



Access to the city: Mobility patterns, transport and accessibility in peripheral settlements of Dar es Salaam



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ARTICLE INFO

Keywords:

Mobility
Accessibility
Urban transport
Urban expansion
Peri-urban
Cost-distance analysis

ABSTRACT

This paper is concerned with access to the city for urban residents living in the periphery of Dar es Salaam, Tanzania. The paper presents an analysis of the mobility practices of residents and investigates the mobility constraints they experience in relation to the limited accessibility provided by the urban transport system. The paper draws upon qualitative interviews with residents in the periphery as well as recently collected travel speed data and offers a unique combination of testimony with GIS-based modelling of overall accessibility. A central finding is the overall importance of regular mobility and access to the city for residents in the periphery. Regular mobility is an ingrained part of residents' livelihood strategies. The majority of households rely on one or more members regularly travelling to central parts of the city in relation to their livelihood activities. The analysis reveals a widespread, near-to-universal, dependence on motorized transportation, with the vast majority depending on public transport. Raster-based modelling of overall accessibility provides an indication of the very high travel times endured by residents in the periphery. The analysis identifies and distinguishes between three overall mode types: 1) Private car, 2) public transport and 3) motorcycle/car combined with public transport. While private cars appear marginally faster, differences in travel times are actually limited. This suggests that travel times are less influenced by mode of transport than by road and traffic conditions and highlights how accessibility problems of peripheral settlements are not easily understood separately from the general dysfunctions of the overall mobility system of city.

1. Introduction

Urban expansion is a significant trend in the cities of Africa (Angel et al., 2011; Arku, 2009). Much urban expansion is taking place in peripheral areas characterized by inadequate or non-existent transport infrastructure and services. Long-term under-investments have resulted in insufficient and over-stretched transport systems lagging far behind the demographic as well as the spatial growth of the cities (Foster and Briceno-Garmendia, 2010; Pieterse and Hyman, 2014; Sietchiping et al., 2012). Much expansion consists of low-density urban sprawl, which encourages high levels of daily mobility, long journeys and dependence on motorized transport (WB, 2002).

This paper explores mobility and accessibility in the periphery of Dar es Salaam, the largest city and de-facto capital of Tanzania. In Dar es Salaam rapid population growth has resulted in widespread spatial expansion (Andreasen, 2013). Urban expansion has continued undeterred despite massive problems in the mobility system of the city, which is characterized by highly inadequate road networks, insufficient public transport and severe congestion problems (JICA, 2008; Kanyama

et al., 2004; Kiunsi, 2013; Melbye et al., 2015).

Mobility is a basic need for most urban residents in sub-Saharan Africa, because of the strong links between mobility and livelihood (Bryceson et al., 2003; Esson et al., 2016; Gough, 2008; Langevang and Gough, 2009). As many urban settlements remain poorly serviced, urban residents often also need to travel relatively long distances to access urban facilities, services and markets (Lucas, 2011; UN-Habitat, 2010; WB, 2002). Mobility is a resource that not everyone has equal access to. Mobility constraints reduce the number of accessible jobs, limit access to services, prevent the development of social networks and contribute to processes of social exclusion (Olvera et al., 2003; Salon and Gulyani, 2010; WB, 2002). A number of studies highlight mobility constraints related to poverty, documenting that a substantial share of urban residents is unable to afford motorized transportation on a regular basis (Behrens, 2004; Bryceson et al., 2003; Hansen, 2005; Lucas, 2011; Olvera et al., 2008a; Olvera et al., 2008b; Olvera et al., 2013; Salon and Aligula, 2012; Salon and Gulyani, 2010; Venter, 2011). Some emphasize mobility constraints related to characteristics of the individual, esp. gender, but also age and disability (Kanyama et al.,

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2004; Levy, 2013; Njoh, 1999; Salon and Gulyani, 2010; Venter et al., 2007).

Accessibility is often highlighted as a crucial factor shaping and constraining mobility of residents in cities of sub-Saharan Africa (Behrens, 2004; Bryceson et al., 2003; Olvera et al., 2003; Sohail et al., 2004; WB, 2002). Accessibility is in this context concerned with the opportunity or potential for mobility provided by the urban transport and land-use systems. As such accessibility is spatially bounded and exhibits strong spatial variations (Bryceson et al., 2003; Howe, 2001). Previous studies have shown that peripheral urban settlements are often characterized by very poor accessibility (Melbye et al., 2015; Møller-Jensen et al., 2012), and that residents in the peripheries often face longer journeys and spend a larger share of their household budgets on transport expenses (Kanyama et al., 2004; Khosa, 1995; Khosa, 1998; Olvera et al., 2003; Ojoro, 2011; Sohail et al., 2006; Venter et al., 2007).

This paper contributes to the above literature with a study of access to the city for urban residents living in the periphery of Dar es Salaam, Tanzania. The paper presents an analysis of the mobility practices of residents and investigates the mobility constraints they experience in relation to the limited accessibility provided by the urban transport system. The paper draws upon qualitative interviews with residents in five selected settlements in the periphery of Dar es Salaam as well as recently collected travel speed data from same city and offers a unique combination of testimony with GIS-based modelling of overall accessibility. Firstly, mobility practices of residents are analysed to explore the variety in mobility patterns and modal choices. Based on this analysis, we consider that it is analytically useful to distinguish between three overall mode types: 1) Private car, 2) public transport and 3) motorcycle/car combined with public transport. Secondly, the collected speed data are used to model overall accessibility for the three mode types identified in the qualitative analysis. The analysis of accessibility applies a time cost-surface approach, which enables a fine-grained analysis of travel times from different parts of the urban territory with differing access to road networks and public transport services (Mitchell, 2012). Previous accessibility studies have looked primarily at accessibility for cars on networked roads (Melbye et al., 2015; Møller-Jensen et al., 2012). The approach of this paper ensures that both public transport as well as the travel time related to walking outside networked roads is taken explicitly into account.

2. Context: growth and expansion of Dar es Salaam

Dar es Salaam is the largest city and de-facto capital of Tanzania. Administratively, Dar es Salaam consists of three municipalities; Kinondoni, Temke and Ilala. With a total population count of 4.4 million in 2012, it is a large city in the context of sub-Saharan Africa (NBS, 2013). Dar es Salaam's population grew at a very rapid pace of 5.8% per year on average in the most recent inter-census period from 2002 to 2012 (NBS, 2006; NBS, 2013). Recent population growth has resulted in widespread spatial expansion (Andreasen, 2013). A recent study estimates that the total built-up areas of Dar es Salaam increased by 133% during 2002–2011, while the population only grew by 75% during 2002–2012. A considerable increase has been noted particularly in low-density discontinuously built-up areas (Macchi et al., 2013).

Urban expansion has continued undeterred despite massive problems in the mobility system of the city. Dar es Salaam has a monocentric structure, where most employment opportunities as well as most urban facilities and services are located in the central areas (Kiunsi, 2013; Mrema, 2011). The 2002–2012 period was characterized by extensive spatial growth, while the road network largely maintained status quo except for ad-hoc development in new urban areas (Melbye et al., 2015). The road infrastructure is highly insufficient and characterized by congested arterial roads in combination with rough feeder roads, which are often in a very bad condition (Hill et al., 2014; Kiunsi, 2013; Mrema, 2011). The network relies on only four main

radial roads connected in big junctions that cannot easily be circumvented, while only two larger ring roads enable connectivity without going through the centre itself (Melbye et al., 2015).

Public transport services are highly insufficient and provided by numerous privately operated minibuses known locally as *daladalas*. The minibuses offer cheap public transport, but are characterized by low service levels, crowding, low vehicle standards and often reckless driving (DART, 2011; Kanyama et al., 2004; Kiunsi, 2013; Marcel and Ngewe, 2011; Mrema, 2011; Nkurunziza et al., 2012). More individualized and costlier public transport is offered by privately operated motorcycle taxis, known locally as *bodabodas*, and three-wheel scooter taxis, known locally as *bajaj*. In recent years the number of private cars has also been increasing rapidly and at a much faster pace than population growth (Mrema, 2011). The increasing rates of car ownership along with intense redevelopment of central areas into high-rise commercial buildings have further increased pressure on the urban transport system (JICA, 2008; Kiunsi, 2013). These factors combined result in massive congestion, very low speed levels, frequent queuing and traffic jams (CEP, 2010; Marcel and Ngewe, 2011). The massive congestion causes delays and reduces overall accessibility significantly (Melbye et al., 2015). Besides increasing fuel consumption congestion is also a major source of stress causing much frustration and exhaustion among regular travellers (Marcel and Ngewe, 2011).

3. Data collection

This paper is based on in-depth case studies of five rapidly growing, peripheral settlements in Dar es Salaam. Four are newly developing areas, while one is an older and more consolidated settlement. The selection of case study areas was based on an analysis of spatially disaggregated population data for Dar es Salaam from the two most recent censuses, which can be found in its full length in Andreasen, 2013. All five case areas have experienced very high population growth rates, around or higher than 10% per year in 2002–2012 period, and significant increases in population densities. Table 1 provides an overview of the selected case study areas. Locations of case study areas are indicated in Fig. 1.

All five areas have experienced large in-flows of new residents and transformed from sparsely populated rural or peri-urban areas dominated by bush and agricultural land-use to more densely developed residential areas forming part of the contiguously built-up urban area. Transformation processes are characterized by incremental construction of residential housing, financed, built and inhabited by growing volumes of new residents. The new residents are of mixed ethnic origin, but predominantly long-term urban residents moving from central parts of the city (Andreasen and Agergaard, 2016). Their motivations for and aspirations towards settling in the periphery are shaped primarily by the search for affordable and comfortable housing, especially opportunities for self-built, owner-occupier housing (Andreasen et al., 2016). Housing development often began with very little services or infrastructure in place, though some levels of services and infrastructure has emerged subsequently (Andreasen and Møller-Jensen, 2016). The quality of transport services and infrastructure remains highly inadequate across all five case study areas. Only one or two primary outlet roads facilitate access to one of the main radial roads from each case study area. Interior access roads are rough, without proper drainage systems and often provide limited plot accessibility. The quality of outlet roads and interior roads is highly influenced by the specific geographies of the case study areas, esp. in terms of how much roads are affected by waterlogging. The quality and extent of public transport services is closely related to the road network and depends less on distance to the centre and more on the distance to good-quality roads. Small minibuses are to some extent servicing the interior parts of the settlements, connecting with larger bus routes along the main radial roads. Minibus routes often expanded into the interior areas closely following improvements of outlet roads.

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