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ABSTRACT

A focus on motorized mobility has been subtracted from the advancement of the modes of mobility used by the majority in Nairobi, especially the most vulnerable, with a discernible outcome of injustices. This article explores mobility in relation to spatial justice through three accessibility dimensions—spatial, modal, and individual—that place significance on the comprehension and configuration of spatial justice in relation to mobility. Viewed from this perspective, the organization of space and the prioritization of the mobility needs of the most vulnerable present a notable way in which spatial justice unfolds and is understood. Through a spatial assessment of Nairobi's urban growth and analysis of the existing modes of mobility, we find that the mono-centricity of Nairobi city contributes to challenges in accessibility to places of necessity. The city's spatial layout where places of necessity cluster in the urban core, together with the spatial brokerage role of the central business district within the public transport network, speaks for greater attention to the reorganization of places of necessity. We argue that promoting transit-oriented development, investing in state-provided public transport and provision of safe non-motorized infrastructure are integral to advancing justice in relation to mobility and building an inclusive city for all.

KEYWORDS

Accessibility; mobility;
spatial justice; Nairobi

Introduction

In the recent decades, mobility has witnessed numerous innovations where technology has become a catalyst of change facilitating ease of access through various modes of mobility. Ride hailing through mobile applications are novelties that have altered the functioning of mobility systems and as the innovations continue to develop, they present mobility as a dynamic field of systemic unfolding. Planning for mobility is therefore a process that requires constant adjustment to understanding the diversity of individual mobility behavior among city inhabitants. To systematically analyze these dynamics, we examine the interlinkages between accessibility and mobility in relation to the broader questions of spatial justice. We postulate that accessibility is governed by a set of dimensions that entail the individual, spatial and modal dimensions. The interplay of these dimensions frames our approach and understanding of how spatial injustices are reflected in urban mobility.

The *spatial dimension* refers to the organization of functions within space. The clustering and redistribution of necessary functions within the city and the layout of land-uses reflects the accessibility levels to places of necessity relative to residential areas.

The *modal dimension* is associated with the array of means or modes that enable the individual to obtain access. The unavailability, unaffordability, lack of safety and inefficiency of the existing modes of mobility may reflect the injustices that some commuters are exposed to and the difficulties of access.

The *individual dimension* which refers to the commuter, interacts intensively with the modal and spatial dimensions and encompasses an individual's social, cultural and economic characteristics such as income, gender, age, religion, employment status, physical capabilities, residential choice and

location, preferences, and education level, *inter alia*. These factors influence the ability of the individual to take advantage of opportunities necessary to improve one's well-being and the accessibility to places of necessity.

Each of these dimensions present varying degrees of complexity and it cannot be assumed that addressing them directly correlates to obtaining spatial justice. We do not perceive justice as a conclusive state but rather in agreement with Sen's (2009) Idea of justice and Sheller's (2018) Mobility justice concepts, we perceive justice as an ongoing pursuit of the public good and an evolving concept that can be improved and advanced. By mobilizing these dimensions, we aim to contribute to the discourse of understanding mobility and justice especially in a southern context. We explore the mobility of individuals in urban space in relation to the spatial layout of land uses, the network of mobility infrastructure, the available modes of mobility and the existing regulations that govern the mobility sector in Nairobi.

Nairobi, Kenya's capital, is a city shaped by rapid urban growth and a historic legacy of socio-spatial fragmentation with large disparities in terms of income and access to resources among different population groups (Klopp, 2012). Spatial justice, which is discussed in more depth in the following section, hinges on Rawls's (1971, p. 100) "difference principle" whose core reasoning is to advance outcomes that ultimately benefit the underprivileged in society. In a spatial context, this broadly relates to fairness in the outcome of the allocation of resources within space while giving attention to individuals' circumstances, rights, and entitlements (Fainstein, 2009; Soja, 2009). In the perspective of urban mobility, spatial justice places emphasis on intentional investment and prioritization of the mode of mobility mostly used by the poor and people with disabilities since their mobility options are often limited (Kenyon & Lyons, 2007; Lee et al., 2017; Martens et al., 2012).

Mobility is more than a process of journeying from origin to destination. It is linked to the livelihood and health of an individual, to the advancement of a city's economy, to the history and political engagement of the city, to the environmental conditions of the city, to the impact of climate change, to the international relations of the city, to participation of city's inhabitants in cultural, social and religious activities, to the access of civic services, and nearly every other necessity that an individual requires to dwell in the city (Sheller, 2018). Put differently, mobility is more than movement and opportunities, services and social interactions are causal factors of mobility (Hansen, 1959).

The placement of structures and infrastructure within space directs the movement of an individual and determines the accessibility to desired destinations. Accessibility is conditional to the design of the physical space and the layout of land uses within that space (Geurs & van Wee, 2004). Land use influences mobility and has an impact on access to services and livelihood opportunities (Hagans, 2011). Mobility and accessibility can be understood as mutually interdependent. The places of necessity, referred in this paper as areas of opportunities and services, and the potential life that an individual can build or achieve are all in one way or another dependent on accessibility and mobility and the way space is organized in cities. Mobility can therefore be defined as the inevitable action that enables accessibility to places of necessity.

Although the allocation of land uses determines whether the places of necessity can be conveniently accessible to individuals living in dispersed areas throughout the city (Geurs & van Wee, 2004), accessibility gaps are inevitable because the growth of cities creates a core and periphery (Martens & Bastiaanssen, 2019) meaning that individuals closer to the core, where places of necessity are clustered benefit from proximity and have higher levels of access in relation to those living in the periphery without access to adequate motorized mobility. Many highly privileged urban residents in Nairobi, however, choose to live in exclusive areas in the periphery, contributing to a spatial extension of the city and generating access by use of private vehicles. In many cases, journey times for these inhabitants in the periphery are the same or even longer as an individual from the low-income settlement who walks for an hour to the desired destination. The proximity versus exclusivity trade off distorts the city's mobility system and land-use patterns to cater for that exclusion. It is also a perpetuation of the spatial colonial history of Nairobi where segregation by design discouraged mixed-use and reinforced social segregation and shaped the contemporary patterns of land use and mobility that sustain



inequalities. We postulate that accessibility can be enhanced by the re-distribution of places of necessity throughout the city and investing in the modes of mobility used by the poor urban commuters as a means of advancing the concept of spatial justice in relation to mobility.

Notably, accessibility connotes both access to the mode of mobility and the access to places of necessity. This research, however, directs attention to accessibility to places of necessity, whereby the mode of mobility is considered a facilitator of access. This is in part due to the already existing high accessibility levels to public transport for a significant majority of Nairobi's inhabitants (Salon & Gulyani, 2019).

Nairobi is a city with a large share of urban commuters who walk to work daily (Fried et al., 2020) and at the same time, a large youthful population of under 35 years who make up over 75% of the total population according to the 2019 Kenya National Census (KNBS, 2018). We perceive this as a unique opportunity that can be harnessed toward uptake of sustainable modes of mobility. In contributing to the planning of urban mobility in Nairobi, we point out specific areas that could strengthen the resilience of the public transport route network in the city and potential ways to direct the youthful population in the city to drift from personal car ownership and be drawn to more sustainable modes of mobility. This research further aims to assist the county government of Nairobi in their efforts to provide a more efficient public transport system by providing ideas for transit-oriented development and non-motorized infrastructure provision.

The paper is organized as follows: we continue the next section with a discussion on the relationship between spatial justice and accessibility while relating this to the three dimensions. We then explain the methods and data that we used to assess the case of Nairobi city. The section that follows explains the existing situation of mobility in Nairobi within the framework of the various dimensions and finally a discussion of the findings and some planning recommendations.

Accessibility in relation to spatial justice

Spatial justice is concerned with the localization of social justice across various geographies (Soja, 2013). It portrays the understanding of how the spatial form shapes social processes (Harvey, 2010). The core concern of social and spatial justice is in the distribution of resources that are confined within a particular place, the associated processes of resource distribution and the individuals or institutions that ultimately promote and guarantee fairness in distribution of resources (Rawls, 1971; Soja, 2009). These resources are broadly defined as goods that an individual requires to successfully pursue their intentions and they entail: "rights and liberties, opportunities and power, income and wealth" (Rawls, 1971, p. 62), services and opportunities generated by and in a city, as well as 'natural and cultural' resources (Soja, 2013, p. 46). Although accessibility and mobility may not be perceived as resources that are subject to distribution or re-distribution, we understand them to be a necessity that individuals require to pursue their daily intentions. Using the framework of the three dimensions—individual, spatial and modal—we relate accessibility to the notion of spatial justice based on the understanding that space does not only contain resources that can be distributed but also consists of individuals who undertake various activities that require movement within that space and whose actions continuously re-arrange the space, generating various levels of accessibility. The dimensions are not treated as separate entities but are rather parts that interact together and constitute a holistic understanding of accessibility within the city as shown in Figure 1.

Relating the spatial dimension to the city, the organization of urban functions determines the diversity of access among individuals. The heterogeneous landscapes of the city produce challenges in achieving homogeneous equality across space (Soja, 2013, p. 71), hence, accessibility levels are bound to vary across the city. Spaces are mainly organized according to the individual's needs such as need for housing, employment, recreation etc and most individuals tend to prefer proximity to these essential places to reduce time and costs related to longer distances. However, the desire for the wealthy individuals to live in exclusive neighborhoods that can be reached by a motor vehicle contributes to the advancement of car-centric mobility.

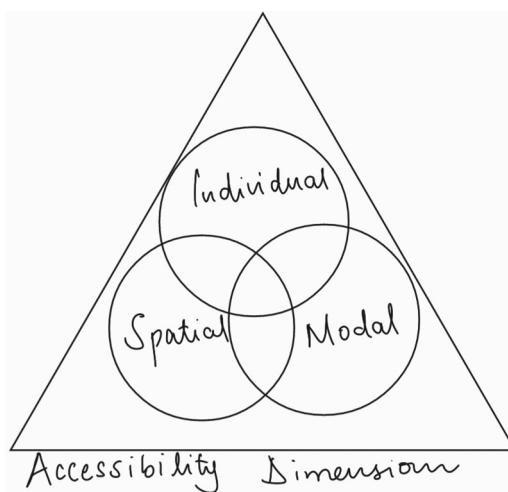


Figure 1. Accessibility framework.

Source: The authors.

Physical distance, as a product of the organization of space, constitutes a precondition of spatial justice. The tendency to minimize distances in accessing places of necessity, especially for the poor, is a fundamental part of the spatiality of individuals (Soja, 2009). An individual's level of access is directly correlated to the distribution of land uses within an urban area (Kang, 2015). Land use planning that is attentive to proximity to places of necessity closer to residential areas contributes to better social and spatial interactions and improved accessibility (Handy et al., 2005; Martens & Bastiaanssen, 2019; Strauch et al., 2005).

The re/production of space in a city through spatial planning and, importantly, the social processes and activities undertaken by individuals and groups are factors that can explain spatial injustices (Soja, 2013, p. 72). The diversity of individuals in a city means that mobility and accessibility are experienced differently among individuals. Those with low income and disabilities, for example, have more limited options of mobility; children and women may be more vulnerable to unsafe spaces when using certain modes of mobility; those residing in peripheral areas may experience more disadvantages of access to necessities that are centrally located, *inter alia*.

When relating spatial justice to the individual dimension, we draw from Rawls (1971) "difference principle" which, in general, promotes actions that aim to improve the situation of the least fortunate. The principle argues that improving the situation of the underprivileged in society constitutes to benefits across all other members of society (Rawls, 1971, p. 100). Linking this to urban mobility means deliberate actions and investments that are directed to improving the accessibility levels of the most vulnerable (Kenyon et al., 2002; Preston & Rajé, 2007). Put differently, it relates to prioritizing the mode of mobility used especially by the poor and people with disabilities, whose choice of mobility is often limited (Dong, 2018; Jeekel & Martens, 2017).

The modal dimension can be categorized into two. The first is the available mode of mobility, either motorized or non-motorized, that facilitates accessibility to places of necessity. The second is the infrastructure that supports and enables the use of motorized or non-motorized modes e.g road or rail infrastructure. With reference to the latter, inequalities in the spatial provision of infrastructure contribute to mobility challenges that generate social and spatial inequalities (Cass et al., 2005; Currie et al., 2010; Guzman et al., 2017). Such is the case where large capital investments are directed toward infrastructure that prioritizes the use of motorized modes over other more sustainable non-motorized modes (Banister, 2011; Lucas, 2013). The availability of efficient, safe, affordable and reliable modes of mobility determines an individual's level of access (Martens & Bastiaanssen, 2019)

and reduces burdens of access especially for those living in peripheral areas (Jeekel & Martens, 2017). Additionally, a wide array of available modes of mobility reflects the freedom of choice for the individuals in deciding the most preferred mode and confronts historically entrenched inequalities of access to space (Klopp, 2012). In a report developed by the Socially Just Public Transport Working Group in collaboration with the Friedrich Ebert Stiftung based in Nairobi, access to safe and affordable public transport and the freedom to choose from different travel options are considered a form of equity and make up one of the pillars of a socially just public transport system (Kamau & Manga, 2020).

Justice in relation to mobility also relates to a nuanced debate on mobility justice that associates movement with politics. Mimi Sheller argues that power controls mobility in cities resulting in unequal capabilities for movement that are ultimately influenced by systems of political management occurring within and between borders (Sheller, 2018). Looking specifically at the context of Nairobi, politics and planning are conjoined whereby the political context dictates the development progress (Mitullah, in Charton-Bigot & Rodriguez-Torres, 2010). The enforcement of laws and regulations governing mobility are in most cases dependent on the political situation of the country and are characterized by authoritarian politics that continue to influence mobility in the city (Klopp, 2012).

Bringing these dimensions together, we understand that spatial justice in relation to accessibility connotes (a) the arrangement of space intended to reduce disadvantages of distance, (b) the intentional investment in improving the accessibility of the most vulnerable, (c) the equity in provision of mobility infrastructure to support more sustainable, safe and affordable modes of mobility, and (d) the influence of politics on mobility in the city. The distinction of what constitutes spatial justice in terms of allocation of space involves several other layers relating to individual preferences, choice of residential location, policy and governance, income and employment, etc., reinforcing the indirect correlation between spatial justice and mobility and drawing attention to constant depth in understanding these complexities.

Methods and data

In order to contextualize these dimensions in Nairobi, we carried out a progressive analysis of each dimension. Starting with the spatial dimension, we conducted a spatial assessment of Nairobi city using Geographical Information Systems (GIS). We first explored the periodical growth of the city to observe changes in urban development over time. Using Landsat imagery, we developed maps of the changes in the extent of the built-up area within 5-to-10 years intervals. Starting from the year 1984, which was the oldest year available for download, we examined changes over a longer time series up to the year 2020. Landsat scenes of Nairobi were downloaded from the United States Geological Survey website (USGS, n.d.). Using QGIS and its Semi-Automatic Classification Plugin for supervised classification of remote sensing imagery, we manually created ROIs (Regions of Interest) for the various classes in the imagery. We focused on built-up areas, forested areas, and open spaces. The spectral signatures were recorded, and the automatic land cover classification of the whole image was performed using these ROIs. The final output images were “re-classified” to only one region for built-up area and all other regions were set to “Null.” This process was repeated for each available Landsat scene. We initially intended to generate the maps of the imagery at 10-year intervals, however, due to the dense cloud cover in the 1994 imagery, we selected 1995 and mapped in 10-year intervals until 2015 then a 5-year interval until 2020. The urban extents of the city across the years were then compared and used to calculate the urban growth using the percentage change in land cover. Secondly, we analyzed the land uses in the city using data from the Nairobi County Urban Planning Department. The data comprised of shapefiles of the various land uses according to the 2014 Nairobi Country Integrated Urban Development Master Plan (NIUPLAN). We generated maps from the shapefiles of

the existing land uses in the city to visualize the organization of urban functions within space, especially the distribution of places of necessity within the city. This spatial assessment aided in the analysis of the spatial dimension.

To investigate the individual dimension, we used County level secondary data obtained from various Kenya government websites. We obtained household survey data from the Kenya National Bureau of Statistics (KNBS), a governmental body that is mandated to collect, analyze, and disseminate statistical data. The KNBS conducts countrywide longitudinal household surveys every 10 years that we used in this research. We used available data for the periods 2005–2006¹ and 2015–2016 household surveys and filtered out individual mobility data of Nairobi County respondents. The data contained information for over 1,200 respondents for the year 2006 and over 1,050 respondents for the year 2016. Analyzing data from both years allowed for comparison of the modes of mobility between the two periods. Secondly, we obtained data from the National Transport and Safety Authority (NTSA) on commuter fatalities from the period 2017 to 2019. This data was used to analyze the safety of individuals using various modes of mobility and to understand how spatial injustices are reflected at the individual level.

The same data provided information that was used to analyze the modal dimension. Additionally, network analysis was conducted to calculate centrality measures within the public transport network using matatu route network data. Matatus are privately owned and privately operated vehicles that provide public transport as a service in the city. They found their niche, post-independence, in meeting a crucial need for mobility in the event of the decline of State-provided public transport (Mutongi, 2017). They have now become a crucial player in the urban mobility landscape of Nairobi (Salon & Gulyani, 2010). Reference of public transport in this paper hence implies mobility by use of matatu which range from minivans to high-capacity buses. The matatu route network was mapped out by the Digital Matatus Team that consisted of a collaboration between the University of Nairobi School of Computing and Informatics, Center for Sustainable Urban Development at Columbia University, and the Civic Data Design Lab at the Massachusetts Institute of Technology. The team developed transit data for Nairobi, collecting data for the various matatu stops using a phone-based tracking application that also relied on the knowledge of the regular users of the various routes (Williams et al., 2015). The data culminated in the design of a matatu transit map for the city which is publicly accessible (Digital Matatus Project, 2015).

We used the existing data and maps to carry out network analysis using Gephi, a software for calculating network centrality measures, to observe the varying degrees of spatial influence that some spaces exert on others and how this affects the functioning of the entire network. The measure of betweenness centrality was used to capture the degree to which a single node stands in between others and hence its position of power within the network as it influences the access to other nodes. The nodes in our network analysis represented the origin and destination of matatu routes and the linkages represented the various ply routes of the matatus. We also reviewed the 2019 Kenya National Census Data to map the population distribution in the city and the KNBS National Economic Survey of 2020 to note the changes in acquisition of personal vehicles and to substantiate the necessity of investing in sustainable modes of mobility.

These different types of analysis helped to unpack the complexity of spatial justice in relation to urban mobility and to advance the understanding of the relationship between the two concepts.

Finally, we reviewed the existing regulations that govern the transport sector. Most of the regulations exist at a national level but some, such as the 2017 Non-Motorized Transport (NMT) policy, the county integrated development plan and the transport development plan were specific for Nairobi.

Spatiality of access in Nairobi

This section investigates the spatial dimension of accessibility starting with a brief historical overview of the growth of the city to provide a broader perspective of the origins and perpetuation of mobility injustices (Sheller, 2018). It also assesses the periodic growth of the urban form and the existing spatial layout.



Nairobi's historical urban growth is rooted on segregation by design and typified by chaos as the city was established without any intent of expanding into its current global city status (Halliman & Morgan, 1967). It developed in the late 19th century as a railway camp and a resting point for the construction of the Kenya-Uganda Railway (Ogot & Ogot, 2020). Given that the city was only meant to be a resting point, it grew without a proper plan (Murunga, 2012). The first urban master plan was developed in 1926 and updated and commissioned in 1948, half a century after the city was established (Kingoriah, 1983). Although the plan was never implemented, the spatial design that already existed in the city was in a fashion typical for colonial urban planning, to guard the interests of European settlers in securing private land ownership and to discriminate Asians while largely excluding Africans (Hagans, 2011, p. 17; Polèse et al., 2000, p. 251). The development pattern of the Central Business District (CBD) was dictated by the Europeans and Asians who owned land in the city center while the residential location of Africans was to the east of the CBD (Kingoriah, 1983). From its foundation as a colonial railway quarter on, Nairobi has experienced decades of significant and fragmented urban growth.

Presently, Nairobi is fully urbanized. Figure 2 shows a periodical expansion of the city within the past three and a half decades starting from the year 1984 to the year 2020. The boundaries of Nairobi changed four times since the establishment of the city in 1899 to the time of Kenya's independence in 1963 and have since remained unchanged (Halliman & Morgan, 1967, p. 99). The urban growth of Nairobi from the mapped year of 1984 is witnessed to have grown toward the east and later spread to the North. Conspicuous growth occurred in the period between 2005 and 2015 with development toward the south inhibited by the Nairobi National Park. Presently, the city's urban agglomeration has a significant extension, stretching over more than 20 km from the CBD to the west and over 30 km to the east.

Urban growth has been consistently high with an observed rapid growth rate of 12% and 18% in the periods 2005 and 2020 respectively as shown in Table 1, suggesting that the urban development process has more than doubled roughly every 10 years. The current urban built-up area is an estimated

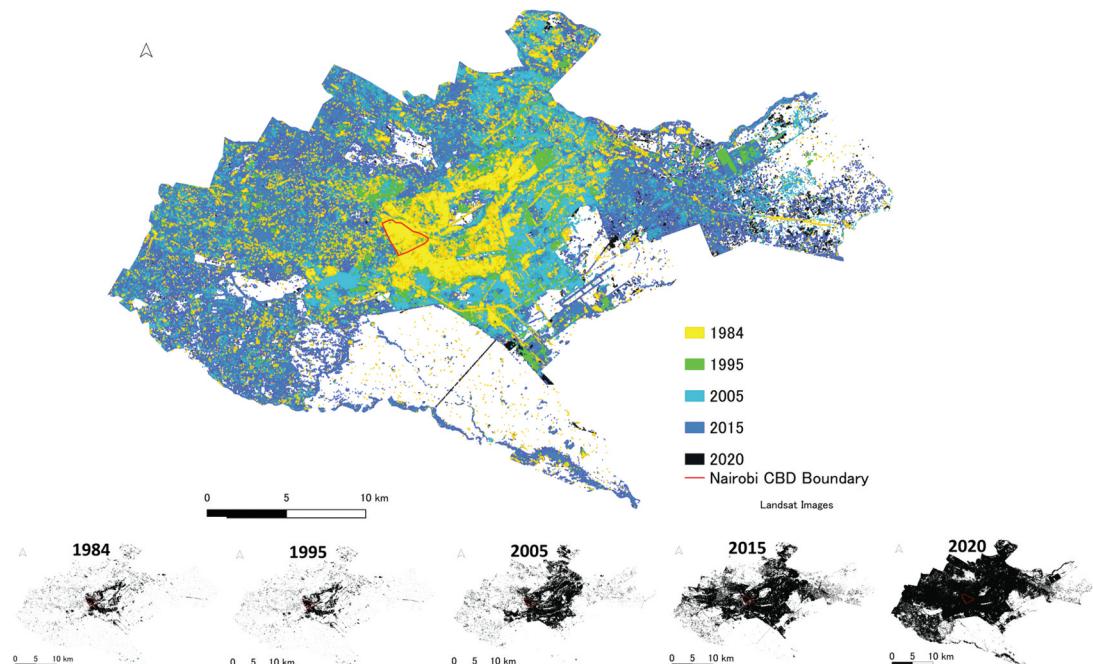


Figure 2. Historical development of Nairobi.

Source: The authors, mapped from Landsat images. The map shows the development of the built-up area over a period of 36 years from 1984 to 2020.

Table 1. Land cover change in Nairobi as observed and calculated from Landsat images between the period 1984 and 2020.

Period	Built-Up Area (km ²)	No of Years	% change	% change p.a
1984	46.7	-	-	-
1995	58.6	11	28%	2%
2005	152.9	10	59%	16%
2015	427.8	10	80%	18%
2020	696	5	63%	12%

696² sq. km, around five times larger than in 2005 and more than fifteen times larger than in the year 1984. Nairobi has a present population of over 4 million inhabitants and is expected to reach 6 million inhabitants by the year 2030 (Alam & Powell, 2017), compelling need to develop sustainable ways of mobility as many more people will need to be mobile.

The city's history is reflected in the fragmented materiality of built space and infrastructure provision and apparent in land-use patterns, where high-income areas are low density and vice versa. The map of the existing land use plan for Nairobi in Figure 3 illustrates selected zoned out areas in accordance with the research interests of this paper. We singled out commercial, institutional and industrial zones as areas that (a) concentrate and attract opportunities and services that individuals require for their livelihood and (b) generate a demand of necessities that require individuals to journey to these locations from their residential areas (Geurs & van Wee, 2004).

Many of the historically wealthier urban areas are located toward the higher-lying and greener northwest and southwest of the city, around the regions of Karura and Ngong Forests. The neighborhoods are characterized by low density generous villas surrounded by large green spaces and tree-lined

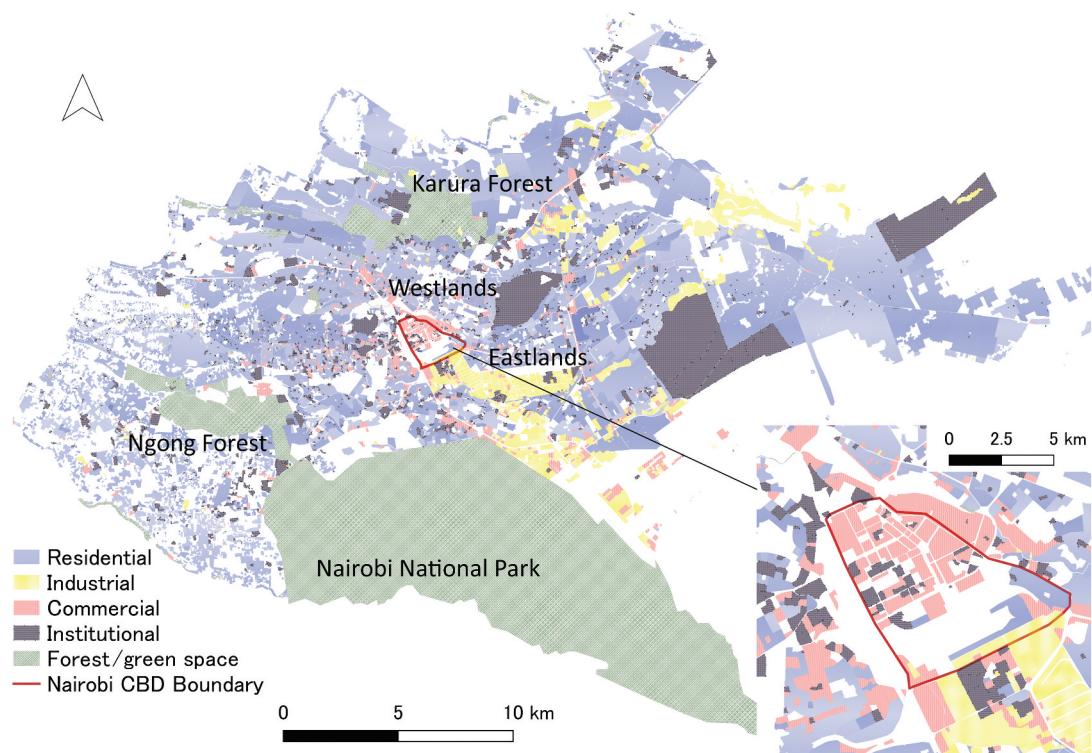


Figure 3. Land use map of Nairobi.

Source: The authors, generated from shape files obtained from Nairobi County planning office in accordance with the 2014 Nairobi urban master plan. The figure maps out selected land uses in Nairobi that illustrate places of necessity.

alleys that still reflect the garden city ideal colonial planners once pursued. The lower-lying, dryer eastern parts of the city around the Eastlands area, that were reserved by colonial planners for “African” housing (Kingoriah, 1983) are today locations of affordable housing, characterized by high density and home to a rapidly growing urban lower- and middle-income class.

Nairobi has developed into a regional hub connecting other cities in the East African region and as a global player, receiving the highest number of foreign direct investments in East Africa according to the State of African Cities Report (UN-Habitat, 2018, p. 49). These investments have altered the spatial landscape of the city, shifting the commercial and institutional land uses to other areas proximate to the CBD.

Within the past decade, two main areas, west and northwest of the CBD, have developed as clusters of places of necessity, with a high concentration of international and government institutions and a mixture of private and public commercial areas. These are the areas of Westlands to the northwest and Upper Hill to the west of the CBD as shown in Figure 4. The area of Upper Hill changed use from a low-density residential area to a high-density commercial area with very few residential areas (Njehia, 2015). Westlands is a recently emerging commercial zone with a fair share of residential space; however, changes are anticipated in the coming years after the completion of the ongoing construction of the Nairobi Express Highway whose aim is to accelerate the growth of Westlands area for business according to a press release by the Kenya National Highway Authority (KeNHA, 2022). As postulated in the gravity model by Hansen (1959), areas that concentrate opportunities tend to have high accessibility levels and are more likely to attract other areas of opportunity within proximate reach. This can be witnessed in the current spatial growth of Nairobi. The CBD, which has the highest cluster of commercial and institutional areas, and a density of public transport

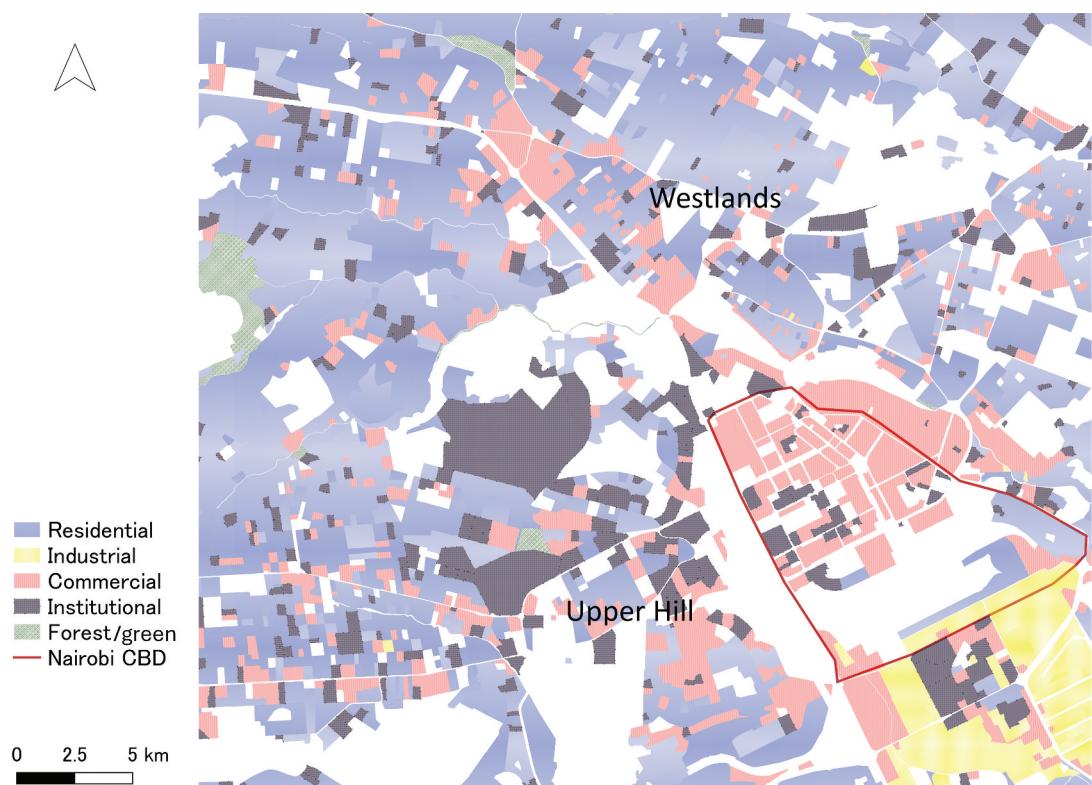


Figure 4. Emergent places of necessity within 5 km radius from the CBD.

Source: The authors, generated from shapefiles obtained from the Nairobi County planning office. Upper Hill and Westlands areas have, in the recent past, developed as clusters of commercial and institutional activity.

connections as will be illustrated in the following section, has attracted clusters of places of necessity within its proximity. These two emergent areas of Upper Hill and Westlands are strategically located within 5 km radius from the CBD, benefitting from the high accessibility levels of the CBD.

What is however striking about the CBD is the meager availability of residential areas, resultant from its colonial zoning as a commercial area. This means that it is a space of quiet neglect in the night while it could be transformed to become the most ideal location for residential use. The emergence and growth of Upper Hill and Westlands have led to an emptying of several buildings in the CBD indicated by the number of rental signs on the buildings that formerly housed offices that have relocated to these areas. The situation could have arguably been aggravated by the outbreak of the Corona pandemic as more people became accustomed to working from home. These empty buildings, however, present a chance for converting some of the former office spaces to residential spaces, a move that could attract people to take advantage of the proximity to places of necessity and the density of transport interchanges in the city center. This action calls for a policy shift that would ultimately support active mobility for movement over short distances and support a high quality of life. In addition, increasing the residential space in the CBD would advance the second agenda of Kenya's Vision 2030 "Big 4 Agenda" of providing affordable housing.

The individual dimension of access in Nairobi

A comprehensive study conducted by Salon and Gulyani (2010) investigated the mobility of slum residents in Nairobi using data from a household survey that was conducted by the World Bank in 2004. Through inductive research, the authors found a negative correlation between poverty and accessibility to motorized mobility among *slum* residents. Over 65% of the adult respondents registered walking to work as their main mode of mobility and over 96% of children walking to school (Salon & Gulyani, 2010). Additionally, research on urban mobility in Nairobi by Fried et al. (2020) found walking to be a popular mode of mobility across all income groups but especially among the poor and low-income commuters who travel for far distances of 10–15 km. This situation is reflected in many parts of Nairobi where a large percentage of the inhabitants walk to their places of work or other important destinations. The 2014 Nairobi Integrated Urban Master Plan (NIUPLEN) indicates that walking is the dominant mode of mobility for over 51% of Nairobi's inhabitants who travel to school and to all other activities except for work trips where public transport (34%) recorded a 6% higher usage than walking (28%; County Nairobi, 2014). Other studies on mobility in Nairobi also conclude that walking is the mode of transport for more than 80% of all trips especially among the urban poor mainly attributed to high costs of public transport (Alam & Powell, 2017; Avner & Lall, 2016).

Our analysis of the KNBS household survey data of 2006 and 2016 revealed that walking and public transport were the most dominant modes of mobility among the respondents in both study periods. Walking and public transport recorded a higher usage in 2016 as shown in Figure 5. In another comprehensive study conducted by Salon and Gulyani (2019) using 2013 household data from the World Bank database, one third of the surveyed households in Nairobi registered walking as the only means of mobility to reach their work destinations.

Although walking is the norm for many urban residents in Nairobi, it is unfortunately by the same token, subject to peril (Salon & Gulyani, 2019). An analysis of NTSA data between the years 2017 and 2019 revealed that nearly 60% of all commuter fatalities annually constitute pedestrians. The figures would certainly be higher with non-recorded pedestrian fatalities. In a recent study conducted by the Climate and Development Knowledge Network (CDKN), all the 12 pedestrian corridors that registered high foot traffic in Nairobi had inadequate pedestrian crossings and inadequate protected footpaths (Odhiambo, 2021). Many roads are characterized by narrow and in many sections, divested sideways where pedestrians are forced to risk sharing the road with motorists. Relating this situation to spatial justice, the high number of pedestrian deaths, relative to other modes of mobility reflects the

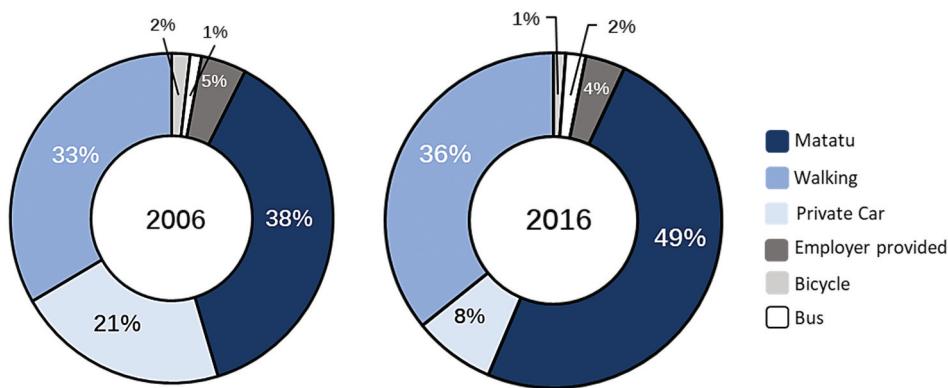


Figure 5. Modal split in Nairobi for the years 2006 and 2016.

Source: The authors, generated from KNBS data. The graphs represent responses from individual commuters based on two periodical household surveys conducted by the Kenya National Bureau of Statistics.

neglect to invest in providing safe mobility for the underprivileged who make up most of the population especially because walking is directly correlated with unaffordability of motorized transport costs among the poor (Salon & Gulyani, 2010).

It is apparent that prioritization of safe non-motorized mobility infrastructure has the potential to alleviate these injustices. This, however, requires political will and intentional shift from addressing the interest of the elite and powerful to addressing pertinent issues of spatial injustice that manifest in the mobility system of Nairobi (Klopp, 2012).

The recent changes in the governance of Nairobi County have proven that safe non-motorized infrastructure can efficiently be provided through concerted efforts among various governmental authorities. Following an agreement between the Nairobi County government and the Central government, four core functions of the city were transferred to the National Government, among which was the county transport services. This engendered the formulation of a new task force, Nairobi Metropolitan Services (NMS, 2021), whose functions quickly advanced the provision of NMT infrastructure in Nairobi's CBD. In less than a year, more than 5 km of safe pedestrian and cycling infrastructure was provided in the CBD as shown in Figure 6 with a plan to extend to the eastern part of the city where foot traffic is highest (Odhiambo, 2021).

Notably, multiple factors such as individual commuter preferences or residential location within the city, *inter alia*, influence the choice of either motorized or non-motorized mobility modes. The emphasis however is on advancing the mode of mobility that will benefit many urban residents, especially the poor and at the same time promote the use of more sustainable modes.

Another focus of the individual dimension is the existing demographics in the city. Nairobi is comprised of a striking number of young people who make up over 75% of the city's residents according to the 2019 National Census report. Many of these young people, however, are said to be employed in the informal sector according to the KNBS Economic Survey (KNBS, 2020). This implies a high number of the population that either (a) do not own a personal vehicle due to their economic or social status e.g., students who may not have the capacity to afford a vehicle or who may prefer cheaper modes of transport; or (b) individuals, who, due to circumstances presented by everyday mobility such as intense traffic congestions, find no incentive to own a vehicle; or (c) simply forfeit vehicle ownership by choice. This represents a group whose mobility patterns could be shaped and directed toward the uptake of the already ubiquitous sustainable modes (i.e., walking) and nudged toward cycling when safe infrastructure is provided. It also presents a decisive moment to shift the current focus of investment in car-centered mobility (Klopp, 2012) to people-centered mobility by prioritizing safe non-motorized infrastructure provision. Delayed action, however, is likely to lead to a missed



Figure 6. Non-motorized mobility infrastructure in Nairobi's CBD.

Source: The authors.

opportunity since income and education levels are directly linked to use of motorized transport according to research on commuting in Nairobi by Salon and Gulyani (2019). This means that as this group of young people become more educated and move up the income ladder, there is a high likelihood to shift to motorized transport, in the extreme case—car use if the public transport is unreliable and inefficient. The rising middle class acquire a personal vehicle as soon as they can afford one while walking among the urban poor increases (Klopp, 2012). Harnessing the potential of the youthful population to take up sustainable modes of mobility can be done through safe and aesthetically valuable walking spaces and provision of safe cycle routes in addition to providing an efficient public transport system that enables circular mobility through the city.

The modal dimension of access in Nairobi

The mode of mobility in this paper is understood to be a facilitator of access to spatially disjointed places of necessity. As examined from the analysis of the two household surveys of 2006 and 2016, conducted by the KNBS in Figure 5 and from previous cited research on mobility in Nairobi, walking and the use of matatu constitute the largest modal share among Nairobi's urban commuters. Although infrastructure provision and mobility design in Nairobi focus on improving the accessibility of those with private vehicles, the acquisition of private cars has been declining. The findings of the KNBS household survey in year 2016 recorded a decline of 13% in private car usage compared to year 2006 and additionally, a decline in private car acquisition was recorded in the KNBS Economic Survey report (KNBS, 2020). In Figure 7 below, a steady decline in private car registration was observed between 2017 and 2020 while acquisition of 14-seater matatu vans and high-capacity buses was observed to have a steady increase.

The decline in private vehicle acquisition is attributed to a few reasons, among which is the increase in taxes and levies imposed on imported vehicles (KNBS, 2020), hence a higher demand for public transport as the population increases. The same report recorded a 10.3% increase in the issuing of public service vehicle licenses between 2018 and 2019, however, it is not clear whether the licenses were exclusive to matatu drivers or drivers of shared vehicle services such as Uber and Bolt. These findings only testify to the indisputable need to shift from the existing path dependency of car centric planning and invest in people-centered mobility, particularly active mobility, together with an efficient and reliable public transport system. Put differently, the approach to planning cities only for cars is outdated and calls for a shift toward active mobility which would directly address the needs of many Nairobi's commuters including the most vulnerable.

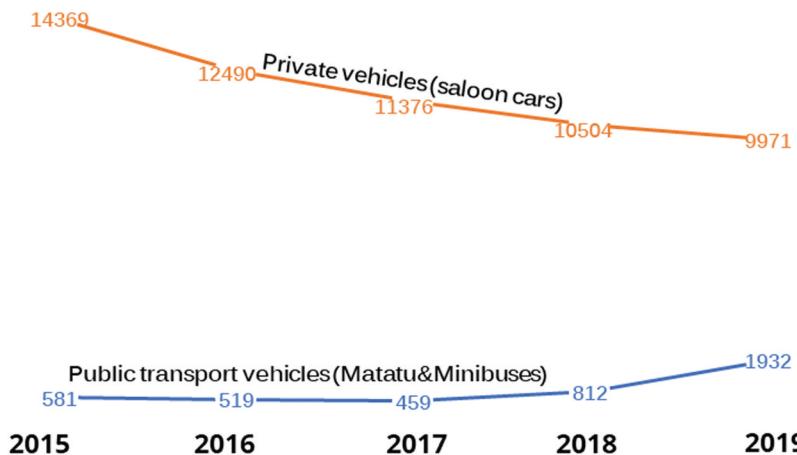


Figure 7. Vehicle registration in Kenya.

Source: The authors, generated from Kenya National Bureau of Statistics Economic Survey report 2020 data.

In the second step of analyzing the modal dimension, we investigated the flows and patterns of public transport throughout the city. The mapping of the matatu route network was conducted by the University of Nairobi School of Computing and Informatics, Center for Sustainable Urban Development, Columbia University, and the Civic Data Design Lab, Massachusetts Institute of Technology. The data is freely available for use and research. We overlaid the matatu route network on the existing road network in Nairobi to show the coverage of public transport in the city as shown in Figure 8.

The CBD is an origin and destination for nearly all the public transport routes. The Kenya Roads Board classifies the Kenyan roads from A to F roads in hierarchy of connectivity between international, regional and local boarders: Classes A—corridors that connect international boundaries, Class B—corridors that link various counties and Class C—primary feeder roads that link to Class A and B roads and so on up to Class F which is the smaller unit in residential neighborhoods. The matatu route network indicates a radial pattern that is funneled to a restricted set of major highways, mainly Classes A, B and C. These routes converge to the CBD where majority of the route interchanges take place, inhibiting circular mobility and making journeys unnecessarily longer for those whose final destinations are not in the CBD.

In addition, being a privately owned service, matatus are costly for many urban commuters especially the poor. We analyzed the transport cost data from the KNBS longitudinal surveys of 2006 and 2016. Over 62% of the commuters who used matatu paid more than 100 Kenya Shillings (≈ 1 USD) for a round trip. Of these commuters, over 37% were casual and seasonal workers whose daily wage, according to the 2017 Kenya Regulation of Wages Amendment Order, averages between 400–600 Kenya shillings (≈ 4 USD–6 USD) a day. This indicates the high cost of mobility among many matatu users who spend on average 20% of their daily income on transport. Research by Hagans (2011) also found that matatus were unaffordable to many urban poor who relied on this mode of mobility for their livelihoods. These findings are also in line with research by Salon and Aligula (2012) on urban travel in Nairobi where affordability ranked highest for choice of mode especially among the urban poor in a sample of 2105 surveyed households.

We carried out a network analysis of the routes to get a clearer indication of the trends in the public transport route network. Using betweenness centrality—a measure used to reflect the strategic position that a place holds within the city, relative to other places within the network (Newman, 2005)—we observed the role of the CBD and other areas in the network. The output of the network as shown in Figure 9 is not based on spatial coordinates as with GIS mapping but

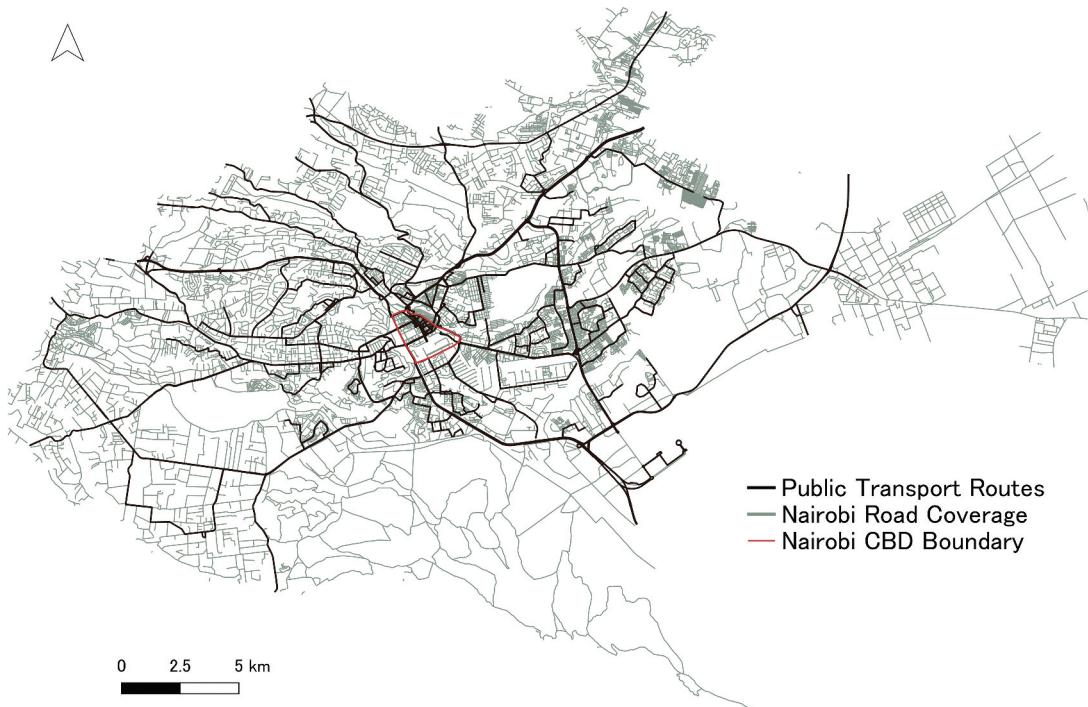


Figure 8. Public transport route network in Nairobi.

Source: The authors, generated from digital matatu data (Williams et al., 2015) and data from Nairobi County Planning Department.

rather represents the mathematical distribution of the route networks. Each matatu is assigned a number depending on the ply route and the end destination, for example, matatu number 15 would have the route (CBD—Langata) or number 44 (CBD—Kahawa West). The nodes represent the origin and destination points of the matatu, and the linkages represent the ply routes. Some linkages are thicker than others indicating that multiple matatu numbers ply that route. The analysis revealed the CBD as the center with the highest degree of betweenness centrality meaning that it holds a strategic position relative to all other destinations in the matatu route network. This is not surprising as its dominance emerges from the mutual reinforcement of the clustering of places of necessity and the high density of route interchanges and flows of public transport.

The strategic positioning of the CBD within the network makes it a spatial broker, connecting all other areas within the city and other neighboring counties. Nearly all public transport destinations have a direct link to the CBD. While this presents the significance and importance of the CBD, it also represents the fragility and the weak resilience of the entire public transport network. An elimination of the CBD from the network could result in a collapse of the complete network, negatively impacting the whole city since it bears the highest degree of clusters of places of necessity. This draws attention to the need for re-distribution of places of necessity to other areas in the city but also the focus on transit-oriented development by planning for public transport hubs outside of the city center.

To investigate potential areas for transit-oriented development, we carried out the network analysis a second time, eliminating the CBD from the network and re-running the network calculations. This process helped to observe the changes in the network that might result in other emergent areas of betweenness centrality. A few areas emerged as strategic places of connectivity. These are areas whose

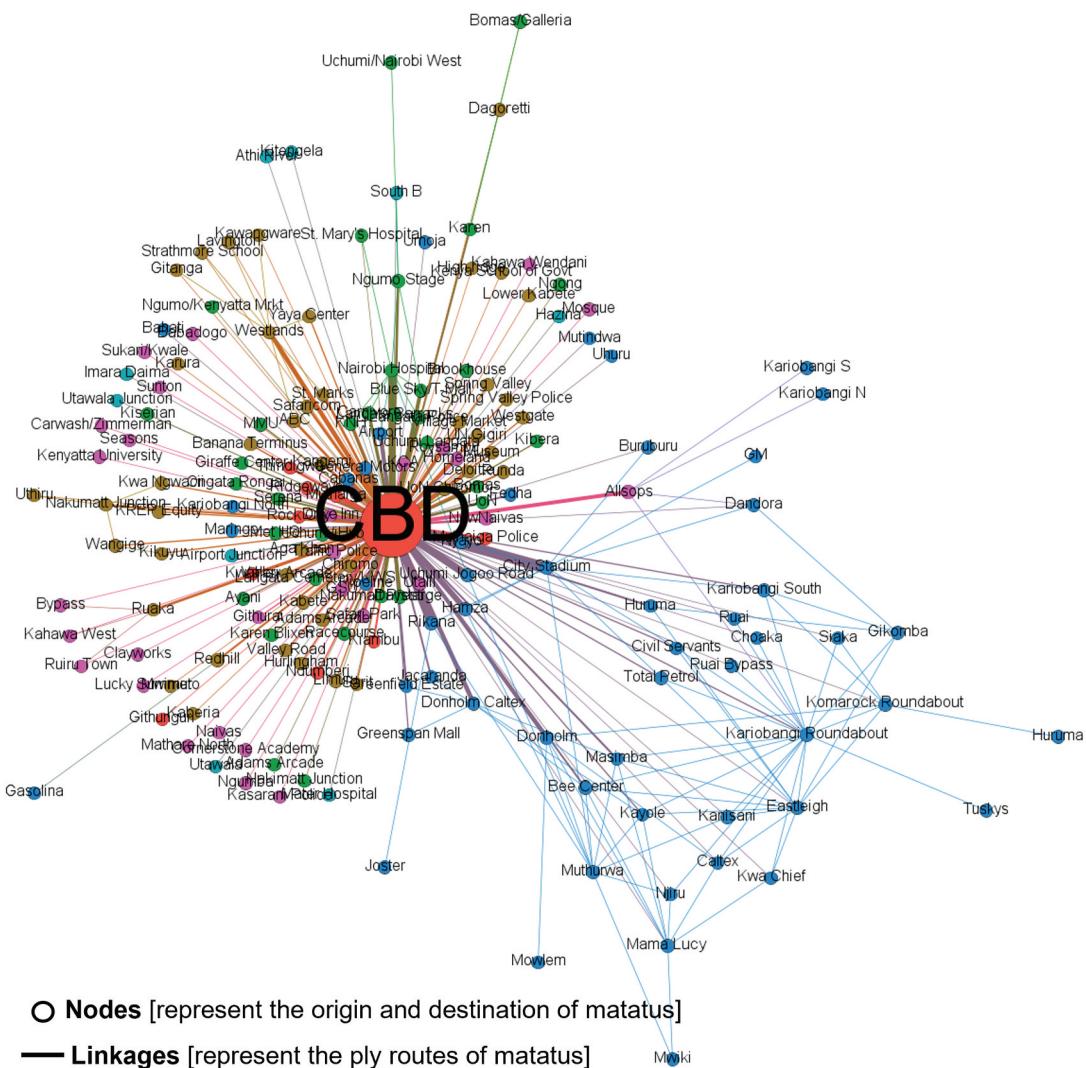


Figure 9. Betweenness centrality of matatu routes in Nairobi.

Source: The authors, generated from existing data on matatu route networks from digital matatu data (Williams et al., 2015). There seems to be a relatively independent network in the east differing from the situation in the west, which is totally oriented toward CBD.

functionality is independent of the CBD, and they facilitate connections to other areas in the city. Majority of these strategic destinations are in the east of the city, an exception being the area around Nairobi Hospital which lies west of the city center as shown in Figure 10 below.

These emergent areas of betweenness, present a possibility for creating a self-sustaining space in the most densely populated areas of the city. Specifically, areas of Kariobangi Roundabout and Mutindwa are in the eastern part of the city that are located in Embakasi and Njiru sub counties respectively. These sub counties recorded the highest population of Nairobi's residents in the 2019 Kenya National Census, with a total of over one million residents, constituting over 37% of Nairobi's urban population as shown in Figure 11. The areas of Kariobangi Roundabout and Mutindwa are connected to multiple other destinations in the network including Allsops—an area northeast of Nairobi. They present a budding chance for transit-oriented development through maximizing on places of necessity and the existing population density to encourage movement within short distances. Investing in a well-

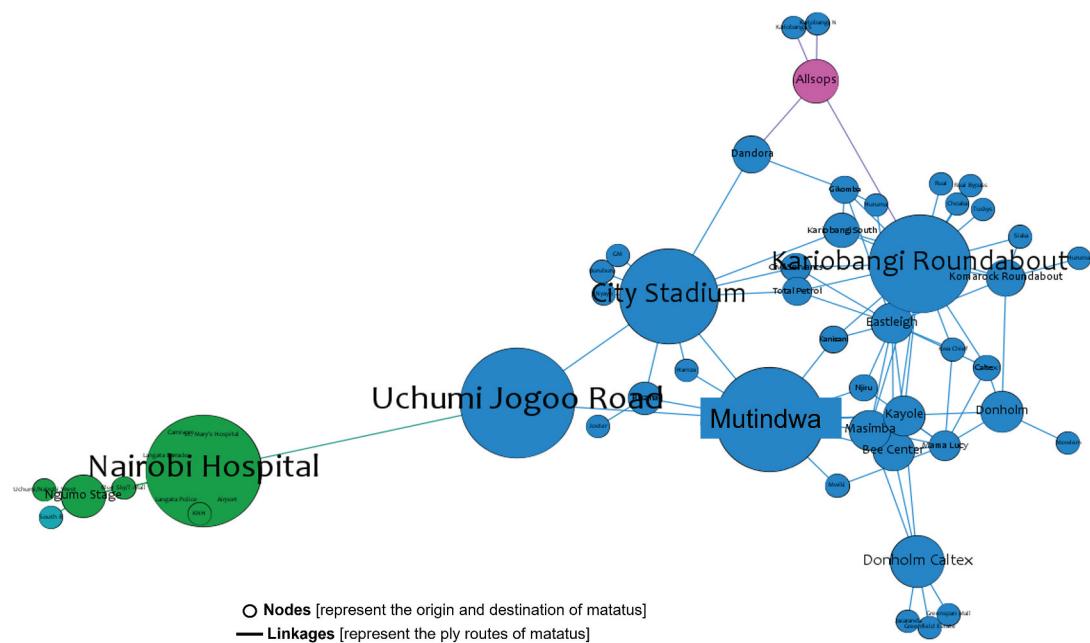


Figure 10. Emergent areas of betweenness centrality without direct linkages with the CBD.

Source: The authors, generated from existing data on matatu route networks from digital matatu data.

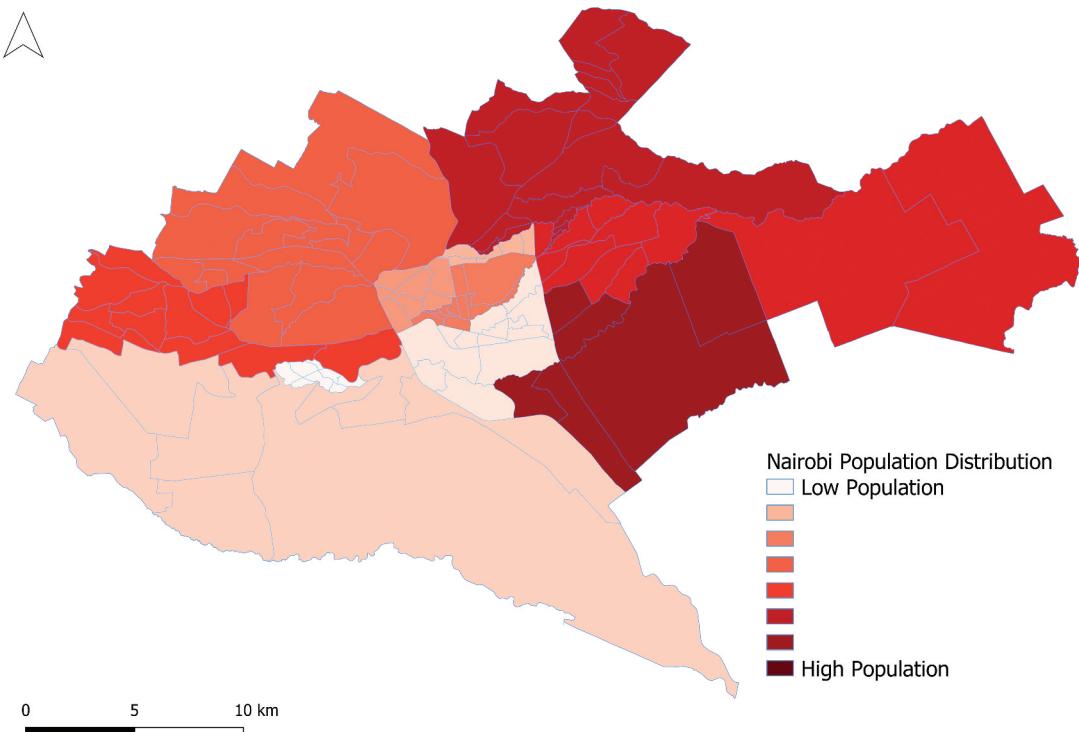


Figure 11. Population distribution in Nairobi.

Source: The authors, generated from 2019 National Census Data.



functional and efficient public transport terminus in these areas might potentially improve their attractiveness and generate some gravitational pull for other opportunities and services to locate in these areas.

An interesting location was the Nairobi Hospital which appears to be strategically located as a connection point in the western part of the city. Nairobi Hospital can be reached by public transport from the west and southwest of the city. As an example, it is possible to take a direct line (Line 34) from St. Mary's Hospital in Langata whose end destination is Kenyatta Hospital located directly opposite Nairobi Hospital. Since the completion of the Ring Road Kileleshwa, Nairobi Hospital can also be reached by public transport commuters from the western part of the city albeit with a changeover at Yaya Center.

Discussion

Investigating mobility and accessibility in Nairobi through the lens of the spatial, individual and modal dimensions reinforces the understanding that the interplay among these dimensions advances the concept of spatial justice in relation to mobility. Neither of these dimensions should be addressed independently. It is not enough to only provide safe non-motorized transport infrastructure and reliable public transport networks without considering the spatial organization of the city. Conversely, if the spatial layout of the city was made favorable to encourage shorter distances and ease of access to places of necessity, other elements of the individual dimension also need to be factored such as gender, age, and physical capabilities. Concisely, the three dimensions are mutually dependent.

Spatial justice in the spatial dimension

The spatial dimension indicates the residential growth of Nairobi that has led to a vast expansion of the city's built-up space. While the city has sprawled extensively to about 30 km to the east and 20 km to the west, places of necessity are still clustered in the CBD with other emergent areas of opportunity, specifically Westlands and Upper Hill, located in proximity to the CBD. Considering the projected population growth of Nairobi, the slow spread of places of necessity closer to residential areas means that many urban commuters will continue to rely on the CBD to get access to opportunities. This comes at a disadvantage to many since according to Fried et al. (2020), the average resident of Nairobi has only 12% access to all opportunities due to the mono-centricity of Nairobi where many opportunities and transport connections are clustered. Accessibility declines already when moving 3 km away from the CBD particularly when using matatus (Fried et al., 2020). Re-distribution of places of necessity from a single location—the CBD—to multiple locations within the city is therefore paramount to enhance accessibility for many inhabitants, especially in high density residential areas, hence advancing spatial justice. As revealed by Campbell et al. (2019), high density residential areas have access to fewer hospitals within an hour of walking compared to low density residential areas. The proximity to the CBD is beneficial to those who dwell closer, but inequalities of access are higher for those residing further from the CBD.

Injustices in the individual dimension

Evaluating from an individual dimension, investments on mobility infrastructure favors those who are already well-off. It is evident that the highest level of injustice is experienced by pedestrians who risk their lives daily to make a living. The chances of death among pedestrians are more than 60% higher than that of an individual who moves by any other means, presenting an unfair chance for the urban poor, who constitute most of the pedestrians (Hagans, 2011; Salon & Aligula, 2012) and whose choice of mobility is limited.

Injustices are also apparent when one is forced to adapt to walking long distances due to the high public transport costs or even yet, one fails to look for job opportunities elsewhere due to mobility constraints. Walking is the only means of mobility that exclusively relies on the infrastructure for safety—since the use of helmets or safety belts is ludicrous—however, investment in motorized modes of mobility has gained more attention in comparison to non-motorized means. The use of a car is often associated with positive aspects such as convenience, comfort and freedom, often advertised as the most ideal mode of mobility. Besides, it is an aspiration to modernity that has impacted on lifestyle and culture as it is deemed to elevate one to a higher social status (Dupuy et al., 2008). Planning for car use to facilitate direct access to destinations is often at a higher level of consideration, arguably because the decision makers who are responsible for providing the necessary mobility infrastructure are not attuned to the realities of all other modes of mobility except the private motorized modes. In many cases, when a city begins to shift toward active mobility, pedestrian paths and cycling lanes are often expanded to follow the routes that were initially designed for the car. These routes are mostly indirect routes for those walking and cycling and usually make these sustainable modes of mobility unattractive due to longer distances and health reasons when inhaling fumes from motorized vehicles, creating difficulties in convincing car users or even youthful populations to take up active mobility.

Spatial justice in the modal dimension

From a modal dimension, it is evident that the spatial brokerage role of the CBD weakens the resilience of the public transport network. Furthermore, the radial structure of the network hinders circular mobility, and results in longer commute journeys for individuals who would wish to circumvent the CBD, potentially restricting the number of activities that a public transport user is able to undertake. A study by Campbell et al. (2019) reinforced this finding by revealing that the radial pattern of public transport routes decreases the accessibility to health facilities when moving away from the CBD compared to the use of private vehicles primarily because of the density of interchanges in the CBD relative to other areas.

Spatial injustices of accessibility have been experienced by many commuters who rely on public transport due to (a) the constrained circular movements within the city, (b) long and arguably forced commute to the CBD for individuals intending to circumvent the CBD, (c) restrictions in the number of activities to undertake due to long commute times, and (d) high costs of transport especially among the poor.

Advancing spatial justice from the perspective of the modal dimension would mean first and foremost investing in state-provided public transport that is affordable and efficient. The plans and ongoing implementation of the Bus Rapid Transit (BRT) system and the revival and improvement of the rail system is an indication of progress for implementing sustainable mobility that needs to be advanced especially for ease of access in the first and last mile journeys. The privately owned matatu seeks to maximize on profits resulting in high expenditure on transport among many poor households. Although the County government of Nairobi has made several attempts to get rid of the matatu industry and to restrict their operation in the CBD, the efforts have proven futile partly due to vested interests where some government officials and politicians are also owners of matatus (Klopp, 2012) but also due to their historical role in meeting the crucial need of mobility particularly in areas that were underserved by the bus service in the years following Kenya's independence (Mutongi, 2017). This draws attention to the need for incorporating the matatu in the public transport reforms especially those that revolve around the introduction of the BRT as opposed to their complete eradication. Their contribution to direct and indirect employment, relevant knowledge of the routes, areas of high demand and the passenger needs, reinforces their central role in the re-organization of the public transport sector (Klopp, 2021).

Although there has been a decline in car acquisition in the past five years, there is an increase in car promotion infrastructure. In 2019, the central government of Kenya endorsed the construction of a 27.1 km express way for quicker and direct movement of motorized vehicles from the southwest of



the city where the international airport is located to the west of the city, counter to the existing demand for more safe and sustainable means of mobility. The project which was a top-down implementation, lacked public participation, reflecting the developmental injustices as postulated by Fainstein (2009) where public opinion is ignored through authoritarian top-down approaches. This can also be attributed to colonial and post-independence practices where the needs of the well-off are prioritized over those of the poor (Hagans, 2011). In addition, the role played by the international investors and aid from international governments facilitates the bias toward promotion of infrastructure for motorized vehicles (Klopp, 2012) evident in the construction of the Nairobi Expressway, which is a public private partnership between the Government of Kenya and the China Road and Bridge Cooperation (CRBC, 2020). This tends to perpetuate the neglect of walking as a dominant mode of mobility and takes away from the interests of most of Nairobi's inhabitants including the poor, children and people with disabilities.

The role of policy

Nairobi's urban and transport policy makers and planners are not unaware of the issues presented in this paper. There are several plans and policies at the national and local level that recognize the need to improve the spatial, modal and individual dimension. The Kenya National Spatial Plan (2015–2045) bears ideas and visions for improved accessibility within urban residential areas through an improved urban land use system. The plan proposes an integrated national and urban transport system that seeks to maximize efficiency and sustainability of the public transport system and NMT. This is also a vision that is shared in the 2017 NMT policy for Nairobi County. The vision of the policy is to incorporate NMT to the existing transport network especially for short- and medium-term trips. The challenges faced by pedestrians and cyclists such as inadequate and unsafe infrastructure and disconnected cycling networks are recognized in the policy and suggestions of incorporating NMT into the existing transport network are included in the policy (KARA, n.d.).

Another policy is the Kenya National Urban Policy that recognizes the need for integrated transport networks. The policy places emphasis on the need for development and improvement of pedestrian walkways and highlights the benefits for investment in cycling modes alongside mass public transport. Other plans such as the 2015 National Integrated Urban Master Plan (NIUPLAN) encourages improved accessibility through circular mobility as a strategy for Nairobi County to achieve the Metropolitan's Vision 2030 goal of optimizing mobility and accessibility through effective transportation. In addition, the plan also identifies satellite cities where functions could be devolved to encourage poly-centric city growth.

These policies and plans reflect a clear understanding of the need to improve NMT and public transport toward a more annular distributed system. However, the policies exist independently and lack harmony among them. This is primarily because the transport sector in Nairobi County is governed by seven different authorities, separately enforcing the policies. Concerted efforts, however, can result in successful and expedited enforcement of policy as exemplified by the actions of the NMS in providing NMT infrastructure in parts of the CBD.

Our analytic framework on accessibility and spatial justice suggests that the three dimensions of spatial, modal and individual, when addressed together both in planning and policymaking can improve accessibility to places of necessity and contribute to the advancement of spatial justice in relation to mobility. If applied in practice, there is need to pay attention to the non-uniformity of the city. Areas should be addressed differently, i.e., residential areas and commercial areas and even high-density residential areas and low-density ones all have differing characteristics of commuter flows and spatial structure. Although challenges of non-motorized transport are evident in many parts of the city, mapping the quality of non-motorized infrastructure on specific roads where foot traffic is highest would be a necessary addition to this research. There is indeed a necessity for further studies on the complex relationship between mobility and justice that take into account diverse individual choices and preferences which is a limitation of this research.

Conclusion and recommendations

We have developed a framework of three dimensions—spatial, modal and individual—in order to assess accessibility in relation to spatial justice in Nairobi based on an analysis of the city's spatial layout, the modes of mobility, and the demographics of the city. Thus, we provide a systematic analysis of the relation of spatial justice and accessibility in a city facing rapid population growth together with a relatively young population and a high incidence of poverty.

Reflecting on the aspects of accessibility and mobility collectively, we argue that for urban spatial justice, firstly, priority should be given to improving the mode of mobility mostly used by the poor and people with disabilities since they have the most limited choice of mobility options. Secondly, we recognize that a poly-centric city has the potential to enhance accessibility to places of necessity for many of Nairobi's residents especially public transport commuters who have to travel to the CBD for transport interchanges, increasing their travel time. Additionally, the dynamic interrelations between the city's spatial layout where places of necessity cluster in the urban core speaks for greater attention to the reorganization of places of necessity to build more resilience by developing other areas with high degree of betweenness centrality.

Promoting transit-oriented development by re-distribution of public transport/matatu terminus to other parts of the city would encourage shorter commute journeys and improved neighborhood accessibility within the city. This is reinforced by Fried et al. (2020) research findings where accessibility for matatu users is highest in proximity to the CBD and less in neighborhoods that are located further from the city center. The key role of matatus in the mobility system would require careful action in relocation of the termini

Walking remains the norm for many, and the inherent risks reflect the urgent need to deliberately provide safe infrastructure. Investing in walking would not only require provision of safe infrastructure but intentionally seeking out more direct access to places of necessity away from the main trunk roads with heavy motorized traffic. It is rarely the case that direct routes are provided for pedestrians and many allocated footpaths are next to major roads where those on foot inhale toxic fumes from motor vehicles. A good example is the access routes through the Uhuru Park and Central Park from the CBD to Upper Hill that provide direct access through green areas and away from traffic. Provision of such infrastructure will be a move toward equity in the mobility system and justice for pedestrians in Nairobi.

Cycling is another mode of mobility, less popular than walking but with great potential to improve the individual's level of accessibility. Investment in cycling infrastructure as well as the industry of cycling would also require deliberate efforts to create more direct routes that may not necessarily follow the existing motorized transport lanes. Planning and providing safe cycling infrastructure on alternative streets apart from the major trunk routes could increase flexibility of movement and facilitate circular movement within the city, increasing the level of access to other areas. Safe infrastructure could potentially shift the perceptions of risks associated with cycling (Fried et al., 2020) as well as supporting infrastructure such as parking facilities and access to affordable bicycles through local manufacturing to increase the uptake of cycling in Nairobi.

Notably, justice in relation to mobility is gaining recognition in various circles in Nairobi. Cycling activists such as the critical mass group are advocating for a just mobility system in Nairobi through monthly cycling events that create awareness on the need of safe cycling infrastructure for inclusive mobility. Academics and civil society groups are also advocating for a just mobility system. The Socially Just Transport Working Group, for example, comprises of researchers, activists and civil society representatives who have developed pillars for just public transport in the 'Just City' publication that calls for action toward a just mobility system (Omenya, 2020). Additionally, social media groups such as the Kenya Transport Research Network (KTRN), a social media group that was initiated by the Institute for Development Studies at the University of Nairobi brings together researchers, practitioners, relevant government authorities, international actors, police officials, policy makers and activists to exchange knowledge and experiences for inclusive urban mobility.

Since the ideal mobility system of Nairobi is well documented on paper—given the numerous policies that recognize the substantive challenges—change will be more impactful when the authorities become attuned to realities of everyday mobility in the city. Building a system around the mobility needs of the most vulnerable will advance the concept of justice in relation to mobility and a better city for all. It is much more than a technical process that will require a normative undertaking, involving discussions and consultations with everyday users and the policymakers themselves being users of the different modes of mobility. If decisions on just mobility systems will continue to lie in the hands of those who use private vehicles, without first-hand experience of the walking commuter, change will always be near at hand but evermore far from reach.

Notes

1. The final year of completion of the surveys i.e. 2006 and 2016 appear as the years of reference throughout this paper.
2. Landsat analysis provides for the identification of parcels of land within the urban footprint that are as yet undeveloped, i.e., open spaces, parks, gardens etc. The Landsat analysis hence tends to produce lower estimates of total urban land. The calculated figure was therefore corrected from 688 sq. km to the current statistics of 696 sq. km according to the Kenya National Census 2019 report.

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