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SPECIAL FEATURE: ORIGINAL ARTICLE

Urban Sustainability and the Governance of Heterogeneous Energy Systems

Power struggles: urban heterogeneity and unruly electricity access in Dar es Salaam

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Abstract

Among the considerable challenges many African utility companies and governments face in universalising electricity access are the economic losses and technical problems resulting from irregular practices of electricity access. Despite its concerted efforts, TANESCO—the Tanzania Electric Supply Company—is no exception to this. Against this backdrop, this study empirically investigates the tensions between energy access and cost recovery goals and the spatially heterogeneous practices of unruly electricity access in Dar es Salaam. Here, organised networks of street electricians act as intermediaries between TANESCO and electricity users and facilitate energy access in a grey zone of illegality, informality and entrepreneurship. We studied two contrasting neighbourhoods in Dar es Salaam: Mabwepande, an unplanned peri-urban neighbourhood with low- to middle-income residents, and Msasani, a low-density neighbourhood of wealthy households and upmarket hotels and businesses. Based on a literature review and the analysis of policy documents, utility reports and statistical data, participatory observations and interviews with key stakeholders, our empirical investigation demonstrates that the phenomenon of widespread unruly energy access practices is far from exclusive to low-income communities: in Msasani, wealthy urban households and local businesses have developed sophisticated practices of energy theft, causing a considerable financial burden to the utility company. Our findings indicate that to address irregular energy access more effectively, more differentiated policy responses are needed that take account of the heterogeneous user experiences within cities and that take advantage of informality and entrepreneurship as potential resources for infrastructural and urban futures.

Keywords Energy theft · Electricity · Urban infrastructures · Energy policy · Informality · Dar es Salaam

Introduction

Since the inception of Tanzania, deliberate efforts have been made to make electricity universally accessible. Together with national governments and international donors, the vertically integrated parastatal Tanzania Electric Supply Company (TANESCO) has achieved substantial progress in electrification in the nation's commercial centre Dar es Salaam. Yet, TANESCO has struggled to provide affordable and reliable electricity services to all urban residents, meet the increasing energy demands of the rapidly growing city and shift towards clean energy. Among TANESCO's fundamental challenges are the persistent problems of cost recovery, its heavy reliance on government grants to finance investments and its default on loans from both the government and the World Bank (Huenteler et al. 2020). Between 2010 and 2017, only 74% of its full costs could be recovered (ibid., p. 53). There are three main reasons for the limited

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financial viability and low cost recovery rates: first, massive investments in extending the capacity of power generation (e.g. USD 2.9 bn in the contested Julius Nyerere Hydropower Station) and in transmission and distribution grids far exceed revenues; second, the Tanzanian government has regularly intervened in setting tariffs to spur economic growth, increase users' disposable income and enable poor residents to access electricity; third, significant technical and non-technical system losses, which together exceed twice the global average, restrict TANESCO's efforts to recover its costs. From 2000 to 2014, an annual average of 20% of the electricity fed into the transmission grid was not metered/billed (OECD/IEA 2018). These factors are deeply intertwined with Tanzania's historical and political–economic context (for details, see van der Straeten 2023; Degani 2022; Andilile and Kapaya 2021; Ghanadan 2009): The colonial era left a legacy of splintered energy networks designed to serve White colonial areas and extractive networks of plantations and railroads. In the post-colonial period, the country faced numerous challenges, including state financial and currency crises, reduced support from international donors, shifts in lending policies and priorities, and the adverse effects of market-oriented reforms in the 1990s.

Urban residents' and businesses' practices of irregular energy access are a particularly intractable challenge. In 2009, the hidden costs of distribution losses in sub-Saharan Africa exceeded 0.5% of the countries' GDP (World Bank 2009). In Tanzania, Dar es Salaam alone accounts for more than 60% of the national revenue loss arising from non-technical electricity losses—a deficit of USD 13.5 million between 2010 and 2018 (see Table 1). Despite multiple counterstrategies in the last 10 years, these losses persist, with the result that TANESCO, like many other electricity companies in the global South, must either remain trapped in a spiral of weak revenues, underinvestment and dependency on governmental subsidies or international donors, or must impose higher tariffs on its paying customers. Besides these economic challenges, irregular access also results in significant technical and managerial challenges for TANESCO in balancing electricity loads, securing grid stability and building resilience to blackouts. These impacts harm the poorest segment of the population the most, who tend to be the first to remain disconnected, be unable to afford electricity or be exposed to load shedding (Eledi Kuusaana et al. 2023).

Over the last two decades, considerable research efforts have contributed to a better understanding of irregular electricity access in countries of the global South: several studies have documented that irregular access to basic services is not solely driven by the accessibility and affordability challenges of energy users, but also by mistrust between users and their supplier, cultures of corruption, poor energy governance (Winther 2012; Never 2015) or the state's tolerance of irregular power access (López-Cariboni 2019). Other authors have investigated practices of illegal connections, meter tampering, billing irregularities, etc. (e.g. Smith 2004; Gaur and Gupta 2016; de Bercegol and Monstadt 2018). Much research has focused on the negative impacts of electricity theft, be it on the cost recovery capacity of many utilities or the technical and managerial challenges of load management (e.g. Depuru et al. 2011; Jamil and Ahmad 2019). Finally, multiple studies have proposed varied strategies for combating non-technical losses (e.g. Depuru et al. 2011; Jamil and Ahmad 2019; Yakubu et al. 2018).

Although the aforementioned debates provide important insights into irregular electricity access, several research gaps remain. First, irregular access—and informality in general (Mercer 2020; Roy 2005)—has been misdiagnosed for too long as a phenomenon prevailing primarily in poor neighbourhoods, and the non-technical losses resulting from the irregular practices of large commercial and industrial users and high-income residents have mostly been disregarded (exceptions are: Winther 2012; Degani 2022). Secondly, debates on illegal or "informal" energy access often obscure the involvement of state authorities, public utilities and professional intermediaries who either ignore or facilitate unruly energy access. Finally, research has often focused on universally applicable, techno-managerial strategies for combating electricity theft.

We argue that to mitigate irregular access more effectively, it is necessary to evaluate and address the spatially variegated practices of unruly energy access more systematically. In this paper, we therefore aim to reveal how practices of unruly energy access are shaped by distinct socio-economic and spatial contexts, (non-) payment practices and the accessibility to electricity networks. By showing how non-technical losses happen in grey zones between illegality, informality and formality, our objective is to provide a more differentiated and ambiguous picture of "energy theft" than in mainstream debates and to reflect critically on techno-managerial strategies for reducing non-technical losses. To this end, we empirically explore the variegated practices of irregular energy access in two of Dar es Salaam's neighbourhoods: Mabwepande, a growing peri-urban area, characterised by informal settlement growth and splintered electricity networks, and Msasani, a wealthy neighbourhood of Tanzanian political and economic elites and upmarket hotels and businesses, characterised by universal electricity access. Drawing on field research conducted between 2018 and 2021, we examine unruly energy access at the neighbourhood and city scales and discuss implications for energy policy.

Below, after reviewing the literature on irregular energy access to highlight the research gaps that our research seeks to address, we present our methodology. We then explore the tension between Dar es Salaam's ambition to increase energy access and cost recovery and the role of *vishoka*, the

street electricians who are often seen as 'conmen' posing "as Tanesco workers… [with]… fake IDs and stolen uniforms" (Degani 2022, p. 143). Our case study of the two neighbourhoods follows. It reveals that unruly practices of energy access are far from exclusive to low-income neighbourhoods: wealthy neighbourhoods and local businesses have also developed sophisticated practices of energy theft, thereby posing considerable financial burden on the utility company. In conclusion, we discuss the ambiguity of practices of unruly energy access and reflect on adequate energy policy responses.

Understanding irregular energy access: a literature review

According to USAID, high technical and non-technical losses in power transmission and distribution are "the canaries in the coal mines", i.e. early signs of poor management, corruption and/or shortage of resources and expertise warning investors, donors and governments about an electricity utility's likely financial and operational inefficiency (Lawaetz 2018). Major reasons for power losses in global South countries are non-technical (ibid.), i.e. the electricity delivered by a supplier is not paid for by the users. Whereas well-performing utilities in the global South may expect a total loss of 10% or less (ibid.), electricity losses averaged 15% in Africa in 2020 (IEA 2022, p. 130) and 16.4% in Tanzania in 2017 (RVO 2018, p. 9). A utility with high losses, USAID concludes, "is unable to collect the revenues necessary to cover their operating costs and is 'decapitalizing' or unable to maintain their system assets, resulting in outages and voltage fluctuations for existing customers and inability to expand to new customers" (Lawaetz 2018, p. 1). Negative financial viability assessments often cause international donors to be reluctant to support investments in the utilities concerned, and utility companies are put under increasing pressure from the World Bank and other international donors to recover their costs and commercialise their services (Ghanadan 2009). However, studies show that key solutions proposed by donors, e.g. increasing tariffs for paying customers or instituting punitive measures, such as disconnecting defaulting users, disproportionally impact the urban poor, since electricity payments represent a significant share of their household income[1] (ibid.; López-Cariboni 2019).

In recent decades, a vigorous debate mainly focusing on sub-Saharan Africa, Latin America and Southeast Asia has explored the impacts of non-technical losses, particularly energy theft, its causes and mitigation. As a result of high non-technical losses, international donors see many electricity utilities in the global South as being trapped in a vicious cycle of weak revenues, significant financial losses, underinvestment, austerity pressures, dependency on public subsidies or on injections of capital by international donors and increasing indebtedness, or having to impose higher tariffs on their paying users (Lawaetz 2018; IEA 2022). Besides hampering cost recovery, energy theft adversely affects load management, as it makes it difficult for utility companies to estimate how much electricity they need to provide to their consumers—whether paying or illegal (Depuru et al. 2011). Thus, electricity theft also poses significant technical and managerial challenges to securing grid stability and building resilience to blackouts. For example, electricity thieves may unknowingly feed power back into the electricity lines, causing blowout of the system (Blimpo and Cosgrove-Davies 2019). Moreover, illegal and secondary connections can pose a significant safety hazard for users due to poor wiring and the absence of safety measures.

According to Smith (2004), the various ways electricity can be stolen include theft, fraud and unmetered supply (see also Jiménez et al. 2014). In many Southern cities, it is not uncommon to find users circumventing electricity meters illegally by connecting wires to electricity poles. Even when electricity meters are in place, users often tamper with them (e.g. by using magnets) to reduce the meter readings. Finally, users either default completely on their bills or bribe utility employees to record lower than actual readings, both of which lead to billing irregularities and non-payment or underpayment for electricity consumed (see also Gaur and Gupta 2016; Jamil 2018; Jamil and Ahmad 2019). Beyond such illegal practices by users and rogue utility employees, non-technical losses can be aggravated by utility companies' mismanagement, including miscalculations or errors in accounting and record keeping and lack of proper registration (Jiménez et al. 2014).

Four significant causes of electricity theft have been identified by existing research. The first are losses occurring when defective or unintentionally damaged meters do not record the correct amount of electricity consumed. The customers involved may be unaware of the problem until notified by power utility staff. The second cause is related to the challenges poor residents face when they cannot access electricity because they are not connected to power grids or cannot afford electricity. For example, Jamil and Ahmad (2019) point to users' income and the price of electricity as the

[1] Affluent households in Tanzania incur higher absolute electricity costs due to their extensive use of electrical appliances—such as refrigerators, air-conditioners, televisions and computers—and because they do not benefit from lifeline tariffs designed for low-income users. However, low-income households allocate a significantly larger portion of their income to basic energy needs, particularly for cooking and lighting. Lusambo (2016) indicates that low-income households spend between 28 and 34% of their income on energy.

most important factors that influence electricity theft, arguing that with the rising income of users, electricity theft falls (see also Smith 2004). Other authors argue that financial insecurity (i.e. insufficient income, unpredictable income flow and credit constraint) correlates with users' ability to pay for electricity (Carr and Thomson 2022). Furthermore, the high connection charges often exceed users' financial capacity, so in many African countries it is common practice to seek alternative means to secure electricity, including sharing a meter with neighbouring households, usually based on informal payment agreements (Smith 2019). However, Winther (2012) challenges simplistic assumptions that theft is primarily driven by limited affordability. She found that wealthy users are more likely to steal as they have the resources to bribe meter readers, invest in technology to circumvent the meter or use other means (see also Degani 2022). Affluent residents may perceive the employment of intermediaries to tamper with electricity meters or install bypass switches, as well as allocating funds to bribe inspectors if detected, as strategic long-term investments to reduce ongoing utility expenses (Degani 2022, p. 141).

Third, in addition to affordability issues, it appears that some users refuse to pay for electricity as a form of resistance to and an expression of dissatisfaction with utility companies' poor and unreliable services and bureaucratic procedures. In Uganda, Never (2015) highlights that non-payment of bills and illegal connections are "largely accepted as an informal, social and practical norm arising from poverty, inability to pay and frustration with scant service delivery" (ibid.: 204). Additionally, she underlines consumers' distrust that the utility company will reinvest revenue fairly (ibid.). Similarly, Winther (2012) demonstrated that the low performance and lack of investment by utility companies can jeopardise users' trust in the provider and state authorities, leading to a lack of compliance with payment rules. Particularly in low-income areas bypassed by network extensions, electricity can often only be accessed through illegal connections. Here, non-payment may dominate, since users see electricity as a basic service that the state or state-owned utilities should provide for free (de Bercegol and Monstadt 2018).

Finally, several authors have asserted that countries with ineffective accountability, unstable political environments, inefficient governments and corruption experience the most electricity theft. It is well documented how utility employees have accepted bribes that lead to non-payment or reduced electricity bills (Smith 2004; Gaur and Gupta 2016; Carr and Thomson 2022). Other crucial drivers of power theft in the global South pointed out, in addition to corruption and bribery, are poor governance, including lack of effective accountability, weak law enforcement and political instability (Gaur and Gupta 2016; Never 2015; Depuru et al. 2011). Furthermore, utility employees may tacitly tolerate specific forms of theft, bribery and other unruly practices (Degani 2022). Such tolerance of unruly access to basic services by state authorities, López-Cariboni (2019, p. 288) argues, may reflect an intentional "social policy by other means" as a "cost-efficient and politically viable strategy to increase levels of de-commodification of dislocated and poor voters during negative income shocks". Unlike a failure of the state, it can thus be seen as an informal redistribution mechanism benefitting poor energy users (and voters).

In the last decade, a slew of literature has discussed effective strategies for combating non-technical losses (e.g. Jamil and Ahmad 2019; Yakubu et al. 2018) or regularising electricity access (Pilo' 2017; de Bercegol and Monstadt 2018). Although the socio-political and cultural parameters of irregular electricity access have been well established by multiple studies, both research and utility policies tend to focus primarily on universal technofixes, such as "smart", tamper-proof metering technology, theft detection technology, the securitisation of transformer stations (e.g. Depuru et al. 2011), or effective sanctioning mechanisms and the prosecution of unruly users. Utilities across the global South have introduced new payment regimes and have radically moved towards prepaid electricity systems (Baptista 2015) to deny access to non-paying users and improve revenue collection. However, as Carr and Thomson (2022) indicate, the cost of implementing prepaid meter schemes is significant and the cost–benefit ratios might be overestimated. Moreover, progress in tamper-proof meters has been accompanied by the inventiveness of professional intermediaries who circumvent or manipulate meters (de Bercegol and Monstadt 2018).

Overall, previous debates have provided important insights into utility companies' significant losses from energy theft and the resulting challenges of attaining universal and reliable access to energy and of combating energy theft, particularly given poor residents' inability to pay electricity tariffs and connection fees. However, although multiple studies have highlighted the spatially and socio-technically heterogeneous energy constellations within Southern cities and the huge differences between neighbourhoods and user groups (e.g. Koepke et al. 2021; Rateau and Jaglin 2022; Silver 2023), most studies treat irregular access primarily either as a phenomenon restricted to low-income groups and neighbourhoods or as occurring uniformly within cities. We argue that exploring the heterogeneous practices of energy theft and their situatedness in specific spatial contexts is essential to effectively regularise energy access and improve the viability of energy utilities. Particularly, the practices of energy theft among high-income groups or businesses need to be better understood and tackled by utility companies and state authorities. At the same time, we contend that scholarly

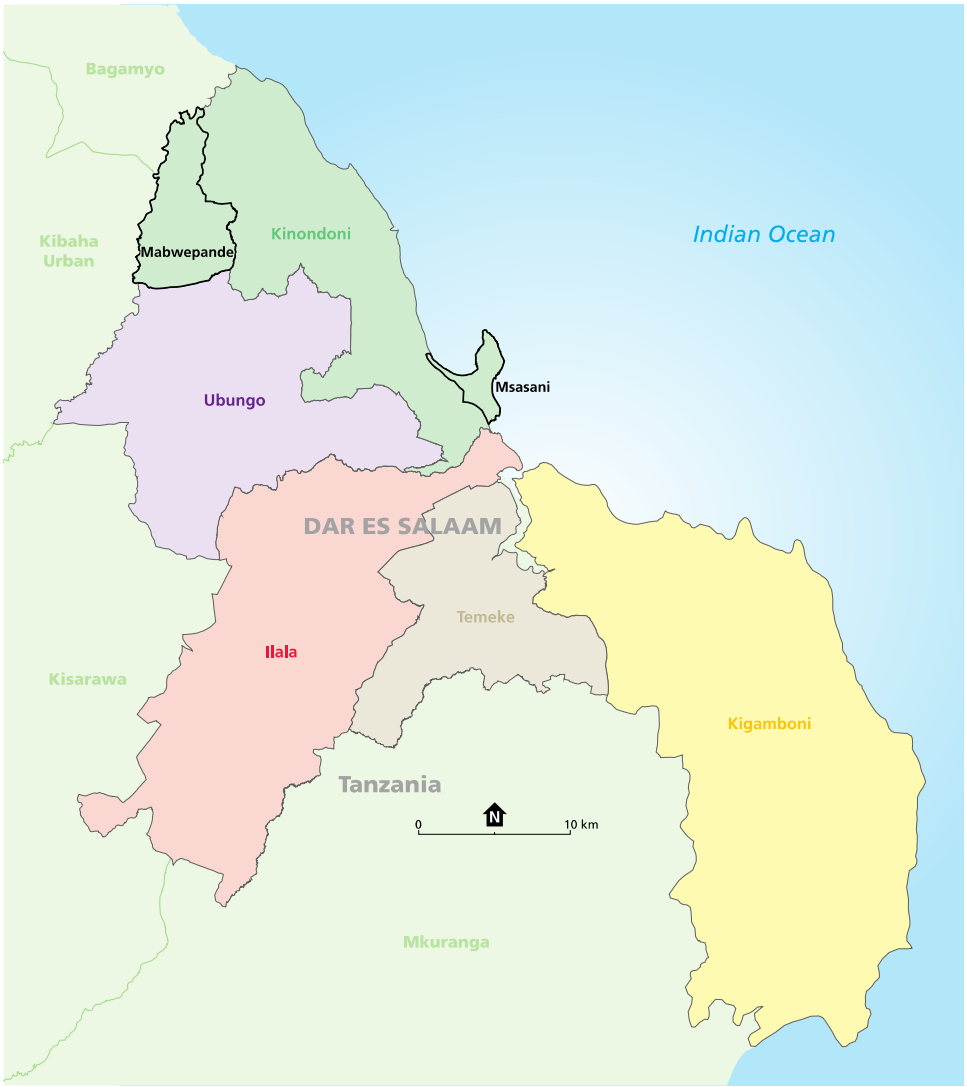

Fig. 1 Dar es Salaam's five districts and the location of the wards of Mabwepande and Msasani. Source: own map

focus should shift from the pejorative debate about energy theft and instead engage with the ambiguity of irregular energy access practices.

Methodology

To explore electricity theft in Dar es Salaam, we combined the analysis of policy documents, utility reports and statistical data with field research involving participatory observations of neighbourhoods that differ considerably in their socio-economic composition and built environments. After scoping different neighbourhoods in Dar es Salaam, we selected two contrasting neighbourhoods in Dar es Salaam's Kinondoni district (see Fig. 1). We investigated irregular electricity access and the role of *vishoka* in Mabwepande, a peri-urban ward 35 km from the city centre, where the predominant land use has shifted from agriculture to residential. Low-income households mostly occupy this peri-urban ward, which has been expanding rapidly since the mid-2000s. Interviews with the Ward Executive Office in 2019 confirm that over 75% of the settlement is unplanned and informally occupied. Between 2012 and 2022, the ward's population grew by 262%: from 25,460 to 66,794 residents (Kinondoni Municipality 2018; URT 2022b). Most residents are low income and face challenges in their access to electricity and other networked infrastructure services.

The other neighbourhood, Msasani, is a settlement of high-income households and businesses on a peninsula in the Indian Ocean. Originally planned during the colonial era as a residential area for Europeans, it has become home to Tanzania's elites. Apart from residences for politicians and expatriate workers, the settlement has government offices, schools, hospitals, tourist hotels and luxurious supermarkets. Its population density is relatively low, with low-density plot sizes ranging from 1200 to 2000m^2. According to official

records,[2] Msasani's population fell slightly in the last decade to ca. 40,000. Unlike Mabwepande, in Msasani there is universal access to electricity.

In both wards, non-structured interviews were conducted between 2018 and 2021 with key informants, such as entrepreneurs, employees in educational facilities and public administrations and one prominent street electrician. In addition, semi-structured interviews were held with representatives of the Ministry of Energy, TANESCO's revenue protection office, and of Dar es Salaam's City Council and with ward executive officers of Msasani and Mabwepande. In Mabwepande, we also interviewed several residents, while this turned out to be difficult in Msasani. Similarly to Degani (2022), it was difficult to gain access to the owners of wealthier, fenced properties, as house staff and security guards kept insisting that they were not authorised to provide information on energy access. Most interviews were conducted in Swahili and transcribed; the quotes reproduced here have been translated into English.

The preliminary findings and potential counter strategies were discussed and commented on in two "Community of Practice" meetings held in Dar es Salaam in 2020 and 2023 involving key stakeholders in the energy sector, policy and finance and spatial planners, at which we discussed the need for a more differentiated and place-based approach to non-technical revenue losses and the regularisation of street electricians.

The tension between energy access and cost recovery: the case of Dar es Salaam

With an estimated population of 5,383,728 residents in 2021 (URT 2022b) and an average annual growth rate of 5% (World Population Review 2023), Dar es Salaam is East Africa's largest and most rapidly growing city and the economic hub of Tanzania. As multiple studies have shown, settlement growth is occurring primarily beyond official planning designations. There are uncoordinated and hybrid mosaics of informal, quasi-formal and formalised settlement patterns, including sporadic redevelopment and gentrification in the old planned and unplanned settlements, widespread incremental settlement growth and planned neighbourhoods without basic infrastructure services (e.g. Kombe 2005; Todd et al. 2019; Mercer 2020). In recent decades, efforts to confine urban growth, regulate land uses and initiate a more coherent land development through several master plans have, at best, been palliative. Like in many African cities, the reach of state authority in land use planning and the provision of public services has been patchy (ibid.).

Constrained by their financial and institutional resources, the city authorities and public utilities struggle to adequately keep up with rapid informal growth and their delivery of infrastructure services has remained splintered. However, compared to water and wastewater services, the state-owned public utility TANESCO has made substantial progress towards universal electricity access in Dar es Salaam. Electricity access in Tanzania increased from 7% in 2011 to 37.7% in 2020, with the government setting a target to achieve universal access by 2030 (World Bank 2022). The national government claims to have already achieved universal electricity access in Dar es Salaam, but the national energy policy defines this as grid coverage or the "percentage of the population living within 600 m from a transformer" (URT 2015, p. 8). The latest national household survey draws a more realistic picture, indicating that 80% of households in the city are physically connected (URT 2020, p. 31), which means more than 1 million urbanites are not connected to formal electricity grids. Moreover, even households physically connected to the grid cannot always afford electricity or experience intermittent load shedding and power blackouts due to regular power shortages and limited grid capacities (Eledi Kuusaana et al. 2023; Koepke et al. 2021). As a result, highly heterogeneous socio-technical alternatives to centralised electricity supply have emerged, such as individual off-grid installations, backup systems, informal subscriber–retailer arrangements between landlords and tenants or between neighbouring residents, or illegal network extensions.

As has been demonstrated, Dar es Salaam's heterogeneous and highly unequal energy landscape differs considerably across neighbourhoods (Koepke et al. 2021). Such heterogeneity is shaped by limited spatial coverage and differentiated service levels of centralised networks and by residents' distinct socio-economic status and political clout, the local settlement patterns (e.g. densifying neighbourhoods, planned or unplanned influx of new residents or sprawling peri-urban neighbourhoods) and the urban functions of each neighbourhood (e.g. residential, commercial, industrial) (ibid.). At the same time, the reliability of electricity supply and frequency of blackouts differ considerably across the city, with high-income areas, industrial districts, upmarket hotels, service industries and government buildings experiencing planned and unplanned interruptions less frequently (Eledi Kuusaana et al. 2023). At the same time, official urban energy policies in Dar es Salaam and TANESCO's investments focus primarily on incrementally achieving the ideal of a uniform and universal electricity grid while ignoring the complex interplay with service co-provision beyond or complementary to the conventional grid (Koepke et al. 2021).

[2] Statistical data from the national census and the municipality indicate that the population fell from 48,920 in 2012 to 40,406 in 2022 (Kinondoni Municipality 2018; URT 2022b). However, the reliability of the data is questionable.

Since the 1990s, TANESCO, the country's principal electricity generator, transmitter and distributor, has undergone radical reforms to achieve the political goals of universalising electricity access and improving its financial viability. Ghanadan (2009) has vividly shown how the World Bank imposed the commercialisation of utility services and laid the foundations for the outsourcing of TANESCO's management to a South African contractor for an interim period at the beginning of the 2000s. To improve cost recovery, the private contractor initiated a shift toward prepaid meters, launched aggressive disconnection campaigns for defaulting users with conventional meters, raised tariffs, scaled back residential lifeline tariffs, and retrenched nearly a third of TANESCO's workforce (ibid.). Since the private company only partially succeeded in increasing revenue collection but failed to invest in the grid or new power plants, the plans for TANESCO's full privatisation were reversed in 2005, and the utility governance was reverted to its previous institutional structure (for further details see Dye 2021; Degani 2022; Godinho 2023). In the following years, TANESCO invested massively in increasing its generation capacity with natural gas and major hydropower plants and in grid expansion. Somewhat reluctantly, it has also started to facilitate an enabling environment for solar home systems and allowed limited private sector participation in the generation and distribution of electricity in rural areas (International Trade Association 2022). At the same time, a differentiated tariff system based on users' average consumption has been implemented, with its first tier of monthly 75 kWh being charged at a highly subsidised lifeline rate.

To increase the recovery of TANESCO's heavy investment and to service its increasing debt burden, the energy regulator approved TANESCO's plan to increase its tariffs by 8.53% in 2017. This triggered a fierce public controversy, and the nation's then President Magufuli sacked TANESCO's Managing Director, since tariff increases would stymie his industrialisation and "energy-for-all" plans. The controversy was followed by the president's decision to radically reduce the fees for urban household and industrial connections.[3] However, given TANESCO's increasing indebtedness, the severe criticism by the company's auditors and regulatory authority, and growing difficulties in qualifying for international loans, Magufuli's successor, President Samia, reversed this decision in 2020 and approved a radical increase of connection charges differentiated according to the distance to the nearest electricity pole.[4] To relieve TANESCO from its increasing indebtedness[5] and to sustain its operations, the national government initiated a debt-to-equity swap.

Because of the utility's massive financial problems, TANESCO's non-technical losses have gradually become the focus of its cost recovery ambitions. The National Audit Office regards meter tampering as the primary cause of TANESCO's financial losses. It has also called for immediate action to combat vandalism of TANESCO's infrastructures, including theft of conductors and transformer oils (URT 2022a, p. 33f.). Dar es Salaam has been experiencing a consistently high number of reported energy thefts since 2010. As Table 1 shows, the city alone accounted for 62.5% (USD 13,534,782) of the total national non-technical losses between 2010 and 2018. Nationally, more than half of the customers caught stealing energy were from Dar es Salaam. Tackling energy theft has thus become an urgent issue for TANESCO to protect its revenue base and to mitigate the frequency of blackouts and load shedding.

Combating unruly energy access and the role of *vishoka*

In the last decade, the financial crisis and increasing pressure from international donors have spurred TANESCO to adopt policies to curb non-technical losses and prosecute energy theft. Learning from international experience, the focus has been on the following techno-managerial strategies (URT 2022a):

- Apart from establishing a multi-tier tariff system, including a lifeline tariff, connection fees were drastically reduced for an interim period to incentivise legal connections but then drastically increased again.
- Particularly for new customers, the utility has shifted to prepaid meters and has invested in installing modern sealed meters and remote observer meters to surveil electricity use. This has been accompanied by punitive measures for non-paying customers: disconnecting them and charging a reconnection fee.
- New meters are remotely controlled and installed on electricity poles instead of inside houses.
- The frequency of routine inspections to monitor energy usage and investigate energy theft has been increased.

[3] Residential connection fees were reduced from TZS 177,000 to TZS 27,000 (ca. USD 75 to USD 11.5) and industrial connections from TZS 912,000 to TZS 139,000 (ca. USD 385 to USD 60) (Daily News 2022).

[4] Residential fees ranged from TZS 272,000 (USD 115 for 30 m) to TZS 590,398 (USD 250 for 120 m) and from TZS 912,014 (USD 380) to TZS 1,639,156 (USD 690) for industrial customers (Daily News 2022).

[5] This had risen to a total of TZS 3.14 trillion (ca. USD 1.32 billion) in the financial year 2021/22 (URT 2023: 17).

Table 1 Energy theft cases and revenue losses (2010–2018)

Tanzania Mainland			Dar es Salaam Region	
Year	No. of customers caught	Non-technical losses by TANESCO (in billion TZS)	No. of customers caught	Non-technical losses by TANESCO (in billion TZS)
2010	736	1.2	421	0.69
2011	194	2.1	118	1.26
2012	1700	6.2	1002	3.65
2013	4872	10.8	2858	6.59
2014	2298	5.8	1836	3.79
2015	1864	5.2	1775	4.64
2016	2173	9.4	1452	4.23
2017	1600	6.9	1008	4.99
2018	6184	2.0	1139	1.29
		49.6 (USD 21,565,217)		31.13 (USD 13,534,782)

Source: Revenue Protection Office, TANESCO, October 2019

Security guards and surveillance systems have been introduced to protect the company's critical infrastructure, particularly at substations.

- TANESCO has strengthened its relationships with leaders of local communities to protect transmission and distribution infrastructures, enhance informer reward systems and financially incentivise citizens to provide information on vandalism and power theft.
- TANESCO has launched regular public awareness campaigns on the impact of energy theft and vandalism and its potential legal consequences, including public shaming of convicted users.

Despite TANESCO's concerted efforts since the 1990s, the overall share of non-technical losses has persisted or decreased only marginally. One reason for this limited success is the practices of organised networks of *vishoka* (singular: *kishoka*)—street electrical technicians acting as intermediaries between TANESCO and electricity users. Other than *mafundi*, who repair end users' electrical appliances such as refrigerators, TVs and fans and who install electricity backups in people's homes, *vishoka* tinker with electrical systems to circumvent TANESCO's technical and bureaucratic inefficiencies and to enable, maintain or restore electricity access to households (Degani 2022; Mchome 2022). Most *vishoka* have had some formal education or have been trained by TANESCO. Many are former utility employees and some still work as TANESCO day workers. They informally provide supplemental labour to TANESCO at the user–utility interface, including various unlicensed maintenance and repair work for downed distribution lines or the provision of replacement parts. Through their informal contacts with TANESCO and familiarity with utility procedures, they can expedite applications for formal utility services (Degani 2022).

As Degani (2022) and Mchome (2022) describe, the emergence and expansion of *vishoka* as an informal profession were largely stimulated by years of disinvestment in electricity infrastructures and TANESCO's subsequent austerity measures from the 1990s onwards. Instead of mainly deploying a low- and semi-skilled work to read meters manually, issue and collect bills, etc., TANESCO followed the World Bank's recommendation to roll out remote monitoring of energy use and prepaid meters (Mchome 2022, p. 92) to rectify the company's financial position, rationalise utility operations and to combat the pocketing of illegal cash paid to rogue TANESCO employees by electricity users (Mchome 2022; Degani 2022). These measures resulted in many low- and semi-skilled employees being laid off and de facto institutionalised a labour market of temporary and underpaid contract workers and "self-employed" street technicians (ibid.; Ghanadan 2009).

Vishoka, as intermediaries between energy users and TANESCO, thus work in a grey zone[6]: as *private entrepreneurs*, they are either temporarily and informally hired by TANESCO employees or, in most cases, tasked by electricity users to perform maintenance and repair work to fill gaps caused by technical and administrative inefficiencies or scarce staffing of TANESCO's distribution services. As *informal labourers*, they are hired by users to perform unlicensed work because TANESCO is so slow to act. They

[6] Building on Yiftachel's (2009) concept of "grey spaces", Förster and Amman (2018) define grey zones as a fluid and open concept, distinct from the rigid formal-informal dichonomy. This perspective acknowledges that urban economies, practices, and actor roles are not fixed; rather, individuals and groups adapt their roles based on situational judgments and strategic considerations. Living in a grey zone requires continuous assessment and negotiation of interactions with others, navigating shifting circumstances to determine the most advantageous course of action (ibid., 10f.).

repair cables, fix loose connections and broken electrical meters, install wires or reconnect users, all tasks formally under TANESCO's remit. At the same time, they support informal subscriber–retailer arrangements between landlords and tenants or between neighbouring residents if users cannot afford formal connection fees or wish to avoid TANESCO's bureaucratic approval procedures or long delays in achieving connection. As *illegal service providers*, *vishoka* use their technical knowledge and TANESCO networks to facilitate energy theft by tampering with electricity meters and installing illegal spaghetti lines. A *kishoka* described this as follows:

> We have a big group that is well organised with good channels of accessing and sharing information regarding where we can make our deals, sharing the money we get out of such deals, have channels for communication, when we are in danger, e.g. being pursued by the authorities, as well as plans to soften the police when things go wrong. (Interview, 2019).

The above was confirmed during an interview with the Dar es Salaam Revenue Protection Officer, who underscored the presence of a well-organised network of *vishoka* with a clear line of management, working equipment and even official uniforms and fake identity cards resembling those of TANESCO officers. If their customers do not cooperate, *vishoka* may blackmail them or report them to TANESCO:

> c[A kishoka's] operations are organised in three stages: first, customers are convinced to steal energy by proposing that he can help them to do the work at a very low price; second, once a customer has consented, the theft will be facilitated; finally, to maintain incomes, customers are blackmailed, whereby the kishoka approaches his former customers and demands payment so that he does not reveal the energy theft. Should customers refuse to comply, the kishoka plays a double agent role by acting like a good citizen who volunteers to reveal that person to TANESCO" (Informal interview with a prominent kishoka, 2019).

These quotes indicate that TANESCO's austerity policies since the 1990s have resulted in the emergence of an informal business at the interface between users and the utility. While TANESCO somewhat benefits from *vishoka* contractual or informal labour, their illegal services considerably undermine TANESCO's ambitions to increase the technical reliability of power distribution and its recovery of costs. These unruly practices have also triggered a major national controversy. For example, in its 2020/21 report, the Controller and Auditor General referred to 5000 TANESCO power meter seals being on sale in unauthorised shops, further confirming the existence of loopholes that denied the utility TZS 105.49 billion (USD 45.66 million) in revenue (URT 2022a). However, as documented in the following sections, the modalities of irregular access and energy theft differ considerably across Dar es Salaam's neighbourhoods.

Placing energy theft within Dar es Salaam's energy landscapes

The general observations in TANESCO's statistics on non-technical losses, its nation- and city-wide policies to combat energy theft and previous studies on *vishoka* tend to portray irregular access and energy theft as a more or less homogeneous phenomenon, occurring across the city's heterogeneous energy landscapes. The following sections challenge such assumptions, focusing on two contrasting cases within Dar es Salaam's Kinondoni district (see Fig. 1): Mabwepande and Msasani (see Section "Methodology" and Fig. 1).

Irregular electricity access in Mabwepande

Mabwepande represents an urban expansion zone experiencing rapid population growth and densification. Its coverage by electricity distribution grids is splintered. Thus, off-grid technologies such as solar home systems and, to a lesser degree, fuel-powered individual installations supplying residents' electric base loads are more prevalent here than in most other parts of the city. However, interviews with residents indicate that they strongly prefer to be connected to "modern" electricity grids.

The scattered settlement structure and piecemeal densification resulting from unplanned incremental housing pose considerable challenges to TANESCO in rolling out electricity grids (Koepke et al. 2021). In such settlements, it is not only costly to provide new distribution grids and transformer stations, but also to maintain and repair existing ones and provide reliable services. As TANESCO needs to consider the commercial viability and cost recovery of grid expansion, new connections are usually added piecemeal in response to individual applications from new residents who can afford the connection fees. As a result, the power supply is less stable than in other neighbourhoods, and residents already connected to the official grid experience interruptions more regularly since electricity grids cannot keep up with unplanned growth (Eledi Kuusaana et al. 2023).

Residents already encounter problems when applying to be connected to the grid. The connection fees depend on the distance to the nearest pole and can be as much as TZS 697,000 (USD 300) within 120 m or even more at greater distances. Residents, therefore, often delay their application until they have saved enough money to apply for a connection. In addition to the fee, applicants for new electricity

connections must buy materials and equipment to wire their building; moreover, an electrician needs to be paid to develop a wiring plan to be officially certified by TANESCO. The resulting additional costs amount to approximately USD 500. Only after the wiring plan has been certified can a formal application for an electricity connection be submitted, and then the connection fee must be paid upfront. The entire process is not only costly, but also bureaucratic and highly time-consuming: it can easily take multiple months or even years before the connection is made, depending, among others, on TANESCO's backlogged application queue, the building's distance from the electricity pole and whether applicants can mobilise networks with TANESCO employees or pool their applications to accelerate procedures.

TANESCO's piecemeal grid extensions, its intermittent power supply, its tedious bureaucratic processes, high fees and extremely long waiting times for new connections not only severely restrict residents' livelihoods; they also spur business opportunities for *vishoka* and trigger irregular energy access in four ways involving different degrees of informality and illegality.

First, middle- to high-income residents pay *vishoka* to facilitate and expedite official application procedures for electricity connections by employing their knowledge of application procedures, their networks with utility employees and by underhand payments to utility employees.

Second, residents hire *vishoka* for informal maintenance and repair work. TANESCO formally prohibits residents and their electricians from physically interacting with its transformers and electricity poles, distribution grids and meters. In practice, however, Mabwepande's residents recurrently experience power interruptions or load imbalances and become very frustrated with TANESCO's piecemeal investments in grid stability, slow or lacking response from its customer and emergency services or its neglect of routine maintenance. Users routinely wait several months for requested new meters or connections and can experience long delays after reporting equipment failures or downed lines in their neighbourhoods. A long wait for TANESCO's repair or emergency teams can be avoided by paying a *kishoka* for "bureaucratic shortcuts" (Degani 2017, p. 301) to restore electricity flows or rebalance the load by tinkering with ill-maintained transformers, poles and scattered power grids. Furthermore, *vishoka* can also provide discounts on the poles and meters for new connections (Degani 2022, p. 172f).

Third, residents hire vishoka to enable them to informally tap a neighbour's or landlord's electricity connection because this is a speedier and, at least in the short-term, more affordable alternative. According to one resident:

> A year ago, I wanted to connect electricity to my house, but the electricity lines are far away, more than 100 metres from my house and I do not have the money to pay for all the costs involved. I needed electricity for lighting and for my children to do their school homework at night. Thus, I negotiated with my neighbour, who agreed to extend a cable to my house to light up the sitting room. I have two bulbs, and I pay him [the neighbour] TZS 3,000 [≈ USD 1.3] per month (Interview, February 2019).

Vishoka thus provide informal and often temporary connection services by extending wires to the neighbours, adjusting switches and burying cables underground to hide them from TANESCO's inspection and disconnection teams. By providing a cost estimate of materials, wiring and maintenance services, *vishoka* act similarly to TANESCO's technicians. When such "collective wiring" is opted for, neighbours negotiate how to divide the estimated costs relating to the shared electrical appliances, their electricity demand and the duration of their use. Often, neighbouring retailers and subscribers agree on schedules of electricity use and to only switch on lights, fans, etc. late in the evening or the early morning, i.e. outside office hours, to evade TANESCO inspection teams (see Smith 2019 for similar observations in Kenya).

Our observations in Mabwepande largely confirm Degani's (2017, 2022) findings: while official utility policies warn against *vishoka*, branding them as illegal, poorly educated amateurs, the practices described above are tacitly tolerated by TANESCO's distribution services, as long as meters are not bypassed and electricity infrastructures not vandalised. Although informal and repair work by *vishoka* and informal connections between neighbours can aggravate the likelihood of power disruptions due to low voltage, loose wires, unstable poles and malfunctioning meters, TANESCO lacks the means and incentive to dissuade or prosecute *vishoka* for unofficially accelerating application procedures, restoring electricity flows or for informally pooling customers (pooled users may no longer qualify for lifeline tariffs, thereby increasing TANESCO revenues).

The key focus of TANESCO's inspection teams and legal prosecution is thus the fourth type of *vishoka* service, in which considerable technical expertise and tinkering with TANESCO's infrastructures are required and which entails bribery, unsealing or bypassing TANESCO's meters or connecting households directly from electricity poles to avoid electricity being metered. *Vishoka* thus do not solely aggravate grid instabilities and vandalise TANESCO's infrastructure, but also engender direct revenue losses. Yet although illegal practices of meter bypassing and illegal wiring are widespread in Mabwepande, TANESCO is often incapable of detecting them, partly because *vishoka* collaborate with the utility's employees.

To summarise, in Mabwepande, *vishoka* ensure their paying customers obtain TANESCO's services more cheaply, more efficiently and more quickly, or provide alternatives to TANESCO's services. Operating in the grey zone at the user–utility interface, vishoka meander between roles of private entrepreneurship, informal labourers co-providing unlicensed repair and connection services and illegal service providers that facilitate energy theft and undermine official utility policies.

Irregular electricity access in Msasani

Living in Dar es Salaam's most affluent neighbourhood, individual electricity users in Msasani ward use extraordinarily high amounts of electricity. They are regularly classified in the higher tiers of TANESCO's differentiated tariff system and are charged higher unit costs of electricity. Msasani's physical coverage of electricity grids is universal, its frequency of unplanned blackouts or load shedding is low and the affordability of electricity services is not an issue for most of its businesses and high-income residents (Koepke et al. 2021; Eledi Kuusaana et al. 2023). Except for massive building activities along its main roads, fuelled by international investments, development in Msasani occurs at a slow pace. Although Msasani's planned structure and limited growth facilitate TANESCO's power distribution, its affluent residents, government employees and businesses have successfully lobbied for premium electricity services. As power outages here cause relatively high economic loss to TANESCO, the company strives to avoid service deficiencies. Outages nevertheless still occur and can seriously disrupt the expectation of uninterrupted supply in wealthy residences, offices or shopping malls; therefore, high-end generators and battery–inverter backup systems complement TANESCO's grid services (Koepke et al. 2021; Eledi Kuusaana et al. 2023).

Contrary to the prevalent framings of electricity theft as a phenomenon of low-income residents due to affordability problems, highly elaborate illegal practices occur in this wealthy neighbourhood. Although TANESCO's repair and emergency teams are more responsive to complaints from the ward's energy users and in Msasani informal retailer–subscriber arrangements are rare, affluent residents hire vishoka to bribe meter readers, instal technology to circumvent or unseal meters, or to steal energy by other means. Despite these privileged individuals' higher energy uses, thanks to their higher social status, political clout and financial means, they tend to escape legal repercussions and instead resolve their fraud "silently", as the following quote indicates:

> During 2019, one resident who is well educated and leads a good life bypassed a meter installed in his house with the assistance of a kishoka so that he pays less for electricity bills. Every month the kishoka received TZS 40,000 [USD 17] from this resident as a monthly payment for the service. After that, when TANESCO was doing inspections on illegal connections in this area, the incident was discovered. The kishoka who made the connection was summoned, and he admitted to having assisted the rich man in bypassing the meter. He was asked to undo the connection, and the house owner was subjected to a fine of TZS 700,000 [USD 304]. The Mtaa [subdivision of a ward] government officials witnessed the case. Upon payment of the fine, the matter was resolved silently (Interview, Mtaa Chairperson, Msasani Bonde la Mpunga, 2019.

In many cases, affluent residents and business owners rely on their domestic staff. According to a TANESCO revenue protection officer, some of these conspire with workers of TANESCO to install defective or tampered-with meters or inflate the charges without the knowledge of their TANESCO superiors:

> The rich people do not take the trouble to follow up on things by themselves. Instead, they ask their domestic staff to do it for them. For example, in paying for electricity or doing meter installation, they give the required amount of money to their helpers to pay for the services. The helpers capitalise on their bosses' trust to arrange with vishoka for unofficial meters, which have been removed from other houses due to defectiveness. Thus, vishoka pay less in the black market and pocket the difference. However, upon inspection later, these meters are found not only to be defective, but they are also not recorded in TANESCO's registers (Interview, Dar es Salaam Regional Revenue Protection Office, 2019).

The same officer confirmed that, although inspections are carried out across all neighbourhoods, and although the revenue protection office improved theft through smart metering and remote control, conducting inspections in affluent neighbourhoods is restricted. Here, properties are often fenced and difficult to access (see also Degani 2022, p. 141), and residents are uncooperative or use their political and/or economic power:

> At times, we are denied access to households in rich neighbourhoods, but we are, in many cases, able to track their meters with a meter-auditing system from our office. […] Their major technique is to keep us waiting outside their gates, hoping that we will get tired and decide to go. But in situations where we are suspicious of their energy spending patterns, we often […] wait until they come out. Once we establish the

> evidence, they softly agree to settle the bills to avoid going public (Interview, Dar es Salaam Regional Revenue Protection Office, 2019).

For affluent energy users, the savings in energy costs are large and far outweigh the risk of being detected. Under Section 9 of the Energy Act (2006), users or *vishoka* found to have broken the meter seal can be fined up to TZS 200,000/= (≈USD 87). But wealthy users have the wherewithal to pay fines (or illegal bribes) or to "outsource" energy theft to their domestic employees. However, using *vishoka* to steal energy can also come with risks for residents or business owners. As a prominent *kishoka* explains:

> Concerning energy theft, we do approach rich people and convince them that we can fix their meters so that they pay less for the electricity they consume […]. Once customers enjoy using energy with little payment to TANESCO for a year or two, we send our local assistant kishoka to the rich person's home to demand more money. In case they resist, we argue that we know and have evidence that they have tampered with the meter, and we threaten to expose them to TANESCO or the police. For fear of being exposed, they often pay big sums of money, sometimes going up to TZS 2 million [≈ USD 870] (Interview, 2019).

As our empirical observations and interviews indicate, the role and practices of *vishoka* are tailored to Msasani's wealthier customers and affluent businesses. Here, they apply more elaborate techniques and technologies than in Mabwepande to lure and blackmail well-paying customers. Although TANESCO does not have geographical data on the distribution of non-technical losses, it can be assumed that wealthy neighbourhoods are responsible for the largest proportion of overall non-technical losses in Dar es Salaam. Although they have the means to pay for electricity, their well-off residents are more likely to exploit the system than those who are less privileged.

Discussion and conclusion

Based on our literature review on the impacts, drivers and countermeasures relating to energy theft in Southern cities and our empirical case study of two contrasting wards in Dar es Salaam, our paper has investigated the tension in the cash-strapped public utility TANESCO, which is torn between the goals of cost recovery and energy for all. Such tension is emblematic of African utilities and is exacerbated by international donors and public authorities exerting massive pressure on them to increase their financial viability, reduce their indebtedness and recover their costs while simultaneously being under political pressure to make electricity accessible. Hopes were high that revenue gains through new connections combined with austerity measures could be used to improve services. However, whereas TANESCO's heavy investment in generation capacity and grid extension has boosted connectivity rates, its increasing debt has brought non-technical losses into focus. In response, TANESCO has invested in punitive, incentivising, technological and communicative strategies to curb irregular access. However, TANESCO has largely failed to restrain practices by users or intermediaries transcending legal norms and co-providing services at the user–utility interface, and non-technical losses continue to rise.

Our empirical analysis points to several reasons for the limited impact of TANESCO's strategies. First, austerity policies pursued by state authorities and donors, such as laying off a substantial portion of TANESCO's workforce or the radical hike in connection fees regardless of energy users' income or location in the city, are at odds with the ambition to push back irregular electricity access. Retrenching trained employees and promoting outsourcing to temporary and short-term workers might have contributed to realising short-term revenue goals but have further consolidated an informal economy of retrenched TANESCO employees seeking to sustain their livelihoods, and TANESCO's unsatisfactory customer and repair services have driven users to hire *vishoka*. Meanwhile, the higher connection fees will further deepen city-scale inequalities and increase the attractiveness of *vishoka* services, particularly for low-income groups or those living at the network periphery. Our analysis thus indicates that the redistributive effects of austerity policies and their impact on driving informal and illegal co-provision channels should be addressed more systematically.

Second, our study indicates that the spatial situatedness of irregular energy access and the heterogeneous practices of users and *vishoka* have not been adequately addressed by TANESCO. Its official policies tend to tackle non-payment either by focusing on poor users or by treating users as a homogeneous group. Unlike many studies that link energy theft to households' income and affordability, our case study points to the role of energy theft among wealthier residents. Mabwepande's low- and middle-income residents hire *vishoka* to perform unofficial repair and maintenance work, to facilitate meter sharing between neighbours or between tenants and landlords and to expedite application procedures for electricity connections. While we could also observe cases of tampering with meters or installing connections to electricity poles, the resulting financial loss to TANESCO might be rather limited as residents' consumption levels are low. In many cases, Mabwepande's residents commit electricity theft because they have been disconnected for failure to pay, cannot afford official (re)connection fees or have been bypassed by electricity networks.

Wealthier residents in Msasani, on the other hand, already enjoy the benefits of "premium network services" and are prioritised by TANESCO's repair and emergency services, with the result that they experience fewer blackouts. While *vishoka* also perform repair and maintenance in Msasani, organise meter sharing, etc. and mediate application procedures, they also offer elaborate energy theft services tailored to Msasani's affluent residents and businesses. The incentives for these energy users to exploit the system are their high electricity consumption, lower risks of being detected (utility employees find it difficult to gain access to properties) and their economic and political power (to settle infringements "silently" and avoid legal actions). Since individual users and businesses in Msasani and their organised *vishoka* account for higher non-technical losses than low-income users, our findings indicate that utility strategies to combat energy theft should focus more systematically on practices of energy theft in such neighbourhoods. Here, authorities and utility companies should implement advanced monitoring and strict enforcement to deter sophisticated energy theft methods. In contrast, in network peripheries and low-income neighbourhoods, affordable access programmes, community engagement and infrastructure investments to provide reliable energy access should be prioritised, which could help reduce reliance on irregular sources.

Third, the involvement of state authorities in causing and tolerating energy theft deserves further attention in research and energy policy. In her analysis of Tanzania's power sector reforms, Godinho (2023) highlights the sector's susceptibility to political interference, with state-owned utilities being particularly prone to rent-seeking and patronage practices. This involves several private high-volume energy users, who are considered critical for national industrial development agendas. Although they have been introduced to metering and prepayment schemes over the last decade, further research is needed to explore whether non-payment remains an issue and to what extent they can rely on TANESCO employees' cooperation and deliberate neglect. At the same time, several state organisations, such as the police, postal services, the military and high-profile national ministries, are known to be chronic non-payers (Degani 2022; Godinho 2023; Ghanadan 2009). As Godinho (2023) indicates, those politically connected customers were forced to pay during the private management contract, resulting in improved collection rates, but then "slipped into old patterns of politically condoned non-payment," causing collection rates to decline significantly dramatically (ibid., p. 282f.). Mitigating TANESCO's vulnerability to political interference and disentangling the publicly owned company from political patronage are crucial steps towards enhancing cost recovery rates and financial sustainability.

Fourth, TANESCO's official policies brand *vishoka* services as illegal and economically and technically detrimental to the reliability of service provision and the recovery of costs, and the utility attempts to curb their business through punitive measures. However, electricity users, local leaders and TANESCO technicians on the ground tacitly tolerate certain services and engage in what Degani (2017) calls "modal reasoning"—i.e. they distinguish unruly infrastructural practices that are tolerable from those that are not sensible.[7] Similar to the findings of Janet Roitman (2006) on the ethics of illegality, specific practices by *vishoka* have become normalised, and energy users regard them as acceptable or rational responses to systemic state failures and socio-economic challenges. The TANESCO management and public authorities are less lenient: they hardly differentiate between the roles of *vishoka* as private entrepreneurs, informal labourers and illegal service providers and seem blind to the fact that particularly in areas where networks are splintered and TANESCO's customer services are poor, *vishoka* provide pragmatic solutions to crumbling infrastructures, meter sharing and lengthy, bureaucratic procedures. Arguably, by so doing, they take advantage of the potential to accelerate users' energy access and increase the reliability of electricity supply. The persistent gap between official approaches and the reality of tacit practices on the ground, however, has serious consequences. While *vishoka* provide critical services to users, they operate in the realm of illegality. However, if *vishoka* were licensed to perform predefined services, there could be opportunities to organise official training programmes for them, provide them with better technical equipment and regularise their service provision. In the words of Rateau and Jaglin (2022, p. 183), this could "take informality into account both as a feature of and as a potential resource" to increase the accessibility and reliability of energy systems. Engaging progressively with *vishoka* might also give regulators and TANESCO better insight into their illegal business and enable more effective control and prosecution of meter tampering and illicit connections circumventing meters. Regularising the business of *vishoka* would not, however, dispense with the need for TANESCO and public authorities to tighten their punitive measures for the most privileged who exploit the system the most: affluent residents, large industrial users and state organisations.

Whereas a large body of energy theft literature has responded to the question of how users may be disciplined to adhere to regulations and improve the financial viability

[7] However, the question of how to distinguish whether energy theft or non-payment is a criminal offence or a morally defensible response to failures of public service providers remains a major challenge for public authorities and TANESCO. Key are differentiated enforcement and energy access policies that assess the underlying causes of non-payment or unauthorised delivery channels. This involves evaluating service reliability, affordability and accessibility to determine if such actions stem from necessity or deliberate misconduct.

of utility companies, our study reveals severe limitations to punitive, top-down, technology-focused and one-size-fits-all approaches to combat irregular access. Although the socio-technical heterogeneity of urban energy landscapes in the South, the role of private actors and their intermediary work at the interface of users, electricity utilities and state authorities have attracted increasing scholarly attention (e.g. Degani 2017, 2022; Castán Broto 2019; Verdeil and Jaglin 2023), their implications for urban energy governance require more systematic research. Our study indicates that more differentiated approaches are needed to appreciate the heterogeneous user experiences and grey zones of (il)legality, (in)formality and entrepreneurship in which intermediaries such as *vishoka* operate. Changing the current mindset and seeing informality and entrepreneurship as a potential resource for infrastructural and urban futures might open opportunities for increasing energy access levels and regulating negative externalities of irregular access that would otherwise not be effectively addressed.

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