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Urban-economic geographies beyond production: Nairobi's sociotechnical system and the challenge of generative urbanization

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Abstract: Urban-regional economies are developing in highly variegated, uneven ways globally. In economic geography, studies of urban-regional development emphasize the prospects for innovative, globally-competitive industrial sectors to emerge and enhance a city-region's exchange value in global markets. This focus reflects a productivist bias that may fail to address issues related to the use-value of, or living conditions associated with urban transitions. Such concerns are particularly significant in the Global South where urbanization has often not led to socioeconomic transformations that benefit the majority of urban residents. To examine the relationships between a city's exchange and use value, this paper argues for a sociotechnical systems approach that conceptualizes cities as constituted by interdependent or coupled regimes related to production, consumption, and infrastructure that stabilize urban-regional economies and determine development pathways. The framework is deployed empirically to examine the case of Nairobi, Kenya – a rapidly growing urban-regional economy characterized by high rates of inward foreign direct investment, principally in speculative real estate ventures in the consumption regime. Domestic manufacturing industries (the production regime) are stagnating, struggling to compete against imports, and failing to generate widespread formal employment and raise tax revenues for the infrastructure regime. The net result is a city characterized by fragmented or splintered regimes that create highly uneven, exclusionary development outcomes. These dynamics and findings are analyzed in relation to a similar study of Dar es Salaam, Tanzania in order to demonstrate the comparative potential of this conceptual approach. The paper concludes with a call for economic geographers to better account for the use-value of urban-regional econo-

mies such that development concerns beyond production become more central to our analyses.

Keywords: urban-regional development; sociotechnical systems; urban transitions; consumption; infrastructure; East Africa

Introduction

The world's population is now predominantly urban with most major cities in the Global South growing at exponential rates. Megacities (those with populations greater than 10 million) are on the rise and by 2035, 26 of the 30 largest urban agglomerations in the world will be in developing or emerging economies in Asia, Africa, and Latin America. As this urban transition proceeds, pressing questions are emerging with regard to what it means for development pathways, possibilities, and outcomes. At the same time, mature cities in the Global North are marked increasingly by extremes of inequality as urban-economic growth widens the gaps between haves and have nots. Whether and how cities can develop in ways that generate progressive development outcomes for all residents is arguably the most pressing urban question of the 21st century.

Historically, and in the views of neoclassical economists, urbanization is associated with shifts from agrarian or rural-centric economies that facilitate industrialization (Davis and Henderson, 2003; World Bank, 2009; Venables, 2018). Successful transitions occur when cities create agglomeration, urbanization, and specialization economies that generate positive externalities to spur innovation and increase the competitiveness of base industries in tradeable sectors and regional/global markets. When managed effectively, the growth of cities and urban-based industries raises productivity levels significantly as migrants from rural areas are absorbed into urban labor markets with greater value-added potential (Collier, 2017). Although this 'recipe' seems straightforward, it can be increasingly difficult to deliver on given the challenges of aligning development and urbanization processes. Within cities, elites can capture and control land markets through

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speculative and rent-seeking practices that do little to improve productive sectors or provide for the basic needs of growing populations (Goodfellow, 2018; Venables, 2018). In the Global South, urbanization without industrialization may be the net result as productive sectors – especially manufacturers – are unable to compete against imports and a dynamic of preemptive deindustrialization occurs (De Vries, Timmer, and De Vries, 2015; AfDB, OECD, and UNDP, 2016; Gollin, Jedwab, and Vollrath, 2016; Rodrik, 2016).

This then is the pressing question that is accompanying urban-regional development pathways today: How can cities grow in a manner that is generative of distributive, just, and sustainable development outcomes for all residents? A challenge in this regard relates to existing conceptual tools in economic geography; frameworks that are marked by a focus on production and the emergence of new and/or innovative industrial sectors through agglomeration economies. Such dynamics are oft-viewed as the fundamental drivers of successful urban-regional development with quality-of-life concerns such as congestion, pollution, and urban amenities viewed principally as matters of (post-agglomeration) governance, or as factors that can attract the right workers to productive sectors (Florida, 2002; Shapiro, 2006; World Bank, 2009; Glaeser, 2011). While productive concerns are surely important, the primary focus on these can come at the expense of more comprehensive understandings that capture the interactions between production and the quality of life of a city-region's residents. As Venables (2018, p. 99) notes, there is a “need to see the city as a whole” where livability (use value) and productivity (exchange value) co-constitute one another, and where connectivity within and beyond the city shapes development trajectories.

Drawing off recent work by Murphy and Carmody (2019) that examined urbanization in Dar es Salaam, Tanzania, this paper further advances and illustrates a framework to better account for the city as a whole – as a sociotechnical system constituted by three interdependent, overlapping, and multiscale regimes related to production, consumption, and infrastructure. The framework strives to capture and compare the key practices, structures, flows, and contingent features that shape urbanization pathways and the development outcomes associated with them. Epistemologically, the approach calls for grounded, qualitative research that focuses on the everyday practices and governance structures through which urban functions are realized, markets operate, and basic services are distributed, managed, and accessed by residents and municipal authorities. A key objective is to more fully understand how the use value of the city for its

residents shapes and is shaped by the exchange value of the goods and services it produces. The paper applies the framework to an empirical examination of Nairobi, Kenya, drawing additionally on the Tanzania case to highlight its comparative potential.

The paper is organized as follows. First, geographical concepts and theories related to urban-regional development are briefly surveyed and their limitations highlighted. Second, the paper's conceptual framework – a sociotechnical systems approach – is then explicated. Third, the case of Nairobi is then presented with a focus on its extant production, consumption, and infrastructure regimes and their interrelationships. This analysis draws on findings from the Dar es Salaam case to highlight the comparative utility of the approach. Fourth, the paper concludes with a discussion on the key empirical findings and insights regarding future directions in urban-economic geography research.

Economic geographies of the urbanization-development nexus

The role that cities play in shaping the spatial distribution of economic activities, and their unevenness, has long been a central concern of economic geographers. Historically, concepts and theories were built through analyses of the experiences of European and USA city-regions that often essentialized how urbanization proceeds and to what end points developmentally and spatially. More recent interventions have sought to transcend these teleologies by studying Southern cities and deploying postcolonial, assemblage, and grounded theoretical and methodological approaches. Although differences abound between competing views of what shapes prospective development trajectories in city-regions, there are significant complementarities that can be fruitfully integrated into a more unified, yet not totalizing, framework for studying and comparing urbanization pathways.

To begin with, it is useful to highlight some of the classical economic perspectives on cities and their development that remain relevant today. These view cities as central places for consumption and production activities whose rational spatial distribution can create efficient, hierarchical distributions of markets and industries within countries (Christaller, 1933; Jacobs, 1969). Within city-regions, land markets – when operating effectively – can help to productively distribute economic activities through location-rent differentials (Alonso, 1960). Agglomeration is, of course, a core reason why cities come into being in

the first place – a means to concentrate markets, industries, and workers in place in order to create scale and scope economies (Marshall, 1920; Scott and Storper, 2003; 2015). Positive externalities associated with agglomeration reduce production costs, facilitate information and knowledge spillovers, and lead to pecuniary benefits as cities grow. Importantly, however, scholars have long recognized that agglomeration alone will not necessarily cause progressive development but that effective institutions, strategic planning, and investments in infrastructure are vital for kick-starting and sustaining cumulative causation (Davis and Henderson, 2003; Venables, 2009; 2018; UN-Habitat, 2016). Such concerns are particularly relevant for developing regions – especially Latin America and Africa – where urban primacy/concentration has been found to inhibit growth when insufficient infrastructures and institutions are in place (Castells-Quintana, 2016; Frick and Rodriguez-Pose, 2018).

Beyond these established ideas, economic geographers have specified key processes, resources, and relationalities that make city-regions more or less successful. At the intra-urban or regional scale, places can develop innovative, globally competitive industries through the emergence, maintenance, and augmentation of critical, embedded assets able to support learning and knowledge accumulation. Such assets include: “thick” layers of complementary and interrelated institutions in support of industries (Amin and Thrift, 1994); “untraded interdependencies” (conventions, rules, practices) that enable firms to acquire, integrate, and produce new forms of knowledge (Storper, 1995); industrial environments that are “buzzing” with ideas (Bathelt *et al.*, 2004); functional entrepreneurial ecosystems (Iacob *et al.*, 2019); and complementary competencies (i.e., related and unrelated variety) shared between different sectors in the same region (Frenken *et al.*, 2007; Boschma and Iammarino, 2009). At the inter-urban or transnational scale, geographers have also highlighted the importance of positionality in relation to, and/or couplings with, lead firms, cities, regions, and centers of innovation in the global economy. Such relationalities are manifest in world-city networks (Taylor, 2005), global production networks and value chains (Coe *et al.*, 2004), and the “pipelines” of knowledge and information flow that connect a region’s firms to new/novel ideas (Bathelt *et al.*, 2004; Bucholz and Bathelt, 2021).

Other debates and dialogues cover a wide, diverse, and often complementary range of emerging concepts and epistemologies including: planetary or extended urbanization (Brenner and Schmid, 2012), assemblage urbanism (McFarlane, 2011), postcolonial and decolonial urban theory (Lawhon and Truelove, 2020), “late”

urbanization (Fox and Goodfellow, 2021), and conjunctural urbanisms (Peck, 2017). A concern of several of these projects is how to frame and conduct robust comparative analyses that will advance urban theory in ways that move it beyond what Robinson (2013, p. 659) terms “the inheritance of modernity”; that is, in part, that only the most modern cities “count” for advancing theories. Instead, it is more useful to consider that we live in a world of diverse, complex cities whose study can reveal contingent variegations and differentiations that transcend developmentalist teleologies (Robinson, 2016).

While geographers have made significant advancements to our understandings of what constitutes cities and makes urbanization more or less developmental, three challenges persist. The first is the need to think about urban development in a much broader manner, as a process where by residents fundamentally seek to improve their quality of life and experience social mobility for themselves and their families. Successful, progressive forms of urbanization are not simply about the growth and competitiveness of industries but about livelihoods and the material conditions that residents experience in their lifeworlds, a consideration that is often ignored except as it relates to attracting particular types of workers to productive sectors (e.g., creatives). Urban geographers attend more readily to livelihood and quality of life concerns (e.g., see Brenner *et al.*, 2009) but such works often have the opposite problem, an underappreciation or poor accounting for the economic, as it were. Needed are frameworks that bridge these concerns and develop richer accounts of the development dynamics and outcomes accompanying urban transitions. One way to consider development in a broader sense is to bring (back?) questions about consumption into our frameworks – that is how urbanization changes the consumption possibilities available to all urban residents, especially food, housing, wage goods, basic services, and savings possibilities.

A second concern is the need to bring a more robust political economy perspective to bear on the approaches we use to examine and compare city-regions. Here I think it is fruitful to draw on urban regime theory (see Stone, 2015), an approach that sought to conceptualize localized power configurations/distributions and the dynamics of coalition building that shape the development of cities. Following the work of Khan (2010; 2018) on political settlements, Goodfellow (2018) notes that governance configurations in cities constitute urban regimes that regulate and guide urban-regional development. Particularly useful in this regard is to consider how regimes are “constructed in different moments in time and in different places”, and how the capitalisms they enable are “regulated through

extra-economic relations in particular places”, such as those beyond the production sphere (Hankins, 2015, p. 156).

A third concern is to capture the relational, multiscalar nature of cities and the role that translocal and transnational relations play in shaping urban transitions. Urban regimes are not simply localized entities containerized in particular places, they are constituted by extraterritorial ties, flows, networks, and linkages (Hankins, 2015). As such, analyses of urban-regional development processes must explicitly incorporate and account for these relations as forces and factors shaping development dynamics. This is, by no means, a new concern as relational economic geographers have long highlighted the importance of transnational ties for innovation (e.g., Bathelt *et al.*, 2004) and urban-regional development processes (Coe *et al.*, 2004; Yeung, 2021). Needed are more integrative approaches that account for the role of extra-regional linkages and non-firm actors in shaping socioeconomic and industrial development processes locally.

Drawing off Murphy and Carmody (2019), this paper illustrates a conceptual framework that strives to account for these concerns in order to develop a fuller understanding of the drivers and outcomes of urban-regional development. The approach draws principally on sociotechnical transitions thinking, particularly works associated with the emerging geography of sustainability transitions community (see Coenen and Truffer, 2012; Murphy, 2015). The goal is to bring use and exchange value concerns together as these relate to urbanization, and to provide a conceptual framework or template to examine, identify, and compare urbanisms globally.

Cities as sociotechnical systems

Sociotechnical systems research emerged in the late 1980s and has since proliferated as a diverse, global epistemic community interested in the evolution of sector-specific infrastructures, innovation systems, and collective goods vital for economies and societies (Hughes, 1987; Coutard, 2002; Geels, 2002; 2004). Sociotechnical systems are configurations of actors, artifacts, rules, knowledge, meanings, resources, and spaces through and within which sector-specific goods and services are produced, distributed, and utilized (Geels, 2004). Social groups or actors – engineers, consumers, planners, financiers, researchers, distributors, universities, workers, suppliers, utilities, and others – carry and reproduce systems, operating through interdependencies and networks that align them

to each other thus giving the system stability. Artifacts and infrastructures too embody rules and norms related to their design, construction, and everyday use. While systems reflect the totality of the sector, a core emphasis of sociotechnical systems research is on the sociotechnical regime, what Rip and Kemp (1998) define as a “rule set” (*a la* Giddens’ [1984] structuration theory) that governs the system and which is manifest in practices, meanings, material artifacts, structures, policies, and knowledges (Geels, 2002).

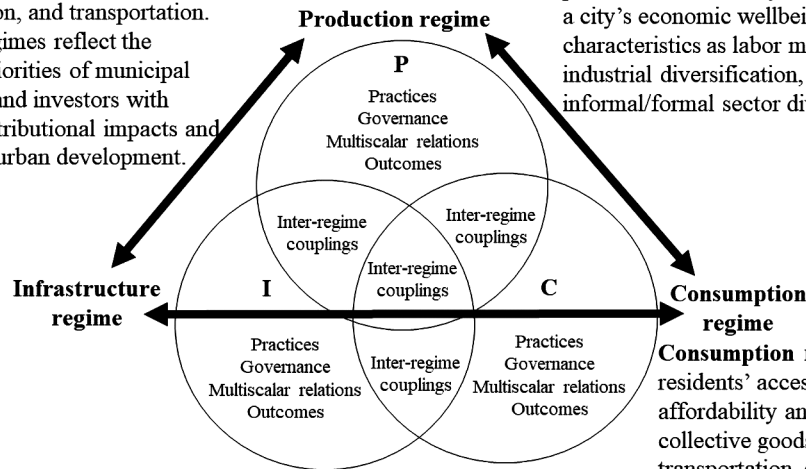
Sociotechnical systems research has evolved significantly over the past two decades with a particular emphasis on sustainability transitions – the prospects for, and processes through which sectoral systems (e.g., energy, water) might become more environmentally friendly and developmentally progressive. Important here has been the increasing engagement between transitions researchers and economic geographers, with the latter bringing a much-needed spatial and scalar sensitivity to transitions research (Coenen *et al.*, 2012; Boschma *et al.*, 2017). Place-based, rather than sector-specific, transitions have been an increasing focus with an emphasis on urban governance and the evolution of cities (Murphy, 2015; Frantzeskaki *et al.*, 2017). As such, the sociotechnical systems approach offers a promising framework within which to situate analyses of urban-regional development.

In a recent paper, Murphy and Carmody (2019) conceptualized cities as sociotechnical systems constituted by three overlapping regimes related to *production*, *consumption*, and *infrastructure* (see Figure 1). These regimes capture three governance realms of the urban in a manner that seeks to account for the production of exchange value and the realization of use value by residents. Production regimes govern the basic and non-basic economic and industrial activities through which firms, workers, and entrepreneurs create, enhance, and capture value through manufacturing and service provisioning activities. Consumption regimes account for the use value of city-regions with an emphasis on the governance, distribution, affordability, and quality of markets for wage goods and basic services (e.g., water, energy, education). Infrastructure regimes are essential for consumption and production, determining the supply, accessibility, quality, and distribution of the collective goods and basic services used by residents and firms alike.

Regimes are constituted by institutionalized practices that reflect their governance structures and the multi-scalar relations that shape development outcomes (e.g., inequality, upgrading). Each regime is interdependent on the others, coupled together in functional and other ways that create, constrain, and/or enable practices and

Infrastructure regimes (I) shape the supply, quality, affordability, regulation, use of, and investments in essential services such as water, energy, housing, sanitation, and transportation. Infrastructure regimes reflect the capacities and priorities of municipal leaders, donors, and investors with respect to the distributional impacts and sustainability of urban development.

Production regimes (P) shape the value creation and enhancement (upgrading/innovation) activities of (formal/informal) manufacturers and service providers within a city region. These regimes reflect a city's economic wellbeing as manifest in such characteristics as labor markets, innovation, industrial diversification, unemployment, informal/formal sector divides, etc.



Consumption regimes (C) shape urban residents' access to, and the utility, affordability and quality of private goods and collective goods such as health care, transportation, education, and housing. These regimes reflect the socioeconomic conditions in cities and provide insights into the dynamics of social mobility, scarcity, and livelihood security in cities.

Figure 1: Cities as sociotechnical systems, a conceptualization (from Murphy and Carmody, 2019)

development outcomes in the others. Following Jones and Murphy (2011), regime analysis should focus on core/general practices associated with production, consumption, and infrastructures. In the Dar es Salaam case, Murphy and Carmody (2019) focused on manufacturing practices (including labor skills, technologies), financing and investment practices in industry, competitive practices, and innovation practices in the production regime. Consumption regimes were examined through consumer practices across a range of market hierarchies (low income to high income), accounting for the ways in which these are shaped by competing household demands. Infrastructure regimes were analyzed through the lens of service-accessing practices (e.g., how residents get, and from whom, water or energy), the practices of firms in response to infrastructure services (e.g., how they adapt to power outages), and generalized assessments of infrastructure-related activities such as commuting and water provisioning. The empirical analysis yielded critical insights into Dar es Salaam's urbanization pathway at the regime and city-scale, highlighting its tendencies toward extraversion, splintering, and the crowding out of domestic manufacturers by imports (what Murphy and Carmody [2019] term intraversion). Throughout the discussion below, contrasts and comparisons between this and the Nairobi case are made to demonstrate the comparative potential of this conceptual approach.

The urban question in Kenya: a sociotechnical systems view on Nairobi's development

Nairobi is East Africa's largest and most industrially diversified city with a population of about 5.0 million, growing at nearly 3% per annum between 2000 and 2015 (UN Habitat, 2020). The city has grown and transformed significantly in recent years, in large part due to real estate and retail developments that have reshaped the city's built environment. Despite Nairobi's growth, 60% of its residents live in slums where there are extreme challenges related to basic services such as water, sanitation, health care, and energy (Bird *et al.*, 2017). In 2015, only 48% of the population had piped, in-household water and 38% of residents had a sewerage connection (UN Habitat, 2022). Poverty rates remain high, the city's cost-of-living has increased significantly, and there are pressing public safety concerns related to congestion. These conditions are similar to those of Dar es Salaam, an emerging mega-city that is struggling to provide for its rapidly growing population.

The analysis presented below is based on three episodes of field research conducted in Nairobi in 2017, 2018, and 2019. Fieldwork entailed 35 interviews with a range of planners, government officials, non-governmental organizations, venture capitalists, bankers, entrepre-

neers, scholars, donors, investment authorities, and technology-hub administrators based in Nairobi. These interviews, depending on the individual/organization, covered a range of issues related to the city's development including: manufacturing industries, housing issues, municipal government, foreign direct investment, debt, productivity, new-build cities (e.g., Konza Techno City), planning, markets, and the provisioning of basic services. Further insights into infrastructure and consumption regimes were garnered through my participation in a multi-year project to examine sanitation systems in the city, particularly as they related to informal settlements. Time was also spent in three informal settlement communities – Mathare, Mukuru, and Kahawa Soweto – where I was able to interact with cooperative/self-help groups (e.g., *muungano*) and residents to discuss the day-to-day realities facing them, particularly as these relate to collective goods provisioning (e.g., water, sanitation, energy). I also conducted direct observations throughout the city, walking through markets, neighborhoods, and downtown areas in order to gather additional data on everyday life. Primary data is complemented, where possible, by scholarly work and relevant reports and media accounts that address Nairobi's development. The qualitative data that was gathered was compiled and coded in relation to each regime type, specific practices, governance traits, inter-regime couplings, multiscale relations, and development outcomes. The results presented below focus on the production regime and its couplings to consumption and infrastructure regimes; highlighting key practices, governance features, and development outcomes associated with the evolution of Nairobi's sociotechnical system. Whenever possible, these are compared briefly with the findings from the Dar es Salaam case (Murphy and Carmody, 2019).

Importantly, there are methodological limitations with respect to this approach given the scale and complexity of studying an urban sociotechnical system. It is simply not possible to examine all practices, governance traits, couplings, relations and development outcomes associated with production, consumption, and infrastructure regimes in any city. As such, the focus of the data gathering and analysis is on broad trends, features, and generalized practices associated with regimes, as revealed through the interviews, observations, secondary research, and reports. This was also the case in the Dar es Salaam study and a common set of indicators was focused on in the Nairobi case as well. For the production regime, focus was on basic manufacturing practices, the state's governance of industry, trade and FDI flows, innovation, and the prospects for industrial upgrading. With respect to the

consumption and infrastructure regimes, emphasis was placed on the couplings between these and the production regime but with an emphasis on how consumption and infrastructure regimes impact or reflect residents' quality of life through markets, costs of living, basic services, and collective goods distributions.

All told, the study can be replicated methodologically to examine and compare the evolution and governance of regimes in these and other cities in order to assess the factors shaping the exchange and use value of urban-regional economies. This is significant for economic geography in two ways. First, it provides a template for systematic comparative analyses of cities and their variegated economies and welfare distributions. Second, it moves such analyses beyond agglomeration and production by explicitly considering the interrelationships between production (exchange value) and the use value or quality of life of urban residents, not simply those of the workers thought to matter most (e.g., creatives). The framework thus views quality of life concerns not as negative externalities to be managed post-hoc and separately from industry but as co-constitutive of production regimes and the exchange value associated with them. In other words, and for better or worse, a city's (in)ability to develop innovative agglomeration economies and globally competitive value-added industries is a function of the life worlds its residents occupy and the everyday challenges they face to meet their basic needs.

Nairobi's production regime

This section examines Nairobi's production regime in order to assess the degree to which agglomeration economies, strategic transnational couplings, and other competitive assets are developing in ways that can facilitate industrial upgrading and widespread employment generation in the city-region. Focus here is on key practices and policies of domestic manufacturing firms, foreign investors, importers, and Kenyan state actors charged with enabling industrial development. As is the case of Dar es Salaam, Nairobi is one of the largest manufacturing centers in Kenya with its firms historically playing an important role in supplying consumer and other goods to the East African region. Many of the larger manufacturing firms, traditionally located in the industrial zone near to the city center, were established by members of the city's South Asian community. More recent FDI and other investments in industry have focused on industrial parks, special economic zones (SEZ), and new-build cities in peri-urban areas as means to develop manufacturing further. Informal or small/micro-

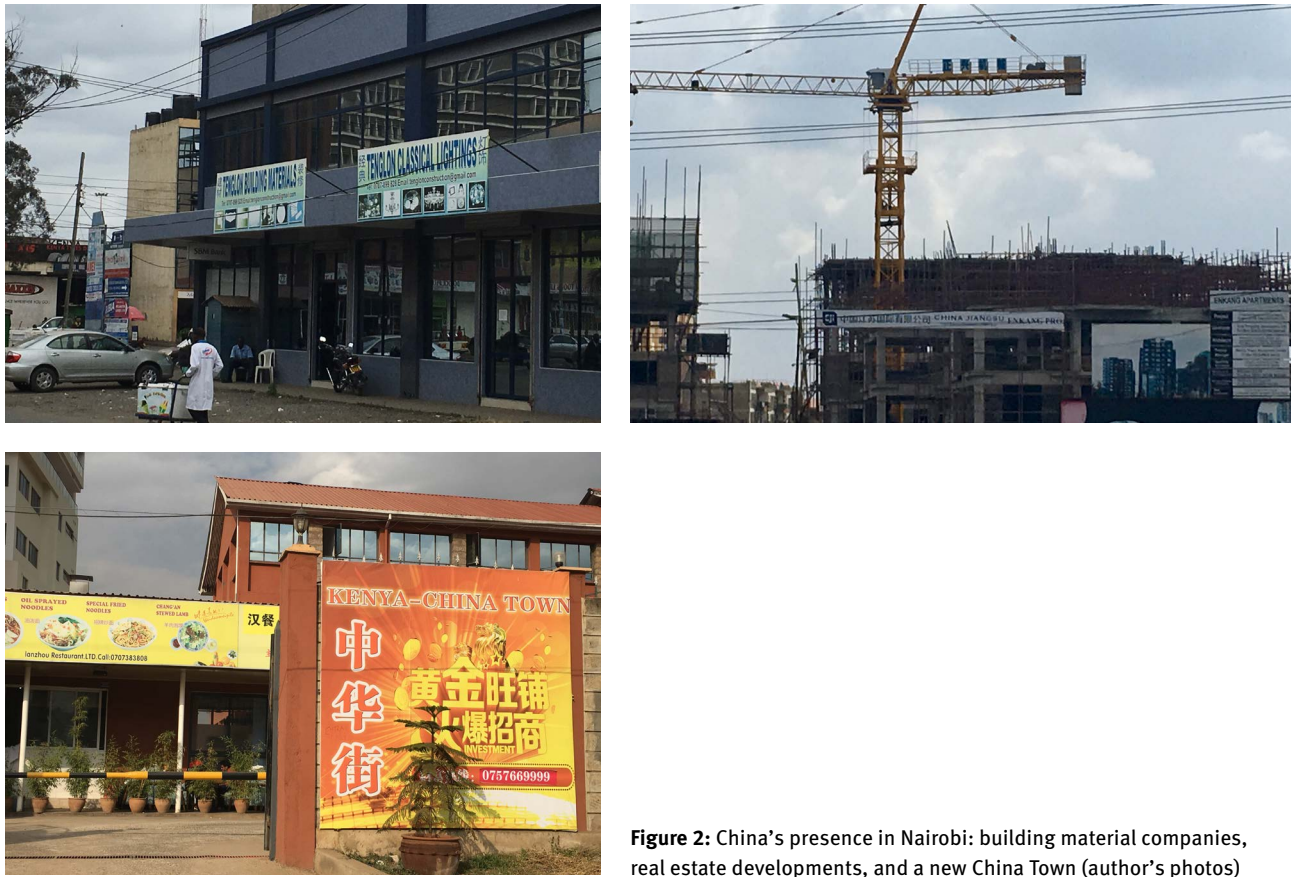


Figure 2: China's presence in Nairobi: building material companies, real estate developments, and a new China Town (author's photos)

scale enterprises operate throughout the city, producing goods for the consumer market.

A few key, generalized practices are indicative of Nairobi's production regime today. The first is the shift of manufacturing firms from production to the commercial trade of imported goods. Emblematic of this practice is the Yana Tyre company which closed down its Nairobi factory in 2016 and shifted toward commercial ventures such as the wholesale import of goods from China and India (Business Daily Africa, 2016). Other manufacturers, e.g., Eveready batteries, have followed suit citing, in part, the challenge of trying to compete with imports. Inward foreign investment (FDI) practices are exacerbating the situation with Chinese firms (in particular) increasingly present in mature industries, particularly in the building materials sector where Belt and Road Initiative (BRI) infrastructure and real estate development projects are creating high demand (Xia, 2019; see Figure 2). As of 2018, there were 106 Chinese companies operating in Kenya, employing 50,000 workers in a diverse range of industries including aluminum and ceramic building materials, furnishings, batteries, automotive and machinery assembly, and diapers (Otieno, 2019; Xia, 2019). As such, they are increasingly fulfilling the basic needs of Kenyan consum-

ers, marking a significant coupling to the consumption regime.

The government has, as part of Kenya's Vision 2030 and President Kenyatta's "Big 4" policy program, sought to support manufacturing through subsidies for industrial parks, special economic zones (SEZ), export processing zones (EPZ), and content requirements that mandate that 40% of inputs to FDI-related manufacturing or construction activities be sourced from Kenyan firms.¹ Although the policies make sense on paper, their implementation has been by-and-large ineffective in stimulating long-term growth in domestic manufacturing value added. There are a few reasons for this. First, several respondents noted that there are bureaucratic inefficiencies and challenges in implementing industrial policy given the poor coordination among the multiple agencies tasked with supporting economic development. Case in point is the continued operation of both an older EPZ policy and a more recently

¹ Poverty alleviation and affordable housing concerns are also part of the Big 4 agenda but here the focus is on its relevance for production regimes in Nairobi. Affordable housing and general poverty concerns are addressed in the sections on production-consumption and production-infrastructure couplings.



Figure 3: Konza Techno City headquarters in Nairobi with future design plan (author's photos)

(2015) devised SEZ policy, a circumstance that has created redundancies and tax loopholes. As Laryea *et al.* (2020) and respondents noted, businesses will shift between EPZ and SEZ to gain tax benefits and other subsidies but often leave once the window closes on these, sometimes even reinventing themselves as “new” companies in order to restart the benefits in new ways.² Such practices mark an inefficient use of fiscal resources that are considered by many to not be worth the cost.

As for the local content regulations that are associated with inward FDI, these have been in place for several years with Kenyan law stipulating that 40% of all inputs and/or labour be sourced from Kenyan firms or Kenyans. The challenge here is that “politically connected oligarchs” in Kenya hold significant control over these supply chains and most of the locally sourced goods, services, and labor are of low value (e.g., sand, stone for construction), unskilled, and/or have limited upgrading potential (e.g., trucking) (Wang and Wissenbach, 2019). Most manufacturers in EPZ and SEZ opt instead to import higher-value intermediate goods given lack of availability or poor quality of locally sourced inputs.

Financing practices reflect domestic industries that have stagnated in recent years. As a commercial banker noted, there is little demand or need for capital to invest in fixed assets (e.g., factory expansion) given the fact that Nairobi's domestic manufacturing sector is already over capacity. In this context, commercial loans are often used to address working capital needs, rather than long-term development. Other commercial loans, when available, often focus on non-productive, speculative investments in property although most bankers view these as high-risk given the glut of high-end real estate in the city. As such, these investments are often made with cash or through other financial arrangements.

² As Laryea *et al.* (2020) document, 60% of all firms left the EPZ scheme just before the end of the 10-year tax holiday, ensuring that the government's up-front tax giveaway did not translate into long-term revenues.

Support is more coherent and significant for large, greenfield projects such as industrial estates, SEZ, and new-build, satellite cities. Two of the more high-profile projects in the Nairobi area, Tatu City and Konza Techno City (see Figure 2), seek to facilitate Nairobi's industrial development by kick-starting industries in peri-urban enclaves developed through private investors or public-private partnerships (Splinter and Van Leynseele, 2019). Utopian urban visions such as these have become common throughout Africa (see Watson, 2014), seen by their developers and planners as modern means to upgrade urban livelihoods, infrastructures, and industries without having to deal with the messiness, costs, and complexities associated with cities like Nairobi or Dar es Salaam. However, these planned cities, more often than not, fail to come to their promised fruition, often never being built, and are poorly aligned the realities of extant production, consumption, and infrastructure regimes; reflecting a form of splintered urbanism in East Africa today.

With respect to innovative capabilities and practices, there are several innovation hubs in Nairobi where entrepreneurs are developing manufactured products and services such as mobile phone applications (apps). Hubs (e.g., Gearbox, the I-Hub, see Figure 4), show some promise with respect to ideas/innovations to service domestic markets particularly in sectors such as FinTech where mobile money apps have become essential, everyday technologies for consumers in East Africa (Chitavi *et al.*, 2021). However, innovative hubs are limited in two significant ways. First, they are often dependent on on-going financing relationships to venture capitalists or non-profit organizations, thus unlikely to be self-sustaining given limited domestic market formation thus far. Second, even when innovations have scaling-up potential, there is often insufficient manufacturing capacity or capability in Nairobi to support domestic production. Instead, innovators choose to work with Chinese or other international companies in order to shift from prototypes to marketable products, and/or to scale-up production

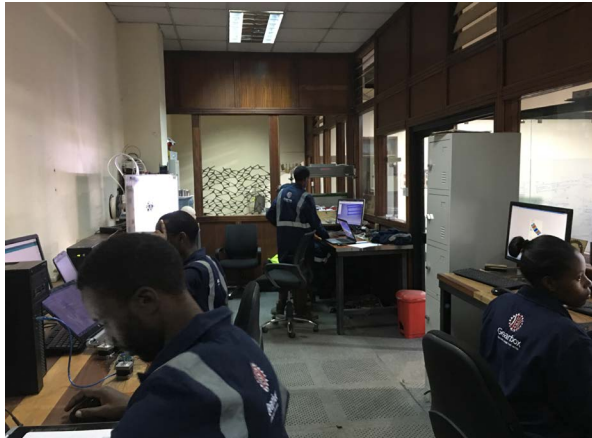


Figure 4: Gearbox innovation hub (author's photos)

given the cost advantages of outsourcing/offshoring manufacturing.³

Taken together, these practices and multiscale relations govern Nairobi's production regime in four primary ways. First, foreign capital (esp. from China) has assumed greater control over the regime as imports flood markets and inward FDI assumes a greater presence in the city-region. Second, and despite recent policy shifts to the contrary, the Kenyan state has maintained a by-and-large hands-off approach to industrial policy with the exception of large projects meant to attract inward FDI through SEZ and new-build cities. Big projects reflect expansionary fiscal strategies as they relate to industrial development but they are often mired in corruption and rent-seeking activities, and poorly coordinated with other policies vital for industrial upgrading (e.g., vocational training). Third, subsidies are by-and-large essential to attract investments in larger-scale manufacturing, particularly those firms operating in EPZ or SEZ, yet the tax holidays and other incentives associated with these are not generating net benefits by most accounts. Fourth, and very much as it is Dar es Salaam, the city's large informal sector is by-and-large ignored by the state with the exception of regulatory interventions aimed at cleaning up, displacing, and/or formalizing small-scale enterprises. As such, a large portion of the urban-regional economy remains unsupported by the state, further marginalizing the livelihood strategies of millions of residents.

This assessment of Nairobi's production regime would usually mark the endpoint for economic-geograph-

ical research of the city-region's development. It is productivist in nature, focusing mainly on the prospects for development through the firms, clusters, FDI, and industry-specific assets. To fully understand Nairobi's development trajectory, however, it is important to consider how its production regime relates to, or is shaped by, its consumption and infrastructure regimes. Such relationships – inter-regime couplings – are crucial to consider in order to develop a more comprehensive picture of the city's development pathways and potentialities.

Nairobi's consumption-production regime couplings

This section examines the links or couplings between Nairobi's production regime and consumption regime in order to show how the majority of residents' struggles to obtain basic goods and adequate housing further shapes the production regime and the prospects for industrial and socioeconomic upgrading. Nairobi's consumption regime reflects the use value of the city in terms of amenities and quality of life, and potential pathways for social upgrading amongst its residents. Such factors are important in that they create demand and supply-side couplings to the production regime that can influence industrial development. On the demand side, consumption can support non-basic industries (i.e., non-exportable) and enable local firms to upgrade their capabilities. At the present, however, consumption practices are not conducive to such a dynamic given the fact that the majority of citizens live in precarious, high-cost housing arrangements that reduce their purchasing power. Approximately 56% of the city's population lives in informal settlements or slums characterized by tenure insecurity, poor basic services, congestion, and

³ For example, an NGO that developed an innovative system for distributing cooking gas in informal settlements was forced to turn to foreign manufacturers to develop and mass-produce the associated gas regulation and flow measuring technologies.



Figure 5: Luxury property development advertisements in Nairobi (author's photos)

high costs of living that drain household resources and impede upgrading (Gulyani and Talukdar, 2008; Bird *et al.*, 2017; Talukdar, 2018). Ninety-two percent of all slum dwellers are tenants, driven to live in high-priced, low-quality housing in order to be proximate to labor opportunities in the city. Land-lording arrangements are mired in corruption with politically connected individuals having significant control over the construction and leasing of housing in areas where property rights may be poorly defined or illegally granted. This results in landlords seeking short return periods on their investments through high rents given the prospects for capital losses if the state decides to demolish the slum or transfer control over the land to someone else (Bird *et al.*, 2017).⁴ All told, slum dwellers pay a rent premium of about 16% more than those residents in formal residential areas, indexed in relation to the quality of housing (Talukdar, 2018). Housing conditions – the so-called “slum deficit” – such as these leave little surplus money for households to spend on wage goods, basic services, and savings.

Compounding this problem is the supply of affordable housing stock, despite the issue being a central pillar of the Kenyatta government's Big 4 agenda. While slums are home to nearly 60% of the population of the city, they only cover 6% of all residential land area; thus raising key

questions as to how the other 94% of land area is being utilized (Talukdar, 2018). The affordable, improved housing challenge has been exacerbated by land speculation as local and foreign investors buy up every available parcel in central areas of the city. Favored investments include high-rise and/or fancy apartment blocks, petrol stations, car lots, and, for the bigger investors, shopping malls that cater to higher-end consumers (see Figure 5). Speculative practices such as these are a highly inefficient use of land given the desperate demand for upgraded housing. As has been observed in other parts of Africa – e.g., Kigali and Addis Ababa – such practices often entail a *de facto* tax break for investors in that while the land itself is taxed, the buildings constructed on it are not. As Goodfellow (2017, p. 800) notes:

“Under such conditions and in the context of rapid economic growth, people with resources may be more inclined to speculate on buildings than on land itself. This is potentially even more damaging if it results in an oversupply of buildings that does not match demand, a reduction in the availability of land for different uses and the sucking away of resources from productive investment.”

Beyond the mismatch between housing supply and needs, the consumption regime is characterized by the increasing significance of imported wage and other goods; particularly from China. As in the case of Dar es Salaam, this is evident in the massive trade deficit that exists between Kenya and China, averaging over US \$5 billion between 2014–2020 (UN Comtrade, 2021). This deficit is particularly

⁴ For example, Mukuru, a large slum located near Nairobi's CBD and traditional industrial area, recently experienced the demolition of 13,000 homes and the displacement of 40,000 residents to create space for a new expressway meant, in part, to ease traffic congestion from the airport to the city center (Ram, 2021).

significant given that many of these imports are in mature industries for materials and consumer goods that Kenyan firms could, ideally, supply. As noted above, Chinese imports have made it extremely difficult for Kenyan manufacturers to compete in domestic markets and this has stifled industrial upgrading. In the apparel sector, the circumstances are exacerbated by the imported used-clothing (known locally as *mitumba*) trade that further crowds out manufacturers. A recent attempt by the East African Community to ban *mitumba* imports was effectively blocked when the US government threatened to force Kenya, Tanzania, and Uganda out of the Africa Growth and Opportunity Act (AGOA) agreement given many used-clothing imports come from the USA (Kelley, 2018). This multiscale relation is thus of great significance to local manufacturers striving to gain any advantage in domestic clothing markets.

Spatially, Nairobi's markets – like its housing distribution – are increasingly marked by privatized, securitized, and enclaved shopping malls that cater principally to middle- and higher-income residents. Foreign supermarkets (e.g., Shoprite [South Africa], Carrefour's [France]) commonly serve as anchor outlets in malls and other transnational retail chains (e.g., Java House [owned by Washington, DC based Emerging Capital Partners]) also mark these consumption spaces. Imported goods play a prominent role in terms of what is sold, even in the case of food. This is due in part to the entry barriers – pricing and payment terms, access to finance, quality standards, and machinery – that domestic food processors face when seeking to supply chain stores (Kamau *et al.*, 2019). At the same time, more traditional public markets (wet and dry goods) are struggling to respond to shifting consumption patterns with one respondent commenting that malls and chain stores are “killing public markets”. Similar dynamics were observed in Dar es Salaam, both in terms of markets and housing distributions.

Taken together, and quite similarly to the situation in Dar es Salaam, the evolving attributes of Nairobi's consumption regime do not bode well for domestic manufacturers and its production regime. Nairobi's economy is growing but increasingly through commercial trade and services – a consumption driven dynamic that will more than likely be unable generate the kinds of employment and multiplier effects needed to keep pace with population growth. For consumers, more affordable, accessible, and often higher-quality consumer goods are a benefit given the cost of living in Nairobi and Dar es Salaam. While at the same time, however, residents who rely on informal-sector livelihoods in public markets are facing increased precarity as consumption practices shifts toward chain stores, malls, and foreign-owned retail outlets.

Nairobi's infrastructure-production regime couplings

This section examines the interdependencies and couplings between Nairobi's infrastructure regime and the production regime, focusing particularly on how the governance and distribution of vital services and collective goods is shaping the prospects for productivity improvements. There is little doubt that there have been significant upgrades to Nairobi's infrastructure and built environments over the past two decades. Road networks have been expanded and extended, electricity supplies are much more reliable and widely distributed, and the city's skyline is marked a number of new, modern buildings. Construction cranes and sites are seemingly everywhere, evidence of a city flush in investment. At the same time, there is a continued maldistribution of basic services and vital collective goods, indicative of exclusionary, splintered urbanization (Graham and Marvin, 2001; Swilling, 2014; Murphy and Carmody, 2019). Governance of the extant infrastructure regime is driving these developments, creating a city that is simultaneously more globalized and fragmented or splintered.

By far the biggest infrastructure success is access to mobile phones and wireless networks which have become ubiquitous throughout the city and country. Services such as the mPesa banking app have made money transfers and payments more convenient, safer and speedier for residents, often replacing cash transactions in their entirety. Application development for mobile phones has become a popular area of innovation, particular in incubators like Nairobi's I-Hub (<https://ihub.co.ke/>) where, in particular, FinTech apps have taken off (see Chitavi *et al.*, 2021). As noted above, however, the scaling up of these innovations in a manner that might generate widespread employment in the information-communication technology (ICT) industry has not occurred as of yet.

Transportation and logistics networks have also experienced significant upgrades in recent years, particularly with respect to Nairobi's connectivity to the global economy. New ring roads and expressways have been built to bypass the city center, Jomo Kenyatta International airport has been upgraded, an inland container depot has been constructed, and the standard gauge railway (SGR) now provides a high-speed linkage to the port in Mombasa. China has played a central role in infrastructure projects as part of its BRI with most of these projects enabled by concessional loans and other forms of state-backed capital (namely ExIm bank). Chinese state-owned enterprises (SOEs) and subcontractors almost always manage construction and project implementation. As a



Figure 6: The Ngong Road upgrade with disrupted manufacturers (author's photos)

result, and despite the 40% local procurement requirements, the spillover effects of infrastructure projects have been limited given that higher-value inputs, machinery, and skilled labor continue to be imported.

While ICT and transportation/logistics infrastructure investments such as these have improved Nairobi's connectivity to the global economy, intra-urban infrastructure realities tell a different story. Traffic congestion is one of the most pressing issues facing the city's development as a rising middle class increasingly owns automobiles.⁵ Traffic jams and congestion result in significant costs and productivity losses, \$500,000 per day according to a 2016 estimate (Honan, 2016). The city has one of the lengthiest average commuting times in Africa with 47% of residents choosing to walk to work given the costs and time public and automobile transport takes during rush hour (Rajé *et al.*, 2018). Dar es Salaam is similarly challenged by traffic congestion, gridlocks, and public transportation systems that are wholly inadequate to meet the needs of growing populations. In both cases, such conditions impinge on the production regime by creating spatial mismatches between where people can afford to live and where employment opportunities are. Moreover, air pollution, especially particulate matter conditions, has worsened as a result, often exceeding World Health Organization guidelines (Rajé *et al.*, 2018). When road upgrading projects are carried out, e.g., the Ngong Road expansion or the airport expressway, they often come at the expense of local enterprises and informal settlement communities who are displaced as a result (see Figure 6; Ram, 2021)

Beyond traffic, the most compelling challenge facing the city's infrastructure regime is what to do about the city's slums (see Figures 7a and 7 b). Recent master plans for Nairobi's development barely specify strategies for slum upgrading, instead focusing on how the city can become a global and regional economic center through projects like the SGR (Myers, 2015). One respondent, a planner, was dismissive of concerns about slum conditions, inferring that these will simply disappear as the city's economy grows. The evidence to this effect is contrary on two fronts. First, most of Nairobi's slums have been in existence for decades and show little sign of going away any time soon despite sustained economic growth. Second, slums can often become "poverty" traps locked into low-level equilibria, even in cases where there is greater resource availability due to economic growth (Marx *et al.*, 2013; Castells-Quintana, 2017). These outcomes are due in large part to the effects that poor services can have on long-term development. As Castells-Quintana (2017, p. 169) note:

"Access to basic services, in particular, is not just desirable *per se* in terms of quality of life for urban residents, but also in terms of capital accumulation and economic efficiency at national level, as they allow for the realisation of agglomeration economies and the control of congestion costs. The results provided suggest that investments that raise access to basic urban services, like sanitation, can have a non-negligible effect on long-run economic growth, especially for countries with high levels of urban concentration."

Water and sanitation infrastructure remains a major challenge given the capital costs associated with modernizing such systems in the contexts of informal settlements (Talukdar, 2018). Finding the space to construct underground piping, regulating, and metering systems would inevitably result in the mass displacement of residents with the state unlikely provide affordable alternatives.

⁵ Rajé *et al.* (2018) note that the number of registered vehicles in Kenya increased by 77% between 2008 and 2012 with motor- and auto-cycles increasing by 368% alone.

7a.



7b.



Figure 7: Conditions in Mukuru (7a) and Mathare (7b) slums (author's photos)

In lieu of this infrastructure, drinking water in slums is accessed through public standpipes and/or privatized supply systems that are controlled by “cartels” in some settlements. As such, rent-seeking is commonplace in these markets with local officials and utility workers often profiting. Sanitation is even more troubling given the costs and complexities of waste disposal and processing, and the need for coordination within communities. As a result, many households/residents rely on coping strategies that ensure that waste remains in or around communities, creating public health concerns such as cholera outbreaks (van Welie *et al.*, 2018). See Figure 8 for examples from the Mathare slum.

In sum, and very much as it is in Dar es Salaam, Nairobi's infrastructure regime is coupled to its production regime in problematic ways. On one hand, the state and foreign capital's interest/desire to connect the city's economy to global and regional markets has meant that there is a priority placed on big (often national) projects intended to improve and enhance global flows of commodities, information, and capital into the city-region. While there is little doubt that the city is much better connected to the global economy as a result, these infrastructure investments appear to be facilitating non-productive or counter-productive development outcomes as imports and speculative capital (esp. for luxury housing and retail space) flow more readily into Nairobi. Imports crowd out domestic industries while speculative land and building investments tie up land in inefficient or non-productive

ways. All told, the city's infrastructure regime remains woefully behind what is needed to support widespread industrial and social upgrading for the majority of its residents.

Discussion and conclusions

In an earlier application of this approach to Dar es Salaam, Tanzania, Murphy and Carmody (2019) observed similar features with regard the functioning, couplings, multiscalar relations, and development outcomes of Nairobi's sociotechnical system. Viewed comparatively, and perhaps unsurprisingly, similar processes – namely urbanization without industrialization, splintering, and intraversion – are occurring in both city-regions. Both cities can also be characterized as experiencing circumstances common to “late urbanizers” (Goodfellow, 2017; Fox and Goodfellow, 2021): high rates of population growth, speculative FDI and domestic investments in “unproductive” assets, and the splintering or fragmentation of collective good and basic service distributions. In Dar es Salaam, industrial policy is by-and-large non-existent or simply manifest in economic liberalization policies, imports increasingly crowd out domestic manufacturers, and the state's (limited) infrastructure investments are focused on enhancing global connectivity rather than improving living conditions for the majority of residents. In Nairobi, similar conditions



Figure 8: Drinking water standpipe and public toilet, Mathare (author's photos)

exist but the city's governance is also distinguishable with regard to its development strategy. Specifically, the governance of Nairobi's sociotechnical system is akin to a Dubai model for development – one focused on creating a service-based economy while skipping over a domestic manufacturing pathway with the exception of FDI driven investments in EPZ/SEZ; investments that are by-and-large poorly aligned with the extant, dominant production regime. Emphasis is on place-branding, developing high-end spaces for consumption (e.g., shopping malls, real estate), establishing a regionally dominant financial services sector, and improving connectivity to the global economy (Hvidt, 2009; Myers, 2015; Upadhyaya, 2020).⁶

Despite there being logical dimensions to this approach, Nairobi's formal development strategy remains partial and limited as a means to foster generative urbanization. It is partial in the sense that it focuses primarily on big-push, big-money projects that officials believe can rapidly jump-start economic-industrial-urban transformations that will not get bogged down in the city's congestion, informality, and infrastructure deficits. In one sense

such optimism is refreshing and a direct challenge to the oft-negative assessments of the development challenges facing African cities today. The notion being that African cities should be viewed as sites/foundations for the realization of prosperous, modern, and globally significant futures with SEZ, greenfield cities, infrastructure megaprojects (e.g., the SGR), and inward FDI leading the way.

Viewed in a more comprehensive manner, however, such an approach fails to account for the Nairobi socio-technical system in its entirety and the challenges of productively aligning utopian plans with the situated realities facing most residents. Prioritizing a narrow set of features – large-scale formal manufacturing, financial services, middle and upper-class consumption, and globalized connectivity – means that the focus is almost exclusively on the city's exchange value and its potential to serve as a growth machine for regional and national development (see Molotch, 1976). How this emphasis articulates with the dominant features of existing regimes is where the challenge lies – particularly considerations related to the precarious livelihood strategies and living conditions of residents. As is the case in Dar es Salaam, it is ultimately a hollowed-out development strategy, one that can serve to provide a set of material projects to continue and expand

⁶ For example, prior to the pandemic, Kenya Airways established its first non-stop flight to North America (New York) in 2019.



Figure 9: Splintered urbanization in Nairobi (author's photo)

growth but without making substantive changes to the internal workings of the everyday/ordinary city, particularly those associated with the inequalities that have reproduced generations of slum dwellers. In short, splintered urbanization is the dominant development pattern in these East African cities as reflected in the contrasts evident in Figure 9, an everyday sight on the streets of Nairobi.

The singular focus on transforming urban sociotechnical systems into modernized growth machines in some ways (metaphorically) reflects economic geography's focus on production and the exchange value of city-regions. What constitutes regional development success stories is generally measured on the basis of whether region-specific economic externalities – e.g., untraded interdependencies, buzz, institutional thickness, and/or relational assets – can emerge to establish and sustain comparative or competitive advantages in the global economy. Missing here is a more holistic conceptualization of place-based development as manifest in the living conditions of residents, considerations of inequality, collective goods provisioning systems, and the prospects for the least well-off to experience social upgrading. Recent work in the field has considered the implications of uneven development at the

national scale – see, for example, Rodriguez-Pose (2018) – but what about within city-regions? Such concerns have historically been the focus of urban geographers but why not economic geographers as well?

The approach presented and illustrated here and in the case of Dar es Salaam (Murphy and Carmody, 2019) is one that seeks to address this gap – that is to integrate concerns about the use-value of city-regions with analyses of their ability to create exchange value through productive activities. Such an integration captures the development process in a more comprehensive manner by moving beyond firms, industries, and clusters and into the streets and communities that constitute the city as place. Such considerations may strike as peripheral to some but I would suggest that if agglomeration, localization, and urbanization economies in fact produce cities marked by extremes of haves and have-nots, homelessness, poverty, and/or inadequate, maldistributed collective goods and services, then perhaps our understandings of what successful regional development is need to be rethought.

The cases of Dar es Salaam and Nairobi speak for themselves but it is critical to note that such development outcomes are visible in cities worldwide, even those (e.g., San Francisco, London, Seoul) characterized as winners

in the so-called “spiky” world of the 21st century (Florida, 2005). While economic geographers have been attentive to the uneven development of cities within national economies, we have paid far too little attention to intra-urban/regional inequalities that often accompany creative, innovative urban success stories. For example, Lee *et al.* (2016) show that wage inequality is highest in the wealthiest of UK cities, especially London, an issue that speaks to the exclusions and disarticulations associated with urbanization pathways today. That is, productivist success stories often come with dark sides such as inequality, poverty, and livelihood precarity for many, exclusions that can serve to subsidize the globalized development of innovative milieu yet which simultaneously make everyday living a struggle for many residents.

The goal of this paper has been to further advance and illustrate a framework for examining and comparing urban-regional development pathways such that wider considerations of place-based development can be accounted for and assessed. The focus on East African cases is not intended to signal that this is a “Southern” framework, it is not. It is instead a mid-level conceptualization of how cities function through the creation and distribution of exchange and use value. By explicitly considering “other” urban regimes – namely consumption and infrastructure – the approach demands a more comprehensive perspective on what cities do and how collective goods, amenities, and the quality of life available to their residents shape the prospects for sustainable, just, and distributive forms of regional development. In application, it calls for grounded, place-based research that goes beyond the firms, industries, and clusters in order to understand the life-worlds and everyday experiences of residents that reflect the city’s use-value. The quality of these experiences and the prospects for social upgrading, improved livelihoods, and welfare distribution should be what marks a successful urbanization pathway, not simply whether agglomerative externalities materialize.

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