated

networked city are not shaken by the decades-long failure of the successive post-independence states to cater for the majority of the urban population.

The majority of the urban population on its turn got used to its indiscernibility by the state's energopolitical machine and grew skeptical of fully accessing its services. While both Ismail and Asha strongly oppose the idea of self-generating their own power via roof-top solar options, Suad and Asma who are both used to such configurations from their previous lives in poorly serviced Southern and Western Sudan respectively, are actually enthusiastic about self-generation and perceive it as an option even better that can render them independent from the unreliable grid connection. Ismail and Asha, whose profiles match that of 'official citizens' for whom connection application requirements are designed, perceive power generation as the state's responsibility in which they prefer not to intervene. Younger Asha is even willing for further integration into the state realm in her preference for usage of online banking for purchase of pre-paid electricity.

Such a state of abandonment by the state limits the choices of the peripheral Khartoum dwellers to their preferred mode of "decentralized despotism" (Mamdani, 1996:26). Hamid and Yahya who suffered from the costly and limited power supply from diesel generators owned by small entrepreneurs, were highly grateful for the state-funded private MFI whose profit margins proportionally increase with their rating at the poverty scale.

*Y: the micro-finance was a great benefit and without it, the blocks that have electricity now, wouldn't have it.*

However, even for the grid-connected and the officially recognized citizens, the unreliability of public services keeps them entangled in the complex networks of "people as infrastructure" (Simone, 2004, 407). This could be traced in Asha's every other day rickshaw trips to her mother's house, or Ismail's resort to his connections at the SEDC office to get his occasional pre-paid meter faults fixed. Ironically, Ismail casually refers to this point without making the link between such practices of nepotism and his diagnosis of issues of public services for which he holds the informal city dwellers responsible.

Yet, frustrations with such a life of marginalization amongst Khartoum's urbanites are still poorly articulated. The non-democratic nature of access to information related to public services leave many individuals in a status of political illiteracy such as the case of the off-grid refugee family of Suad. Suad is subjected to multiple layers of exclusion exercised by multiple actors; firstly, by the state that excludes public housing schemes from service delivery, by her surrounding neighborhood that doesn't make her integration within the ethnically homogenous and Arab dominated community achievable, and by the landlord who denies her any clarity about issues of services, intentionally or not.

Nevertheless, less organized modes of insurgency could be found in some individual practices. Praise of pre-paid meters for allowing self-discipline and better control of one's consumption expressed by grid-connected Ismail and Asha was contrasted by Asma's desire for greater meter manipulation. In her view, the state is something to get around and maybe get independent from eventually. Similarly, the sense of gratitude that Hamid and Yahya hold for the benevolent private MFI doesn't seem to be shared by the entire community. For many of the defaulting beneficiaries end up illegally connecting to their neighbors and splitting the instalment costs. Electricity theft via illegal connections is also something SEDC is struggling with:

*R: now I see that there are the new network lines, where the three lines are tied together. Is this one better in terms of efficiency or safety?*

*M: in the connection works it is easier, for safety reasons it is easier. We also struggle with corruption. Excuse the term but we struggle with electricity theft (Al Jabada) in peripheral areas. But with this system you can't do that. Theft is a big issue for the network, because we would put a sub-station for certain number of users with certain load, then we will shortly find that there is an over-load.*

## **Conclusion**

Whether due to the kleptocratic mismanagement of resources by the then oil-rich Islamist regime, or the current status of extreme scarcity of resources into which the state has plunged, the urban poor face the same struggles with regards to access to services. In Khartoum, the

universal ideal of democratically accessible networked infrastructure is only universal to the extent of guaranteeing for everyone the right to submit a connection application. Viewing this conditionality in a light of equality doesn't qualify it as socially just in a context of high fragmentation. The variations encountered in the studied cases in terms of access to electricity significantly overlap with the historical ethnic and socio-political differentiations in the country. Even at the scale of a single locality, the power dynamics that have been halting the shift to a more equitable and conflict-free country are all present.

On one hand, there is the seamless integration into the urban fabric of the old residents of "formal" Khartoum in their sense of entitlement to public services that was tainting Ismail's answers. Or that of the socially mobile; a mobility that is reserved for the few to which Asha happened to belong to, what fuels her faith in the system in place. On the other end of the spectrum, there are Asmaa and Hamid displaced by the economic hardship in the war-torn western Sudan, or Suad escaping the terror of war in the newly independent South Sudan to the country that they desperately wanted to stop calling home. For them, finding a foothold in the city is the least evil, while accessing its services is something that was met with gratitude as a public favor, with sense of puzzlement as a highly complex matter or with skepticism of the state's promise that was never met. Most of the time, their needs, back home or at the city fringes, are not met by the state but by a myriad of alternative actors. In other words, the analysis of differential access to electricity supply shows that the colonial device of "decentralized despotism" (Mamdani 1996) of the colonial indirect rule, that was historically reserved for the rural subjects to keep them under control without carrying their administrative burden, and later inherited by their postcolonial successors, is accompanying the rural migrants to the city.

Articulation of policies and institutional architectures by a state that has been historically captured by a minority, remain at the service of the needs and priorities of the elite. As long as the current configurations are functioning for this elite and its allies at both ends – at the supply side as a market for employment and investment, and the demand side as targeted receivers –

these configurations will continue to be depicted as the only imaginable blueprints for formal policies.

## Chapter 6 - Conclusion and recommendations

The studied cases in Eastern Nile locality have covered three main electricity users' categories; firstly, those grid-connected via the standard producers set by the Sudanese Electricity Distribution Company (SEDC). The second are those grid-connected via emerging models that could be classified as micro-financed co-production grid-connection. The third are those who remain off-grid and follow alternative routes. The research findings point to the fact that the issue of access to services in Khartoum, as in other Southern cities, is becoming more and more a complex and multi-faceted question with overlapping historical and spatial factors. While the Northern paradigm of networked infrastructure with its decades-long failure to attain the modern ideal of universal access to services is still the dominant mode in formal policies, the proportion of the population for which the state's institutions are catering is rapidly decreasing due to the general state of impoverishment that both the supplying and the receiving ends are suffering.

Listening to both sides of the delivery equation, the supplying and the receiving side, one is left puzzled. The supplying electricity companies are barely capable of maintaining themselves operational and are highly dependent on the central treasury even for their day-to-day operations, and their flow of funds is way slower than the pace at which the city is sprawling. The same hardship that emptied the state coffers and swelled the capital's peripheries is depriving these same rural migrants and IDPs from earning enough money to afford their imagined urban life. While grid connection is not strictly tied to tenure status, with different tenure modalities accepted by SEDC, connection costs can leave a considerable number of urban dwellers off-grid. Not only the so called "informal" or undocumented residents are left in the dark, but also recognized beneficiaries of public housing schemes can spend years before accessing the grid whose connection costs are supposed to be included in their instalments. A few elements that could be abandoned, adopted or improved will be discussed in the brief sections below.

### **On the short-term: re-shuffle available resources**

The benefits gained from the experience of the co-produced micro-finance project in Al Tawidat hint at the fact that re-organizing the same available resources differently could make significant improvements in communities' lives within reasonable time. That devising organizational models whose parameters speak to targeted communities' means and needs have better chances of functioning for all actors involved. If we think about the key three players in this model; the public sector, the private and the community, they all won to varying degrees. Harnessing its ability for larger institutional coordination, the public sector has managed to extend the reach of its services without being asked to add this cost to its deficit-ridden balance sheets. At the same time, the private sector has found a niche market where it can make lucrative margins from a conventionally high-risk clients' segment whose "risk" is partially mitigated by the public sector such as in linking the monthly instalments with SEDC pre-payment system. As for the community as a service receiver, and when compared to the monthly paid formal employees, income patterns for the urban precariat are characterized by a flow of small sums over shorter intervals. Therefore, models that use monthly or weekly instalments as in Al Tawidat project can work better than the current SEDC model that expects a huge once-off payments.

The issues with Al Tawidat project mainly stem from the fact that, as a nascent model, ambiguities surrounding several aspects of it have left a wide room for power abuse by the different actors at different phases. This shortcoming points to the necessity of striking a balance between the need for clearly defined duties along with their enforceable accountability measures without falling into the trap of rigidity that undermines the autonomy and flexibility of low-level actors.

## On the long-term: phase out from connecting new customers to centralized grids

The global shift towards renewable energy (RE) sources makes any long-term plans that doesn't take into consideration a gradual phasing out of the high dependency on conventionally generated electricity into a kind of perpetuation of the access problem. Compared to other neighbouring countries, Sudan is falling behind in terms of installing or planning for renewable-based power projects, with only two small mini-grids, 5 MW each, recently inaugurated (Sudanese Thermal Power Generation Company, 2018) compared to 109 systems totalling 158 MW in Tanzania (World Resources Institute, 2017). Abandoning rigid national grids configurations can automatically eliminate too many technical, financial and governance inefficiencies.

The steadily decreasing cost and rising efficiencies of RE technologies that brought the global installed capacity from 40 GW in 2010 to 480 GW in 2018 (IRENA: <https://www.irena.org/Statistics>), are providing an opportunity to access free and local energy sources. This is coupled with a growing number of new and disruptive innovations in technical and financial systems such as ICT solutions facilitating communication, remote-control and virtual banking. Consequently, all this could result in greater flexibility with production sites, elimination of transmission costs and labyrinthian bureaucratic procedures. More importantly, locally produced and managed energy sources are the best way for involving local communities in decision making, installation and operation of energy systems.

Particularly with emerging voices like Suad's and Asmaa's, expressing a desire for greater autonomy from the central state whose willingness to provide for its poor population is steadily diminishing. These are the people for whom the promise of a universal modern infrastructure was never fully met to engrave this faith in the mighty central power without which their daily needs wouldn't be delivered as Asha, Ismail and too many privileged urbanites believe.

### **In other words: Keep it decentralized, eliminate the despots**

If the narrow options for technical solutions available and relatively abundant finance that was at the disposal of 19th century Northern metropolises have oriented the conception of urban infrastructure into such a state of highly centralized and rigid configurations, this is not the case today in many Southern cities. The landscape of our world's resources today is that of remarkable breakthroughs in flexible technical configurations for power generation, scarce financial resources at the level of Southern cities and a global finance seeking new markets. The scalability and relatively low complexity of these new technologies can eliminate technical barriers but can't automatically result in their democratic deployment given the varying power dynamics within which they could be deployed. Particularly, celebrations of such technological innovations have been recently put into question with private developers co-opting them to further extend their reach into and exploit marginalized communities, raising the question of how their benefits could be reclaimed.

In Khartoum, the limited consolidation of state power is currently leaving a huge void in service supply which is increasingly filled by a heterogeneity of actors and whose degrees of "despotism" is subject to the combination of contextual elements with their personal interests. Nevertheless, the state of helplessness in which many urban dwellers live that can render them desperate for larger involvement of the state, shouldn't orient the transformation agendas towards higher centralization. Agendas for change should identify the contextual lines along which demands could be articulated in a way that enables citizens an equitable and democratic access to services without entangling them into the disempowering networks that the elitist state can operate or mediate. Ultimately, a call for larger decentralization of services production and operation without being accompanied by an adequate regulatory framework will do nothing but change the face of the despot. Research for academic or non-academic ends should explore the optimal combination of ownership models between public, private and community actors, levels of community involvement in the different phases and clearly defined accountability channels. A project to which this research hopes to contribute -even a small building block- by

shedding some light on the dynamics in play between the delivering and the receiving actors in the strikingly fragmented context of Eastern Nile locality.

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Primary sources: list of interviews and interviews questions

Interview	Details
Interview-SEDC office, August 2020	Interview with Yosif a telecommunication engineer from one of SEDC's Khartoum offices.
Interview-SEDC Projects and Planning, September 2020	Interview with Maaz, electrical engineer at SEDC head offices, department of Projects and Planning.
Interview-Eastern Nile locality Center for Information, March 2020	Interview with Abbas, the head of Center for Information at Eastern Nile locality head office.
Interview-Khartoum North Control Room, January 2020.	Interview with Hala, control room operator at Khartoum North central offices.
Interview -SETC, July 2020	Interview with Omer from the Sudanese Electricity Transmission Company.
Interview-Al Fayhaa, April 2020	Interview with Asha and her mother Fatma in Al Fayhaa., 1 <sup>st</sup> class area.
Interview-Al Wadi Al Akhadar, January 2020	Interview with Suad in her house in Al Wadi Al Akhdar, 3 <sup>rd</sup> class area.
Interview - Al Haj Yousif, March 2020	Interview with Ismail in Al Haj Yousif- Al radmia, 2 <sup>nd</sup> class area.

Interview- Al Mozdalfa, February 2020	Interview with Asmaa from Al Haj Yousif Al Mozdalafa, 2 <sup>nd</sup> class area.
Interview-Al Tawidat. January 2020	Interview with Hamid and Yahya in Al Tawidat, 3 <sup>rd</sup> class area.

## Annex A: Interviews Questions

The questions below were used as guiding questions for the interview that took on the form of a free conversations.

### Households Interview-Grid connected

#### General

Date

Name

Age

Geographical area

#### Socioeconomics

Type of access (grid, other)

How regular is the electricity supply (hours of blackouts during the week)

What is your biggest concern when the power goes off?

How much do you pay/buy per month?

Does the tariff include water/waste?

How do you find the electricity cost?

Do you know the source of the electricity that you access?

What do you know about this source (good, bad, etc)

What do you think about other alternatives (e.g., solar, biogas)?

## **Distribution ;**

Metering system (pre-paid/post-paid)

How/where do you buy electricity?

How do you compare the prepaid meter with the old meters? (If applies)

Which one is better?

How do you find the purchase process (slip, card, digits to enter, etc)?

## **Energo-politics**

What is the importance of electricity for you and for your community in general?

Do you see any danger associated with your current supply system?

In your opinion, what is the reason behind the unreliability of the supply (if applies)?

What is the best way to solve it?

What do you think about authorities' performance?

In your opinion, who is responsible for ensuring reliable supply (individuals, municipalities, neighbourhood committees, central government, etc)?

## **Households Interview-off-Grid**

### **General**

Date

Name

Age

Geographical area

### **Socioeconomics**

Type of access (grid, other)

What alternatives do you use for: lighting?

Cooking

Food preservation

Associated cost in SDG for these alternatives

How do you find these costs (affordable, not)?

How does these costs compare to your monthly budget (%)?

When are you expecting to have access to the grid?

What do you think about other alternatives (e.g. solar, biogas)?

### **Energo-politics**

What is the importance of electricity for you and for your community in general?

If you have the option to connect only one thing/appliance/device, what would it be? Why?

Do you see any danger associated with your current supply system?

In your opinion, what is the reason behind the unreliability/lack of the supply (if applies)?

What is the best way to solve it?

What do you think about authorities performance?

In your opinion, who is responsible for ensuring reliable supply (individuals, municipalities, neighbourhood committees, central government, etc)?

### **Officials interviews: Sudanese Electricity Distribution Company (SEDC)**

Date

Interviewee

Tariffs components: is the tariff the same all over the country?

Do all the customers have prepaid meters?

Subsidy level (%): how does the subsidy system work? What is the average actual cost/kWh?  
How much of it is subsidized?

Is there a difference between commercial, industrial, agricultural and residential users?

Other responsibilities of distribution companies

Schematics for the distribution network (33/11kV) for Al Haj Yousif, Eastern Nile?

Supply profiles (Summer/Winter Day, Annual profile MVA Vs Time)

Connection cost for new house zone 1, 2, 3?

Cost of Km of grid extension? For the distribution company, for the client?

How do you work with new areas? Do you coordinate with Land authorities regarding allocation of new plots, release of new housing project, Sakan Shaabi or commercial?

How does the distribution company work with the water authorities to estimate monthly fees?

Are they aware of users who build new houses but don't apply for connection because of high connection fees?