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The Spatial Planning of Informal Transportation

By

Tamara Kerzhner

A dissertation submitted in partial satisfaction of the

requirements for the degree of

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University of California, Berkeley

Committee in charge:

Professor Daniel G. Chatman, Chair

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Professor Karen Chapple

Summer 2023

Abstract

The Spatial Planning of Informal Transportation

by

Tamara Kerzhner

Doctor of Philosophy in City and Regional Planning

University of California, Berkeley

Professor Daniel G. Chatman, Chair

This dissertation explores how private-sector transport operators in African cities make individual and collective decisions on the change and expansion of transport networks, based on a comparison of Lilongwe, Kampala and Nairobi. This network geography underpins crucial accessibility questions, including the equity, affordability and usefulness of mass transportation services available to different people across metropolitan areas. Governance of informal transport is disjointed, and rarely engage with the planning processes within the sector itself. Informal transport is often described as flexible, reactive, demand responsive, niche-filling, and in-tune with passenger needs. This paper proposes expanded definitions of flexibility in the operations of informal transport networks and presents a theoretical framing for understanding the growth and change in the locations of routes and terminals.

Based on surveys and interviews in four African cities, I argue that spatial transport planning is neither top-down nor bottom-up. Different forms of internal organization, the role and power of workers, and the geographic scope and level of organization in the industry affect the planning practices of operators and the ways and locations to which they expand their services. Where there is little route-level organization, independent operators have difficulty creating services to new destinations. Where route-level organizations take the initiative and invest capital to start new services, whether vehicle owners or frontline workers such as drivers and conductors are more involved leads to different levels of dialogue with communities and different willingness to tolerate internal conflict, creating different types of transport networks and different mobility patterns.

This research shows that individually competing vehicles encounter coordination failures that limit their incentives for improving services for passengers. Meanwhile, in cities with localized, route-based associations, organizations of multiple vehicles are able to take on the initiative and risk of developing new service locations and responding to passenger demand. This is done through a complex, gradual process that includes temporary subsidies to drivers and operators, testing and measuring potential demand, and advertising the new route. The key mechanism is in competition - not between individual drivers, who manage internal competition carefully with a variety of mechanisms to distribute income opportunities fairly - but between firms and associations over territorial coverage. Understanding this phenomenon not only opens potential for engaging transport associations in planning and policymaking, but also reveals limitations to the coverage and equity of access offered by existing networks and incentive structures.

Finally, this dissertation considers the effectiveness of services from the passenger and resident point of view. Mobility opportunities throughout the city circumscribe residents' opportunities and experiences, and I explore the limitations and experiences of travel in Lilongwe, Malawi, a mid-sized African capital city, focusing on mobility options, barriers and frictions. I particularly consider latent demand, or missed travel and unreachable destinations, and the physical, mental and emotional experiences of travel. A sense of constraint and limited agency emerges strongly from urban residents, in which expensive, difficult and ineffective travel is linked to poverty and marginalization. This is experienced both as curtailed physical movement, and as a deprivation of agency, sapping choice, opportunity, and time. All transport options in Lilongwe are privately provided, "informal" systems, and this study considers the effects and limitation of for-profit, market services in shaping the urban daily experience in Sub-Saharan Africa.

Dedication page

Dedicated to my parents, Dmitry and Olga, for their boundless support and equally boundless disinterest in convention. And to Dmitry, for making a point of taking me on the Kyiv metro when I was a toddler, as we were leaving Ukraine, just in case I would never see another one. Which he only told me about last week.

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Introduction

Informal transportation is widely used but little understood. A number of axiomatic assumptions - some of them contradictory - have emerged in the literature over several decades of research, relating to adaptability, economic efficiency and community ties, but these have not been tested or studied. This dissertation's guiding motivation is understanding the process of *planning* in informal transport, and relating this to labour and operational practices among informal workers.

I address this in the direct spatial sense: where does the bus go? How are the alignments of routes decided upon - why one street and not the next, one neighbourhood and not another? From here, several sets of questions emerge. The first goes to the mechanisms of this process. Who are the actors - individual and institutional - who make these decisions? What is their motivation, rationale, worldview, body of knowledge and capacity? How do the different actors interact? What economic logic guides the process? What histories, power relations and broader structural issues are embedded in it? The second set of questions is about the results in terms of transport provision. What are the mobility outcomes, for individuals, communities and cities as a whole? What are the impacts on urban form, agglomeration, and development? Who benefits from, and who is excluded by these services? Finally, informed by this, what policies can - or should - be used to influence the alignments of informal transport systems?

While often regarded as flexible, in fact a defining characteristic of informal transport might be its intransigence. I make the case that informal transport operators hew to a strongly conservative tendency, and often move slowly to change or expand their route networks. This argument is not driven by any skepticism as to the current or future importance or ubiquity of informal transport, but by centering and studying it on its own terms, and not as a corollary to formal, Global North transport systems. Informal transport is neither a deficient holdover begging to be formalized, nor a superpowered antidote to the limits of complex, expensive, formal public sector systems.

The importance of informal transportation to global mobility is difficult to overstate, and prevalence breeds heterogeneity. The matatu in Kenya, dala-dala in Tanzania, tro-tro in Ghana, kombi in South Africa, danfo in Nigeria. The marshrutkas of post-Soviet states; services,



Figure 1: An informal transport route, defined on a sign. Old taxi park, Kampala, Uganda.

tranzits, sheruts and dolmuşes in the Middle East. Tap-Tap in Haiti, paseros in Mexico, angkots in Indonesia, jeepneys in the Philippines, jitneys and dollar vans in the USA. Everywhere, taxi, share-taxi, colectivo. The General Transit Feed Specification (GTFS), used to digitally encode public transport schedules and location, gives us mode 1501 - *Share Taxi*.

A first difficulty is in defining informal transport¹. Mini- and midi-buses predominate, alongside auto-rickshaws, adapted pickup trucks, lorries and in some cases, large buses of 50 seats or more. Arguments have been made for finding elements of informality in the operations of trains in Siberia (Kuklina and Baikalov, 2021) and planes in rural Canada (Vannini, 2016). These vehicles, many in poor condition but some state-of-the-art, operate across thousands of cities in most of the countries of the world, motivated as a solution to similar problems but each arrived at more or less independently.

What distinguishes “formal” and “informal” transport is sometimes unclear, though research across several fields, going to at least the 1970s, stresses that binary conceptualization should be avoided (Behrens et al., 2015; Cervero, 2000; Ocampo, 1982). Informal operators often have licenses, pay taxes, and some must meet vehicle standards and carry insurance. The more important aspect defining informal transport is economic, rather than legal. Informal transport is a fully private-sector phenomenon, which must make a profit, as any other business, with no support from the state in terms of subsidy of operations or protection from free competition, nor any requirements of minimal coverage, prices or level or quality of service, and its operations must be understood in this context.

The history of informal transport is usually pinned to the era of the First World War, when a first wave of private vehicle owners started to pick up passengers at streetcorners in New York, Philadelphia and other large cities globally (Eckert and Hilton, 1972; Hodges, 2006), including in West Africa (Hart, 2016). Often following existing railcar routes, Hodges makes the case that newly-suburbanizing residents preferred the jitneys to railcars as part of the growing status of the private car, and the popularity of the informal taxi services provided by private vehicle owners helped to reorient American cities and streets to favoring travel by car over public transport and walking (Hodges, 2006; Norton, 2011).

However, the appearance of the car came after horse-drawn urban transport systems which operated with limited regulation. The comparison in the operations of the horse-drawn omnibuses of Paris and London as described by public health reformer Edwin Chadwick in 1859 are alarmingly familiar to the 21st century, including the perverse incentives, negative externalities and “habits of ruffianism” in the workforce. He compared London to Paris, which

¹ A variety of other terms are used, often interchangeably, the most common alternative to informal transport being “paratransit”. I choose to use “informal transport” in order to avoid confusion with the North American definition of paratransit, and to follow the existing body of literature.

had forced independently operating vehicles into firms through buyouts and regulation on locations of operation:

Instead of streets encumbered and disturbed by nearly empty, or only partially filled inferior vehicles, sometimes crawling with a few passengers, annoyed by detentions for a full load, at other times racing, and dangerously over laden, the circulation throughout Paris was made regular from regularly appointed stations, at fixed charges, which precluded extortionate variations.

But I was particularly struck with the necessary effect of the change in the social relations of the men engaged in the reformed service, in the immediate suppression of that antagonistic relation, and its consequences, which we see most fully developed in London, in perpetual wolfish conflict, engendering habits of ruffianism, with extortionate yet precarious earnings spent in dissipation and without reserves for sickness and old age. (Chadwick, 1859)

Chadwick's lecture, subtitled "Competition for the Field, as Compared with Competition within the Field, of Service", examines this perennial question in service provision², more commonly referred to today as competition in-the-market versus competition for-the-market (Gwilliam, 2001). This distinction more usefully defines formal and informal operations, while nevertheless allowing differing levels of state regulation, intervention, and/or support. Various types of formal services can be distinguished, from public monopoly to outsourcing, but all are distinct from pure in-the-market competition (Dementiev and Han, 2020; Estache et al., 2004).

This study is interested in the geographical operations of services which must make a profit though competition for passengers, in the market. This leads to the overall question on the ways public transportation operated in market competition, and broader issues on the spatial operations, limitations and market failures of the geography of the private sector in providing services across cities.

The literature on spatial aspects is limited. Klein et al characterize "curb rights" as a tragedy of the commons, in which passengers waiting on the curb to catch a bus may be overgrazed by hungry minibuses. Vehicles concentrate on more profitable, passenger-dense routes, which draws more passengers, who have lost services on their original, preferred routes (Klein et al., 1997). Small considers the market failures in the temporal operations of private bus services, identifying a case of Hotelling's Law - competing businesses tendency to cluster together rather than spread apart - as multiple vehicles may be incentivized to set off as a cluster rather than spacing themselves, but does not address the spatial aspects (Hotelling, 1929; Small et al., 2007). Similarly, Gomez-Lobo creates a model to understand competitive pricing between private transit vehicles, arguing that the costs incurred by waiting will intrinsically overwhelm

² Also covering the provision of cabs, trains, water and sewage, bread, "the moral and social evil" of beer, and the internment of the dead.

passengers preferences for reduced fares and limit the usefulness of competition in improving transit services (Gomez-Lobo, 2007).

Never just a phenomenon of the Global South, various private-sector, lightly-regulated mass transit services also operate in wealthy countries. The 1986 deregulation of intercity bus services in the United Kingdom led to a system with free entry into providing transit with no support, no protection and little regulation, and which shows some of the characteristics of informal transport in the Global South. This included shrinking vehicle sizes and the emergence of minibuses and loss of services on peripheral routes (Klein et al., 1997; White, 1997).

However, in focusing on developing countries and Sub-Saharan Africa in particular, another key aspect of transport informality is that of labour relations, where drivers rarely have an employer-employee relationship with the owner of the vehicle, or are one-vehicle businesses. This also extends to some services in rich countries, such as the New York dollar vans where one-man-one-van operations are common (Best, 2016a; Goldwyn, 2020), and to some extent to platform-mediated, precarious employment such as app-based ride hailing firms (ie, Uber, Lyft) or delivery workers. Other cases, like private buses, do have formal or more protected labour relations, and even the context of Uber drivers cannot be entirely compared to the employment context in Sub-Saharan Africa.

The typical employment form across many global south cities is “the target system”, where drivers and vehicle crews typically pay a daily set sum to lease a vehicle and keep only what they are able to earn above it. While it is ubiquitous, there are also complexities and variations to this arrangement, and forms of bottom-up organization and association that affect workers’ earnings, working conditions and labour relations. Nevertheless, these working relations are often exploitative and fragile, requiring long working hours and operating under dangerous conditions.

Thus the other main goal of this dissertation is to critically center workers and these informal labour practices, and their role in creating and planning informal transport systems, and in urban development more widely. Research on transport workers, their livelihoods, culture and politics, is growing in multiple disciplines. This work often focuses on their marginalized and vilified positions in elite discourse, difficulty and vulnerability in economic relation and in making a living, unionization and organization efforts, and elements of culture, community ties and contribution to urban character. A gap in this literature is the lack of engagement with questions of transport service and provision to passengers and residents and the role of informal transport in broader questions of urban planning, such as interactions with land use and equitable provision of accessibility.

What role do the daily working conditions and forms of organization of transport workers and staff have on transport planning and provision in informal systems? In fully and partially informal transport systems, transport workers - at the level of the driver and conductor in some cases, or at the level of rank or small company managers in others - carry much or all of the responsibility and capacity for de-facto transport planning. They hold power for choosing where

and when to operate, and in aggregate, which areas and corridors receive access to where, at what frequency, capacity and price.

In the first paper of this dissertation (Chapter 1: Is Informal Transport Flexible?) I provide a framework for answering these questions. Who does the work of planning in informal transport networks, and what guides them? What interests and incentives influence the spatial distribution of transport, and what market failures can emerge in providing useful, efficient and equitable services across cities? Going through both policy and academic research across a wide variety of disciplines, recurring assumptions and language going back to the 1970s frequently describes informal transport as 'reactive', 'flexible', 'adaptive'. This research suggests or assumes that the forms of transport networks and the accessibility they provide - as well as other aspects of passenger experience - are particularly and uniquely well-suited to their passengers and their cities at large.

I attempt to both critically deconstruct and give form into these descriptions, drawing on available cases in the literature and my own fieldwork in four African cities. I distinguish and characterize the degree of autonomy by a given vehicle and its crew in their daily operations, from the medium and long-term process of growth and change of entire networks. I argue that where informal transport systems do operate in adaptive, flexible ways, this is driven neither by community ties nor by individual competitive entrepreneurialism. Rather, it is through a much more quotidian process of considered, informed and researched planning carried out by what I describe as the 'middle management' of the informal transport system. It is in those cities where the transport sector has a substantive degree of organization above the most atomized, into firms, cooperative or route associations, that the most innovative, pro-active, and community-responsive services appear to emerge.

Drawing on fieldwork in Nairobi, I show how it is precisely the firms and SACCOs (cooperative associations) which government regulation forced into being that are taking initiative to expand the route network and discover new niches of potential passengers, extend routes into new neighbourhoods, and provide services across slums and low-income areas. It is precisely not individual drivers, drawing on their 'local knowledge', who do this, as I argue drawing on fieldwork in other cities - Djibouti, Lubumbashi and Lilongwe - where neither semi-formal firms or the type of regulatory regime of Nairobi exist. That is, where operating decisions are indeed far more fully in the hands of an independent, informal single bus driver, I find that they operate in a cautious and constrained manner, rarely deviating from established routes, almost never attempting to explore or develop new ones, and with little room to take close consideration of their passengers needs, with their own hold over their jobs precarious and uncertain.

The second paper (Chapter 2: How are Informal Transport Networks Formed?) attempts to answer the implicit question of the first - if informal transport isn't flexible, what is it? Based on fieldwork with transport operators in three cities - Nairobi, Kampala, and Lilongwe - it uses a comparative case study method to develop a framework of the ways informal transport

networks expand, or fail to. I find that the different ways in which the sector is internally organized at the city and local level - down to the route and terminal - affect both the planning processes and resources that can be marshalled to expand the network, and the pattern of that expansion.

Several important elements emerge: the relatively high cost in time, money and organization between multiple drivers and operators that is required to start or expand a service; the importance of formal and informal territorial claims by associations of operators; and the different loci of planning authority within the sector, particularly between vehicle owners and drivers. The way these are interrelated in a given city or system can help shed light on the fundamental nature of its operations and the way it expands. In Nairobi, where the interests of vehicle owners dominate, expansion tends to be competitive, with associations willing to risk conflict between them and often attempting to capture passenger share through frequency and differentiation of their services along the same routes. In Kampala, the more important role of drivers means associations are careful to avoid friction and focus on resolving competing claims and avoiding competition, while in Malawi the lack of local associations means resources can't be mustered to expand at all.

Finally, the third paper (Chapter 3: Accessibility and Experience in Informal Transport in a Secondary City) switches to exploring the demand side and passenger perspective. Based on a mix of quantitative and qualitative data collected in Lilongwe, Malawi, it examines the quality and experience of travel via informal modes, with a particular focus on transport exclusion and lack of viable services provided by informal transport. Here too, I stress the importance of understanding informal transport operations not as a supplemental mode or an alternative providing a very particular service, but considered as a network, in a setting where *all* transport options are largely created by the market.

I argue that notions of flexibility and reactivity are exaggerated and underbaked when centering the point of view a wide swathe of informal transport passengers, and especially those who are often excluded from these services. I show that neither daily practices or the long term change of the system in Lilongwe are especially reactive to the needs of the majority of the city residents who are captive audiences for those services. In this setting, there is little evidence to support the idea of a unique, symbiotic 'fit' between city, population and transport system - in terms of accessibility, efficiency or equity.

Considering the people and institutions that make up informal transport, their operating patterns and their incentives and structures, reveals both the strengths and limitations of informal transportation. Informal transportation systems in African cities provide key services for the urban poor and middle classes, but are simultaneously arenas of exploitation and precarity. Informal transportation important community ties and cultural and social functions, but also operates fully for profit and through little-regulated market forces, leading to significant negative externalities and inequities.

As I strive to show in this dissertation, the informal transport sector operates in a narrow, difficult niche of viability and at the crux of different competing and extractive forces. These make change or adaptation limited, difficult processes unless there is reform of the underlying economic, social and political structures and relationships of the sector.

The purpose of this research is to answer policy questions on the effectiveness of informal transport in meeting social, economic and sustainability needs, and what interventions can be useful. For example, as early as 1976, one US writer recommended that “jitneys might be encouraged to feed public transit” in Oakland (Higgins, 1976). This approach, of informal modes switching to become feeders, has remained a frequent axiom in proposals for incorporating new, formal transport services such as BRT or light rail. But without understanding whether such re-arrangements will be profitable and viable for operators, or whether they will run counter to their internal norms, they may well fail.

A better policy making and implementation approach requires engaging with operators, and engaging with them city-by-city, in ways that recognize the specific forms of organization, the history, and the internal relations of the transport sector. This study identifies patterns and commonalities, but simultaneously stresses that these add up to very different forms of operation and provisions of transport. Planners should, firstly, have an interest in reforming and improving these systems, rather than assuming that the market is an adequate response for mobility justice, in Africa as elsewhere. Secondly, improvement have to be rooted in local context and actual, specific forms of operation.

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Working across cities and methods meant intense collaboration with numerous colleagues and students - Sekani Tukula, Wilfred Jana and Zayeenab Chilumpha in Malawi and Judith Mbabzi, Daniel Ochiengo, Sumayiya Nalubulwa and Fatumah Nantongo in Kampala. All are superb colleagues, collaborators and co-authors - critical, thoughtful, and with a clear moral compass and sense of outrage.

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Curriculum Vitae

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CV

2018-2023 <i>Expected</i>	PhD, City and Regional Planning <i>The Spatial Planning of Informal Transportation</i>	University of California, Berkeley
2015-2018	MA, Geography and Urban Planning	Hebrew University of Jerusalem
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PUBLICATIONS

Kerzhner, T., 2022. Is Informal Transport Flexible? *Journal of Transport and Land Use* 15, 671-689. <https://doi.org/10.5198/jtlu.2022.2213>

Kerzhner, T., 2022. Formalization of East Jerusalem public transport: Mobility, politics and planning. *Journal of Transport Geography* 105, 103463. <https://doi.org/10.1016/j.jtrangeo.2022.103463>

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Kerzhner, T., Kaplan, S., Silverman, E., 2018. Physical walls, invisible barriers: Palestinian women's mobility in Jerusalem. *Regional Science Policy & Practice* 10, 299-314. <https://doi.org/10.1111/rsp3.12162>

Under Review & Working Papers

Kerzhner, T, "How are Informal Transport Networks Formed? Bridging Planning and the Political Economy of Labour", [R&R at *Cities*, December 2022]

Stokenberga, Aiga, Tamara Kerzhner, Eulalie Saisset, Xavier Espinet Alegre, "Connecting to Health and Education: Assessing the accessibility provided by public transport in major African cities." [R&R at *Area Development and Policy*, September 2022]

Kerzhner, T and Karel Martens, “Labour informality in paratransit services: case study of Lubumbashi, Democratic Republic of the Congo” [submitted to *Research in Transportation Economics*, October 2022]

Kerzhner, T, “I Have No Choice”: Mobilities of Care and Exclusion in Lilongwe, Malawi”, [manuscript in preparation, for potential publication in *Transport Reviews*]

Chatman, Daniel, Elisa Barbour, **Tamara Kerzhner**, Michael Manville, and Carolina Reid, “Policies to improve transportation sustainability, accessibility, and housing affordability in the state of California,” [report for Department of Transport, California, in review.]

Media

Kerzhner, Tamara, “How are new informal transit routes formed?”, CityFix Blog, 2022

Kerzhner, Tamara, “Who plans bus routes in African Cities? Ask the Bus Drivers.” Digital Transport 4 Africa Blog, 2021

RESEARCH GRANTS

2022	IGC Early Career Research Grant (\$27,000)
2021	Lee Schipper Memorial Scholarship (\$10,000)
2021	SSATP - World Bank - Mobility of Vulnerable Populations Project (\$18,500 USD, via Concern-Worldwide Malawi)
2021	Soroptimist Women’s Empowerment Doctoral Student Fellowship (\$10,000)
2021	Rapid Response Research Grant, UCB Institute for Indian Studies (\$4,300)
2020	Rocca Dissertation Research Award, UCB Center for African Studies (\$6,000)
2020	Exploratory Grant, Weiss Foundation for Development Economics (\$7,500)
2019	Rocca Pre-Dissertation Research Award, Center for African Studies (\$4,000)
2016	Frances Gutner Excellence in Geography Scholarship (\$4,500)

SCHOLARSHIPS and AWARDS

2022	Luxembourg-Berkeley Student Exchange
2021	ACSP Annual Conference Student Travel Award
2019	Volvo Research and Education Foundation PhD Student Travel Award
2017	Excellence in Transportation Planning Coursework Award, HUJI
2016	Shalom Reichman Prize for Best Geography Seminar Paper, HUJI
2015	AGN Social Justice Student Activist Scholarship

TEACHING EXPERIENCE

- Sum. 2022** “Introduction to Urban Data Analytics”, Instructor of Record, Department of City and Regional Planning
- Fall 2021** “Introduction to Economic Analysis for Planners”, Graduate Student Reader for Prof. Sarah Hinkley, Department of City and Regional Planning
- Spring 2021** “Global Cities”, Graduate Student Reader for Prof. Karen Frick, Department of City and Regional Planning.
- Fall 2020** “Transportation and Land Use Planning”, Graduate Student Reader for Prof. Dan Chatman, Department of City and Regional Planning
- Spring 2019** “The City: Theories and Methods in Urban Studies” Graduate Student Instructor, leading two sections, for Prof. Marco Cenzatti, College of Environmental Design
- Fall 2018** “Introduction to Transportation Planning and Policy” Graduate Student Reader for Prof. Karen Frick, Department of City and Regional Planning.
- 2010-2012** “Environmental and Social Justice in Jerusalem”, Primary Instructor, Social Involvement Unit, Hebrew University of Jerusalem (not-for-credit)

SELECTED RESEARCH and PROFESSIONAL EXPERIENCE

- 2018-22** **World Bank, Urban Transport Researcher**; fieldwork, research design, literature reviews, and data analyses of a variety of topics in public transport system operations, transport decarbonization, and accessibility analysis to employment, health and education opportunities by public transport for African and Latin American cities.
- 2019-2022** **Housing and Transport Linkages and Policy in California**; Research Assistant to Prof. Dan Chatman, UC Berkeley Department of City Planning. Comprehensive review on housing production and affordability in conjunction with transport services and infrastructure.
- 2019** **Djibouti Public Transport Technical Assistance, World Bank**; Design and management of transport sector mapping and analysis study.
- 2018** **Cities and Spatial Justice Research Group** - research on transport Formalization in East Jerusalem.
- 2017** **Kaplan Associates, for UNDP/Suriname NIMOS**; Planning, research and GIS to develop ecological database for Suriname.

- 2017 Ministry of Transport, Office of the Chief Scientist, Israel; Research Assistant.
- 2016 Shelter Associates, Pune, India; Fieldwork in participatory mapping and digitizing slum housing and infrastructure.
- 2015-2016 ROM Transportation Engineering, Lubumbashi, DRC; Reform of public transport services in Lubumbashi. Project lead.
- 2015 Bimkom: Planners for Planning Rights, West Bank, Palestine; Research assistant for planning strategy for Bedouin settlements in the West Bank.
- 2014-2015 Tevel Be'Tzedek, Makamba Province, Burundi; led a financial literacy program with women's microfinance groups.
- 2014 Israel Central Bureau of Statistics; mapping long term urban growth trends, created GIS updates to statistical and census zones.

PRESENTATIONS

Mobility of Care and Exclusion in Urban Malawi, to be presented at the Southern African Transport Conference, Pretoria, South Africa, June 2023

How do Informal Transport Operators Create New Routes? ACSP. Toronto, Canada, Nov 2022

Technology and Informal Transportation, presentation at TRB standing committee on Transport in the Developing Countries, Jan 2022

Learning from Labour in African Urban Transport. CODATU Conference, Online, Nov 2021

Is Informal Transport Flexible? INTALinC Early Career Researchers Workshop, April 2021

The Diverse Dynamics of Paratransit: Learning from Labour in four African Cities. Was to be presented at the ACSP annual conference, virtual, November 2020. *Missed due to COVID*

The Formalization Process of East Jerusalem Minibus Operators: Space, Culture and Politics. Poster presented at the Transport Research Board Conference, Washington DC, USA. January 2020

How do Transport Planners Plan for Unplanned Transport? Presented at the Institute for Development Studies Seminar, University of Nairobi, August 2019

The Matatu Across Borders: Transportation planning for and from African cities; Graduate Student Conference in African Studies at Boston University, March 2019

Driver and Passenger Experience of Transit in Lubumbashi and Jerusalem: Subjective Formalities; Spatial Dynamic of Informal and Shared Mobilities Conference, Berlin, Germany. November 2018

The Politics of Transport Formalization in East Jerusalem: Integrating the Informal Economy in Urban Development; XIX World Congress of Sociology, Toronto, Canada. July 2018

Barriers to Integration of the Informal Transport Sector in East Jerusalem: Culture, Politics, Technology. Marshrutka Project Summer School. Tbilisi/Kazbegi, Georgia. June 2018

The role of labour informality in paratransit services: case study of Lubumbashi, Democratic Republic of the Congo. Transport Research Board Conference, Washington DC, USA. January 2018

Barriers to Access: Fear-Based Exclusion for Palestinian Women in Jerusalem, Transport Research Board Conference, Washington DC, USA. January 2018

Informal Transport, Informal Work, Informal Space: Experiences and Economies of Paratransit in Lubumbashi, DRC. Conference on the Right to the City in the South: everyday urban experience and rationalities of government, Paris, France. November 2017

Physical, Historical and Social Walls: barriers to transit use in a divided city, case study of Palestinian Women in Jerusalem. ERSA Congress, Groningen, Netherlands. September 2017

“None of it is for us”: Access and Mobility for Palestinian Women in Jerusalem. NECTAR Annual Conference, Madrid, Spain. June 2017

Between the Walls in A-Tur: Divisions of space, community and authority in the public realm in a Palestinian Jerusalem neighbourhood. Poster presented at the Bimkom Conference on Planning and Community, Jerusalem. May 2017

Paratransit Services in Lubumbashi, DRC: Drivers, Passengers and the City. Joint Conference of Young Researchers in European Studies and African Studies, Ben Gurion University, Israel. January 2017

Paratransit Services in Sub-Saharan Africa: The Role of Informal Labour. Africounters, Truman Institute, Hebrew University of Jerusalem. December 2016

ACADEMIC SERVICE

Reviewer *Journal of Transport and Land Use; Transport Findings; Journal of Transport and Health; Case Studies in Transport Policy; TRB Conference 2020; 2021; 2022; Berkeley Planning Journal; World Symposium on Transport and Land Use Research; Journal of Regional Science Policy and Practice*

Guest Lecture Zoom: Harvard, 2022; Cornell, 2022; UC Berkeley 2021; Hebrew University of Jerusalem, 2020, 2021; Instituto Tecnológico Autónomo de México, 2020.

2020-22 Student Representative - Faculty Committee, DCRP UC Berkeley

2017 Organizing Committee Member, “Africounters 2017-2018” Workshop Series, Truman Institute, Hebrew University.

2017 Organizing Assistant, Conference on “Christian Renewal Movements in the Global South in the 20th and 21st Centuries: Religious, Social and Political Transformation,” Social Science Faculty and Mandel Institute for Humanities, Hebrew University.

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LANGUAGES

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VOLUNTEERING AND ACTIVISM

2010-2017 **Labour Organizer** - Support for unionization, bargaining and collective action of marginalized workers in Jerusalem.

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Chapter 1: Is Informal Transport Flexible?

Introduction

Informal transport, or paratransit, provides crucial transport services in cities worldwide, but remains poorly understood and marginalized in academic and policy discourse (Behrens et al., 2015; Cervero and Golub, 2007). Especially considered in terms of accessibility and transport justice, the geography and locations of operation of transport systems which are not subject to central planning, nor receive any subsidy or protections for their operations, has had little empirical or theoretical investigation. Based on fieldwork in four African cities, this paper interrogates the idea of ‘flexibility’ as a mechanism explaining the urban geography of informal transport and proposes a concrete delineation of forms of flexible operations. Engaging with the role of both economic competition and social and labor structures, I theorize market failures in the equity and efficiency of mass transit provision by private-sector operators and highlight the role of associations in overcoming these and holding the role of network planners.

Flexibility, reactivity, and demand-responsiveness are often used to explain the spatial distribution of informal transport, but often go undefined or unexplained, and the process by which routes are formed is unclear. Operating in competition for passengers across the city, individual vehicles are assumed to be motivated to pick up and deliver as many people as possible, and thus collectively form a varied and evolving route network through competition for different passenger segments with different mobility needs. In practice, rather than competition and individual laissez-faire market response, it is organization and coordination among transport workers and operators that facilitate flexibility and route changes and the creation of new services and destinations.

Over the past half-century, there has been a regular pendulum of approaches to regulation of informal transport. Currently, calls are increasingly being made for integration and support for drivers, operators and organizations in the sector. These center, or at least aim to maintain, the informal transport sector while working at ameliorating negative externalities, increasing the professionalism and capacity of firms, and improving working conditions and incomes for crews (Klopp and Cavoli, 2019; Stucki, 2015). This, however, raises the question of how this mode, if centered and regulated, and accepted as a major - and often only - mode of public transport, will be planned, and by whom?

The central importance of informal transport services is inarguable, as there are often no alternatives. In this regard, the great advantage of informal transport is that it *exists*. There is no dispute that informal transport modes are crucial to the mobility of almost all population groups in African cities (Behrens and Ferro, 2015; Kumar et al., 2021). Formal, state-managed or state-planned transport systems have increasingly ceased operating, and in many cities were always planned to exclude and limit the mobility of all but elites (Mutongi, 2017). From a policy perspective, reforms and the integration of formal and informal modes are pressing. Transport plans and programs often call for informal operators to operate in complement to higher-

capacity systems, taking on a feeder role or providing coverage in peripheral areas (Behrens et al., 2012; Gauthier and Weinstock, 2010; Paget-Seekins and Munoz, 2016), which operators frequently resist (Asimeng and Heinrichs, 2020; Schalekamp, 2017; Spooner et al., 2020). Understanding where informal operators choose to drive, and why, is a key issue in their active inclusion in transport planning, and whether they will act as competitors or partners to high(er)-capacity formal services is critical for inclusive and effective reform efforts.

With some exceptions, academic analysis of informal transport in Africa is disproportionately centered on a handful of major national and international cities. These cities are exceptional not only for their size, but for their role as political, economic and cultural centers, national capitals and regional and international megacities (Pojani and Stead, 2015). Research on such transport systems is often dominated by questions of political process, global financial flows and complex infrastructure investments. These include frequent efforts to ban, reform or integrate informal modes, the introduction of BRT or rail services, and questions of national and global visibility and city branding, modernity, development and planning ideology (Goodfellow, 2015; Mūngai, 2013; Paget-Seekins, 2015; Rizzo, 2017).

However, informal transport systems dominate motorized public transport in almost all cities in Africa, medium and small as well as large. Reforms and investments into public transport from governments or international organizations in many are limited and the central role of informal transport is uncontested. Therefore this study aims to focus particularly on the dynamics of such smaller or “secondary cities”. Research is based on empirical data on planning and route setting by transport operators gathered in four African cities, as well as available academic and grey literature. In particular, this paper focuses primarily on what may be considered “secondary” cities, Lubumbashi, Djibouti and Lilongwe, and contrasted with supplemental fieldwork in Nairobi, Kenya.

The paper is structured as follows: “Case Studies” describes the research cities and the backgrounds of the studies carried out in each. “Background” encompasses a review of relevant literature, defining what is meant by informal transport in this paper and examining the existing theoretical and empirical literature on flexibility, network geography and operator incentives and decision-making processes. “Defining Flexibility” develops and explains the importance of a distinction between two types of flexibility - Daily Operations and Long Terms Network Change. “Explaining Network Planning” presents an argument for the role of organization, over competition, in the creation of route networks. “Conclusion” summarizes and raises some policy and theoretical considerations.

Case Study Cities and Methodology

This paper is based on mixed-methods research conducted in Lubumbashi, DRC, Djibouti-ville, Djibouti, and Lilongwe, Malawi, supplemented by comparative research in Nairobi, Kenya. In the four cities studied, as in many African cities, informal transport is the dominant, and often only, motorized mode of public transport available (Kumar and Barrett, 2008).

Research in Lubumbashi was carried out in 2015-16 as part of an effort to develop a transport master plan for the city with ROM Transportation Engineering and the University of Lubumbashi. It included digital mapping of the city's transport routes and surveys of 278 minibus drivers and 3,000 passengers (see Kerzhner and Martens, 2018). Work in Djibouti, in May and October 2019, was likewise a transport sector analysis and reform proposal carried out by the World Bank, alongside the University of Djibouti and the Djibouti Ministry of Transport (see World Bank and Djibouti Ministry of Equipment and Transport, 2019). Alongside mapping of the bus routes and an on-street survey of 1,500 people carried out with trained enumerators, this study also included on-site interviews with minibus drivers (conducted in French and Somali with the assistance of a translator), a focus group held with drivers and conductors, and a separate focus group with vehicle owners.

Qualitative research was carried out in Lilongwe in June 2019 and May-August 2021, and in Nairobi in July-August 2019 and February-April 2021. This included interviews with drivers, vehicle owners or terminal managers, and regulators across multiple institutions in both cities. Two focus groups with bus drivers and bus owners, and a total of 30 interviews in Lilongwe were conducted, transcribed and translated by trained research assistants in Chichewa. Drivers were approached at bus terminals, while focus groups were organized through the Malawi Driver's Association and the Malawi Minibus Owners Association. 18 interviews were carried out in Nairobi, in English, by the author. These were primarily SACCO management personnel and vehicle owners, and government and planning professionals in the transport sector, recruited through a snowball method, as well as via referral from members of the Kenya Transport Research Network (KTRN).

Nairobi, a metropolitan area of approximately 5 million people, is one of the best studied urban informal transport systems, but in some ways atypical. In 2010, independent matatus were required to join SACCOs - Savings and Credit Cooperatives. Each vehicle must be part of a SACCO of at least 30 vehicles and each SACCO limited to a set of pre-defined routes. It is vehicle owners, not drivers, who join the SACCO, and drivers largely continue to be employed on a one-to-one basis on informal contracts (Kelley et al., 2018; McCormick et al., 2013).

Lubumbashi (pop. approx. 1.5-2 million), Lilongwe (1.1 million) and Djibouti (650,000) hew more closely to a model of independently owned and operated vehicles, with drivers leasing vehicles and competing to collect passengers across the city, with little further regulation. There are no route-based associations or cartels, and vehicles are licensed to operate in any locations within the city. Authorities and terminal managers maintain a degree of oversight over major departure terminals, including efforts to enforce departure queues. However, the choice of which route to operate on, whether to go off-route, or even to act as a 'pirate', poaching passengers along the route without queuing, is largely at the driver's discretion.

Background: Informal Transport

The definition of 'informal transport' and the choice of vocabulary has been widely debated and contested. This paper, following Behrens' et al definition (Behrens et al., 2015), focuses

on vehicles traveling with multiple passengers and operating on largely fixed routes, with destinations chosen by the drivers or operators, though they may be influenced by passengers' demands. Secondly, services are provided by the private sector with no subsidy, and there is limited or no 'top down' planning. That is - locations of routes, schedules and prices are not, or very weakly, influenced by the state (though they may be enforced, to some degree, by the state once they have been arrived at, or maintained in a given status-quo.) Thirdly, the finances of operation - even where multiple vehicles are owned by a single person or amalgamated into associations or cooperatives - are primarily carried at the individual vehicle level and costs and revenues are not pooled across multiple vehicles. This leaves out the majority of bicycle, motorcycle and most rickshaw operations in which passengers request a specific destination, while leaving in some four-door sedans and most jeep, van, minibus and, in some cities, midi- and large-bus services.

Transport workers in African cities have been widely documented to have precarious incomes, extremely long working hours, physically and mentally difficult working conditions, lack of social and economic mobility, and often a fatalistic, devil-may-care attitude embedded in work culture (Agbibo, 2016; Barrett, 2003; Ference, 2016; Mūngai, 2013; Rizzo, 2017; Spooner et al., 2020). Drivers in many cities operate on a daily 'target' lease, in which a daily fee - the "target" - is paid to a vehicle owner, regardless of the days' earnings. Drivers therefore carry almost all the risk of operations, and their income can be unpredictable, with the targets often difficult or impossible to meet without extremely long working hours, speeding, and dangerous driving (Kumar et al., 2021; Kumar and Barrett, 2008; Rizzo, 2017; Spooner et al., 2020).

In practice, the "target" can be shifting, with under-payment common, but never risk-free. In Santiago, some 20% of vehicle crews' income comes from under-reporting ticket sales (Estache and Gómez-Lobo, 2005) and in Nairobi, systemic under-payment of the daily contract fees appears common (Kelley et al., 2018). This is both tolerated and policed by vehicle owners, leaving even the informal contracts dubious and in a constant state of negotiation. Ference (2021) sheds light on this financial complexity in Nairobi and Mombasa. Relations between different drivers and owners, drivers and conductors and other temporary workers associated with the transport industry are marked by constant conflict, mistrust, surveillance and negotiation. The flows of money, and who is owed what, are both constantly changeable and never fully known. At the same time, there is a strong redistributive element, with constant flows of cash into the community through payment for various small and temporary jobs on the vehicle.

As each vehicle operates as a separate business, they must compete for passengers, and there is rarely protection against entry of more competitors on in a given route or area. Such a system is described in what may be the earliest analysis of urban mass transport regulation, with the effects of "competition for the field" and "competition within the field" laid out by Edwin Chadwick in 1859, comparing the independent, free-entry, system of omnibuses in London, to that of Paris, which had introduced route franchising:

“Instead of, as in London, streets encumbered and disturbed by nearly empty, or only partially filled inferior vehicles, sometimes crawling with a few passengers, annoyed by detentions for a full load, at other times racing, and dangerously overladen, the circulation throughout Paris was made regular from regularly appointed stations, at fixed charges, which precluded extortionate variations.” (Chadwick, 1859).

Such a binary conceptualization of competition in-the-market and competition for-the-market has been used to differentiate formal and informal operators up to the present (Cervero and Golub, 2007; Gwilliam, 2008, 2001; Klein et al., 1997).

Associations are described as a critical organizational backbone of informal transport services, arguing they help to prevent duplication of services, balance supply and demand and avoid ‘all out anarchy’ (Cervero, 2000). Others are more skeptical, noting that route cartels are not universal and that they vary widely in the types of regulation and enforcement they carry out (Gomez-Lobo, 2007). Even where associations exist, their reach and importance can be variable. Associations may manage queuing for a given route, but individual vehicles can choose to circumvent this system to different extents by cruising around, trading off the waiting time with the uncertainty of picking up a full complement of passengers for the same trip length. As fine-grained recent financial analyses from Kampala (Ndibatya and Booyesen, 2020a; Spooner et al., 2020), and the prevalence of both practices in many cities show, neither tactic is obviously financially advantageous.

Another key issue that emerges in the analyses of the work practices and labor conditions of the transport sector is in identifying not an easily delimited set of professions with specific responsibilities, but as ‘ecosystems of labour’, with a wide assortment of jobs and services (FERENCE, 2016; Mūngai, 2013; Rink, 2018; Rizzo, 2017). Drivers do not only lease buses and hire conductors, but rely on a variety of terminal personnel, with sub-leases of the bus over the course of the day. This is an important entry mechanism into the sector, and aspiring drivers may take this role until they develop relationships with owners and get a permanent driving position. Entry into the sector can be time consuming and elaborate, moving up through ranks of terminal gigs, conductor, and driver. Turnover is high, and drivers cycle in and out of employment, often being relegated to “the bench” until a full-time driving opportunity arrives again.

What is Flexibility?

The term flexibility is used almost axiomatically in writing on informal transport. Services are ‘nimble’ and ‘flexible’ in their ability to connect passengers to their desired destinations, and this responsiveness is furthermore key to profitable operations (Cervero, 2000; Cervero and Golub, 2007). It is often described as a direct contrast to the ineffectiveness of formal, protected, or centrally planned services, with informal operators “more likely to craft new, tailor-made services in response to increases in suburb-to-suburb commutes, trip-chaining, and off-peak travel” (Cervero, 2000).

As early as 1978, writers note “the key concepts appear to be flexibility and responsiveness” and “they exploit quickly all demand situations. The operators are immediately aware of new patterns, and they can step in at a moment's notice” (Grava, 1978). Others describe “the advantages of minibuses are their agility...flexibility of fares and schedules...ability to rapidly respond to changes in demand” (Kumar and Barrett, 2008), and “adaptability, flexibility, important territorial coverage and demand-responsiveness.” (Stucki, 2015). Studies using similar terminology can be found for Lagos (Alcorn and Karner, 2021) and Ibadan (Moyo and Olowosegun, 2021), Kinshasa and Nairobi (Heinze, 2018), Cape Town (Clark and Crous, 2002) and Kampala (Spooner et al., 2020).

A vein of research further positions informal transport in its social context, rejecting a purely market-based understanding. Operations may be shaped by “non-market norms and institutions, involving reciprocity, mutuality and sharing” (Rekhviashvili and Sgibnev, 2020). In Quito, informal transit is argued to be oriented to accessibility and safety in marginalized neighbourhoods (Gamble and Dávalos, 2019), and in Indonesia, to be responsive to specifically indigenous transportation needs (Mateo-Babiano, 2016). Brooklyn's primarily Caribbean immigrant-serving Dollar Vans are “practices of movement defined as flexible, vernacular, and specific to postcolonial subjects” (Best, 2016a). Routes are assumed to change over time without intervention a central planner, in response to the needs of the passengers and the city, often with a special and specific suitability to local conditions.

There are also long-standing critiques of romanticization and exotification of informal transport. A 1980's study of five Asian cities identifies strands of tension between sympathetic (primarily Western) observers praising ‘responsiveness’ and ‘flexibility’, compared to local scepticism over the tendency to utilize the same flexibility to raise prices at will (Ocampo, 1982). Another early paper critiques the preoccupation of writers on informal transport in developing countries for their excessive fascination with cataloguing and classifying vehicle types with ‘exotic names’, to the detriment of studying labour, operations and practical service provision (Rimmer, 1980). More recently, Rizzo, in positioning transport workers in Dar es Salaam within a broader discourse on the African urban informal economy, takes task with “the steady flow of romantic and unsubstantiated celebrations of the choices and repertoires of ‘people at the grassroots’ ...[that] crowds out an understanding of the concrete realities they face” (Rizzo, 2017, pg 7).

In analysing the fit of services to needs, an obvious limitation is that an unsubsidized service can only operate where it is profitable to do so (Cervero, 2000; Grava, 1978; Gwilliam, 2001). Ticket prices are often high across Africa, and many people and locations are simply priced out (Olvera et al., 2008). For example, attempts to assign *daladalas* to specific, underserved, routes in Dar es Salaam failed, because they were deemed unprofitable by operators (Rizzo, 2017). Otunola et al, on Lagos, observe that less-profitable routes are underserved, “leaving many citizens behind” (Otunola et al., 2019). In urban West Africa, state regulation is argued to be necessary to counter the private sector focus on “market segments where it is most relevant”

(Godard, 2013) and the informal operators of Kampala and Nairobi tend to “operate a basic route structure” (Pirie, 2013).

Several studies have measured the accessibility provided by informal transport networks by mapping routes and calculating travel times to jobs, hospitals or other amenities. A study of Nairobi looking at access to workplaces found a large gap between wealthy and poor areas, and an even greater one between formal and informal residential areas, with *matatus* having relatively limited penetration into informal, low-income areas (Nakamura and Avner, 2021). Also in Nairobi, an analysis of access to hospitals found substantial gaps in the distribution of the transport system (Campbell et al., 2019). A comparisons of access to employment by informal transport in major Sub-Saharan African cities find a great deal of variation, and both low overall accessibility and substantial inequality within many cities (Quiros et al., 2019). Outside Africa, in Santiago, Chile, the liberalization of bus transport in 1979 did see expansion of geographic coverage and reduced distance to bus routes. At the same time, bus fares increased by 100%, and despite expansion, 80% of bus routes post-liberalization passed through just six corridors. (Estache and Gómez-Lobo, 2005)

As well as spatial distribution, travel times, convenience and connections also appear to be poor, though the passenger experience of low and middle-income urban residents remains understudied. A small survey of commuters in Lagos, Nigeria, found that over 65% had at least three transfers, including multiple payments (Ibitayo, 2012). A majority of Kingston, Jamaica passengers in 1987 reported that outlying routes services were insufficient and low-frequency (Anderson, 1987 in Cervero & Golub, 2007). Minibus services in Cape Town, which act as feeders for a BRT system (Plano et al., 2018) were found to have long off-peak headways and early end of operations, failing to match the BRT’s operations and passenger travel needs.

Research into how operators decide where to operate are limited, particularly for urban Africa. A recent theoretical contribution by Ndibatya and Booyesen (2020a), tracked minibuses in Kampala and show that routes evolve substantially over just eight months, with local residents calling drivers to locations they have organized as impromptu terminals. However, daily searches for passengers lead to long wait times, stops and deviations. Combined with an analysis of driver’s changing profit margins, they show in a companion paper that such searches offer little in the way of greater profits or productivity for the vehicle crew (Ndibatya and Booyesen, 2020a).

In contrast, a study of a single Dollar Van in New York City reveals the analysis of changing demographics carried out when introducing a new route, as the Caribbean-immigrant population that was the basis of ridership was being displaced by gentrification (Goldwyn, 2020). Gamble and Puga’s study of routes developed by informal transport firms in Quito, Ecuador, finds a complex, evolving process of route apportioning between firms, often socially-driven and carefully considered. Firms in this instance are highly organized, often with fixed schedules, (Gamble and Puga, 2019).

Rural informal operators in South Africa (Venter et al., 2014) are also highly organized into associations, which make routing decisions based on determination of exclusive, violently-enforced geographic service areas. Coupled with a lack of information by operators as to passenger demand and low densities, means that routes are not “determined with user convenience in mind, leading to sometimes fragmented routes, unnecessary transfers, circuitous routings, and even complete withdrawal of service from conflicted areas.” Informal services are found to function alongside formal, cheaper, subsidized and scheduled buses on the same routes, rather than filling spatial gaps where the latter do not operate (Venter et al., 2014).

This matches another unusually detailed study, this one from Lima, Peru, in the 1980s (Uzzell, 1987). Lima’s system was organized into associations (comités), each controlling defined zones, which constantly grew and changed in competition with one another. Incumbent associations would carefully scout potential new services, surveying passengers and testing out the route. Changes and expansions to route networks in Lima appear to have been driven substantially by competition between associations for the same passengers, rather than by providing new services to new passengers. The ability of competing operators to change their service networks, moreover, was buttressed as much by political party backing and police cooperation as by passenger demand - which itself was garnered by campaigns and petitions organized by the associations, which could be used to show a form of squatters right in Peruvian law, justifying the new routes (Uzzell, 1987).

A number of models of informal transport operations have also been developed. Many of these identify market failures, where de-regulation leads to negative effects on the quality, quantity or location of services (Ardila, 2008; Chavis and Daganzo, 2013; Evans, 1990; Gomez-Lobo, 2007). One study of the UK bus deregulation experience in the 1980s argues that informal operators use the anchor of a high-capacity formal route to compete at greater frequencies, lower prices, or a more direct or transfer-less route. This damages the passenger base of the core route and it goes out of business, but the informal sector is not able to provide enough service to meet the full demand, the passenger base dwindles, and the service area is then lost altogether (Klein et al., 1997), echoing Venter’s findings in South Africa.

Assumptions on the competitive provision of services tend to describe a “dispersing” tendency, with each vehicle attempting to “distance” itself from competitors, identifying new locations and routes of service. However, at the same time, models and case studies discussed above also show centralizing tendency, as passengers gravitate to reliable, and therefore, without set schedules, high-frequency routes, and in turn draw more vehicles. Hotelling’s Law (Hotelling, 1929) states that competing businesses, rather than distributing themselves evenly throughout space in order to each capture a unique share, instead tend to cluster together in order to compete for the densest section of the market. This is usually applied to static businesses, and has occasionally been considered with the temporal clustering of bus services on a single corridor (Cowie, 2009; Foster and Golay, 1986).

Another way to think about “researching” new routes and service locations may be in terms of coordination failure, a market failure where multiple equilibriums - higher and lower productivity ones - are possible, and a given sector, industry or economy has settled in the lower one. This can be due to disinvestment in knowledge production due to spillovers: if any new approach or know-how adopted developed by a given firm is non-excludable - there here are no barriers for any other firm in the local environment to immediately take it up as well - there is no gain to the firm in putting resources into developing it in the first place, as it will not gain any competitive advantage (Rodriguez-Clare, 2005).

Defining Flexibility

The idea of flexibility often elides different practical aspects of transport operations, and drivers’ and organizers’ decisions and constraints. Flexibility in daily operations, expressed in deviations from established routes and fare changes, must be separated from the medium- and long-term evolution of the route network and geography of terminal locations. Table 1 summarizes the distinction, and the following section consider how these patterns of operation take place in practice, and the effects for access and equity, based on research in the four cities in this study as well as available detailed case studies.

Table 1: Distinguishing daily and long-term flexibility of informal transport operations

	<i>Daily Operations</i>	<i>Long Term Network Change</i>
Operations	<ul style="list-style-type: none"> • Choosing routes over the course of the day • changing route alignment on-the-go • changing destination • dropping people mid-way • dropping passengers at requested locations • alignment of supply with demand over the course of the day • changing prices over course of the day 	<ul style="list-style-type: none"> • Development or extension of new routes • Establishment of new stops, terminals, locations of service • Changes in expected operating hours • Changes in overall prices long-term
Incentives and motivations	<ul style="list-style-type: none"> • avoidance of traffic • avoidance of police checkpoints • minimizing fuel expenditure, • searching out new passengers, • alignment to passenger requests, • avoidance of excessive competition • familiarity 	<ul style="list-style-type: none"> • Avoidance of vehicle-damaging or unpaved roads • competition with other associations • perception of captive transit riders
Equity and Access for Passengers	<ul style="list-style-type: none"> • Increased safety/convenience with closer drop-off • Unpredictability, long travel times/waits, fluctuating prices • hostile behaviours from vehicle crews • unequal treatment of passengers - gender, class, ethnic/social group 	<ul style="list-style-type: none"> • Changing distance from residence to transport route • Changing distance of activity location to transport route • Travel times • Number of transfers required • Overall price of travel

Main actors in decision-making process

- drivers and crews
- individual or small groups of passengers
- terminal managers
- route-based associations
- Route/Area-based association management
- Associations of vehicle owners
- planners or regulators
- passenger or resident groups or organizations

Daily Operations

Informal transport vehicles often deviate from the routes on which they are assumed to be operating. The definition of a route itself can be vague, with multiple parallel routes or different end points, but generally vehicles have relatively set origin and destination points, whether formally sanctioned or collectively recognized. Increasingly widespread mapping of informal transport systems is only possible because some route stability is evident (Digital Transport 4 Africa, 2019; Klopp et al., 2015).

Despite these generally-agreed-upon routes, drivers usually have substantial de-facto freedom to make changes. This can be to avoid bad traffic, search out new passengers, or follow the requests of existing passengers. For example, minibus drivers in Queens in New York City, and in Tbilisi, Georgia, have been found to frequently deviate from their route to drop off passengers in need at their door, such as those with children or heavy shopping (Musili and Salon, 2019; Rekhviashvili and Sgibnev, 2020). In Kampala, there are extensive search behaviours, with drivers zigzagging, stopping to wait along the route, and going off-route in search of potential new passengers when the taxi is underfilled (Ndibatya and Booysen, 2020b, 2020a). In some cities both minibuses (12-20 passengers) and sedan cars (4-6) passengers operate, with minibuses usually having stronger route adherence and sedans having more capacity to deviate according to passenger requests, such as in Iran, in Kano, Nigeria or in Cape Town (Askari et al., 2020; Madugu, 2018; Rink, 2020).

While providing potential benefits to new passengers being picked up, this can come at the detriment of existing ones. Interviews with Djibouti drivers found that they may shift their route based directly on passenger requests, but primarily if these were a sizeable group, and were vocal in making the demand. There is considerable frustration with this arrangement - some groups of passengers were able to be vocal - indeed, rude - and bludgeon the driver into route changes. Others were not. In Djibouti, drivers were also frustrated with a norm of very frequent stops, at intervals of just tens of meters, demanded by both boarding and alighting passengers (interviews).

This substantially slows the trip, cutting into drivers' earnings and lengthening other passengers' travel times - but drivers perceived themselves as powerless against the demands of middle-class passengers expecting to be dropped at a precise spot along the street, and called for the imposition of regular stop locations by regulators (interviews). GPS tracking of Kampala minibuses also shows very high waiting and hold-back times (as drivers stop along the trip with a partly-filled vehicle to wait for more passengers) and very low operating speeds. In fact "a

large portion of minibus taxi commuters' travel time consists not of actual travel but of sitting in a stationary vehicle waiting," (Ndibatya and Booyen, 2020b).

Another common, though rarely measured, practice is the in-completion of routes. Passengers are dropped short of the destination and must walk or wait for another bus to come by. In Nairobi, drivers may coordinate with another vehicle to transfer passengers over at no cost. In Lubumbashi and Lilongwe there is no recourse, logistical or financial - the vehicle simply turns around (interviews, observations). A study from Kingston, Jamaica similarly found that 74% of passengers had experienced an incomplete route (Anderson, 1987 in Cervero & Golub, 2007).

Long Term Network Change

The more complex issue to pinpoint is the nature of the long-term evolution of informal transport networks. In many cities, bus drivers and owners have the legal authority to set their own routes. In Lilongwe, Djibouti and Lubumbashi, operating licenses for public transport vehicles are issued at a city-wide level, and there are no statutory restrictions on which locations buses may stop or wait at (interviews). On the other hand, in Nairobi, vehicles are required to join route-specific cooperatives (interviews), as is the case some other major cities, such as Lagos (Alcorn and Karner, 2021). They may drive only on routes the association has claim to, and any deviation from the set route are illegal and can be enforced by both the cooperative and the traffic police, though in fact the practice remains common (Kelley et al., 2018).

How much do operators take advantage of such freedoms? Firstly, informal services are often praised for their ability to go where formal, or at least large, buses cannot, particularly narrow and unpaved roads (Kumar and Barrett, 2008). There is no evidence that operators see the issue the same way. Based on interviews, operators strongly prefer to avoid unpaved roads to avoid wear and tear on vehicles, in all four cities in the study. Mapping of routes in Djibouti and Lubumbashi, as well as studies from rural South Africa (Venter et al., 2014) and Nairobi (Kelley et al., 2018), corroborate this, finding most services strongly concentrated on paved routes. In Lilongwe, two routes were identified which operated partially on unpaved routes, and both of these were dominated by especially poor quality vehicles which could not pass inspections to receive operating licenses or required insurance. Vehicles chose these routes because they avoided police checkpoints (interviews, route mapping).

Explaining Network Planning

Driver: If we could find passengers - for new destinations - at a higher price, we would do that, [but] we never experiment.

Interviewer: when was the last time you tried a new area?

Driver: never. We have to be very careful, if we experiment we will lose a lot of money.

Focus group notes, Djibouti, 2019

In many cities drivers and operators have the ability to freely choose their routes, stops and locations of operation. How is this freedom exercised, and by whom? Do the ‘target’ contracts, and the resulting precarity, social positioning and economic incentives, lead to effective in-the-market competition? This assumes operators are strongly incentivized to pro-actively search out profitable locations to operate, in turn producing adaptive and responsive routes, which change or expand “in tune” with the diversity of passenger needs?

In the research carried out in Djibouti, Lilongwe and Lubumbashi, drivers stated that they prefer to stick to the network of familiar pre-existing routes, and do not search out new ones. At the same time, drivers recognize that this is a right they have, and could theoretically do so. This is the case both legally - in all three cities, licenses are issued city-wide, permitting any vehicle to operate any route, stop, or road segment - and de-facto, in terms of formal and informal practices of associations and terminals. But, despite this freedom, quite stable route networks persist in all three cities. Individual drivers make decisions as to where to operate primarily along the existing network, balancing a variety of factors in their route choice, but very rarely “exploring” for un-served locations. As the quote above from a Djibouti focus group shows, drivers *consider* the possibility, but in practice, avoid it. Further, as well as little tendency to explore off-network, the Lubumbashi survey of drivers found that 46% preferred a single, regular route, and a further 27% drove only on two routes weekly. Driving on multiple routes in Lubumbashi was highly uncommon and only a small percentage of drivers choose this kind of changeable work pattern (survey, n=287, Kerzhner and Martens, 2018).

How to explain this? Searching out new market niches and geographical areas of operation requires investment and overhead of time and fuel. In an atomized transport system - one where each vehicle’s operations are a closed financial unit - this means taking time off operations on established, profitable routes and, given the nature of daily target contracts, an associated loss of earnings if a given “route-making” attempt is does not immediately prove productive.

The process of starting new routes of operations cannot be considered a uni-directional one, where passenger demand is discovered like an uninhabited island. The introduction of services to relevant locations may draw passengers over time, but this process cannot be carried out with a single vehicle, which would not generate the density of service that would make new locations fully and easily accessible, and lead to changes in travel habits, and eventually, in residential, employment and other activity location decisions. These are months- and years-long processes that informal operators cannot invest in individually.

This is illustrated by the process in Nairobi, a highly organized, route based system, where - unlike in the other three cities - SACCOs have a license to operate only on specific, designated routes. Interviews with SACCO managers show that SACCOs take the initiative to develop new routes, petitioning the authorities to approve them. This is driven by a complex process on the part of the SACCO, which may try out a new route with a small number of vehicles, and subsidize their operations - paying drivers’ incomes and owners leases from collective funds - for several

months. Before and during this experimental phase, the SACCO will measure demand - including, in some cases, by sending out surveyors and calculating traffic flows along a corridor - assess potential market share vis a vis competing SACCOS, and advertise new routes by handing out leaflets and hanging posters. Rather than an intuitive process by individual drivers, in Nairobi it is the emergent, professionalized middle management of the SACCO which carries out route planning.

In contrast, in Lilongwe, Lubumbashi and Djibouti, while there are cooperatives of drivers, and in Djibouti and Lilongwe, association of minibus owners, none of these are *geographic* in nature, belonging to a particular terminal, route or neighborhood. The drivers' groups are primarily emergency funds for medical, legal or funeral expenses. The Djibouti and Lilongwe owners' associations play a political lobbying role vis a vis the government. Interviews with drivers, owners and regulators in all three cities found no evidence that these groups played any role in developing routes or controlling entry and behavior along them.

Explaining the resistance on the part of individual drivers is complex. Firstly, it appears drivers often do not fully know their revenues, expenses, profits, or have a strong big-picture view of their business. In the surveys conducted in Lubumbashi and Djibouti, drivers yielded highly uncertain assessments of basic facets of operations, such as number of daily trips, numbers of passengers, and estimations of daily income. Interviews in Lilongwe found some drivers did not keep track of the number of trips made per day. The 'target' based daily lease system is also often more fluid and complex than a simple daily payment. In Djibouti, where minibus owners were interviewed, found a frequent state of clashes, hostility and contract-breaking between owners and drivers, with targets and debts going unpaid, and drivers cyclically moving from vehicle to vehicle as relationships sour. Vehicle owners, meanwhile, are often dissatisfied with drivers, frequently firing and hiring new ones. This means the ability and resources to analyze the preferability of any given route within the financial constraints of the target arrangement is difficult and risky and risk-aversion understandably high.

As well as fraught relationships with vehicle owners, drivers' often cite difficult relationships with *passengers*. In Djibouti, interviews found drivers feeling bullied by middle class passengers into irritating and unprofitable behavior, such as short intervals, non-payment, and pressure by groups of passengers to change routes. (Disrespect and non-payment from passengers are also found to be one of the major problems recounted by minibus crews in Kampala, and, for female conductors, misogyny and harassment (Spooner et al., 2020)). In Lubumbashi and Lilongwe, surveys and interviews with passengers found hostility and frustration with drivers behaviours, personal conduct, and driving decisions, such as delaying, deviating or cutting short trips, over-filling buses, and changing the expected payment mid-trip.

Vehicle owners' preferences and incentives also need to be understood - they may be little involved in daily operations (McCormick et al., 2013), but it is their investments regulate the number of vehicles in operation and contribute to managing competition across routes. Informal transport networks remain highly atomized in many cities, with little organization into firms.

In Lubumbashi, the survey of drivers found that 36% of bus owners had one bus only, and 40% between two and four (Kerzhner and Martens, 2018). In interviews with Lilongwe bus owners and drivers, owners are not involved, and do not keep track, of where the vehicle operates (interviews).

As with drivers, it is unclear how this form of ownership contributes to flexibility, except that it appears to offer few constraints. However, the inability, in many cities, to build up businesses and expand ownership to multiple vehicles means vehicle fleets may remain smaller than demand, and competition between vehicles is limited due to undersupply. This appears to be the case in Lubumbashi, where the total vehicle capacity in 2016 was only a fraction of the city's population and violence was frequently reported in attempts to gain a seat on a bus during morning peak time.

Further, in contrast to the free-roving, vehicle-level-autonomy suggested by a demand-responsive system, it also appears that the labour force - even when unorganized - might be highly localized. Once organized routes and terminals are established, drivers have strong incentives against operating away from them or branching out. This is not just a question of profitability of daily operation, but also of entry to the sector. The economic and social mechanisms that provide entry into driving and conductor jobs are tied to specific locales and webs of familiarity and reciprocity, that, for many drivers, further bring them back to the same small set of terminals and routes. It is at these that their labour ecosystem is rooted, rather than stretching across the whole space of the city.

What kind of impact do these complex and shifting spatial, social and monetary relationships have on assumptions about response to demand? A few points can be made: firstly, it is not clear that drivers and crews have an especially accurate or conscious mechanism for assessing passenger demand via ticket sales. The management of incoming cash from passengers, outgoing cash for expenses (fuel, taxes, bribes) and into the labour-ecosystems (handovers of the vehicle to replacement drivers, payment to terminal personnel) and what is paid, and unpaid, to the vehicle owner is fluid and unrecorded. Calculating or intuiting from such flows whether a given service is better compared to another, appears questionable. Relationships with passengers, rather than organically delivering an understanding of mobility needs across the city, can be confrontational and frustrating for vehicle crews. A variety of other considerations play an important, and it appears from interviews, possibly more important role in guiding route choices, including familiarity and a need to meet other social or economic obligations (such as handing over the vehicle to a substitute driver at a particular location).

Comparing the atomized structure of operations in Lubumbashi, Djibouti and Lilongwe to the strong geographically-distinct SACCOs of Nairobi, as well as evidence in the literature, illustrates collective, organized nature of demand-response. Driver's and other on-the-ground transport workers, caught in exploitative contracts and with precarious incomes, hew to cautious, conservative choices to guarantee a return for a day's work. The creative, flexible responsiveness which may theoretically be able to pick up varied passengers needs is not

evidenced. The investment needed to develop new destinations and routes, and test their profitability, can be carried out only at a higher level of organization, such as route associations, who are able to pool the resources needed to carry a loss, protect their members investment (time, for drivers; capital, for owners) as well as having the wider perspective to direct and manage the expansion of the network.

Conclusions

When returning to the model of “competition-for-the-market” and “competition-in-the-market”, with a different perspective can be considered: individual vehicles compete for passengers along *already established routes*, while organizations compete for *space* in expanding their route network to new locations, or capturing passenger shares from one another. Cartels, terminal managers, route associations or government franchising, provide a degree of control of entry and enforcement ticket prices and orderly departures, guaranteeing a full vehicle in return for a long wait to all route-members. However, only geographically-bounded associations, such as Kenya’s SACCOs, work to develop their networks.

Cruising, searching behaviour by drivers does not translate into new routes - passenger bases cannot be consistently established. However, when vehicles are organized beyond the individual level, spatially-responsive, exploratory and competitive behaviour can emerge. By pooling together multiple vehicles, pre-advertising routes and stops, and, crucially, creating a management cadre who are responsible for the operations multiple vehicles, the market failures that affect the competitiveness of individual drivers are partially circumvented. Firms or association can carry a few weeks’ or months’ loss on the operation on a number of vehicles, coordinate multiple vehicles, and invest resources into studying and testing new destinations and routes.

Importantly, this does not resolve accessibility issues. In Nairobi, and from available literature, it appears that associations are motivated strongly by competition over existing passenger bases, and less in establishing new services. They compete to capture a fraction of traffic on popular routes from competing associations, rather than being primarily interested in extending the network. Secondly, SACCOs view their services as differentiated on vehicle quality, style (with or without music, for example), and maximum price caps, not on serving specific routes or niche destinations.

It is important to make explicit - informal transport is not equitably flexible and responsive. Operation patterns do not purely follow profitability, but must also reliably serve the complex internal financial flows of exploitative employment, mutual obligation and collective organization within the sector. This does not ‘fill the gaps’ left by formal planning and formal services - it exacerbates them. Informal transport tends to build on corridors established by formal transport, where it existed in the past, and doubles down on existing high-frequency, high-traffic corridors, providing services that primarily serve profitable, direct patterns of mobility. More research is required to understand the equity and justice concerns, but existing

literature on the mobility of women, informal workers and low-income populations suggest it is these groups who are least well served by trunk, radial routes often evinced by such systems.

The dire working conditions, poor knowledge base and limited reliability and margins of the labour structure of informal transport underly this. Where efforts at expansion, niche-finding and creativity are taking place, they are being driven at a level of greater organization, sophistication, managerial capacity and stability than that of the romanticized figure of the 'ear to the ground', preternaturally demand-aware driver of a bus or taxi. Exploitative labour conditions mean less, not more, variety of transport services.

Informal transport networks are actively organized and developed by their workforce and operators in response to a variety of economic and social incentives and positions, which can result in market failures and externalities. These can be substantially at odds with some passenger needs, particularly when considering questions of equity across different population groups with different mobilities and destinations of interest. The planning work carried out by informal operators to identify and measure demand and operate profitably is often de-professionalized and de-skilled, instead becoming a product of instinct, reflex, and responsiveness based on fuzzy 'local knowledge'.

The possibility of flexibility is no guarantee that this will be used benefit the most marginalized and underserved locations and groups, contribute to mobility justice and equity, or be aligned to best contribute to urban transport measures like poverty reduction, GDP growth, employment and amenity access, or agglomeration. While informal-sector actors can be proactive planners, this planning is limited precisely by its responsiveness. Without intervention and longer-range planning, a marginalized and impoverished workforce, responding to the in-built inequalities of post-colonial cities, has little choice but to perpetuate them.

Chapter 2: How are Informal Transport Networks Formed?

Introduction

Informal transportation, or paratransit, is the main mode of motorized transport in many African cities and holds an important role around the world (Behrens et al., 2015). Often described as demand-responsive and flexible (Cervero, 2000; Grava, 1978; Kumar and Barrett, 2008), there is limited analysis on the ways informal transport networks are created and evolve, and the role, agency and motivations held by transport workers and managers. It is not clear how route and service locations are chosen and provided, by what mechanisms, to whose benefit in terms of access and equity of mobility, and what forms of power relations are embedded in the process. Without intervention or 'top-down' planning, it remains to transport operators themselves to make these decisions and define terminal locations and route alignments. How is this done?

Operation within informal transport systems have often been considered spontaneous, chaotic or laissez-faire - thousands of vehicles independently assessing and pursuing passengers in their choices of operating location (Cervero, 2000; Klein et al., 1997), but this is a stark simplification. In most cities, the sector is internally organized in a variety of ways which strongly affect how and where any given vehicle can operate (Cervero, 2000; Estache et al., 2004; Mūngai, 2013; Schalekamp, 2015). Different cities and parts of the world have complex local politics and regulation, urban form and infrastructure, and the history of public transport. In Latin America and Eastern Europe, informal transport often coexists with formal modes, in sub-Saharan Africa, it may be the only mode. Some cities require amalgamation into firms or issue franchises and regulate entry, others are punitive and work to limit the locations of informal operators, and many cities offer neither support or interference.

This study finds that, in fact, spatial expansion is not produced through atomized competition between vehicles, but through careful, and often highly time0 and resource-intensive shepherding and coordination of labour and resources by associations of workers and vehicle owners within the sector. Different modes of organization and particularly the different loci of decision-making, financing and political power affect how the transport networks are produced and evolve over time. The key differences are in the sensitivity to information on passenger needs, managerial and financial capacity to invest the funding necessary for the startup of new routes, and tolerance for conflict between groups and associations within the sector. These means that some private, urban transport networks are more responsive and faster-growing than others, and also have different strategies, competing for density on existing corridors or expanding to new locations.

The paper is based on interviews and observations conducted in three African capital cities, with different urban and national histories, governance structures, economies and global prominence - Nairobi, Kenya; Kampala, Uganda; and Lilongwe, Malawi. In all three, paratransit, or 'informal' transport, is the most important form of motorized transport. Beyond this,

however, similarities end. Nairobi's well-studied and culturally-notable matatu industry has been organized into cooperatives (SACCOs) and firms since 2010, with a membership of vehicles owners. Kampala's minibus-taxis belong to complex, highly managed regional and then national association, based on workers' membership in stage associations. In Lilongwe, meanwhile, organizations have little authority or membership at the route or terminal level. These differences allow a critical comparative case-study approach, identifying both consistency and variation.

Little existing research has explored the ways that informal manage their operations and incorporate risk and long term business viability, and particularly how this produces the services available for passengers. This study finds that rather than smoothly reading and adapting mobility needs, transport operators must work within a complex set of limitations and tradeoffs to choose their routes. They must contend with unpredictable costs and revenues, limited access to capital and credit, and exploitative working conditions (Rizzo, 2017; Spooner, 2018; Spooner et al., 2020). These create market failures and extensive negative externalities, which, as I show, operators are often keenly aware of.

As well as practical policy implications, I highlight the processes and interactions of markets and community actions in providing urban services in informal and post-colonial settings, integrating the questions of livelihoods, labor and economic structures which cannot be divorced from social and political agency. These questions are of increasing salience as attempts at reform, engagement, improvement and incorporation into new proposed systems - such as BRT - are undertaken by cities, yet often met with skepticism and resistance from incumbent operators, particularly in Africa and Latin America (Asimeng and Asabere, 2022; Paget-Seekins and Munoz, 2016; Schalekamp and Behrens, 2010). If cities are to improve their public transport and move away from car-centered planning, they must integrate the existing transport sectors' incentives and goals for their operations, and their understanding of mobility, accessibility and claims on urban space.

Spatial planning, organization and labour in informal transport

Informal transport plays an important role in cities across the world, including Africa, Latin America, South East Asia, and in Eastern Europe and Central Asia after the collapse of the Soviet Union and state socialism by the 1990s (Grava, 1980; Kumar et al., 2021; Muleev, 2019; Ocampo, 1982; Rekhviashvili and Sgibnev, 2020; Vozyanov, 2018). A growing body of research has worked to map networks (Klopp and Cavoli, 2019; Vergel-Tovar et al., 2022), analyse efforts at digital ticketing (Tinka and Behrens, 2019), regulation and reform (Kerzhner, 2022; Mateo-Babiano et al., 2020; Venter, 2013). The economics, politics, culture and history of informal transport workers is also widely researched (Agbiboa, 2016; Asimeng and Heinrichs, 2020; Barrett, 2003; Ference, 2016; Hart, 2016; Mungai, 2013; Mutongi, 2017; Rizzo, 2017; Spooner and Mwanika, 2018). However, the integration of these two bodies of literature, particularly relating to spatial planning of informal transport, has remained little explored beyond axiomatic assumptions on laissez-faire market operations. (For a more extensive exploration of this question, see Kerzhner, 2022).

The operations of informal transport are often described as market-driven and laissez-faire, and frequently regarded as an effective answer to slow, inept, and discriminatory state-planned and provided public transport, or its lack. Informal transport is stressed as particularly well adapted to local needs, in that it “can easily alter schedules, routes, and operating practices in response to shifting market conditions” (Cervero, 2000. See also - Clark and Crous, 2002; Kumar and Barrett, 2008; Stucki, 2015). Other writers do not see market competition as the key element, and instead explain operations through response to community needs, arguing that informal transport “can flexibly address diversifying mobility needs”(Rekhviashvili and Sgibnev, 2020. See also - Best, 2016; Heinze, 2018; Mateo-Babiano et al., 2020). Skeptical authors have questioned this, arguing there are intrinsic limitations to private sector services, including in terms of price setting (Estache and Gómez-Lobo, 2005) and spatial distribution (Klein et al., 1997.)

While a highly diverse industry, and few key practices are common globally which must be understood to characterize operations. The typical labor arrangement is a daily lease, often known as the “target system”, where a vehicle is rented daily by the driver for a fixed sum from the vehicle owner, and the driver keeps any earnings above this. The driver is usually responsible for most expenses, including payment to a conductor, cleaners or security guards, the cost of fuel, and daily operating fees, and taxes or bribes to government or internal bodies. The owner is responsible for long term maintenance and licensing (Barrett, 2003; Behrens et al., 2015; Kelley et al., 2021; Kumar and Barrett, 2008).

This method leads to low and unpredictable incomes for drivers and conductors (Kumar and Barrett, 2008) and a physically difficult and highly stressful work environment. Drivers have extremely long working days, with 14-15 hours being typical (Behrens et al., 2015), difficult physical conditions and no protections against immediate dismissal or guarantee of any reliable daily income (Barrett, 2003; Rekhviashvili and Sgibnev, 2018; Rizzo, 2017). Several studies were able to find that drivers may often de-facto underpay the daily target (Estache and Gómez-Lobo, 2005; Kelley et al., 2021), with owners knowing that the rate they set is all but impossible to meet every day and allowing a measure of leeway. However, it is still the owner who reaps most of the income from a vehicle, while being little involved in day-to-day operation.

At least in some cities, mutual mistrust, graft, theft and underpayment characterize working relationships in the sector (Agbibo, 2016; Ference, 2021; Rizzo, 2017) even as they include reciprocity and redistribution. Research stresses the interconnected, shifting and social nature of the work, with informal contracts and handshake agreements not just between drivers and owners, but frequent “micro-employment” with short driving stints (as during a lunch break), small jobs on vehicles and at terminals - like cajoling passengers in a bus or repairs and cleanings - supporting a much larger workforce than a simple count of vehicles reveals (Ference, 2021; Mūngai, 2013).

The difficult and exploitative working conditions are widely argued to explain the many of the worst practices of the sector (Plano, 2022; Rizzo, 2017). Vehicles are of poor quality and

maintenance. Drivers incentives are to maximize the number of trips and passengers per day, rather than drive carefully or avoid damage, while owner's are removed from day-to-day operations. There are usually no schedules, and fares are often variable, with drivers and associations having the liberty to raise prices at will, which may often happen at rush hour or if it rains (Otunola et al., 2019; Spooner et al., 2020). Passengers face long and unpredictable waiting and travel times as vehicles will only depart when full. They may also practice "hold-backs" en-route, stopping and waiting once a passenger has gotten off in order to only drive with a full bus.

Regulation is often weak to non-existent. Where state or city authorities do undertake a degree of control, they often have little ability to enforce it, or technical capacity to set vehicle standards or manage the number of vehicles operating across the city. Transport planning by authorities in African cities is typically focused on infrastructure 'wish-lists' (Kumar et al., 2021), or new services such as BRT (Paget-Seekins et al., 2015; Schalekamp and Behrens, 2010; Wood, 2022). They often makes no plans for informal modes (Boutueil et al., 2020) or expect they will be replaced in due course (Behrens et al., 2012).

Internally, however, are organizations and associations of different forms in almost cities' informal transport systems. Most frequently, they take the form of workers welfare funds or savings and loans associations, and may support workers financially for emergencies such as hospitalizations, funerals, or to bail or bribe drivers' out of jail, as frequent arrests can be part of the job in many cities (Barrett, 2003; Ference, 2016; Kumar et al., 2021; Rizzo, 2017). In some cities organizations also hold roles in operating and managing passenger-serving functions (Estache et al., 2004; McCormick et al., 2013; Plano, 2022). They organize the queues of vehicles, set prices, and serve as an address for passenger requests or complaints on issues like lost-and-found, poor driving or harassment.

These associations often rely on collecting fees from members or per-departure, and this structure can lead to saturation and excessive competition, as they have no incentive to limit the number of new entrants regardless of the pool of passengers (Schalekamp, 2017). There is a steady stream of new entrants to employment and vehicle ownership in the industry. For workers, this is widely regarded as a 'catch-all' category of employment, requiring only a relatively accessible skillset of a driving license (and not even that for roles such as conductor) (Muñoz-Raskin et al., 2015). For vehicle owners, the leasing out of a vehicle can be a source of income with limited involvement (McCormick et al., 2013; Schalekamp, 2017). With little proactive planning by authorities, fast urban population and spatial growth, and a large pool of transport workers and vehicles, how do informal transport systems carry out expansions and route changes?

Methodology

The three cities in the study all have privately-operated, unsubsidized, informal or paratransit systems forming the backbone of daily mobility, but with different forms and levels of organization of the industry. They were chosen for different types of organization in the system

- Lilongwe most resembles many secondary- and tertiary cities around the world where informal transport is the only mode, operating with little interference and accepted as the norm, with little internal organization. Nairobi represents an opposite case, where informal transport is heavily politicized, contested and regulated, and is also a powerful industry, managed and organized through a variety of sophisticated organizations. Kampala is not an in-between, but represents a markedly different pattern from either, with strong worker's associations and a national labour union (see Author, 2022, for a wider discussion on differences in transport organization between different types of cities, and Pojani and Stead, 2015, for the importance of research beyond megacities.)

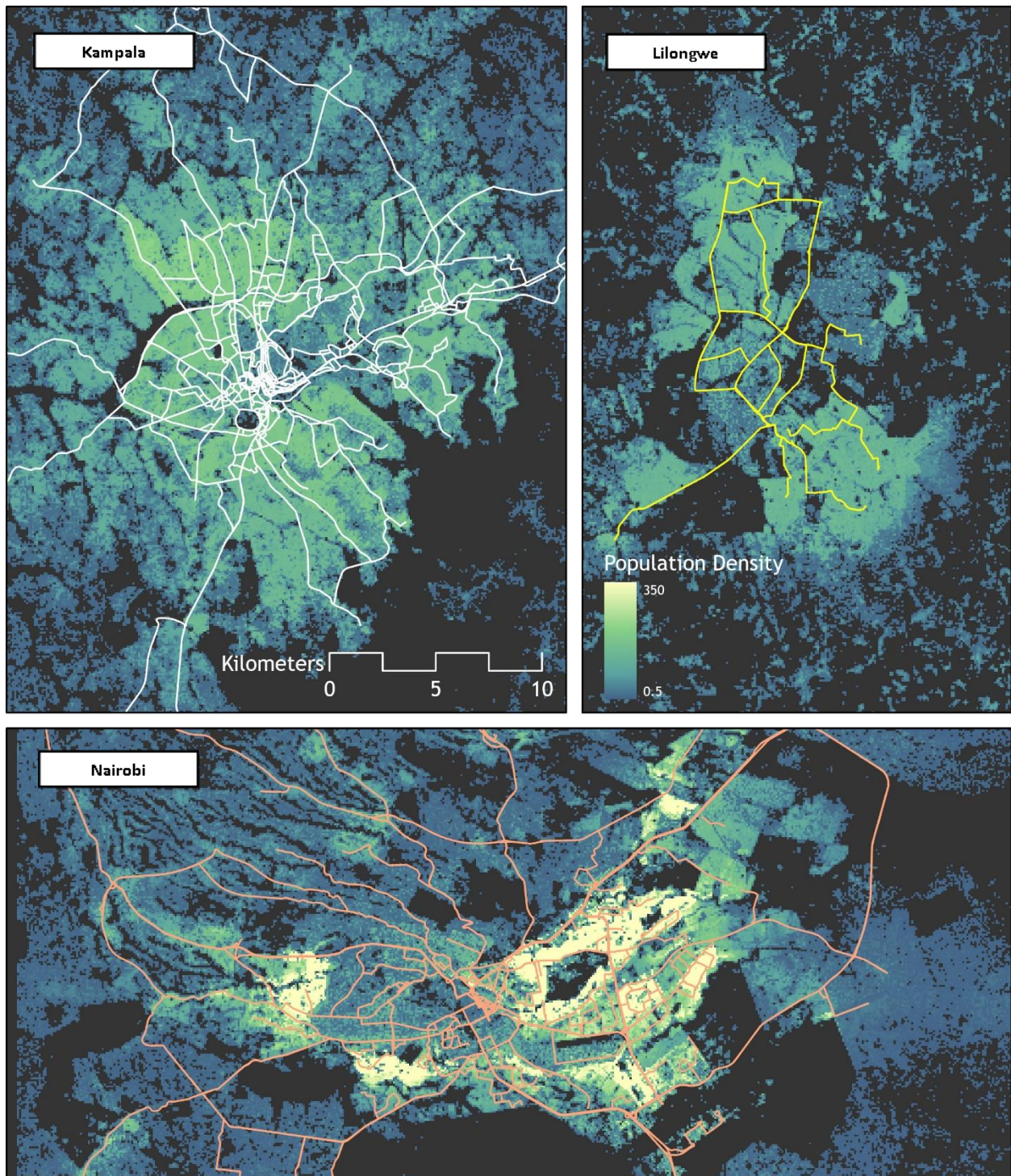


Figure 2: Population Density and the extent of the informal transport network in Lilongwe, Kampala and Nairobi. The three maps are at the same scale. Population density from WorldPop.

Case Study Cities

Lilongwe, Malawi, population 1.1 million (United Nations Population Division, 2022), is a sprawling, low-density, modernist, master-planned capital. It was developed in the 1970s, influenced by South African apartheid planning, and has never been fully built out, with parts of the city still waiting to be ‘filled in’. The original plan assumed “almost every family will have a car”(Munthali, 2017; Mwathunga, 2014; Potts, 1985). In practice, only 47,000 private cars are registered in the region, approximately 2.7% of households (Malawi National Statistics Office, 2018). Motorcycles are owned by 3.8% of households, and the only common vehicle is a bicycle, at 38%. Nevertheless, Malawi has one of the world’s highest death tolls from road accidents (World Health Organization, 2018). Pedestrians, especially children, are especially vulnerable (Banza et al., 2018; Christophersen et al., 2021; Sundet et al., 2018). One estimate shows Malawi losing 10.3% of its GDP annually to road accidents (World Bank, 2020).

Public transportation is entirely provided by the private sector with little state involvement, based on sector analysis from 2017 (Atkins and the World Bank) and 2009 (JICA), as well as this study. The Road Safety Authority, operating under the Ministry of Transport, issues driving and public service vehicle licenses. A de-centralization process, initiated in 1998, remains mired in an “incoherent legal and policy framework” (Chiweza, 2019), and municipalities, including Lilongwe, hold nominal authority over road planning, parking and bus stage regulation, but in practice have no funding to carry it out. Current data on public transport is largely unavailable, but a 2015 report estimated 4,000 minibuses operating nationally (Roberts and Vilakazi, 2015) and 2021 Roads Authority data shared with the author shows 11,000 medium and large-capacity vehicles nationally, though not all may be operated as public transport. Over 50% of buses are over 20 years old, and over 80% of minibuses are over 10 years old.

Kampala, capital of Uganda, has a metro population of 6.7 million. The city predates the British colonial era, and took its current form during the early twentieth century, seeing uneven development between the colonial and African city. A series of car-oriented masterplans, pre- and post-independence, failed to keep up with growth, and the informal transport industry dates to the early decades of the 20th century. It grew rapidly in the 1980s as public services collapsed during the Amin regime, and repeated efforts have been made to re-introduce large buses since the 1990s, but these have seen little success (Goodfellow and Mukwaya, 2021).

2012 data estimates that 82.6% of non-walking trips were by minibus, 8.5% by boda-boda (motorcycle taxi) and 8.8% by private car. However, walking was the most important mode of non-work trips, at 55%-75% (KCCA et al., 2018). The network of the minibus taxis is highly radial, according to a 2018 transport plan, with over 60% of trips requiring a transfer (KCCA et al., 2018). Traffic and congestion are reported to be the issue of highest concern for Kampala residents, and traffic accidents and deaths are fast rising (Goodfellow and Mukwaya, 2021). One study estimated the cost of congestion to be 4.2% of the metropolitan GDP (Baertsch, 2020). The Ministry of Works and Transport holds the role of creating and assigning new routes, but in practice this has not been implemented as of 2022, and according to interviews, it is the Kampala Central

City Authority (KCCA) and other municipal councils who gazette new service locations for minibus operations.

The industry is operated through Stage Associations. Drivers on each route or subset of routes elect a leadership, who manage savings and welfare funds, set fares, organize orderly queueing, and attempt to enforce the removal 'pirate' operators who avoid the queues and poach passengers (Goodfellow and Mukwaya, 2021; Spooner et al., 2020; Spooner and Mwanika, 2018). Stages are organized into several overarching city- and nation-wide associations, who both collaborate and compete for members and policy influence. Starting in 2010, the sector is affiliated to formal unions, and the Stage Association are, at present, gradually incorporating into the Amalgamated Transport and General Workers of Uganda (ATGWU) while maintaining the existing structures of the Stages (Webster et al., 2021).

Nairobi, metro population 9 million (KNBS, 2019), dates to 1899, growing from a worker's camp on the Mombasa-Kampala railway. It was built and governed as a racially and spatially segregated city, with African residents restricted to peripheral settlements and 'pass laws' that barred Africans from entering administrative center. It was also immediately conceived as a car-oriented city, with mass importation of private cars by the white colonial population throughout the first decades of the 20th century, and even public transport was oriented to the mobility of white residents (Mutongi, 2017; Nyamai, 2022).

Matatus emerged in the 1950s as a response (Mũngai, 2013; Mutongi, 2017), and dominated public transport by the 1980s and anywhere from 15,000 (Plano, 2022) to 60,000 public transport vehicles (Nairobi City County Government, 2015) currently operate in Nairobi. Estimates from different sources suggest the currently 30-40% of trips are made on foot, 40-50% by matatus, 15% by private car, and the remaining 5-15% by motorcycle, taxi, and rideshare. (Masaoe et al., 2011; Nairobi City County Government, 2015; Nyamai, 2022; Salon and Gulyani, 2019). Motorization is increasing rapidly (KNBS, 2020) with 12% - 15% of households in Nairobi owning a car.

The Kenya National Transport Safety Authority (NTSA), registers public service vehicles, while planning authority is held by Nairobi Metropolitan Area Transport Authority (NaMATA). In 2010, regulation required independent vehicles be organized into route-based Transport Management Companies (TMCs) or Savings and Credit Cooperative Organizations (SACCOs), operating at least 30 vehicles (McCormick et al., 2013). For TMCs, at least a portion of the fleet is directly company-owned and operated, paying salaries to drivers and conductors. In SACCOs, vehicles belong to private owners who affiliate with the SACCO and its routes (Plano, 2022).

Methods and Analysis

Research was carried out over several years - interrupted by COVID - between 2019 and 2022. In each city I undertook a primarily qualitative research program, which included semi-structured interviews with a variety of stakeholders, visits to bus terminals, organization offices and meetings and analysis of available documentation. Numerous informal conversations with

operators, drivers, and passengers and experiences and observations though regular travel by informal transport were also invaluable.

Fieldwork in **Nairobi** was done July-August 2019 and February-May 2021. Managers from 7 SACCOs of different size, longevity, and organization were interviewed, as well as professional planners, NGOs, transport firms and start-ups, government agencies, the financial sector, and bus drivers and conductors. In **Lilongwe**, interviews with drivers were carried out by three research assistants, in Chichewa. Interview protocols were first tested, then revised to capture nuances of translation and local context. Government and stakeholder interviews were carried out primarily by the author, in English, with support from research assistants. In **Kampala**, in March-June 2022, research was carried out in English, by the author. The focus was on the management of the urban transportation industry, with a particular effort to interview those involved in recently created (3 years) stages.

Table 2: Summary of interviews conducted in the study

	<i>Nairobi</i>	<i>Kampala</i>	<i>Lilongwe</i>
<i>Drivers and Conductors</i>	6	8	27
<i>Minibus Owners</i>	0	0	8
<i>SACCO or Stage Managers</i>	9	9	0
<i>City- or Sector-Wide Management</i>	5	8	3
<i>Government or Municipal Actors</i>	3	2	6
<i>NGO, Union, or other stakeholders</i>	3	8	3

While a fraction of those interviewed in Kampala and Nairobi own minibuses, they were interviewed in their role as management or union leadership. Lilongwe was the only city where the owner’s association permitted contacting minibus owners directly, but out of 60 called, only 4 agreed to be interviewed, as well as 4 women-owners, who have an existing group. These interviews are considered supplemental, in corroboration with the wider and more random sample of drivers and expert interviews. In Nairobi, there was also degree of respondent fatigue, as prominent figures in the industry reported they were often asked for research interviews (this did not arise in Kampala or Lilongwe.)

Interviews were semi-structured, focusing on network geography and routing, but also following a ‘grand-tour’ (Leech, 2002) where Interviewees were asked to walk the interviewer through their work. Points included entry and history into the transport sector, the structure, operations and history of organizations, and specific practices and projects. Interviews were transcribed and coded using MaxQDA software with an inductive, flexible-coding approach (Deterding and Waters, 2021). Narrative analysis (Wiles et al., 2005) was used in tandem, with points of discussion positioned in the wider context of the interview, including topics of particular interests, emotional resonances such frustration or pride, and attention to elision or disinterest in topics.

Findings

Lilongwe

In interviews with regulators at the national and municipal level, they reported that there is no requirement for any route- or terminal-based affiliation from operators in Malawi. The Road Safety and Traffic Services Directorate grants licenses for operation of public service vehicles, and these are valid throughout a given district, for example, the entire district of Lilongwe. There is no setting or approval process of routes or terminal locations by authorities.

Within the industry, there is very limited localized organization or leadership on the part of minibus owners or drivers in Lilongwe. The Minibus Owners Association of Malawi (MOAM) may be the most prominent, and by their own estimate, approximately 60% of minibus owners nationally are members - it is difficult to assess how accurate this assumption is, as neither the government nor MOAM's records are up to date or organized. The MOAM's main role is in representing and advocating for the industry, but they have made proactive planning efforts, lastly in 2004-5, when MOAM proposed a route-network plan, which had no response from regulators.

A driver's association was formed in 2020. It operates country-wide and across all professional drivers, with 7,000 registered (but mostly non-paying) members in Lilongwe. The association's active role is in mediating labor disputes between drivers and vehicle owners, particularly wrongful terminations. Drivers often move between jobs - trucker to bus driver to chauffeur - and the target based daily lease is common for trucks and other industrial vehicles as well as in public transport, including the same issues of work relations, target payments, and unfair dismissals.

"They [drivers] don't register routes and they don't have specific working places - they can be a minibus driver today and tomorrow change to driving something else, like a taxi or a lorry."

Malawi Drivers Association Administration Member

The driver-owner relationship is unusually complex in Malawi, and appears to be unique, at least in the available literature. Drivers are almost universally paid a monthly salary by vehicle owners, even as they pay a daily target - this is widely regarded as a norm by all stakeholders interviewed. Based on reports by owners, drivers and organizations on payment structures and wages, the lump-sum monthly payment can constitute about 30-50% of drivers' earnings over the course of the month, with the rest coming from daily ticket revenue after expenses, as is more typical. It was also reported by several drivers and by the Driver's Association that vehicle owners may pay for drivers to get a driving license, which is also rarely reported in other cities. The monthly salary appears to function as a savings mechanism, allowing drivers to make important large payments such as rent or school fees, whereas the same amount of money, if held daily, would be spent on daily expenses and emergencies.

In terms of the geography of operations, drivers and regulators interviewed all agreed that drivers are free to operate throughout the city, regardless of location. Drivers can follow multiple routes throughout the day or week, joining queues at different terminals as they see fit. They can also change the route they are taking when underway, turn around before completing it - either dropping the passengers on the road or facilitating a transfer to another vehicle - and choose their own hours of operations. Owners are entirely un-involved in these location choices by drivers, and in fact drivers consider their freedom to choose routes and hours a key aspect of the job.

Motivations for choosing a route are the expected density of passengers, but also the quality of the road, the level of traffic, and the presence of traffic police along a route. Where vehicles operate on unpaved or very poor quality roads, they are usually very old or damaged. Drivers explained that they worked on these routes because the vehicles could not pass safety inspections for insurance coverage and operating licenses, and these locations have little police presence. Further damage is likely to come to the vehicle due to operation on an unpaved road, meaning these may be the final destination of vehicles at the end of their lives.

Drivers, when discussing searching out new service locations, consider this primarily in terms of for-hire services, and are happy to make trips to new locations when the entire minibus is hired out. But many drivers were highly resistant - even offended - at the notion of changing their chosen route in response to passenger requests or operating flexibly in the moment. As one driver put it:

“They ask, but they cannot tell me what to do. As long as they are on my minibus and know that the minibus goes where they stay, then they have no reason to tell me to use a different route. No way”.

Minibus Driver, Lilongwe

The process of developing new service locations, even as the city has grown, moves slowly in Lilongwe. The only reason for expansion to new service locations discussed by drivees was in following the expansion of the paved road network, even as drivers are aware of under-served residential areas:

Driver: The routes have not changed. These were the same routes that were there when I first started in this sector [in 2001]. The only change now is that bus fares are higher [...] the issue of a good road also counts here. I would also look at the demand for minibuses in the [new] area. Most times, it is very low and not worth the service.

Driver-Owner, Lilongwe, Interview

The interview excerpt above, with an experienced driver who owns both his own minibus and a second vehicle, which he leases out, shows some of this tension. Drivers recognize there are gaps and limits to their services, but also make conservative choices in daily operations, and

see high barriers to expansion. Almost all existing routes in Lilongwe connect the downtown area to outlying neighbourhoods in a highly radial pattern.

Most of us drivers are used to certain routes. We make money on these routes and there is no need to search out new routes. Why should we?

Driver, Lilongwe, interview

As well as the lack of deliberate spatial growth, interviews and observations showed the sector is relatively undercapitalized - vehicles are primarily 12-seater minibuses, and there appears to be growing importation of smaller vehicles, 8-seat “Hi-Jets” and even regular sedan cars being put into service along minibus routes (the latter are illegal, but often go unenforced). Minibuses are largely managed by the queue at a given terminal, but smaller vehicles are often perceived as encroaching. These are seen as forming the main source of competition for the sector, rather than competition between minibuses or between associations.

Kampala

Compared to Lilongwe, transport operations in Kampala are highly managed and organized, and new routes and stages are created carefully but relatively frequently through a variety of processes. Once established, stages are required to be approved by the Kampala Central City Authority (KCCA), but KCCA does not play an active role in choosing these new locations, according to interviews with stage leadership and city authorities. Operators report that they are sensitive to passenger requests and demand. This can come as an accumulation of requests from individual passengers to drivers,, until the stage leadership decides an attempt to create a route extension is warranted, or more formally, through a request by community leadership.

For example, the letter below was issued in 2015 by the local chairman of a level-1 Local Council (Uganda’s smallest administrative unit), with a newly-opened health center. It was delivered to an existing stage serving a nearby location, showing the need and the rationale of the community and drawing on both a high level of passenger demand, as well as making an argument about accessibility and equity across the city:

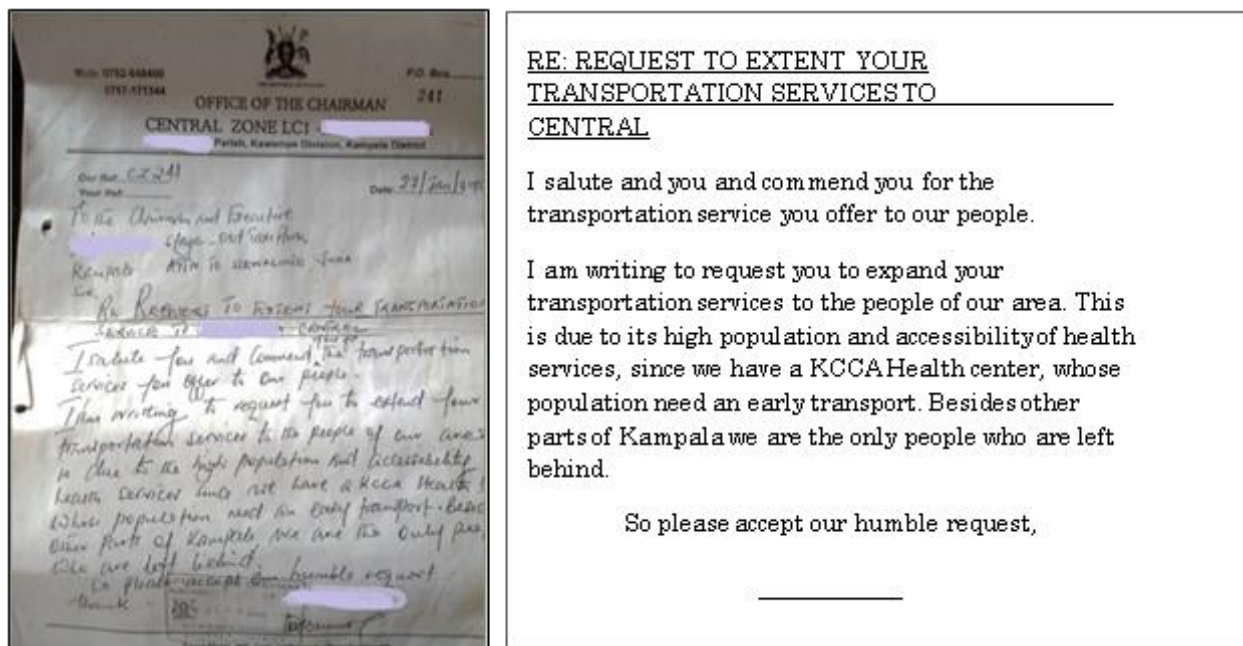


Figure 3: Letter sent from local authority to stage association chairman, requesting a route extension

As well as communicating to the stage the request for a route extension, this letter was used - and retained up to the present - by the stage management in requesting the official recognition of the route. KCCA at first refused, arguing the area was already well-served. This was appealed both by the stage and by a further letter directly from the neighborhood chairman, and the route was finally approved after two months. In this instance, it was immediately successful, starting operation with 24 vehicles on the first day and passengers informed of the new route through signs and callers.

Route formation and extension can also be carried out more speculatively, often with higher costs and a slower start. Interviews with drivers and stage managers with recent experience working on new stages found that they usually required up-front investment. These costs include lease of land and office space at the end of the route, advertising, which can take the form of loudspeaker announcements, signs, leaflets, and hiring staff to talk to passengers at adjacent terminals and even local radio advertising.

However, the most important, and complex, cost of a new route is the subsidy for drivers. Supplemental payments (usually referred to as “top-ups”) are paid to the vehicles on the new routes, who may have to go with buses with only a few passengers, as it takes time for travelers to learn of the new service and change their travel patterns. A long waiting time in a bus means

passengers will lose patience and switch to a different route or faster mode. On a new route without an existing passenger base, management and drivers can set an initial number of passengers to depart with, which may be as low as 25% of the vehicle capacity, and gradually raise this number over the course of weeks or months as it gains passengers.

Several strategies exist for gathering and managing these start up costs. One route was extended to new locations through a joint decision making process, holding a meeting of the stage drivers to discuss the expansion. Drivers operating on the new route in this case were not paid, but on arriving at the new destination, received a chit which allowed them to skip the line on arrival back in the home-terminal. This meant essentially an extra trip per day, compensating their loss-making trip out to the new terminal. In essence, other drivers each sacrificing a fraction of a trip in order to support the establishment of the new location.

Other terminals are formed through personal initiative, with an investor or small group - usually well experienced in the industry - leasing land and paying drivers to operate underfilled vehicles. In other cases, driver-owners, who do not need to pay targets and have higher profit margins, were recruited as early movers on new route, operating at a loss for several months in expectation of higher incomes down the line - described by one as “a hungry time”. Operators estimate anywhere from two to six months until routes are established and operate at a profit, and that it can take a over year to fully recoup the start up costs.

In terms of location, most new stages are formed through the extension and branching of existing routes, which follow the growth of the city outward. As new stages and routes are started, there is a sense of “ownership” by the drivers or operators who are the early movers, usually an adjacent stage:

“It is in our culture - if a new stage, a new branch, is to start, this must be done by the mother-stage of that area.”

National Association Management Member, Kampala

Attempts have been made by KCCA to rearrange the locations of city-center terminals (though research found no efforts to start new ones) and stages’ areas of operations which has been resisted as heavy-handed and leading to violence as different stages are handed overlapping locations. Rather, the territories and passengers belonging to each stage are highly internally managed and allocated within the industry. With new destinations, the “mother stage” may maintain them as part of its operations, with its drivers and conductors remaining members of the original stage, and drivers and leadership moving vehicles between the existing and new routes. Eventually, stages may break off to become independent, or the formation of new stages may be pursued by a pool of drivers from adjacent stages. Few stages therefore operate an extensive route network, and most appear to manage 1-3 routes at most.

Interviewees estimate that driver-owners are relatively common in Kampala, some 30% of drivers owning their own vehicles. Most of the leadership are also former drivers, often currently combining leadership roles with ownership of one several vehicles. However,

“external” vehicle owners, including those who many own a large number of vehicles, are elusive and uninvolved. While Stage Associations and sector-wide unions hold a variety of roles and extensively manage collective funds, they do not collectively own vehicles, access credit or have diversified income sources. There is an ongoing discourse between regulators and operators around the introduction of large-bus services, but existing paratransit associations themselves resist a move to larger vehicles. Leadership in the sector are cautious, seeing this as an over-fast disruption of operation and existing equilibriums of earnings, wait times and passenger volumes between vehicles and stages, according to interviews.

Nairobi

As in Kampala, Nairobi’s transport industry is well-organized at the route/terminal level, with decades of regulation and firm growth leading to an estimated 272 SACCOs and TMCs of different sized and types of operations (Plano, 2022). The regulator, the National Transport Safety Authority (NTSA) is tasked with approving new routes, which are developed and proposed by SACCOs and submitted for approval. As well as route planning, SACCOs hold important financial roles, offering loans to their members, managing welfare funds, and taking substantial bank loans themselves. In some cases, they directly purchase vehicles, which they operate, as well as real estate or other investments, which pay dividends to their members. Management of operation by SACCOs may include tracking departures and collecting fees, rotating vehicles between routes, disciplining crews over infractions and responding to passenger complaints. In many cases, SACCOs manage or directly provide vehicle upkeep, repair and cleaning, set fares and develop new routes.

Unlike in Kampala, the structure of SACCOs and TMCs is overwhelmingly of vehicle owners rather than of workers. It is vehicle owners who are members of SACCOs, or who lease their vehicles to TMCs, and who constitute the elective body or other decision making process within the SACCOs, who reap dividends from SACCOs investment, and to whom the managers of SACCOs are accountable. At the same time, SACCOs relationship to their drivers is increasingly fraught. Drivers are not members of the SACCO and have no formal power to affect the SACCOs operations.

This system is supported by the government licensing structures in place. As of 2021, drivers are tied to a single SACCO and must annually, pay for a PSV (Public Service Vehicle) driver’s license with the NTSA, on top of which they must obtain a certificate of good conduct from the police, for and then further pay to register with a given SACCO. In total, this amounts to up to 2,000 shillings, or 20 USD, a non-trivial sum. Their operating license is then issued by the SACCO itself, and is exclusive to that SACCO. A driver cannot move to a different SACCO without repeating the entire process, voiding their previous license in the process (interviews).

The vehicle owners may be or have been drivers, but most are investors who may not have any on-the-ground experience of the transport sector. In some cases, vehicles may even be owned fractionally, or by institutions such as school or churches. SACCO leadership and management are more likely to be former drivers or small scale owners, but many may never have been, or

are long removed, from front-line workers. A number of operators, primarily those who are registered as TMCs, have moved to a salaried model where conductors and drivers, are direct formal employees. However, the majority of operators either retain a fully informal system, where workers are managed directly by vehicle owners, or are increasingly a hybrid. In this system, the ultimate employment (non-)relationship may be between the vehicle owner and the driver or conductor, but the SACCO plays a managerial role, de-facto responsible for workers' daily conditions, hours, trips and routes assigned.

SACCO managers describe their roles as key in searching out new locations of services. They respond to pressure from the investors (vehicle owners) of the SACCO to increase revenue, and they must juggle between the SACCOs interest to grow its fleet and collect fees from more vehicles, and each individual vehicle's own revenues. As the number of vehicles on a route grows, it may become saturated and vehicles spend most of their day waiting for their turn. SACCOs are therefore interested in expanding, but also in expanding their market share vis a vis other SACCOs.

It is kind of spontaneous...no one sits down with officials to say tomorrow we shall open this route. No, people test, they test, they test. If it is making money, they stay. If it's not making money, they move to another one.

SACCO Manager, Interview

Route formation is done through an ongoing process of testing and estimating potential destinations and routes. It follows requests from passengers, communities, and housing estates, as well as road improvement and paving, and the intuition of managers and drivers. SACCOs test the waters by sending a small number of vehicles to try a route for several weeks. They will pay the drivers for their losses in operating empty by subsidizing their incomes or directly paying the owners. Some operators also report more structured research processes, sending survey teams to measure traffic volume and the number of competing vehicles on new roads or existing corridors.

Even smaller SACCOs and firms keep records and manage multi-layered data collection, even if informal, to assess the performance of routes and locations. Drivers report to terminal supervisors, who collect information on passenger numbers, revenues and fuel costs, and supply this back to SACCO headquarters, as well as qualitative information and gut feeling on passenger demand and experience. Management then takes the role of exploring and testing new locations, eventually seeing some routes solidify, while others wither away.

The process of expanding throughout the city is competitive, and can be violent as workers compete for passengers or are seen as muscling into existing operators' territories. On many major and even minor corridors, multiple SACCOs may operate, closely duplicating routes and services. They may form consortia, which are or approved by the regulator to claim ownership of particular routes or corridors. Alternatively, SACCOs can compete directly with one another in the same corridor, distinguishing their vehicles with a common livery and color scheme. They

position themselves and fight for market share on their prices, including the *reliability* of given price being charged (rather than raised at-will by the driver), the quality of vehicles, and their conduct and driving. Even music, atmosphere and the passenger experience may be a form of differentiation:

“Unlike some SACCOS, we play the radio, not loud “thunk thunk” music. Old men, old women, young people - they can all ride the bus. Our SACCOS also does not overfill our vehicles. People may prefer to wait for a vehicle they know will not be filled with standing-room-only passengers, even if it is 10 shillings more expensive. Passengers also know they can recover lost items.”

Notes from interview with SACCO Management, Nairobi

Interviewees across SACCOS generally agreed Nairobi’s radial route structure is inefficient. Most routes terminate at the CBD, which is highly congested, making travel times and unnecessarily long as vehicles struggle to get in and out, while also requiring transfers for many cross-city trips. However, the sector economics continue to encourage a focus on relatively short, fast, back-and-forth peak hour trips, while struggling to develop longer cross-city routes which may be more unpredictable in terms of traffic, encounter more police, and may give fewer runs, even if at a higher price.

Analysis and Discussion

The three cities in this study show markedly different behaviors in the organization of the public transport sector, and can explain the difference in route-forming mechanisms and the spatial operations of informal transport.

These case studies are summarized in Figure 3. Kampala’s strong route-based associations are amalgamated at the city and national level, and carefully manage internal conflict between them. Nairobi’s SACCOs are more independent, and less conflict-averse, while Lilongwe has little in the way of route-based organizations. While vehicle owners may be willing to tolerate conflict, it is not they who directly experience it, and the greater decision-making power of drivers in Kampala may explain the emphasis on fair conduct between drivers and between Stage Associations. Nairobi SACCOs, on the other hand, frequently see operating in parallel and competing for other SACCOs passengers as a legitimate form of growth.

Lilongwe	Kampala	Nairobi
National-level associations of passengers, workers, owners	Worker-based associations route level to national union.	Owner-based SACCOs organized at the route(s) level.
Limited, more radial network	Extensive, more radial network	Extensive, less radial network
No investment in new routes	Start-up costs from drivers and management at stages	Start-up costs from owners, via SACCO
Conflict primarily between drivers and rent-seeking factions from outside transport industry	Conflict between drivers and stages managed and settled by regional associations	Competition/conflict between SACCOs tacitly accepted as norm
Little expansion	Focus on expansion to new locations	Focus on competition for existing corridors

Table 3 : Comparison of organizational structure and operations between cities

As a planning practice, this means that Kampala’s route network may show a stronger radial tendency, and the city’s Transport Master Plan estimates 1.19 transfers per AM peak trips, meaning that a *majority* of trips require a transfer (KCCA et al., 2018). Each Stage extends its routes outwards from the hub of the downtown Taxi Parks, creating something of a pizza-slices pattern, with outlying areas understood to belong to their ‘mother stage’. Cross-city routes are more difficult to initiate, as they work against this pattern, requiring multiple stages to be involved and in dialogue. Passengers may also have more difficulty conceptualizing and demanding non-radial services, compared to requests for extensions on existing routes.

Nairobi’s less internally-restricted systems for expansion may potentially be better at creating cross-city routes, but also over-service central corridors. In Lilongwe, meanwhile, expansion is limited and moves extremely slowly, with no route-level organizations to pay attention to passenger needs, pool financial resources and test and subsidize new services. Minibus services are limited to a few main roads, vehicle quality is extremely poor, prices are high, and journeys

long and difficult (Author/World Bank, forthcoming), with no indication of growth and improvement in the sector.

In Lilongwe especially, the industry is highly risky and the finances of vehicle operations are bundled into general household livelihoods, rather than being maintained as a separate business. Owners may be cycling in and out of vehicle ownership and operations, unable to meet repair costs after an accident or even routine maintenance, leaving minibuses frequently and unpredictably parked and making carrying the responsibility of waged employees prohibitive, despite the unusual hybrid wage-target model already in place. This highlights the thinness and riskiness of highly individuated operations, while in Nairobi, for a counter-example, such risks are bundled by SACCOs and TMCs, some of which operate in-house repair shops and collect fees from vehicles owners in return for vehicle maintenance and upkeep.

Figure 4 offers a broader conceptual model on the relationship between forms of organization, labour structure and spatial change and expansion practices in Informal transport. This can be summarized through three axes -

- Are associations organized at the route level, or primarily city- or national-wide? Without local initiative, they do not invest - in management capacity and money - in the initiation of a new service.
- Are drivers or owners are the more immediate stakeholders in associations? Drivers have fewer resources but are closer to the ground. They may be more focused on avoiding violence and maintaining a fair spread of income opportunities.
- Finally, are how are associations organized at the city or regional level? Are they competitors, constituents of a single organization, or something in between? This may produce mechanisms that discourage competition over the same corridors, and therefore push expansion to new locations.

Conclusions

This paper aims neither to praise nor castigate informal transportation systems, but to understand their operations and patterns of service. The differences and limitations of informal transports' ability to meet varied passengers' needs, and their impacts on urban development more broadly, has substantial policy implications. Gaps in service, I argue, are intrinsic to the in the structure of the sector and lead to specific and complex consequences city-by-city, each requiring equally specific engagement with the local particularities of the industry.

The cities in this study give some examples of policy implications. Kampala is notorious for the high prevalence of motorcycle taxis (boda-bodas), and while there are important reasons for the sectors emergence (Goodfellow, 2015; Tapscott, 2021) the limited structure of the minibus network may also play a role. This pattern may be soon followed in Lilongwe as motorcycles are starting to proliferate - but in Nairobi, with more robust connectivity provided by matatus, this more expensive, more polluting, and more dangerous mode may have fewer advantages. The unusual combination of an informal salary payment with a daily target in Malawi guarantees a daily return for the owner while nevertheless limiting responsibility towards the driver's

income and working conditions. Setting up a full move to a salaries model appears unlikely, but it isn't simply a matter of preference, but of the limited capacity of individual owners to provide formal contract.

While being cautious in extrapolating from these three cases to explain a global phenomenon, following Flyvbjerg's points of the systematic uses of the critical case study (Flyvbjerg, 2006), some points can be made. Informal transport economics are just starting to be substantively researched and require more analysis, data and conceptual innovation in how to assess growth, efficiency, and welfare in the sector. Different actors have different assessments of the most profitable types of driving and behaviour. Long waits in established queues for a full vehicle or 'pirate' queue cutting and circulation? Short, radial trips or long cross routes at higher prices? And how is traffic, vehicle depreciation, maintenance and fuel costs to be factored in? Public transport is generally gauged to be almost impossible to operate profitably on fares alone, and informal systems appear to belie this.

Yet, studies of drivers work patterns and incomes in particular suggest this may be naive, and that they are all but subsidizing operations, supplementing long work hours driving with other work (Spooner, 2018; Spooner et al., 2020) and constant on-call presence when not directly employed. Owners are difficult to reach, including for this study, but interviews suggest that this too, despite being the more profitable aspect of the sector, is highly precarious. Particularly in cities where ownership remains entirely individual, minibus import and ownership are risky in the long run, with vehicles requiring increasingly high maintenance costs and facing ever higher odds of accident or mechanical failure before the investment has been returned, possibly leaving many vehicle owners *also* losing money, subsidizing operations through debt.

Informal transport systems, far from being expressions of resilient adaptation providing for a romanticized vision of effective mobility for the urban Global South, are in fact fragile and marginal vehicle-by-vehicle, surviving only by exploiting the labor of drivers, indebting owners and extracting high payments from captive passengers. Particularly in poorer, less regulated cities like Lilongwe, with atomized competition in-the-market, they are rife with social failures, including in their limited provision of basic accessibility due to limited spatial coverage. However, as the different forms of organization in the sector show, genuine bottom-up response in creating more resilient and effective mobility system is produced through organization, professionalization, access to resources and credit, and taking collective responsibility for working environments in a variety of constellations.

The questions raised in this study as to the geography of operations, however, point to continued and perhaps inevitable limits for fully private sector public transport operations. Even at the most economically sophisticated end of industry, operators may have only partial ability to serve the most complex mobility needs of the most vulnerable populations and locations. Varied forms of regulation into associations and financial support, including incentives, protection on entry, subsidy of operations or of passengers, need to be brought to

bear if public transport is to meet social and equity functions - with an understanding of the underlying processes that produce it, city by city.

Chapter 3: Accessibility and Experience in Informal Transport in a Secondary City

Introduction

The experiences and feelings of public transport users in the Global South remain under-explored. Only a handful of studies directly consider the embodied, personal perspective of passengers in urban Sub-Saharan African, and fewer still those for whom public transport is unaffordable or simply unavailable. This study searches out both users and non-users of different transport modes in Lilongwe, Malawi, to understand the variety of transport needs and decisions, the uses and burdens of the transport system, and the meaning for considering choice and agency, informal transport and mobility justice in the context of a mid-sized African city.

Lilongwe is characterized by immobility, high travel burden, and limited access to entirely informal transport modes. These are often characterized as a mobility niche for the marginalized urban poor, but this study shows that many residents are excluded, and most pay a high cost - in money, time, health and mental burdens, highlighting the limitations of reliance on the market to provide a public service. Metrics for assessing mobility, including equity and justice, often focus on what trips can be made, and on whether and how much people travel. These findings require recognizing that mobility can support wellbeing and empowerment, but also highlights the reality that travel undertaken can also be burdensome and dangerous, with high costs that are unevenly distributed.

Assessing accessibility is often focused on work travel, and to a lesser extent services such as education and health. Using an explicitly feminist, mobility of care framework (de Madariaga and Arroyo, 2019), we also take into account activities of household and community reproduction, positioning the travel of individuals within the framework. As well as travel to formal and informal work locations, this paper considers issues such as shopping and consumption, and access to personal, social and community activities and leisure. As well as mode choice and experiences of travel, this study integrates considerations of *latent* demand, identifying skipped and missed trips, un-fulfilled needs and un-reachable destinations.

We find that walking is the most important form of travel, while a variety of informal transport modes are both crucial and entirely insufficient. For poorer residents, they are largely out of reach due to high cost. Even for regular users of motorized transport, experience of travel for all but wealthy car-owners is overwhelmingly characterized by high cost, physical pain and exhaustion, and emotional and mental frustration due to unreliability, danger, and undignified treatment. Key destinations and trips are frequently out of reach. Lilongwe residents prioritize income generation, employment, and children's schooling in their travel, making series of poor tradeoffs. Travel for social and family visits, personal health and wellbeing is often skipped altogether.

The issue of choice and agency is especially fraught. The sense of being a captive traveler, who is forced to ignore and subjugate her own needs in terms of safety, exposure and embodied experience is a powerful through-line in these findings. Coping mechanisms for the limited mobility options are few and far between, and often felt as further pinpricks of frustration. The agency and adaptability of the urban poor is frequently stressed positively in development contexts, but paying attention to voices and experiences finds little of this sentiment here. Being forced to expend time, money and energy on complex navigations of a large city is felt only as a deprivation and a distraction, taking residents away from the things that matter to them - cutting into their work and businesses, reducing their time and opportunities to be with family and community and eroding their health and mental wellbeing.

The subjectivity of individuals in transport research is often ignored, or limited to a technocratic measurement of rationally-traded mode choice, without considering the lived context and complex narratives of decisions and experiences around travel (Schwanen, 2020). But a body of research stresses that daily, ordinary mobility carries its own micropolitics and should be understood not only at the infrastructure and levels of accessibility provided, but in the experiences of travel themselves, (Bissell, 2018a). Writing on informal transport in particular stresses that it is innately produced for and by marginalized groups (Best, 2016b; Heinze, 2018; Mateo-Babiano, 2016), but this has often come in exploring the supply side of transport, focusing on the informal transport workforce and its frequent vilification and dismissal by elites and regulators. Less attention has been paid to whether the users of these modes find them well attuned to their needs or reflective of their identities.

Cities such as Lilongwe are both qualitatively and quantitatively different from the largest metropolises which have typically received greater attention on transport research - megacities and economic hubs such as Nairobi, Cape Town or Lagos (Pojani and Stead, 2015). The African urban and mobility landscape is highly heterogenous, and different cities, countries, urban histories and transportation policies, and this heterogeneity remains unexplored. Lilongwe may be more representative of mid-sized African cities throughout the continent, which are the fastest growing sites of urbanization. They are often low-density, sprawling, and have seen comparatively little planning, investment, or regulation or replacement attempts of their informal transport systems, which are often not just the dominant, but the only public transport mode available. Likewise, the areas and residents studied in Lilongwe run a range of socio-economic and income levels. The barriers discussed in this paper are common across the urban population and not produced by marginalization and disinvestment of a particular neighbourhood, categorization as 'informal' or slum area, but are a widespread feature of the urban experience.

These findings are important from several policy perspectives. Poverty reduction, economic growth and improvement in livelihoods and wellbeing require effective urban transport. The success of urban growth and agglomeration, with the depth of markets for employment, the viability of businesses and their customer base, and the proliferation of specialized services reliant on urban residents' ability to access them, rather than merely the size of the city

population or the existence of *some* transport. Transport is also a fast-growing source of carbon emissions. While the motorization rate in Sub-Saharan Africa is still modest by global standards, it is growing quickly. This is driven by strong practical considerations as well as issues of comfort, status and dignity, and this paper considers the dynamics around car ownership, in practice and in aspiration, in context of the lived experience of daily mobility.

Background

A variety of approaches have been taken to analysing transport exclusion, but most stress its multiple and interconnected nature, between the limited supply of (useful) transportation, and the individual and social characteristics of the traveler that form barriers to using what transport is available (Delbosc and Currie, 2011; Lucas, 2011; Preston and Rajé, 2007; Schwanen et al., 2015). In particular, these can be mutually reinforcing - vulnerable groups and travelers may have travel needs that aren't well served by the safest, fastest, cheapest and most comfortable modes. These same travelers may further be some of the most constrained by lack of money, technology, language or physical ability to navigate complex transport systems, and time, with inflexible and/or unpredictable caring and work responsibilities, and be especially vulnerable to harassment and safety concerns (Oviedo Hernandez and Titheridge, 2016).

Travel can serve as opportunity for reflection, relaxation, exercise and “me-time”, in ways that passengers find useful, pleasant and even empowering, particularly with as smartphones, music and other mobile technologies can be used (Cornet et al., 2021; Julsrud and Denstadli, 2017), but also sites finds anger and frustration (Bissell, 2018b). Others find that travel has relatively little effect on mood, at least in the US context, though cyclists are more likely to feel pleasant emotions while commuting (Morris and Guerra, 2015). Some studies stress the positional and interpersonal experiences of travel, finding that nuances of signage and language, small gestures, looks, and just being in the same place with others in the particularly random-yet-purposeful manner of public transport can have a powerful impact on people's sense of their vulnerability and exclusion, or capability, belonging and wellbeing (Martin, 2021; Nolte and Yacobi, 2015; Purifoye, 2020).

In urban, Sub-Saharan Africa, travel is dominated by walking, followed by ‘informal’ public transport modes, generally mini- or midibus shared taxis. In some cities, motorcycle and rickshaw taxis which provide point-to-point services hold a significant mode share, but they are more minimal in others (Behrens et al., 2015). Walking, despite its centrality, is poorly provided for (Mitullah and Opiyo, 2017; Odhiambo, 2019; Oviedo et al., 2021) and has received relatively little attention in research and less in policy.

The way informal transport and walking options and decisions are entangled and related, particularly the equity implications, has received especially little attention (Randall et al., 2023). In Nairobi, 65% of low-income residents trips are on foot (Salon and Gulyani, 2019), while those that travel by minibus/matatu spend on average 20% of their income on transportation (Nyamai, 2022). In Maputo, *despite* the availability of multiple informal transport modes, low-income and working class residents in a study all walked at least one hour for their work commute into the

central city, and expected harassment and attack along the route, as well as feeling that it was an expression of poverty and deprivation (Massingue and Oviedo-Hernandez, 2021). Despite the potential health benefits, research finds that walking in African cities is dangerous, uncomfortable, and an option of last - but often only - resort.

Informal transport, meanwhile, is increasingly being mapped (Klopp and Cavoli, 2019), and analyses of access to jobs and services provided finds patchy and unequal distribution in many cities, with the poorest and most marginalized locations often receiving poorer service (Campbell et al., 2019; Nakamura and Avner, 2021; Peralta-Quiros et al., 2019; World Bank, 2021). Safety concerns, frictions with drivers and high and changeable costs further impact captive passengers (Borker, 2019; Ibitayo, 2012; Kirabo et al., 2020; Otunola et al., 2019; Vanderschuren and Zuidgeest, 2017). On the other hand, informal transport has important cultural and social implications in some cities, such as Nairobi's subset of highly decorated, music-playing matatus where "the journey is point" (FERENCE, 2019).

However, the ability and preference to use available transport modes, and the effects and experiences of using them, go beyond proximity and travel time (Lucas, 2011). The experiences of transport are perceived very differently according to individual characteristics. A walking commute may be regarded as healthy and climate-friendly in a wealthy city, but is dangerous and burdensome in a low-income city. Urban form that allows most trips to be made on foot - such as ideas of the "15 minute city" - may be felt as empowering for men, but exposes women to harassment and risk, limiting rather than expanding their accessibility (Nyamai, 2022). For example, women in Delhi choose their university based on whether they can reach it safely, passing up higher-ranked colleges which cannot be reached without stretches of walking from safer public transport modes, while men make no such adjustments (Borker, 2019). Women's mobility is also particularly entangled with their time-use and household responsibility. Available studies suggest that longer travel times will affect women's employment more steeply than of men, for example - men can shoulder multi-hour commuted, while women, who need to juggle care work in the home, cannot (Venter et al., 2007). The mobility of people with disabilities is particularly limited in for-profit transit systems where the relatively more time consuming and complicated matter of dealing with a passenger with limited mobility means that in Malawi, for example, they may simply be left behind (Munthali et al., 2019).

Case Study: Lilongwe

Lilongwe is the capital city of Malawi, with a population of 1.1 million (United Nations Population Division, 2022) . Malawi is, at present, the 3rd poorest country in the world, with an annual GDP per capita of less than 400 USD and over 70% of the population living on less than 2 dollars a day. It is an overwhelmingly rural country, with only 16% of the population living in cities in 2018, having grown just one percent since the previous census in 2008 (Malawi National Statistics Office, 2018). At the same time, given the overall fast population growth of the county - the median age is 17 - Lilongwe is growing quickly and has more than *doubled* in population since 2000.

Compared to its population, Lilongwe is vast. Master-planned as an ersatz capital city from a small administrative center, it became the national capital in 1975 (Munthali, 2017). The original plan was developed by South African consultants and leaned heavily on apartheid-era planning practices as well as low-density modernism (Myers, 2003). The original plan declared that “almost every family will have a car” (Potts, 1986), and the city was built accordingly. Large open areas and police, military and government institutions separated spread-out neighbourhoods. The road grids are convoluted and ‘containerized’, with limited entry to each residential area and, cul-de-sacs, poor connectivity, and with no pedestrian networks or infrastructure, including sidewalks or footpaths.

Land uses were planned to be strictly segregated, with distinct commercial and employment centers spread in major nodes throughout the city. Residential areas were further highly separated by class and ethnicity. Distinct zones were drawn up of high, medium and low-density, formal and informal housing typologies which closely corresponded to social class. Low- and middle-income housing was planned to be publically developed, but lack of resources, technical planning capacity, and social and economic contestation of land markets has means that large areas remain unbuilt. Spatial growth, meanwhile, is primarily at the periphery with the construction of low-density new housing with limited infrastructure, no longer following the master plan but neither upending its central logic (Munthali, 2017; Mwachunga and Donaldson, 2018).

All available public transport modes in the city (World Bank, forthcoming) are privately provided and can be categorized as informal transport or paratransit. These include Minibus taxis, which operate on fixed (though not formally defined) routes and receive public service vehicle licenses. Most commonly, these are 12-seat minibuses, but a growing number of smaller “HiJet” vehicles seating 7-9 passengers also exist, as well as small fleet of 20-30 seat midibuses (no counts of vehicles by type are available, according to the Road Safety Authority, which issues licenses.) Lorries, known as Matolas, which typically carry cargo, may also pick up passengers, either spontaneously or as a pre-arranged service. Pirate taxis are private cars which pick up passengers, usually poaching from minibus routes rather than door-to-door.



Figure 4: On right, minibus Taxis at the Area 1 (downtown) taxi terminal. On left, bicycle taxis – Kabazas - in Area 25.

Known as “Black Plates” due to the black license plates of government vehicles, these are often owned by government officials who lease them out to drivers during the day. While considered illegal, according to interviews with regulators, there is little capacity to enforce this.

Legal private hire, door-to-door taxis are operated by sedan cars and rickshaws, and can be found at some major commercial locations. Rickshaws are typically cheaper than private cars but otherwise operate similarly. Bicycle Taxis, known as Kabazas, are common in Lilongwe. These are pedal-powered bicycles with a seat installed which can carry one, or rarely two passengers. They operate from ranks, but can also be hailed en-route. Motorcycle Taxis are still less common, but their numbers are growing, and operate similarly to bicycle taxis.

Motorization is extremely limited, with less than 100,000 private cars registered in the entire country (Malawi National Statistics Office, 2018), or 2.7% of households. Motorcycles are owned by 3.8% of households, and bicycles by 38%. Yet, Malawi has an extremely high burden of road accidents and deaths, with over 10% of the national GDP estimated to be lost each year to the consequences of road accidents (World Bank, 2020). An analysis of all trauma patients admitted Kamuzu Central Hospital, the most important medical facility in Lilongwe and northern Malawi, found a 62.4% increase in road injuries between 2007 and 2015, estimating that these could double by 2030. 26% of *all* patients were road accident victims. (Banza et al., 2018).

Children and pedestrians are the group most vulnerable to serious injury, and face the fastest growing incidence of road injury (Sundet et al., 2018). A study conducted over three months in 2019 mapped the exact location of road accidents of admitted patients in Lilongwe, finding pedestrians were especially likely to be injured in the Central Business District, in locations where pedestrians are forced to navigate main roads alongside moving traffic. (Sundet et al., 2021), Alcohol use was also found to be extremely prevalent among road injury victims, with approximately 20% of all drivers either testing positive for, or reporting, recent drinking - including 19% of cyclists, 20% of minibus and lorry drivers, and 23% and 24% of car and motorcycle drivers and 41% of pedestrians involved in accidents (Christophersen et al., 2021).

Methodology

The study was carried out in May-August 2021, employing a mixed-methods approach. 42 in-depth, semi-structured interviews were conducted, both through a random approach at markets and other public locations, and by approaching households directly at random in two neighbourhoods, Area 24 and Area 25³ (see map in Figure 3: Map of minibus routes and survey locations in Lilongwe, Malawi. Minibus routes were comprehensively mapped by the author in 2021 via GPS tracking.). Interviews lasted between 15 and 45 minutes and were conducted in Chichewa, and recorded, transcribed and translated into English. A flexible, inductive coding approach was used to identify themes and connections across topics, as well as a narrative analysis approach which considered the full context and flow of the interview. Interviewees range in age from 20 to 61; 22 women and 20 men. Only nine are in forms of formal employment

³ Neighbourhood in Lilongwe are typically numbered rather than named, as per the master plan. Names such as “Area 24” and “Area 25” are used both formally and popularly for a majority of neighbourhoods.

(5 of them in government), and three are in secondary school or college. The rest search out day labour, operate street and market stalls, stores or other small businesses such as beauty salons and tailors. Six were pensioners or unemployed.

Descriptive findings from a survey of 600 households are also included. This was conducted in Area 24 and Area 25 as a Computer-Assisted Personal Interview (CAPI) survey, using Qualtrics, carried out by enumerators trained on the questionnaire and mobility topics. The survey was a modified household travel survey and included a 1-day travel recall diary, demographic, household and income information and broader questions of travel habits, including mode choice; safety, security and other travel barriers; travel costs and affordability; accessibility of desired locations and latent demand; and travel by children and with children. The survey was carried out in Chichewa, lasted between 30 minutes and 2 hours.

In each household approached, a list of all adult residents, including extended family, lodgers and live-in servants, was made and a random person selected using a random number generator app on the survey tablet. If the person selected was not home, up to three attempts were made to contact them, before a new household was selected. The goal of this approach was to minimize bias in selecting for residents who were not traveling during the day. Nevertheless, women are over-represented in the survey, due to higher refusal rates by men and fewer men being reported present in households due to work outside of the city. The two neighbourhoods were chosen for their different locations within the city and variety of income levels, though more granular, precise income data is not available. Area 25 is a large, growing residential neighbourhood located over 10 km from downtown and stretching into the urban periphery to the north. Area 24 is more centrally located, approximately 5 km from the downtown.

This paper is primarily focused on the personal and experiential aspects of travel and exclusion, and centers narrative and qualitative analysis. The findings of the household survey are used in tandem to give a sense of the prevalence of different aspects of travel across locations and population groups, as well as flesh out background information on issues like mode share and travel times. A more extensive analysis of quantitative and spatial data is available in a forthcoming study (Authors/World Bank). Funding was supplied by the World Bank's SSATP program and logistical and community support by Concern-Worldwide, Malawi. The survey was conducted in the afternoon and early evening hours, following community meetings with ward leaders in each neighbourhood.

The survey participants range in age from 18 to 77, and the median age 32 for women and 30 for men. 65% of women and 55% of men are married. The gap can be explained by the differences in the average age of marriage, and men are on average 5 years older than their (female) spouse. 58% of men, and 86% of women in the survey have children, with a median of 3, which is consistent with the current fertility rate in Malawi, which is 4.1 births per woman. In terms of education, 16% have completed at least some years of college or university education, while 33% have at most a primary school level education, and 33% have completed secondary school (Form 4, in Malawi.) 32% of respondents have a bank account in their name,

for a further 26%, someone else in the household has one while 42% of respondents do not. 91% of respondents have a working cell phone.

Note on currency: prices were recorded in Malawi Kwacha (MwK), and shown in MwK and the dollar rate, at the time, of 800 MwK to 1 USD throughout June-November 2021. In May 2022, Malawi sharply devalued its currency, driving prices up across the economy while lowering the exchange rate from 800 to 1,000 to the dollar (Reuters, 2022).

Locations of Households Surveyed (Approximate)

— Minibus Routes Respondent Gender ● Male ● Female

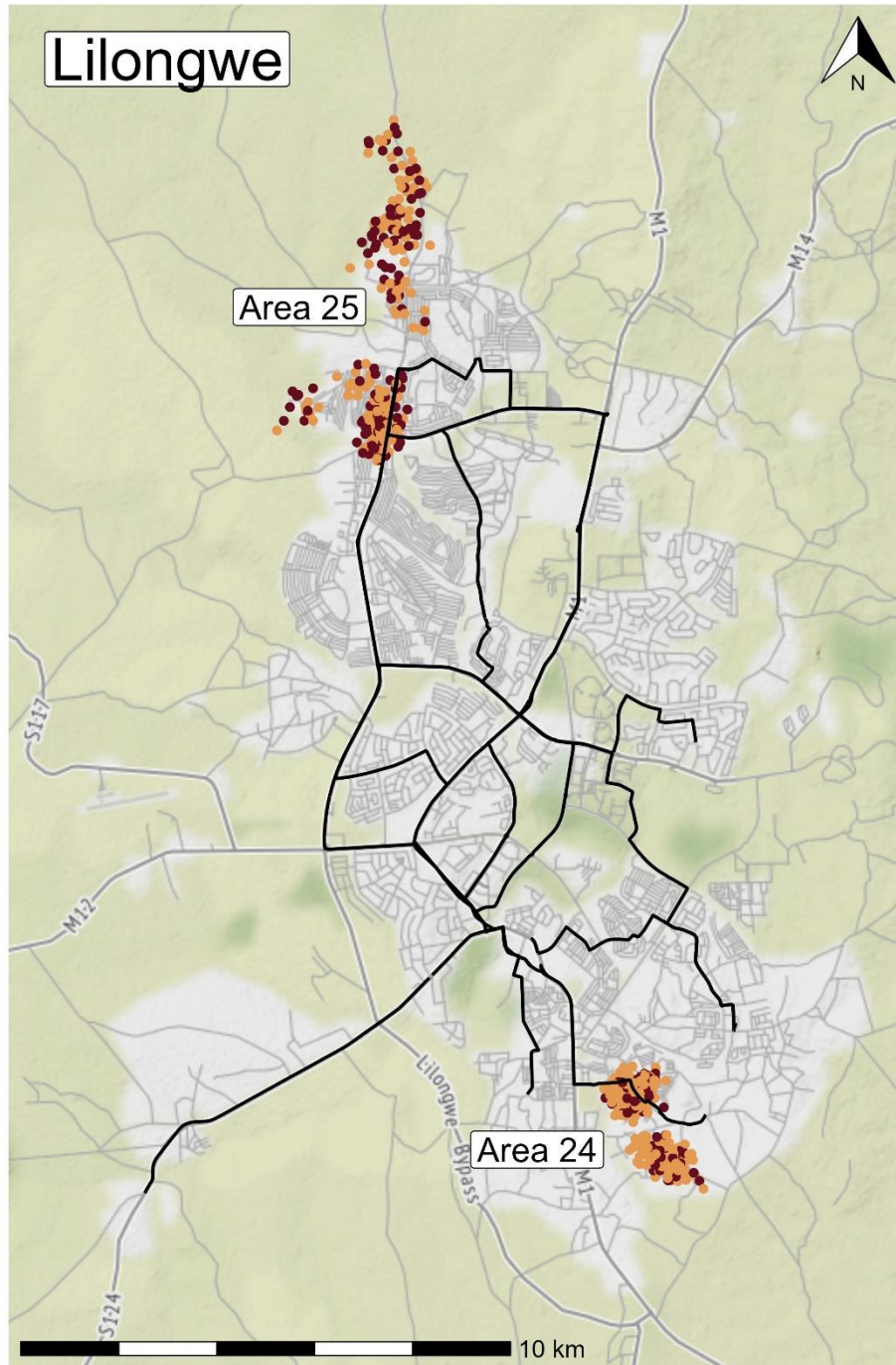


Figure 3: Map of minibus routes and survey locations in Lilongwe, Malawi. Minibus routes were comprehensively mapped by the author in 2021 via GPS tracking.

Findings: Limitation and Frustration

Lilongwe residents face a complex and unequal landscape dominated by exclusion and inaccessibility. Travel is frequently described by interviewees as a lack of choice, made through a series of poor tradeoffs of money, time, safety, dignity and physical exhaustion and pain with no satisfactory options. Choices, poverty, and the capacity to manage ones' time and make a living are deeply intertwined in mobility:

It is painful. I walk because I do not have any other means of transport. If I had a different option, I would not choose to walk.

Female, 54, Teacher

No, you cannot feel safe in minibuses...But the fact is, I do not have any other option. I must live with that, otherwise I will not be able to buy bread for my children.

Male, 44, Fish Seller

Sometimes I use a motorbike, when the worst come to the worst, but my wife never uses a motorbike.

Male, 61, Employee at a Formal Firm

According to the 1-day travel recall survey, 20% of women, and 10% of men, had not left their home the previous day. Of women, 10% had left their home at least once on the preceding three days, and the other 10% had not left in at least three days. For men, the corresponding numbers are 5% and 5%. Among the trips recorded by the survey, the most important mode is walking. Over 50% of all trips recorded were conducted on foot, with women likelier to walk than men. Men are more likely to use personal vehicles - cars, motorcycles and bicycles - as drivers or passengers, but even for men the use of these is low, at less than 20% of trips (see **Error! Reference source not found.**, **Error! Reference source not found.**).

The experiences of walking, reflected in interviews, are overwhelmingly negative. This includes issues of safety and security on the roads, physical tiredness and lost time when walking long distances, but is also strongly tied to a personal sense of disempowerment - constraint, lack of choice, and poverty. While many walking trips are short, to local destinations, a significant portion are for longer distances. 50% of men's walking trips are over 30 minutes long, and 29% of women's trips. This is particularly true for poorer residents, with unreliable, day-to-day incomes. Their days may include hours of walking to run basic errands and looking for day-work in commercial or high-income residential areas:

I walked all the way and to all places ... It took about 4 hours to get to Kanengo and another 2 hours to get to Dzenza. After I was done at Dzenza, I decided to take a bicycle [taxi] to get home because I was very tired and hungry.



Figure 4: Left, a stretch of a tolled, pedestrian bridge in central Lilongwe. Right, a street in Area 25, unpaved and with no pedestrian space, but with gated car parking.

Male, 38, Casual Labourer

Despite the importance of walking, there is virtually no pedestrian infrastructure in Lilongwe. Roads lack sidewalks and the grid is circuitously laid out, requiring long detours. Walls and ‘containerized’ neighbourhoods are common, meaning few available footpaths or shortcuts. What infrastructure exists is built up in the interstices of the formal city, often at high cost. Pedestrians may use the railway tracks or other paths through open areas to stay off of main roads, but report that these areas are often unsafe, including from packs of dogs. The footbridges which traverse the Lilongwe River, shown in Figure 4: Left, a stretch of a tolled, pedestrian bridge in central Lilongwe. Right, a street in Area 25, unpaved and with no pedestrian space, but with gated car parking., connect the two sides of the city’s busiest market and are privately constructed, and require a toll to pass. Using the main road, which has little pedestrian space and is notable black spot for road accidents (Sundet et al., 2021), would require a significant detour. While the fee was relatively low at 20-50 MwK for a single person, or 3-6 US Cents at the time, consider that a cross-city minibus trip costs 200-700 Kwacha, and this is unaffordable to many.

However, this sense of constraint and choice extends to almost all other modes - with the notable exception of private cars. For example, during COVID-19 prices rose when vehicle occupancy was limited. However, this could either be negotiated by passengers, or insisted on by operators, as recounted by a respondent in Area 25 who travelled daily to her workplace in the city center by minibus:

There is always a catch. In exchange for a reduction in transport fares, the minibus drivers request that we sit 4 people per row, instead of the required

3. In such cases, I just put on my mask and get on the bus. The most important thing is to have the transport fare reduced.

Female, 34, Civil Servant

This kind of choice may at least appear as a clear tradeoff. However, in practice, these forms of semi-negotiation are often forcefully imposed and engender more layers of frustration and sense of powerlessness. Minibuses, even under COVID-19 regulations, operated at full capacity regardless of passengers' preferences or the prices they had paid. They may set out with fewer passengers, but would stop to pick up more along the way way, and conductors and drivers would argue, cajole or attack dissenting passengers.

...sometimes minibus conductors make us sit 4 people per row. On some days, I protest. I remember this other time when I tried to protest, but I was the only passenger protesting. Everyone else was just quiet. I felt hopeless and stopped protesting.

Male, 43, Plumbing Equipment Seller

This is an image anchor.

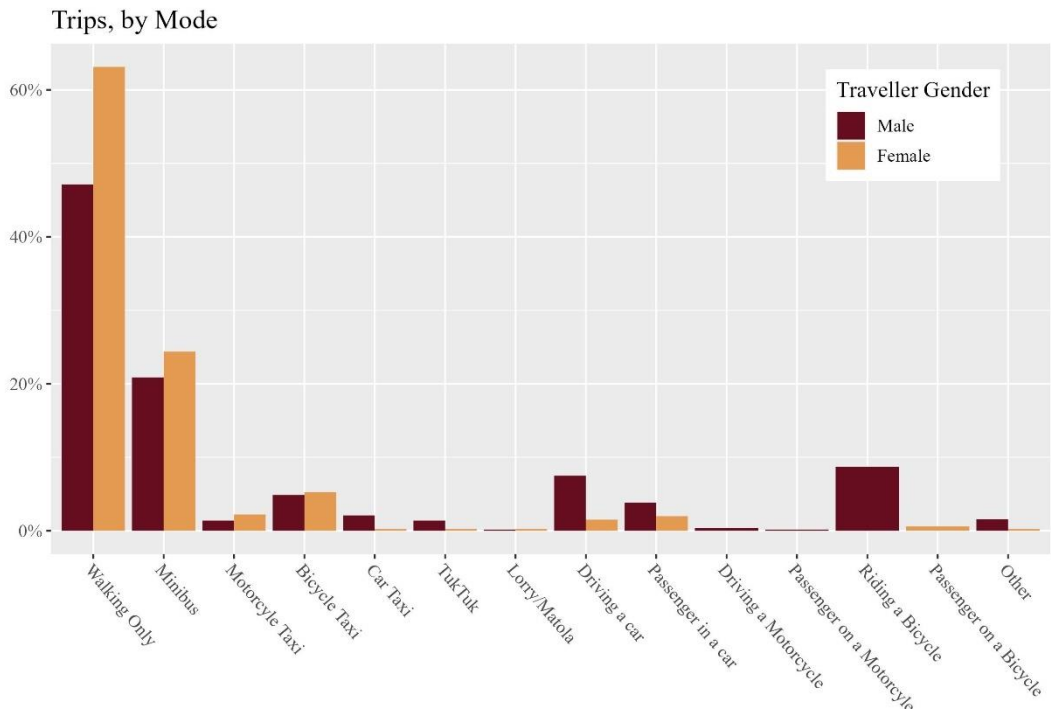


Figure 5: Share of trips by mode and gender. Source: Household Survey travel recall

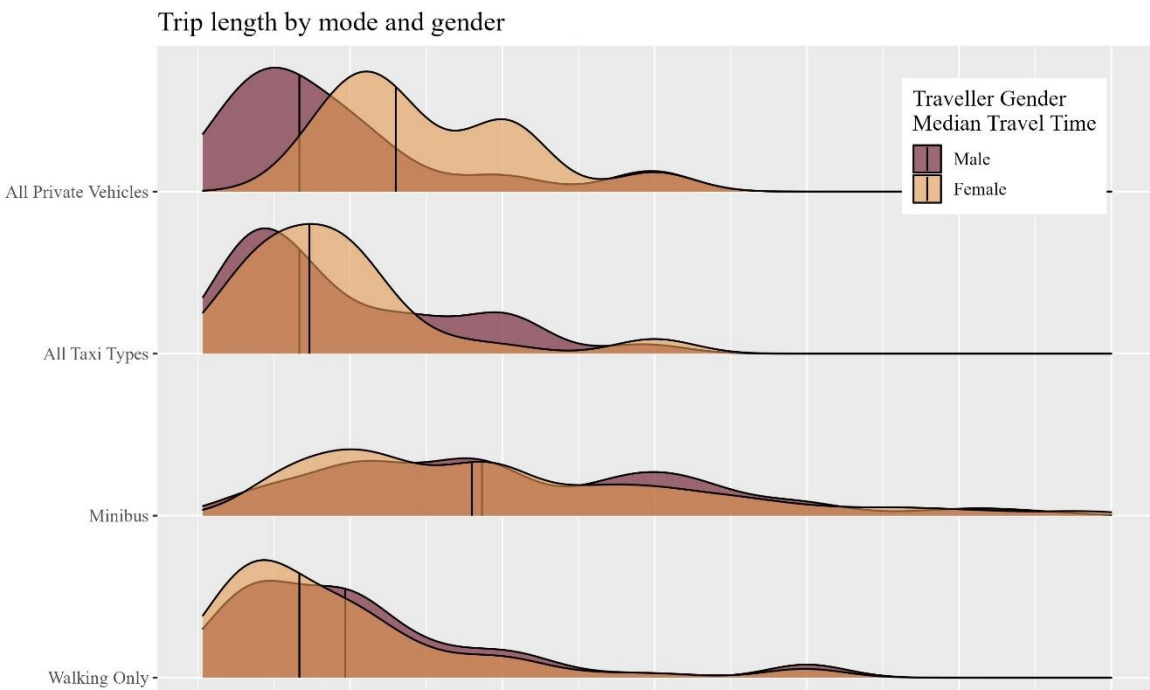


Figure 6: Distribution and median travel time by gender and mode. Source: Household Survey travel recall

Separate to the concerns on crowding and the price increases due to COVID, minibus travel was almost always seen as too crowded, uncomfortable and exhausting. Respondents described serious physical costs, spending up to 2 hours stuck in traffic daily in trips across the city and arriving home or to work drained from their commutes, or physically numb or in pain from cramped and uncomfortable travel conditions. Travel with children is particularly tricky, requiring a higher payment, carrying a child on one's lap so they do not take a separate seat, or, often, both. Travel with children is described as especially difficult and uncomfortable, and this has a significant gendered dimension. 50% of women travel with children occasionally or frequently, but only 22% of men.

Prices and the need to limit and manage travel costs is the dominant consideration when travelling. Long walking trips are carried out due to lack of funds. The cheapest motorized alternative is the minibus. Other modes, such as bicycle and motorcycle taxis and rickshaws and regular taxis, are used rarely due to a mix of cost and, in the case of bicycles and motorcycles, safety concerns. Their main uses appear to be to transfer cargo by vendors and merchants, for emergencies, or to arrive at locations where minibuses do not provide service, but often as a last resort in cases of exhaustion or time pressure, in combination with walking long distances.

Even on the minibuses, prices are often too high. In Area 25, a major residential area located over 10 km from the CBD, minibuses to downtown cost from 500 to 1000 Mkw (approximately 0.6-1.0 USD.) Area 24 is approximately 6 km from downtown, and prices start at 200 Mkw (0.25 USD.) The median estimation of their own typical daily travel for survey respondents was 1,000 per day. The median cost of children's travel to school was 400

Interviewees found 200 kwacha per trip to be relatively affordable, but 500 or more to often be expensive and difficult to manage, choosing to make one trip per day or travel off-peak. As there are no transfer tickets or discounts of any kind, even a simple there-and-back daily trip pattern from Area 25 costs a minimum of 1000 kwacha (1.2 USD) in 2021 - a significant burden when minimum wage is set at 50,000 (~60 USD) monthly.

Prices can rise when it is dark. Prices are also high when we are going to work very early in the morning. They know you do not have a choice.

Civil Servant, 34, Female

These fares are often changeable, based on the level of demand, time of day, weather and more. For many, the constant price changes, negotiations - exacerbated by COVID restrictions, but not unique to it - shifts of destination or mid-way turnarounds and altercations with drivers are upsetting and frustrating in and of themselves, as well as making costs difficult to predict and sometimes meaning a trip has to be cancelled when the price is raised in-the-moment. This affects the profitability of businesses, as well as individuals ability to plan and manage their household budgets. Fuel costs are also substantial burden, and even the households that own a car are often concerned with the price of fuel, calculating expenditures and travel by car on

day-by-day basis. Being stuck in traffic longer than expected one day, may mean the cost of fuel cannot be covered and the car will not be used the next.

Travelling with children, as well as children's own travel to school is also often expensive. Strategies such as sending children to boarding schools to save on the cost of transport are discussed by some respondents. Others would prefer children attend other, better schools within the city, but the travel costs make it prohibitive. Children who do study further from home must walk long distances or catch minibuses, especially a concern when they are late, or if heading home after dark.

...my first-born son walks some distance before getting into a bus [to school]. He does this to cut the usual cost he pays for the whole distance. He walks and gets into a bus when he has the money to pay the distance left.

Male, 38, Casual Labourer

Latent Demand

Expensive and difficult travel for many residents requires time, money and physical effort to compensate for, but also simply means some trips are not made and locations that are not visited. Based on the travel diaries, an average of just 1.5 destinations are visited per day by the survey respondents, and there are likely to be extensive, unmet travel needs.

Social and community activities are the most inaccessible for all but the most mobile residents, who have cars or are not concerned with the price of frequent taxi use. Both within and outside the city, travel to visit relatives and friends is too expensive and time consuming, and often felt keenly.

If you have money, you can get to any place you want. There are minibuses, motorcycles, and private taxis that can get you to any place you want if you have the money. My mother stays in Area 49. I do not visit her as much as I would like to because it is far. I need at least MwK 2,000 to visit her.

Female, 27, Not Employed

I would most definitely visit my friends. I fail to visit them when they are sick and I always feel bad, but what can I do?

Woman, 28, Casual Labourer

Health needs and emergencies have particularly limited recourse. 29% of men and 37% of women had been unable to make routine or emergency visits to a clinic or doctor over the past year due to travel barriers. Visits for malaria treatment, pain and pre- and anti-natal visits were the most common. In more severe emergencies the solution is usually to take patients to the hospital, but this is often difficult due to poor transport options. Cars are present even in low-income communities, and neighbours often ask for favours or pick rides, but this is neither systematic nor reliable.

Lucky enough in our neighborhood we are united people, so if you have an emergency you can approach a neighbor asking for transport help ... but sometimes all these alternatives are not there, then we just wait until dawn so that we can catch the early minibus.

Woman, 25, Operates a Saloon

There was a time my husband fell ill in the middle of the night and he needed to go to the hospital immediately. Unfortunately, we failed to go at the time because we had no means of transport. We tried to call one of our neighbours but they said they were far away from the city. Others said they did not have fuel in their cars. As a result, we went very early in the morning. It was a very bad situation. There was no any other way, the patient could not even sit on a bicycle or motorbike so we had to wait till dawn.

Woman, 51, Teacher

There was a time we walked up to Kamuzu Central Hospital at night with the patient on our back.

Women, 47, Former Vendor

Social and community activities are perhaps the most inaccessible for all but the most mobile residents. Both within and outside the city, travel to visit relatives and friends is expensive and time consuming, and often felt keenly. 60% of both men and women in the survey reported that they had failed to make a trip to meet friends or family due to travel costs or time over the past year. This is especially true around family visits and caring for sick or elderly relatives, but also personal activities like going to music and sports events, going with children to see family, or even taking them to a playground.

I love music. I want to go to a Black Missionaries⁴ show when they are in town. But I need transport to get there. At the same time, I have children to take care of. In such situations, I stop myself from going to the concert...When you are determined, you travel, even though the travel cost is high. But the only trips I avoid are social and entertainment trips like music concerts.

Male, 43, Tailor

I would watch football in town in some nice bars and I would be the happiest man on earth

Male, 28, Street food vendor

On the other side of the coin of accessibility, services and businesses are relatively well distributed, at least in local neighbourhoods centers. Food and other regular items, are easily

⁴ A Malawi reggae band. <https://www.youtube.com/watch?v=1kAXZrvzqoM>

accessible and even low-income residents are satisfied with their local markets, primarily within walking distance or a bicycle-taxi ride from their homes. Residents throughout the city prefer the large local markets in their area for food shopping, citing the lowest prices, freshness and short distances to travel. The main alternative, a number of large super markets and general purpose stores located primarily in the city center, are visited more rarely and only have an advantage in terms of a few goods, for example, cleaning products.

However, this elides the process of food and goods *arriving* at these local markets. Numerous of the interviewees and survey respondents were involved in trade of basic goods like food, charcoal and second-hand clothes. Their journeys to deliver goods were often long, complex, expensive and risky, both in terms of their business and their wellbeing. Two processes are underway, with produce brought in for sale from outside of the city from local farms, and other goods, such as fish and clothes, which travel longer distances, bought daily or weekly at the central markets and brought into neighbourhoods. In both cases, routines appear hard to establish, with the travel to collect goods - a central aspect of the work - being unpredictable and travel costs cutting significantly into earnings. Further, this transport is largely handled personally, micro-business by micro-business, with very little access to truck or groups of vendors making orders together.

When we want to go and collect tomatoes we wake up at 3am, and go to the road and wait for a car to drop us where we want to collect tomatoes. [Then] we have to look for a car to drop us here at home, so our journey is not efficient.

Women, 35, Tomato Seller

The fluctuating prices affect my daily budget. There are days when I plan that I am going to order fish for k10,000 in town, but when the transport fare is high, it affects me. I must pay a high minibus fare for myself and a high fare for my goods. There are also days when I am late and decide to use a motorcycle. This also affects my earnings because motorcycles are expensive. We pay k1500 from town to Area 24 on a motorcycle.

Male, 44, Fish Seller

It was a truck accident - it was loaded with tomatoes and we were sitting on top...I was badly injured - I stayed 8 months in the hospital and it took 2 years to heal...But I haven't been able to go back to that business because my capital was lost from the goods that I didn't recover from the accident.

Woman, 48, Charcoal Seller

Even without accidents, transporting goods is difficult. Vendors, particularly of fragile, fresh items like fish and vegetables, are sensitive to the difficulty of traveling with produce in crowded minibuses. Delicate produced may be jostled and damaged. If the trip is unexpectedly

long, it may even go bad, such as with fish. Minibuses also charge high rates for bulky goods, often higher than for a passenger. A common solution is to send such items - such as a bale of second-hand clothes or charcoal for sale - via bicycle taxi, while the purchaser travels by minibus from the central market to their home neighbourhoods. This incurs further costs, time and the possibility of theft or loss of the goods.

Fear and Exhaustion

The experience of travel needs to be understood not just as a question of travel times, costs and locations, but as a physical, embodied experience. In Lilongwe, as well as the frustration with unreliability and burden of constant mental arithmetic and assessment, the physicality of travel is dominated by fear, pain and exhaustion. The risks of travel are omnipresent in travellers minds, particularly in terms of road safety as passengers or pedestrians.

Sometimes I sit inside a minibus and I see, right in front of me, a piece of metal protruding ... I immediately know that that piece of metal is going to go through me an accident.

Woman, 34, Civil Servant

I walked. It was 1 hour and 30 minutes [...] It was painful because I got tired of walking around the area looking for a job that I did not even find. I returned home with nothing, only wasted efforts. It is the worst mode of moving around, madam. It is because I am poor. I feel a lot of pain, I also feel exhausted from walking all day and in the sun.

Female, 25, Casual Labourer

Accidents are common, and a majority of survey respondents reported that they did not feel safe from vehicle traffic while walking. This was particularly strong with regard to busy, downtown areas, where over 70% feel unsafe, but is also the case within respondents' neighbourhoods, where almost 50% feel unsafe (see Figure 7 for detail.) As well, 59% of survey respondents with children who went to school on their own worried about their safety while traveling.

Notably, there is little difference by gender, with regard to feelings of safety, either from traffic or from harassment. Both men and women experience public spaces as largely unsafe, especially in busy central areas. Lack of safety is conditioned more strongly by fears of robbery when walking or when travelling by some modes, like black-plate taxis, and altercation and conflict with transport workers on minibuses. Detailed accounts of street robberies, minor and

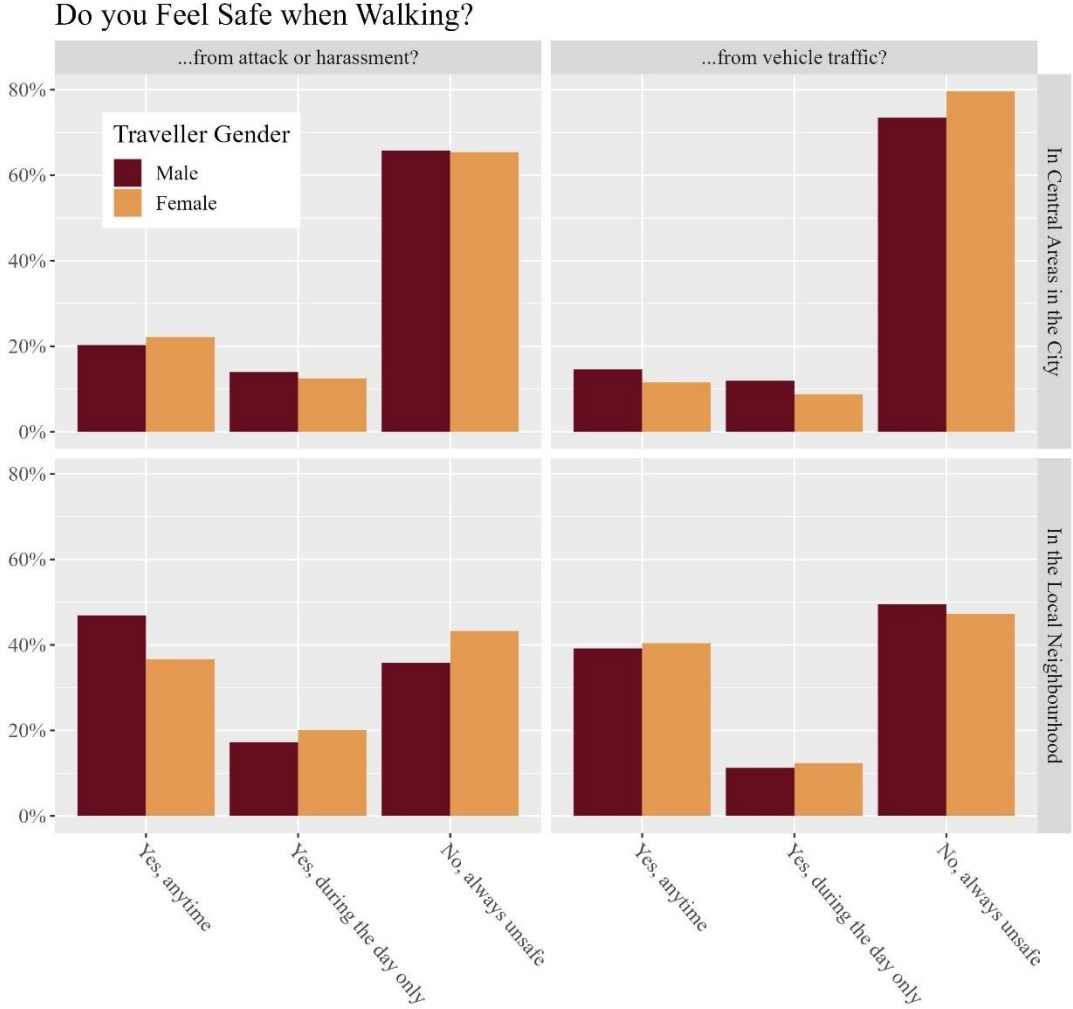


Figure 7: Feelings of safety while walking

major traffic accidents, and the pervasive sense of worry while traveling were common in interviews.

Indeed, even more acute than safety from robbery and harassment, the fear of traffic accidents predominates. Given the high rate of accidents, this is entirely rational, and 24% of survey respondents had experienced an accident while travelling, including while walking, in just the past 6 months. Half of these were described as severe, where someone was injured badly enough to go to hospital. Respondents were particularly critical of drivers, whether of minibuses, bicycle or motorcycle taxis, who were described as speeding, driving recklessly, and untrained. However, many also recognized that it was the interactions with traffic and

use of narrow roads with no infrastructure and no separation from private cars that made them especially vulnerable, especially when using motorcycle taxis.

Discomfort, dignity, and pain also play a role. As well as concerns and experiences of traffic accidents, the experiences of many transport modes, especially riding the bicycle taxis and extended minibus trips, can be physically painful. This can be compounded by memories of falls and accidents which are felt not just as physical injury, but also as frustrating or humiliating. Despite the relatively widespread availability of bicycles, they are in fact not ridden often. Women, especially, feel riding is extremely dangerous, as well as undignified and potentially inappropriate, particularly in terms of requiring improper dress.

It is difficult to find silver linings. Minibuses, while still unpopular, are seen as efficient and cost-effective in some cases, particularly the shorter, cheaper route serving Area 24, though this was far from widespread. Motorcycle taxis, while particularly marked out for their high risk, with many respondents refusing to ever take them, were nevertheless at times acknowledged as the fastest and most efficient options. Bicycle taxis, on the other hand, received little support, being extremely expensive over even short distances, but serving primarily as the cheapest available replacement for walking for locations where minibuses are not available.

I would use a car. Is walking a go-to option for anyone? It is not. I dream of having a car one day. After I retire, the first thing I am purchasing is a car. This is the first thing I am buying. I have never doubted this. I do not have money now, but even my children know that I shall park a car here one day. I always tell them that this space is reserved for my car.

Woman, 54, Teacher

Cars, on the other hand, are aspired to by many. For some this is a concrete desire, but more frequently it is an un-attainable “if-only” dream. Lilongwe residents recognize that cars - either personally owned, or taking taxis as often as necessary, without concern for the cost - are the best way to navigate the city. This is the only option that allows them to sidestep not just their mobility constraints and reliably meet their travel needs, but also avoid the frustrations, frictions and indignities of travel.

Perhaps more insidiously, though 50% of trips are made by walking, when asked about improvement or change to transport options and policy, respondents almost entirely focus on roads. Fixing potholes, paving roads, and adding roads and lanes to reduce congestion are seen as priorities, and secondly the training and policing of minibus and motorcycle taxi drivers. Pedestrians safety and infrastructure are never discussed, nor are other aspects of public transport, such as safer, less crowded and more comfortable vehicles, sheltered bus stops, lower prices or more service location by minibuses. On the one hand, this may reflect the aspirations of driving and car ownership, but it also shows the importance of drivers and cars behaviours on pedestrian safety. Finally, it also reveals the way cars structure

respondents ideas of what transport *is*, with walking and even simply not understood as spaces where policy is possible.

Discussion and Conclusions

Lilongwe suffers both the worst impacts of a history of inappropriate, coercive, modernist master planning, state disinvestment and disinterest, and an unregulated and inadequate free market response in urban mobility. Available public transport modes are too expensive for many, offer limited coverage of necessary destinations, and when used are often still expensive, unpredictable and extremely uncomfortable and exhausting. Walking, the main mode in the city, is ignored and marginalized even for local trips where it is a reasonable option, streets are dangerous and pedestrians vulnerable, especially to car traffic. Travel for which walking is a last recourse, covering long distances within the city, is worse, carrying a high cost in terms of time and physical exhaustion.

One contribution in this paper is to study the available modes and mobility strategies holistically, with no initial focus on walking, transit, car ownership, or other. Letting the overall picture emerge organically from the research, we can see the binds and tradeoffs residents find themselves in, with precisely these choices - or their lack - making up their personal sense of the city's mobility and their own accessibility. With no categorization as "walkers", "cyclists", "drivers", residents and households use different modes as and when they need them and can afford them, and are often simply stuck.

Questions of freedom and constraint run through these experiences. Informal modes, at times, have been romanticized, and often argued to be "well-suited" to the cities they operate in. The role of informal modes as nodes of political discourse, art, music or youth culture have been stressed by some authors. Without dismissing this, it is not clear that these are always of first, or any, importance to passengers or reflective of their experiences. In the case of Lilongwe, such sentiments were never in evidence among the respondents to the interviews.

Women's mobility in this low-income setting is multiply-constrained. Women travel less than men, when they do travel they have less access to private vehicles and are more reliant on walking and public transport, and then are more poorly served by these modes. Women experience greater risk while walking, and have less access to public transport. Cars are often described as status symbols, globally and in Africa, associated with consumption and masculinity (Jeske, 2016). In Lilongwe, however, men and women equally "dream of cars", in the context not of aspirational lifestyles, but of facilitating their daily mobility. This includes accessibility, but is also an escape hatch from the damage, frustration, unreliability, lack of choice and control and constant friction of their daily travel.

With urban mobility being channelled ever further into the construction of roads and interchanges in the city the mobility options of most urban residents restricted to unsatisfactory and unaffordable informal modes are likely to grow ever worse. Planning discourse in Lilongwe appears happy to allow the minibuss sector to continue to operate with neither support nor further regulation, and even less interest in the accessibility - or lives - of pedestrians. In this

landscape, the pull of car ownership - expensive and complex as it may be - is difficult to contest. It is likely to lead further into a vicious cycle of car-dominated planning, worsening traffic, and social and mobility exclusion for the rest of the population as they become an even greater barrier to the flow of the private car.

The public transport system and walking facilities both require rapid, extensive improvement. Full formalization is unlikely, both in terms of funding, technical capacity and political priority. Thoughtful investment and collaboration is needed to address this, rather than throwing both the blame and the expectation of “bottom up” solutions on barely-profitable, spatially constrained minibuss operators. Without creating mobility options that are safe, reliable, affordable and dignified, Lilongwe will become further un-sutured, a series of barely-connected quasi-urban villages which only the rich can traverse.

Conclusion

To conclude this dissertation, I move to position informal transportation operations as examined in the cities in this study within the broader, most pressing questions of urban and transport planning in an era of human and environmental crises. What kind of policy, with regard to informal transport, will support environmental and social justice? Informal transport can be seen through multiple justice lenses, multiple planning lenses, and multiple environmental lenses. It is at once public transport, private business, a source of employment and livelihoods, and an important constituent form of a type of urbanism, and all of these avenues need to be not just balanced, but understood in concert.

At the same time, this identification cannot remain descriptive, but program and policies must be developed, decided, funded, pursued. That is, the realm of informal transport cannot be placed outside the realm of the active, collectively social, political pursuit of environmental justice as a project and outside the realm of public policy and the public interest. This means that as well as *positioning* informal transport - as a whole, and city-by-city, service-by-service - in its contributions and gaps to environmental justice, its future must be imagined and the *process* of arriving there must equally be fully developed.

Any policy that entrenches the immobility of the poor can never be an environmentally just outcome. From this perspective any framing of informal transport that does not explicitly bring together decarbonization, worker's rights, *and* accessibility is lacking, as is any that imagines this mode as frozen in amber and outside the realm of public services, political demands and governance, as are, for example, education or health. Public transport - formal, informal, or anything in between - is not a decorative element of the city to be considered within the realm of culture or touristic entertainment mediated by an exotifying western gaze. It may play those roles, but first and foremost it is a public good and a daily life need, and a nexus of exposure and vulnerability for many of its users.

To put it another way, transport is a necessity, but one that can also be a burden. Moving from sustainability as primarily an ecological question, centered at issues of natural resource and energy consumption, pollution and climate change, to environmental justice, which considers the social harms and gains of both environmental degradation and sustainability policy, requires bringing together policy for social goals of human equity and wellbeing as inherently imagined to exist within, and with, a frame that is ecologically sustainable in terms of its impacts (Agyeman, 2013).

As Agyeman notes (2013), environmental un-sustainability and carbon emissions are influenced by the equality of societies. This is usually considered in the context of wealthy countries, where more equal societies, such as Europe, have lower emissions and show greater concern for sustainability agendas than more unequal ones, such as the USA, through more collective politics and less pressure for consumption. Low-income countries are often left out of this debate, as their overall emissions are only a tiny fraction, per capita, of even the least-polluting rich countries. However, some of the world's lowest income countries are also its most unequal,

with low trust in both government institutions and across society. Transportation services can at once *be* more or less equal in and of themselves, and at once support greater equity and well-being in other spheres. As Agyeman argues, “above a certain threshold, greater equality makes far more difference to real lives than greater income.” Transportation services play a role in both elements - in hitting the threshold, and in equality (Agyeman, 2013).

If environmental justice, in an a stricter formulation applying primarily to government policy can be considered an avoid-harm framework - “a public policy goal of ensuring that the adverse human health or environmental effects of government activities do not fall disproportionately upon minority populations or low-income populations” (Forckenbrock and Schweitzer, 1999). Then, the concept of just sustainability provides the possibility of a more proactive design of policy that integrates sustainability and climate change reduction and adaptation with social and economic equity questions at the outset.

A holistic consideration of transportation in African cities must therefore include several elements. While in the context of developed countries different aspects of transportation provision and planning are slowly being de-siloed, the process is slower in the context of developing cities, fragmented between different academic disciplines in research and governing and policy-making bodies in governance. This includes the connections between transportation and land use, employment, public health, and individual and group mobility and accessibility. First and foremost, any analysis must include *who is left out*.

Passengers and their accessibility levels and mobility needs are an obvious starting point, and yet are often invisible within academic research. As in Klein et als (1997) formulation, passengers are a kind of commodity, an often-undifferentiated mass. In fact, the passenger experience and the equity, effectiveness and connection to needs and opportunities presented by informal transport for its users - and those left out - are the foundation of analysing informal transport services.

Transport workers and their livelihoods constitute a key part of mass transit policy - as they do in all parts of the world - and yet the questions of workers incomes, health, well-being and political and social organization are also often considered separately from questions of transport provision and accessibility. Workers’ need to be understood within the frameworks of their precarious and vulnerable employment - operating on informal, day-to-day contracts with no recourse to labor law or protections, and within an entrepreneurial industry dominated by individual owners and investors. Policy towards informal transport workers too needs to encompass a variety of aspects: as well as economic questions precarity, poverty and wages, and training and opportunities for social mobility, it must be recognized and centered that drivers are often at high risk, with extensive physical and mental health issues being prevalent. They must also negotiate violence on part of criminal- and semi-criminal factions targeting the transport sector for extortion on the once hand, and state and police corruption which do the same on the other. They must contend with driving on dangerous roads with limited formal

training, and often after long, exhausting days. Finally, they must contend with passengers, absorbing their ire and frustration at dysfunctional and undignified transportation options.

Externalities - Road Crashes, Injuries and Pollution are a critical part of the picture. Low-income countries often bear the highest burden of road injuries despite lower motorization rates, to the point of frequently being described as an epidemic, and its impacts worst in lowest-income countries which have weaker health services and worse infrastructure. It is not confined to drivers or even public transport passengers. Data is patchy, but one recent meta-study of 10 hospitals in Malawi, both urban and regional, found road crashes responsible for 48% of all serious trauma patients, requiring hospitalization, and 49% of these were pedestrians and cyclists (Chokotho et al., 2022). The injuries sustained are often life-changing and care is limited. Here too, applying a just sustainability lens, despite having fewer cars, trauma experienced is greater.

Environmental and urban impacts more broadly, ie, externalities, also need to be considered, though they may often be handwaved into an indefinite future or sidelined as luxuries. This includes localized air pollution and carbon emissions, but also medium and long term effects on built environments, take-over of public spaces, such as streets and parks, by vehicles, and fractured and disconnected urban form due to poor transport connectivity, hampering urban agglomeration benefits and economic growth.

Policy Recommendations

A number of current trends exist in terms of transportation in African cities, and in particular of mass transit.

Electrification is an important but very partial vector of informal transport improvement, with several projects underway, and some in operation, to shift informal systems to operating with electric vehicles. Electrification must be considered carefully. While an obvious, direct and popular pathway for limiting the carbon emissions of transportation, from a just sustainability point of view and given the context of the worldwide body of informal transport passengers and workers, two points must be centered. Firstly, electrification of informal transport, if it is undertaken, must firstly benefit the residents of those cities. It must lead to improvements in accessibility, safety, health and quality of life for its existing passengers and others in the global south, and the main purpose cannot be worldwide reduction of emissions to benefit carbon reduction goals that benefit the global north or the global community at large.

Ideally, overall emissions reductions and local improvements come in tandem. Less polluting vehicles can benefit the health of local residents, as well as being safer and more comfortable. However, if electrification comes as the cost making vehicles more expensive to purchase or operate, meaning fewer travel options and higher costs passed on to the workforce and passengers, they cannot be considered sustainable.

Formal Mass Transit Services, particularly those involving substantial infrastructure investments such as Bus Rapid Transit (BRT) or rail, are also slowly being implemented across

African cities - Dar es Salaam is a notable case, as are several cities in South Africa - and more are planned. It is also meeting with criticism, and the relationship to informal operators is often especially fraught.

Improvements to transportation options for the poor that can encompass all these elements of justice and sustainability - globally, but particularly in the lowest-income countries - cannot be doodling around the edges. Maintaining the levels of inequality of mobility that are currently present between those that can afford to own cars and drive, and the rest, in these cities, is neither just nor environmentally sustainable. Improvements to mobility must challenge car dominance and provide truly effective public transportation - as everywhere. The resources, scale of effort and breadth of conceptualization and long terms horizons needed to transform exploitative, limited informal transport operations into just transportation systems are vast.

All of these require careful, slow, and extensive engagement with the transport labour force, that will often need to be transformational. Piecemeal, incremental steps that hope the informal sector - with neither support or accountability - will simply deliver miracles are unlikely, unprofessional, and unjust.

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