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A framework for inclusive transport planning in medium-sized Sub-Saharan African cities

The case of cycling in Kisumu, Kenya

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Dissertation submitted in partial fulfilment of the requirements for the award of degree of Doctor of Engineering (Dr.-Ing.)

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12th January 2017

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Dortmund, 12th January 2017

Declaration

I hereby declare that this doctoral dissertation is the result of my independent investigation and that it has not been submitted to TU Dortmund University or to any other university in any version for purposes of examination. Acknowledgements have duly been made where the investigation is indebted to the work of others.

Walter Alando

Dortmund, 12th January 2017

It is only for the sake of those without hope that hope is given to us…

Walter Benjamin (1892 – 1940)

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Abstract

Cycling remains poorly integrated into urban transport in many sub-Saharan African cities despite its potential to contribute positively to inclusive transport. Its active use in many medium-sized cities of the region has not elicited much support in terms of conducive street spaces and traffic conditions either. This dissertation reasons that this inattention to cycling is perpetuated by neoliberal transport planning, which ignores the needs of the poor majority who are the dominant users of the mode in the region. Specifically, the tools that support this neoliberal transport planning are thought to be incapable of identifying the relevance of creating street spaces that enable cycling. Consequently, transport planning aggravates the social disadvantage that cyclists face. This dissertation therefore questions whether social exclusion can form a basis for revealing the need for street spaces and traffic conditions that support cycling.

The main objective of the study is to find out whether, and the extent to which, the concept of social exclusion can offer a complementary framework for identifying the need to support cycling. The study searches for empirical evidence of this exclusion from three main sources, namely *i*) the conditions of street spaces and traffic thereupon; *ii*) the objectives of policies that relate to the changing transport conditions; and *iii*) the ongoing transport policy reforms and infrastructure development. This empirical evidence is collected from Kisumu, a medium-sized city in western Kenya. The mixed methods approach is employed to investigate these dimensions of social exclusion. This method enables the study to draw on the strengths of both quantitative and qualitative approaches. Accordingly, the study sets off by qualitatively identifying the dimensions of exclusion from expert interviews, interviews with users of different modes, and field observations. Quantitative data on these dimensions is then collected through household surveys, expert interviews, and reference to secondary sources. Resulting data is analysed quantitatively and qualitatively. Data on the conditions of streets and traffic behaviour is analysed through a log-linear analysis to find its association with exclusion. Multinomial logistic regression analysis is conducted to understand the influence of the changing transport conditions on mode choices and by extension the restriction of cycling. The study also conducts a content analysis of economic and transport policies to find out how they accommodate cycling. The results of these analyses are interpreted quantitatively from the statistical coefficients while their qualitative meaning for exclusion is sought from qualitative sources.

The key findings of the study are that cycling is excluded by the conditions of the streets and traffic, changes in transport conditions and the pursuit of policies that emphasise capital transport infrastructure projects but fail to consider the implications of these projects for the transport of the poor. These results are interpreted within the framework of the critical urban theory to find out if social exclusion can be a basis for negotiating street spaces and traffic that address the needs of cycling. The critical urban theory argues against the modes of thought and behaviour that supress aspirations, values, and ideas which do not conform to the rationality of the dominant thought. In this regard, the prevailing neoliberal orientation to transport planning in Kisumu is critiqued for creating development priorities, policies, and conditions of infrastructure and traffic that suppress modes that do not conform to motorisation that this orientation holds to signify modernity. The study thus presents social exclusion as the frame through which the shortcomings of the prevailing orientation to transport planning can be examined and be tackled.

The original contribution of this dissertation is its conception of transport-related social exclusion through the active exclusion of cyclists from street spaces and its demonstration of how this exclusion is reinforced by development priorities, policies, and conditions of streets spaces that result from neoliberal transport planning. The study argues that inclusive transport planning in medium-sized sub-Saharan African cities should facilitate cyclists and users of other excluded travel modes by eliminating these conditions of street spaces that hinder them from participating in mobility to access destinations. These conditions are presented by the study as the new dimensions of impedance to accessibility. Accordingly, they should be incorporated in accessibility evaluation to ensure that transport decisions are sensitive to the needs of cyclists and other excluded modes.

Key words: *Boda boda; cycling; inclusive cities; Kisumu; transport-related social exclusion; transport disadvantage; travel behaviour; street spaces; urban transport; motorcycle-taxi*

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List of acronyms

AfDB	- African Development Bank Group
BRT	- Bus Rapid Transit
CBD	- Central Business District
CGK	- County Government of Kisumu
EST	- Environmentally Sustainable Transport
GIS	- Geographic Information System
INTP	- Integrated National Transport Policy
ISUD	- Integrated Strategic Urban Development (Plan)
ITDG (EA)	- Intermediate Technology Development Group (East Africa)
KenHA	- Kenya National Highways Authority
KSh.	- Kenya Shillings[1]
KV2030	- Kenya Vision 2030
NMT	- Non-Motorised Transport
OECD	- Organisation for Economic Cooperation and Development
SDG	- Sustainable Development Goals
SPSS	- Statistical Package for Social Sciences
SSA	- Sub-Saharan Africa
SUM	- Sustainable Urban Mobility
TAZ	- Traffic Analysis Zone
UK	- United Kingdom
UN	- United Nations
UNCHSUD	- United Nations Conference on Housing and Sustainable Urban Development
UN-HABITAT	- United Nations Human Settlements Program
WB	- World Bank

[1] *US $ 1 = Ksh. 84 at the time of data collection*

Operational definitions

Boda boda:	A bicycle used commercially for ferrying pillion passengers (I have restricted this term to its original reference to bicycles although it has recently been used to refer to motorcycles as well)
Household:	The official definition of a household in Kenya was adopted. The term refers to a person or group of persons who reside in the same homestead/compound but not necessarily in the same dwelling unit, have same cooking arrangements, and are answerable to the same household head.
Matatu:	A privately-owned van, typically with a capacity of 14 passengers in the case of Kisumu and used for public transport (Figure 3-2a)
(Utility) cycling:	Cycling for purposes other than recreation. Used in its general term in this dissertation to refer to both passenger and personal cycling
Passenger cyclist:	A person who uses the bicycle as a passenger, normally as a pillion passenger. This dissertation uses *boda boda* to refer to passenger cycling (Figure 1-2a)
Private cyclist:	A person who uses the bicycle and rides him/herself (Figure 1-2b & c)
Social exclusion:	Based on Silver Hilary's conception of social exclusion, the concept is used in this dissertation to denote the constrained ability to participate in normal mobility and accessibility that occurs when a powerful class of auto-oriented planners uses the social, cultural and institutional power it wields to restrict access to valued resources (street spaces) from the underprivileged cyclists (Silver, 2007).
Street space	The road reserve viewed as a public space that serves not just the fast mobility functions based on the auto but also slow mobility needs that include cycling and walking among other functions. The term has been used by UN-HABITAT (2013) and other authors to underscore the importance of streets as shared public spaces
Transport-related policy	Any policy that has a bearing on travel behaviour change in Kisumu

1 Introduction

Chapter summary

Cycling is increasingly presented to hold the potential to make positive contributions to the ongoing quest for sustainable urban transport. In medium-sized sub-Saharan African cities, active use of the mode is however hardly matched by infrastructure and traffic regulations that can support it. This lack of support renders the mode unsafe and discounts its potential contribution to sustainable transport. This chapter lays the foundation for examining this present lack of attention to cycling through the concept of social exclusion of the poor majority who comprise the main users of the mode. The chapter begins by contrasting the situation in cities that have invested in cycling and those that have not done so to find the possible reasons why sub-Saharan African cities ought to support cycling. It then zeroes in on sub-Saharan African cities to show that the present tools for evaluating transport decisions are not adequate to support cycling. This inadequacy is attributable to the orientation of these present tools, which focuses on promoting the use of cars. The chapter questions if the concept of social exclusion could offer a basis for revealing the need to support cycling.

1.1 Background

Transport planning in many cities around the world focuses on facilitating motorisation while in contrast paying little attention to non-motorised travel modes (Buehler, 2011; Pucher, Korattyswaropam, Mittal, & Ittyerah, 2005; Rietveld & Daniel, 2004; Sietchiping, Permezel, & Ngomsi, 2012; Smith, 2016; Tapp, Davis, Nancarrow, & Jones, 2016; Underwood, Handy, Paterniti, & Lee, 2014; Watson, 2014). This bias is evidenced by unsupportive land-use and transport policies, skewed road infrastructure development efforts, and biased traffic regulations. All these hardly facilitate other modes apart from the motorised ones (Diaz Olvera, Plat, & Pochet, 2013; Gwilliam, 2003; Trans-African Consortium, 2008). Users of non-motorised modes such as pedestrians and cyclists emerge the most disadvantaged by this skewed orientation to transport planning (Odero, Sibanda, Njenga, Mbathi, & Opiyo, 2009; Pucher et al., 2005; Salon & Gulyani, 2010; Sietchiping et al., 2012). The disadvantage facing users of non-motorised modes is aggravated by the inferior social presentation of non-motorised modes in many cities (Pucher et al., 2005; Sietchiping et al., 2012; Tapp et al., 2016; Underwood et al., 2014).

Cycling remains particularly neglected by the above orientation to urban transport planning. This neglect is more blatant in fast growing cities of the Global South and particularly those of sub-Saharan Africa (Pirie, 2012; Salon & Aligula, 2012; Sietchiping et al., 2012). In the latter case, scattered efforts that aim to address the needs of non-motorised modes have been dominated by the demand exerted by walking (Pendakur, 2005; Salon & Aligula, 2012). This demand eclipses the visibility of cycling from official statistics, State policies, and project implementation. All these hardly distinguish between walking and cycling, thus making it difficult to decide the kind of attention that ought to be accorded to cycling (see e.g. Pendakur, 2005; Salon & Aligula, 2012). Ambiguous attitudes towards the mode by its

potential users reinforce this inattention to cycling (Cao, Mokhtarian, & Handy, 2007; Pucher et al., 2005; Rietveld & Daniel, 2004).

The above neglect notwithstanding, there is a re-emerging interest in promoting the use of cycling. This interest is founded on the argument that the mode is environmentally clean, space-efficient, and physically healthy (Banister, 2008; Bertolini & Clercq, 2003; United Nations Conference on Housing and Sustainable Urban Development, UNCHSUD, 2016). A number of contemporary researches confirm these positive attributes of cycling. First, the use of cycling has been shown to be consistent with the objectives of Environmentally Sustainable Transport (EST) (e.g. Geurs & van Wee, 2003; Guttikunda & Goel, 2013). These objectives provide that an EST should i) meet the objectives for health and environmental quality such as those set by the World Health Organisation regarding noise and air pollution; ii) not compromise ecosystem integrity by introducing excess critical loads that lead to acidification, eutrophication and ground-level ozone depletion; iii) not result in worsening of adverse global phenomena such as climate change and stratospheric ozone depletion (OECD, 2001 p.14). In terms of space-efficiency, cycling is demonstrated to be capable of transporting more people per unit area of road space than the private car (Kim & Dumitrescu, 2011; Sallis, Frank, Saelens, & Kraft, 2004). This quality is particularly relevant in the context of sub-Saharan African (SSA) cities, where transport planning is mostly inclined to promoting the use of private cars. Figure 1-1 contrasts the amount of space required to transport the same number of people by bicycles and by private cars.

Figure 1-1: The amount of space required to transport the same number of people by bicycles, and by private cars
Photo credit: Cycling Promotion Fund (downloaded and edited on 22.09.2016 with permission from cyclingpromotion.org)

Lastly cycling is also positively associated with health benefits, such as reduced cases of obesity, that derive from active transport (Frank, Greenwald, Winkelman, Chapman, & Kavage, 2010; Rojas-Rueda, Nazelle, Teixidó, & Nieuwenhuijsen, 2012).

Added to the above arguments is the role of cycling in enabling low income earners to move faster and affordably (Dimitriou, 2006; Kim & Dumitrescu, 2011). This role is particularly relevant in the context of sub-Saharan African cities where the majority are captive cyclists and walkers because they can hardly afford the fares charged by motorised modes (e.g. UN-HABITAT, 2010, 2014). A growing body of literature recognises that cycling can make positive contributions to the on-going quest for sustainable transport if it is integrated into the mainstream urban transport (da Silva, Antônio Nélson Rodrigues, da Silva Costa, Marcela, &

Macedo, 2008; Dimitriou, 2006; Zhao, 2010). Enabling the use of bicycles therefore contributes directly to the realisation of sustainable transport objectives of the New Urban Agenda (UNCHSUD, 2016) and Sustainable Development Goals (UNDP, 2015).

The debate on how to actualise the above potential contribution of cycling to sustainable transport is not a recent one. Literature dating as early as 1960s already questioned the efficacy of disproportionate attention that was given to motorised transport in Europe and America at that time (e.g. Bookchin, 1974; Illich, 1974; Jacobs, 1961). The authors argued that the formal planning processes that supported this motorisation were largely out of touch with the lived reality. Accordingly, motorisation produced social, environmental and economic outcomes that led to further exclusion of the underprivileged. For instance, Gorz (1973) points out that investment in motorised transport infrastructure magnified motorisation leading to traffic congestion and the collapse of public transport, cycling and other modes used by the underprivileged. Private cars were further argued to be barriers to social interaction because they concealed drivers behind what was termed as 'steel and glass' (Bookchin, 1974; Gorz, 1973). This earlier debate attempted to package cycling as a tool for achieving inclusive cities in the wake of the disadvantages occasioned by rapid motorisation and growing urban inequality that characterised the period.

Debate on cycling-inclusive transport has over the years centred on redressing the persistent government preoccupation with facilitating private cars to the disadvantage of other modes. This observation is demonstrated by the dominant formulation of cycling concerns as a contestation between the cycling and private car over street spaces (see e.g. Furness, 2010; Jacobs, 1961; Mumford, 1963; Pucher, Buehler, & Seinen, 2011; Pucher, Jan, & Stephen, 2011; Pucher, Komanoff, & Schimek, 1999).

Two parallel arguments have emerged on how to address the above contestation. On the one hand are those who reason that cycling can only be accommodated if the car is eliminated from the streets (e.g. Böhm, Jones, Land, & Paterson, 2006; Mumford, 1963). This thinking however seems impractical because not every urban citizen would be interested in cycling. Besides, eliminating the car can only be realised by limiting the rights and choices of motorists. Doing this runs counter inclusion, which is a key element of sustainability. Other writers (see Furness, 2010) have on the other hand argued that bicycles should share the same infrastructure with motorised modes instead of having their separate provisions. These authors posit that having separate provisions for cycling reinforces the very segregation that bicycle advocates endeavour to redress. The position of these writers is also debatable considering that sharing the same streets in their current forms exposes cyclists to traffic accidents caused by motorised modes (Manyara, 2016; Parkin, Wardman, & Page, 2007). The possibility of accidents that pit cyclists against motorists is even higher in the case of sub-Saharan African cities, where traffic congestion and negative driver attitudes towards cyclists make cycling even riskier (Gwilliam, 2003; Odero et al., 2009). In deed researchers like Parkin et al. (2007) have shown that the perceived risk of accidents involving cyclists and motorised modes is a major deterrence to cycling.

A seemingly convincing approach to the question of cycling is presented by Chin (1996), Jacobs (1961), and Poudenx (2008). These authors underscore the importance of grounding this question within the broader socio-economic context that surrounds the use of bicycles. They

specifically present the need to redress the neglect of cycling through a positive orientation to unregulated motorisation. This orientation shifts the focus onto making cycling competitive rather than simply banning cars from the streets. At the same time, it calls for a re-examination of the imbalanced power relations between cycling and motoring. The position taken by these authors leads one to wonder about the theoretical underpinning upon which the narrative of cycling could be investigated and be advanced. This curiosity is strengthened by the observation that current literature on cycling has mainly collected anecdotes of best practices but hardly theorised on how to achieve these best conditions (Koglin & Rye, 2014).

Useful lessons for improving the competitiveness of cycling suggested above can be drawn from the accessibility concept. Accessibility is an indicator of the ease with which the convergence of land-use and transport conditions enables participation in spatially-disjointed activities (Dalvi & Martin, 1976; Hansen, 1959). Findings from accessibility research (e.g. Bocarejo & Oviedo, 2012; Geurs & van Wee, 2004; Karou & Hull, 2014) suggest that improving the land-use and transport conditions for cycling could enhance its competitiveness. A number of questions have to be addressed to achieve this though – What are the barriers to accessibility by bicycles? Whose accessibility is hindered? How do the power relations that (in) validate the claim to street spaces by various modes shape this accessibility? What policy processes produce the extant accessibility? Finding how transport-related social exclusion feeds onto these questions lies at the core of this dissertation. The dissertation specifically focuses on unearthing how social exclusion is manifested in and reinforced by biased land-use organisation, transport infrastructure and service provision, and allocation of street spaces to different modes. These biases are argued in this dissertation to create conditions that hinder cycling. The aim of exposing them is thus to improve the conception of barriers to accessibility for the mode.

This section has pointed out that cycling can make some positive contributions to the quest for sustainable transport. The next section builds this position by contrasting the possible lessons that can be drawn from cities that have facilitated cycling against those that have not.

1.2 Why cycling?

Current efforts to tackle the challenges that face cycling are founded on weak theoretical basis (Koglin & Rye, 2014). Due to this, the reason why cities should commit their resources to the mode remains contentious especially in the Global South (see e.g. Duarte, Procopiuck, & Fujioka, 2014). This section assembles a basis upon which attention to cycling in sub-Saharan African cities could be founded. It draws lessons from cities that have intervened in cycling, those that have not, as well as the emerging international development goals and local reforms in sub-Saharan African cities.

1.2.1 Lessons from the interventionists

Studies show that indicators of urban liveability, such as accessibility and inclusivity, improve when cities develop infrastructure and traffic regulations that support cycling (Cervero, Sarmiento, Jacoby, Gomez, & Neiman, 2009; Hunt & Abraham, 2007; Pucher & Buehler, 2008; Replogle & Kodransky, 2010). A review of the cities that have recorded positive developments on these indicators after investing in cycling is given by Duarte and Rojas (2012), Furness (2010), Pucher and Buehler (2007) and other authors. Among the cities are

Amsterdam, The Netherlands; Münster, Germany; Copenhagen, Denmark; Portland, Oregon, USA; Bogota, Colombia; Ahmedabad, India; and Guangzhou, China. Münster has for instance curved an identity as a vibrant and attractive city due to its transport infrastructure that makes cycling attractive to both genders, different age-groups, different income groups and diverse professions (Pucher & Buehler, 2007). In Bogota, the inclusion of bicycle infrastructure has enabled cycling to supplement the city's Bus Rapid Transport (BRT), private cars and taxis. The modal share of cycling and walking is in this case estimated to be 17% and accounts mostly for feeder trips between the BRT stops and the city's residential places (Duarte & Rojas, 2012). In Portland, Oregon, Furness (2010) shows that cyclists are among the happiest commuters due to their ability to manoeuvre traffic jams, which are otherwise frustrating for car drivers.

In contrast to the above, cycling in many sub-Saharan African cities remains largely unsupported in spite of its role in enabling faster and cheaper accessibility to jobs, schools, health facilities, market places and other destinations. This role is exemplified by its active use in cities such as Tamale in Ghana (Abane, 2011), Ouagadougou in Burkina Faso (Pochet & Cusset, 1999), Kisumu, Busia, Kakamega and Eldoret in Kenya (Pirie, 2012; UN-HABITAT, 2004), Pretoria in South Africa (Bechstein, 2010), Morogoro in Tanzania, Jinja and Kampala in Uganda (Howe, 2003; Pirie, 2012) among others. It is estimated that the modal share of cycling could be as high as 37% in some of these cities (e.g. Ouma, 2009). However, its actual share remains unclear because it is shrouded in statistics that lamp cycling and walking together as non-motorised modes (e.g. Kim & Dumitrescu, 2011; Odero et al., 2009). Such unclear statistics hamper the estimation of the form and depth of attention that cycling requires. This lack of clarity is worse in cities where cycling commands a noticeable yet poorly documented modal share. Among these cities are Quelimane (Mozambique), Kumasi (Ghana), Nairobi, Kakamega, and Busia and Eldoret in Kenya. Although cycling is actively used in many sub-Saharan African cities, it is hardly allocated any commensurate spaces on the streets nor is it supported by the extant traffic regulations (Pirie, 2012; Pochet & Cusset, 1999; Sietchiping et al., 2012).

Unsupportive conditions discourage cycling because they render the mode unsafe and unattractive (Parkin et al., 2007; Salon & Aligula, 2012; Sietchiping et al., 2012). Consequently, its use is mainly restricted to the captive cyclists whose choices are limited to either walking or cycling (Diaz Olvera et al., 2013). Evidently, cycling offers the captive cyclists a faster alternative to walking. Although negative social representation of cycling has been argued to exacerbate its disadvantaged position (e.g. Sietchiping et al., 2012), lack of access to bicycles and poor infrastructure are suggested to constrain the mode most (Kim & Dumitrescu, 2011; Odero et al., 2009; Salon & Aligula, 2012). Recent researches seem to suggest that negative social representation of the mode is not the main deterrence to cycling (e.g. Gatersleben & Appleton, 2007; Salon & Aligula, 2012). The authors invariably show that a significant majority would be willing to cycle if they had access to bicycles and if the road infrastructure made it safe to do so.

Active cycling in Tamale and other cities that have made efforts to improve the conditions of cycling confirm the willingness of people to cycle when the infrastructure supports the mode. A number of road sections in Nairobi have also recorded increased volumes of cycling thanks to a new infrastructure programme that aims to make the roads safe for all road users in the city

(Ooko, 2014). Increased modal share of cycling in these cities (see also Godard, 2013; Pochet & Cusset, 1999; Wilson, 2002) demonstrates that social appeal exerts a secondary deterrence on cycling if the existing infrastructure supports it. These revelations arouse curiosity as to whether focusing on addressing the accessibility needs of the captive cyclists presents a more proactive entry point to the question of cycling in sub-Saharan African cities. I explore this question in chapter 6.

The experiences discussed above lend valuable lessons to planning for cycling in sub-Saharan African cities.

To begin with, it is demonstrated that facilitating accessibility – rather than mobility – constitutes a higher and more inclusive objective of sustainable transport planning (Bertolini, Le Clercq, & Kapoen, 2005; Frank et al., 2010; Geurs & van Wee, 2004; Iacono, Krizek, & El-Geneidy, 2010). In their analysis of a number of European cities, the authors conclude that the main reason why people engage in trip making is to partake in activities that are spatially disjointed rather than simply to travel for its own sake. The findings of these authors thus present evidence for a paradigm shift away from planning that facilitates mobility as its main concern. Such has dominated transport planning in sub-Saharan African cities and other parts of the world. In this regard, enabling the modes that increase this accessibility should thus form the core objective of transport planning in sub-Saharan African cities. This reorientation is particularly relevant in enabling the users of neglected modes to access destinations that would enable them to productively engage in different socio-economic activities.

The experiences reviewed in this section also reiterate that investing in alternative modes such as cycling can mediate the achievement of the objectives of sustainable urban transport (Bertolini et al., 2005; Pucher, Buehler et al., 2011). This is especially so in the case of short distances within cities. It is shown that the past two decades alone have witnessed a renewed commitment by cities to integrate the use of bicycles as a component of urban transport (Banister, 2005, 2008; Cervero et al., 2009; Lanzendorf & Busch-Geertsema, 2014). Underlying this commitment is the growing realisation by these cities that cycling can help them reduce some of the contemporary urban transport challenges like traffic congestion, pollution and the widening inequality gap with regard to accessing transport services (Currie et al., 2010; Pucher et al., 2005; Rees, 2003; Sietchiping et al., 2012). The authors partly attribute these challenges to lack of attractive alternatives to the car coupled with a growing attitude towards travelling as an end in itself rather than a means to an end.

It is within the context of the pursuit of the above objectives of sustainability that cities such as London (Jones, 2012; Pooley et al., 2013), Paris (Sayarshad, Tavassoli, & Zhao, 2012), Brisbane (Fishman, Washington, & Haworth, 2012), Berlin (Pucher, Dill, & Handy, 2010) and Bogota (Duarte & Rojas, 2012) and a growing list of others have embarked on pro-cycling infrastructure and policy programmes. It is hoped that these programmes will make cycling convenient and attractive, ultimately contributing to a reduction in the dominance of the car. This unfolding thinking is particularly relevant in the context of sub-Saharan Africa cities, where the contemporary urban transport challenges are now exposing the shortcomings of transport policies that pay little attention to modes other than automobiles (e.g. Gwilliam, 2003; Manyara, 2016; Watson, 2014). It is conspicuously ironical that transport planning is these cities remains uncommitted to supporting non-motorised modes yet the prevailing poverty locks

out as many as 60% of their population from motorised transport (see e.g. Diaz Olvera et al., 2013; Pendakur, 2005).

1.2.2 Lessons from laissez faire policies on cycling

The need for sustainable urban transport options is fast commanding research attention thanks to the emerging ecological and socio-economic challenges posed by the contemporary urban transport (Pucher et al., 2005; Rees, 2003; Sietchiping et al., 2012). Researchers have partly attributed these challenges to the skewed transport strategies that neglect sustainable options such as cycling while placing a premium on motorised transport.

From ecological perspective alone, it is estimated that motorised transport is responsible for over 90% of urban air pollution and accounts for above 17% of global greenhouse gas emissions (International Energy Agency, 2010; Kim & Dumitrescu, 2011). Air pollution is responsible for increasing cases of cardiovascular diseases and is one of the leading causes of death in the world (Su, Chen, & Chan, 2011; WHO, 2009a; Yamamoto, Phalkey, & Malik, 2014). On the other hand, greenhouse gases are responsible for global warming and its associated challenges such as loss of biodiversity, melting of polar glaciers and threats of submersion of coastal cities (Courchamp, Hoffmann, Russell, Leclerc, & Bellard, 2014; Parker, 2014).

Another challenge posed by the current auto-centric focus of urban transport planning is that it propels unsustainable energy consumption. It is estimated that transport as a whole consumes almost 25% of global energy (International Energy Agency, 2010). Available studies suggest that urban transport contributes a significant proportion of this demand due to the concentration of travel densities in cities (e.g. Böhler-Baedeker & Hüging, 2010; Kim & Dumitrescu, 2011; Lo, 2016). The main concern with this level of consumption is that 90% of the energy derives from non-renewable fossil fuels (Kim & Dumitrescu, 2011; Ribeiro et al., 2007). The sustainability of the current transport strategies that fuel, rather than manage, motorisation is thus put to doubt if one considers the realities of world peak oil (see e.g. Aftabuzzaman & Mazloumi, 2011; Chapman, 2014). The world peak oil is that point at which the global output of conventional oil reached its maximum and subsequent flows went down (Bowden, 1985).

The above environmental challenges associated with motorisation will continue to pose a challenge to urban sustainability and liveability for as long as no proactive strategies are put in place to redress them (Courchamp et al., 2014; Parker, 2014; Su et al., 2011; WHO, 2009a, 2009b). While cycling on its own cannot address these challenges, making the mode attractive can ameliorate the situation by attracting some of the travel demand that is currently met by motorised modes. This is especially the case in the Global South where many get into motorised transport (especially motorcycling) because of a lack of affordable alternatives to it (see e.g. Cervero & Golub, 2007). It is therefore unsettling that the number of cars is projected to triple by the year 2050 and that the effect of this increase will mostly be felt in cities of the Global South if the current preoccupation with motorisation persists (International Energy Agency, 2010; Kim & Dumitrescu, 2011).

Sub-Saharan African cities can draw lessons from the challenges that face other cities of the Global South whose transport planning has mainly focused on enabling motorisation. I take a

closer examination of the transport-related challenges that face some Asian cities in order to understand the shortcomings of their transport planning that engendered their current challenges. I should point out that the transport-related challenges facing these Asian cities typify the catastrophe that is in the offing for many sub-Saharan African cities if their current transport planning orientation persists. This is because current transport development patterns of many sub-Saharan African cities seem to trail the trajectories that were followed by these cities. For instance, the use of motorcycling for transport is an emerging development in many sub-Saharan African cities (see e.g. Diaz Olvera, Guézéré, Plat, & Pochet, 2016) but yet a major cause of urban transport challenge in many Asian cities (see e.g. Cervero & Golub, 2007). Transport planning in the sub-Saharan cities can draw lessons that enable them to leap-frog some of these urban transport challenges that face Asian cities.

Urban environmental challenges characterised by massive traffic congestion, unsustainable consumption of non-renewable energy, air and noise pollution are already a major threat to the development of many Asian cities (Cervero & Golub, 2007; Guttikunda & Goel, 2013; Gwilliam, 2013). As a result, some of the worst outdoor air pollution are found in these Asian cities where pollution is responsible for over half a million premature deaths per annum (Qizhi et al., 2012). These deaths are attributed to the inhalation of particulate matters (PM), volatile organic compounds (VOCs), carbon monoxide (CO), Nitrogen Oxides (NOx), and Sulphur Oxides (SOx) (Guttikunda & Goel, 2013; Liu, Yan, Birch, & Zhu, 2014; Qizhi et al., 2012; Truc, Vo Thi Quynh & Kim Oanh, Nguyen Thi, 2007; Zhao, 2010). Transport alone is estimated to contribute the largest proportion of these fatal air-polluting gases. For instance, Chin (1996) estimates that transport accounts for over 65% of outdoor air pollution in Singapore. In Delhi, Guttikunda and Goel (2013) reveal that motorised transport is responsible for the highest percentage of NOx, CO and VOC pollutants. Consistent results are revealed in Karachi, Delhi, Colombo, Kathmandu, Dhaka, Bangkok, Surabaya and other Asian cities that have witnessed rapid growth in motorisation in the recent past (Faiz & Sturm, 2000; Masud, 1999; Truc, Vo Thi Quynh & Kim Oanh, Nguyen Thi, 2007). Transport planning in these cities has been unable to address these challenges, partly due to its focus on encouraging car ownership and use (Dahiya, 2012; Gwilliam, 2003; Hook & Replogle, 1996). Moreover, transport planning in these cities pays little attention to non-motorised transport options such as cycling in spite of the potential they have in ameliorating the situation (Gwilliam, 2003; Munshi, 2016). The effectiveness of strategies such as pollution reduction and Bus Rapid Transit (BRT) that aim to reduce environmental challenges associated with transport in these cities is discounted by rapid growth in car ownership and use (Dahiya, 2012; Gwilliam, 2003; Gwilliam, 2013).

A section of disadvantaged commuters has also emerged in the above Asian cities thanks to their skewed transport policies and strategies that mainly favour motorisation (Dahiya, 2012; Grieco, 2015). The exact number of these disadvantaged commuters seems undocumented. Nonetheless, research indicates that they face multiple disadvantage because they can afford neither the private cars nor the services offered by buses and trains (Grieco, 2015; Qizhi et al., 2012). Accessibility for this group is hindered not only by increased motorisation but also by ambivalent focus of transport planning towards the modes they use. While increased motorisation has made it unsafe for them to walk and cycle, transport planning has on its part exacerbated their disadvantage by failing to influence the supply of quality infrastructure that supports the modes they use.

The above mismatch between demand and supply of transport infrastructure and service has seen the emergence and unsustainable growth of motorcycles and rickshaws as alternative modes to bridge the gap (Cervero & Golub, 2007; Qizhi et al., 2012). In Hanoi for instance, motorcycles account for over 90% of the modal share (Truc, Vo Thi Quynh & Kim Oanh, Nguyen Thi, 2007). The impact of this 'affordable' mode has been to reinforce negative externalities of transport that already afflict the cities (Gwilliam, 2013; Liu et al., 2014; Liu, Dong, & Qian, 2013). It is estimated that there are over 100 million two-stroke motorcycles in South-East Asia alone (Potera, 2004). These two-stroke motorcycles account for 50 times more pollution when compared to the four-stroke motorcycles (Potera, 2004). This is not to mention increased traffic jams caused by increased motorcycling.

It is projected that without deliberate and informed intervention, rapid growth in motorisation will trigger similar environmental challenges in sub-Saharan African cities. This projection is based on studies conducted in principal cities such as Nairobi (Klopp, 2011), Kumasi (Abane, 2011), Johannesburg, Lagos and Kampala (UN-HABITAT, 2014). All these cities already experience the challenges that are similar to those of Asian cities albeit of lower magnitudes. It is predictable that these challenges will cascade to their secondary counterparts considering that the development patterns of these secondary cities have historically followed the paths taken by the principal cities. While it is expected that growth in motorisation will always trail economic growth, emerging researches suggest that the pace of motorisation and its associated externalities can be slowed down if cities pursue deliberate strategies that make cycling attractive (e.g. Lanzendorf & Busch-Geertsema, 2014; Poudenx, 2008; Pucher & Buehler, 2008).

Similar to the Asian cities, comparable withdrawn attitude towards non-motorised modes is evident in sub-Saharan African cities (Klopp, 2011; Salon & Aligula, 2012; Steyn, 2012). Interestingly, cycling in this case is sometimes viewed as a cause of transport problems rather than a valid agenda of transport planning (see e.g. Alal, 2014; Municipal Council of Kisumu, 2009). This, despite its active use for both personal and passenger transport (de-Langen & Tembele, 2001; Howe, n.d.; Mutiso, 2010). Due to these unsupportive attitudes, the attractiveness of cycling has continued to decline in many sub-Saharan African cities as governments intervene to 'modernise' the transport sector to match the economic gains made by the cities (see Government of Kenya, 2007; Institute of Economic Affairs, 2008; Steyn, 2012; Watson, 2014). Inattention to cycling coupled with seemingly naïve popularisation of motorcycles by the State coincides with rapid increase in motorcycling over the past fifteen years (Diaz Olvera et al., 2016; Dinye, 2013; Howe, 2003; Olawo, Ochieng, Ombok, & Achieng, 2014). In Kenya for instance, the State encourages motorcycling because it believes that the mode offers a modern and affordable means of travelling for the urban poor (see e.g. Institute of Economic Affairs, 2008; Nyachieo, 2013; Olawo et al., 2014).

The above orientation to transport planning does not internalise the full socio-environmental and traffic externalities of motorcycling that are already evidenced by Asian cities. But even more important for the current study is the evident lack of understanding of the possible contribution of motorcycling to worsening the transport disadvantage that faces sub-Saharan African cities. With urban poverty reaching as high as 60% in some of its cities (UN-HABITAT, 2014), the extent to which current transport policies and strategies enhance inclusion in transport remains unclear. I explore the answers to this concern in chapter 6.

Unchecked motorisation is not just environmentally and socially costly though; it is economically expensive as well. A number of cities of the Global South are reported to incur huge losses due to traffic congestion that delays the delivery of goods, services and workers. In metropolitan Bangkok for instance, rapid motorisation results in a daily loss of 3 million person-hours due to average daily traffic delays that last between two to three hours (Cervero, 2000). Comparable traffic delays have been reported in Nairobi, Khartoum, Lagos, Luanda, Maputo and Johannesburg among other sub-Saharan African cities as well (Amoh-Gyimah & Aidoo, 2013; UN-HABITAT, 2014). A quantification of the cost of these delays in Nairobi reveals that the city loses up to Ksh. 50 Million[2] per day to traffic congestion (McGregor & Doya, 2014). This loss is attributed to lost fuel and time, stress as well as environmental degradation that result from this congestion (McGregor & Doya, 2014). Although the city has significantly expanded its road capacity over the last ten years to curb traffic congestion (see Kenya National Highways Authority, KeNHA, 2013), congestion seems to reduce only in the immediate term but soon worsens again. This observation is confirmed by studies which show that congestion and its associated economic losses are actually increasing over the years (e.g. Gori, 2014).

The foregoing revelation casts doubts on the sustainability of the current focus on expanding road capacity for motorised transport as though it is the panacea for the traffic problems that face sub-Saharan African cities. Evidence from other parts of the world shows that increased capacity reinforces demand for its use by influencing new land-use development and additional motorisation along new transport corridors (e.g. Doi & Kii, 2012; Wegener, 2013). It is similarly theorised that trip-makers often have a fixed time budget and would therefore travel longer distances in order to exhaust the time savings occasioned by a new infrastructure (Zahavi, 1974). On account of this body of evidence and theory that explains travel behaviour, it makes sense that infrastructure supply efforts aimed at meeting projected travel demand be accompanied by management of that very demand. Meyer (1997) defines transport demand management (TDM) as '*any action or set of actions aimed at reducing the impact of traffic by influencing people's travel behaviour*' (p.107). Among the TDM strategies are investments in alternative modes of transport and provision of incentives to make such alternatives attractive to commuters. Transport planning in many sub-Saharan African cities as exemplified by the case of Nairobi seems not to have paid deliberate attention to demand side policies and strategies. Consequently, their focus on motorised transport reinforces car dependence while at the same time discouraging modes such as cycling by rendering them unsafe and unpopular. This raises questions whether cycling could have other potential beyond transporting the poor in these cities. Chapter 7 explores this possibility.

1.2.3 The rising visibility of cycling in sub-Saharan African cities

Besides the challenges posed by air pollution and traffic congestion, the ongoing socio-political reforms in sub-Saharan Africa cities now compel governments to pay attention to inclusive transport. These reforms recognise the need for sustainable transport solutions that protect the needs of the modes that are typically used by socially marginalised commuters (e.g. Government of Kenya, 2009; Nairobi City County Government, 2015; Republic of South Africa, 2008). Studies have shown that cyclists in sub-Saharan African cities are often marginalised by transport planning due to their low socio-economic and political status (Diaz

[2] US $ 1 = Ksh. 86.50 when the report was released

Olvera et al., 2013; Watson, 2014). Moreover, the majority of them reside in deprived areas that are hardly served by decent transport infrastructure and service (Grieco, 2015; Lucas, 2011; Salon & Gulyani, 2010). Tackling these disadvantages is partly the reason for the growing attention to cycling and other intermediary travel modes.

The ongoing reforms offer an opportunity to challenge the marginalisation of cyclists presented above. Specifically, these reforms guarantee individuals the basic fundamental rights which must be recognised, respected and protected. Chapter 6 of the Kenyan Constitution for instance guarantees Kenyan citizens the right against discrimination on the basis of their social status, as well as the right to inherent dignity which must be respected and protected (Government of Kenya, 2010a). The constitution further guarantees Kenyan consumers the right to goods and services of reasonable quality (Section 69). These reforms raise three fundamental questions about cycling: i) can transport infrastructure be viewed as a public good? ii) what quality of this good addresses the demands of its different users? and iii) what is the role of transport planning in delivering this good? These questions are explored in chapter 7.

Aside from the above reforms, there is also a growing research attention that supports the recognition of informal modes of transport such as cycling by the State (Lucas, 2011; Salon & Aligula, 2012; Salon & Gulyani, 2010). These researchers suggest the need to make these modes safe by providing them with supportive infrastructure and traffic regulations. Their suggestions are founded on the observation that informal modes play an important role in filling the supply gaps created by the conventional transport system (Cervero, 2000; Gwilliam, 2003; Howe, 2003; Pendakur, 2005). The conventional transport sub-Saharan African has been described as quasi-formal and generally inefficient, inadequate and predisposed against the poor (e.g. Lucas, 2011; Sietchiping et al., 2012).

Growing attention to cycling is further grounded on the international development targets and commitments on inclusive development. The recently adopted New Urban Agenda (UNCHSUD, 2016) and the revised Sustainable Development Goals (UNDP, 2015) are particularly compelling in this regard. Five commitments that specifically address the question of cycling are identified by the New Urban Agenda. These include i) the promotion of safe, inclusive, and accessible public spaces, including streets and cycling lanes (paragraphs 37 and 100). These spaces are viewed as areas of social interaction and inclusion; ii) enabling the participation in social and economic activities by supporting accessible, efficient, affordable, and sustainable infrastructure for public transport as well as non-motorised options such as cycling (paragraph 114); iii) encouraging governments at different levels to develop and expand financial instruments to improve transport and mobility infrastructure systems including adequate cycling infrastructure (paragraph 118); and iv) improve road safety for cyclists (and pedestrians) through transport infrastructure planning and design. The target here is to prevent injuries and non-communicable diseases which have notably been on the rise in developing countries with the emergence of motorcycling (paragraph 113). Investing in cycling is therefore relevant in realising inclusive, resilient, and sustainable cities (UNDP, 2015, goal number 11). This is especially the case in sub-Saharan African cities where transport disadvantage restricts the participation of people from socio-economic opportunities and even transport itself (see e.g. Salon & Gulyani, 2010). Facilitating cycling also links positively with other targets that aim to reduce inequality and to improve access to education.

This section has discussed various reasons why sub-Saharan African cities should pay attention to cycling. It reveals various arguments upon which the support for cycling has been advanced in cities that have invested in the mode. At the same time, parallels are drawn between transport development trajectories of Asian and sub-Saharan African cities to demonstrate the challenge posed by the current preoccupation with facilitating motorisation. The revelation of cycling promotion efforts in some sub-Saharan African cities shows that transport planners in the region are aware of the need for cycling-inclusive transport. This awareness is supported by a number of local and international commitments that consolidate it. Despite all these, transport planning has not resulted in a meaningful inclusion of cycling in sub-Saharan African cities. What then could be missing? The next section questions the adequacy of the current tools of evaluating transport plans to identify the need for cycling in these cities.

1.3 Adequacy of transport evaluation tools to support cycling

In spite of the recognition of the need to facilitate cycling in sub-Saharan African cities, transport policy and infrastructure development remain reactionary and seemingly at variance with this objective. There is an evident mismatch between the intentions of governments to support cycling and the actual implementation of infrastructure and policies that validate these intentions (See e.g. Sietchiping et al., 2012; UN-HABITAT, 2010; Wilson, 2002). Consequently, a number of transport projects that have been implemented in the region hardly address the needs of cycling. These projects are specifically characterised by unclear targets relating to cycling, weak budgetary allocation to the mode, and a general inclination to tackle cycling concerns as though they are separate from urban transport (see e.g. African Development Bank Group, AfDB, 2013c; Carruthers, Krishnamani, & Murray, 2009; Government of Kenya, 2007). The role of cycling in addressing challenges such as traffic congestion, pollution, accessibility, and affordability that are pursued by these projects seems discounted in practice.

Ongoing transport projects in sub-Saharan African cities confirm the ambiguity with which cycling concerns are addressed in the region. In Kenya for instance, plans to provide for cycling in the ongoing infrastructure projects seem to be abandoned at project implementation stage. Although the official designs of these projects sometimes envision the need to cater for non-motorised modes including bicycles, these visions are hardly translated into the actual project implementation (see e.g. AfDB, 2013b; World Bank, 2004). Provision for non-motorised modes is instead narrowly interpreted as catchphrase for the provision of pedestrian facilities. The focus has been predominantly on pedestrian walks and overpasses. The recently launched Bus Rapid Transit project in Dar es Salaam demonstrates yet another dimension of unclear attention to cycling. In this case, the design of the streets does not proactively accommodate cycling but instead only states that the mode will be provided for '*whenever possible*' (AfDB, 2015, p.5). The implications of such ambiguities on the ease of cycling remains less understood.

The ease with which cycling is sidestepped by transport projects raises doubts about the adequacy of current transport evaluation criteria to identify its relevance in sub-Saharan African cities. So far, these criteria have focused on the ability of transport projects to generate rapid economic growth, minimise environmental degradation and cause minimum negative social impacts (e.g. Carruthers et al., 2009; Onishi, 2014; Pendakur, 2005). Although these objectives are plausible and necessary (see Section 1.2), invisibility of cycling from

ongoing projects suggests that the tools used to evaluate transport decisions require additional information to enable them identify the need to accommodate cycling.

The current tools include Cost-Benefit Analysis (CBA), Environmental Impact Assessment (EIA), and Social Impact Assessment (SIA). The application of first set of tools results in the most cost-efficient projects (Dreze & Stern, 1987) while the second set identifies and mitigates negative environmental impacts associated with a project and enhances their positive impacts (Jay, Jones, Slinn, & Wood, 2007). Lastly, Social Impact Assessment identifies and manages the social impacts that are generated by planned interventions (Vanclay, 2015). The application of these tools in supporting transport decisions has been discussed by various authors (e.g. Jones, H., Moura, F., & Domingos, T., 2013; Kopp, 2011). Social Impact Assessment is of particular interest in this current dissertation. Although it is concerned with the broad social issues that arise from development projects, its use in supporting transport decisions is evidently reactive rather than proactive to motorisation (see e.g. AfDB, 2013b, 2015; Vanclay, 2015). Consequently, the tool can identify the social impacts of motorisation but does not proactively spell out the minimum social conditions that transport decisions ought to support. Bridging this gap is the central concern of this dissertation.

1.4 Why medium-sized cities?

The current dissertation deliberately focuses on medium-sized sub-Saharan African cities. This is because this is where poverty and transport exclusion predominate yet they remain mostly invisible from research and policy. Policies that guide transport development in these cities are traditionally formulated by the national governments on the basis of studies that are done in their capital cities. It is not uncommon for such policies to borrow from experiences that worked in other countries without domesticating their provisions to the local contexts (see e.g. Watson, 2009b, 2014). The implication of this policy arrangement is that transport development in these medium-sized cities is hardly realistic to their local conditions. This dissertation grounds the global discourse on cycling upon the local realities of medium-sized sub-Saharan African cities. The modal composition that is characterised by a large share of Non-Motorised Transport that is hardly facilitated provides a basis for understanding the transport disadvantage that results from transport planning as practiced in this region.

My choice of medium-sized cities is also informed by the projections that show that they will contribute the most to rapid urbanisation in Africa (UN-HABITAT, 2014). Given their development trajectories that trail those of their principal counterparts, it is arguable that they will be faced with similar transport challenges encountered by the latter unless they intervene now. These cities will thus be the enclaves of poverty and inequality that goes hand in hand with the transport challenges that are currently witnessed in their larger counterparts. This makes it necessary to understand their transport situation and put in place measures to make it sustainable before it gets out of hand. An opportunity to forestall the challenges that face their principal counterparts in presented by their small sizes, active cycling and weakly established travel behaviours that favour motorisation. Poudenx (2008) observes that it is easier to change behaviour towards more sustainable modes when such behaviour are still weak. On the strength of this observation, I argue that medium-sized cities present an opportunity to theorise on cycling inclusion based on both the active and potential travel behaviour.

Empirical investigations of the study are based in Kisumu, Kenya. Kisumu is an active cycling city with transport challenges that typify those of other medium-sized sub-Saharan African cities (UN-HABITAT, 2004, 2005). Most recent estimates indicate that there were about 8,000 bicycle taxis used for delivering light freight and services as well as for commuting to work, schools and colleges, and for running errands (UN-HABITAT, 2004). There is also a sizeable number of private cyclists that remains undocumented. Figure 1-2 exemplifies some of the uses of the bicycle in Kisumu.

Figure 1-2: Various uses of the bicycle in Kisumu

Photo credit: Author, various dates

Despite this active use of the bicycle, there is no concomitant infrastructure and traffic provision to support the mode. This leads to increased motorised traffic congestion and accidents due to competition that pits cyclists, motorists, and pedestrians over the available street spaces. Lack of provision for cycling seems to generate a collateral inconvenience for cyclists and other road users alike. I detail the methodological basis for selecting Kisumu in chapter 3.

Although cycling is not restricted to the poor, I have deliberately chosen to focus on them because of three reasons that I considered important in the context of the ongoing discourse on sustainability and inclusive cities: *i*) they comprise the majority of cyclists in Kisumu; *ii*) lack of infrastructure and traffic provision that support cycling affects them the most by restricting their participation in mobility and socio-economic opportunities; *iii*) making it safe for them to cycle improves the conditions for potential users who could be reluctant to cycle due to the current unsupportive conditions. I argue that prioritising the needs of the poor could form a basis for making cycling attractive to other socio-economic groups. This prioritisation hence has the

potential to make cycling useful in ameliorating other transport challenges such as environmental pollution and traffic congestion.

1.5 Positioning cycling within the wider urban transport system

Cycling is certainly not a panacea for urban transport challenges in spite of its potential to address some of these challenges (see e.g. Pucher & Buehler, 2008). It must be understood that urban transport is a complex system that demands multidimensional solutions. Such solutions must focus on both the supply and demand sides and remain in agreement with environmental, social, and economic sustainability. A discussion of some of these solutions is offered by Banister (2008), Bertolini et al. (2005), Cervero et al. (2009), and OECD (2001) among other authors. It should be pointed out that no city has focused only on one solution and succeeded in sustaining its urban transport. It is within this context that cycling should be understood as one of the options that ought to be pursued in conjunction with other options.

1.6 Problem statement

Economic and social analysis tools used to support transport decisions are inadequate to identify the need to facilitate cycling in sub-Saharan African cities. These tools are specifically incapable of prioritising infrastructure and traffic conditions that support cycling. First, the use of economic tools such as Cost-Benefit Analysis prioritises projects that yield highest economic returns (e.g. Onishi, 2014) but fails to recognise the use value of complementary projects that permit cycling. This failure discounts the relevance of supporting cycling, considering that the mode yields negligible economic returns when compared to its motorised counterparts. Although Social Impact Assessment holds the potential to reveal this relevance, its capability is diluted by its current orientation that is evidently reactive rather than proactive to motorisation. This orientation limits its ability to proactively identify the social conditions that transport decisions ought to support. Yet it is mainly due to disadvantaged social conditions such as poverty that majority of people cycle in sub-Saharan African cities. The use of both economic and social tools to evaluate transport decisions ignores the need to support the underlying reasons why people cycle in sub-Saharan African cities.

The limitations identified above are compounded by the competing demand to improve the poor state of transport infrastructure that supports motorisation in these cities (See Trans-African Consortium, 2008). This competing demand makes the need to facilitate cycling a peripheral concern because investments that facilitate motorised transport are often seen to generate higher economic returns (Ascher & Krupp, 2010). Besides, such investments are a powerful political campaign tool and are a symbol of 'modernity' in the eyes of the predominant modernist transport planning inclination in the region (Steyn, 2012; Watson, 2014). Modernity in this context is a catchphrase for transport infrastructure conditions that are based on aesthetic formalism and technology that reproduce those of the Western societies (Hobson, 1999; Holston, 1995; Watson, 2009b, 2014). Often, these ignore the local practices and social realities. The result of this modernist inclination and the use of transport evaluation tools highlighted earlier is that cycling concerns are either ignored or simply relegated to erratic political goodwill of the day (Jones, S., Tefe, M., & Appiah-Opoku, S., 2013; Sietchiping et al., 2012).

The recent emergence of motorcycling as an alternative mode for passenger transport in sub-Saharan African cities further complicates the difficulty of identifying the need to support cycling. While motorcycling has been popularised as a 'modern' mode for the poor (e.g. Dinye, 2013; Institute of Economic Affairs, 2008), its implication for the need to facilitate cycling in the region remains unclear.

The above discussion shows that the orientation of transport planning, its tools and emerging trends cannot expose the need to facilitate cycling in sub-Saharan African cities. This, despite the fact that the majority of cyclists in this region comprise the socially disadvantaged. In view of this contradiction, the current dissertation questions if the concept of social exclusion could offer a basis for revealing the need to support cycling. Social exclusion is said to occur when a powerful class uses the social, cultural and institutional power it wields to restrict access to valued resources from the underprivileged (Silver, 2007). In the context of transport in sub-Saharan African cities, transport planning has been shown to produce auto-centric street spaces that restrict the use of these spaces from cycling and other socially inferior modes (Pochet & Cusset, 1999; Salon & Aligula, 2012). This study therefore specifically questions whether the restrictions imposed on cycling by transport planning in Kisumu can reveal the need for street spaces and traffic conditions that support its use.

1.7 Objectives

The main objective of this dissertation is to find out whether, and the extent to which, the concept of social exclusion can offer a complementary framework for identifying the need to support cycling in Kisumu. I hypothesise that lack of infrastructure and traffic conditions that support cycling is a manifestation of the wider social exclusion of its users due to their low socio-economic statuses. Based on this premise, I reason that the need to facilitate cycling can be understood better if its active restriction from street spaces together with the processes that generate this restriction are made clear. I therefore pursue three specific objectives to help me realise the objective of this study: *i*) to find out how street space and traffic conditions relate to the exclusion of cyclists of Kisumu; *ii*) to find out the implications of the changing policy conditions for the inclusion of cycling in Kisumu; and *iii*) to explore the extent to which social inclusion can be used to frame cycling-inclusive transport policies in Kisumu.

The dissertation poses a central research question that narrows down each of the above specific objectives to its researchable units. With regard to the first specific objective, the study seeks to find out whether and the extent to which the current street spaces and traffic conditions restrict cycling from the streets. For the second objective, the study seeks to understand how the choice to cycling is shaped by changes in infrastructure and traffic conditions that result from changes in transport-related policies. Lastly, the study questions how social inclusion could be framed as a benchmark for analysing the components of transport planning that lead to the exclusion of cycling.

1.8 Structure of dissertation

The remaining part of this dissertation is organised in 6 chapters.

The second chapter assembles the theoretical framework that underpins my critique of the current lack of attention to cycling in sub-Saharan African cities. This chapter draws on the social quality theory, right to the city, critical urban theory and accessibility concept to argue that the present restriction of cycling from these cities is not only unacceptable; it is an infringement of the rights of its users to city.

The theoretical framework developed above offers the lens through which different conditions of street spaces and traffic as well as the policy processes that produce these conditions in Kisumu are viewed in this study. I argue in the methodology (chapter 3) that to understand the connection between these dimensions of transport-related social exclusion, one needs to understand the lived experience of exclusion yet at the same time base the analysis on objective scientific procedures. This position explains my choice of the mixed methods approach to investigate the central theme of this dissertation.

Empirical findings of the dissertation are presented in chapters 4, 5, and 6. The fourth chapter presents the relationship between the conditions of the street spaces and traffic on the exclusion of cycling. Chapter 5 analyses the changing policy environment and its implications for cycling. The opportunity to tackle the extant exclusion that faces cycling through social inclusion is explored in chapter 6. This chapter sets off by evaluating the policy content of Kenya's economic development and those of transport development to find the possible disconnect in State priorities that engender the conditions investigated in chapter 4 and 5. The study uses this disconnect as the basis for formulating the opportunity to redress the current invisibility of cyclists through social inclusion.

Chapter 7 synthesises the findings from the above analyses and reflects upon their meaning for exposing the need to support cycling through the concept of social exclusion. This chapter further explores how the knowledge generated from the empirical findings of the study could be used to develop a framework for cycling-inclusive transport planning for a medium-sized city such as Kisumu. A reflection of the theoretical and methodological foundations of the study is also made in this chapter. The general conclusions and recommendations of the study are also presented in this chapter.

The next chapter begins by assembling the theoretical framework that guides the arguments of this study.

2 Theoretical framework

Chapter summary

In the previous chapter, I hypothesised that lack of support for cycling in Kisumu is a manifestation of the wider marginalisation of its users due to their low social statuses. In this current chapter, I now assemble a theoretical framework within which I explore this marginalisation, contextualise it to the transport situation in sub-Saharan African cities and ultimately develop the standpoint from which I challenge it. The chapter sets off by examining the critical urban theory and its usefulness in discussing urban transport in sub-Saharan African cities. This examination opens to a discussion of social quality theory and the concepts of the right to the city. I argue here that social quality is a right that ought to be recognised and be protected. The chapter concludes by examining the connection between transport-related social exclusion and accessibility. This examination lays a basis for questioning whether transport-related social exclusion can help in understanding accessibility challenges in the context of sub-Saharan African cities.

2.1 Critical urban theory

Critical urban theory is a collective term associated with the writings of post-1968 leftist urban scholars such as Henry Lefebvre, David Harvey and others who were inspired by Marxist political economy (Brenner, 2009). The theory is founded on the belief that the city is not just a mere physical formation, but rather that it is a deeper reflection of power relations between the powerful and the less powerful groups. Although these power relations are traditionally confined within single cities, their influence on urbanisation extends beyond single cities in the wake of the current globalised economy (see e.g. Therborn, 2008). In fact, to writers like Lefebvre (1991), the city is not necessarily the geo-physical confines but rather an *oeuvre* – a piece of art that is produced by the interaction between its various actors. Given these deeper processes that underlie the production of cities, critical urban theory argues that their production should not simply be left to the assumed bureaucratic rationality, economic efficiency, and historical processes of social organisation (see e.g. Harvey, 2012; Lefebvre, 1991; Soja, 1996). This is because these modes of producing the city are argued to generate inequality, injustice and exploitation (Brenner, Marcuse, & Mayer, 2012; Harvey, 2012; Soja, 2010). Instead, the theory reasons that the production of cities is a political and ideological contestation between different social groups and interests (see e.g. Boano, Lamarca, & Hunter, 2011; Harvey, 2012). In this context, the theory calls for the recognition of this contestation and proposes that the process of producing cities should involve a continuous negotiation between different social powers and interests (Brenner, 2009).

At the heart of this petition for a negotiated process of producing cities is the belief in the possibility of a '*more democratic, socially just and sustainable form of urbanisation*' (Brenner, 2009, p. 198). This belief traces its roots in the criticism of economic, social, and political order that existed until mid-20th century (see e.g. Horkheimer, 1937; Marcuse, 1964). A compelling criticism of this order is offered by Marcuse (1964) in his seminal publication titled '*one-dimensional man*'. In this publication, Marcuse raises concern about the new forms of domination and social control generated by civilisation of advanced industrial societies at that time. He specifically criticises this civilisation for generating modes of thought and behaviour that

supress aspirations, values, and ideas which do not conform to its rationality. In fact, this form of civilisation is projected to be an attempt to introduce a universal system of thought and behaviour in which technology restructures all aspects of life including the modes of thought (Horkheimer, 1975; Marcuse, 1964, 1969). The authors argue that such attempts are a threat to human freedom and individuality because they kill all forms of originality by integrating individuals to conform to the world of thought and behaviour of consumer capitalism. A new dialectical philosophy that seeks alternative modes of thought and behaviour as a standpoint for critiquing these established thoughts and social practices is thus proposed. Marcuse refers to these as 'negative thoughts'. Thus, in this new philosophy, existence is negated with essence; facts are negated with potentiality; while appearance is negated with reality. I take these 'negative thoughts' as the basis for understanding transport planning in the context of sub-Saharan African cities in this dissertation.

Although capitalism has changed its form since mid-20th century, literature shows that its predisposition to dictate thoughts and behaviour has endured into the present times (e.g. Brenner, 2009; Caprotti, 2014; Watson, 2006). As such, manipulation, repression and exploitation remain a living characteristic of its present form that Therborn (2008) describes as globalised, neoliberalised and financialised. Nowhere else are these characteristics of capitalism more evidenced than in the city (see e.g. Harvey, 2009, 2012; Lefebvre, 1996; Marcuse, 2009; Purcell, 2002; Schmid, 2012; Soja, 2010). These urban scholars show that the present form of capitalism is responsible for inequality, injustice and exploitation that characterise the city.

To begin with, the city itself is presented as the convergence not only of social surplus and spatial organisation of societies, but significantly the dominant mode of economic organisation as well (Harvey, 2009). In this sense, the city is thus the arena where capitalism engages in an enduring process of seeking profits (and rent) and mopping the surplus capital back to gain more profits (Harvey, 2012; Marcuse, 2009). This process exploits the poor by keeping them in a vicious cycle of dispossession of their chance to pull out of poverty (Harvey, 2012; Iveson, 2011; Marcuse, 2009; Soja, 1996). Harvey (2012) draws examples from China to demonstrate how debt-funded mega-infrastructure projects such as highways, dams, large-scale housing projects are used to ensure that the poor remain in a vicious cycle of repaying the debts used to build such projects. Such strategies that perpetuate poverty are reinforced by the glorification of consumerism of products which can only be funded through debts supplied by rich states, multinationals and individuals (Harvey, 2012). These exploitative processes are further supported by the extant practice of urban planning in total disregard of the growing urban poverty and social polarisation (see e.g. Mello-Théry et al., 2014; Watson, 2009b).

This rent-seeking tendency of capital highlighted in the previous paragraph has been termed the commodification of the city (Harvey, 2012; Purcell, 2002). This reference is mainly in regard to urban development processes and relations that take place in the city. Yet it is not only these elements that are commodified; the socio-spatial form of the city is itself commodified to facilitate the rent-seeking capacity of capital (Brenner et al., 2012). For instance, urban land-use and streets are organised to facilitate high speed mobility for businesspeople and the middle-class (Brenner et al., 2012; Harvey, 2012). The authors present the growing popularity of gated communities, high-rise apartments, and shopping malls in a

number of cities as a furtherance of this rent-seeking objective. Purcell (2002) points out that commodification of cities is problematic for urban development because it prioritises economic value of urban spaces over their use value. Doing this makes economic value, rather than the use value, to be the basis for allocating users to urban spaces (Purcell, 2002). The problem with this arrangement is that users which do not generate high economic values can hardly appropriate any urban space in such a predominantly neoliberalised market (Harvey, 2012; Purcell, 2002; Watson, 2009b). This commodification of cities has been variously termed market-oriented or market-driven production of the city (see e.g. Brenner, 2009).

The shortcomings of the extant mode of producing cities highlighted above confirm the need for a dialectic process that tempers this mode with other alternative possibilities. These alternatives exist in what Holston terms 'insurgent citizenship' (Holston, 1995, 2008). He uses this phrase to denote citizenship that is actively engaged in producing the city outside the formal planning framework because law and practice do not recognise their efforts. In this dissertation, I consider cyclists in sub-Saharan African cities to be among these insurgent citizens. This consideration is founded on the reasoning that their active appropriation of street spaces to satisfy their mobility needs in defiance of unclear support by the state fits Holston's conception of insurgent citizenship.

The above conception enables me to tackle the question of cycling within the wider ambit of social exclusion that characterises urban planning in sub-Saharan African cities. The challenges of neoliberalised system discussed earlier are made worse in this region given that they operate within planning regimes that are borrowed from foreign contexts, often without domestication (Watson, 2003, 2009b). This planning framework is often at variance with the lived realities of marginalisation and impoverishment of urban population that barely survives under conditions of informality (Watson, 2009a). Watson identifies this challenge as that of 'conflicting rationalities' between state and market on the one hand and the marginalised urban poor on the other (Watson, 2003, 2009a). She therefore calls for a fundamental rethinking of the role of planning in reconciling this conflict if it is to help these countries to meet international development targets such as those discussed in the previous chapter (see UNCHSUD, 2016; UNDP, 2015).

This section has discussed the need to dialogue the extant planning framework with the lived realities in order to generate more inclusive cities. The next two sections examine social quality theory and the concept of the right to the city to find out the opportunities they hold for this dialogue.

2.2 Social quality theory

Social quality theory emerged in Europe in response to the withdrawn approach of policy making towards the social dimension of development. The theory decries the inability of economic growth on its own to solve social challenges such as limited access to social services and rising poverty (Walker & van der Maesen, 2003). It specifically argues that focusing on economic growth as the sole indicator of development conceals the totality of development by subordinating the social and cultural dimensions of people's needs and preferences (van der Maesen & Walker, 2002; Walker & van der Maesen, 2003). This central argument of the theory supports a growing body of literature that casts doubt on the sufficiency of the

traditional economic analysis to explain the changing nature of daily social circumstances such as the quality of life (Herrmann, 2012; Stiglitz, Sen, & Fitoussi, 2009; Walker & van der Maesen, 2003). The authors argue that the neoliberal orientation of traditional economic analysis tools generates a disjuncture between economic and social progress.

The theory argues that development efforts should be concerned with creating conditions that enable individuals to effectively be part of the wider society. This position is founded on the idea that the individual in the basic unit of the society and should as such form the focus of social development (Beck, van der Maesen, & Walker, 1997; van der Maesen & Walker, 2002). In this regard, development policies should produce conditions that enhance individual wellbeing and potentials while at the same time creating room for them to participate in the social and economic life of their societies (Beck et al., 1997; van der Maesen & Walker, 2012).

While the initial development of the theory aimed to redress weak social welfare and industrial relations in Europe, its scope has now widened beyond this narrow theme and geographical concern. Within Europe alone for instance, the theory has been tested in wide range of policy areas including urban development and even health (e.g. van der Maesen, 2010; van der Maesen & Walker, 2002; Ward, Meyer, Verity, Gill, & Luong, 2011). Applications outside Europe have also been documented (e.g. Abbott, Wallace, & Sapsford, 2011; Lin, Ward, & van der Maesen, 2009). In this dissertation, I use the arguments of the theory as the lens through which I analyse exclusion in the context of urban transport. I draw from the idea of the theory that the welfare of the individual should be seen within the context of the wider society to examine whether, and the extent to which, transport policies facilitate cyclists to 'belong'.

Social quality theory offers a theoretical and methodological tool for measuring human wellbeing that goes beyond the conventional quality of life measures such as social indicators (e.g. Baud, Sridharan, & Pfeffer, 2008) and human needs and basic needs (e.g. Doyal & Gough, 1991). While these individualised indicators offer a robust approach to assessing quality of life at the individual level, they are less useful when community and other social relations are the focus of analysis (Siltaniemi & Kauppinen, 2005). For instance, this conventional quality of life paradigm presupposes the existence of certain social structures and relationships (Siltaniemi & Kauppinen, 2005; Ward et al., 2011). This assumption denies these individualised indicators the chance to critically analyse how social structures and relationships relate with exclusion and wellbeing.

In contrast, social quality theory sets off from the premise that the wellbeing of individuals (i.e. social quality) must be understood within the wider scheme of the happenings at the larger societal level. The theory views individual wellbeing as the product of the two sets of tension (van der Maesen & Walker, 2002). On the one hand is the tension between individual development preferences and societal development needs. This tension is tempered by another tension between community development aspirations and the development aspirations defined by groups, institutions or formal organisations on the other. Figure 2-1 demonstrates the interaction between these tensions to produce social quality.

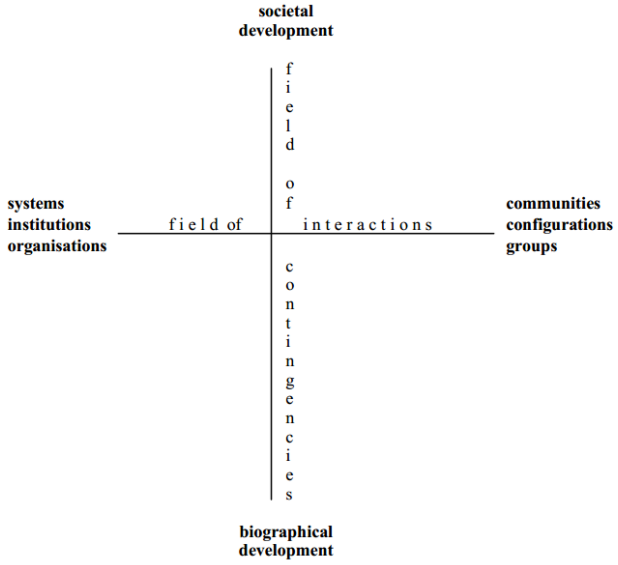

Figure 2-1: Interaction of tensions that produce social quality

(Source: Beck, van der Maesen, & Walker, 2001)

The above conception guides in identifying and analysing the tension that arises from emerging travel modes such as motorcycling on the one hand and cycling on the other. At the same time, it guides in analysing the tension between the use of street spaces as conceived by state planners one the one hand and their actual use particularly by the cyclists on the other. The idea that informs this analysis is consolidated further by the concept of the 'right to the city' presented in the next section while the actual analyses are presented in chapter 4 to 6. Figure 2-1 however reveals that the challenge for policy is to temper these tensions such that the individual is enabled to actualise. This idea is extended in chapter 7, where I address the central objective of this dissertation.

Four hypotheses that are fundamental for enabling individuals to participate in their societies are proposed by social quality theory (Herrmann, 2012; Walker & van der Maesen, 2003). First, that people must have access to socio-economic security to protect them from poverty and other forms of deprivation. The second hypothesis holds that people must experience social inclusion or minimum levels of social exclusion from key social and economic institutions. The third hypothesis holds that people should be able to live in communities that are bounded together by shared norms and values where individuals are facilitated into self-realisation as members of the larger community. Lastly, social quality theory also hypothesises that people must be autonomous and empowered to be able to fully participate in the face of rapid socio-economic change.

The above hypotheses offer the lens through which this dissertation interrogates transport planning in Kisumu and even interprets its empirical findings. First, the situation in Kisumu is interrogated to find out the extent to which it has created inclusive streets and traffic conditions that facilitate cycling and by extension enabling access to socio-economic security. It should be pointed out that cycling directly enables bicycle taxi operators to earn their living while indirectly enabling poor households to free up portions of their incomes that would otherwise be tied up on transport expenditure. The discussion in chapter 6 shows that transport expenditure is a major source of financial burden for poor households in the context of sub-Saharan African cities. Transport planning is at the same time interrogated to find out the

extent to which it has created street spaces that accommodate all modes irrespective of the socio-economic status of their users. This discussion is developed in chapter 4 and 5. The dissertation draws from the third and the fourth hypothesis of the social quality theory to propose the norms and values that cycling-inclusive transport planning ought to develop. Lastly, the fourth hypothesis guides the study in its search for an institutionalised policy framework that puts an end to the *ad-hoc* manner in which cycling concerns are addressed.

This section has shown that development effort is incomplete until excluded individuals are facilitated to participate in social activities alongside the other members. The next section pushes this idea further by arguing that this inclusion is a right and not a privilege. The section also shows how this concept informs the investigation that is documented in this dissertation.

2.3 The right to the city

The concept of the 'right to the city' was first formulated in 1968 by Henry Lefebvre as a call for a radical alternative to capitalism (Lefebvre, 1996). He criticised the continued disenfranchisement of urban residents through political and economic agenda that were pursued under the extant form of capitalism of that time (Lefebvre, 1996; Marcuse, 2009). Lefebvre specifically argued that the preoccupation of capitalism with managing individual consumption impeded its ability to tackle the larger social essentials, which were not necessarily material products (Lefebvre, 1996). The capitalist model was argued to be wrought with internal contradictions and crises, which produced injustice as a result of its failure to tackle non-materials concerns of the society (Marcuse, 2009; Soja, 2010). The consequent injustice denied urban residents the right to appropriate and produce the city.

In contrast to capitalism, which tackled what has been termed as the symptoms of development challenges (Harvey, 1982; Marcuse, 2009), Lefebvre focused on the root causes of these challenges to present a new perspective for understanding them. He took the radical stance that a better solution could be found by addressing unjust structural relations that denied urban residents the right to appropriate and to produce urban spaces (Lefebvre, 1996). This stance presents a departure from welfare protection and market (de)regulation and other capitalistic interventions, which focused on satisfying 'wants' (Marcuse, 2009) instead of dismantling the underlying structures that generated injustice. Lefebvre's idea of the right to the city has been developed further by many scholars. Among these is Marcuse (2009), who argues that this right to the city is both a cry and a demand. To Marcuse, the right to the city presents a demand for resources that should be justly accessible to the excluded and a cry by the alienated for the right to determine how these resources are produced. This understanding demonstrates a plea for genuine change that not only enables urban residents to access resources but empowers them to determine how these resources are produced.

The above conception forms the basis for my account of the current indifference to cycling concerns by transport planning through underlying structural relations in the society. The conception of the right to the city raises curiosity as to whether cyclists can also be argued to have a right to urban streets. This curiosity poses the question about the users for whom urban streets are created. Similarly, this conception raises curiosity to understand whether the extant use of street spaces by cyclists, albeit outside formal recognition, could be a basis for transport planning.

The foundation of the crises that inspired Lefebvre's call for the right to the city remains alive in cities of today. Contemporary researchers have articulated the modern-day urban crises within the purview of socio-economic polarisation, skewed access to basic services and the withdrawal of the state from social service provision (see e.g. Harvey, 2003; Schmid, 2012; Watson, 2009a). These factors have led to increased fragmentation, segregation and inequality (Harvey, 2003; Schmid, 2012; Watson, 2009b). At the same time, the preoccupation of the modernist planning regime with 'homogenising lifestyles and engineering the daily life' to match the ideal global city has also exacerbated urban exclusion by discounting the relevance of unique traits of places, locations and activities therein (Hobson, 1999; Schmid, 2012; Watson, 2009b). This disconnect between state interventions and social needs, together with the on-going commodification of the city under neoliberalised economy (Harvey, 2009; Purcell, 2002; Schmid, 2012) makes the plea for the right to the city even more relevant today. Commodification of the city attaches economic value to space, making it an object of the production and formation of surplus (Lefebvre, 2003). Under this arrangement, social encounter and other factors that embody the quality of urban spaces become part of the economic logic that are to be exploited for economic gains (Lefebvre, 2003; Schmid, 2012).

The logic that underlies transport infrastructure development and policies is analysed within above context in this dissertation. To understand this logic, I investigate the priorities of the state in transport infrastructure development, how street spaces are allocated to various travel modes and the policies that underlie transport planning.

To understand the relevance of the 'right to the city' to the current study, I set off by putting Lefebvre's conceptualisation of urban space into perspective. To begin with, Lefebvre conceives of the city as an *oeuvre* rather than a simple material product (Lefebvre, 1996). This conception projects the city as a piece of art that is produced by different interest groups through the tensions that are similar to those identified by social quality theory (see Figure 2-1). The city is thus the arena where the struggle against injustice takes place. This presentation of the city as an *oeuvre* not only demystifies the dominant role of the state in producing the city; it recognises that there are other actors in the process as well. I draw from this demystification of the role of the state to consolidate the question I raised earlier regarding the validity of the right of cyclists to produce the city alongside the state.

Aside from presenting the city as an *oeuvre*, Lefebvre categorises space itself into perceived, conceived and lived spaces. Accordingly, space is perceived insofar as it constitutes the environment in which daily encounters take place; conceived in the minds of the state planners as the ideal space that 'ought to be'; and lived as the complex product of the contestation between the abstractions of the state planners and the realities of daily life (Lefebvre, 1991). This presentation of urban space as an entity that transcends material and geographical confines that define the typical conception of the city allows me to appreciate the totality of urban space as the geographical unit, the inhabitants (actors), and the spatial (social) processes therein. With this understanding, I build upon the tensions identified by social quality theory to question the power relations between different actors in urban transport, how this power is exercised and its implications for producing (or not producing) spaces that accommodate the interests of cyclists.

The concept of the right to the city offers a valuable tool for advancing the social aspect of transport (Attoh, 2012; Furness, 2010; Murthy, 2011). It has been suggested that the right to the city is not simply about re-ordering urban spaces but rather also about attacking the very processes and relations which generate injustice that inhere in these spaces (see e.g. Iveson, 2011; Marcuse, 2009; Soja, 1996). This dissertation employs this critical viewpoint of the concept to extend the on-going debate on inclusive cities (UNCHSUD, 2016; UNDP, 2015) to the need to accommodate cycling in sub-Saharan African cities. Because streets are public spaces, I reason that they should facilitate equitable access to both motorised and non-motorised modes. This means that the requirements of these modes in terms of spaces that they need to safely and conveniently use the streets should meaningfully determine how the streets are functionally designed. In this regard, it is therefore necessary to focus on the practice of transport planning and the policies that support this practice with a critical mind. It should be pointed out that transport planning and policy have for the most part yielded infrastructure and traffic conditions that do not facilitate the use of non-motorised modes in general and cycling in particular (Attoh, 2012; Murthy, 2011).

Current attempts to advance the transport agenda through this critical viewpoint have mainly focused on cities of the North. Studies have mainly focused on expanding the right to (geographical) space to modes other than the motorised (Attoh, 2012; Furness, 2010). These studies do not however account for the social relations that possibly underlie excluded streets that they investigate. Other studies indirectly allude to the need to safeguard this right, albeit with a focus on the right to accessing the bus system for residents in different residential locations (see e.g. Church, Frost, & Sullivan, 2000; Engels & Liu, 2011). Still, other studies have concentrated on the normative categorisation of transport exclusion on the basis of parameters like poor residential locations (Shergold & Parkhurst, 2012), inadequate access to the car (Cass, Elizabeth, & John, 2005; Shergold & Parkhurst, 2012), and socio-demographic characteristics such as age and race in the case of the excluded elderly and minority groups respectively (Engels & Liu, 2011; Shergold & Parkhurst, 2012). These studies are useful to the extent that they identify some of those whose rights have been suppressed by the current focus of transport planning.

Newer insights into this critical view of transport planning could be obtained by focusing on medium-sized sub-Saharan African cities. The irony of unsupported, yet active captive cycling that happens amid limited, inefficient, and often unaffordable motorised options (see e.g. Pendakur, 2005) arouses curiosity about the extent to which lack of support for cycling suppresses the rights of its users to the city. Articulating this right to the city in the context of transport in sub-Saharan African cities therefore involves giving a voice to users of the 'wrong' yet often the only pragmatic alternative. This contrasts with cities of the North where the right to the city involves expanding modal choices and including people whose social circumstances manifest in transport exclusion.

The previous sections have identified the critical standpoints through which I view transport planning in this dissertation. These sections have presented a theoretical argument that identifies the participation of excluded individuals as not only a precondition for inclusive development but also a right that needs to be recognised and be upheld. In the next section, I now examine the concept of accessibility that provides the framework through which this inclusion can be guaranteed in the context of transport.

2.4 Accessibility

Although literature shows the importance of focusing on accessibility in order to encourage cycling, the contextual ingredients of the concept remain unclear in sub-Saharan African cities. The discussion in chapter 1 has demonstrated that cycling requires deliberate land-use and transport strategies to encourage its use. Evidence presented in that chapter shows that the mode thrives when land-use strategies result in shorter distances to destinations, and when transport strategies lead to safety and comfort in using it (Bertolini et al., 2005; Parkin et al., 2007). In this regard, accessibility offers the unifying indicator that can be used to assess the responsiveness of land-use and transport strategies. By extension, the concept thus offers a basis for understanding how the prevailing land-use and transport conditions impact on transport-related social exclusion. This potential is however shrouded in the questions that I raise in Section 1.1 regarding the weak conception of barriers to accessibility for cycling in the context of sub-Saharan African cities.

A well-defined concept of accessibility is argued to offer a useful framework for integrating land-use and transport (Bertolini et al., 2005). Various definitions of the concept have been offered (see e.g. Ben-Akiva & Lerman, 1979; Dalvi & Martin, 1976; Hansen, 1959). In this dissertation, I adopt the conception of accessibility as the ease of reaching activity nodes using a specific travel mode (Dalvi & Martin, 1976), and therefore a signifier of the potential opportunity for interaction (Hansen, 1959). The decision to adopt this conception is guided by the focus of the current dissertation on contributing to the understanding of the relationship between transport-related social exclusion and the difficulty that faces cyclists in participating in mobility to access spatially disjointed opportunities.

The concept of accessibility is founded on the idea that land-use and transport conditions interact with each other to constrain the amount of opportunities that travellers using different modes can reach within a given time (Dalvi & Martin, 1976; Geurs & van Wee, 2004; Hansen, 1959). For instance, longer distances coupled with costly transport increase the burden of overcoming the spatial separation of trip destinations from their origins. Shorter distances and affordable transport on the other hand have the opposite effect. Distance is in this case measured in terms of the actual length between trip origins and destinations, while the cost of transport can be measured through actual monetary cost, travel time, and the physical efforts among other indicators (Geurs & van Wee, 2004; Iacono et al., 2010). In this context, accessibility enables travel behaviour in terms of trip frequency, destination choice, mode choice and trip complexity to be explained (Geurs & van Wee, 2004; Iacono et al., 2010). The current dissertation exposes different components of transport-related social exclusion that comprise the barriers to accessibility for cyclists in Kisumu. The central aim in doing this is to find out whether transport-related social exclusion can improve the modelling of accessibility and thus make accessibility a useful indicator of this exclusion.

The nexus between transport and land-use presented above draws attention to what has been termed 'spatial mismatch' (see Brueckner & Zenou, 2003; Kain, 1992). This term has been used mainly in metropolitan areas of the United States to describe the disparity between location of residential neighbourhoods and opportunities such as schools and employment. Studies reveal that the spatial structure of cities can generate problems of accessibility when workplaces are located in zones that are difficult to reach from the residential zones (Brueckner & Zenou,

2003; Cho Yam Lau, 2010). Based on evidence from the United States, Brueckner and Zenou (2003) point out that emerging land-use structures have concentrated minority groups in areas with low quality housing stock and limited employment opportunities. The implication of these land-use structure has been to subject these minority groups to more complex job search processes and subsequent longer commutes once they are in employment. Similar accessibility challenges have been reported in China, where Cho Yam Lau (2010) attributes them to lack of affordable transport connection between disadvantaged residential neighbourhoods and places of work. These revelations raise curiosity about the extent to which land-use and transport conditions facilitate access to destinations for residents of disadvantaged neighbourhoods in sub-Saharan African cities. Whereas land-use systems in these cities are characterised by many disadvantaged neighbourhoods (UN-HABITAT, 2014), the ease with which the urban poor access opportunities using modes that are affordable to them remains less investigated. I discuss the components of transport-related social exclusion that hinder this accessibility for neighbourhoods of varying socio-economic statuses in chapter 4, 5, and 6 and synthesise their meaning for the urban poor in Section 7.2.

Addressing the above spatial mismatch calls for the integration of land-use and transport interventions. So far, attempts to address transport challenges in general have remained mostly disjointed. These efforts either focus on urban growth management (see e.g. Zhao, 2010) or transport infrastructure supply (see e.g. Srinivasan & Rogers, 2005). In the case of sub-Saharan African cities, efforts have mainly focused on transport infrastructure supply in the hope that doing so can address the transport challenges that these cities face (Trans-African Consortium, 2008). It is evident that there is little effort to integrate land-use and transport strategies (Curtis & Scheurer, 2010; Tennøy, 2010). Yet literature shows that neither the supply of transport infrastructure nor focusing on land-use strategies can on its own lead to sustainable urban transport (e.g. Bertolini et al., 2005; Tennøy, 2010). Specifically, these disjointed efforts address neither the spatial mismatch identified above nor even the current transport challenges that they focus on. Tennøy (2010) identifies the challenge that hinders this integration as having to do with the conflict in framing urban transport problems between land-use planners on the one hand and transport planners on the other. The current dissertation contributes to addressing this gap by exploring ways through which transport-related social exclusion can form a basis for reconciling land-use and transport objectives. Specific attention is given to the cyclists.

It has been argued that sustainable transport planning must understand the co-influence of land-use and transport strategies on each other with a view to integrating them (Banister, 2008; Bertolini et al., 2005; Curtis & Scheurer, 2010). Research shows that land-use planning shapes urban form through the location, distribution and densities of opportunities. In turn, these elements of urban form impact on key transport indicators like trip length, trip frequency and mode choices (Cao et al., 2007; Wegener & Fürst, 1999; Zhao, 2010). For instance, centralised employment triggers longer trips, while mixed development that balances job opportunities and the population of workers in residential locations generates shorter trips (Cao et al., 2007; Wegener & Fürst, 1999). From transport point of view, studies have shown that transport strategies influence urban land-use patterns by altering location behaviour of firms and households. Locations that are accessible due to new transport developments are also more attractive to locate in (Bertolini et al., 2005; Wegener & Fürst, 1999). These analyses however remain focused on motorisation. It would therefore be interesting to find the

likely patterns in terms of cycling. Section 7.2 discusses the possible implications of some proposed land-use changes in Kisumu for accessibility and the social inclusion of its cyclists.

Transport infrastructure and its functional design in terms of the space it allocates to different travel modes also has a bearing on travel costs, travel time, safety and accessibility (Hunt & Abraham, 2007; Pucher, Komanoff, & Schimek, 1999; Rietveld & Daniel, 2004). Streets that either have separate cycling paths or allow lower car speed are perceived to be safer. These streets are more cycled compared to those that are perceived to expose cyclists to accidents (Hunt & Abraham, 2007; Pucher et al., 1999; Rietveld & Daniel, 2004). However, provision of cycling infrastructure alone cannot generate its active use (Rietveld & Daniel, 2004). This provision must be coupled with supportive land-use policies that encourage cycling (Pucher et al., 1999; Rietveld & Daniel, 2004). Moreover, the social image of cycling, and policy support also have to be considered (Sietchiping et al., 2012). The extent to which the quality of the streets support cycling is investigated in chapter 4, while the general concerns that need to be addressed to promote cycling are addressed in chapter 7.

The preceding discussion shows that accessibility offers a useful tool for analysing the extent to which transport and land-use strategies support the objectives of socially-inclusive transport planning. However, this usefulness of the tool cannot be realised unless the contextual components of accessibility are made clear. Considering that cycling in the context of sub-Saharan African cities is mainly characterised by social exclusion, this dissertation explores the extent to which this exclusion can improve the understanding of the ingredients of accessibility in these cities.

2.5 Conceptual framework

The arguments of this dissertation are founded on the premise that the prevailing modernist orientation to transport planning in sub-Saharan African cities is inadequate to expose the need for transport infrastructure and traffic conditions that would support cycling (Section 1.6; see also Sietchiping et al., 2012; Watson, 2003). Accordingly, the central research problem of the dissertation is to find out whether the concept of social exclusion could offer a complementary basis for exposing this need to support the mode. The decision to focus on social exclusion is deliberate and based on evidence which shows that the majority of cyclists in sub-Saharan African cities comprise the poor who are largely excluded by urban planning in its broader sense (Salon & Gulyani, 2010; Sietchiping et al., 2012). The extant approach to transport planning – largely auto-oriented – is thus conceptualised here as a specific dimension of the exclusionary form of planning practice that prevails in the region. This dissertation specifically analyses transport planning as it relates to the need to accommodate cycling. Figure 2-2 sketches out how the study is conceptualised.

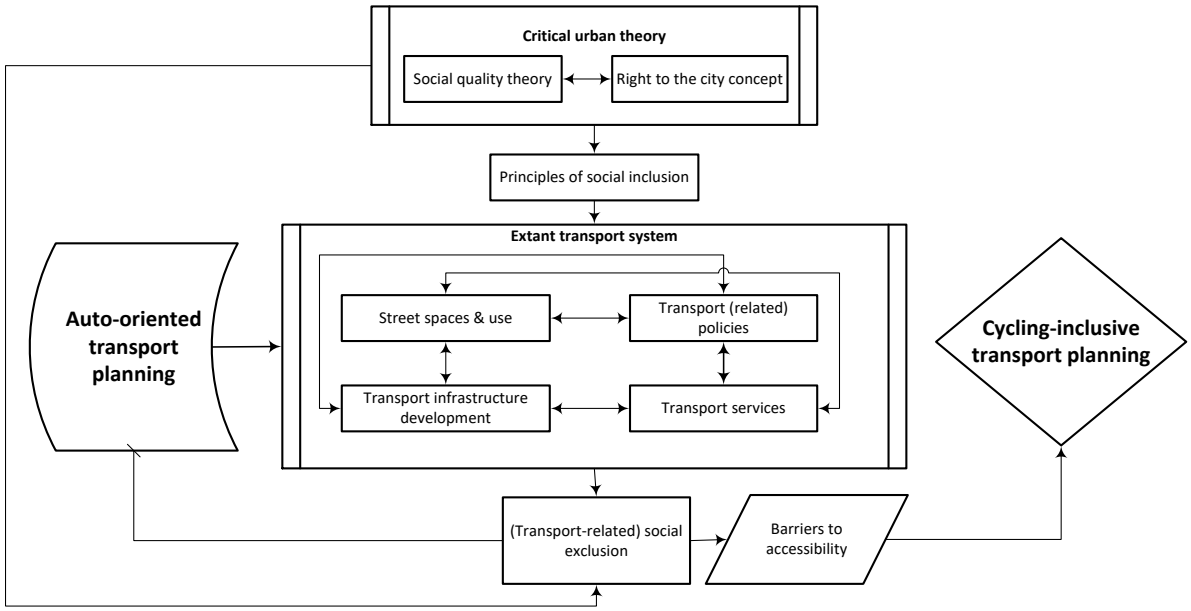

Figure 2-2: Conceptual framework for the study

The study proceeds on the reasoning that the need to support cycling could be found through a dialectic that reconciles the objectives of auto-oriented transport planning with those of inclusive cities. This reasoning is founded on the postulations of critical urban theory (see e.g. Brenner, 2009) and consolidated in the tenets of the social quality theory (Beck et al., 2001) and the right to the city (Lefebvre, 1996). Sections 2.1, 2.2, and 2.3 give details of the postulations of these theories and concept. Suffice it to mention that the social quality theory exposes the social exclusion that is generated when cities make economic growth the sole focus of their development, while the right to the city concept argues that inclusion is a necessary right that ought to be upheld by planning.

The tenets of the critical theory, social quality theory, and the right to the city offer the frame through which the above dialectic is achieved. The critical urban theory offers the guiding vision of what the social quality theory and right to the city concept, as used in the dissertation, should inspire. This vision centres on creating transport infrastructure and traffic conditions that do not act as barriers to cycling. In this regard, the study extracts the principles of social inclusion from these theories and concept and bases the examination of the transport system that results from the auto-oriented transport planning on these principles. The transport system is conceptualised to include four broad components. These are *i*) the street spaces and the relationship between different modes that compete for these spaces; *ii*) transport policies and other policies that have a bearing on transport decisions that people make; *iii)* transport infrastructure development, together with the goals that underlie them, and *iv)* transport services. The aim in analysing the system is to find out if and how it varies from the principles of inclusion and the implications of this variance for the inclusion of cyclists

Three analyses are carried out on the transport system described above. First, the study examines the conditions of street spaces and traffic thereupon to find out whether they support cycling as much as they support other modes. Similarly, transport policies and other transport-related policies that trigger changes in mode choices are also examined for the extent to which they support cycling. This analysis also considers emerging modes such as the motorcycle

to find out how they relate to the service level for the clientele whose transport needs are met through cycling. Lastly, the study analyses the tension between the goals of economic growth and transport infrastructure development to find out the extent to which this tension supports cycling. The focus of these analyses is to find out how the conditions of street spaces, the coexistence on these spaces by different modes, land-use, transport service, policies, and development priorities enable cyclists to participate in mobility. At the same time, the analyses also focus on finding out whether these conditions uphold the right of cyclist to the city.

The study conceptualises that the factors that make cycling invisible to policy makers could be revealed from the interaction between the above elements. These factors are conceptualised to manifest in the conditions of these elements and to concurrently reinforce them at the same time. In other words, since transport planning is not founded on the principles of inclusion (Sietchiping et al., 2012; Steyn, 2012; Watson, 2014), it produces streets that largely exclude all modes apart from the car. By associating the conditions of the transport system to social exclusion that underlies their production, this study introduces a new way of understanding why cycling in many sub-Saharan African cities remains unsupported by transport planning. Chapter 4, 5, and 6 develop the indicators for investigating this exclusion. The central idea is to challenge the notion that social exclusion should even constitute an accepted basis for transport planning in the first place. Therefore, rather than offer a feedback to auto-oriented transport planning, this exclusion is instead conceived of as an avenue for exposing the barriers to accessibility for cyclists. This conception is deemed necessary to improve accessibility modelling and to enrich the usefulness of accessibility in evaluating transport systems for inclusiveness. Suffice it to reiterate that accessibility in this context is seen as the ease of getting to destinations (Section 2.4).

This chapter has assembled a theoretical argument that forms the basis for challenging the exclusion of cyclists by transport planners in sub-Saharan African cities in general and Kisumu specifically. Tenets of the critical theory that is discussed in this chapter also guide the way in which the study investigates the disadvantage that faces cyclists. In the next chapter, I begin by discussing how the critical theory paradigm shapes my methodological approach before I embark on detailing the methods of the study.

3 Methodology

Chapter summary

The previous chapter has presented a theoretical argument that decries the limitations of bureaucratic rationality and economic efficiency to deliver social justice to the city. Its central argument has been that there is a need for dialectic between these traditional modes of producing the city and a new thinking that believes in possibilities beyond the urban forms that these traditional modes can imagine. This current chapter builds upon this idea that there is more than one dimension to how the city can be imagined. Specifically, the chapter builds a basis for investigating the possibility of negotiating street spaces to accommodate cycling in addition to automobiles that they are currently planned for. The chapter begins by introducing what it considers as reality and the critical theory paradigm that enables it to understand this reality. The critical theory paradigm argues for pragmatism rather than a rigid application of positivist and naturalist thinking to produce knowledge about reality. The chapter then proceeds to present the research design that is founded on this pragmatism. The study area is also put into perspective by introducing its key characteristics that shape the use of bicycles in Kisumu. The chapter concludes by presenting the procedures for data collection and analysis.

3.1 Introduction

The arguments of the critical urban theory discussed in the previous chapter provide the lens through which this study views reality. This dissertation builds upon the theoretical foundation presented in that chapter to argue that the use of economic tools to evaluate transport plans conceals the need for street spaces that can facilitate cyclists to participate in mobility alongside their motorised counterparts. The central objective of the study is to find out whether, and the extent to which, the concept of social exclusion can offer a complementary framework for identifying the need to support cycling in Kisumu

In this current chapter, I now present the steps that I followed to claim knowledge about this social exclusion that faces cycling. In producing this knowledge, I am guided by the conception of social exclusion as the disadvantage that occurs when a powerful class of *auto-oriented transport planners* uses the social, cultural and institutional power it wields to restrict access to valued resources (*street spaces*) from the underprivileged *cyclists* (Sen, 2000; Silver, 2007, emphasis added). I should point out that this dissertation deliberately uses the expressions transport disadvantage, exclusion of cyclists, restriction and inhibition from street spaces and traffic to denote social exclusion. This usage is informed by the observation that these expressions are the forms through which social exclusion that faces cyclists is manifested in the study area.

The chapter is organised in five main sections. Section 3.2 presents the research paradigm and justifies why the mixed method was adopted to claim knowledge about exclusion of cyclists. The research design is presented in section 3.3. Section 3.4 on the other hand presents the research context. The study area (Kisumu city) is presented in order not only to highlight the pertinent conditions that surround cycling but also to present the basis for the approaches that

are followed in sampling and data collection. Section 3.5 details the methods used in the study. I detail here the sampling procedures, data collection tools, and a summary of the data that was obtained. The final section of the chapter presents an overview of the strategies used to analyse the data.

3.2 Research paradigm and strategy

A research paradigm is defined as the philosophical stance about what knowledge constitutes, how we know about this knowledge and the process of studying it (Creswell, 2013; Crotty, 1998). A strategy on the other hand is the plan of action that offers the rationale for choosing particular methods and also describes these methods (Creswell, 2013). I begin this section by expounding on the critical theory paradigm before I return to the case study strategy.

In this study, I follow the critical theory paradigm to claim knowledge about the exclusion of cycling (and cyclists) from street spaces of Kisumu. The critical theory paradigm is associated with the Frankfurt School, specifically with Max Horkheimer, Theodor W. Adorno and Herbert Marcuse among others. The paradigm offers a contradistinction to the philosophical dichotomy that exists between the positivist and naturalist paradigms. It faults this dichotomy for robbing knowledge production of its vitality by restricting it to either that which can be verified statistically or to what it terms as '*lebensphilosophie*' that narrowly interprets knowledge in terms of the immediate values and direct experiences with little attention to empirical data. The critical theory paradigm seeks a middle ground that synergises the strengths of the philosophical constructs and empirical details presented by these disparate paradigms. It emphasises a dialectic discourse between philosophy and science as the way of understanding social reality (Brenner, 2009; Crotty, 1998).

The development of the critical theory paradigm is inspired by the recognition that realities are multifaceted entities that stand neither in a linear nor causal relationship to one another (Creswell, 2013; Crotty, 1998). They are instead shaped by the social, economic, political, ethnic forces that gain acceptance over time as the natural ways to emerge as reality itself (Creswell, 2013). In this sense, therefore, the way both the positivists and the naturalists perceive reality limits how it can be investigated. On the one hand, the positivists view reality as an entity that is 'out there' and only needs to be measured (Creswell, 2013). The naturalists, on the other hand, see reality as being subjectively interpreted by individuals and that it can therefore only be understood by either constructing it or interpreting it with these individuals (Creswell, 2013; Crotty, 1998). Neither of these perceptions offers the complete picture of reality.

It is the limitations of knowledge production generated by the positivist-naturalist continuum described above that the critical theory paradigm addresses. It does this by presenting the antagonistic relations within societies as something that demands that reality is not simply interpreted on its face value but that it is most importantly interrogated with a view to changing it (Crotty, 1998; Freeman-Moir, 1992; Marcuse, 1964). The critical theory paradigm endeavours to understand reality within the context of the tension between the established social order, the institutional structures, and even individual behaviours (Crotty, 1998; Marcuse, 1964). In this regard, knowledge is therefore claimed by adopting a pragmatic approach that

is not bounded by the dictums of this positivist-naturalist continuum (Creswell, 2013; Crotty, 1998).

In the current study, I conceive the exclusion of cycling to be a product of established social order, institutionalised approaches to transport planning and driver behaviours that are created and sustained by the predominant modernist planning regime in many sub-Saharan African cities (e.g. Hobson, 1999; Steyn, 2012; Watson, 2009b, 2014). All these are evidently biased against cycling. The modernist planning regime itself is hardly based on the realities of sub-Saharan African cities where it is applied (Hobson, 1999; Watson, 2009b, 2014). Instead it borrows 'best practices' from success stories of other cities whose circumstances and level of development are often quite different from those of sub-Saharan African cities (Hobson, 1999; Watson, 2009b, 2014), thus perpetuating the exclusion of cyclists.

Exposing the kind of exclusion that faces cycling in Kisumu calls for an understanding of the actual travel behaviour of the cyclists, their lived experience of exclusion from the streets and the policy drivers that perpetuate this exclusion. Neither the positivists approach nor the naturalists approach could generate this knowledge on its own. I therefore opted for the mixed methods approach. This choice was informed by arguments which show that the mixed methods approach has a good capacity to support the enquiry of different dimensions of exclusion that the study documented in this dissertation sought (see e.g. Creswell, 2013; Crotty, 1998). The mixed methods has specifically been described as pragmatic because it draws on the elements of quantitative and qualitative approaches so long as doing so permits a study to realise its objectives (Creswell, 2013; Platt, 1992). In this regard, I quantitatively analysed the limitations to cycling and the changes in travel behaviour but sought the meanings of their results from field observations, expert interviews and the opinions of the users themselves. Section 3.5 give the details of how the approach was implemented in this study. The mixed methods approach has been used successfully within transport research (see e.g. Lanzendorf & Busch-Geertsema, 2014).

Having explained what I conceived to constitute knowledge in this study and how the critical theory shaped my choice of study approach, I now revisit the case study strategy that I introduced at the beginning of this section. Yin (2009) offers a two-fold definition of case study research in which he depicts the case study as both a method and a strategy.

As a method, the case study is conceived of as '*an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*' (Yin, 2009 p.18). In this context, I focus on the case of cycling in Kisumu to provide the real-life context for investigating how the social exclusion of the poor, who are the predominant bicycle users, shapes the physical exclusion of cycling from street spaces. I argue that the physical exclusion of cycling is a phenomenon that cannot be easily separated from the social exclusion of cyclists from the society. Studies have shown that cycling is hardly accorded commensurate attention it requires because of its inferior social representation as a mode for the poor (e.g. Khayesi, Monheim, & Nebe, 2010; Pochet & Cusset, 1999).

As a strategy, the case study does three things (Yin, 2009). It *i)* establishes the justification for using evidence from multiple sources to explain a given phenomenon, *ii)* draws upon

theoretical propositions to justify data collection and analysis approaches, and *iii)* enables data points in technically disparate research situations to be described from a multiplicity of perspectives. I drew on these properties to design a study that sought evidence about the exclusion of cycling and cyclists from three key perspectives the – *i)* conditions of street spaces and how different mode users related with cycling on these spaces; *ii)* changes in policies that had a bearing on transport infrastructure and service; and *ii)* extant policies on transport infrastructure development. The specific details that were investigated are explained in the next section. Case studies are appropriate where the interest of investigation is to answer the 'how' or 'why' questions or where an investigator has little control over the events under investigation or where the investigation focuses on a contemporary phenomenon within its real-life context (Yin, 1994, 2009). I explain how the case study strategy was used in the current study in the next section.

This section has presented the research paradigm and strategy. The need for pragmatism in understanding the exclusion of cycling within the context of the exclusion of its users emerged from the discussion. The next section now presents the research design that enabled this exclusion to be investigated.

3.3 Research design

A research design is the logical sequence that links a study problem to empirical data and the conclusions that are drawn from the analysis of that data (Yin, 1994, 2009). It comprises of five key components: *i)* the questions posed by the study, *ii)* the proposition for the study, *iii)* the units of analysis used in the study, *iv)* the logic that links the data to the proposition, and *v)* the criteria for interpreting the findings (Yin, 2009). The current section puts these components of a research design into the context of the current study.

The study question

It should be restated that the central research problem of the current study is to find out whether the restrictions imposed on cycling by transport planning in Kisumu could reveal the need for street spaces and traffic conditions that support cycling. Existing studies seem to suggest that cycling is excluded by auto-oriented policies that produce land-use, streets, and traffic conditions that are biased against cycling in Kisumu (e.g. ITDG-EA, 2004; Steyn, 2012). Evidence from cycling conditions in other cities further suggests that this exclusion of cyclists from the streets is reinforced by the social exclusion of cyclists due to their low socio-economic statuses (e.g. Khayesi et al., 2010). Despite these pieces of evidence that suggest that cycling is excluded from the streets by the formal planning processes, it remains unclear how this exclusion occurs and what its drivers are. This fuzziness of knowledge makes it difficult to base the justification for the need to support cycling on this exclusion. The question therefore is how these streets, planning processes, and social exclusion can be understood to make them useful for presenting the need to support cycling. Based on the argument of the critical theory paradigm (e.g. Crotty, 1998), this study collates knowledge about exclusion that results from these varying dimensions through a mix of quantitative and qualitative approaches. The next section explains how this is achieved.

The mixed methods design

The study adopts the mixed methods design (Creswell, 2013; Platt, 1992) to investigate the central research problem explained above. The design is used because it is deemed practical in enabling the study to obtain the full picture of transport-related social exclusion as it occurs in Kisumu. This design permits a dialectic between the objective results of the changes in travel behaviour and the conditions of the streets that generate exclusion and a host of their underlying subjective accounts on the other hand (Hancock & Algozzine, 2006).

Given the above strength of the mixed methods design, it was necessary to combine the best of what the quantitative and qualitative approaches could offer. A purely qualitative approach could have yielded equally good insights into transport exclusion in Kisumu. However, it would have required much resources to engage with a representative size of respondents from different parts of the city to realise the objective of the study. The quantitative design fixed this challenge by allowing the study to draw a representative sample of respondents from the city. A survey that generated quantitative data that was analysed to understand the changes in travel behaviour and the restrictions imposed by transport conditions was then carried out on these respondents. On the other hand, the rich qualitative account of exclusion that was offered by the qualitative data from various sources would have been lost if the study adopted a purely quantitative design. I therefore used the mixed methods design to gain from the advantages offered by the two dichotomous research designs. The explanatory sequential mixed methods design is adopted in this study. This design involves a survey whose data is analysed quantitatively to enable an understanding of the street conditions that associate with the exclusion of cyclists. Data from this survey also enable an understanding of the changes in travel choices and the drivers of these choices. The results of these analyses are quantitatively interpreted from the statistical coefficients while the meanings of these results in real terms are sought from qualitative accounts of the respondents, experts, and field observations (Hancock & Algozzine, 2006). The findings of the study are generalised analytically to transport-related social exclusion (Yin, 2009). I should point out that this exclusion is the phenomenon that this dissertation investigates. Chapter 7 contains these generalisations.

The detailed operationalisation of this mixed methods design is given in Section 3.5.

Embedded case of cycling within a survey

The mixed methods design explained above is operationalised through a survey that is followed by an embedded case of cycling. In other words, the survey involved all respondents irrespective of the mode that they used. However, there were special questions that were only administered on cyclists since they did not apply to non-cyclists. Yin (2009) refers to this design as a 'case within survey' design. The survey sought to understand the socio-demographic characteristics, travel behaviours, and transport challenges that faced individual household members of Kisumu in using their main travel modes. The case of cycling was then embedded into this survey to enable a closer examination of 'how' its exclusion occurred and 'why' it did (Yin, 2009).

The case of cycling in Kisumu was purposively selected because the conditions that defined cycling in Kisumu were considered typical of the conditions in other sub-Saharan African cities. First, the circumstances that defined exclusion of cycling in Kisumu were typical of those that defined general transport exclusion in other sub-Saharan African cities (Patton, 1990; Stake, 1995; Yin, 2009). Specifically, these circumstances related to poor visibility of excluded modes from policy (e.g. Khayesi et al., 2010; Pochet & Cusset, 1999; Salon & Aligula, 2012). These authors stress that this poor visibility is the result of low socio-economic statuses of excluded social groups that use these modes. Secondly, unsupportive infrastructure, traffic, social and policy conditions that hindered cycling in Kisumu were typical of comparable conditions in many other medium-sized sub-Saharan African cities (e.g. Abane, 2011; Diaz Olvera et al., 2013; Howe, n.d.; Pendakur, 2005; Pochet & Cusset, 1999). Therefore, while this study could have selected any other comparable city, I selected Kisumu because it presented an information-rich case that was representative of transport exclusion in general and cycling exclusion specifically (Yin, 2009). For practical reasons, it was easier to obtain data from Kisumu given my previous research experiences with cycling in the city. Moreover, I lived in the city and actively used bicycle as a mode of transport. I therefore understood the dynamics of cycling in the city as well as where and how to obtain information about the challenges that faced the mode.

Study propositions, link to data and criteria for interpreting findings

The study developed three propositions to direct its attention to various perspectives of exclusion that it sought to examine within the scope of its central concern (Yin, 1994). The formulation of these propositions was guided by the content of existing literature on cycling and my own personal experiences with cycling in Kisumu (Baxter & Jack, 2008).

The first proposition held that there was a relationship between the prevailing conditions of street spaces and traffic conditions in Kisumu on the one hand and the exclusion of cycling from the city. Evidence from previous studies in other contexts confirms this relationship (e.g. Church et al., 2000; Parkin et al., 2007; Salon & Aligula, 2012). The current study therefore sought to find out the extent to which this relationship held in Kisumu and how it influenced the exclusion of cycling. To investigate the link, the study developed indicators for the conditions of street spaces and traffic and asked its survey respondents whether these conditions posed a significant restriction to using their main travel modes. Although the conditions restricted the use of all modes in one way or the other, only those that were significant to the respondents were recorded to restrict them from using the streets. The results of the survey were analysed to find out the extent to which the conditions restricted cycling, either by themselves or in combination with each other. The coefficients of the log-linear model explained in chapter 4 were used to interpret the findings. As explained before, the meanings of these coefficients to real life was sought from qualitative data.

The second proposition held that changes in transport-related policies impacted on the exclusion of cycling. This proposition was formulated to enable the study assess the impact of policy changes such as taxation on bicycles, the shift to commercial motorcycling, and transport reforms. These policy changes were thought to relate to the exclusion of cycling and cyclists. To ascertain this proposition, the study examined the changes in mode choices and sought an account of these changes from the respondents. A retrospective survey of mode choices and the

reasons for changes in mode choices over the last fifteen, ten and five years till the time of the survey was carried out to obtain data for this examination. These dates coincided with the major events in history of cycling in Kisumu. The period around fifteen years from the time of data collection marked the large-scale commercialisation of pedal cycling for passenger transport. This is also the period that saw the publication and enforcement of the Legal Notice Number 161 of 2003 (Government of Kenya, 2003b). These rules banned the use of shared taxis that provided public transport in Kisumu. The effect of this ban was that the city was left with hardly any public transport. Cycling also received some attention that sought to make it safe and promote its use during this time. This attention was however mixed as it concurrently promoted and banned cycling from the city centre (UN-HABITAT, 2004). The period around ten years from the time of the current study marked the emergence of commercial motorcycling to offer similar services as the pedal bicycle-taxis. The Government also removed import taxes on motorcycles during this period in order to encourage their use as they were seen to be more superior to pedal bicycles (Institute of Economic Affairs, 2008). The present period is marked by a concurrent use of both commercial pedal cycling and motorcycling. The trend over the last ten or so years has thus witnessed a general decrease in the supply of pedal cycle services, partly as previous pedal cycle operators 'upgrade' to motorcycling. The study analysed the data on these changes in mode choices and their drivers to find out their relationship with the exclusion of cycling from Kisumu. This analysis was carried out using the multinomial logistic regression. The findings were interpreted from the coefficients of logistic regression and supported by the subjective findings from qualitative sources. Chapter 5 presents these findings.

The final proposition held that there existed an ambiguous support for cycling by the extant transport and general development policies that shaped the creation of street spaces in Kisumu. This proposition was formulated to guide the study to interrogate the persistent exclusion of cycling from street spaces when there were various policies that sought to address social exclusion in its broader conception. The proposition directed the study to analyse the extent to which the provisions of these policies enabled the creation of streets spaces that supported cycling in Kisumu. In this case the rival explanations of social inclusion offered by the tenets of the right to the city and the social quality theory offered the basis for interpreting the provisions of these policies. The results of this analysis are contained in chapter 6.

Units of analysis

According to Yin (2009), the unit of analysis is the major entity that is analysed in a study. The current study analyses the exclusion of all travel modes in general but pays specific attention to the exclusion of cycling. The study considers the global picture of exclusion because it holds that a more satisfactory discussion of the exclusion of cycling can be obtained by considering it relative to the other modes. This is because the exclusion of cycling does not take place in isolation but rather in relation to the other modes (Sen, 2000; Silver, 2007). The study has two units of analysis. The first is the individual user of travel modes. These individuals are the entities that are analysed to understand changes in travel behaviour and the relationship between the conditions of streets and traffic on the exclusion of cyclists. The second unit of analysis is the city itself. This is the entity that is analysed to understand the impact of policy processes on exclusion in a typical medium-sized sub-Saharan African city.

3.4 Putting Kisumu in context

Introduction

The present study deliberately focused on Kisumu, Kenya to obtain data and to analyse the exclusion that faced cycling in medium-sized sub-Saharan African cities. Kisumu was chosen as the study site mainly because of the irony presented by its active pedal cycling amid the constraints imposed on the mode by the factors that were thought to constrain the use of the mode. These factors included the combination of the city's street spaces and traffic conditions, the changes brought about by transport-related policies, and policies that influenced the development of transport infrastructure in the city. This mix of contradictions that characterised cycling in Kisumu was considered comparable to the situation in other medium-sized sub-Saharan cities where cycling was an active mode of transport. Kisumu offered a representative site for the current study to realise an in-depth account of the factors that inhibited cycling in sub-Saharan African cities. As explained earlier, Kisumu was also selected because it was deemed easy to obtain data about it given my personal experiences in cycling and general urban planning issues in the city. This section presents an overview of the background information that I considered relevant in discussing cycling in Kisumu.

General overview of Kisumu city

Kisumu city is the headquarters of Kisumu County and the third largest city in Kenya after Nairobi and Mombasa respectively. It lies on the western part of Kenya (Figure 3-1). The National Population and Housing Census of 2009 estimates that Kisumu city has a population of 409,928 inhabitants, 97,461 households and an annual population growth rate of 2.6% (Government of Kenya, 2010c). Like the other 46 County headquarters of Kenya, the city (hereafter referred to simply as Kisumu) serves as the principal commercial, administrative, transport, and educational hub of Kisumu County (Nodalis Conseil, 2014). It also provides higher order goods and services to other urban centres in western Kenya due to its rank as the principal city in the western region. The implication of these roles has been a sustained demand for transport as people participate in producing and consuming these goods and services that are spatially disjointed across the city. This interdependence between transport and land-use has been documented by various researchers, among them, Geurs and van Wee (2004), Priemus, Nijkamp, and Banister (2001), Scheiner (2010a), and Wegener and Fürst (1999).

The present study focuses on intra-urban passenger transport in Kisumu. Travel demand in the city has traditionally been met by walking, shared taxis, *matatus* and *boda bodas* (Kola, Onyango, & Oindo, 2012; Nodalis Conseil, 2014). Commercial motorcycling and rickshaws have also emerged since 2004 to supplement these traditional modes. Lack of an organised public transport is a conspicuous challenge to passenger mobility in the city. Presently, the city's 'public transport' is supplied by paratransit service that is largely dominated by *matatus*.

Like other Kenyan cities however, the service offered by *matatus* remains generally deficient in terms of its adequacy, efficiency and safety (e.g. Asingo & Mitullah, 2007; Kola et al., 2012; Odero et al., 2009; Salon & Aligula, 2012). Moreover, with high poverty levels in Kisumu (Nodalis Conseil, 2014), transport cost turns out to be one of the leading factors that keep the city's urban poor in poverty (Maoulidi, 2012).

The above deficiencies have been some of the core drivers of cycling in Kisumu. Lack of affordable transport, inadequate 'public transport' and relatively shorter travel distances occasioned by the compact nature of Kisumu reinforce each other to sustain cycling in addressing the city's transport disadvantage. This disadvantage disproportionately impacts the city's poor majority. For this group, cycling presents a better alternative to walking. Inflexibilities of the structure of *matatu* routes has also encouraged cycling in intra-urban connections (UN-HABITAT, 2004). This is because these *matatu* routes are presently organised to facilitate home-based trips, a fact that renders non-home-based trips unsupplied unless they fall on the same routes used by *matatus* (field observation).

City size and growth trends

The total landmass of Kisumu city is estimated to be 417 km^2. This comprises of 297 km^2 of dryland and 120km^2 that is under water (UN-HABITAT, 2004). The present study however focuses only on the urban footprint of the city – an area defined by Riat centre to the north-western side, Mamboleo to the north-eastern side, Nyamasaria centre to the south-eastern side, and Dunga to the south-western side. Other features that define this area are Lake Victoria to its western side and Riat Hills on its north (Figure 3-1).

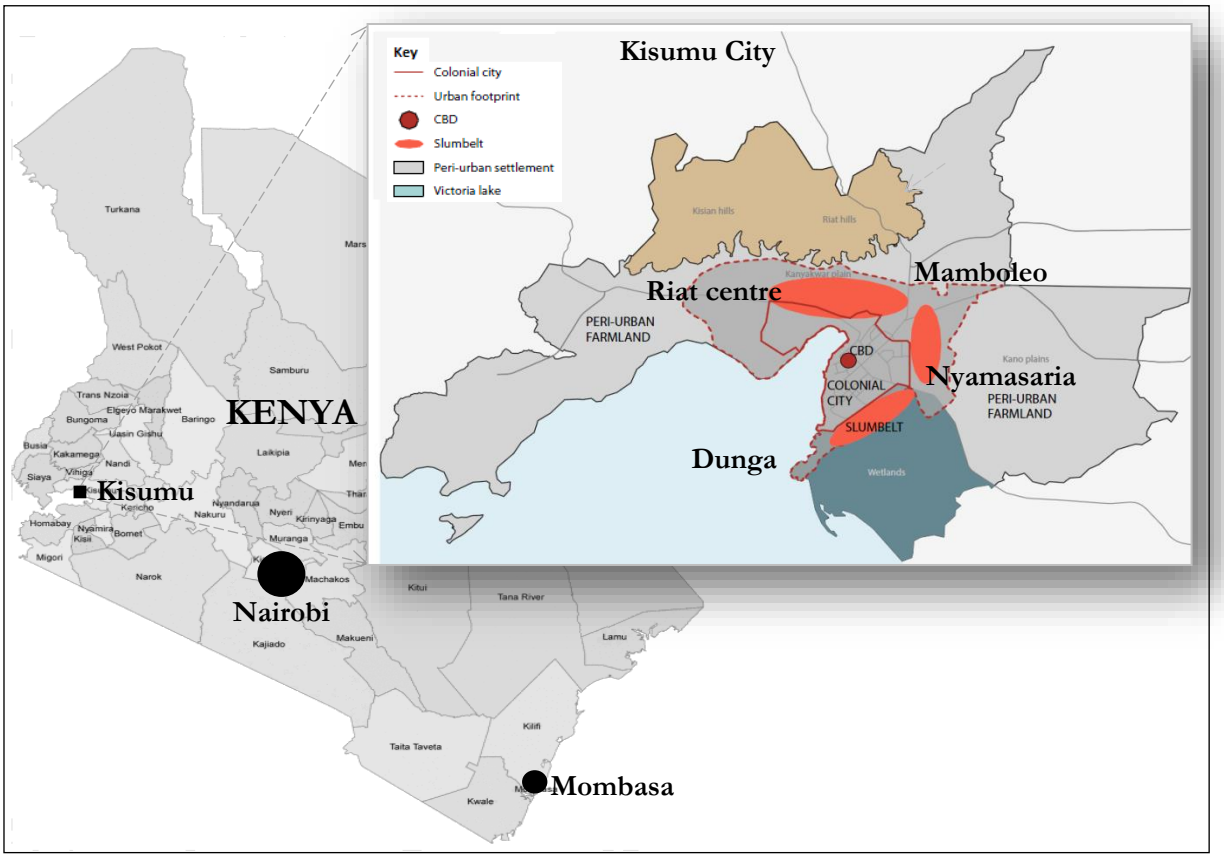

Figure 3-1: Kisumu city within Kenyan context

Redrawn with permission from Nodalis Conseil (21.10.2016)

Although the history of Kisumu dates back to the precolonial times, the city's current built form derives from its colonial legacy (Anyumba, 1995). Consequently, the city can be divided into three zones based on the predominant urban morphology. These include the old town (the

colonial town), the peri-urban, and the extended areas (Figure 3-1). Previous studies have reported that households from these zones are almost homogeneous in terms of their socio-economic compositions (e.g. Anyumba, 1995; Maoulidi, 2012; UN-HABITAT, 2005). The zones were therefore used as the basis for sampling in the current study. The sampling procedures are explained later in section 3.5.

Poverty situation and its implications for planning for cycling in Kisumu

Because of its position as the principal urban centre in western Kenya, Kisumu has continued to attract considerable population from its rural hinterlands and neighbouring urban centres. This population is attracted by relatively better life opportunities that Kisumu offers (Maoulidi, 2012). However, the production of these opportunities that pull newcomers into the city has hardly matched the inflow of these newcomers. This mismatch has made unemployment, poverty, and poor access to services a daunting planning challenge for the city (Maoulidi, 2012; Nodalis Conseil, 2014). Unemployment and poverty rates are estimated at 30% and 48% of the city's total workforce and households respectively (Nodalis Conseil, 2014). The bulk of this poor population resides in the slums and informal settlements of the city (Nodalis Conseil, 2014). Majority of this population either walks or cycles to their daily destinations. These mode choices are not just because they can hardly afford *matatu*[3] fares; but also because motorised transport service is often unavailable in their settlements due to poor roads (Kola et al., 2012; UN-HABITAT, 2004). Commercial motorcycling has recently emerged as an alternative mode of transport to bridge the service gap in the settlements dominated by the urban poor of Kisumu (Kola et al., 2012). The affordability of this new mode to the urban poor remains undocumented even though the fares they charge are generally higher than those charged by *matatus* for comparable distances.

Figure 3-2: Typical Kisumu matatu (a) and commercial motorcycle (b)

Photo credit: Author (various dates)

The relevance of this poverty situation for the current study is the contradiction it presents for transport planning. It would be expected that the city authority would support cycling as a strategy to ease the movement of its poor majority who are the dominant users of bicycles in meeting their daily accessibility needs (Mutiso & Behrens, 2011; UN-HABITAT, 2004). On the contrary, cycling has received ambiguous attention from the authorities. The mode is

[3] A privately-owned omnibus typically with a capacity of 14 passengers in the case of Kisumu and used for public transport (Figure 3-2)

concurrently encouraged and discouraged from the city (e.g. Alal, 2014; Municipal Council of Kisumu, 2009; UN-HABITAT, 2004). Figure 3-3 exemplifies the contradiction between documented commitments by the State to promote cycling and its actions in practice.

Figure 3-3: Contradicting support for cycling in Kisumu: the mode is banned from some sections of the city
Photo credit: Author (06.07.2014)

Topography

The topography of the study area is divided into the hilly northern part, the relatively flat part in the old city, and the gently sloping part from the city's CBD towards the lake (Figure 3-4).

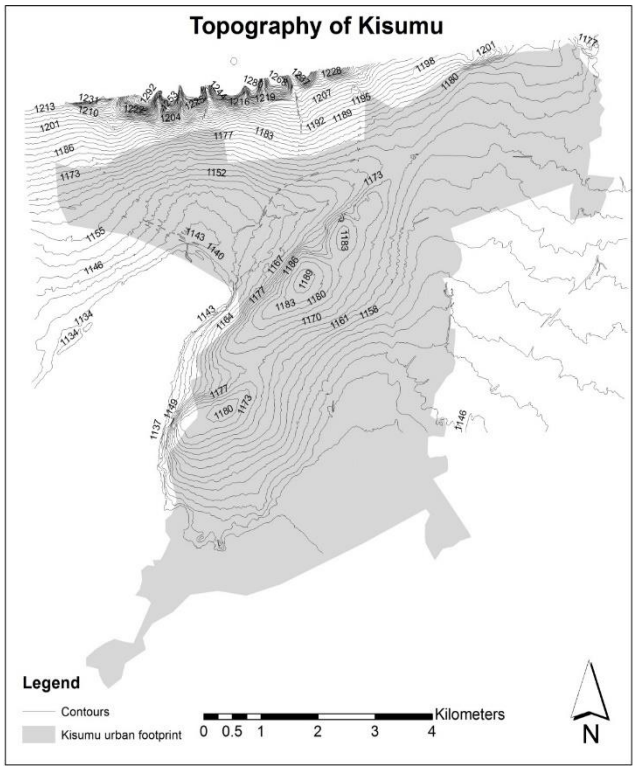

Figure 3-4: Topographical features of the urban footprint of Kisumu
Compiled from geo-data obtained from the Kisumu City Planning Office

The hilly area peaks at about 1,192 metres above sea level comprises and flat area towards the city's Central Business District (CBD). This hilly area has witnessed vibrant high-income residential development over the last ten years. Most of the new residents here are car users although other modes are also recorded. The hilly part is however outside the spatial scope of the current study. The relatively flat part of the study area extends from Nyamasaria to Dunga through Nyalenda, and into the southern part of the CBD (Figure 3-1). Another flat terrain is to be found from Obunga through Bandani settlement through to Riat centre. The altitude of this area ranges from about 1,146 metres above sea level around Nyamasaria centre to 1,152 metres above sea level around Riat centre. These two flat terrains are interrupted by a flat ridge that runs along Jomo Kenyatta Highway and Nyerere Roads from around Kondele junction into the central part of the city. The altitude here ranges from 1,189 metres above sea level around Kondele junction to 1,164 metres above sea level in the CBD. This ridge gives way to a gentle slope to the lowest point at the shores of the lake. The lowest point is about 1,137 metres above sea level. The major streets of the city are presented in Figure 3-5.

The implication of the topography of Kisumu described above is that cycling is relatively easy save for the areas towards Riat Hills and from the lake towards the CBD. Generally, the city can be said to face minimal topographical barriers to cycling.

Climatic conditions

The climatic conditions of Kisumu are relevant in a discussion of active travel modes such as cycling. This is because previous studies have associated high temperatures, humidity and precipitation with occasioning low modal share of cycling (e.g. Cervero et al., 2009; Pucher & Buehler, 2006; Pucher, Jan et al., 2011).

Kisumu records an average of about 116 mm of rainfall per month[4]. The long rains come in the months of March to May while the short rains are registered between November and December (*Appendix iv*). According to data from the Kenya Meteorological Department, at least 1mm of rains is recorded for an average of ten days per month throughout the year. Rainfall in Kisumu is notably characterised by heavy afternoon downpours that do not last for more than two hours in most of the cases. The fact that there are distinct rainy seasons and that the time of the rains can also be predicted makes it easy to plan for the use of bicycle in Kisumu.

The city experiences hot temperatures throughout the year (*Appendix iv*). According to the data from the Meteorological Department, the average monthly temperature ranges between 23.2^{0}C to 29.4^{0}C. The months of October to March are the hottest, with the highest temperature reaching above 29^{0}C while the lowest temperatures do not go below 23^{0}C. On the other hand, the months of June and July are the coldest with maximum temperature of less than 28^{0}C and lowest temperatures of about 22^{0}C.

The relative humidity in Kisumu ranges from 64% to 75% (*Appendix iv*). This humidity is reported to be lower than would be expected because of unstable ascent of saturated air in the city and its hilly surrounding to the north (Anyumba, 1995). This saturated air is said to be

[4] Data from Kenya Meteorological Department 1938-1990

responsible for the upward distribution of vapour that would otherwise collect closer to the ground in stable conditions (Anyumba, 1995).

Although the climatic conditions presented above would arguably raise doubts about the viability of cycling in Kisumu, the city registers some of the highest amounts of cycling in Kenya (UN-HABITAT, 2004). Its climatic conditions do not therefore deter its cyclists from using the mode. This situation is not unique to Kisumu. Active cycling has been reported in Tamale, Ghana (Abane, 2011), Ouagadougou, Burkina Faso (Godard, 2013), Kampala, Uganda (Howe, n.d.), Morogoro, Tanzania (de-Langen & Tembele, 2001) among other sub-Saharan African cities. All these cities register climatic conditions that would be imagined of as a deterrence to cycling.

Fitting cycling into Kisumu's transport service and infrastructure

Cycling constitutes an important mode of transport in Kisumu. The mode is used for private and passenger transport as well as for transporting light freight. A discussion of cycling is therefore incomplete unless it is put within the context of transport service situation in Kisumu and the city's infrastructure conditions. This section offers a brief overview of this situation.

As already mentioned earlier, transport demand in Kisumu is met by walking, shared taxis, rickshaws, *matatus*, *boda bodas,* rickshaws and commercial motorcycles. The modal share of these different modes however remains unclear. This lack of clarity is occasioned by the fact that fewer transport researches in Kenya have focused on Kisumu. The few studies that have focused on Kisumu have not documented the complete picture of the modal share of all the modes used for daily trips in the city. Recent investigations (e.g. Kola et al., 2012) have tended to lump pedal cycling together with motorcycling, thus further making it hard to separate the modal share of these two modes. Nonetheless, this study by Kola et al. (2012), is perhaps the only attempt thus far at a comprehensive understanding of the modal split of different modes in Kisumu.

Kola et al. (2012) estimate the modal share to be 45 - 54% for *matatus* in Mamboleo and Otonglo, and 30% in the case of Nyamasaria. On the other hand, *boda boda* (in this case pedal bicycles and motorcycles) is estimated to have a share of 47% in Nyamasaria, 33% in Otonglo and 20% in Mamboleo. The share of private car is estimated at 55% although it is only reported for Mamboleo. Finally, walking is estimated to have an overall modal share of 15% in all the neighbourhoods. While these findings are indicative of the modal split in Kisumu, the picture could be different if one considered residential places which are much closer to the city centre. Suffice it to mention that the three residential places from which the study collected its data are the furthest residential places from the city centre (see Figure 3-1). A study by Makajuma (2006) for instance estimates the modal share of cycling on its own to be 16%.

Transport services discussed above are closely linked to transport infrastructure conditions of the city. The current study restricts its discussion to road infrastructure alone. Kisumu is characterised by a simple street network structure. This network comprises of eleven main streets that are joined by other secondary and unclassified streets. The main streets include Kenyatta Highway, Nairobi Road, Nyalenda Ring Road, Achieng' Oneko Street including the

road to Dunga, Oginga Odinga Street, Mumias Road, Nyerere Road, Ondiek Highway, Manyatta Ring Road, Kibos Road and Mamboleo Road (see Figure 3-5).

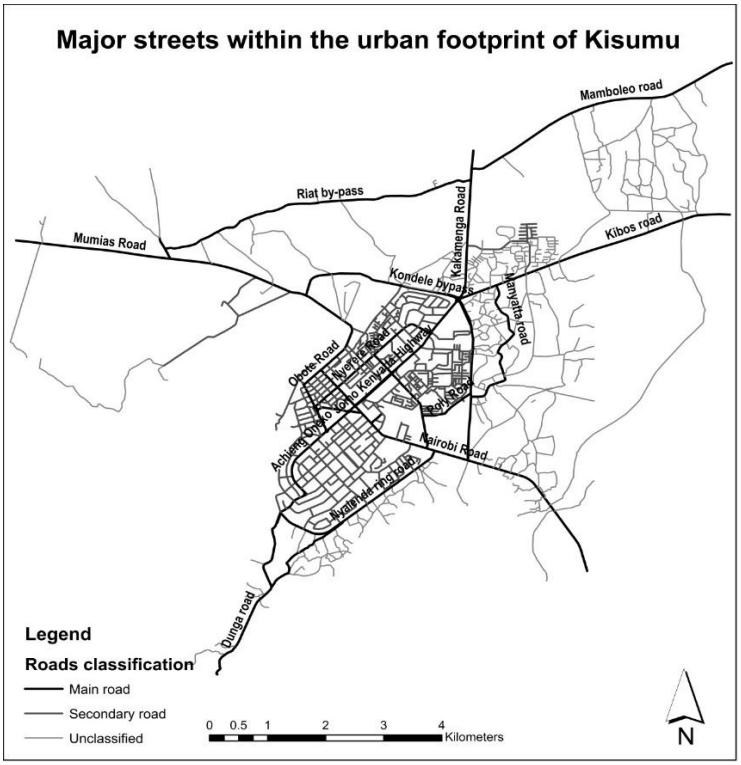

Figure 3-5: The major streets within the urban footprint of Kisumu
Compiled from geo-data obtained from the Kisumu City Planning Office

Generally, the infrastructure conditions of Kisumu have been developed and maintained in favour of the old city when compared to the extended settlements. As evidenced by Figure 3-5, the network density and connectivity of the streets of the city are higher in the old city, where most the high-income residents of the city reside. Moreover, the streets within the old city comprise mainly of tarmacked street surfaces. The conditions of the streets in the old city present a sharp contrast with those of the feeder roads in the slums and peri-urban settlements. The latter are mostly dry-weather streets (see Figure 3-6). Most of these feeder roads are narrow, dusty during the sunny seasons, and muddy and waterlogged during the rainy seasons (Othuon & Chavene, 2012; UN-HABITAT, 2005). Moreover, they mostly lack any form of drainage and street lighting (Othuon & Chavene, 2012; UN-HABITAT, 2005). The slums and peri-urban settlements are connected to the rest of the town by single streets that run from the Central Business District of the city to these settlements. The implication of this is that all connections to Riat centre, Mamboleo, Kibos, Nyamasaria and even Manyatta have to be made through the city centre. Streets that connect Nyamasaria and Riat centre are of well-maintained tarmac quality, partly because these settlements are on the major highways that link Kisumu to other cities. In contrast, the connection to Dunga, Kibos and Mamboleo are of poorly maintained tarmac. These settlements can be described as the terminal settlements within the boundaries of the city as they do not link Kisumu to other major towns.

Figure 3-6: Contrasting between roads in the old city (A&B) and streets in slums and peri-urban settlements (C&D)
Photo credit: Author (May-June, 2014)

There is a close connection between the conditions of the streets described above and access to transport service – whether by public or by private means. Most residents of the old city, particularly Milimani, use their private cars and can also walk to the city centre where most trips in the city terminate. As such, there is no public transport that serves this residential area. The main public transport to the other settlements is *matatus*. Comparatively better quality *matatu* service has traditionally remained restricted to the tarmacked streets that serve the densely populated settlements of Manyatta, Kondele and Mamboleo. Nyalenda, Nyamasaria and Riat centre are also serviced but the frequency of service here is irregular (field observation). There are only a few *matatus* that ply these routes – mostly during the peak hours. Part of the reasons for this irregularity of service on these routes is because *matatus* take long to fill their passengers before they can leave the designated main stops. This is because most residents of these neighbourhoods prefer to either go by other alternative modes to *matatus* or by intercity *matatus* that pass through the settlements (Kola et al., 2012). These long waiting times make the routes unattractive for the profit-driven service providers (Kola et al., 2012).

The transport situation described above is made worse by high incidences of poverty. I already presented an argument that this poverty stifles access to transport service from many residents of the slums and peri-urban settlements of Kisumu. Specifically, transport service is either unavailable or of poor quality or even unaffordable. These disadvantages force affected residents of these neighbourhoods to either walk their entire journeys or walk longer distances to reach places where they can catch *matatus* (UN-HABITAT, 2005). Walking and cycling and recently, motorcycling and rickshaws have thus developed to ameliorate this transport disadvantage. They form an integral component of transport in the city. Despite their role in enabling accessibility to opportunities, walking and cycling remain inhibited by auto-

oriented transport planning that creates streets that exclude them. This dissertation focuses more on the challenges that face cycling.

The next section details the methods that were used to collect and analyse data to understand the limitations imposed on different modes by the street conditions described above and the policy environment that create and support the conditions.

3.5 Data collection and overview of data analysis

The current study collected and analysed quantitative and qualitative to address its objectives. Quantitative data was gathered through a survey that targeted members of sampled households from Kisumu. Government of Kenya (2010c) defines a household as 'a person or group of persons who reside in the same homestead or compound but not necessarily in the same dwelling unit, have same cooking arrangements, and are answerable to the same household head (p.4). On the other hand, qualitative data was obtained from government policy documents, field observations and through expert interviews with transport experts in both government and private practice. In addition, follow-up questions with respondents who took part in the household interviews also supplied qualitative data. These follow-up questions were administered randomly to probe the respondents to offer qualitative clarifications of their answers to the original questions that the study administered. Respondents were observed to note particular emphasis or withdrawal in their answers before they were selected for further probes. The study deemed these respondents to possess hidden information that could improve the understanding of transport challenges and mode choices in Kisumu. Results of these qualitative accounts are organised thematically and used to interpret the results of the empirical analysis presented in chapters 4, 5, and 6. The spatial data that has been used to generate the maps in the dissertation was obtained from a geodatabase that was maintained by Kisumu City Planning Department. This section begins by presenting the procedures that were followed to obtain and analyse quantitative data before it turns to those of the qualitative data.

Quantitative data

The geographical scope of quantitative data used in this study was the urban footprint of Kisumu (Figure 3-1). This urban footprint was selected because it was deemed representative of both the urban and semi-urban nature of Kisumu. I thought it was useful to reflect this dual nature of the city and how it impacted on the central research problem that was tackled by the current study. There existed active spatial interactions within settlements within this urban footprint as well as between them and the city centre. Because of these interactions, the settlements constituted a rich source of information on the difficulties that faced different modes in overcoming the time-space impedance to their interaction. Quantitative data was collected using a semi-structured survey of members of households that resided within the settlements in this urban footprint.

Sampling

The study began by drawing a representative sample of households from the study area since it could not have been practical to study the entire area identified in the previous paragraph (Kothari, 2004). A two-step sampling procedure was followed to achieve the required sample.

The first step involved a spatial sampling (see e.g. Páez & Scott, 2004). To do this, the urban footprint of Kisumu was first clustered into three zones, namely the old city, the slum belt, and the peri-urban areas of the city (Figure 3-7a). These zones were based on the urban morphology of the city (Anyumba, 1995). The advantage of adopting this urban morphology is that it allowed the study to investigate and discuss its findings within the perspective of the specific socio-economic and transport conditions of the households in these zones.

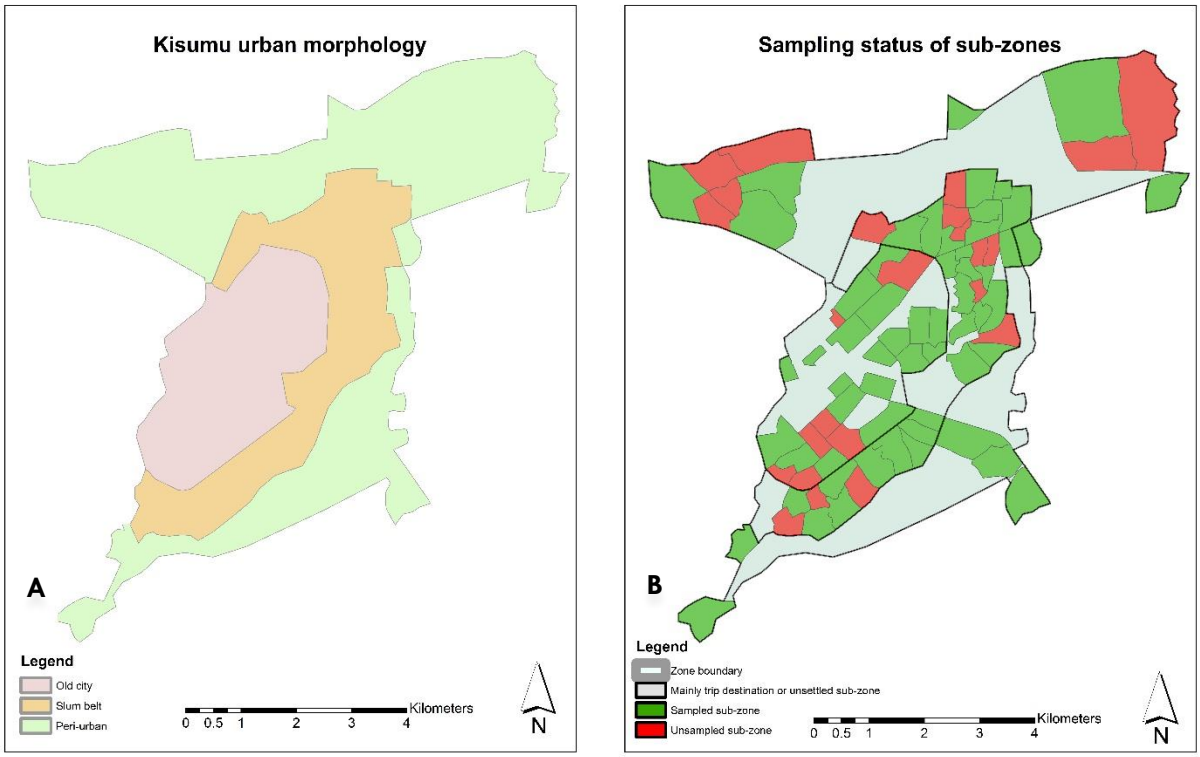

Figure 3-7: (a) The urban morphology of Kisumu as a basis for sampling of (b) Residential zones from where respondents were drawn

Compiled from geo-data obtained from the Kisumu City Planning Office

Each of these three zones could be described to comprise of households with similar socio-economic characteristics (see e.g. Anyumba, 1995; Othuon & Chavene, 2012; UN-HABITAT, 2005). The study therefore deemed it relevant to group them together for ease of the subsequent travel behaviour analysis.

The zones were further divided into smaller sub-zones to enable data collection and analysis. Part of the intention in creating these sub-zones was to enable their later adoption as the Traffic Analysis Zones. In creating these sub-zones therefore, the study was guided by the density of settlements, socio-economic conditions of residents of the neighbourhoods, and the natural traffic flow boundaries. Consequently, areas that had denser settlements were divided into smaller sub-zones compared to those that had more scattered settlements. Also, households that were deemed to have similar socio-economic conditions were placed in similar sub-zones.

It should be reiterated that the city was already divided into coarsely distinct socio-economic zones by the three clusters that I began with. Finally, the natural traffic flow provided the geographical limits of the sub-zones. The built-up boundaries were adopted as the limits of the sub-zones in cases where roads did not exist. These boundaries were observed from a digital map of the city that was obtained from the City Planning Office. A total of 83 sub-zones were created from this procedure. These comprised of 26 sub-zones in the old city, 39 sub-zones in the slum belt and 18 sub-zones in the peri-urban zone.

The sub-zones above constituted the sampling frame for sampling the sub-zones in which household interviews were carried out. Accordingly, 19 sub-zones were sampled randomly from the old city; 28 sub-zones from the slum belt, and 12 sub-zones from the peri-urban zone (Figure 3-7b). The distribution of the sub-zones was done to reflect the observation that about 48% of Kisumu's population lives in absolute poverty and are to be found mainly in the slum-belt of the city (Nodalis Conseil, 2014; UN-HABITAT, 2004). This slum belt comprises of Nyalenda, Manyatta, Kondele and Obunga. Settlements immediately around Mamboleo, Nyamasaria, Molem, Bandani and Riat shopping centres were purposively sampled because they contained unique cases that characterised transport needs of the peri-urban zone which the study would not have wished to leave out (Yin, 1994, 2009). Similarly, Dunga Nanga and Dunga beach, and Kenya-Re were also purposively sampled on the strength of their uniqueness. The sub-zones were numbered for each cluster zone and fed onto SPSS to enable random sampling of the required number of sub-zones. Sub-zones that had been purposively selected were excluded from their cluster zones to allow the study to randomly select only the number of sub-zones that were required for a complete sample size per cluster zone. This operation affected the samples from the slum belt and the peri-urban zone where some sub-zones were purposively selected.

The sample size formula below was used to determine the minimum number of households and by extension individuals that was necessary to carry out a representative study (Zar, 1984):

$$ss = \frac{\boldsymbol{Z^2} * (\boldsymbol{p}) * (\boldsymbol{1-p})}{\boldsymbol{c^2}} \qquad \textit{Equation 3-1}$$

Where:

ss = Sample size
Z = Z value (in this case taken as 1.96 for 95% confidence level)
p = percentage of population participating (in this case taken as 0.5 of the sample size needed)
c = confidence interval (in this case taken as 0.02)

The calculations were based on the total number of households in Kisumu (97,461) since the distribution of individuals across the clusters could not be obtained from the official government census reports. Using the above formula would have yielded a sample size of 2,387 individuals whose spatial distribution across the city could have been hard to tell unless they were connected to the households. To address this difficulty, the study calculated the sample size for the households to obtain 2,343 households. This resulting sample size was then distributed equally among the 59 sub-zones explained earlier. This way, the study hoped to interview individuals from 39.7 (rounded off to 40) households in each sub-zone. With an average household size of about 4 members per household (Government of Kenya, 2010c),

the expected number of individuals would have been realised even in the unlikely event that only single-member households were found in the sampled zones.

Systematic random sampling was then employed to select the households in which the interviews were carried out. The researcher identified a random street within each sub-zone and randomly selected one household as the starting point for the interviews. This starting point was noted down on a field map in case there was need to retrace any household later. Thereafter, the researcher skipped the next four households and carried out the interviews in the fifth, tenth, fifteenth households etc. until the required sample size was achieved. This procedure targeted to sample 760, 1120 and 480 households from the old city, the slum belt and the peri-urban zone of the city respectively. It is notable that this study sampled households although it was interested in responses from individuals. This was a deliberate strategy that hoped to put the responses of these individuals into spatial context by assigning the responses to the places where the respondents lived.

Household interviews

These interviews were carried out between May and August 2014.

Fifteen field assistants were recruited and trained to help in administering the questionnaires. Field assistants were sought from recent graduates of urban planning program from a local university. The reason for setting this criterion was to ensure that the researcher worked with research assistants who were knowledgeable on questionnaire administration as well as the local context. The field assistants were taken through the entire questionnaire to ensure that they understood the objective of each question that was posed therein.

A pre-test survey was then carried out to find out if the questions were clear to the respondents and to estimate the amount of time that was required to answer them. This pre-test triggered the revision of some questions and resulted in a rearrangement of the order of the questions to achieve a logical flow that was comfortable with the respondents. A secondary objective of the pre-test survey was to enable the researcher to assess the competence of the field assistants.

The respondents were approached in person from their homes at their convenient time. Although the initial design was to approach the respondents from 6PM after they had come back from their occupations, the researcher realised that some household members were willing to be interviewed during the day. Consequently, the timings of the interviews were changed to accommodate this flexibility. We therefore approached the households in the evenings and where necessary, made appointments for later interviews with members of these households who were willing to do so. The field assistants moved in pairs of 3 to each household in order fast-track interviews with members of each household before moving to the next household. In each case, there was a leader who approached the household head to explain the exercise and to seek informed consent. Each field assistant then interviewed different members of the household once permission to do so had been granted. Each respondent was interviewed separately to ensure that the responses of other members of the household did not make them give biased responses. All respondents participated voluntarily and no incentive was given to elicit this participation. On average, a questionnaire took about 30 minutes to complete.

Because the study focused on independent travel decisions, only household members who were aged 10 years and above were interviewed. The study assumed that household members who had attained this minimum age could make such independent travel choices. Nonetheless, the interviews only considered household members who had not attained the age of 18 years (i.e. children) after confirming that they in deed made independent travel decisions. This confirmation was based on self-report given by the respondents themselves about who was responsible for making their travel decisions. In the case of the retrospective survey presented in chapter 5, respondents were first asked if they had attained the age of 10 as at the data points and whether they made independent travel decisions at that point before the survey was administered on them. Respondents were only interviewed if they responded in the affirmative and if they lived in Kisumu at the time under consideration. The details of these data points are discussed in chapter 5. Although the main focus of the survey was on cycling, the questionnaires were presented as individual travel surveys of daily commutes without the specific attention to cycling being stated. The reason for presenting the questionnaires in this form was to forestall any bias or strategic response that could have been elicited from the respondents if they knew the express interest of the study.

Once a field assistant had finished the interviews for a day, I checked the data with them for completeness, comprehensibility, consistency, and reliability. Initially, we did this checking together in the afternoons, just before we could embark on a new day's work. However, this arrangement was changed to focus on each field assistant to enable them the flexibility to conduct interviews in cases where they had appointments to visit respondents at the respondents' convenient times.

Data was obtained through semi-structured interviews with individual members of households that were obtained through the sampling procedure explained in the preceding section. The data was collected between May and August 2014 using semi-structured questionnaires that comprised of 28 questions (see *Appendix i*).

The questionnaire was organised in 6 sections.

Section 1 focused on obtaining the background information of the household in which the respondent was a member. This part was administered on the household head only or a partner, who was assumed to be knowledgeable enough to give reliable background information about the household. The section sought information about the size and composition of the household, mode ownership, tenure structure of dwelling unit, years lived in Kisumu, residential mobility since coming to Kisumu and the reasons that triggered that mobility. A question on the household income was also part of this section even though it was posed at the end of the questionnaire. All the questionnaires were serialised such that members of the same households could be linked.

Section 2 of the questionnaire focused on the background information of the respondent. This part contained the gender and age of the respondent, marital status, relationship to the household head, years of formal education, and occupation and place of occupation.

Data about mode choice and use was captured in the third section of the questionnaire. This part was organised to obtain data about the main daily or regular destination, the primary

mode used to travel there, ownership of that mode and who drove or rode the mode, and the frequency of travel to the destination. This section also sought to find the main factor that respondents considered in choosing the main mode that they used. In addition, information about accessibility to transport service in terms of the duration of time it took respondents by foot to reach the nearest public places where they could access bicycle taxi services, motorcycle services, rickshaw services and *matatu* services was also sought from this section. A further perspective to service accessibility sought to find out the duration of time that the respondents had to wait before the mode arrived as well as before the mode started off the journey. This section culminated with questions that were specific to cycling. In this case, the study sought to find the frequency of use of the bicycle, the purpose of use, the main reason for its use, and the prohibitions. Respondents who reported that they used the bicycle for at least 2 weeks in a month were deemed to be cycling for purposes of the subsequent sections of the questionnaire. Although the current study did not obtain the exact percentages of respondents who were involved in alternating between different modes, the use of multiple modes is a common practice among residents who do not have modes of their own[5]. This was particularly the case with cycling and walking. The modal share of cycling and walking presented in the results of this study should therefore be interpreted with caution as they could be biased in favour of the cycling. It should be pointed out at this point the purpose of the current investigation was not to carry out a modal split study even though the results it presents could be indicative of the modal split in Kisumu.

The fourth section delved on finding out the changes in the travel patterns over the past fifteen years from the time of the study. It should be recalled that the present study was designed to allow it to align its findings with important historical dates in the development of cycling in Kisumu (see section 3.3). A retrospective study was conducted in which the respondents were asked about their places of occupation, places of residence, places of occupation and the primary mode used in the last 15, 10, 5 years. For purposes of data collection and analysis, 15 years was the period between 1999 and 2003; ten years was considered the period between 2004 and 2008; while 5 years was taken to be the period between 2009 and 2013. The present time was considered the months of 2014, running up to the time of data collection. Important historical dates in the city were used to prompt the respondents to remember the exact year that was of interest to the study to minimise deviations (see *Appendix i* for details). The section then paid specific attention to changes that involved cycling between any of the dates that were considered. Four important directions of these changes were investigated. The first two investigations involved finding out why respondents changed from cycling to other modes and vice versa. The third investigation sought to know the reasons why some respondents had never cycled at all were also sought while the last one probed the reasons why some respondents never changed from cycling to other modes as the primary way of getting to their regular destinations.

Section 5 of the questionnaire focused on the potential for use among children. In this case, the study investigated the willingness of parents to allow their children to cycle to school under the current infrastructure and traffic circumstances. Results of this investigation are however not analysed in this thesis. I therefore do not discuss the details of the questionnaire.

[5] Issues emerged from the follow-up questions on mode use

The last section focused on the infrastructure and traffic challenges that were encountered by respondents. A number of conditions were identified to signify these challenges. Respondents were then asked if each of these conditions posed a considerable challenge to using the modes that they actually used. The respondents were restricted to report only about the specific modes and routes that they actually used in a bid to control for speculative responses from them. In addition, they were also asked about their coping strategies in each case (see *Appendix i* for details). The section also sought to find the connection between these conditions and the quality of life and the priority improvements that the respondents recommended in order to improve the conditions.

Qualitative data

Qualitative data was obtained from government policy documents, field observations and through expert interviews with transport experts in both government and private practice. This data was sourced by the researcher.

The study sought to find out the Government policy targets relating to economic development in general and transport development specifically. This information was sought from the Kenya Vision 2030 (KV2030) and the Integrated National Transport Policy (INTP). These two documents were purposely selected for analysis because they contained the principal policies that shaped transport in Kisumu and other Kenyan cities. The contrast between economic pursuits of the Kenya Vision 2030 and the targets of the transport policy specifically offered a platform for identifying the threats and opportunities available for cycling-inclusive transport. The aim of obtaining data from these two documents was therefore to enable an assessment of the extent to which cycling concerns had been included by Government policies. Data collection was guided by the ideals of social inclusion that were derived from social quality theory and the right to the city concept. Data collection involved critical content analysis that was guided by these ideals. Details of how the ideals of social inclusion guided data collection are given in section 6.4.

Field observations on the other hand targeted observable conditions of the streets such as their widths, surface conditions, and the behaviour of motorists towards cycling. An observation checklist was prepared to guide the field observations (*Appendix ii)*. At the same time, observation was also carried out to verify the responses that were obtained from household respondents and transport experts that were interviewed. Where possible, photos of observed data were taken. Data obtained from field observation has been organised thematically in this dissertation to support the findings from other data sources.

Expert interviews with one non-motorised transport practitioner and an officer at the County Government were also conducted. The later oversaw transport planning docket at County Government of Kisumu. These experts were selected purposively for the interviews because of the vast knowledge that they possessed on transport planning in general and non-motorised transport in particular (Yin, 1994, 2009). They possessed this knowledge by virtue of their professional practice and official responsibilities. Once the experts had been identified, appointments were organised to interview them at their respective offices and at their convenient time. The interviews were conducted in the month of August 2015 and lasted for about one hour in each case.

The expert interviews focused on understanding a number of qualitative concerns that the study deemed to be of policy relevance to cycling planning. These included the challenges facing cycling in Kisumu as well as the places where they were experienced; Government commitment to providing for cycling in the wake of the emergence of commercial motorcycling; emerging patterns in ridership in the wake of a number of developments that have seen the number of universities increase over the years; Government plans to accommodate cycling under the on-going transport infrastructure improvement programme; opportunities and challenges presented by the Kenya Vison 2030 and the Integrated National Transport Policy for local transport planning and cycling planning in particular; the extent of multi-modal infrastructure planning and planning for cycling in particular; and the future plans and strategies to encourage and accommodate cycling. An interview schedule was prepared to guide these interviews (*Appendix iii*). The interviews were researcher-led. The researcher posed these concerns to elicit a broad view of the experts on them in terms of trends, patterns, emerging issues. The researcher took field notes during these interviews. The data obtained from the expert interviews has been organised thematically to strengthen the explanation to findings from other data sources.

Spatial data

The study obtained spatial data from the geodatabase that was maintained by the City Planning Department of the County Government. This data contained the shapefiles of various attributes of the city. Among these were the city's transport network, land-use, and contours showing the elevation of different parts of the city. The attributes of the transport network shapefile included the street names, classes of the streets, and the permitted vehicular speed on the streets. The land-use data contained land-use classification of different parts of the city. This data has been used to prepare the maps presented in this dissertation.

Overview of survey results

This current section describes the results of the survey presented in a preceding part of this current section. Results from qualitative data are integrated into the analysis and therefore not described here. At the same time, results from spatial data are used to prepare the maps that are used to put the study area into perspective.

The survey presented earlier managed to interview members of 1,490 households that were located in the three zones in Kisumu. This number of households represented about 63.2% of the total number of households that was sampled by the survey. The distribution of successfully interviewed households was 303 in the old city (zone 1), 804 in the slum belt (zone 2), and 383 in the extended areas (zone 3). The total number of expected individual respondents was computed from the sizes of households that responded to the survey. These expected individuals comprised only members of households who were at least ten years and made independent travel decisions (see section 3.5 for a discussion of eligibility to participate in the survey). This computation yielded a total of 3,574 individuals. However, only 2,165 (about 60.1% of the total number of expected respondents) gave useful responses that have been analysed in this study. Table 3-1 presents a summary of the response rate for each zone. A detailed distribution of the response rate for households and individuals in each zone is presented in *Appendix v*.

Table 3-1: Summary of response rate from survey

Zone	Sub-zones	Sampled No. of households	Actual No. of households	Rate of household response (%)	Expected individual respondents	Actual individual respondents	Rate of individual response (%)
1	19	760	303	39.87	685	450	65.70
2	28	1120	804	71.79	1,901	1,118	58.81
3	12	480	383	79.79	988	597	60.43
Total	**59**	**2,360**	**1,490**	**63.14**	**3,574**	**2,165**	**60.58**

The failure to attain a complete response rate is attributed to three reasons.

First, there was non-cooperation in 292 households in the entire study area. These included 228 households in the old city, 46 households in the slum belt and 18 households in the extended area. Either none of the members of these households was willing to be interviewed or the households could not be accessed at all. The latter was especially the case in Milimani, which is a gated-community within the old city. In this case, the challenge of non-cooperation was compounded by the fact that in most cases, the gatekeepers could not allow us into the residential compounds even after we explained to them what the study entailed. The researcher could not find anyone in the remaining 578 households even after revisiting them. The implication of this non-cooperation and inaccessibility of households is that the study could not compute the total number of eligible respondents in the study. By extension, this inability to obtain accurate information about the number of eligible respondents limited the calculation of individual response rates. I should point out that the response rates given in Table 3-1 are based only on the total number of individuals that were present in the households that could be accessed. As such, the rates are higher than what would have obtained if the total number of all eligible respondents in the sampled households was known.

In terms of individual respondents, the failure to attain a complete response rate was caused by the fact that some members of the households that participated in the survey were not in Kisumu over the period of the interviews. In this case, we only interviewed household members that we could reach. These members included those that were found and actually agreed to do the interviews immediately and those that requested to be interviewed at a later date that was convenient for them. Expected respondents who could not be reached for interviews even though they requested to be given different appointment dates for the interviews were not interviewed. This inability to reach some members of households that agreed to be interviewed accounted for the failure to obtain feedback from 1,361 expected respondents. These included those that did not want to talk about mode use – specifically cycling as they thought it did not concern them.

A further 48 questionnaires were spoilt either because the respondents did not have time to complete them once they had started to respond or because they were adamant to reveal important information that were useful for later analysis. The missing information from these questionnaires included the mode of transport they used, the key infrastructure challenge, and places of occupation. In this case, respondents were adamant that this information constituted sensitive security information to reveal even though they were assured at the beginning of the interviews that any information they gave would be treated with utmost confidentiality. In total,

33 questionnaires were spoilt from the old city, 10 questionnaires from the slum belt and 5 questionnaires in the extended areas. These questionnaires were processed as incomplete and not considered for subsequent analysis. Where the spoilt questionnaires involved household heads, the basic household information was extracted and assigned to a member of the household before the questionnaires were discarded. There were seven such cases of respondents who completely refused to answer other questions that were of relevance to the analysis sought by the current study.

The low number of spoilt questionnaires is attributable to the interviewing technique on the part of the field assistants. Specifically, their interpersonal skills, previous involvement with surveys in the city, and understanding of the cultural context within which the interviews were conducted allowed them to carry out the interviews successfully as long as the respondents were willing to be interviewed. Moreover, I attribute the success of the survey to the fact that the subject under investigation was relevant and of interest to the respondents thus arousing their interest to participate. In addition, the pre-test survey that was conducted not only prepared the interviewers for the task, it also allowed them to ask the questions in a chronological flow that did not confuse the respondents. The total number of actual individual respondents obtained is therefore considered to be within an acceptable range of 2,387 individual respondents which would have been required if Equation 3-1 was applied to calculate a representative sample of individual respondents for the city's population. The study deems the response rate to be satisfactory.

Description of the respondents

Household sizes

The average household size in the sample was 3.4 members per household. On the other hand, the modal household size was 4 members per household. The size of the household ranged between 1 to 8 members per household. These findings were within the margins of the results revealed by the national population census (Government of Kenya, 2010c). This report estimates the average household size at 4.07 members per household.

Age of respondents

The sampled households comprised of respondents whose ages ranged from below 10 years to above 60 years. However, as already mentioned in section 3.5, only respondents of the age of 10 years and above were considered in the survey. Figure 3-8 contrasts the percentage composition of different age cohorts that responded to the survey with their actual population size (Government of Kenya, 2010b) to assess the representativeness of the data.

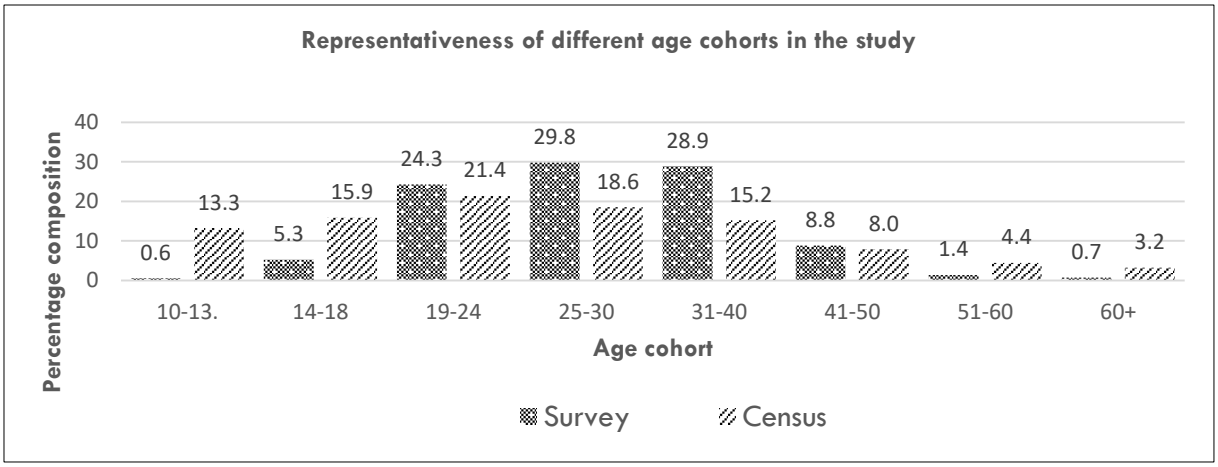

Figure 3-8: Representativeness of different age cohorts in the study

The above percentages were obtained by calculating the number of respondents of each age cohort as a percentage of the total sample and population sizes respectively. I should mention that the study extracted only population data that corresponded to the age cohorts in the sample to calculate these percentages. Accordingly, persons aged below 10 years are not included in the population totals that form the basis of the percentages presented in the table because they are not in the sample either. The complete population data can be found from the national census report (Government of Kenya, 2010b).

The contrast between the percentage composition of the sample and population age cohorts revealed in Figure 3-8 closely associates with the level of participation of different age cohorts in the survey. Generally, the most physically active segment of the city residents was readily willing to participate in the survey. The group comprised persons aged between 19 to 50 years. The majority of the respondents belonged to the age cohorts 25-30 and 31-40 years. These two cohorts constituted 29.8% and 28.9% of the respondents respectively. These proportions contrast with their actual proportion in the actual population, which stood at 18.6% and 15.2% respectively. Respondents of the age cohort 19-24 years also constituted significant proportion of the total number of respondents (24.6%). Again, this composition contrasts with their actual proportion in the population size. The latter stood at 21.4%. Lastly, the age cohort 41-50 also registered a level of participation that seemed to be higher than normal. They comprised 8.8% of the respondents although they only constituted 8.0% of the population. The proportions of these different age cohorts is not surprising if one considers that the survey did not include children below the age of 10 years. Furthermore, the survey only considered respondents who made independent travel decisions. This design of the survey excluded many children below the age of 18 years from the survey. It is for this same reason that the age cohorts 10-13 years and 14-18 years comprised only 0.6% and 5.3% of the total number of respondents respectively although they formed the majority of Kisumu's actual population (see Government of Kenya, 2010b). Higher numbers of respondents from the age cohorts 19 to 50 years is also explained by the fact that it is them that actively made out-of-home trips and experienced the transport challenges that the study investigated. Consequently, they did not shy from participating in the survey because they could comfortably respond to different questions that the survey sought to understand.

It is apparent that many children below the age of 18 years did not make independent travel decisions. The variance between their proportion among the respondents and their proportion in the actual population of the city confirms this observation. The observation is not surprising. A separate analysis that is not reported in this study shows that parents were concerned about the safety of their children. Consequently, they made travel decisions for their children because they thought these decisions were in the best interest of the safety of the children.

Respondents' length of stay in Kisumu

Table 3-2 summarises the respondents according to their lengths of stay in Kisumu.

Table 3-2: Summary of residents according to their lengths of stay in Kisumu

	15 years	10 years	5 years	Less than 5 years
Percentage	29.5	22.4	45.3	2.8
Cumulative	29.5	51.9	97.2	100

In total, 29.5% of the respondents had lived in Kisumu for more than 15 years. A further 22.4% had lived in the city since about 10 years before the study was carried out. At the same time, 45.3% of the respondents lived in the city since about 5 years. This seemingly large population size matches the recent historical developments that took place in Kisumu. These include the growth of Kisumu as University City, which has seen it attract a number of youthful population that study in the university campuses that have located in the city since the year 2008. Furthermore, the 2007/2008 violence that followed the general elections of the year 2007 also saw a significant number of people relocate to the city (researcher's own observation). Finally, about 2.8% of the respondents had only lived in Kisumu for a year. These years of arrival of the respondents have a bearing on the results of the analysis carried out in chapter 5. These lengths of residence in Kisumu are deemed satisfactory for the analysis that is contemplated in chapter 5.

About 2,039 respondents were above the age of 19 years. This means that they qualified to give details of their travel behaviour in the year 2004 if they lived in Kisumu. This attribute of the respondents is particularly useful for the longitudinal analysis presented in chapter 5.

Respondents' level of education

The present study positively related the respondent's level of education with their ability to understand their transport situation and be able to report on the same. On average, the respondents had spent 11.1 years in formal education. The modal number of years spent in formal education by the respondents was 12 years. About 37.4% of the respondents attained secondary level of education (12 years). This group was followed by respondents who attained mid-level college education (23.5%). Persons with primary level of education (8 years) comprised 22.8% of the respondents while those with technician level of education comprised 6.4%. Those with university level of education (16-21 years) comprised 9.9% of the respondents. Table 3-3 summarises the respondents' level of education.

Table 3-3: Respondents' level of education

Level of education	Frequency	percentage
Primary	494	22.8
Secondary	810	37.4
Artisan	138	6.4
College	508	23.5
University	215	9.9
Total	**2165**	**22.8**

The implication of these levels of education is that the respondents could understand various transport concerns that the survey sought to investigate. Moreover, revealed levels of education meant that respondents were engaged in out-of-home trips to make use of the skills acquired at the various levels of education. These trips were useful to enable the study to assess the modes that were used to make them as well as the challenges that were encountered in making the trips. The present study deems these reported levels of education to be sufficient to enable the respondents to report confidently on their daily travel choices and experiences in using their travel modes.

Respondents' primary occupation

The respondents were engaged in various forms of primary occupations. These ranged from unskilled jobs such as street vending, to skilled jobs, office and managerial jobs, and even self-employment. For purposes of brevity, these occupations were reclassified into self-employment, formal employment, student, housewives, unemployed, and retirees. Majority of the respondents (50.4%) were self-employed. The form of employment in this case ranged from small-scale trade that was only adequate for the daily subsistence to mid-level businesses. Those employed in the former comprised the majority of the respondents. They are often reported in official government statistics as jobless and constitute the bulk of the city's urban poor (see Section 3.4). About 27.1% of the respondents were formally employed and earned a monthly salary while 0.3% were retirees. Students comprised 18.2% of the respondents. Housewives and persons with no employment at all comprised 2.7% and 1.3% of the respondents respectively. These occupations have a bearing on the incomes and ultimately the travel decisions that the respondents can make.

Household incomes

Although income data was collected from individual respondents, I have deliberately aggregated this data to the household level in this dissertation. The reason for doing this is to enable me to associate the travel decisions of respondents who did not earn any income to the income levels of the households of which they are members. Such respondents included school children whose travel choices were constrained by the incomes of their parents. This information would have been lost if I analysed the income data at the scale of the individual respondents.

The total monthly household income ranged from less than Ksh. 10,000[6] to over Ksh. 200,000 (*Appendix viii*). These total monthly household incomes were computed by summing all incomes of each household member who earned an income. About 27.9% of the respondents came from households that earned a total monthly income of less than Ksh. 10,000. A further 16.6% of the respondents came from households that earned between Ksh. 10,001 and Ksh. 19,000

[6] *US $ 1 = Ksh. 84 at the time of data collection*

per month. It is striking that respondents from households that earned a total income that ranged between Ksh. 29,001 and Ksh. 100,000 only accounted for 28.4% of the total number of respondents in the survey. Moreover, respondents who came from households that earned over Ksh. 100,000 accounted for less than 4% of the total number of respondents.

These revealed income levels indicate that almost half the total number of respondents (44.5%) came from households that earned less than Ksh. 20,000 a month. Given the demands imposed on these incomes by rent, food, and the cost of education among other fixed costs of living, it is arguable that households that earned less than Ksh. 20,000 per month were basically poor. This argument is based on the average household size of 3.4 persons that was realised by this current study and the classification of the poor as those who live on less than US$ 1.95 per day (Ravallion, Chen, & Sangraula, 2009). The combination of this household size and the poverty line implies that households that earn less than Ksh. 20,000 cannot meet their fixed cost of living and still be able to sustain their recurrent ones.

Although the present study could not find evidence of a citywide income study, it nonetheless found comparable income levels from a study that was carried out in the slum settlements of Bandani, Manyatta Arab, Nyalenda and Obunga (see Lidahuli, 2015). According to this study, 16-31% of households in these settlements earned less than Ksh. 9,000 per month while 37-43% earned a monthly income of between Ksh. 9,000 to 20,000. The findings of this study suggest that income levels vary across the settlements of the city. The findings further confirm that these slum settlements contribute the bulk of the low income earners of Kisumu.

The levels of income revealed above raise curiosity about the affordability of transport in Kisumu. This curiosity is stronger if one considers that the revealed incomes have to be spread to meet both the fixed household expenditures such as rent and food as well as recurrent expenditures incurred by individual members of the households. Nonetheless, the income data should be treated with caution because the exact details of the income levels could not be obtained. Most respondents considered these to be sensitive personal information thereby making it hard to obtain this information. Moreover, there were unreported incomes from informal sources. It should be recalled that the bulk of the population is informally employed and earn fluctuating incomes. Although the challenge of underreported incomes has been revealed in Kisumu (e.g. Maoulidi, 2012), cases where respondents inflate their income levels to hide their low income status also do exist (researcher's previous experiences). Due to these factors that cast doubts on the reliability of income data, the incomes levels reported in this dissertation are only used indicatively. This decision is founded on the researcher's reasoning that this data cannot support reliable statistical inferences to be drawn.

Gender composition of the respondents

In total the survey respondents comprised 31% females and 69% males. Females were clearly underrepresented in the survey. I discuss the reasons for this underrepresentation and the limitations it imposes for the study in section 7.5.

Ownership, accessibility, and the frequency of use of mobility tools

Availability of mobility tools for private use among members of the households was also of interest to the present study. About 66% of the respondents had access to bicycles for private use. This access did not however mean that they could use the bicycles. Only one member of the household could cycle in situations where only one bicycle was available to a household. This impacted on the frequency of cycling among members of households that reported to have a bicycle within the household. About 50.2% of the respondents reported that they had only one bicycle available to their respective households. On the other hand, only 7.6% and 9.9% of the respondents reported the availability of private cars and motorcycles respectively for their private use. The implication of these low levels of availability of these modes to the sampled households is that the majority had to use public transport. This comprised the *boda boda*, *matatus*, motorcycles, and rickshaws.

The study paid specific attention to the frequency of use of bicycles. A breakdown of its usage among the household members shows that 664 respondents used the mode on a daily basis. A further 436 used the mode for more than 2 weeks in month but not daily. The mode was used for less than a week per month by 278 respondents. 83 respondents reported that they only cycled between 1-2 weeks a month. Lastly, 177 respondents reported that they almost never cycled while a further 527 never cycled at all. These frequencies of the use of bicycles had a bearing on whom the study considered a cyclist. This definition is given in the empirical chapters of this dissertation whenever it is necessary to make this clarification.

An overview of data analysis

The data described in the previous section is analysed to find out 3 different aspects of exclusion of cycling that form the specific objectives of the study documented in this dissertation.

i. The study carries out a log-linear analysis of the indicators of the quality of routes in terms of the width of the streets, the volumes of motorised traffic on the routes, dangerous junctions among others. The objective here is to assess the influence of street spaces and conditions of traffic on restraining cycling;
ii. A multinomial logistic regression analysis is carried out to find the influence of transport-related policies on the changing mode choices in Kisumu. The purpose of this analysis is to understand how different policies how influenced shifts into and out of cycling. The analysis finds the factors that changed because of these policy changes and their implications for the inclusion of cyclists;
iii. A critical content analysis of government economic policy pronouncements and transport policy to find out the contradictions and opportunities that these two documents present for the inclusion of cyclists. The purpose of this analysis is to explore the possibilities of making social inclusion a central aim of transport policies.

Detailed procedures and outcomes of these analyses are reported in chapter 4, 5, and 6. The next chapter sets off this analysis by examining the impact of the conditions of the street spaces and traffic thereupon on the exclusion of cycling.

4 The impact of the conditions of street spaces and traffic on the exclusion of cycling[7]

Chapter summary

Current research on transport related social exclusion focuses typically on normative classification of exclusion based on socio-demographics, vehicle ownership and residential location. This classification does not reveal the relationship between the conditions of streets spaces and the ease of participating in mobility using various travel modes. The possible impact of these conditions on excluding the poor due to the modes they use in the context of sub-Saharan African cities thus remains unknown. This chapter explores whether accounting for the conditions of street spaces could reveal new dimensions of exclusion that are missing from the current literature. A log-linear regression model is developed that associates these conditions with the restriction they impose on different modes as reported by 2,165 respondents from Kisumu, Kenya. Cycling emerges as the most restricted mode. Poor street surface conditions hinder cycling the most, followed by speeding motorised traffic and careless driving. Although the city does not have traffic controls at most of its street intersections, road junctions reveal only a weak association with restricting cycling unless their effect is compounded by other conditions. This chapter offers a systematic and transparent approach for identifying the conditions of street spaces that hinder the participation of cyclists in mobility.

4.1 Introduction

The concept of social exclusion presents an opportunity for problematizing the transport disadvantage that faces many sub-Saharan African cities. This opportunity is however hidden in the dominant conception of transport-related social exclusion through socio-demographics, vehicle ownership and locational disadvantages (e.g. Lucas, 2012; Shergold & Parkhurst, 2012). Specifically, these conceptions do not account for the conditions of streets spaces yet these conditions are thought to play an important role in exclusion in sub-Saharan African cities. The current chapter argues that conceptualising exclusion to embrace the unique transport conditions of sub-Saharan African cities could enrich the concept's applicability. The chapter thus explores the extent to which unfavourable conditions of street spaces could aid in exposing the transport disadvantage that faces cyclists in sub-Saharan African cities. It specifically examines the conditions of street spaces in Kisumu, Kenya, to find out how they contribute to the exclusion of cyclists by restricting their participation in mobility. Although street spaces are multifunctional public spaces (UN-HABITAT, 2013), their discussion in this chapter is limited to their mobility function. The findings of this chapter broaden the scope of the current debate on inclusive cities (UNCHSUD, 2016; UNDP, 2015) by placing cycling-inclusive streets at the centre of this debate.

[7] An earlier version of this chapter was submitted to the *Journal of Transport Geography* in August 2016. The submission is co-authored by Walter Alando, Joachim Scheiner and Mark Zuidgeest. I designed the study and developed the methodology with help of Joachim Scheiner. I also performed the analysis and wrote the manuscript. Mark Zuidgeest advised on the case study methodology and analysis. Both co-authors reviewed and commented on several versions of the manuscript. Author contributions: Walter Alando-60%, Joachim Scheiner-25%, and Mark Zuidgeest-15%.

Cycling plays a central role in enabling the movement of people and merchandise in Kisumu and other medium-sized sub-Saharan African cities. Although few modal split studies have been conducted in Kisumu in particular, Makajuma (2006) estimates that cycling accounts for more than 16% of its weekly total trips. The majority of cyclists are the urban poor who reside in the slums and peri-urban settlements of the city (Nodalis Conseil, 2014; UN-HABITAT, 2004). For them, cycling combines the benefits of affordability, speed and convenience. The popularity of cycling in Kisumu is attributable to the city's vibrant cycling culture (Mutiso, 2010) and compact urban form (Nodalis Conseil, 2014). The attractiveness of cycling is further explained by its role in expanding employment opportunities for operators of bicycle taxis, popularly known as *boda boda*. It should be mentioned that cycling remains a leading employer of the youth of Kisumu given the city's high rates of unemployment and poverty (see Section 3.4 for details of these socio-economic characteristics of the city).

Despite the central role of cycling in Kisumu, the State has remained indifferent to producing street conditions that facilitate its use (Alando & Scheiner, 2016; UN-HABITAT, 2004). I present these conditions to include both the physical quality of the street spaces and the traffic regulations that support their use by different modes. This indifference renders the city's insufficient and poorly developed quasi-public transport (Nodalis Conseil, 2014) increasingly incapable of addressing the accessibility needs of its residents. Efforts to bridge this gap through cycling is further curtailed by streets that do not facilitate the mode. The implications of the current indifference to inclusive streets for aggravating the exclusion of cyclists is however little understood.

Past efforts to support cycling in Kisumu have remained *ad-hoc*, sometimes populist and even contradictory. For instance, efforts to facilitate cycling through appropriate infrastructure (UN-HABITAT, 2004) are contradicted by its concurrent view as an obstruction to motorised traffic (Municipal Council of Kisumu, 2009) and its subsequent prohibition from the city centre (Alal, 2014). On-going transport infrastructure development projects (World Bank, 2010, 2012) similarly remain ambiguous towards cycling. While only one main road has been provided with a lane that could accommodate cycling, no explicit user of this lane has been designated. This ambiguity has generated user-conflict that pits cyclists against motorcyclists, pedestrians and street vendors.[8] Despite this conflict, the strategic plan for Kisumu County's Transport Department (County Government of Kisumu, 2015) fails to explicitly isolate pedal-cycling concerns from those of motorcycling. Instead, the two modes are bundled together thus concealing the unique challenges that cycling faces due to unclear support for it in terms of infrastructure and traffic regulations.

The objective of this current chapter is to find the association between the extant conditions of the streets of Kisumu and the social exclusion of the city's cyclists. Three specific objectives are pursued: 1) to identify the conditions of street spaces that restrict the use of all travel modes in Kisumu; 2) to compare the association between these conditions and the restriction of different modes; and 3) to evaluate the utility of focusing on the conditions of street spaces as the basis for understanding transport-related social exclusion

The remainder of this chapter is organised in six sections. Section 4.2 explains the concept of social exclusion. Section 4.3 presents its application in transport studies. The fourth section

[8] *Field observation and notes*

presents the data while Section 4.5 explains the modelling procedures. Results and discussion are presented in Section 4.6. Section 4.7 examines how the conditions that cause exclusion relate with the exclusion of cycling specifically. The conclusion to the chapter is presented in Section 4.8.

4.2 Social exclusion in perspective

Although social exclusion is not a new concept, its use in problematizing transport disadvantage is a recent development (Church et al., 2000; Kenyon, Lyons, & Rafferty, 2002; Lucas, 2012). The concept's central hypothesis is that groups or individuals identity can be a basis for their alienation from full participation in normal social activities, thereby depriving them of a decent standard of living (Sen, 2000; Silver, 2007). Social exclusion offers an analytical tool for revealing how skewed structural distribution of opportunities reinforces cultural norms and values that worsen the marginalised circumstances of the underprivileged (Gerda & Vrooman, 2007; Saraceno, 2001).

Saraceno (2001) distinguishes between social exclusion in the French, Anglo-American and Anglo-Saxon contexts on account of the main social aspects that they emphasise. Social exclusion in the French setting is understood within the notion of social cohesion and normative integration (Durkheim, 1897, cited in Gerda & Vrooman, 2007). In this case, social cohesion signifies the dominant consensual values, mores and social bonds. Thus socially excluded individuals and groups are those who do not conform to the expected social bonds. They include people who are generally seen as social misfits (Sen, 2000). On the other hand, the Anglo-American perspective conceptualises social exclusion in terms of the institutional barriers that prevent individuals who depend on social assistance from accessing social rights. Exclusion in this case is seen to be the consequence of the inability of the excluded individuals and groups to make the best use of the options offered by the society to include them (Saraceno, 2001). Lastly, the Anglo-Saxon paradigm conceptualises social exclusion within the context of the power relations between those who exclude and the excluded. Although the French and Anglo-American conceptualisations are not useful for the discussion envisaged in this dissertation, I have deliberately highlighted them in order to disambiguate the meaning that I attach to social exclusion in this dissertation.

The Anglo-Saxon paradigm is particularly relevant for the current study. It hypothesises that exclusion occurs when a powerful class uses the social, cultural and institutional power it wields to restrict access to valued resources from the underprivileged (Silver, 2007). This stance echoes the current indifference of the auto-centric transport planning regime in Kisumu towards producing streets spaces that accommodate underprivileged modes such as cycling (Steyn, 2012). The next section contextualises this imbalanced power relation in transport discourse.

4.3 Social exclusion and transport research

Social exclusion gained prominence in transport research after the publication of the influential report on transport and social exclusion in the UK (Social Exclusion Unit, 2003). The concept exposes the transport disadvantage that faces underprivileged groups and shows how this disadvantage reduces their accessibility to opportunities such as jobs and education (e.g. Diaz Olvera, Plat, & Pochet, 2008; Lucas, 2011; Salon & Gulyani, 2010). Researchers contend that

reduced accessibility intensifies the disadvantaged position of the underprivileged. The use of the concept within transport research is still an evolving development. Nonetheless, social exclusion is presently conceived around the spatial imaginations that define exclusion in cities of the developed world where dominant researches on the concept have originated thus far (Cameron, 2006). Accordingly, exclusion is understood in terms of normative attributes such as residential location in economically poor neighbourhoods (Shergold & Parkhurst, 2012), inadequate access to cars (Kenyon et al., 2002), and socio-demographic characteristics such as age and race (Engels & Liu, 2011; Shergold & Parkhurst, 2012).

Sub-Saharan African cities however manifest an additional form of exclusion due to their social conditions as well as the conditions of their streets, which vary from those of the cities where current research on social exclusion originate. Specifically, the majority of these cities are characterised by widespread absolute poverty (Lucas, 2011), low car ownership and a predominant use of non-motorised modes (Diaz Olvera et al., 2013; Gwilliam, 2003; Salon & Aligula, 2012). A gender dimension of transport exclusion is also evident. It is reported that in some cases the most vulnerable women, children, the elderly, and the physically disabled are constrained from making out-of-home trips due to unaffordability (Salon & Gulyani, 2010), poor road infrastructure conditions (Diaz Olvera et al., 2013), and poor and unreliable public transport (UN-HABITAT, 2014). The impact of these factors on the poor is exacerbated by mono-functional land-use zoning regime, which locates key services and jobs at the city centres and key activity nodes (Diaz Olvera et al., 2013). All these conditions are significantly different from those of the developed cities where the dominant literature on transport-related social exclusion has emerged so far.

The present emphasis on building more roads to match the increasing motorisation in many sub-Saharan African cities thus seems to be inconsistent with the above realities. Whereas additional roads are necessary to address the challenges posed by low quality transport network and rapid urbanisation (UN-HABITAT, 2014), accessibility needs of the poor majority of these cities seem to be largely an invisible concern. In fact, emerging studies have questioned the appropriateness of these road building projects in generating meaningful positive social impacts for the low-income groups (e.g. Watson, 2014). These studies show that most residents of sub-Saharan African cities will continue to face exclusion unless transport planning is deliberately reoriented to address their accessibility needs.

Normative conceptions of exclusion discussed earlier seem to implicitly assume that individuals are automatically excluded if they fall within the thresholds they define. Neither the travel behaviour of the "excluded" nor the connection between this behaviour and their exclusion is explicitly known. The current study fills this gap by linking the conditions of street spaces in Kisumu and the restrictions they impose on active travel behaviour. Active travel behaviour is assessed in terms of the actual modes and routes used by the respondents. The conditions of street spaces are alternately referred to as route quality in the rest of this chapter.

4.4 Methods

4.4.1 Data

Indicators of route quality were identified from secondary materials (e.g. ITDG-EA, 2004; UN-HABITAT, 2004), field observations and informal interviews with mode users in Kisumu. The aim

was to establish the factors that generally restricted the use of street spaces for any mode. This procedure revealed that narrow streets, dangerous junctions, poor street surface conditions, careless driving, volumes of pedestrians, volumes of vehicular traffic, speeding vehicular traffic, and poor road shoulders all restricted the use of street spaces.

Data on the restriction imposed by the above conditions was obtained through standardised interviews that targeted respondents from 2,360 households that resided within the urban footprint of Kisumu (see Section 3.4and 3.5 for details). Household members older than ten years were asked whether each route quality indicator presented a significant hindrance to using the main mode that they actually used to travel to their main daily destination. The significance of the hindrance presented by the conditions was in this case measured on a nominal scale. Respondents were asked to evaluate each condition in terms of whether it presented no hindrance, normal hindrance or a serious hindrance. A normal hindrance was considered that which the respondents did not have to stop their movement while a serious hindrance was that which caused them considerable discomfort, instilled fear in them or made them to stop their movement for safety considerations. Only cases where the hindrance was reported to be serious were taken to be significant. Respondents were asked to give only their experiences with the actual mode and route that they used in order to avoid speculative responses. Children (below 18 years of age) only participated if they made independent travel decisions. A total of 2,165 respondents from 1,490 households gave categorical (yes/no) responses that are analysed in this chapter. Of these respondents, 129 were children. The respondents comprised 377 pedestrians, 825 private cyclists, 253 passenger cyclists, 256 motorcyclists, and 454 private car, rickshaw and *matatu* users. Respondents who used the bicycle as the main mode for at least two weeks in a month were considered to possess valuable information about cycling concerns and were therefore considered cyclists for purposes of data collection and analysis. They comprised 436 respondents, who alternated between cycling and walking. To obtain information about the frequency of cycling, respondents were directly asked to state how often they used the bicycle as the main mode of travelling to the main daily destination in a month (*Appendix i*).

4.4.2 Modelling procedure

Associations between the modes and their restriction by the conditions of the routes were modelled using log-linear analysis (Goodman, 1979). This analysis works by developing a linear model of the logarithm of the expected cell frequencies that confirm association. A cell frequency is an instance of the total number of respondents who confirm that a corresponding condition restricts their ability to use the respective mode. Modelling the logarithm of the frequencies (categorical variables) is analogous to a nonparametric analysis of variance with discrete dependent and independent variables (Goodman, 1979). The aim of log-linear analysis is to achieve a parsimonious model that fits the expected frequencies to the observed frequencies (Tabachnick & Fidell, 2007).

The hierarchical log-linear procedure in SPSS (Hilog-linear) was used in the analysis. This procedure provides a test of each main effect; simultaneous tests of all "*k*-way effects" (i.e. all main effects combined, all two-way effects combined etc.); and simultaneous tests of all "*k*- and higher-way effects" (i.e. all main effects combined with two-way effects) (Tabachnick & Fidell, 2007). No a *priori* information existed about the effects that would have yielded a

parsimonious model. I therefore first tested all the observed frequencies that were thought to predict the expected frequencies to establish if they made the predictions. Such a model that contains all observed frequencies is termed a 'saturated model' (Tabachnick & Fidell, 2007). Effects that did not predict the expected frequencies were eliminated using the backward hierarchical method. This method works by eliminating higher-order effects that generate significant p-values for Pearson χ^2 and likelihood ratios G^2 (Tabachnick & Fidell, 2007). Road shoulders, volume of pedestrians, volume of motorised transport and speeding motorised transport were eliminated from the saturated model because they yielded goodness of fit statistics that prompted a failure to reject the null hypothesis. A failure to reject the null hypothesis implies that the observed frequencies do not predict the expected frequencies. These eliminated effects were deemed unique to cycling; they were thus tested on cycling alone (Section 4.6).

A five-way exploratory frequency analysis of exclusion caused by the retained main effects was then designed (Equation 4-1). This was a hierarchical model for a five-way design, ABCDE with a significant *k=3* (three-way association), ABC or ABD or ABE or BCD or BCE or CDE. The model is described as hierarchical because it contains all the significant lower effects (*k=1,2*) that are retained in the higher order effect, *k=3* (Tabachnick & Fidell, 2007):

$$\begin{aligned}\mathrm{Ln}(F_{ijklm}) = \theta + \lambda\mathrm{A} + \lambda\mathrm{B} + \lambda\mathrm{C} + \lambda\mathrm{D} + \lambda\mathrm{E} + \lambda\mathrm{AB} + \lambda\mathrm{AC} + \lambda\mathrm{AD} + \lambda\mathrm{AE} + \lambda\mathrm{BC} \\ + \lambda\mathrm{BD} + \lambda\mathrm{BE} + \lambda\mathrm{CD} + \lambda\mathrm{CE} + \lambda\mathrm{DE} + \lambda\mathrm{ABC} + \lambda\mathrm{ABD} + \lambda\mathrm{ABE} \\ + \lambda\mathrm{BCD} + \lambda\mathrm{BCE} + \lambda\mathrm{CDE}\end{aligned}$$ **Equation 4-1**

where θ is a constant; Ln(F_{ijklm}) is the expected natural logarithm of the frequency of the cell ijklmn, A, B, C, D, and E are indicators of route quality (main effects - dummy variables); λ is the relative weight of each variable (coefficient of log-linear regression).

Higher order effects of more than 3 associations (*k>3*) are insignificant and therefore not shown in the model.

Initial screening

Initial screening was conducted on the retained effects from the saturated model to determine the level of association that was required to develop a parsimonious model (*Appendix vi*, item 1.1). Equation 4-1 was solved and effects whose p-values were less than .05 and thus significant in fitting the model selected for further modelling. Only $k \leq 3$ effects met this condition for simultaneous tests of "k-way effects" and "k-way and higher order effects" (Table 4-1).

Table 4-1: Unambiguous effects (k≤3 effects with p<.01)

Main effects	2-way effects	3-way effects
mode	mode*narrow streets	mode*narrow streets*junctions
narrow streets	mode*junctions	mode*narrow streets*street surface conditions
junctions	narrow streets*junctions	mode*street surface conditions*careless drivers
street surface conditions	mode*street surface conditions	narrow streets*street surface conditions*careless drivers
careless drivers	narrow streets*street surface conditions	junctions*street surface conditions*careless drivers
	junctions*careless drivers	
	Street surface conditions*careless drivers	
	mode*careless drivers	

A stepwise model selection (*Appendix vi*, item 1.2) was done to clear the ambiguity found in *mode*junctions*street surface conditions* and *narrow streets*junctions*street surface conditions* effects, which were not outrightly significant ($.01 < p < .05$). First, all higher-order effects were tested together. These effects included all $k=3$ effects in Table 4-1 and the two ambiguous effects. An optimal model ($\chi^2=28.369$) was yielded. However, *narrow street*junctions*street surface conditions* had the smallest ($p=.029$) effect and was therefore deleted to enable a second test. The resulting model was also insignificant ($\chi^2=33.147$), with *mode*junctions*street surface conditions* yielding the smallest change χ^2 ($p=.018$). This effect was also deleted to allow further testing on the remaining effects. Further deletion of any effect violated the criterion $p=.01$. The model with all effects at the second step was thus accepted. However, a simultaneous condition in log-linear analysis demands that the selected model should not be significantly worse off than the next more complicated one. This next more complicated model was the first model that contained all the higher-order effects. Deleting any effects from the accepted model was found unsatisfactory because doing so yielded a worse model than the next more complicated one. For instance, deleting *narrow street*junctions*street surface conditions* alone resulted in a significant difference between the models, i.e. $\chi^2=33.147-28.369 = 4.778$, $p<.01$.

Final model

Having established a parsimonious model, parameter estimates were generated to find the strength of association between the effects and restriction on travel modes (*Appendix vi*, item 1.3). The estimates were obtained by finding the log odds-ratio for each effect (Goodman, 1979). The ratio evaluates whether the association of one effect with exclusion is related to the association of the other effects with exclusion.

The ratio is calculated by serially taking each effect at $k=n$ as the case while all the remaining effects at the same $k=n$ as non-cases. The frequency of cases that are positively associated with exclusion are then divided by the frequency of cases that are negatively associated with exclusion. The resulting quotient is then divided by the quotient of the frequency of non-cases that are positively associated with exclusion and the frequency of non-cases that are negatively associated with exclusion. The natural log of the resulting odds-ratio is then calculated. Results are presented in Table 4-2.

Table 4-2: Estimates for parameters of exclusion of cyclists compared to other modes

Parameter	Coeff.	Std. Err.	Z-Value	Lower 95 CI	Upper 95 CI
Main effects (k=1)					
careless drivers	0.659	0.035	19.064	0.591	0.726
street surface condition	0.469	0.039	12.003	0.393	0.546
narrow streets	0.225	0.033	6.875	0.161	0.289
junctions	0.002	0.033	0.065	-0.063	0.068
mode					
walking	0.291	0.064	4.511	0.165	0.417
bicycle (self)	0.828	0.059	13.952	0.712	0.945
bicycle (passenger)	-0.306	0.080	-3.823	-0.463	-0.149
motorcycle	-0.664	0.105	-6.343	-0.869	-0.459
private cars, rickshaw & *matatu*	-0.149	0.080	-1.865	-0.306	0.008

Table 4-2: Estimates for parameters of exclusion of cyclists compared to other modes (Continued)

Parameter	Coeff.	Std. Err.	Z-Value	Lower 95 CI	Upper 95 CI
2-way effect (k=2)					
narrow streets*junctions	0.301	0.032	9.514	0.239	0.363
junctions*careless drivers	0.126	0.031	4.045	0.065	0.186
street surface condition*careless drivers	-0.098	0.034	-2.847	-0.166	-0.031
narrow streets*street surface condition	-0.172	0.034	-5.096	-0.238	-0.106
mode*street surface condition					
walking*street surface condition	-0.001	0.064	-0.022	-0.127	0.124
bicycle (self)*street surface condition	0.211	0.059	3.611	0.097	0.326
bicycle (passenger)*street surface condition	-0.198	0.079	-2.504	-0.354	-0.043
motorcycle*street surface condition	0.280	0.103	2.728	0.079	0.482
private cars, rickshaw & *matatu*street surface condition	-0.292	0.070	-4.183	-0.428	-0.155
mode*junctions					
walking*junctions	-0.115	0.056	-2.075	-0.224	-0.006
bicycle (self)*junctions	0.234	0.047	5.019	0.143	0.326
bicycle (passenger)*junctions	0.379	0.067	5.620	0.247	0.511
motorcycle*junctions	0.332	0.077	4.302	0.181	0.484
private cars, rickshaw & *matatu*junctions	-0.830	0.071	-11.708	-0.969	-0.691
mode*narrow street					
walking*narrow streets	0.105	0.057	1.842	-0.007	0.217
bicycle (self)*narrow streets	0.022	0.048	0.458	-0.072	0.116
bicycle (passenger)*narrow street	0.104	0.068	1.522	-0.030	0.237
motorcycle*narrow streets	0.123	0.080	1.523	-0.035	0.280
private cars, rickshaw & *matatu*narrow streets	-0.353	0.069	-5.142	-0.488	-0.219
mode*careless drivers					
walking*careless drivers	-0.290	0.058	-4.986	-0.404	-0.176
bicycle (self)*careless drivers	-0.017	0.053	-0.324	-0.122	0.087
bicycle (passenger)*careless drivers	0.004	0.072	0.052	-0.137	0.145
motorcycle*careless drivers	0.189	0.094	2.001	0.004	0.374
private cars, rickshaw & *matatu*careless drivers	0.115	0.063	1.820	-0.009	0.238
3-way effects (k=3)					
narrow streets*street surface condition*careless drivers	0.100	0.028	3.562	0.045	0.155
junctions*street surface condition*careless drivers	0.061	0.028	2.142	0.005	0.117
narrow streets*junctions*street surface condition	0.039	0.028	1.370	-0.017	0.094
mode*narrow streets*junctions					
walking*narrow streets*junctions	-0.262	0.052	-5.078	-0.363	-0.161
bicycle (self)*narrow streets*junctions	-0.045	0.042	-1.057	-0.127	0.038
bicycle (passenger)*narrow streets*junctions	-0.151	0.064	-2.343	-0.277	-0.025
motorcycle*narrow streets*junctions	0.046	0.067	0.689	-0.085	0.177
private cars,rickshaw & *matatu*narrow streets*junctions	0.411	0.067	6.889	0.280	0.542
mode*junctions*street surface condition					
walking*junctions*street surface condition	-0.108	0.053	-2.037	-0.212	-0.004
bicycle (self)*junctions*street surface condition	-0.072	0.044	-1.652	-0.158	0.013
bicycle (passenger)*junctions*street surface condition	-0.092	0.066	-1.396	-0.222	0.037
motorcycle*junctions*street surface condition	0.033	0.076	0.435	-0.115	0.181
private cars, rickshaw & *matatu*junctions*street surface condition	0.240	0.069	3.496	0.105	0.374
mode*narrow streets*street surface condition					
walking*narrow streets*street surface condition	-0.044	0.056	-0.786	-0.154	0.066
bicycle (self)*narrow streets*street surface condition	-0.108	0.046	-2.358	-0.198	-0.018
bicycle (passenger)*narrow street*street surface condition	-0.023	0.064	-0.358	-0.148	0.102
motorcycle*narrow streets*street surface condition	-0.005	0.078	-0.059	-0.157	0.148
private cars, rickshaw & *matatu*narrow street*street surface condition	0.179	0.061	2.962	0.067	0.298
mode*street surface condition*careless drivers					
walking*street surface condition*careless drivers	-0.079	0.058	-1.360	-0.194	0.035
bicycle (self)*street surface condition*careless drivers	-0.169	0.053	-3.187	-0.273	-0.065
bicycle (passenger)*street surface condition*careless drivers	0.114	0.072	1.578	-0.027	0.255
motorcycle*street surface condition*careless drivers	-0.012	0.095	-0.128	-0.197	0.173
private cars, rickshaw & *matatu*street surface condition*careless drivers	0.147	0.064	2.298	0.022	0.273

4.5 Results and discussion

The coefficients in Table 4-2 represent the log odds-ratio while the standard error is the square root of the variance of the effects. The Z-values are the ratios of the coefficients and their corresponding standard errors. The Z-value offers an important index for the qualitative interpretation of the results. A positive Z-value indicates that the case effect is more likely to be associated with exclusion relative to non-case effects at corresponding $k=n$. A negative Z-value indicates the reverse.

The main drivers of exclusion

Careless driving presented the main hindrance to using the streets for all modes. It associated more with restricting the use of the streets when compared to the other main effects (*leading Z-value=19.06*). Careless driving was reinforced by poor street surface conditions (*Z-value=12.00*), narrow streets (*Z-value=6.87*), and dangerous junctions (*Z-value=.06*) to make the streets difficult to use by any mode. Figure 7-1 gives a typical cross-sectional design of the streets that gives rise to narrow streets. These results give new insights into previous studies (e.g. Gwilliam, 2003; Khayesi et al., 2010), which identified similar concerns in cities of identical planning context as Kisumu. Specifically, these results demonstrate that the strength of association of these factors with the limitation they impose on the use of street spaces can be estimated. It is striking that junctions were the least associated with restricting any mode relative to other main effects (*Z-value=0.06*). I expected junctions to be among the leading restrictions to the use of streets given that Kisumu did not have traffic signals at most of its intersections[9]. However, the restrictions they imposed only became stronger when they were compounded by other conditions. This result suggests that junctions themselves were not the problem but rather the way in which they were used by different modes. This compounding effect is discussed in a later under '*The compounding effect of the main drivers of exclusion.*'

The exclusion of individual modes

Private cycling emerged as the most restricted (*Z-value=13.95*). This finding was not surprising if one considers that non-motorised modes in general were unattended in Kisumu and other sub-Saharan African cities (e.g. Alando & Scheiner, 2016; Khayesi et al., 2010; Sietchiping et al., 2012). The current findings however present another dimension to this inattention by showing that it exposes different modes to different levels of restriction. Although walking could be considered more vulnerable than cycling, it was not the most restricted (*Z-value=4.51*). It is likely that pedestrians' coping strategy of appropriating other spaces away from dangerous streets[10] protected them from the dangers posed by street spaces that did not accommodate them. Cyclists did not have such possibilities. Instead, they had to share the same street spaces with motorised modes although these spaces were not designed to accommodate them in the first place (Alando & Scheiner, 2016; Steyn, 2012).

Passengers of any mode generally seemed less likely to experience the challenges posed by the conditions of street spaces, unless in very specific cases where they also felt that their safety was compromised. The next section examines these specific cases. It should be

[9] *Field observation*
[10] *ibid.*

mentioned that private cars, rickshaws and *matatus* (Z-value=-1.87), passenger cycling (Z-value=-3.82 and motorcycling (Z-value=-6.34) were the least restricted. The only plausible explanation I could give for their levels of restriction was that their passengers did not directly encounter the challenges of exclusion in most cases. It was striking that motorcycling yielded the weakest association with exclusion. This was contrary to my expectation, considering that motorcycling has in the recent past emerged as a leading cause of accidents in many Kenyan towns (Mwangangi, Omar, Chebiwot, & Witte, 2015). These results suggest that motorcycle accidents are due to poor riding skills and behaviour of the operators themselves rather than street spaces that do not accommodate the mode. This hypothesis is emboldened by the findings from other cities, which show attribute the accidents that involve motorcyclists to poor riding skills (Jones et al., 2016; Mwangangi et al., 2015). The authors report that poor riding skills is because riders often do not attend the requisite training before they embark on operating the motorcycles.

The findings of the analysis presented in this chapter further confirm the hypothesis of conflicting claims on street spaces that pits non-motorised modes against their motorised counterparts (e.g. Khayesi et al., 2010). The auto-centric street design and traffic regulations, which support motoring while suppressing non-motorised modes in Kisumu (Steyn, 2012; UN-HABITAT, 2004) aggravates this contestation. It is not surprising therefore that motorcycling (*Z-value of -6.34*) and private cars, rickshaws and *matatus* (*Z-value=-1.87*) were least likely associated with exclusion when compared to private cycling and walking.

Relating mode exclusion to main drivers of exclusion

The two-way effects that involved modes and route quality reveal how the main effects discussed above restricted the modes in general and cycling in particular. Relative to the other factors, poor street surface conditions (*Z-values=3.61*) and dangerous junctions (*Z-values=5.02*) yielded the strongest association with restricting private cycling. These results are attributable to the fact that cycling was majorly used to access slums and peri-urban settlements (UN-HABITAT, 2004) where conventional streets[11] were either non-existent or in poor physical conditions (e.g. Maoulidi, 2012). Interestingly however, street surface condition (*Z-value=-2.50*) was the least concern of passenger cyclists. This suggests that passenger cyclists were less concerned about their comfort than their safety, which was compromised by dangerous junctions (*Z-value=5.62*), narrow streets (*Z-value=1.52*) and careless driving (*Z-value=0.05*).

Poor street surface conditions yielded a weak negative association with walking (*Z-value=-.02*) and private cars, rickshaws and *matatus* (*Z-value=-4.18*). These results indicate that poor street surface conditions remain a challenge, albeit of a lower priority, among pedestrians. Like in the case of cycling, this challenge was prominent among respondents from the slums and peri-urban settlements of the city.[12] Walking was particularly restricted in these areas during the rainy seasons when most of the streets were rendered impassable. The results of private cars, rickshaws and *matatus* is attributable to the fact their use was generally restricted to paved

[11] *Used here to denote the planned and paved streets*

[12] *Field observation and notes*

roads that served the residential areas of their users.[13] Moreover, passengers never experienced the effects of exclusion directly.

Narrow streets emerged a leading concern among pedestrians (*Z-value=1.84*). This was expected given that pedestrians were more physically vulnerable and thus most constrained when they had to share the same spaces with all the other modes (Khayesi et al., 2010). This was the case on major streets where lack of alternative spaces forced pedestrians to walk along the edge of the streets that did not have provisions pedestrian walks.[14] Narrow streets further yielded a moderately weak but positive association with motorcycling and passenger cycling (*Z-value=1.52*). In contrast, private cycling had the weakest association to exclusion occasioned by narrow streets (*Z-value=.46*). This contrast is explained by the freedom that private cyclists enjoyed in choosing alternative routes where they could avoid the constraints imposed by narrow streets.[15] Similar freedom was not enjoyed by passenger cyclists and motorcyclists since their routes were decided by the riders. Majority of these riders preferred the shortest routes that allowed them to make more trips and hence more money from their passengers.[16] These were mostly the same routes that were used by motorised traffic that posed a danger to other road users (ITDG-EA, 2004). Table 4-3 shows the conditions that reinforced narrow streets in restricting cycling. Lastly, the combination of private cars, rickshaws and *matatus* (*Z-value=-5.14*) was the least excluded by narrow streets. I attribute this to the advantage it draws from the auto-centric transport planning presented earlier.

Careless driving also hindered the use of the streets. In this case, motorcycling (*Z-value=2.00*) yielded the strongest association with its restriction. It was followed closely by private cars, rickshaws and *matatus* (*Z-value=1.82*). These results expose another dimension of the contested streets of Kisumu; this time pitting motorcyclists against private cars, rickshaws and *matatus*. This contestation occasioned careless riding by motorcycle operators, consequently exposing their passengers to accidents (Mwangangi et al., 2015). Although careless driving was a leading challenge, it seemed not to impede walking and private cycling relative to private cars, rickshaws and *matatus*. Z-values of *-4.98* and *-.32* were yielded for walking and private cycling respectively. It appears that careless driving only restricted private cycling and walking in situations where they absolutely had to share the same street spaces. This was particularly the case with the recently-expanded streets, which made no provisions for safe turning thereby making it particularly difficult for cyclists to use them.[17] Among the areas that reported this challenge were Nairobi road at Nyamasaria centre, Nyalenda ringroad/ Nairobi road intersection (Kachok), Kakamega road/Mamboleo road intersection, and Mumias road at Bandani and Riat centres (see Figure 3-1 and Figure 3-5 for these places). Lower association to exclusion caused by careless driving that was revealed by walking (*Z-value=-4.98*) was attributed to relative ease of finding alternative footpaths which enabled pedestrians to avoid streets with careless drivers. That passenger cyclists did not have much control over their route choice has already been highlighted. This argument offers an explanation why passenger cycling was comparatively more exposed to the effects of careless driving (*Z-value=.05*).

[13] *Field observation and notes*

[14] *ibid.*

[15] *ibid.*

[16] *ibid.*

[17] *ibid.*

The compounding effect of the main drivers of exclusion

A further two-way analysis of the indicators of route quality revealed their compounding effect on exclusion. The combination of narrow streets and dangerous junctions (*Z-value=9.51*) contributed most to restricting all modes in general. It was followed by the combination of dangerous junctions and careless driving (*Z-value=4.04*). These results indicate that junctions where road users were not mindful of each other were more restricting. The two findings confirm my earlier assertion that junctions by themselves only imposed a small restriction, which worsened when their effects were compounded with other effects.

The combination of narrow streets and poor street surface conditions was least associated with exclusion (*Z-value=-5.10*), while the combination of poor street surface conditions and careless driving held the third place (*Z-value=-2.85*). These two results are attributable to the fact that poor street surface conditions mainly characterised the slums and peri-urban settlements. Streets in these settlements registered fewer motorised modes, hence the diminished impact of their associated exclusion caused by careless driving. However, even in cases where these streets were found outside the slum settlements, their poor physical state pacified speeding that could have restricted their use for all modes. A much stronger association between the combination of narrow streets and poor street surface conditions on the one hand and exclusion on the other would have been expected. This is especially so in the case of the respondents from the slum areas where these conditions were most prevalent. However, results presented here show the contrary. These results are probably an indication of other conditions that make the combination of narrow streets and poor street surface conditions to cause exclusion. I explore these possibilities in the next paragraph.

The two-way effects presented above were further associated with the modes to obtain the parameter scores that allowed the exclusion that they caused on the modes to be assessed. These results are presented in Table 4-3 as 3-way effects due to the inclusion of different modes in the analyses. In contrast to motorised modes, the findings revealed a general weak association between non-motorised modes and exclusion caused by the combination of these restrictions. Walking, bicycle (self), and bicycle (passenger) all registered a negative association with the exclusion caused by the combination of *narrow streets*dangerous junctions, dangerous junctions*poor street surface conditions,* and *narrow streets*poor street surface conditions*. These results are indicative of the nature of the routes where cycling and other forms of non-motorised travelling were actively used. First, there was a predominant use of non-motorised modes in the slums and peri-urban settlements where these restrictions could not compound themselves because of the nature of the streets there. For instance, while the areas had narrow streets, their junctions were not dangerous because motorised modes that could have posed a risk at the junctions could hardly drive at dangerous speeds. I also indicated earlier that non-motorised travellers tended to avoid complicated routes that compounded their exclusion. This was however only a coping strategy. These reasons explain why the combination of narrow streets and poor street surface conditions also registered a low association with exclusion.

Among the non-motorised modes, passenger cycling emerged as the most excluded by the combination of dangerous junctions and poor street surface conditions (*Z-value=-1.40*), poor street surface conditions and careless driving (*Z-value=1.58*) and narrow streets and street

surface condition (*Z-value=-.36*). On the other hand, private cycling curiously yielded the strongest association with the combined effect of narrow streets and dangerous junctions relative to the other non-motorised modes (*Z-value=-1.06*). No field observation revealed a consistent account that could explain this result. Nonetheless, respondents in areas that had benefited from the recent road expansion project (World Bank, 2012) reported this challenge more. It is therefore possible that these respondents were restricted by narrow streets within their settlements and dangerous junctions which made it harder for them to make turns between these narrow streets and the main roads. Private cars, rickshaws and *matatus* experienced the least restriction at the junctions (*Z-value=-.11.71*). This is indicative of the traffic priority that they enjoyed and the danger they posed to the other modes.

4.6 Examining bicycle exclusion on its own

The foregoing findings reveal that pedal-cycling is the most excluded due to unsupportive conditions of the street spaces. Nonetheless, analysing its exclusion relative to other modes sometimes concealed the challenges that it faced. This section examines the exclusion of cycling on its own in an effort to generate results that can be compared within the mode itself. This analysis also allows route quality effects that were unique to pedal-cycling (Section 4.4.2) to be considered. No distinction is made between passenger and private cycling because the objective is to find the factors that constrained cycling in general. Drawing a distinction between the two forms of cycling would not add value to the possible interventions on street spaces that this study sought to generate. The modelling procedure explained in Section 4.4.2 was followed.

The initial screening showed that only $k \leq 2$ were significant in yielding a parsimonious model in this case (*Appendix vii*). Consequently, *narrow streets*junctions*, *narrow streets*volume of pedestrians*, *careless drivers*volume of pedestrians*, *junctions*speeding motorised transport*, *volume of pedestrians*speeding motorised transport*, *narrow streets*, *junctions*, *careless drivers*, *volume of pedestrians* and *speeding motorised transport* were all significant. The interaction of poor street surface conditions with all the other infrastructure conditions also yielded a significant contribution to restricting cycling. The result of their parameter estimation is given in Table 4-3.

Table 4-3: Estimates for parameters of exclusion of cyclists considered on their own

Parameter	Coeff.	Std. Err.	Z-Value	Lower 95 CI	Upper 95 CI
Main effects (k=1)					
street surface conditions	0.7179	0.0565	12.70	0.6071	0.8287
speeding motorised transport	1.1548	0.1094	10.56	0.9404	1.3692
careless driving	1.3293	0.1297	10.25	1.0751	1.5834
narrow streets	0.2888	0.0405	7.13	0.2094	0.3682
junctions	-0.4928	0.1034	-4.77	-0.6955	-0.2901
volume of pedestrians	-1.2495	0.1324	-9.44	-1.5090	-0.9901
2-way effect (k=2)					
junctions*speeding motorised transport	1.4728	0.1019	14.45	1.2731	1.6726
careless driving*volume of pedestrians	1.1269	0.1273	8.85	0.8775	1.3764
volume of pedestrians*speeding motorised transport	0.3551	0.0428	8.29	0.2712	0.4390
narrow streets*volume of pedestrians	0.2270	0.0349	6.50	0.1586	0.2954
narrow streets*junctions	0.2074	0.0349	5.94	0.1390	0.2758
junctions*street surface conditions	0.1533	0.0575	2.67	0.0406	0.2661
volume of pedestrians*street surface conditions	0.0907	0.0398	2.28	0.0128	0.1687
careless driving*street surface conditions	-0.1602	0.0470	-3.41	-0.2523	-0.0682
narrow streets*street surface conditions	-0.1807	0.0380	-4.76	-0.2551	-0.1063
speeding motorised transport*streets surface conditions	-0.3903	0.0675	-5.78	-0.5227	-0.2580

The results included speeding motorised transport and high volumes of pedestrians, which were shown at the initial screening to be unique to cycling (Section 4.4.2).

Street surface conditions emerged the leading factor that excluded cycling when the mode was analysed on its own. This clarifies the previous finding, which showed that private cycling was mainly excluded by poor street surface conditions while passenger cycling was not. The finding confirms that poor street surface condition was generally a major hindrance to cycling of all forms.

Speeding cars (*Z-value=10.56*) and careless driving emerged second and third respectively in restricting cycling (*Z-value=10.25*). Narrow streets followed (*Z-value=7.13*). These challenges were expected given that the auto-centric production of streets in Kisumu neither supported cycling (Alando & Scheiner, 2016) nor enforced traffic rules that could protect the mode. The traffic law (Traffic Act, Cap 403, 2014) remains conspicuously inexplicit on the need to protect cyclists against speeding and careless motoring. The restriction to cycling posed by these factors is further compounded by a lack of operationalisation of the transport policy (Government of Kenya, 2009) that holds hope for addressing its needs. I revisit this policy in Chapter 6.

Dangerous junctions and high volumes of pedestrians on the streets revealed a weak association with excluding cyclists unless they were reinforced by other factors. Dangerous junctions reinforced speeding motorised transport to emerge a leading cause of exclusion of cyclists (*Z-value=14.45*). This finding clarifies my previous revelation of inexplicit association between dangerous junctions and narrow streets on the one hand and the exclusion of cycling in Kisumu on the other. The finding explicitly shows that this exclusion is imposed by speeding motorised modes.

Streets that experienced higher pedestrian traffic and careless driving also restricted cyclists (*Z-value=8.85*). Similarly, higher volumes of pedestrians reinforced by speeding motorised transport (*Z-value=8.29*), and narrow streets compounded with higher volumes of pedestrians, (*Z-value=6.5*) were conspicuously strong in restricting cycling. As already mentioned earlier, the combination of these factors was evident around busy transport nodes such as Kisumu Bus Park, Kondele, Bandani, and Kachok junctions.[18] These conditions restricted cycling both on and outside the carriageway. Specifically, motorised traffic excluded cyclists from the carriageway while heavy human traffic denied them the chance to escape this danger on the edge of the streets where alternative space could be sought.

Poor street surface condition is shown to be strongest in restricting cycling only when it acted on its own rather than in combination with other conditions. I have already shown that the poor street surface conditions pacified the impact of other factors that restricted cycling. For instance, the poor street surface conditions did not permit speeding motorised traffic. Consequently, the combination of speeding motorised transport and poor street surface conditions resulted in the lowest restriction (*Z-value=-5.78*). It is notable that the combination of poor street surface conditions and other infrastructure factors yielded Z-value less than 3, which were among the lowest when the exclusion cycling was analysed on its own. Nonetheless, the combination of poor street surface conditions and dangerous junctions posed the greatest

[18] *Field observation and notes*

difficulty for cycling (*Z-value=2.67*). An account of this had been offered under the exclusion of all modes.

4.7 Chapter summary and conclusions

A new dimension of transport-related social exclusion has been explored in this chapter. The chapter focused on the substance of social exclusion (Gerda & Vrooman, 2007) to explore the impact of imbalanced power relations between motorised and non-motorised modes in excluding cyclists from street spaces. These skewed power relations are embodied in excluded street spaces that are produced and sustained by the predominant auto-centric planning regime in Kisumu (Alando & Scheiner, 2016; Steyn, 2012). The resulting restrictions aggravate the social exclusion of cyclists by limiting their participation in mobility and socio-economic activities. The findings suggest that directly conceptualising transport-related social exclusion through revealed travel behaviour holds the potential to expose the conditions of street spaces that alienate cyclists from participating in mobility. The findings thus enrich the applicability of transport-related social exclusion beyond the current ones that indirectly conceptualise this exclusion (e.g. Lucas, 2011).

A number of findings are obtained that are relevant for moving forward the current discourse on transport-related social exclusion. First, transport planning in Kisumu is revealed to favour motoring while marginalising non-motorised modes in general and cycling in particular. This, despite the significant role of cycling in facilitating accessibility and income generation. The study also reveals that although non-motorised modes have generally been identified to be disadvantaged (e.g. Khayesi et al., 2010), this disadvantage impacts differently on various forms of non-motorised modes. The gravity of impact is associated with the power that users of different modes have to make decisions about the routes to use and the possibility to appropriate other spaces that are deemed to be safer. It is further revealed that the factors that are responsible for restricting the use of street spaces can be ranked in order to allow the prioritisation of efforts towards inclusive street spaces. A contestation that pits non-motorised modes against motorised modes over street spaces is also revealed. Similar contestation is again revealed between motorcycles and private cars, rickshaws and *matatus*. These revelations enhance the previous findings (e.g. Khayesi et al., 2010) by offering an objective approach for identifying the levels of vulnerability of the modes to exclusion. The study also shows that road junctions are by themselves not the problem that exclude users of different modes from the streets. Rather, it is the manner in which they are used that causes restrictions. This points to the weak traffic regulations and controls that favour motoring while paying little or no attention to cycling in the city. Lastly, the study also unravels the transport disadvantage that faces slums and peri-urban settlements of Kisumu where most cyclists and non-motorists reside. These problems centre on the poor street surface conditions and narrow streets in these areas. Such concerns are often overlooked by public policies because the settlements are often deemed to be outside the official planning framework (Steyn, 2012; Watson, 2014).

The foregoing findings reveal that cyclists are disproportionately disadvantaged in terms of their ability to use the street spaces. This not only complicates their ease of accessing destinations to participate in socio-economic activities; it also hinders their ability to earn a living through *boda boda* operation. By highlighting these transport disadvantages, this study offers a transparent basis for formulating policies that produce inclusive street spaces and by extension, inclusive cities. Moreover, these conditions that generate exclusion point to the

barriers to accessibility, conceived of as the ease of reaching destinations (see Section 2.4). The conditions therefore offer important input into accessibility modelling that is contemplated by the conceptual framework presented in Section 2.5. Nonetheless, I recognise that neither the conditions of street spaces nor the dominant normative classifications of social exclusion can on their own fully reveal the transport disadvantage that faces cycling in Kisumu. It would be interesting to find out how socio-demographics, locational disadvantages and street conditions reinforce each other to produce transport exclusion by constraining accessibility.

The challenges to cycling identified by this chapter are thought to be shaped by changes in transport conditions that either directly or indirectly disadvantage the use of bicycles. These conditions include both infrastructure conditions that this chapter has focused on as well as policy conditions that produce them. The conditions change over periods of time and are conceptualised to shape the travel choices that people make (see Figure 2-2). The next chapter employs longitudinal analysis to investigate how cycling has evolved in Kisumu since the year 1999 in response to such conditions.

5 Implications of the changing transport conditions for pedal cycling[19]

Chapter summary

This chapter extends the discussion in the previous chapter by investigating how changes in transport infrastructure conditions discussed in that chapter are reinforced by policy changes to influence the travel choices that people make. Longitudinal analysis is employed in this investigation. Current longitudinal studies have mainly focused on understanding how travel choices respond to changes in events that are within the control of individuals. Consequently, little is known about the connection between travel behaviour and events outside the control of such individuals. This knowledge gap is particularly pronounced in sub-Saharan African cities, where State actions generate conditions that significantly alter the available choices. The current chapter employs retrospective categorical data obtained from interviews with 2,165 individuals from Kisumu to bridge this gap. It develops a multinomial logistic regression model that investigates the lag effect of the changing conditions on mode choices at three important dates in the history of transport development in Kisumu. These dates are the culmination of the commercialisation of cycling for passenger transport, removal and reintroduction of taxes on pedal bicycles, reforms in public transport, emergence of motorcycle-taxi, and the evolving role of Kisumu as a university city. The results show that State actions mediate conditions that produce changes in travel behaviour. A prominent outcome of the study is the revelation of the re-emergence of private cycling, which remains unsupported by the city's dominant neoliberal planning.

5.1. Introduction

Longitudinal analysis of travel behaviour holds the potential to unravel useful insights about the changing relationship between mode choices and their drivers (e.g. Chatterjee, Sherwin, & Jain, 2013). Such insights are hidden from the traditional mode choice analyses because these analyses focus mostly on static relationships at specific points in time. In contrast, longitudinal studies account for the temporal changes in travel behaviour by examining the changes induced by changes in life events and circumstances such as accessibility (e.g. Chatterjee et al., 2013; Jones, Chatterjee, & Gray, 2014). This ability of longitudinal studies to expose the temporal changes is relevant when the policy intention is to initiate life-long behaviour, such as the use of specific travel modes (Jones et al., 2014).

In spite of the above potential, literature on changes in mode choices in sub-Saharan African cities is yet to explicitly link changes in travel behaviour with life events in these cities (see e.g. Diaz Olvera et al., 2013; Diaz Olvera et al., 2016; Pirie, 2012; Sietchiping et al., 2012). Moreover, this literature seems to pay little attention to the contextual conditions generated by transport-related policies and which generate various life events in these cities. Consequently, the impact of their rapidly changing transport-related policies on their travel behaviour remains unclear and only implied. This vagueness renders the findings from the current research difficult to use to objectively

[19] An earlier version of this chapter was submitted to *Transportation* in September 2016. The submission is co-authored by Walter Alando, Joachim Scheiner and Mark Zuidgeest. I designed the study and developed the methodology with help of Joachim Scheiner. I also performed the analysis and wrote the manuscript. Mark Zuidgeest advised on the case study methodology and analysis. Both co-authors reviewed and commented on several versions of the manuscript. Author contributions: Walter Alando-60%, Joachim Scheiner-25%, and Mark Zuidgeest-15%.

account for the present changes in modal choices and to predict future ones. The current chapter bridges this gap by investigating the situation in Kisumu, Kenya. Like many other cities of its rank, Kisumu continues to pursue various transport-related policies whose impact on travel choices remain scantily understood (see e.g. Government of Kenya, 2007; Sietchiping et al., 2012; Watson, 2014).

The coincidence between transport-related policies and the changing mode choices in Kisumu since 1999 suggests that these policies have impacted both positively and negatively on pedal cycling. This impact is embodied in the shifting mode choices that commuters make in a likely response to the changing transport conditions that are created by the policies. While some of the policies deliberately targeted cycling (e.g. Institute of Economic Affairs, 2008), unplanned impacts on the mode also spawned from indirect policies. The recent government strategy of increasing access to university education (Government of Kenya, 2007) exemplifies these indirect policies. Specifically, this strategy has resulted in increased number of students, whose travel behaviour remains distinct but less understood. Despite the likely connection between various policies and the changing mode choices, structured investigations to unravel this link, its drivers and implications for different modes remain scanty. Close similarities in the transport situation in Kisumu and its peers make Kisumu an informative case for investigating this link.

The current chapter aims to unearth the opportunities and threats that the changing transport conditions present for addressing the policy and infrastructure needs of pedal cycling in medium-sized sub-Saharan African cities. Two specific objectives are pursued *i*) to trace the changes in mode choices at key points in the history of transport development in Kisumu, and *ii*) to explain the drivers of these changes and their implications for addressing the needs of pedal cycling.

The findings of this investigation are relevant for both transport research and policy. To the researchers, the chapter demonstrates the potential of longitudinal analysis to reveal the tacit factors that produce changes in modes choices following changes in transport-related policies. To the policymakers, these factors constitute the practical concerns that cycling-inclusive transport policy and infrastructure development ought to address.

The next section briefly discusses the use of longitudinal data in analysing travel behaviour change. This is followed in section 5.3 by a presentation of the changing context that is thought to frame the changes in mode choices in Kisumu. The fourth section presents the methodology while section 5.5 presents and discusses the results. The chapter concludes in section 5.8.

5.2. Longitudinal analysis into perspective

There is a growing interest in accounting for changes in travel behaviour through longitudinal data analysis. This analysis is argued to improve the understanding of how travel decisions change with time (Schoenduwe, Mueller, Peters, & Lanzendorf, 2015). The inclusion of time dimension of changing travel choices enhances the understanding of both long-term travel decisions such as location choices (e.g. Wegener, 2013; Wegener & Fürst, 1999) as well as short-term decisions such as mode and route choices (e.g. Ben-Akiva & Bierlaire, 1999). Despite the relevance of time in understanding the changes in travel decisions, travel behaviour analysis has traditionally remained centred on cross-sectional data. This kind of analysis can only reveal the choices that are made at static points in time but not how the choices change with time (Schoenduwe et al., 2015). This inability to reveal the temporal changes in travel behaviour discounts the potential of travel behaviour analysis to inform

life-long policy decisions (Jones et al., 2014). Besides, travel behaviour analysis based on cross-sectional data does not explicitly reveal the reasons that underlie the travel decisions (Jones et al., 2014). Recent developments in longitudinal studies present an effort to address this shortcoming.

Emerging research in the last decade demonstrates the potential of longitudinal studies to bridge the limitations identified above. This research shows that using retrospective data can reveal both the short- and long-term relations between travel behaviour and changes in life events such as residential location and ownership of mobility tools (e.g. Beige & Axhausen, 2008; Jones et al., 2014; Klinger & Lanzendorf, 2016). Beige and Axhausen (2008) for instance show that decisions relating to ownership of mobility tools, the duration for which these tools are kept before they are disposed of and residential movement vary with life events such changes in age, education attainment and employment status of individuals. Using retrospective data, this study shows that people of the same age cohorts exhibit similar travel behaviours over their lifetimes. These revelations are relevant in the context of the previous studies, which have positively related mode ownership and travel distances with the propensity to travel using these modes (e.g. Wegener, 2013; Wegener & Fürst, 1999). In a related analysis of panel data, Scheiner (2014) also reveals that changes in travel behaviour coincide with key life events, such as entry into the labour market, birth of a child in the family, and changes in residential location. These studies reveal changes in travel decisions that would otherwise be hidden from policy processes if investigations did not deliberately focus on analysing the past patterns. Nonetheless, they have visibly centred their attention on the changes in individual circumstances that trigger changes in mobility behaviour.

The above restricted interpretation of life events discounts the potential influence of external events, such as State policies in generating some of these reported life events. For instance, changes in mode ownership could as well be the result of events that are outside the voluntary control of individual decision-makers. Lanzendorf (2003) categorises life events into *i*) events which lead to changes in accessibility of places, such as changes in residential places, workplaces, and transport facilities, and *ii*) events which lead to changes in lifestyle, such as mode ownership, educational and professional attainments. Events which lead to changes in residential places, mode ownership, and transport facilities are arguably triggered by both the individual and the State. Yet current researches remain silent on this possible influence of the State. The potential of longitudinal studies to unravel the whole range of circumstances that trigger travel behaviour change is thus discounted.

Some studies on travel behaviour acknowledge the influence of external events identified above (e.g. Beige & Axhausen, 2008; Clark, Chatterjee, Melia, Knies, & Laurie, 2014; Dargay & Vythoulkas, 1999). However, these studies focus on events that are within the control of individuals rather than events outside their control. The closest investigations on the latter events have mainly considered travel behaviour changes that follow disruptions on transport networks (e.g. Ahmad Termida, Susilo, & Franklin, 2016; Fujii, Garling, & Kitamura, 2001; Pnevmatikou, Karlaftis, & Kepaptsoglou, 2015). Little is thus understood about the influence of external events caused by changes in policies. This deficiency of knowledge is particularly severe in sub-Saharan African cities. This is because the liberty to make independent travel decisions relating to cycling is highly constrained by factors that are outside individual control in these cities. Among these factors are poverty, which generates captive use of particular modes (Lucas, 2011), poor conditions of infrastructure such as those analysed in Chapter 4 (see also Trans-African Consortium, 2008), low car ownership and inadequate public transport (Diaz Olvera et al., 2013). External events that lead to changes in these factors would certainly lead to changes in life events such as mode ownership that

predominate the current literature. This relationship together with its drivers however remains obscure.

The current study draws upon the strength of longitudinal studies to investigate the link between historical events in Kisumu and the changing modal share for pedal cycling. Although changes in the share of cycling that follow these historical events have been reported (Maganya, 2008), the underlying drivers of this association remain unclear. This chapter questions the possibility that the conditions created by the events could have generated changes in external factors discussed above to produce the observed travel behaviour changes. The next section puts the changing transport conditions in Kisumu into perspective.

5.3. The changing transport conditions in Kisumu

Many medium-sized sub-Saharan African cities continue to witness travel behaviour changes that coincide with various State interventions that impact on transport (Diaz Olvera et al., 2013; Diaz Olvera et al., 2016; Kopp, 2011; Mwangangi et al., 2015; Salon & Gulyani, 2010; Sietchiping et al., 2012). These changes are characterised by a general transition from walking to the use of private cars, quasi-public transport and other intermediate modes such as motorcycles and bicycles. A striking feature of the transition has been the preoccupation of the State with facilitating motorisation while ironically paying inexplicit attention to various forms of non-motorised modes that are used mostly by the poorest (Gwilliam, 2003; Watson, 2014). Neoliberal thinking which emphasises modern technology and a shift from the traditional forms of consumption explains this irony (Hobson, 1999; Watson, 2009b). The goals of this neoliberal thinking have been argued to be inconsistent with the social development needs of many sub-Saharan African cites (Musandu-Nyamayaro, 2008; Watson, 2009b, 2014). Consequently, various development strategies that are founded on this neoliberal agenda (e.g. Government of Kenya, 2003a, 2007) have generated outcomes that seem to run counter the objectives of inclusive transport. It therefore raises curiosity to find out how these strategies impact on the travel behaviour of the poor.

In Kisumu in particular, the late 1990s heralded a transition from predominantly private to a mix of public and private means of travelling. Walking and cycling were the main means of private travelling prior to the onset of this transition.[20] Limited 'public transport' was also provided by privately-operated shared five-seater saloon cars (Figure 5-1). These comprised of old, mechanically defective vehicles, which were often overloaded, unreliable and operated without any formal regulation (Anyumba, 1995). The transition from these modes can be classified into three broad phases according to their association with pedal cycling:[21] 1) rapid bicycle boom; 2) emergence of motorcycle-taxis as alternatives to pedal cycling; and 3) motorisation and obscure cycling. These phases mark the key turning points in the history of transport in Kisumu.

[20] *Field notes*

[21] *Constructed from field notes*

Figure 5-1: Typical means of public transport in Kisumu around the year 1999
Photo credit: Kenya National Archives and Documentation Service

The first phase commenced in the late 1990s with the commercialisation of pedal cycling for passenger transport service (UN-HABITAT, 2004). This commercialisation was a response to high unemployment that partly resulted from the sustained influx of unskilled labour force in the wake of the city's collapsing industrial base (e.g. UN-HABITAT, 2004, 2005). This phase is associated with an increase in passenger cycling for commuting and intra-urban connections (ITDG-EA, 2004)

Pro-cycling taxation provisions and indirect transport policy are further associated with larger share of cycling in this phase. First, the removal of all taxes on imported bicycles in the year 2001 (Kenya National Assembly, 2001) is reported to have made bicycles much cheaper, leading to increased cycling (Maganya, 2008). The gains made by cycling were further consolidated by the publication and enforcement of Legal Notice Number 161 of 2003 (Government of Kenya, 2003b). This notice amended the Traffic Act of Kenya by introducing measures that sought to improve road safety in the country in general. Relevant among the measures was the introduction of compulsory seat-belt and speed governors on all public service vehicles. At the same time, the notice illegalised overloading of public service vehicles. Although these measures did not deliberately target cycling, they nonetheless increased its usage. This was partly because their stringent standards resulted in the collapse of 'public transport' as it existed in Kisumu.[22] This collapse created a gap in public transport service. Cycling readily filled this gap while at the same time benefiting from the opportunities created by policies that deliberately sought to increase its use.

Support for cycling during the period also emerged from the Sustainable Urban Mobility (SUM) project, which was spearheaded by non-state actors such the Intermediate Technology Development Group in conjunction with the city authority (see ITDG-EA, 2004). The main objective of the SUM project was to develop a long-term strategy for sustainable transportation and mobility for Kisumu (ITDG-EA, 2004). The specific target for cycling was to make the mode safe. This target was pursued through advocating for the creation of separate paths for cycling, sensitising drivers on safe road

[22] *Field interview with practising NMT expert, 20.08.2015*

use and educating pedal cyclists on road safety. The project was active between 2003 and 2005. However, it did not achieve much partly due to lack political support from the city authority.[23]

Two developments followed the collapse of 'public transport' that existed prior to the enforcement of Legal Notice Number 161. The current chapter presents these developments as the second phase of the history of transport in Kisumu. First was the emergence of 14-seater passenger service vehicles, locally known as *matatus,* in 2004 (see Figure 3-2a).[24] Their emergence was arguably a response to the service gap that was created by lack of motorised public transport. The second development was the onset of motorcycling for passenger transport services (see Figure 3-2b).[25] This development is of particular interest in this chapter because of the popular presentation of motorcycle-taxis as substitutes to pedal cycling (e.g. Diaz Olvera et al., 2016; Kopp, 2011; Sietchiping et al., 2012). In Kisumu in particular, motorcycle-taxis have been popularly presented as superior and affordable alternatives for the poor (e.g. Olawo et al., 2014). These developments raise curiosity about the affordability of these emerging modes. Moreover, the importance attached to social appeal as a basis for transport planning is also questioned.

The argument that motorcycle-taxis offer superior and pro-poor travel option has been used by the State to justify its inattention to cycling. In 2008 for instance, the government removed all import tax on motorcycles of engine capacities below 250cc to '*…encourage motorcycle transport as a superior mode of transport to bicycles as well as (to) create employment opportunities for the youth*' (Institute of Economic Affairs, 2008, p. 18). Such attitudes towards pedal cycling raise doubts about the commitment of the State to enabling cycling in cities like Kisumu where the mode plays a central accessibility-enabling role to its majority captive users. It appears that the commercial interest of the operators, rather than supporting accessibility needs of these captive users, was the dominant consideration in removing these taxes. It is not surprising therefore that the government subsequently reintroduced import taxes on pedal bicycles in 2007 (Maganya, 2008). This tax increased the retail price of bicycles by half (Maganya, 2008).

The third and last phase is that of growing motorisation and invisible cycling. This phase is characterised by a drop in the amount of pedal bicycle taxis and a re-emergence of private pedal cycling. This reversal happens alongside walking and a growing use of *matatus*, motorcycle-taxis, and rickshaws. The current re-emergence of private cycling parallels an evolving status of Kisumu as a university city since the year 2009. Over ten university campuses have been established in the city over this period. A growing number of their students prefer to commute by bicycles.[26] Unlike motorisation which is supported by both policy (see Kisumu County Government, 2013; Nodalis Conseil, 2014) and the ongoing transport infrastructure projects (see World Bank, 2012), similar support for cycling remains unclear.

Table 5-1 summarises the above transition in the development of transport in Kisumu.

[23] *Field interview with practising NMT expert, 20.08.2015*
[24] *ibid.*
[25] *ibid.*
[26] *ibid.*

Table 5-1: Summary of the changing transport situation in Kisumu

1999-2003	2004-2008	2009-2014
- Emergence of commercialised pedal cycling - Removal of taxes on pedal bicycles - Transport sector reforms - Sustainable urban mobility project	- Emergence of *matatus* - Emergence of motorcycle-taxis - Reintroduction of taxes on pedal bicycles - End of sustainable urban mobility project - Removal of taxes on motorcycles	- Growing motorisation (*matatus*, motorcycle-taxis & rickshaws) - Development of Kisumu as a University city - Upgrading of roads to support motorisation

The next section presents the procedures that were followed to investigate if these historical developments provided a context for various changes in travel behaviour.

5.4. Methods

5.4.1 Data

A retrospective survey was conducted to obtain data on travel behaviour. These kind of survey has been shown to offer favourable alternatives to panel surveys (Miller & Cottrill, 2013). The latter would have been ideal but were not available in Kisumu. A major limitation of retrospective survey that the study had to address stemmed from the inability of respondents to accurately recall past events (Beige & Axhausen, 2008; Miller & Cottrill, 2013). To deal with this challenge, the study identified the major historical events that coincided with the relevant dates that it investigated. Respondents were then asked to state the choices they made at the time when these events occurred. The intention in doing this was to improve their recall capacity (Beige & Axhausen, 2008).

Household members who were at least ten years of age at any of the turning points were considered competent to participate in the survey. Background information about the households, such as residential mobility, was first obtained from the household heads or their knowledgeable partners. Data on travel behaviour was then obtained from household members who made independent travel decisions. Respondents were asked to state their places of primary occupation in 1999, 2004, 2009 and 2014 and the primary travel modes they used to these destinations. Changes that took place in these elements of travel behaviours before the turning points were probed and recorded. The study was particularly interested in the changes that occurred in years 2004, 2009 and 2014. This is because it deemed these dates suitable for examining the lagged effects of various government interventions on travel behaviour (Section 5.3).

The travel decisions made in the year that immediately preceded the turning points were taken as the reference for the analysis of the changes. Thus, the travel decisions as at the year 2003 were the reference for the changes that occurred in 2004. Similarly, the decisions as at the years 2008 and 2013 were the reference for the changes that happened in 2009 and 2014 respectively.

Changes in mode choices between the reference year and the corresponding turning points were noted and the respondents asked to account for them. Only the main driver of change was recorded in each case. Generally, the respondents tended to consistently use the same main modes over the years. However, some 64, 71, and 18 respondents changed their main mode before 2004, 2009 and 2014 respectively. In this case, the analysis only considered the reason for the change at the turning point. Six directions of change emerged from the investigation. These included changes '*from cycling to other modes*', '*from other modes into cycling*', '*no change from cycling*', and '*never cycled*'. In addition, '*new entry into non-cycling*' and '*new entry into cycling*' were also reported. The latter two

did not reflect change in its strict sense; they were rather the initial choices that respondents made after settling in Kisumu or attaining the age of ten.

5.4.2 Analysis

The objective of the analysis was to trace the changes in mode choices at the key historical dates and explain their drivers. The number of respondents who arrived in Kisumu in different years was first cumulated till the year that preceded each turning point (P in Table 5-2a-c). The aim was to obtain the total size of respondents whose changing travel decisions at the turning points were to be examined. The tables show that there were 492 such respondents in 2003 and a further 1,009 and 2,096 respondents in 2009 and 2014 respectively. In addition, there were other respondents who were only eligible to participate in the survey after they attained the age of ten years. The choices of these respondents, together with those of the respondents who joined Kisumu at the turning points, were considered as '*new entry into cycling*' or '*new entry into non-cycling*.' These choices are collectively referred to as new respondents (N). They comprise 154 respondents in 2004 and a further 329 and 69 respondents in the years 2009 and 2014 respectively.

Table 5-2: Distribution of respondents whose changing choices are analysed in 2004, 2009 and 2014

(a)	1999	2000	2001	2002	2003	2004
P*	321	376	419	447	492	492
N*	56	69	72	74	78	154
T*	377	445	491	521	570	646

(b)	2004	2005	2006	2007	2008	2009
P*	646	731	809	884	1009	1009
N*	75	84	94	99	122	329
T*	721	815	903	983	1131	1338

(c)	2009	2010	2011	2012	2013	2014
P*	1338	1607	1755	1958	2096	2096
N*	2	4	4	6	7	69
T*	1340	1611	1759	1964	2103	2165

*P = cumulative number of respondents arriving at different years that precede the turning point, N = New respondents (either eligible for the first time or moving to Kisumu for the first time), T = total number of respondents who took part in the survey

The share of each mode in the base years and the turning points was then calculated by obtaining the percentage of the proportion of respondents who used the modes. Changes in mode choices were subsequently analysed by comparing the percentage share of each mode at every turning point against its corresponding share in the base year. Results are presented in the next section.

The influence of the drivers of change was predicted using a multinomial logistic regression model. This is a generalised logistic regression that is used when the dependent variable is nominal and takes more than two possibilities (Hosmer, Lemeshow, & Sturdivant, 2013). It estimates the conditional probability associated with each dependent variable (Y) given a collection of *p* independent variables denoted by vector $\mathbf{x}' = (x_1, x_2, \ldots, x_p)$. This probability is shown in the model by the estimated parameter (β), which takes the range $\beta_1, \beta_2, \ldots, \beta_p$ that correspond with the members of the vector $\mathbf{x}'$. The model works by estimating the *k-1* log-odds of each possibility. For instance, in the current case, one possible set of changes would be '*not changed from cycling*', '*change into cycling*', and '*new entry into cycling*'. If these changes are coded as 0, 1, and 2 respectively, and say '*not changed from cycling*' is taken as the reference, the probability of each dependent variable would be estimated as follows (Hosmer et al., 2013):

$$\mathbf{P(Y=0\,|\,x)} = \frac{\mathbf{1}}{\mathbf{1} + e^{g_1(\mathbf{x})} + e^{g_2(\mathbf{x})}} \qquad \textit{Equation 5-1}$$

$$\mathbf{P(Y=1\,|\,x)} = \frac{e^{g_1(\mathbf{x})}}{\mathbf{1} + e^{g_1(\mathbf{x})} + e^{g_2(\mathbf{x})}} \qquad \textit{Equation 5-2}$$

$$\mathbf{P(Y=2\,|\,x)} = \frac{\mathbf{e}^{\mathbf{g_2(x)}}}{\mathbf{1} + \mathbf{e}^{\mathbf{g_1(x)}} + \mathbf{e}^{\mathbf{g_2(x)}}} \qquad \textit{Equation 5-3}$$

where:

$$g_1(\mathbf{x}) = \ln\left[\frac{\mathbf{P(Y=1\,|\,x)}}{\mathbf{P(Y=0\,|\,x)}}\right] = \beta_{10} + \beta_{11}x_1 + \beta_{12}x_2 + \cdots\ \beta_{1p}x_p \qquad \textit{Equation 5-4}$$

and:

$$g_2(\mathbf{x}) = \ln\left[\frac{\mathbf{P(Y=2\,|\,x)}}{\mathbf{P(Y=0\,|\,x)}}\right] = \beta_{20} + \beta_{21}x_1 + \beta_{22}x_2 + \cdots\ \beta_{2p}x_p \qquad \textit{Equation 5-5}$$

g_n = logit of the multinomial regression model associated with Y=n,

The changes in mode choices at each turning point were modelled as the dependent variables. These changes were derived by classifying the nominal difference between the mode at the turning point and the mode in the base year into the appropriate direction of change as explained in the previous section. The corresponding reason for the changing mode choice was modelled as the predictor. Some predictors were revealed to be minor as they predicted only specific changes at some turning points. Where necessary, such predictors were collapsed into common categories in order to avoid having zero frequencies in the changes that they could not separately predict. The aim of doing this was to enhance their predictive strength (Tabachnick & Fidell, 2007). For instance, the use of bicycles because destinations were too far to walk or because destinations were located within distances that allowed cycling from the residential location was collapsed into '*location within cycleable distance*'. Similarly, lack of riding skills, unfavourable weather conditions and slow speed of cycling were merged into '*others*'. Ability to cycle, route flexibility, and susceptibility of motorcycle-taxis to fatal accidents were merged into '*others*' in 2004. The ability to cycle was however dropped from '*others*' in 2014 because it could adequately predict change on its own.

The model was implemented in SPSS. It works in a twin procedure that first classifies the cycling-related changes before identifying their predictors. These changes either supported or negated cycling. Changes that supported cycling involved '(transition) *from other modes to cycling*', '*new entry into cycling*', and '*not changed from cycling*' (Table 5-4). In contrast, changes that negated cycling involved '(transition) *from cycling to other modes*', '*new entry into non-cycling*', and '*never cycled*' (Table 5-5). Changes that supported cycling were evaluated with reference to the number of respondents that did '*not change from cycling*'. This reference was deemed the best account for engaging in cycling and thus the ideal basis for assessing why respondents favoured cycling. Likewise, changes that negated cycling were evaluated with reference to the number of respondents who '*never cycled*'. In this case, '*never cycled*' was deemed to offer the best reference for evaluating the reasons for not engaging in cycling.

The predictors of the above changes are the conditions that were thought to emerge from the changing context of transport in Kisumu (Section 5.3). This chapter views these predictors as the verifiable indicators of direct and indirect State actions that are embodied in the changing historical contexts. Predictors of changes that favoured cycling were evaluated against affordability while

those that negated cycling were evaluated against lack of access to bicycles. The choice of these references was informed by the need to clarify their relative influence in producing changes in mode choices. Previous studies (e.g. Alando & Scheiner, 2016; Mutiso, 2010; UN-HABITAT, 2004) have identified affordability and lack of access to bicycles as the key motivator and disincentive to cycling respectively. However, these studies have not shown how these factors relate with other factors that inspire or hinder cycling. Section 5.6 presents the results of this analysis.

5.5. Results and discussion

Tracing the changing modal share

Table 5-3 presents the changing share of different modes at each of the key turning points. The 'total share before change' is the percentage share of each mode before change. This share is redistributed into various modes after change as shown in the rows. Resulting modal share is presented in the columns as total share in each turning point.

Table 5-3: Changes in modal share between the base years and the turning points

		Modal share after change (2004, 2009, 2014)						
	2003-2004	Walking	Bicycle (self)	Bicycle (passenger)	Motorcycle-taxis	Private cars etc.	Total share before change (%)	Actual size
2003	Walking	58.1	7.3	27.2	0.4	6.9	50.0	246
	Bicycle (self)	26.4	50.9	7.5	1.9	13.2	10.8	53
	Bicycle (passenger)	4.7	0.7	82.6	4.7	7.4	30.3	149
	Motorcycle-taxis	0.0	0.0	0.0	0.0	0.0	0.0	0
	Private cars etc.	2.3	6.8	2.3	2.3	86.4	8.9	44
	Newcomers	46.8	10.4	27.9	0.6	14.3		154
	Total share in 2004 (%)	**36.7**	**10.1**	**36.8**	**1.7**	**14.7**		
2008-2009								
2008	Walking	31.6	27.6	17.1	6.9	16.9	41.7	421
	Bicycle (self)	11.1	11.1	43.4	12.1	22.2	9.8	99
	Bicycle (passenger)	14.1	61.0	8.6	8.9	7.4	32.3	326
	Motorcycle-taxis	0.0	9.5	9.5	52.4	28.6	2.1	21
	Private cars etc.	10.6	11.3	9.9	2.8	65.5	14.1	142
	Newcomers	33.4	21.9	18.2	9.1	17.3		329
	Total share in 2009 (%)	**23.5**	**31.1**	**16.4**	**8.6**	**20.4**		
2013-2014								
2013	Walking	57.3	27.4	2.9	3.3	9.1	23.9	518
	Bicycle (self)	1.7	93.9	2.1	1.6	0.7	26.7	577
	Bicycle (passenger)	6.3	25.8	51.8	14.1	1.9	19.0	411
	Motorcycle-taxis	4.5	3.4	1.7	86.5	3.9	8.2	178
	Private cars etc.	4.1	2.2	0.5	2.7	90.5	19.0	412
	Newcomers	27.5	29	11.6	10.1	21.7		69
	Total share in 2014 (%)	**17.4**	**38.1**	**11.7**	**11.8**	**21.0**		

Declining share of non-motorised modes amid growing motorisation

The findings reveal that Kisumu remains predominantly a walking and cycling city throughout the period of analysis. However, the share of non-motorised transport modes dropped from 91% just before the year 2004 to 67% in 2014. Walking and private cycling are shown to contribute the most to this decline. Their resultant modal share at the turning points suggests that their general drop is the outcome of a growing competition posed by private and public motorised modes especially before the year 2009. The drop in the share of passenger cycling coincides with the declining

availability of bicycle taxis as their operators switch to motorcycle-taxis.[27] I discuss the challenges of this change to cycling in Section 5.7. The share of walking has also decreased as pedestrians switch to other modes, first into passenger cycling in 2004 but later into private cycling. The share of non-motorised modes contrasts with the combined share of private cars, *matatu* and rickshaws, which stood at only 9% at the beginning of the period and rose to 21% by 2014. The share of non-motorised modes still surpassed that of motorcycle-taxis, although the latter had grown rapidly since its emergence in 2004. The shares of cycling and walking should however be interpreted cautiously because no clear-cut definition of pedestrians or cyclists could be obtained from the respondents. This vagueness emerged from 436 respondents who alternated between walking and (private and passenger) cycling as the main travel mode. Since they cycled for at least 2 weeks in a month, they were classified as cyclists because they were deemed to possess useful information that could help in understanding the cycling-related changes.

Re-emergence of private cycling

A striking development in 2009 was the reversal of the share of private cycling with that of passenger cycling. This reversal culminated in a dominant share of private cycling and a diminished share of passenger cycling by 2014. Increased private cycling compensates for the declining share of passenger cycling to sustain the identity of Kisumu as a cycling city.

The findings also reveal the resilience of cycling amidst increasing motorisation discussed above. Generally, the share of all motorised modes combined increased by about 24% over the period (Table 5-3). This transition into motorisation is to be expected as the city grows in size, functions and complexity (e.g. Hook & Replogle, 1996; Poudenx, 2008). It is therefore striking that private cycling is evolving to defy this expected pattern. The share of private cycling would still be about 22% in 2014 if it was to be assumed that all the 349 private cyclists who did not cycle daily were instead pedestrians. This persistence of private cycling raises curiosity about what drives people into cycling and the policy implications of these drivers. I explore these in Section 5.7. At the same time, it suggests the likely exclusion that active pedal cyclists continue to face as a result of the current neglect of pedal cycling by the State.

The emergence of motorcycle-taxis raises even more curiosity about the inclusion of pedal cyclists in Kisumu. This is especially so if one considers the amount of State support that motorcycle-taxis have continued to receive, often at the expense of pedal cycling (e.g. Alal, 2014; Alando & Scheiner, 2016; Institute of Economic Affairs, 2008; Municipal Council of Kisumu, 2009). The share of motorcycle-taxis now surpasses that of passenger pedal cycling and is expected to continue doing so unless passenger cycling is deliberately made attractive.[28]

Tacit association between State policies and travel behaviour

The above changes in modal shares point to the underlying influence of the historical events highlighted in Section 5.3. Increased share of passenger cycling in 2004 could be explained by events such as pro-cycling policies and campaigns that preceded the year. This rise in passenger cycling was accompanied by a shrinking share of walking. At the same time, the share of private cars, *matatus* and rickshaws also increased in 2004. The year also heralded the use of motorcycles

[27] *Field interview with Practising NMT expert, 20.08.2015*

[28] *ibid.*

for public transport. Increased share of private cars, *matatus* and rickshaws associates with the ban imposed by the Legal Notice Number 161. Interestingly, the share of private cycling almost remained stable with only a slight drop from 10.8% to 10.1% during the year. A possible explanation to this trend could be the low fares charged by passenger bicycles operators, which made it affordable for a majority to cycle without necessarily having to ride themselves.[29]

The patterns witnessed in 2004 are further sustained into 2008 and 2013 just before the second and third turning points respectively. The end of pro-cycling interventions and the consequent growth of *matatus* and motorcycle-taxis associate with a drop in the share of passenger cycling. The latter dropped from 32% in 2008 to only 16% in 2009. In contrast, the share of private cars, *matatus* and rickshaws increased by 6% while that of motorcycle-taxis increased by 7%. The year 2009 concurrently witnessed a drop in the share of walking from 42% to 24%. The changes in mode choices point to the tension between the demand for faster and affordable transport service on the one hand and what the market forces are willing to supply on the other. Evidently, the historical events between 2004 and 2009 did not create conducive conditions for passenger cycling. This, combined with policies that stifled pedal cycling in the city centre[30] (also Municipal Council of Kisumu, 2009) prompted an easy shift from cycling when motorcycle-taxis emerged. Private cycling is thus arguably a response to the search for affordable yet faster options and a reaction to government policies that suppress passenger cycling (Alando & Scheiner, 2016; Maganya, 2008; Nodalis Conseil, 2014). All forms of non-motorised modes apart from private cycling continued on a declining trend after 2009. In contrast, the share of all motorised modes increased.

The next section contextualises the above results to cycling. It also outlines a basis for examining the drivers of changes in mode choices in each of the three turning points.

5.6. Putting the changing mode choices within the context of cycling

Table 5-4 and Table 5-5 present the results of the multinomial logistic regression analysis. The tables include the model fitting statistics for each turning point. These statistics show whether the inclusion of the predictors improves the prediction of the changes in mode choices when compared to the intercepts on their own. A significant likelihood ratio statistics was obtained for all the final models. This indicates that the models were better with the predictors included than with the intercepts only. The pseudo R-Square statistic (*Nagelkerke*) is also reported. It is a pointer to the proportion of the variance explained by the model. However, it should be interpreted cautiously in a multinomial logistic regression, because no linear relationship exists between the dependent and predictor variables. Finally, the actual number of respondents (*N*) at each turning point is also given.

The measures used in interpreting the results are the parameter estimates (B in tables). These are the estimated multinomial logistic regression coefficients for the model. They are interpreted relative to a reference group. If all other variables in the model are held constant, a unit change in each predictor variable is interpreted to generate a change in the logit of the outcome, relative to the reference group, that equals its parameter estimate. Table 5-4 gives details of the changes that supported cycling while Table 5-5 details the changes that negated it.

[29] *Field notes*
[30] *ibid.*

Table 5-4: Changes that favour cycling

Modal change/reasons for change	2004		2009		2014	
	B	p-value	B	p-value	B	p-value
From other modes to cycling						
Intercept	-2.35	0.00	-1.23	0.00	-2.97	0.00
Cycling is faster than walking	2.65	0.00	2.82	0.00	2.94	0.00
I now have access to a bicycle	1.69	0.00	0.65	0.01	0.97	0.00
I am now able to cycle	-	-	-	-	2.38	0.00
Location within a cycleable distance	1.44	0.04	0.08	0.88	-0.27	0.73
Route flexibility and less prone to fatal accidents	-	-	-	-	0.20	0.76
Less prone to fatal accidents compared to motorcycle-taxis	-	-	0.78	0.14	-	-
Increased distance to place of occupation is far to walk	-	-	2.74	0.00	-	-
Others (ability to cycle, route flexibility and susceptibility to fatal accidents)	0.45	0.58	-	-	-	-
It is affordable compared to other faster alternatives (reference category)	0[b]		0[b]		0[b]	
New cyclists (making a choice for the first time)						
Intercept	-0.30	0.20	0.88	0.00	-3.73	0.00
Cycling is faster than walking	0.82	0.01	-1.24	0.00	-0.19	0.82
Bicycles are readily available	0.84	0.01	-0.45	0.01	0.48	0.30
I am able to cycle					0.84	0.44
Location within a cycleable distance	-0.46	0.37	-1.88	0.00	0.50	0.54
Route flexibility and less prone to fatal accidents	-	-	-	-	0.56	0.50
Less prone to fatal accidents compared to motorcycle-taxis	-	-	-0.45	0.27	-	-
Distance to place of occupation is far to walk	-	-	0.82	0.29	-	-
Others (ability to cycle, route flexibility and susceptibility to fatal accidents)	-0.29	0.51	-	-	-	-
It is affordable compared to other faster alternatives (reference category)	0[b]		0[b]		0[b]	
a. The reference category is: Not changed from cycling.						
b. This parameter is set to zero because it is redundant.						
Model fitting information (-2 Log likelihood): intercept only	**96.53**		**308.63**		**227.34**	
final	**41.63**		**52.63**		**43.05**	
Pseudo R-Square (Nagelkerke)	**0.14**		**0.26**		**0.23**	
N	**303**		**635**		**1,078**	

Table 5-5: Changes against cycling

Modal change/reasons for change	2004		2009		2014	
	B	p-value	B	p-value	B	p-value
From cycling to other modes						
Intercept	-2.16	0.00	-2.34	0.00	-2.37	0.00
Cycling is no longer safe	0.12	0.83	1.15	0.02	-0.99	0.03
My place of occupation is now far to cycle	0.99	0.16	1.02	0.09	-0.23	0.70
Ready availability of mode I shifted to	1.88	0.00	2.11	0.00	1.21	0.00
Inappropriate type of bicycle	-	-	2.85	0.00	-	-
Cycling is not socially appealing	-	-	1.24	0.07	0.53	0.30
It is easier and less expensive to walk because my daily destination is now not far from home	0.26	0.65	1.50	0.00	-0.01	0.99
Poor infrastructure	3.01	0.00	1.84	0.00	1.27	0.08
Others (Lack of riding skills, unfavourable weather, slow speed of bicycle)	1.47	0.02	1.34	0.03	0.07	0.89
I no longer have access to a bicyle (reference category)	0[b]		0[b]		0[b]	
New non-cyclist (making a choice for the first time)						
Intercept	-1.12	0.00	-0.20	0.30	-3.67	0.00
Cycling is not safe	1.91	0.00	1.13	0.00	0.57	0.38
My place of occupation is far to cycle	1.19	0.01	0.03	0.93	-0.32	0.79
Ready availability of the mode I use	1.52	0.00	-0.17	0.54	-1.55	0.18
Inappropriate type of bicycle	-	-	1.49	0.03	-	-
Cycling is not socially appealing	-	-	0.32	0.42	0.58	0.53
It is easier and less expensive to walk because my daily destination is not far from home	-1.35	0.02	-1.41	0.00	-0.72	0.43
Poor infrastructure	4.40	0.00	2.13	0.00	3.27	0.00
Others (Lack of riding skills, unfavourable weather, slow speed of bicycle)	2.99	0.00	1.58	0.00	1.99	0.00
I do not have access to a bicycle (reference category)		0[b]		0[b]		0[b]
a. The reference category is: Never cycled.						
b. This parameter is set to zero because it is redundant.						
Model fitting information (-2 Log likelihood): intercept only	**270.77**		**332.42**		**170.11**	
final	**53.36**		**77.60**		**55.68**	
Pseudo R-Square (Nagelkerke)	**0.38**		**0.24**		**0.16**	
N	**343**		**703**		**1,087**	

Cycling-related changes reflect a positive continuation of past choices tempered with new choices

Generally, choices that supported cycling were driven by respondents who did '*not change from cycling*'. Similarly, choices against cycling were mainly driven by respondents who '*never cycled*' in the base year and at the turning points. An exception to this general pattern was the year 2009, when choices that supported cycling were mainly driven by '*new cyclists*'. The intercepts of the changes at each turning point clarify these general trends. This general pattern obtained for both female and male respondents albeit with slight differences (*Appendix xi* and *Appendix xii*).

Relative to the respondents who '*never cycled*', those who came to Kisumu in 2004 as '*new non-cyclists*' were more likely to make choices that negated cycling than those who changed '*from cycling to other modes*'. This means that existing cyclists rarely changed to other modes. Majority of the choices that did not support cycling were therefore made by new respondents who came to Kisumu as non-cyclists. The low likelihood of existing cyclists to change from cycling is further confirmed by the changes that favoured cycling. Results show that respondents who did '*not change from cycling*' made a stronger contribution to choices that favoured cycling than the respondents who either changed '*from other modes to cycling*' or '*new cyclists*'. New respondents again emerged second in terms of their association with mode choices that favoured cycling.

The findings show that choices that impacted cycling in 2004 were mainly driven by existing cyclists, existing non-cyclists and new respondents. Changes into cycling or away from it impacted the least on the share of cycling revealed in the previous section. These results should not however be interpreted to mean that the changes were insignificant, particularly when the absolute number of respondents who were involved is considered. Slightly over 23% of both forms of cyclists changed to other modes in 2004. Concurrently, almost 31% of the non-cyclists changed into cycling. These percentages are derived from Table 5-3. All choices that favoured cycling in the base year but changed against it in 2004 were identified and calculated as a percentage of the original size that favoured cycling. A similar procedure was followed for choices that negated cycling in the base year but changed in its favour at the turning point.

The year 2009 witnessed a couple of changes in the choices that impacted cycling. Most notable was the influence of choices made by '*new cyclists*'. These choices emerged to surpass the choices of the extant cyclists who '*never changed from cycling*' (Table 5-4). The implication of this development was that decisions that favoured cycling were now primarily associated with '*new cyclists*' rather than existing cyclists who never changed their choices. At the same time, cycling benefited from choices that produced changes from other modes to cycling. These choices generated more cycling in 2009 compared to 2004. The contrast between the stronger intercept (-1.23) yielded by the changes '*from other modes to cycling*' and the one (-2.35) realised for the same changes in 2004 gives credence to this observation. Pedestrians formed the majority of those who changed to cycling (Table 5-3).

The results presented in Table 5-5 further emphasise the growing influence of new respondents on mode choices made in 2009. Specifically, the new intercept (-.20), which is stronger than -1.12 yielded in 2004 shows that new respondents increasingly made choices that negated cycling although their influence was weaker compared to that of respondents who '*never cycled*'. This contribution of new respondents to negating the use of bicycles is however moderated by their strong entry into cycling in 2009. The results further reveal that fewer existing cyclists changed to

other modes in 2009 as compared to 2004. This is evidenced by the weaker intercept obtained for changes '*from cycling to other modes*' in 2009 (-2.34) relative to that of 2004 (-2.16). The net result of these choices is the persistence of cycling that was alluded to in the previous section that traced the changing modal share.

The above changes that took place in 2009 seem to have heralded a new phase of stable mode choices among the respondents. The subsequent decisions that favoured cycling in 2014 were thus predominantly driven by existing cyclists who did not change from cycling while decisions against cycling were driven by respondents who never cycled before. The diminishing influence of the changes "*From cycling to other modes*" (intercept=-2.37), "*New non-cyclists*" (intercept=-3.67), "*From other modes to cycling*" (intercept=-2.97), and "*New cyclists*" (intercept=-3.73) evidences to this observation. The intercepts of all these changes are conspicuously weaker than they were in 2009.

The next section now accounts for these changes.

5.7. Interweaving the reasons for the changing mode choices and the historical events

This section interweaves the above changes with their historicised drivers in an effort to find the possible association between the changes in travel choices and the changes in policies.

Presentation of cycling as inferior by the State reinforces its avoidance

The above results reveal a general weak inclination of non-cyclists to switch to cycling and vice versa. In particular, motorists from higher income households hardly changed to cycling while cyclists only changed to motoring when that was the only practical option available (Table 5-5 classified according to the average household income – see *Appendix ix*). These results suggest that the official State branding of cycling as an inferior mode (see Institute of Economic Affairs, 2008) reinforces its extant negative social presentation thus leading to its declining use among non-captive cyclists. Although these results are based on the income status at the time of data collection only, they are nonetheless consistent with previous findings (e.g. Pochet & Cusset, 1999). Both findings show that low social status associated with cycling hinders its use among the high-income groups in many sub-Saharan African cities. Furthermore, this inferior status encourages its neglect from policy and infrastructure development (Pendakur, 2005; Sietchiping et al., 2012). Although cycling in Kisumu is generally avoided by users of motorised modes, it offers the only combination of faster and affordable means of travelling for the poor. There is hence a need for policy and infrastructure development efforts to proactively tackle the needs of this particular market segment rather than stifle cycling on account of its perceived social inferiority.

Cycling responds positively to supportive policies

The reasons offered for the changing choices point to the positive influence of supportive historical events on cycling. This influence is particularly seen in 2004 when cycling was mainly supported by its ability to attract new respondents while at the same time retaining its existing users. New respondents were more likely to be attracted into cycling because it was readily available (B=.84) rather than because it was affordable. This finding suggests that the use of bicycles responded positively to the support it received in the early 2000s. This support included its promotion as a tool

for employment creation (UN-HABITAT, 2004), tax exemptions (Kenya National Assembly, 2001), and its promotion as a mode of transport (ITDG-EA, 2004). These developments were evidently instrumental in supporting passenger cycling more than private cycling (Table 5-3). Cycling further seems to have responded positively to incidental policies such as the enforcement of Legal Notice Number 161. It should be recalled that this notice phased out the form of public transport that existed in Kisumu prior to its publication, thus leaving their users without any service apart from walking and cycling. Table 5-4 shows that cycling was in this case attractive to new cyclists (B=.82) and respondents who changed from other modes (B=2.65). These respondents considered cycling to be relatively faster than walking. The fact that the speed of bicycles attracted other mode users into cycling suggests that cycling readily filled the void that was created in public transport by the enforcement of Legal Notice Number 161.

Pro-cycling policies must be validated by supportive road infrastructure

The conditions presented in Table 5-5 suggest that pro-cycling policies are inadequate without concurrent infrastructure support. Although cycling received various support prior to 2004, the failure to address these conditions caused a shift from cycling and the avoidance of the mode by new respondents. Relative to lack of access to bicycles, poor infrastructure emerged the leading factor that hindered cycling for both the new non-cyclists (B=4.40) and respondents who changed from cycling (B=3.01). Poor infrastructure continued to exert a leading influence on new choices that negated cycling (B=2.13) in 2009. Similar patterns were revealed for the changes in 2014. These results confirm the challenges posed by the failure of the State to prioritise the production of infrastructure that facilitates cycling (e.g. Alando & Scheiner, 2016; Steyn, 2012). Nonetheless, the influence of infrastructure on dissuading existing cyclists was discounted by ready availability of motorcycle-taxis and changing tastes in 2009. These are discussed later.

The above concerns confirm the contradictory efforts of the State towards cycling in Kisumu and other sub-Saharan African cities (Pendakur, 2005; Trans-African Consortium, 2008). While the State supported cycling in Kisumu through various soft strategies, it did not create the concomitant infrastructure to validate this support. Consequently, lack of safety partly due to unsupportive infrastructure emerged the third leading factor that stifled cycling for the newcomers (B=1.90) and also contributed to pushing the existing cyclists into motorised modes in 2004 (B=1.88). Lack of infrastructure rendered cycling unsafe for both its active and potential users. It influenced more existing cyclists to shift from cycling than it dissuaded new respondents from cycling.

Other factors that negated cycling included the long distances to destinations and the combined effect of lack of riding skills, unfavourable weather and slow speed of cycling. These reasons could however not be directly related to the historical developments of transport in Kisumu. Nonetheless, they suggested that efforts to promote cycling were incomplete unless they integrated land-use and transport concerns in order to create distances that were within cycling reach. Such efforts could also include imparting riding skills and improving the safety on the streets in order to improve the speed of cycling.

It is striking that the topographic and climatic conditions of Kisumu (see Chapter 3) did not play a central role in deterring the use of bicycles in the city. Table 5-5 shows that the influence of climatic conditions on mode choices was only significant when it was analysed in combination with the influence of other factors which were equally insignificant on their own. The reason for combining

these factors is already explained in Section 5.4. On the other hand, the study could not find any evidence that the topography of the city hindered cycling. This diminished influence of topographic and climatic conditions was contrary to the logical expectation that such unfavourable conditions would deter cycling (see e.g. Gatersleben & Appleton, 2007; Passafaro et al., 2014). However, the two results are not surprising. Similar results have been reported by authors from other sub-Saharan African cities (e.g. Howe, 2003; Quarshie, 2004). A vivid influence of these factors is suggested when the income levels of the households are controlled (*Appendix ix*). This control shows that the conditions make more respondents from higher income households to abandon cycling or not to enter cycling altogether. Relatively higher coefficients of weather conditions associated with lack of entry into cycling or its abandonment by respondents from households that earned income higher than Ksh. 38,000 gives evidence for this. These results are however not statistically significant when the respondents are grouped according to the income levels of their households. They nonetheless resonate with those of Nkurunziza, Zuidgeest, Brussel, and van Maarseveen (2012) who reveal that these conditions mainly hinder those who are in the decision stages referred to as '*pre-contemplation*' and '*contemplation*' to cycle. The pre-contemplation is the stage where people consider the feasibility and desirability to engage in a particular mode out of the range of options available to them (Bamberg, Fujii, Friman, & Gärling, 2011). The contemplation stage on the other hand is where they actually choose a particular mode (Bamberg et al., 2011). The results obtained for the influence of topographic and climatic conditions after controlling for income show that cycling is predominantly used by the captive cyclists. The majority of these captive cyclists are the urban poor (see Section 3.4). Pro-cycling transport policies should therefore proactively focus on creating the minimum infrastructure and traffic conditions that enable them to move with ease using their active travel modes.

The influence of susceptibility to accidents, increased distance to main daily destination, and location within distances that permit cycling were not consistently significant over the years and changes in mode choices. They were hence only reported where doing so enabled comparable changes that were significant to be assessed. Highlighting these predictors in spite of their statistically insignificant effects enabled the study to draw attention to their influence in shaping choices.

The choice to cycle reflects an effort to optimise emerging expenditure on transport

Subsequent developments in cycling in 2009 are arguably a reaction to the growth of motorised transport. In particular, past promotion of motorcycling as a modern alternative to pedal cycling seems to have generated a shift from the operation of pedal bicycle taxis to motorcycle-taxis[31]. This shift culminated in fewer bicycles for passenger transport. The choices in 2009 thus reflect an effort to optimise transport expenditure on alternative modes. In this regard, affordability emerges to exert a stronger influence on the decision to cycle when compared to all the other factors that informed the decisions of '*new cyclists*' (Table 5-4). The findings reveal that new respondents were more likely to cycle as long as it was cheaper than other modes. These results suggest that the emergence and subsequent growth of motorcycle-taxis remained insensitive to transport affordability concerns. Motorisation in general seems to have restricted the supply of affordable modes to only walking and cycling. Under these circumstances, cycling emerged as the mode that could deliver the twin-benefit of affordability and speed. This capability is reflected in the preference of cycling over walking by respondents who changed to cycling from other modes (B=2.82). Like in the case of the new cyclists, increased distances from home to main regular

[31] *Field interview with Practising NMT expert, 20.08.2015*

destination further made cycling attractive for existing respondents who changed to cycling (*B*=2.74). However, the reason was not statistically significant in the case of new cyclists.

The above evidence about the influence of affordability is further confirmed when the income levels of the households from where the respondents were drawn is controlled (*Appendix ix*). Only the income levels in the year 2014 was controlled as there was no data for the previous years. In this case, lack of access to a bicycle and ready availability of the mode shifted to turns out to be the dominant reasons why those in the income bracket below Ksh. 20,000 move out of cycling or do not join the mode. Ready availability of alternative mode in this case signified the ready availability of motorcycles especially in the slum and peri-urban settlements where bicycles were actively used. For the poorer travellers, motorcycling is not necessarily the preferred mode but rather the only available alternative to walking in the absence of bicycles. These results confirm my observation that lack of attention to cycling forces its users to either walk longer distances or spend more of their incomes on meeting the recurrent transport cost.

That cycling serves the poorer segment of the society is further confirmed by the reasons given for changing from other modes to cycling as well as for the new entries into cycling (*Appendix xiii*). Specifically, respondents seem to make a comparison between walking and cycling before they make their mode choices. In general, the reasons suggest that it is mainly respondents who walked that 'upgraded' to cycling. This means that cycling offers an alternative to groups that would otherwise have to walk in the absence of bicycles. Previous studies have shown that these groups comprise mainly the poor (e.g. Salon & Aligula, 2012; Steyn, 2012). For the new entrants with household income of less than Ksh. 10,000, for instance, affordability ranked higher than the fact that cycling was considered faster than walking (B=-16.83). Affordability also contributed more than location within cycleable distances (B=-15.75) and route flexibility (B=-16.30) to make this income group change their mode choices from other modes to cycling. Although these coefficients are not statistically significant when the respondents are decomposed into their income groups, they nonetheless point to differences between the income groups in terms of the drivers of their modal choices.

Effort to optimise transport expenditure is further demonstrated by the tendency of the respondents to relapse to walking whenever the distances permitted. In this case, the fact that walking was easier and less expensive (*B*=1.50) outweighed the influence of lack of access to a bicycle in negating cycling. Results show that respondents would stick to cycling as long as the distances permitted (*B*=.08) and only change to other modes if their main daily destination became too far to cycle (*B*=1.02). These results reinforce my earlier proposal that cycling needs should be addressed because of the role that cycling plays in enabling affordable accessibility.

Support for motorcycling without attention to cycling neglects the travel needs of cyclists

The factors that negated cycling in 2009 indicate the influence of motorcycle-taxis on travel choices. This influence particularly disadvantaged respondents who could only afford cycling and walking. Table 5-5 shows that newcomers were more likely not to cycle because they did not have access to bicycles than because alternatives to bicycles were readily available as shown previously. Thus the leading influence of ready availability of alternatives to bicycles on choices that negated cycling (*B*=2.11) reflects a lack of alternatives. This observation suggests that the shift by operators of pedal bicycle taxis to the operation of motorcycle-taxis created a service gap for the demand that

was previously met by bicycles. The shift forced their clients to use motorcycle-taxis (*B*=2.11) although a majority of them could hardly afford the fares. It is thus arguable that the growing use of motorcycle-taxis was the product of captivity and lack of alternatives rather than a voluntary choice. It is due to this constrained supply of pedal bicycle taxis that new respondents who chose to walk rather than cycle did so not because it was easier and less expensive to walk (*B*=-1.41), but because they did not have access to bicycles (reference category). However, the influence of constrained supply of pedal bicycle taxis on changes from cycling was weaker than the influence of the ease and expenses involved in using it (*B*=1.50). That many respondents had their own bicycles by 2009 discounts the influence of access on modal changes among existing respondents.

The transport disadvantage posed by the emergence of motorcycle-taxis and simultaneous reduction in the number of passenger bicycle operators was aggravated in 2014. This disadvantage is evidenced by the increased influence of lack of access in influencing choices against cycling. Specifically, lack of access to bicycles negated cycling more than safety concerns, distances to main daily destinations, and the comparative advantage offered by walking rather than cycling. Again, lack of access to bicycles had a stronger contribution to inhibiting new entry into cycling than distances to main daily destinations, ready availability of alternative modes, and the comparative advantage offered by walking rather than cycling. These results suggest that motorcycle-taxis have emerged to serve the transport needs of what could arguably be presented as the lower working-class but not necessarily the poor majority. Sustained Government support for motorcycle-taxis at the expense of pedal cycling therefore stifles the supply of a faster mode that is affordable for the poor majority. This comprises the rising student population in Kisumu since the year 2009. The steep rise in private cycling (Table 5-3) is a response the gap created by the 'diminishing supply of affordable transport in Kisumu'.[32]

The growth of motorcycle-taxis also associated with the traffic safety concerns regarding its use. The influence of these concerns on mode choices emerged for the first time in 2009. Cycling was seen to be less prone to fatal accidents when compared to the use of motorcycle-taxis. The effect of susceptibility of motorcycle-taxis to fatal accidents is however not statistically significant. It is nonetheless deliberately presented here because it puts the genesis of fatal accidents involving the use of motorcycle-taxis into perspective. It should be mentioned that motorcycle-taxis have emerged as a leading cause of fatal accidents in many sub-Saharan African cities in the recent years (Manyara, 2016; Mwangangi et al., 2015; Trans-African Consortium, 2008).

Change in mode choices is also the result of changing preferences and generational change

Generational changes and its attendant changes in preferences also impacted mode choices. These effects were particularly evident in the transition from passenger cycling to private cycling in 2009. First, the emergence of '*inappropriate type of bicycle*'[33] as a leading reason for shifts from cycling (Table 5-5) points to the quest by the rising number of private cyclists for bicycles which they could ride easily. By controlling for the age of the respondents (*Appendix x*), this study shows that inappropriateness of the type of bicycle increasingly became a concern with age. Significant coefficient statistics of this factor are obtained for different age brackets (B=22.18 for those presently in the age bracket 31-40; B=20.95 for age bracket 25-30; and B=1.61 for age bracket 19-24). The age bracket 41-50 shows even higher coefficient. However, it is not statistically

[32] *Field notes and interview with Practising NMT expert, 20.08.2015*

[33] *Have no gears thus considered hard to cycle*

significant. It should be borne in mind that respondents in these age brackets were in the age brackets 26-35, 20-25, and 14-19 respectively in 2009 when they reported this concern. What is notable is the coincidence between the year when the concern about inappropriateness of the type of bicycles is first raised and the transition to private cycling in Kisumu in the same year. It should be mentioned that inappropriateness of the bicycles only became a concern when respondents had to ride themselves rather than rely on passenger bicycles.

The pursuit for suitable bicycles for private use further explains the simultaneous emergence of '*inappropriate type of bicycles*' as a leading reason for new choices that negated cycling in the year 2009. Results of the analysis presented in this chapter show that having '*access to bicycles*' attracted respondents into cycling while '*inappropriate type of* (extant) *bicycle*' pushed them away. At the same time, mode changes from cycling and lack of entry to it due to its inferior social status further confirm the demand for geared bicycles which were seen to be socially superior by private cyclists.[34] These concerns coincide with the rising population of youths who commuted by private bicycles to various learning institutions in the city. Inferior social status of cycling could however also be attributed to its negative social representation by the State that was discussed earlier. Although inferior social status of cycling was not statistically significant, it is reported because of its relevance in a city like Kisumu where cycling is associated with low social status of its riders.

The above preferences stabilised in 2014. Table 5-4 shows that more people were likely to change to cycling because they had access to bicycles (*B*=.97), were able to cycle (*B*=2.38), and because they considered cycling to be faster than walking (*B*=2.94). This was in addition to affordability of cycling when it was compared to the other faster modes. Interestingly, residential location mattered less for respondents who had lived in Kisumu prior to 2009 (*B*=-.27) as long as cycling was more affordable. However, this effect of location was statistically insignificant. In contrast, residential location was an important factor that attracted new respondents into cycling (*B*=.50). It should be pointed out that the majority of these new respondents were students. They preferred not to live very far from their institutions because of security concerns in situation where they had to leave the institutions very late in the evening.[35] Moreover, they tended to make more trips back home between the lectures.[36] New entry into cycling was also motivated by access to bicycles (*B*=.48) and ability to cycle (*B*=.84). New respondents preferred to cycle because it was affordable rather than because they considered it faster than walking (*B*=-.19).

5.8. Chapter summary and conclusions

This chapter situated the changing mode choices in Kisumu within the historical contexts that condition these choices. The chapter demonstrates that analysing travel behaviour based on longitudinal data holds the potential to uncover the hidden drivers of changes in choices that would otherwise be lost from policy processes. Although no direct cause-effect relationship between State interventions and changes in mode choices can be claimed, the reasons offered for the changing choices clearly emanated from these State actions. The chapter therefore concludes that State actions mediate changes in travel behaviour. Its findings extend those of previous researches (e.g. Chatterjee et al., 2013) by exposing the contribution of State actions to influencing the changing circumstances that trigger the changes in mode choices. The study reveals that sympathetic policies (see ITDG-EA, 2004;

[34] *Field notes*
[35] *ibid.*
[36] *ibid.*

Kenya National Assembly, 2001) that were pursued prior to 2004 created conditions that enabled active cycling. Incidental policies such as the Legal Notice No. 161 are similarly revealed to have positively impacted cycling. However, these policies are less likely to be successful if they do not create the necessary infrastructure and traffic conditions that support pedal cycling. The ease with which the subsequent emergence of *matatus* and motorcycle-taxis suppressed cycling, by reducing the number of service providers and rendering cycling unsafe, supports this caveat.

The findings further reveal that State-sanctioned commercialisation of pedal cycling for its contribution to employment creation (Institute of Economic Affairs, 2008) erodes its role as a facilitator of accessibility. Travellers who can only afford pedal cycling are thus rendered most disadvantaged when commercial cycling declines. This group is forced to contend with unaffordable motorised transport. The alternative is to walk or cycle privately on unsafe streets that are not produced for cycling (Alando & Scheiner, 2016; Steyn, 2012). A re-emerging popularity of private cycling that is partly sustained by its use among the growing student population also remains unsupported. This lack of support for cycling is attributable to the extant modernist planning attitudes (e.g. Government of Kenya, 2007), which remain indifferent to the felt needs of poor travellers in many sub-Saharan African cities (Watson, 2014). In this regard, the current study concludes that the presentation of motorcycle-taxis as affordable options for the poor (e.g. Olawo et al., 2014) leads to their further exclusion. Specifically, this presentation makes their need for participation in mobility and access to socio-economic opportunities using modes that are affordable to them invisible.

The findings of this chapter are useful for the formulation of transport policies that are concerned with transport affordability, positive branding of cycling, safety, and access to bicycles. Other areas of policy concerns include the nexus between cycling and land-use and inclusive street spaces for cycling. The chapter shows that direct and indirect State actions towards cycling can stifle the mode or create new opportunities for it. Transport policies must therefore take cognizance of these actions with a view to enhancing their positive opportunities while checking the developments that might hinder cycling. Equally important is how these conditions that stifle cycling can be assigned weights in order to make them useful for accessibility modelling that is contemplated in the conceptual framework presented in Section 2.5. Although this chapter has examined the lagged effect of the changes in transport circumstances, it recognises that examining these effects on a yearly basis could greatly improve the detection of other drivers of the observed changes.

Inattention to cycling that this chapter exposes is likely to worsen unless it is proactively addressed alongside the growing emphasis on capital transport infrastructure projects by many governments of sub-Saharan Africa (see e.g. Watson, 2014). These infrastructure projects are part of economic master planning under what are popularly referred to as 'Visions' (e.g. Government of Kenya, 2007; Government of Tanzania, 1999; Government of Uganda, 2007). In the next chapter, I explore the contradictions between the Kenya Vision 2030 (Government of Kenya, 2007) and the national transport policy (Government of Kenya, 2009) to find the opportunities that they hold for the inclusion of cycling. I should point out that both documents guide local urban transport and economic development concerns although they are formulated at the national level.

6 Social inclusion as a benchmark for cycling-inclusive transport policy[37]

Chapter summary

This chapter lays a framework for understanding how the tension between economic and transport development goals gives rise to the conditions discussed in the last two chapters. Cycling in many cities of the Global South faces unending exclusion from street spaces despite the on-going transport policy reforms. This exclusion worsens the marginalisation of the poor majority who use this mode. In this chapter, I formulate social inclusion as a policy tool for reconciling transport policy to the cycling needs of Kisumu, Kenya. I draw on social quality theory and Lefebvre's right to the city concept to assemble the ideals of social inclusion. These ideals form the benchmark for a qualitative content analysis of the policy pronouncements contained in the Kenya Vision 2030 and the Integrated National Transport Policy to ascertain the opportunities presented by these policies for cycling inclusion. Findings from interviews held with transport professionals in government and private practice support this content analysis. Results show that while the Kenya Vision 2030 focuses on economic growth, the Government has prioritised the implementation of its projects, thus diminishing the fragile opportunity for cycling inclusion presented by the transport policy. To consolidate this opportunity, I propose different policy recommendations to improve the terms for cyclists to claim and produce street spaces.

6.1 Introduction

Providing street spaces that support utility cycling remains an elusive target of transport policy in many sub-Saharan African cities. In Kisumu, Kenya in particular, this challenge seems to be compounded by mixed commitment to cycling that is generated by the parallel pursuit of economic growth and transport policy reform agenda. While cycling combines the advantages of speed and affordability for its users, the concurrent pursuit of these economic and transport policy agenda has not influenced the functional allocation of street spaces in ways that support its use. Consequently, transport infrastructure and service expansion projects that aim to improve safety, connectivity and accessibility (Government of Kenya, 2009) have instead created street spaces that exclude cycling. This exclusion worsens the social exclusion of the poor majority who rely on cycling to access opportunities and to generate income by offering bicycle taxi services (Mutiso, 2010; UN-HABITAT, 2004).

Finding a way of addressing this transport exclusion is the central concern of this chapter. The chapter specifically explores the extent to which social inclusion can be packaged to form a policy frame for reconciling transport planning in Kisumu to its neglected cycling needs. Social inclusion is understood to be 'the process of improving *not only* the terms for individuals and groups that are disadvantaged on the basis of their identity to take part in society, *but also... the process of improving their* ability, dignity, and opportunity *available for them to do so*' (World Bank, 2013, p.3-4, emphasis added). Guided by this definition, the chapter pursues two objectives: i) to assemble a literature-based frame for analysing social inclusion in transport, and ii) to find out the

[37] An earlier version of this chapter has been published in *Social Inclusion* 4 (2016) 46-60. It is co-authored with Walter Alando and Joachim Scheiner. I designed the study and developed the methodology with help of Joachim Scheiner. I also performed the analysis and wrote the manuscript. Joachim Scheiner reviewed and commented on several versions of the manuscript. Author contributions: Walter Alando-75%, Joachim Scheiner-25%.

extent to which Kenya's economic development blueprint is consistent with its transport policy and the implications of this extent of consistency for cycling-inclusive transport planning in Kisumu.

The chapter draws on the inclusionary principles espoused by social quality theory (van der Maesen & Walker, 2002) and Lefebvre's right to the city concept (Lefebvre, 1996) to assemble the key tenets that guide its analysis of Kenya's economic development blueprint (Kenya Vision 2030) and transport policy for the opportunities they hold for cycling inclusion in Kisumu. I discuss these policies in section 6.3. The chapter revisits the exclusionary transport strategies that characterise modernist planning (see e.g. Hobson, 1999; Holston, 2008; Steyn, 2012; Watson, 2009b) and employs the understanding thus generated as a basis for reconciling the tension between the planners' ideal city and the lived cycling experience. It should be mentioned that cycling is already actively appropriating and producing urban spaces in spite of the absence of its official recognition and facilitation by State planners (Khayesi et al., 2010; Steyn, 2012). This neglect plunges the current discussion right into the core of social debate, considering that non-motorised transport accounts for over 47% of the modal share in many sub-Saharan African cities and that they are used mainly by the poor (see e.g. Aligula et al., 2005). Their neglect is thus a neglect of this population that uses them. I therefore invoke the presentation of space as not only an arena in which social life unfolds but also an actual embodiment of that very social life (Lefebvre, 1991; Marcuse, 2010; Soja, 1996) to argue that cycling infrastructure and traffic needs should equally have a right to shape the city. This position is emboldened by the work of Park, Burgess, and McKenzie (1967) who assert that the city is '*… a state of mind, a body of customs and traditions, and of the organised attitudes and sentiments that inhere in these customs …*' (p.1). Researchers like Harvey (2003) argue that this right can only be effectively exercised when urban residents change the city in a manner that suits their own desires. These articulations provoke the need to interrogate transport policies and to reorient them to enable cycling and its needs to take an active role in producing urban spaces.

The remainder of this chapter is organised in six sections. The next section presents a theoretical basis for employing social inclusion in the current chapter. Section 3 contextualises transport exclusion in sub-Saharan African cities while section 4 puts Kisumu, the study city into perspective. The methodology is presented in section 5. Section 6 builds a theoretical analysis that generates the themes against which the provisions of the extant policies in Kisumu are analysed in section 7. The implications of policy results for the inclusion of cycling are also presented in section 7. The conclusions and policy proposals are given in Section 8.

6.2 Contextualising transport exclusion in sub-Saharan African cities

The last fifteen years have witnessed a renewed attention to social exclusion in transport research (e.g. Church et al., 2000; Kenyon et al., 2002; Lucas, 2011; Scheiner, 2010b). A common theme through this research is the conception of exclusion as suppressed travel due to disadvantaged socio-geographical residential locations (Church et al., 2000; Shergold & Parkhurst, 2012), limited access to the car and public transport (Kenyon et al., 2002; Shergold & Parkhurst, 2012), and socio-demographics such as gender, age and race (Engels & Liu, 2011; Shergold & Parkhurst, 2012). Transport exclusion is therefore arguably a form of social exclusion given that it occurs because of the social status of the excluded.

While the socio-economic indicators discussed above are useful in enabling a normative categorisation of exclusion, they nonetheless do not take account of different travel behaviour (Shergold & Parkhurst, 2012). This gap raises doubts about their capability to explain transport

exclusion that arises because of the choices that travellers make. Specifically, the results of these indicators remain unclear on the differences in exclusion experienced across travel modes and travel routes, although these choices present unique conditions that can be argued to impact differently on exclusion.

In view of the foregoing revelation, I argue that focusing on the empirical travel behaviour and policy processes that produce spaces where travel choices are made would lend a richer understanding of exclusion. Within the context of Europe, Scheiner (2010b), for instance, alludes to this position even though his study does not directly focus on social exclusion. Based on the notion that households choose residential locations that suit their travel behaviour, he employs empirical travel data to show a positive association between vertical social inequality and limited activity spaces that those in the lower social ranks can access. Such results are concealed when inclusion strategies focus on normative categorisation of exclusion based on socio-demographic and geographical indicators.

It is even more difficult for these indicators to fully account for transport exclusion in sub-Saharan African cities unless they are adapted to do so. This is because of the unique circumstances that define exclusion in these cities. These circumstances include the predominance of non-motorised transport (Gwilliam, 2003; Salon & Aligula, 2012), persistent absolute poverty and consequent low car ownership levels (Lucas, 2011), and the tension between the rapid sprawl of residential locations and the predominant mono-functional urban land-use regime (UN-HABITAT, 2014). All these circumstances contrast to factors that cause exclusion in developed cities, where the current proxies of exclusion have been developed. The interplay of these circumstances creates a situation where as many as 60% of daily trips in sub-Saharan African cities are made using non-motorised options (Diaz Olvera et al., 2013; Salon & Aligula, 2012). In addition, exclusion also takes a gender dimension. Cases have been reported where the most vulnerable women, children, the old, and physically disabled are constrained from making out-of-home trips due to poor road conditions (Diaz Olvera et al., 2013), unaffordability (Salon & Gulyani, 2010), and poor and unreliable public transport (UN-HABITAT, 2014). I therefore argue that richer results of exclusion could be obtained if the definition of transport exclusion in the context of these sub-Saharan African cities incorporated these conditions.

The foregoing revelations present a need to extend the scope of transport exclusion to incorporate the conditions that cause exclusion in sub-Saharan African cities. Policy efforts that aim to address transport exclusion in these cities must ideally address these factors. The next section now puts Kisumu into the context of this transport exclusion by presenting its transport situation and policy environment.

6.3 Putting transport-related social exclusion in Kisumu into perspective

Although inadequate access to transport services is an important dimension of poverty (Kim & Dumitrescu, 2011), little research attention has gone into the transport disadvantage that faces the poor of Kisumu. Instead, efforts to tackle poverty in the city have focused on improving the delivery of socio-economic opportunities such as employment, housing, water, and education (e.g. Nodalis Conseil, 2014). Meanwhile, studies of cities of comparable socio-economic conditions reveal that the poor spend as much as 25% of their disposable incomes on meeting recurrent transport costs, partly due to lack of affordable alternatives (Kim & Dumitrescu, 2011; Odero et al., 2009). Furthermore, they make fewer trips yet they spend more time travelling and are the most predisposed to road-crashes when compared to their high income counterparts (de-Langen

& Tembele, 2001; Kim & Dumitrescu, 2011). In Kisumu, these challenges are compounded by poor road conditions, which cut off most of the city's slum and peri-urban settlements from public transport service.[38] This association between the road conditions and the exclusion of cyclists is discussed in chapter 4.

Utility cycling among the poor of Kisumu is thus a pragmatic response to unemployment and inadequate access to faster and affordable alternatives to walking. Although the poor are the predominant bicycle users, other income groups also cycle, either privately or using bicycle taxis (Kola et al., 2012). The modal share of cycling is estimated at 16% (Makajuma, 2006). It is thought that the recent emergence of motorcycle taxis has caused a general decrease in this modal share because it is mostly the former bicycle taxi riders that have switched to operating motorcycles.[39] However, a new pattern characterised by a rise in the number of private cyclists has also emerged as some travellers who relied on bicycle taxis resort to using their own bicycles.[40] Generally, motorcycles are even more expensive than public transport which is equally expensive for a majority of the poor. Despite this undying significance of cycling in Kisumu, the city authority has failed to support cycling in terms of infrastructure and traffic regulations. This failure occasions not only its exclusion from the streets but also the social exclusion of its riders, passengers, and operators.

The recent formulation of the Kenya Vision 2030 and the Integrated National Transport Policy (INTP) presents an opportunity for interrogating government commitment to inclusive transport that addresses the foregoing disadvantage that faces cycling in Kisumu. As already pointed out in the methodology chapter, these two policy documents are selected for analysis because they contain the overriding principles and targets of local urban transport and economic development. Although they are formulated at the national level, the structure of the Kenyan government (Government of Kenya, 2010a) requires that their provisions are implemented at the local urban level. This structure gives the national government an upper hand in formulating policies in situations where there are overlapping jurisdictions (see Government of Kenya, 2010a, Section 191; Fourth schedule). Urban transport is one of the sectors where the jurisdiction of these two levels of government currently overlap (see Government of Kenya, 2010a, Fourth Schedule; Kenya Roads Act No. 2, 2007, Section C). Furthermore, Kisumu has been selected as a priority city under the Kenya Vision 2030 plan (Government of Kenya, 2007). To this end, the city has prepared an Integrated Strategic Urban Development plan, which provokes an interest in finding out how concerns of transport inclusion are addressed at the local level.

The Kenya Vision 2030 is an economic development blueprint that aims to turn Kenya into a middle-income country by the year 2030 (Government of Kenya, 2007). It was launched in 2008. The document envisages sustained economic growth, social justice, and political accountability as the basis for realising its vision. It provides a long-range vision for these sectors and proposes to achieve their specific targets by implementing priority projects that it identifies within a successive five-year medium-term planning framework.

Relevant to the current chapter is the recognition of the role of transport infrastructure in accelerating business and improving livelihoods. In this regard, the government seeks to develop and maintain a safe, integrated, and efficient transport network as its transport vision (Government of Kenya, 2007). In order to realise this vision, the document prioritises the development of Bus Rapid Transport and the light railway system in Nairobi and later in other priority cities like Kisumu

[38] *Field interview with County Chief Officer in charge of transport, 27.08.2015*

[39] *Field interview with practising NMT expert, 20.08.2015*

[40] *ibid.*

(Government of Kenya, 2007). The vision also targets to develop an Integrated National Transport Master Plan to guide infrastructure development across all Kenyan cities, including Kisumu. Curiously though, the Kenya Vision 2030 plan does not acknowledge the Integrated National Transport Policy, which was prepared two years before the Vision was initiated. The launch of the policy in 2009 after undergoing some amendments to align it to the Kenya Vision 2030 plan should therefore not be confused for its date of formulation. The contradiction presented by this failure to acknowledge existing policy provisions raises curiosity about the consistency between the two documents and the implications of this consistency for inclusive transport planning. This issue is explored further in section 7.

6.4 Methods

The study begins by a theoretical analysis to enable it build a framework for employing social inclusion in problematizing transport disadvantage in the context of sub-Saharan African cities. This is followed by a qualitative content analysis of the Kenya Vision 2030 plan and the transport policy to identify the extent to which the thematic concerns generated from the theoretical analysis are tackled by the extant policies. Where possible, the study refers to the transport proposals of Kisumu Integrated Strategic Urban Development plan (ISUD)[41] to demonstrate the situation in Kisumu. This content analysis is sparingly supported by results of field observations and qualitative analysis of interviews held with relevant government officials and transport experts.

6.4.1 Data

The main data used in the analysis is the content of Kenya Vision 2030, Integrated National Transport Policy and Kisumu Integrated Strategic Urban Development plan. Copies of these documents were obtained from Kisumu County Government. To supplement this data, the study held semi-structured interviews with the chief officer in charge of transport at Kisumu County Government and one Non-Motorised Transport expert. These respondents were purposively selected because of the rich information they possessed on the subject matter of investigation by virtue of their official responsibilities and experience in transport in general and cycling in particular (Singh, 2006). The interviews were held in August 2015, with the main theme being the opportunities and challenges that faced cycling and its users under the present planning framework in Kisumu and the on-going policy reforms. An interview schedule that was tailored along the emerging issues enumerated in section 6.5 was prepared to guide these interviews.

Field observations were made on an on-going basis to get a grasp of the challenges that faced cycling on the streets and to cross-check the findings from the interviews.

6.4.2 Analysis

The theoretical analysis presented in section 6.5 generated 5 main themes that formed the categories that were used in the subsequent analyses in section 6.6. These themes centred on problematizing transport disadvantage in general, contextualising exclusion, visibility of exclusion, conception of spaces of exclusion, and response to the ideals of inclusion. The content analysis is organised according to these themes that enabled me to formulate my preconceptions and pre-knowledge (Mayring, 2014) of what inclusive policies and processes should entail. The content of the Kenya Vision 2030 plan and the transport policy documents were then analysed to find out the

[41] *The ISUD is the strategic plan that guides the development of the city for the period 2013 to 2030.*

extent to which they tackled these thematic concerns and the opportunity they availed for cycling inclusion. According to Mayring (2014), a content analysis is not a standardised instrument; it should rather be flexible enough to suit the material in question and issues at hand. The content-related arguments take preference over procedural arguments because validity is regarded more highly than reliability (Mayring, 2014). Table 6-1 (Miles & Huberman, 1994) presents a summary how the three policy documents have tackled the thematic concerns raised.

6.5 Linking social inclusion to transport discourse

6.5.1 Problematizing transport exclusion through social inclusion

Social inclusion is increasingly presented to be a basic condition for achieving sustainable urban transport (Khayesi et al., 2010; Lucas, 2012; World Bank, 2013). Although it is conceptually differentiated from social exclusion (Labonte, 2004), it arguably offers a basis for problematizing the plight of individuals and groups that are excluded by transport systems (Church et al., 2000; Lucas & Musso, 2014). This opportunity is presented by its conception as both a means to ending social exclusion and concurrently an end to be pursued in its own right. The central aim of social inclusion is to strengthen the participation of excluded individuals and groups in social processes by improving their ability and dignity as well as the opportunities available for them to participate (World Bank, 2013).

The foregoing conception projects social inclusion as the central target of efforts that aim to achieve the tenets of the social quality theory and the right to the city. In fact, the very emergence of the concept of social inclusion is itself a response to the challenges of social exclusion and by extension the restrictions that this exclusion places on the right to the city (Allman, 2013; Harvey, 2012; Labonte, 2004). Specifically, its growing use is motivated by the need to reduce the relative disadvantages that face individuals or groups because of their weaker social statuses, that limit their ability to participate in normal social activities (Sen, 2000). These disadvantages have been argued to limit their enjoyment of the right to the city (Harvey, 2003, 2012).

Despite the potential of social inclusion in problematizing transport disadvantage, it has received little research attention, particularly in in medium-sized sub-Saharan Africa cities (Lucas, 2011). It seems that transport exclusion itself is still not very clearly understood in these cities. In this chapter, I therefore operationalise normal social activities to refer to participation in mobility and accessibility by all modes of transport. I use this understanding to interrogate how Kenya's development blueprint and transport policy problematize the transport challenge in general and the extent to which this problematization accommodates cyclists.

6.5.2 The context of exclusion matters

The fundamentals of social quality theory and the right to the city concept converge at the view that social inclusion forms the common denominator that is necessary to support participation in social processes. This is especially so if one considers that social inclusion outlines the terms and nature of this participation that underpins the achievement of the tenets of the theory and the concept. In the case of the social quality theory, social inclusion is directly identified as a precondition that enables individuals to be part of the society (van der Maesen & Walker, 2012). Similarly, the right to the city concept also argues for social inclusion, not only in appropriating existing resources but also in determining how these resources are produced (Marcuse, 2009).

But facilitating social inclusion requires unambiguous understanding of who the excluded are and the factors that exclude them. Existing literature on social exclusion has thus far narrowly limited the scope of disadvantage that defines exclusion and the excluded individuals and groups to the contexts of the challenges that face countries from where this literature emanates. These include mainly countries of Europe, Asia and to some extent Australia and the USA. Consequently, income status, race, gender, sexual orientation, ethnicity, religion, physical disability status, and caste dominate as the basis for defining exclusion (e.g. Øyen, 1997; Sen, 2000; World Bank, 2013). These forms of exclusion are typical in the context of these countries and are by no means exhaustive, more so with regard to the transport disadvantage in sub-Saharan African cities. A more realistic investigation of exclusion in sub-Saharan African cities must hence begin by recognising this context-specificity of the phenomenon (Silver, 2007).

The foregoing unruly nature of social exclusion demands that the phenomenon is conceptualised to reflect its context-specific drivers and forms in sub-Saharan African cities if it is to be useful in understanding transport disadvantage in these cities. At the same time, while some of the dimensions of exclusion used in existing literature resonate with exclusion in the context of sub-Saharan African cities, these dimensions must be adapted to reflect the unique circumstances in these cities. For instance, although cyclists in many sub-Saharan African cities are predominantly the poor (Pochet & Cusset, 1999; UN-HABITAT, 2004), indirectly addressing their transport disadvantage through poverty is not likely to yield their inclusion. This is because their exclusion has more to do with street spaces, which hardly cater for cycling and less to do with their poverty status. Poverty in this case only adds to their invisibility during the functional allocation of street spaces but does not in itself trigger their exclusion from the streets. Indeed, research shows that not all cyclists are necessarily poor (Bechstein, 2010; Nkurunziza, Zuidgeest, & van Maarseveen, 2012; Salon & Aligula, 2012). This example demonstrates the ease of blurring the real drivers of exclusion when its conception gives undue prominence to the socio-economic statuses of the excluded. Useful insights into different dimensions of transport exclusion could be obtained by shifting attention to the planning processes, products and outcomes that occasion exclusion (Cameron, 2006; Schwanen et al., 2015).

This chapter therefore makes a direct conception of the exclusion of cyclists for what it is – exclusion from the streets. I employ this conception to focus the problematization of the transport disadvantage discussed in the previous section to cycling concerns in Kenya in particular. I interrogate the extent to which current policies enable the disadvantage that faces cyclists to be identified and the extent to which these policies facilitate cyclists to participate in mobility and to influence the allocation of street spaces through their active travel behaviour.

6.5.3 Unrelenting exclusion amid 'progress' in transport

Within transport research, the use of social inclusion has been inspired by transport-related marginalisation that persists despite the progress witnessed in transport service and infrastructure development (Jones & Lucas, 2012; Kenyon et al., 2002). This progress is evidenced by road expansion, improvements in public transport, and a concurrent rapid growth in motorisation (Gwilliam, 2003; WHO, 2015). While these developments are desirable to the extent that they enable goods, services and people to reach destinations, their benefits are evidently skewed against non-motorised modes such as cycling because the planning strategies that generate them are not sensitive to the needs of non-motorised modes (Gwilliam, 2003; WHO, 2015). These auto-oriented strategies not only make it hard and unsafe for non-motorised modes to access cities (Gwilliam, 2003; WHO, 2015); they also lead to increased number of accidents that disproportionately affect non-motorised modes (WHO, 2015). These disadvantages ultimately

lead to reduced accessibility to opportunities such as jobs, education and health services for those who cannot afford motorised modes (Diaz Olvera, Didier, Pochet, & Maidadi, 2012; Salon & Gulyani, 2010). The appropriateness and effectiveness of these auto-oriented transport planning strategies to generate positive social impacts for low income groups remains doubtful (Grieco, Ndulo, Bryceson, Porter, & McCray, 2009; Lucas, 2011; McCray, 2004).

The result of this mismatch between progress in transport conditions on the one hand and its outcomes for non-motorised modes on the other draws particular attention to cycling in medium-sized sub-Saharan African cities. While cycling commands a significant modal share in most of these cities (Howe, n.d.; Quarshie, 2004; UN-HABITAT, 2010), the modernist planning regime that is prevalent throughout the region oddly stifles its use by failing to recognise it and to cater for its infrastructure needs alongside those of motorised modes (Asingo & Mitullah, 2007; Steyn, 2012). This failure exposes cycling to unsafe competition with motorised modes over street spaces that are designed to facilitate motorised transport (Kim & Dumitrescu, 2011; Odero et al., 2009; UN-HABITAT, 2004). It is not surprising therefore that cyclists accounted for about 9.1% of the fatalities reported in Kenya between 1994 - 2008, making it the third most dangerous mode after driving and walking (Ministry of Transport, 2009, cited in Odero et al., 2009). In Kisumu specifically, cycling further faces active government ban (Alal, 2014) although it remains one of the most popular travel modes in the city (Makajuma, 2006). These disadvantages meted on cycling intensify the exclusion of the poor majority who use the mode for commuting, intra-urban connection and as a tool for income generation by operating bicycle taxis (Howe, n.d.; UN-HABITAT, 2004).

Transport exclusion however restricts not only the physical access to opportunities; it also directly stifles efforts to bridge social inequality gap in many sub-Saharan African cities. It is estimated that as many as 50% of the inhabitants of some of the cities live below the poverty line and can afford neither private cars nor public transport (UN-HABITAT, 2014). In the case of Kisumu, the failure to provide for cycling not only generates the physical exclusion of its users; it also excludes bicycle taxi operators from their source of livelihood. As mentioned earlier, this failure also strains household budgets by locking large proportions of their incomes to transport expenditure.

This current chapter therefore questions the extent to which the extant policies make this exclusion visible and the opportunities that such visibility offers for cycling inclusion.

6.5.4 In search of inclusion in excluded spaces and processes

Urban streets have historically been the object of the struggle for the right to the city for modes other than the car (e.g. Attoh, 2012; Furness, 2010; Murthy, 2011). This struggle is shaped by transport exclusion that results from growing motorisation that is reinforced by state planners' conception of street spaces as corridors of motorised traffic rather than spaces of multi-modal use (Banister, 2002; Murthy, 2011). The neoliberal agenda (Harvey, 2012) and the modernist approach to transport planning (Hobson, 1999) are at the centre in propagating this exclusion. On the one hand, this neoliberal agenda is responsible for commodifying urban spaces (Harvey, 1982, 2012), thus reducing the functional allocation of street spaces to various modes to a mere exercise of maximising economic value rather than the use value of street spaces. On the other hand, the modernist planning agenda devalues non-motorised modes by prioritising automobiles in its pursuit for 'modernity' (Furness, 2010). The resulting exclusion of non-motorised modes takes many forms. Key among these are outright stigmatisation of the modes (Furness, 2010; Salon & Aligula, 2012) and a blatant failure to allocate street spaces that support their use (Furness, 2010).

Cycling inclusion remains a difficult target under this modernist planning regime. This is because its ensuing negative social representation (Khayesi et al., 2010; Pochet & Cusset, 1999) prohibits transport planning in its current form from allocating street spaces that can facilitate its use. At the same time, cycling stands no chance for inclusion in commodified spaces because it generates no economic return that is readily quantifiable using the current transport evaluation tools such as the Cost-Benefit Analysis (Jones, H. et al., 2013). It is therefore relevant to explore the extent to which policy efforts that aim to include cycling can centre their ideals on the active travel behaviour of cyclists in terms of their mode choices, route choices and the attendant challenges. Moreover, it is also relevant to explore the extent to which such policies can consolidate the right of cyclists to produce street spaces as they already do, albeit without the recognition of the State. In this connection, the current chapter questions how spaces of exclusion are produced by the policies and explores the challenges and opportunities availed by these policies for cycling inclusion.

6.5.5 Ideals of inclusion

Addressing the limitations imposed on cycling by the planning agenda discussed in the previous section requires clarity on the ideals that social inclusion strives for. It has been suggested that social inclusion must try to achieve and safeguard ability, dignity and opportunity as its basic ideals (World Bank, 2013). Ability in its broader sense is recognised as an innate quality (Fodor, 1975) that must nonetheless be socially mediated (Prinz, 2005). In this context, I present the existing cycling culture in Kisumu as an innate quality that requires deliberate planning support in order to enable it play an effective role in mobility and household incomes. Dignity on the other hand concerns respect and recognition with which cyclists are treated in policy and practice. Low dignity attached to cycling by State planners renders the mode invisible in official statistics and consequently unattended to both in terms of policy and of infrastructure provision (Khayesi et al., 2010). Lastly, inclusionary efforts must also aim to enhance the opportunities for cycling by reducing the physical barriers to cycling. These barriers are occasioned by a lack of supportive infrastructure and traffic conditions (Alando, Brussel, Zuidgeest, & Durgi, 2013). In this chapter, I explore the difficulties that cyclists are exposed to by the failure to provide infrastructure and traffic conditions that support cycling. These ideals form a basis for assessing the policies for the opportunities that they avail for cycling inclusion.

This section interweaved the connection between social inclusion and transport disadvantage in an effort to construct a frame for assessing the extent to which the Kenya Vision 2030 plan and the transport policy are inclusive. The next section now dialogues the two policies to find the extent of their convergence on inclusion and the implications of this convergence for cycling inclusion.

6.6 Dialoguing the Kenya Vision 2030 and the Integrated National Transport Policy: implications for inclusion

This section carries out a qualitative content analysis of the policy pronouncements contained in the Kenya Vision 2030 plan and transport policy to find out the opportunities they hold for cycling inclusion in Kisumu. The content analysis is guided by the categories identified in section 6.5. Accordingly, the policy documents were analysed to find out how the messages they contained had tackled the thematic concerns that were raised in that section (Mayring, 2014). Table 6-1 summarises the findings. Where possible, the study refers to Kisumu Integrated Strategic Urban Development plan to demonstrate its points.

Table 6-1: The extent to which policy and practice have tackled key thematic concerns of inclusion

Concern	*Kenya Vision 2030*	*Integrated National Transport Policy*
Problematizing transport disadvantage	• Hindrance to mobility and economic participation • Modernist objectives • Overall road crashes and pollution • Traffic congestion • High cost of transport	• Hindrance to accessibility • Inadequate transport integration • No vision for transport sector • Poor quality transport services
Contextualising transport exclusion	• Regional disparity in road network coverage	• Inappropriate modal split • Transport unaffordability • Planning biased against NMT • Lack of infrastructure provision for NMT
Visibility of exclusion	• No mention of NMT even in delegated form • Only excluded regions in the country are recognised	• Explicit acknowledgement of bias against NMT modes in general
Production of spaces of exclusion	• Capital infrastructure projects	• Integrated transport
Response to the ideals of inclusion	• Focused on priority projects (capital projects) • Road is synonymous with space for cars • Benchmarking with international 'best practices' • Pursuit of aesthetics in infrastructure design	• Need for integrated transport including NMTs is recognised

6.6.1 Problematizing transport disadvantage

The two policy documents agree on the existence of transport disadvantage that impedes different mode users from full participation in transport activities. However, the manner in which this disadvantage is problematized differs between the two documents.

First, the Kenya Vision 2030 perceives this disadvantage in terms of the hindrance it places on mobility, participation in national economy and the international competitiveness of the country. Thus, transport disadvantage is problematized in terms of the need to improve transport infrastructure in order to '*facilitate firms and citizens in their wealth-creation efforts' (p.17)*. Attendant to this is the need to reduce traffic congestion, high cost of transport, road crashes and pollution, all of which are focused on improving the conditions for motorised modes. At the same time, there is a visible pressure to develop transport infrastructure facilities that are among other things 'aesthetically appealing' in order to '*to provide cost-effective world-class infrastructure facilities and services in support of the Vision' (p.17)*. This confirms the pressure of modernisation (Steyn, 2012) that limits transport strategies from being realistic to the practical challenges that face sub-Saharan African cities. While it is expected for a national policy document like the Kenya Vision 2030 plan to develop targets like these, *inadequate room allowed for policies other than* [the provisions of] *the* Kenya Vision 2030 [plan] *to influence development at the local level*[42] raises doubts about the ease of recognising the challenge that faces cycling under this arrangement.

On the other hand, the Integrated National Transport Policy demonstrates an integrated approach in the way it problematizes transport disadvantage. Specifically, it identifies poor quality transport services, lack of a vision for the transport sector, which particularly disadvantages non-motorised modes (p.46), and inadequate transport integration. The policy acknowledges that these challenges impede accessibility for non-motorised modes like cyclists just like they do for motorised modes. A clear opportunity to problematize the challenge that face cycling is therefore availed by

[42] *Field interview with Practising NMT expert, 20.08.2015*

this policy. However, this problematization is not likely to lead to the prioritisation of cycling issues in Kenya in general and Kisumu in particular unless the Kenya Vision 2030 plan is reoriented to give room for other policies to influence development priorities at the local level. This can be achieved through the five-year-medium-term-planning framework that is provided for under the Kenya Vision 2030 plan (Government of Kenya, 2007). Steyn (2012) has shown the need to reconcile such conflicting forces in order to allow the inclusion of the excluded urban citizens.

6.6.2 Contextualising transport exclusion

The theoretical analysis presented in section 6.5 demonstrated that exclusion meant different things in different contexts and that there was a need to understand this exclusion in transport terms in order to tackle it. There is a mix of social concerns that are raised by the two policies and which can form a basis for cycling inclusion. However, these concerns are scattered and sometimes not even directly related to transport.

The most prominent transport exclusion concern that emerges from the Kenya Vision 2030 plan is presented in terms of regional disparities in road network coverage. Accordingly, the policy seeks to '*implement infrastructure projects that will stimulate demand in hitherto neglected areas targeting increased connectivity and reduced transport and other infrastructure costs*' (p.19). This prioritisation of transport strategies at the regional scale does not however elicit the inclusion cycling because of practicality of using the mode over such long distances. The strategy is thus in every practical sense for motorised transport. It is instructive that the neglected regions mentioned in the policy document are the Arid and Semi-Arid areas of the country and not the neglected slum areas of it cities, most of which equally need a deliberate transport strategy. Salon and Gulyani (2010) for instance demonstrate that most of the urban poor who can hardly afford the cost of transport reside in these settlements.

The social pillar of the Kenya Vision 2030 presents an opportunity through which the inclusion of disadvantaged modes could be contextualised in secondary cities like Kisumu. Specifically, the pillar seeks to implement policies '*that minimise the differences in income opportunities and access to social services' (p.196)*. This target identifies urban slums and pockets of extreme poverty as some of the areas that need this attention. The policy intention fits the situation in Kisumu where cycling is not only a mode for accessing destinations, but also a tool for income generation. However, the policy does not recognise the central part played by transport in income generation and enabling access. The opportunity presented by the policy for the inclusion of cycling is thus lost since the policy prioritises improved education, health, water, and sanitation, among other human resource investments as its strategies (p.198). Moreover, although transport is a major component of household expenditure (Kim & Dumitrescu, 2011), the policy does not address this connection in its bid to 'create a socially just and equitable society without extreme poverty' (p.199).

The INTP on the other hand contextualises the transport disadvantage that faces cycling in a more direct way that can elicit attention to this disadvantage. It identifies inappropriate modal split, transport unaffordability, bias against non-motorised modes by planners and lack of infrastructure provision for non-motorised modes. While these disadvantages resonate with the cycling situation in Kisumu, they are not likely to be addressed as long as they remain separated from the priorities of the Kenya Vision 2030 plan[43]. According to the experts, lack of priority to cycling by the Kenya Vision 2030 plan has been a hindrance to acknowledging the need to cater for cycling in terms of infrastructure and traffic regulations. It should be pointed out that the projects identified under the

[43] *Field interview with Practising NMT expert, 20.08.2015 & County Chief Officer in charge of transport, 27.08.2015*

framework of the Kenya Vision 2030 plan have taken precedence over most other projects when it comes to government funding and support. A possible strategy to deal with this lack of harmony between the Kenya Vision 2030 plan and the cycling priorities would be to acknowledge the social aspect of transport in the social pillar of the Kenya Vision 2030 plan. This would ingrain exclusion issues in the transport sector to the social pillar so that they get prioritised in government plans.

6.6.3 Visibility of exclusion

This analysis sought to understand the extent to which the two policies made the exclusion of cyclists visible and the opportunities that such visibility offered for cycling inclusion. Differences were found between the two policies.

To begin with, the Kenya Vision 2030 plan does not refer to non-motorised modes, whether in terms of acknowledging their problems or putting strategies to deal with the challenges they face. This lack of mention makes the mode completely invisible from any intervention that is initiated by the policy. The only closest mention of exclusion relates to excluded regions and slum settlements. However, as already discussed before, these areas are not mentioned for transport interventions. The implication of this invisibility of cycling concerns from the Kenya Vision 2030 plan is that the mode will continue to face exclusion for as long as the current arrangement that prioritises the projects identified under the framework of the Kenya Vision 2030 sustains.

In contrast, the Integrated National Transport Policy demonstrates a clear articulation of cycling concerns. These have already been discussed earlier. However, it is notable that the policy explicitly acknowledges the bias against non-motorised modes in general. The policy acknowledges that public transport in urban areas remains unaffordable to many members of working households despite the country's elaborate road network (p.45). The policy acknowledges that transport development in Kenya in general has focused its attention on roads for motorised transport, which is only accessible to a small minority as the majority remain poor. What is interesting is that despite this knowledge of this phenomenon that is arguably a case of social exclusion, non-motorised modes in general are not recognised in law to qualify them for government funding and other forms of support (Government of Kenya, 2009). This lack of recognition leads compromised safety as the modes have to share road-spaces that are designed for motorised transport.

The articulation of the challenge that faces non-motorised modes described above brings out the social component of transport disadvantage. This is particularly so with regard to how it impacts on the transport cost for the poor, excludes them from the street spaces, and makes it unsafe for the poor to use the streets. Packaging the solution to this challenge as a social inclusion agenda would arguably afford non-motorised modes in general and cycling in particular the visibility they require for the government to facilitate their use. It should be pointed out that the social pillar of the Kenya Vision 2030 plan already tackles such social concerns although it is not explicitly linked to transport disadvantage. This makes this form of transport disadvantage invisible. The social concerns raised by the Integrated National Transport Policy should hence be packaged as social inclusion concerns and be linked with the social pillar of the Kenya Vision 2030 plan to afford them the necessary government attention. Doing this can lead to the prioritisation of cycling in Kisumu, which is hardly recognised or even catered for despite its active use by a poor majority.

6.6.4 Production of spaces of exclusion

Differences in the conception of the transport disadvantage presented in the previous sections elicit different infrastructure and traffic interventions. While the Integrated National Transport Policy advocates for integrated transport that includes streets that cater for cycling, the Kenya Vision 2030 plan on the other hand focuses on capital infrastructure projects in its effort to address the transport disadvantage that it identifies. As mentioned already though, the Kenya Vision 2030 plan is prioritised in determining not only the planning but also the execution of transport infrastructure projects. This prioritisation leads to the production of spaces that exclude cycling. According to the planning authorities, '… *accommodating pedal cycling [on the road] remains a challenge due to limited funds, lack of policy priority, and the emergence of motorcycles [which attracts more political attention] even though we understand its role in enabling the poor to move*'.[44]

Kisumu is currently implementing key transport infrastructure projects that are intended to improve its linkage with the neighbouring cities of Kakamega, Busia, and other cities along the Kisumu-Nairobi transport corridor. These projects are implemented within the framework of the flagship projects of the Kenya Vision 2030 plan and are largely driven by pursuit of economic goals rather than social ones[45]. It is notable that while the roads affected by these projects double as urban roads within the city boundaries, no clear provision has been made to accommodate cycling on their urban segments. This, despite the significance of cycling in terms of employment for bicycle taxi operators and as an alternative mode of transport, particularly among the low-income earners of the city (Oballa, Mwaura, & Stellmach, 2012). Instead, the car-oriented street design has now cut off access, thereby preventing cyclists from turning at some important junctions in the city. This makes it riskier to cycle on these roads and casts doubts on whether the projects have cyclists in mind in their quest to increase safety, connectivity and accessibility.

The foregoing production of street spaces that exclude cyclists is not improved by Kisumu Integrated Strategic Urban Development plan either. Instead the plan borrows heavily from the Kenya Vision 2030 plan and is therefore a continuation of its desire for capital infrastructure projects. Cycling concerns do not receive any attention beyond the recognition of the role of cycling in enabling accessibility and the need to provide for it in terms of infrastructure and traffic conditions (Nodalis Conseil, 2014, p.36). This is curious because the plan should offer concrete strategies on how to include the mode to enable it play the roles that the plan acknowledges. Instead, the plan only duplicates the capital projects proposed for Nairobi under the Kenya Vision 2030 plan without much regard to the unique cycling culture of Kisumu.

While it would have been expected that this Integrated Strategic Urban Development plan would contextualise the Kenya Vision 2030 plan and tackle the unique local level planning challenges and opportunities, it fails to do so. The plan does not offer any concrete proposals on how to progressively include cycling on the street spaces of Kisumu; it instead evadingly recommends that the present modal mix should be organised by providing dedicated lanes and stops and waiting areas (p.36). In view of this insecure treatment of cycling concerns, I argue in this chapter that presenting these concerns as challenges of social exclusion could generate the urgency needed to integrate the concerns into future infrastructure developments projects. This integration might occasion the production of more inclusive street spaces. Doing this would pre-empt the difficulty of doing so once this opportunity is lost as a result of the expansion of the city and the development of auto-oriented streets that take up all spaces that could possibly accommodate cyclists.

[44] *Field interview with County Chief Officer in charge of transport, 27.08.2015*
[45] *ibid.*

Responding to the infrastructure and traffic needs of the bicycle is complicated by the use of the term 'non-motorised' modes to refer to cycling and walking, and indeed sometimes even more modes. Whereas the Kenya Vision 2030 plan fails to recognise the role of non-motorised transport, the acknowledgment of this role by the Integrated National Transport Policy requires enhanced clarity to allow its operationalisation. In Kisumu, the use of the term '*boda boda*' by planners to refer to both pedal bicycles and commercial motorcycles diminishes the possibility of producing street spaces that include cyclists even further. This lack of clarity about the exact meaning of 'non-motorised modes' and '*boda boda*' in the context of Kisumu has engendered ambiguity with regard to the few non-motorised lanes that have been provided on the Kisumu-Busia and Kisumu-Nairobi roads under the on-going roads projects. It remains unclear who the intended users of these spaces are. Field observation reveals that these lanes have been claimed by cyclists, pedestrians, hawkers, and motorcyclists, thereby making all of them vulnerable to accidents just like they would be if the lanes did not exist. There is therefore a need to operationalise these terminologies to clear the current ambiguities that emerge from their use. Moreover, it also emerges that the production of streets that include cycling cannot be tackled in isolation of these other modes and activities that claim the same spaces as the bicycle. Addressing these concerns is however beyond the scope of the current chapter.

6.6.5 Response to the ideals of inclusion

The theoretical analysis revealed the need to mediate cycling to address its concerns. Whereas the Kenya Vision 2030 plan responds to the projected growth in travel demand through capital infrastructure projects, the recognition of modes other than motorised by the Integrated National Transport Policy presents an opportunity for mediating cyclists to meet their travel demand using the bicycles. However, practicalizing this recognition remains a challenge due to the current influence of the Kenya Vision 2030 plan, which is oriented towards stimulating economic growth rather than social inclusion. Because of this inclination, the Kenya Vision 2030 plan looks at inclusion indirectly as a means to enabling participation in the economy, rather than directly as an end in itself. Moreover, the kind of participation it envisages is by motorised modes, rather than non-motorised ones like cycling. Again, the focus of the Kenya Vision 2030 plan on benchmarking its transport infrastructure standards with international best practices and developing infrastructure that is aesthetically appealing in design (p.38) are clearly informed by the need to facilitate motorisation rather than cycling and other forms of non-motorised modes. It therefore remains doubtful if cycling in Kisumu and other Kenyan cities can be mediated by the current arrangement where projects initiated under the Kenya Vision 2030 plan supersede all other projects.

The above challenge is worsened by Kisumu Integrated Strategic Urban Development plan. This plan proposes the expansion of existing roads and the creation of more roads to create room for the projected growth in motorised transport in the city. Clearly, the accessibility concerns of cyclists will continue to remain secondary unless this planning approach is reoriented to enable cycling. '*… [so far] cycling lanes are only considered in areas where road corridors [reserves] can accommodate it… often what remains after motorised transport has been catered for'*[46]. This attitude not only diminishes the importance of cycling; it also leads to an incoherent cycling network that does not encourage cycling (Kuijper & Braakman, 2009). There is clearly a need to demystify the inferior social construction of cycling that occasions this diminished attention to it, and to design the roads to allow safe multiple-modal use. [47]

[46] *Field interview with Practising NMT expert, 20.08.2015*
[47] *ibid.*

The Integrated Strategic Urban Development plan evidently renders the growth of the city car-dependent, as can be seen in the proposals to decentralise the city to outlying areas in the outskirts of the current city centre (Nodalis Conseil, 2014). The proposed relocation of public transport termini to these new nodes will certainly lead to growth in the use of private cars as these nodes are far from the city centre where most daily services such as government, banking, and social services are located. All these proposals come at a time when the city has not exhausted the space it has close to the city centre. It is curious that no provision is made to accommodate the infrastructure and traffic needs that will arise due to the use of the bicycle to connect these nodes. These proposed changes in land-use structure, in addition to the natural triggers of travel demand, will necessitate the use of different modes by travellers of different socio-economic groups. There will be a need to revise the priorities of the Kenya Vision 2030 plan through the five-year medium-term-plans to accommodate emerging issues that the preparation of the Vision never contemplated[48].

6.7 Chapter summary and conclusion

This chapter has explored the use of social inclusion as a frame for cycling-inclusive transport planning in Kisumu. Basing its arguments on social quality theory and the right to the city concept, the chapter developed key criteria upon which it assessed the Kenya Vision 2030 and the Integrated National Transport Plan for the extent to which their pronouncements were inclusive of cycling and its concerns. The aim was to identify the gaps that the policies presented as well as the opportunities that they availed for making social inclusion an imperative of transport policy. The chapter shows that both the Kenya Vision 2030 and the Integrated National Transport Policy hold some potential for fronting the need for cycling-inclusive streets through social inclusion. While the Kenya Vision 2030 holds the power to influence action at the local city level, it is nonetheless weak when it comes to directly advocating for inclusive transport. On the other hand, the Integrated National Transport Policy identifies challenges that can be packaged as social inclusion concerns. However, it is overpowered by the Kenya Vision 2030 in terms of influencing action at the city level. These dissenting strengths of the two policy documents are not likely to generate the inclusion of cyclists unless they are harmonised. This chapter seizes the opportunity presented by the social nature of the exclusion facing cycling to present social inclusion as a frame for reconciling these contrasting strengths and to articulate the need for cycling-inclusive transport planning. Facilitating cyclists through their social inclusion is argued in this chapter to be a way of not only enabling them to participate in the mobility in ways that they can afford but also a way of recognising that they have a right to access the city by bicycles. Thus achieving social inclusion should form the basis of eliminating the barriers to accessibility as contemplated in Section 2.5.

This chapter makes a number of key policy recommendations that it hopes can consolidate its findings at policy formulation and policy implementation levels.

To begin with, there is a need to harmonise the two policies in order to build on their synergies. In this regard, it is relevant to directly identify transport-related social exclusion as a social concern and make it one of the priority concerns of the social pillar of the Kenya Vision 2030 plan. This would accord it equal priority with other Vision 2030 projects. There will be need for such harmonised policies to emphasise inclusion as a goal in itself rather than a means to participation in the economy. This is because the opportunity for cycling inclusion would be lost if inclusion is

[48] *Field interview with Practising NMT expert, 20.08.2015*

presented merely as a means to participating in economic pursuits. These recommendations are relevant at policy formulation level and would call upon the national government to implement.

It is also relevant that the harmonisation of these two policies recognises that the use of bicycles on street spaces is a right that ought to be protected by the State. These street spaces however have multiple claims. Policies that seek to include cycling must as such link with land-use and other transport strategies to ensure that efforts to include cycling are not thwarted by such multiple claims. This chapter also recommends that the use of social inclusion in advancing the cycling-inclusive policies should consider the context-specific factors that exclude cyclists, such as street spaces and the processes of allocating these street spaces. These factors should be used hand in hand with the socio-geographic indicators that have been used traditionally to study social exclusion. These set of recommendations would call upon both the national government as well as Kisumu County Government to implement given that they concern both policy formulation and implementation. This chapter also recognises the role of local cyclists, bicycle taxi operators, bicycle advocates in ensuring that recommendations relating to the right to access the city is recognised and upheld by the city authority.

This chapter, together with the previous two have presented empirical evidence on transport-related social exclusion in Kisumu. A synthesis of this evidence is now presented in the next chapter. The aim is to find out what this evidence means for problematizing lack of attention to cycling through social exclusion.

7 Summary, conclusions, and recommendations

Chapter summary

The previous three chapters have analysed evidence about the dimensions of transport-related social exclusion. This current chapter now assembles the key messages from these empirical findings to assess their implications for the central research question posed by the study. The chapter also reflects upon the methodology and theoretical foundation upon which the arguments of the study have been based. The aim in this case is to evaluate the relevance of these theories and methods in helping expose the challenge that faces cycling in a typical sub-Saharan African city. A conclusion is then presented that is based on these synthesis and reflections. The chapter concludes with recommendations that I believe would inform transport planning that is more inclusive of cycling. Directions for future researches are also recommended on the basis of the findings of the study and possibilities that are outside its current scope.

7.1 General summary of findings

The central objective of this dissertation has been to find out whether, and the extent to which, the concept of social exclusion could offer a complementary framework for identifying the need to support cycling in sub-Saharan African cities. The study reveals that the current tools that support transport decisions are inadequate to identify the relevance of supporting cycling in these cities. The use of tools such as Cost-Benefit Analysis and Social Impact Assessment is specifically revealed to be auto-oriented and therefore incapable of identifying the relevance of supporting cycling in their current forms. This incapability is evidenced by the continued neglect of cycling despite the application of these tools to evaluate transport decisions. In response to these limitations, the study explores if the need to support cycling could be exposed by showing that these current tools generate conditions that restrict cyclists from using streets to access socio-economic opportunities. Lack of provision for cycling, and the resultant restriction of the mode from streets, is conceived of in this dissertation as a reflection of the general social exclusion that its users face due to their assumed low socio-economic statuses.

Three key dimensions of urban transport infrastructure and service are methodologically investigated to find out if the exclusion of cycling could be exposed through them. These dimensions include *i*) the conditions of street spaces and the traffic thereupon; *ii*) the objectives of policies that relate to transport and their implications for mode choices; and *iii*) the ongoing transport policy reforms and infrastructure development. These dimensions of transport are critically examined to find the opportunities and contradictions that they avail for the inclusion of cycling. This critical examination is guided by the belief that established norms and practices should not necessarily limit other possibilities that exist outside the motorised options that are currently accommodated by transport planning in sub-Saharan African cities. In this regard, the examination exposes how these established norms and practice limit cycling. These revelations then form the basis for a dialectic engagement of the extant planning that is founded on the quest for modernity on the one hand and the need to accommodate cycling on the other. The aim of this dialectic is to open up room for exploring how social exclusion can form a basis for problematizing the challenge that faces cycling. This synthesis therefore presents the last part

of the conceptual framework that I discussed in Figure 2-2. The synthesis establishes ways through which the factors that hinder accessibility for cyclists can be identified with a view to improving them.

Findings from empirical investigations reveal three key messages that are relevant for answering the central objective of this dissertation. First, chapter 4 reveals that the conditions of street spaces disproportionately restrict cycling the most when it is compared to walking, motorcycling, and motoring. Cycling is specifically hindered the most by poor street surface conditions, narrow streets, and street intersections. These, in addition to conditions of traffic such as careless driving, volumes of pedestrians, and speeding motorised transport. Secondly, chapter 5 shows that policies that have a bearing on transport have mostly generated only subsidiary support for cycling. Although these policies seem to have supported cycling at different points, they had other objectives that did not necessarily have to do with supporting cycling *per se*. For instance, the volume of cycling increased following policies that sought to economically empower bicycle-taxis operators (UN-HABITAT, 2004) and to improve traffic safety for motorised modes (Government of Kenya, 2003b). Evidently, this growth was only an incidental one as pointed out in chapter 5. Lastly, empirical findings presented in chapter 6 reveal a mismatch between the lived transport disadvantage on the one hand and the modernist visions espoused by economic development blueprints such as the Kenya Vision 2030 plan on the other (Government of Kenya, 2007, see also Watson, 2003, 2014). The main problem here is not that these visions target to build transport infrastructure to match that which is seen to have worked elsewhere. Rather, the fact that these visions obfuscate the need to facilitate modes that are used by the poor majority is.

In the next section, I synthesise the evidence summarised above to find what it means for the central research question raised by this dissertation. The search for this meaning is guided by my belief in possibilities of mobility that extend beyond the auto-oriented dimension that is created and sustained by transport planning as it is currently practiced. This belief is consistent with the arguments of the critical urban theory (Brenner, 2009; Marcuse, 1964). In doing this synthesis, I bring the above pieces of evidence together to identify how they converge to exclude cyclists. I concurrently question the underlying planning processes and social relations that generate this exclusion. According to Brenner (2009), Iveson (2011), and Marcuse (1964), it is by questioning these processes and relations that a basis for just and inclusive cities can be established. The ultimate aim of the synthesis is to identify the opportunities that social exclusion presents for problematizing the ongoing inattention to cycling.

7.2 Implications of the findings for problematizing inattention to cycling through social exclusion

Present tools of transport evaluation are inadequate to reveal social exclusion

The revelation of a persistent failure of planning to create conditions that support cycling confirms that the present tools of evaluating transport decisions are inadequate to identify transport-related social exclusion. The pieces of evidence presented in this dissertation converge to show that cyclists continue to face multiple exclusion from transport infrastructure, service, and policy. The study shows that exclusion occurs when accessibility to destinations is restricted from the streets or when residential places where cyclists reside are cut off from the

rest of the city. The conditions that generate these restrictions are discussed in chapter 5. What remains interesting from the discussions presented in chapter 4, 5, and 6 is the persistent invisibility of the need to support cycling despite the dominant use of economic and social tools, such as Cost-Benefit Analysis and Social Impact Assessment, to support transport decisions. The capability of these tools to generate infrastructure, service and policy conditions that are realistic to the needs of cycling is therefore put to doubt. There is evidently a need to define the parameters of these tools from the point of view of cycling and other forms of non-motorised transport. These parameters include the costs, benefits, and impacts. All these disproportionately focus on motorised transport and other mega projects (Banister & Berechman, 2000; Weber, 2014). Four pertinent questions seem urgent to address in order to make these tools relevant to the needs of cycling: Whose cost? Whose benefit? Social impacts defined by whom? Social impacts caused by what? Without an explicit focus on cycling and other alternative modes to the car, these tools can only reinforce exclusion that already faces cyclists and these other non-motorised modes.

A new dimension of exclusion that results from the changing attention to cycling is also revealed in chapter 5. In this case, the empirical evidence shows that exclusion occurs due to the emergence of motorcycles, which are increasingly displacing *boda bodas* from transport service provision. This displacement occurs as *boda boda* operators 'upgrade' to motorcycling under the weight of unfavourable conditions that cycling has been subjected to over the past ten years or so. Chapter 5 mainly attributes this change to the State, which has packaged and presented motorcycling as a superior alternative to cycling. The contribution of the economic and operational efficiency of motorcycling to this change cannot be discounted though. Specifically, the fact that motorcycling is much faster and demands less physical energy to operate when compared to the *boda boda* makes it relatively more attractive. In terms of policy support, less attention is now accorded to cycling by the State because its changing use from passenger to personal transport does not attract the same political attention that it did fifteen years back. [49] I should however point out that this changing use has itself been the result of lack of access to transport service due to the decreasing number of *boda boda* operators (chapter 5). The shifting attention of the State from cycling is generated by the reasoning that cycling does not generate as high economic return for its operators as the motorcycles (Institute of Economic Affairs, 2008; Olawo et al., 2014). In this context, economic tools that support transport decisions are again seen to cause exclusion.

The above shifting attention of the State and the consequent drop in the number of *boda boda* operators not only excludes the *boda boda* passengers; it also excludes their operators as well. For the operators, it is increasingly becoming harder to get into transport business due higher capital required. Although the prices of motorcycles have come down (chapter 5), majority of their riders cannot afford to buy them. As a result, they are forced to either hire the motorcycles they operate or get employed by an emerging clique of investors who can afford to buy the motorcycles and employ others to operate them. These changes bear different implications for *boda boda* operators and passengers. For the operators, it means that those who were previously self-employed now have to rely on erratic goodwill of the owners of the motorcycles to earn an income. For the passengers, the shifting attention forces them to resort to either walking and private cycling or to contend with the higher fares that are charged by motorcycles for comparable distances as the *boda boda*. The predominance of this economic

[49] *Field interview with practising NMT expert, 20.08.2015*

reasoning that generates the current shift away from *boda boda* clearly does not contemplate such disadvantages. In fact, it is arguable that motorcycles only address the needs of lower middle income earners but not the poorer groups that cycling caters for – whether as passengers or as operators (see Section 5.7). This latter market segment has largely been ignored by the economic focus that informs the ongoing transition from cycling to motorcycling.

Studies have also shown that exclusion occurs when residential places are located far from places of occupation (Kenyon et al., 2002; Lucas, 2011; Shergold & Parkhurst, 2012). These studies bring to focus the recent proposals to create sub-centres around nodes that are already socio-economically active in Kisumu (Nodalis Conseil, 2014). These include areas such as Mamboleo, Kisian, Otonglo, and Nyamasaria (see Figure 3-1). It particularly remains curious to know the impact that the creation of these sub-centres will have on the exclusion of cyclists in the intervening spaces between the nodes. This curiosity is aroused by the observation that the urban development plan for the city remains unclear on how to handle the travel demand that will be met through cycling. This plan is equally unclear on how to deal with the demand that is currently met through cycling.

The foregoing revelations show that accessibility for cyclists is curtailed by transport infrastructure, service, and policy, as well as land-use plans. This restriction impacts directly on the ease of cyclists to get to destinations and to participate in socio-economic activities. Cyclists are specifically faced with comparatively more obstacles in the form of skewed by-laws that restrict its use from the city centre, poor road conditions, and traffic rules and now physical distances. The resulting exclusion aggravates the social exclusion that majority of cyclists already experience due to their disadvantaged socio-economic statuses (see e.g. Maoulidi, 2012). These forms of exclusion identify with cases from other parts of sub-Saharan Africa (Grieco et al., 2009; Salon & Gulyani, 2010). Despite this evidence, the relevance of supporting cycling in Kisumu remains ambiguous when the present tools of evaluating transport decisions are applied on their own. Efforts to support the mode (e.g. ITDG-EA, 2004) are shrouded in unclear policies and unclear institutionalised commitment as revealed in chapter 5 and 6 respectively. Evidence presented in the chapters therefore gives credence to the doubt I raise about the adequacy of these tools to identify the relevance of supporting cycling. In this regard, I submit that the parameters used to evaluate transport plans should deliberately consider the needs of cyclists if they are to support cycling.

Poorly understood structure of travel demand generates the exclusion of invisible modes

The above revelation of transport-related social exclusion introduces a new dimension of the socially-excluding nature of urban planning as it is practised in many sub-Saharan African cities (see e.g. Goodfellow, 2013; Midheme, 2015; Mobogunje, 1990; Watson, 2003, 2014). Current literature on this exclusion has mainly focused on poverty, housing and access to land. However, little explicit attention has been accorded to transport by this literature. Yet transport-related social exclusion that is revealed in this dissertation falls right within the ambits of exclusion that this literature addresses. Mobogunje (1990) diagnoses the challenge of planning in these cities as that of poorly defined and inadequately understood structural dimensions of urbanisation. Within the context of transport planning, this challenge arguably manifests in a lack of understanding of the travel demands of different socio-economic groups. Empirical chapters of this dissertation reveal that transport planning in this region remains

unresponsive to varying travel demand generated by different socio-economic groups due to the modes and fares they can afford.

Chapter 6 unearths what seems to be an underlying assumption that building roads alone would herald efficient urban transport that solves all the mobility needs of the region. An examination of the efforts that outwardly appear to be geared to transport planning reveals that these efforts are narrowly concerned with building roads to support motorised transport. The discussion in chapter 6 finds no evidence that these efforts are informed by the need to address the mobility needs of the modes used by socially underprivileged road users. These include cyclists and pedestrians who also stake a claim to the spaces on the roads. The failure of transport planning to incorporate the needs of these underprivileged road users results in excluding streets and traffic regulations (chapter 4). At the same time, although the transition in travel choices over the past 17 years has seen the emergence of private cycling, this new use of bicycles hardly forms a basis for transport infrastructure creation and traffic regulations (chapter 5). Instead, the functional design of streets persistently relies on design manuals that are not realistic to the demands presented by active cycling and the changing thoughts about inclusive cities (UNCHSUD, 2016; UNDP, 2015). I revisit the limitations of this design manual under contradictions presented by the foundation of traffic regulations and street design.

The form of transport planning practiced in sub-Saharan African cities is evidently designed to cater for the motorised travel demand (Carruthers et al., 2009; Trans-African Consortium, 2008). As such, it is neither based on any modal split studies nor even geared to facilitating other modes apart from the automobile. Empirical evidence exposed by this dissertation therefore leads one to question whose mobility challenges this transport planning is designed to address then. One equally wonders if the tools of mobility that are currently facilitated by planning are equitably accessible to all socio-economic groups.

The questions raised above are particularly relevant in the context of high incidences of poverty that poses a challenge to transport in many sub-Saharan African cities. It should be recalled that as high as 60% of the population of some of these cities is locked out of using motorised modes without straining financially (Diaz Olvera et al., 2013; Kim & Dumitrescu, 2011). Chapter 6 of the current dissertation shows that in the absence of alternative modes, this group is forced to spend as high as 25% of their incomes on recurrent transport expenditure. In deed, evidence presented in this dissertation shows that the bulk of travel demand generated in the region is met through non-motorised modes. In the case of Kisumu, the study shows that motorised modes comprising motorcycles, private cars, rickshaws and *matatus* account for only less than 33% of the total modal share (chapter 4). This means that close to 70% of the travel demand in the city is met through walking and cycling. Despite this share, transport planning in the city does not cater for these modes used by the majority. This failure is arguably the result of a lack of attention to the structure of travel demand and specifically a neglect of the needs of the socially underprivileged people who use these neglected modes. The ability of the current transport planning to accommodate cycling is therefore doubtful. Without a deliberate attention to the demand generated by modes such as cycling, this transport planning can only continue to exclude 'invisible' modes used by the poorer groups in the society.

Efforts by the urban poor of Kisumu to bridge the above gap through cycling are restricted by transport planning, which generates infrastructure, traffic and service conditions that exclude the mode. This restriction of the mode reinforces the exclusion of the poor not only from participating in mobility, but also from accessing socio-economic opportunities such as education, jobs, and markets. The conditions discussed in the empirical chapters of this dissertation lead one to conclude that transport planning in its current form leads to further marginalisation of cyclists. These conditions resonate with those of other dimensions of urban living that have inspired the conclusion that urban planning in sub-Saharan African cities is generally out of touch with the local realities (Watson, 2003, 2014). In the context of this contradiction generated by planning, social exclusion offers an opportunity for interrogating transport planning for its responsiveness to poverty and exclusion that characterise cycling in Kisumu and other sub-Saharan African cities. It should be reiterated that urbanisation in this region has generally been euphemised with urbanisation of poverty (UN-HABITAT, 2014). There is thus a need for transport planning to proactively make this poverty one of its central foci rather than attempt to wish it away as has been the case.

Negative social presentation of cycling blurs its potential contribution to sustainable transport

Negative social presentation of cycling as a mode for the poor aggravates its exclusion and downgrades its rightful contribution to sustainable urban transport. Chapter 1 demonstrated that the growing attention to cycling has been informed by the recognition that the mode has the potential to contribute positively to ameliorating transport challenges such as traffic congestion, poor accessibility, and environmental pollution. Although this dissertation finds evidence that the mode is predominantly used by the poor (Section 5.7), it concurrently discovers that not all users of the mode are necessarily economically poor. The socio-economic characteristics of cyclists shows that some of them are indeed economically well-off and could afford alternatives to the bicycle. This point is demonstrated further in chapter 5, where it is shown that not all modal choices that favoured cycling were necessarily made because travellers could not afford alternative modes. This evidence contradicts the initial assertion of this dissertation that the failure of planning to accommodate cycling reflected the general exclusion of its users from the society due to their inferior socio-economic statuses.

Arguably, the current exclusion of cyclists is then a product of their perceived low socio-economic statuses rather than their real social circumstances. This argument raises two distinct yet intertwined elements of exclusion that transport planning needs to decouple. First is the need to tackle the exclusion of cycling on its own account from street spaces. This exclusion is driven by the prevailing perception that the mode itself is inferior and ought to be 'modernised' (see e.g. Institute of Economic Affairs, 2008). Secondly, planning also needs to tackle the exclusion of poor individuals who are associated with cycling (Salon & Aligula, 2012; Sietchiping et al., 2012; Steyn, 2012). This form of exclusion is reflected in a lack of provision for the mobility needs of the poor as discussed in chapter 5. I argue in this dissertation that this exclusion is an extension of the wider social exclusion in the society.

A failure to cater for cycling limits both the socially invisible majority that are currently assumed to be its only users as well as the non-poor minority who use the mode out of choice. Most importantly however, the use of bicycles by this non-poor minority suggests that the mode

could be made attractive to other socio-economic groups if transport planning focused on creating infrastructure and traffic conditions that facilitate cycling. This reasoning resonates with the results of studies which indicate that lack of safety for cycling hinders its use in general (Parkin et al., 2007; Pucher, Buehler et al., 2011). In this regard, I argue that creating the necessary conditions that facilitate cycling could be an avenue for decoupling the mode from poverty and realising its potential contribution to sustainable transport. Moreover, addressing the safety concerns that hinder cycling is also a step towards consolidating the opportunity that cycling offers for sustainable transport (see Bertolini & Clercq, 2003; Pucher & Buehler, 2008). These arguments lead me to challenge the failure of transport planning to proactively facilitate cycling simply because it is perceived to be a mode for the poor. My reasoning in this case is that efforts that enable the poor to cycle would by extension create the basic conditions that make it safe for everybody else to use the mode.

Exclusion of cyclists is a subset of the wider social exclusion

Empirical evidence discussed in this dissertation shows that the exclusion of cyclists is not divorced from the wider processes that engender social exclusion (chapter 6). I argued earlier that lack of space for cycling on the streets was not only social exclusion on its own account, but that it was also a confirmation of exclusion that is meted on the perceived users of bicycles. This marginalisation is reinforced by biased transport policies that are skewed in favour of facilitating motorists while restricting non-motorised mode users as demonstrated in the discussion in chapter 6. The discussion shows that transport infrastructure is viewed as a means to economic participation, rather than a commodity that itself ought to be of the right quality that meets the needs of its diverse range of users (see Government of Kenya, 2007). The targets of the Kenya Vision 2030 plan discussed in that chapter recognise transport as a means for connecting nodes of economic activities and opening up politically marginalised areas of the country. The Vision however fails to commit the State to enabling the poor majority to move on the streets with the modes that are most affordable to them. This failure to pay attention to the mobility needs of the poor leads to the marginalisation of this group from the streets.

What is worrying from the above marginalisation is that the Kenya Vision 2030 plan has taken precedence over every other plan that could have offered better opportunities for the inclusion of users of alternative modes to the car (chapter 6). Lack of attention to alternatives to the car therefore provokes one to question how the poor in particular are expected to participate in economic activities that the Vision contemplates when they cannot even conveniently reach these activities in the first place. The contradictions of planning raised by this dissertation resonate with the misgivings of capital transport infrastructure projects that Watson (2014) terms as the 'urban fantasies of the African cities'. The author castigates the extant form of planning for its tendency to 'sweep away the poor' (Watson, 2009b). In this sense, transport is therefore just one way through which planning in its current form leads to social exclusion.

The discussion in chapter 5 further confirms that cycling has only been an incidental beneficiary of policies that target economic empowerment of *bada boda* operators rather than the use of bicycles for transport *per se*. The result has been the continued lack of attention to cyclists because the factors that led the State to pay attention to cycling have now changed with the emergence of motorcycling (chapter 5). Specifically, State attention has now shifted to the

motorcycle, which is seen to generate better incomes for it operators when compared to bicycles (chapter 6). At the same time, the motorcycle is seen as the lowest level of 'modernisation' that is expected to use the new road infrastructure that the State has invested in under the Kenya Vision 2030 programme (Government of Kenya, 2007; Institute of Economic Affairs, 2008). The point raised here demonstrates how attention to the social needs of the poor is easily lost unless these needs are tied to economic growth. My criticism of capital transport infrastructure projects and the focus on economic empowerment of *bada boda* operators should not be construed to run counter this economic focus and capital transport infrastructure projects. Rather, it is the conspicuous absence of attention to the modes that facilitate the poor to access activities that I decry here. This unclear attention to the challenges that face the urban poor and the attendant social exclusion that it generates is not unique to transport. Similar concerns have been raised with regard to access to space for street trading, housing, urban land, and even public transport (Khayesi et al., 2010; Klopp, 2011; Midheme, 2015; Steyn, 2012).

This recognition of the exclusion of cyclists as a subset of the wider social exclusion means that solutions to the exclusion of cyclists from the streets should be tied to the wider efforts to create inclusive cities (UNCHSUD, 2016; UNDP, 2015).

Interventions for cycling are not divorced from the wider effort to address social exclusion

My previous submission that the exclusion of cyclists reflects the wider social exclusion leads to the argument that efforts to address this exclusion should logically build upon various strategies that tackle social exclusion itself. Several sub-Saharan African countries have recently embarked on key reforms to address their worsening social exclusion (e.g. AfDB, 2013a; Government of Kenya, 2007, 2010a; Government of Tanzania, 1999; Government of Uganda, 2007; Republic of Ghana, 2003). These reforms focus on addressing the rising income inequality, marginalisation of the youth, women, physically disabled persons, and vulnerable communities among other groups. In Kenya in particular, the reforms have been entrenched in the Constitution, which explicitly obligates the Government to protect human dignity and govern through equity, social justice, and inclusiveness among other principles and values (Government of Kenya, 2010a, Article 10). Pertinent in the context of cycling is how this constitutional provision can be interpreted to offer a window through which the exclusion of cyclists can be tackled. Article 46 of the Kenyan Constitution goes on to state that consumers have a right to goods and services of reasonable quality.

Considering that roads are public goods (Holcombe, 2000), I argue that cyclists too have a right to streets of reasonable quality that upholds their safety, dignity, and justice. There is a need to recognise and protect this right in order to realign transport planning to its fundamentals, particularly in sub-Saharan African cities where planning remains largely indifferent to the local realities (chapters 4, 5, and 6). Suffice it to reiterate that these realities are characterised by poverty, low ownership of private cars, and a predominant use of non-motorised travel modes (Diaz Olvera et al., 2013; Lucas, 2011; Salon & Aligula, 2012. See also the modal composition in chapter 4). Recent literature has posited that the fundamental goal of transport policy and planning should not just be about building roads for its own sake but rather to improve the dignity and general well-being of citizens (Delbosc, 2012; Scheiner, in press). In this regard, Scheiner (in press) proposes that transport planning should focus on

delivering dignity in order to enable a majority of the global poor to participate in travelling on travel networks that are realistic to the socio-economic circumstances of their countries. This proposal consolidates the challenge I present in this dissertation to the current preoccupation with the creation of transport infrastructure that matches the western standards of mobility (e.g. AfDB, 2015; Government of Kenya, 2007). Empirical chapters of this dissertation suggest that this focus of transport infrastructure will continue to exclude non-motorised mode users such as cyclists unless it incorporates their needs.

Chapter 4 of this dissertation revealed that the safety of cyclists was compromised by dangerous junctions, narrow streets, and careless driving. All these factors compromise accessibility to destinations for cyclists. At the same time, the systematic exclusion of cycling revealed in chapter 4, 5, and 6 shows that policy and practice have accorded little dignity to the mode, thereby worsening the marginalisation of its users and compounding their accessibility challenges. Cycling is thus viewed as an 'alien' mode that ought to be replaced with its more modern alternative – the motorcycle (see Institute of Economic Affairs, 2008). This view runs counter to the tenets of the right to the city that I discussed in chapter 2. As argued in the theoretical framework of this dissertation, this right of cyclists to the streets should not just be construed as a right to be accommodated on the streets. It is most importantly a right to have their active travel behaviour form a core basis for the functional design of streets. This calls for the recognition of cyclists as valid actors in creating the city that Lefebvre (1996) terms as an *oeuvre* (chapter 2). These rights can be consolidated through the opportunities presented by these on-going social reforms.

A need to temper the tools of transport evaluation with the tenets of inclusion

The discussions presented in chapters 4 and 6 point out that the present tools for evaluating transport decisions exacerbate the marginalisation of cyclists in their current forms. This observation echoes the findings of studies which have questioned the adequacy of tools such as the Cost-Benefit Analysis to address equity concerns and the politics involved in transport decisions (Banister & Berechman, 2001; Weber, 2014). Specifically, these findings argue that Cost-Benefit Analysis on its own does not account for the structural differences that produce skewed access to benefits and distribution of cost. The use of Cost-Benefit Analysis that generates the transport conditions revealed in chapters 4 and 6 is evidently more concerned with identifying the most economically cost-effective motorised projects rather than facilitating the travel needs of cyclists (see World Bank, 2004, 2012). This focus on motorisation is perhaps understandable given the need to improve the poor state of transport infrastructure that supports motorisation in many sub-Saharan African cities and the fact that roads are an easy political campaign tool (Ascher & Krupp, 2010; Trans-African Consortium, 2008). However, one is left to wonder why the use of this tool should make the need to support cycling obscure yet it is one of the most actively used travel modes in medium-sized cities such as Kisumu. This biased attention to the automobile raises questions as to whose benefit the tool seeks to enhance then. And most importantly, could the need to support cycling be better captured by tempering Cost-Benefit Analysis with the tenets of inclusion discussed in chapter 6?

Similarly, the potential of Social Impact Assessment to highlight social exclusion concerns that are inherent in transport is lost due to its focus on impact assessment (see e.g. Vanclay, 2015). This focus renders the tool reactive to motorisation rather than proactive. Under this

arrangement, the use of this tool can only reactively identify issues such as involuntary displacement and diseases that are expected to occur due to proposed transport projects (see e.g. World Bank, 2004, 2012). It is evident that this arrangement limits the tool from proactively identifying the social disadvantages such as restricted access to street spaces that emanate from the functional allocation of these spaces and the traffic regulations that guide how they are used by different travel modes (chapter 4). I propose that Social Impact Assessment can be made more useful by reorienting it to proactively identify and mitigate the social disadvantages that inhere in the social exclusion of cyclists.

The foundation of traffic legislations and street design contradicts cycling

Empirical findings of this dissertation reveal that policy and legislation are ambivalent and sometimes contradicting for cycling (chapter 5). As such, they fail to protect the mode, making it comparatively harder to use relative to the other modes. At the national level, the traffic law (Traffic Act, Cap 403, 2014) recognises the use of bicycles on the streets but fails to provide for its safe use. The spirit of this law shows that it is bent on restricting, rather than facilitating the mode. Section 89 of the traffic law explicitly identifies what it terms as 'restrictions on riding bicycles'. This section imposes conditions on cycling in terms of the shape, load, and the number of passengers it can carry. While these conditions are arguably necessary to ensure the safety of cyclists, the traffic law in general is conspicuously silent on any other aspect of cycling. It does not for instance even specify how it expects other modes to relate with cyclists on the streets. This omission raises curiosity if one considers that careless driving is one of the leading factors the empirical findings of this dissertation reveal to restrict cycling in Kisumu (chapter 4). This silence reinforces the view that cyclists are 'aliens' on the streets and partly accounts for the hostility of motorised modes users towards cyclists that I discussed in chapter 4.

The above ambivalence towards cycling by the traffic law is reinforced by the road design manual that is in operation in the entire country. It is striking that this manual does not contemplate other modes of transport that stake a claim on the streets apart from the motorised ones. It therefore only allocates the road reserve to motorised transport. Figure 7-1 (a) shows a typical cross-sectional design from this manual while Figure 7-1 (b) shows the typical street layout that is inspired by this manual.

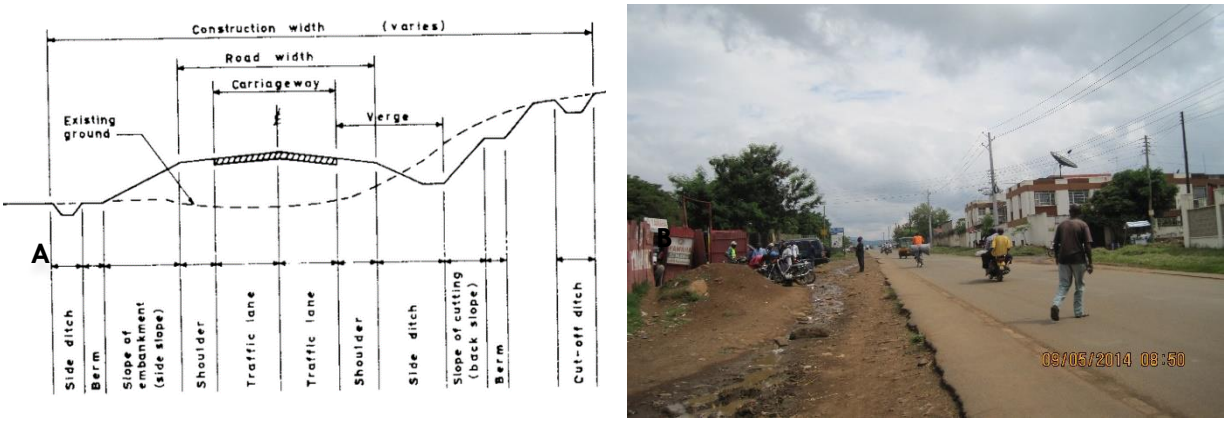

Figure 7-1: Typical functional allocation of street space

Source: (a) Government of Kenya (1979) (b) Author, 09.05.2014

Carriageways that are designed on the basis of this manual are not only narrow; they are also unsafe, especially where the side ditch (Figure 7-1 (a)) is steep. As pointed out in chapter 4, narrow streets make it difficult for cyclists to share the streets with motorised modes while the open ditches make it unsafe for cyclists to escape from careless drivers.

A recent amendment of the traffic law (Traffic Amendments, 2014) identifies the need to provide cycle tracks but nonetheless seems uninformed by the basic principles of networks for cycling (Kuijper & Braakman, 2009). This amendment only specifies that cycling facilities should be provided near schools – a provision that raises doubts about the coherence of the network that is likely to emerge from its implementation. The provision of infrastructure at only specific spots as proposed in this amendment goes against the network coherence principle of good cycling infrastructure (Kuijper & Braakman, 2009). This principle provides that continuous and uninterrupted network of cycling path is necessary to encourage cycling. The conditions of the streets discussed in chapter 4 suggest that existing streets in Kisumu hardly meet the principles relating to safety, attractiveness, and comfort, let alone this coherence. Cycling remains harder as long as these conditions persist.

Besides the traffic regulations and functional allocation of space on the streets, the discussion in chapters 5 and 6 also shows that cycling is historically and actively restricted by hostile policies (e.g. Municipal Council of Kisumu, 2009). The social exclusion of cyclists that emanates from these elements of transport justifies the need to provide for cycling in a city like Kisumu where the mode is actively used.

Objectives of modernist planning run counter to the basic accessibility needs

The modernist inclination to planning is not only detached from the lived transport challenges that face majority of cyclists, it is also in conflict with the ways these challenges are tackled by those that it excludes. For a start, this modernist planning inclination assumes that all mobility needs are met by motorised modes in their various forms – private cars, *matatus*, motorcycles, and auto-rickshaws. This explains why it only creates streets for these modes as evidenced in chapter 6. As discussed in that chapter, this modernist mode of transport planning places a premium on aesthetics and matching motorised transport infrastructure in Kenya to international standards without questioning whose needs that infrastructure is supposed to serve. Statistics shows that over 60% of the urban population in sub-Saharan African cities can hardly afford the recurrent cost of motorised transport and are forced to walk in situations where there are no faster and cheaper alternatives to walking (Kim & Dumitrescu, 2011; UN-HABITAT, 2014). That transport planning does not pay adequate attention to this group by itself generates social marginalisation. In medium-sized cities like Kisumu, innovative ways to deal with this marginalisation through cycling are thwarted, not only by the failure of planning to create spaces on the streets to accommodate the mode but also by actively banning its use from parts of the city (see e.g. Alal, 2014; Municipal Council of Kisumu, 2009).

The modernist planning inclination is also evidently wrought with neoliberal tendencies (Harvey, 1982, 2012). This tendency is evidenced in the way planning commercialises mobility without regard to whether the new travel modes it contemplates are affordable to existing cyclists. The discussion developed in chapter 5 casts doubt on what appears to have been efforts by the State to facilitate cycling. It is shown that strategies such as tax removal on pedal bicycles

were geared more to promoting their commercial use than to their use for the sake of transport. I hypothesise that this focus explains why the State is no longer keen on cycling with the emergence of motorcycling which meets this commercial objective in a more cost-effective way than pedal bicycles. What is striking about the new attitude of the State towards cycling is that the mobility needs of captive cyclists remains unmet. In fact, the discussion in chapter 5 points out that their situation has worsened with the emergence of motorcycles, which has rendered them even less visible from policy.

The question that the above modernist orientation to planning raises is whether transport planning can be informed by the active appropriation of street spaces by cyclists as proposed by Lefebvre (1996) and other critical urban theorists. Moreover, considering the existence of a group of captive cyclists in secondary cities such as Kisumu, this dissertation questions if the commercial objective must necessarily be pursued at the expense of cycling for the sake of transport.

Ambiguities of planning generate conflicting claims to street spaces

Efforts to address the exclusion of cyclists should take cognizance of the failure of planning to cater for the needs of other claimants to the street spaces that are typically used for cycling. Chapter 6 showed that these spaces are claimed by cyclists, street traders, motorcyclists and even pedestrians. These claims conflict each other because of the demands of these different claimants. For instance, street traders are stationary with their wares while mobility tools require space to move freely. Such conflicting demands result in accidents that pit all the claimants to these spaces against each other. Moreover, the discussion in chapter 4 showed that cycling was the most vulnerable of all the travel modes. This vulnerability is reinforced by traffic laws which hardly recognise cycling as a valid mode of transport. Moreover, a trend is emerging where non-motorised transport is almost taken as a euphemism to walking alone. This narrow interpretation of non-motorised transport is evidenced in Nairobi, where the Government has mainly concentrated on building footbridges and other infrastructure that support walking (researcher's observation). This, despite research evidence that shows that lack of safe infrastructure is a major contribution to low levels of cycling in Nairobi (e.g. Salon & Aligula, 2012). In Kisumu, although Kisumu Integrated Strategic Urban Development plan recognises the need to provide for cycling, it only proposes sidewalks in its detailed plans (see Nodalis Conseil, 2014). Such plans aggravate the disadvantage that cycling already faces. At the same time, the exclusion that faces cyclists due to these conflicting claims to street spaces and skewed solutions to these conflicts demonstrates the need for infrastructure and traffic solutions that support cycling.

This section has synthesised the empirical evidence presented in chapters 4, 5, and 6 together with the existing literature, development plans and policies to find how the need to support cycling can be revealed through them. The central message in the section is that planning should strive to fill the gap created by its lack of attention to the needs of cyclists. This inattention complicates accessibility to destinations for cyclists, thus worsening the already disadvantaged social position of most of them. Based on the conception of social quality summarised in Figure 2-1, I argue that planning needs to reconcile four sets of tension to facilitate cyclists to use the streets safely like the other modes are planned to. These tensions emerge from the demands imposed by modernist planning; infrastructure and traffic needs of

the cyclists as a community; individual preferences to use the auto; and the growing attention to social development that focuses on the socially marginalised. Although these tensions currently pull apart in their own interests and powers, planning should strive to move them towards the centre so that none of them unjustly dominates the others. Moreover, there is need for a dialectic that deliberately tempers the powers that these different tensions have over each other. In this case, focus should be on the cyclists who evidently have the weakest power under the current planning framework.

Achieving the above reconciliation calls for an explicit institutional arrangement within which cycling concerns can be articulated. This arrangement is currently lacking in Kenya in general and Kisumu specifically. The discussion presented in this dissertation shows that the focus of the institutions that are charged with transport planning in Kisumu is skewed in favour of motoring. These institutions include the national and country ministries in charge of transport, the legislative arm of the city, the department responsible for physical planning, and the department responsible for regulating road traffic. Due to this bias, cycling concerns remain only an afterthought and often poorly executed as presented in chapter 6 and in the preceding paragraphs. For instance, the designated user of new street spaces that seems to be meant for cycling remains unclear while non-motorised transport is narrowly euphemised for walking. At the same time, the term *boda boda* which originally referred to pedal cycling is now used to refer to motorcycles as well. I argued in chapter 6 that this interchangeable use of the term blurs attention from pedal cycling. This is because doing so makes planners to assume that the needs of pedal cycling are addressed in their plans when only those of motorcycling have been. It remains doubtful if cycling concerns can be addressed under the current institutional arrangement.

The next section now reflects upon the theories that supported the investigations documented in this dissertation.

7.3 Theoretical reflection

The aim in selecting the theoretical framework for this dissertation was to find a standpoint from which I could question the inclusiveness of the existing transport planning models and still manage to offer a framework for finding solutions. This perspective was offered by elements of the critical urban theory, social quality theory and the concept of the right to the city. The critical urban theory offers a perspective for objectively examining the planning system to find if it works for the socio-economically disadvantaged segments of the society. On the other hand, the social quality theory offers a perspective for examining the conditions that are necessary to address social exclusion. The perspective offered by the social quality theory is reinforced by the concept of the right to the city, which emphasises the rights perspective of the conditions that are necessary to enable the excluded members of the society to participate in normal social processes.

While these theories and concept present powerful tools for exposing the social disadvantaged caused by transport, they have mainly been used in discussions that relate to social welfare, and access to housing and land (see e.g. Beck et al., 2001; Soja, 1996; Watson, 2009b). In this dissertation, I have deliberately showed that their substantive concern with social exclusion is not divorced from the disadvantage that faces cycling in the context of

sub-Saharan African cities. In doing so, I introduce a new dimension that enriches the present use of these theories and concept.

In terms of the right to the city, this dissertation draws attention to what is probably the only way that transport planning can take advantage of the ongoing social reforms (e.g. Government of Kenya, 2010a) to cater for the needs of cyclists in sub-Saharan African cities. The right to the city concept has been used to expose the transport disadvantage that faces welfare recipients, users of wheelchairs and the poor when it comes to accessing bus services (Attoh, 2012; Murthy, 2011). Furness (2010) also draws on the tenets of this concept to advocate for the provision of infrastructure that accommodates cycling. The use of the concept by Attoh (2012) and Murthy (2011) fronts for access rights to what already exists. On the other hand, its use by Furness (2010) is an attempt to expand the range of alternatives. The use of the concept in this dissertation presents a slight departure from these two uses. I instead use the concept to demonstrate the need to uphold a right to cycling, which often is the only alternative to walking for the poor yet it remains unattended by planning in sub-Saharan African cities. I also draw on the sheer size of poverty that characterise cycling in the context of sub-Saharan African cities to argue that a failure to attend to the mode means a direct threat to their right to the city itself. The tenets of the right to the city were also useful in enabling the study to demonstrate that cyclists were not mere 'aliens' on street spaces but indeed valid users of these spaces. This validity is demonstrated by their active appropriation of street spaces, albeit without the formal recognition by the State planners. In this context, this dissertation finds the need to functionally design these spaces to protect and uphold the right of cyclists to the streets. This observation is guided by the tenets of the right to the city concept propagated by Lefebvre (1996).

Regarding the social quality theory, this study shows that the substance of exclusion that compromise social quality remain the same although its conception can vary in different contexts. In this dissertation, I adopted the conception of social exclusion as the constrained ability to participate in normal social processes due to the disadvantaged social position of those whose ability is constrained (Sen, 2000). This conception enabled the study to question the actual factors that made it difficult for cyclists to participate in mobility and access to destinations. Through this questioning, the study managed to extend the current conceptions of transport-related social exclusion beyond the socio-demographics and spatial factor that have thus far dominated the topic (e.g. Lucas, 2012; Shergold & Parkhurst, 2012 Church et al., 2000). These factors lead to a normative classification of exclusion without showing how exclusion happens and what exactly causes it. This dissertation improved this gap by identifying the street conditions and traffic factors that actually inhibit the use of streets, thus worsening the exclusion of cyclists. Also, by focusing on the substance of social exclusion, this dissertation has managed to demonstrate that the use of the concept should not necessarily be confined to social welfare concerns that it originally developed to explain in Europe. The use I have made of the theory in this dissertation adds to its use outside its original confines. Similar attempts have been made by other authors as pointed out in the discussion presented in chapter 2 (see e.g. Abbott et al., 2011; Herrmann, 2012; Ward et al., 2011). The results of this current study demonstrate the need to widen the scope of this theory to allow room for other forms of social exclusion that are not necessarily experienced in Europe. Moreover, these results demonstrate that it is possible to develop indicators to monitor the actual causes of social exclusion.

The social quality theory also presented a framework for looking beyond the mere critiquing the shortcomings of transport planning in sub-Saharan African cities. It offered a framework for interrogating the power relations between motorised modes that were facilitated by the predominant modernist transport planning system and cyclists who are marginalised by it. By examining the exclusion that faced cyclists through this power relation, it was possible to think of the omissions of the modernist planning as the cause of the problem. In this regard, solutions to this exclusion that faces cyclists should focus on that power relation. The specific contribution made by this dissertation is that this modernist planning should be tempered with the tenets of social inclusion. Closely relating to this point is the revelation that the ongoing transport infrastructure development should complement its provision for motorised modes with the provision for cycling. It is only through doing this that the aspirations of inclusive cities and sustainable cities contemplated by the New Urban Agenda (UNCHSUD, 2016) and the Sustainable Development Goals (UNDP, 2015) can be realised.

Lastly, the critical theory offered a standpoint from which it was possible to critically examine transport planning processes and policies together with their outcomes to assess how functional they were for cycling. This critique has been achieved by demonstrating that biased transport infrastructure, service and policies in Kisumu remain predisposed against the poor. Furthermore, through this critical viewpoint, it has been possible for the study to look at the existing cycling in Kisumu as an activity that is itself a process of creating street spaces. The objective of planning should therefore not be to suppress cycling as it is currently the case (see Municipal Council of Kisumu, 2009). Rather, transport planning ought to recognise active cycling as a valid use of street spaces and reconcile its current practice to the demands posed by this active cycling. The outcome of this critique lends usefulness to the formulation of strategies that aim to make Kisumu an inclusive city in line with the aspirations of the New Urban Agenda, Sustainable Development Goals and the ongoing social reforms in sub-Saharan Africa (AfDB, 2013a; UNCHSUD, 2016; UNDP, 2015). This dissertation further finds the necessity to politicise cycling to draw the attention of policy and ongoing reforms to the mode. This necessity is in line with the thinking that solutions to transport problems is less of a traffic engineering problem and more of a political decision problem (Böhm et al., 2006).

7.4 Methodological reflection

The mixed methods adopted by this study offered a pragmatic approach for studying the phenomenon of transport-related social exclusion in the context of sub-Saharan African cities. Although the main aim of the study was of a qualitative nature, the variables that were required to realise this aim were of both quantitative and qualitative nature. This central aim could have been investigated using an approach that was purely qualitative. However, a purely qualitative approach would have limited the study from finding the statistical significance of the challenges to cycling and the underlying reasons for the observed changes in mode choices. As such, I found it useful to adopt the mixed-method approach to enable me generate a dialectic between the objective results of these quantitative analyses and the qualitative accounts of the conditions that they explained (Hancock & Algozzine, 2006). To this end, the quantitative approaches enabled me to objectively understand the factors that limited cycling as well as the changes in mode choices while qualitative approaches enabled me to find the meaning of these quantitative results from the lived experiences in Kisumu.

Qualitative approaches were useful at different stages in the study. To begin with, the entire study is based on a qualitative theoretical argument about justice and how to deliver it. This qualitative reasoning was also useful in formulating the objectives of the study and in contextualising its empirical investigations. All the empirical parts begin from a qualitative reasoning in which I show how social exclusion (chapter 4), travel behaviour and its dynamics (chapter 5), as well as social inclusion (chapter 6) relate to exclusion in the context of transport. Furthermore, qualitative approaches were useful in generalising the results and conclusions of the study. Rather than statistical generalisation, I opted for a theoretical generalisation that characterises qualitative studies (Yin, 2009). Accordingly, the results and conclusions of this study are generalised to the concept of transport-related exclusion itself rather than the specific context of this exclusion (Yin, 2009). Lastly, the qualitative approaches were useful in enabling the study to give a rich qualitative account of how social exclusion could be used as a basis for arguing the need to support cycling in cities of similar contexts as Kisumu. The specific contribution of these qualitative approaches is that they complemented the quantitative approaches to draw attention to the inadequacy of the current tools such as Cost-Benefit Analysis that support transport decisions in these cities.

Quantitative approaches were useful in sampling the primary respondents of this study. As explained in chapter 1, I thought it was necessary to do a quantitative sampling because the nature of social exclusion that was under investigation varied from one socio-economic group to the next. Given this variation, it was necessary to have a representative sample of respondents which could enable this difference to be understood. The approach to sampling enabled the study to make a specific contribution that previous studies seem to have paid little attention to. The study managed to give a good account of the transport disadvantages that faced the residents of the slum areas of the city. Such an account would have been lost if the study did not give weight to composition of income groups in the city.

The quantitative approach also proved useful in enabling the study give an account of the street and traffic conditions that inhibited cycling. Through this quantitative approach, the current study introduced another dimension to the existing studies on transport-related social exclusion. Specifically, the current study quantitatively analysed the actual factors that caused exclusion on the streets thereby enriching the existing studies that have mainly dwelt on describing the conditions that make people susceptible to exclusion. By basing the analysis on the actual conditions that caused exclusion, the study drew on the strength of the loglinear analysis to demonstrate that it was possible to objectively understand a qualitative response such as the ones analysed in chapter 4. This opportunity presented by loglinear analysis is relevant to researchers who are interested in the objectively understanding travel behaviour without losing focus of the drivers of these behaviours.

Further to enabling an understanding of the conditions that generated exclusion, quantitative approaches also proved useful in enabling the study to understand the changing policy environment and how it impacted travel behaviour in Kisumu. By drawing on the strength of longitudinal analysis, the study could demonstrate the link between policy changes and travel behaviour. Such a linkage has not been attempted in Kisumu before. Consequently, policy pronouncements have remained erratic because they hardly contemplate their impacts on travel behaviour change. The specific contribution of the study in this context is that it draws policy attention to this link between policy pronouncements and changes in travel behaviour.

For practical purposes (see Yin, 2009), results from the empirical part of this dissertation are interpreted both quantitatively and qualitatively. Given the nature of the problem under investigation, it would have been less useful to give only statistical results without exposing what these statistics meant in qualitative terms. This qualitative interpretation was based on the account of the respondents themselves, the experts in the field and my own observations during fieldwork. The approach to interpretation that I took aimed to strike a balance between the contradictions presented by the positivist and naturalist paradigms. As mentioned in chapter 2, the positivist paradigm holds that reality is out there and only needs to be measured, while the naturalists believe that this reality can only be understood by constructing it with the individuals concerned. These contradicting positions about how to understand reality have been criticised by the critical theory paradigm because they blur reality (Creswell, 2013; Crotty, 1998). This current study therefore demonstrates the strength of combining statistical and qualitative analysis to give a full account of the reality of exclusion as it happens and understood by the residents of Kisumu. The ability of the study to expose the challenges that face cycling using a mix of approaches confirms the usefulness of pragmatism in understanding transport-related social exclusion (Yin, 2009).

7.5 Limitations of the study

The study that yielded this dissertation was not without its limitations. These limitations were mainly data-related. To begin with, respondents from low income neighbourhoods were more willing to participate in the survey compared to those from higher income neighbourhoods. The implication of this varying levels of willingness to participate in the survey is that the socio-economic characteristics and the challenges that face the modes used by respondents from high income neighbourhoods are likely underrepresented in this study. The study used data from qualitative sources to ensure that these differences did not distort the information in it.

Again, data on incomes was also hard to obtain. This difficulty stemmed from the fact that information about income levels were considered personal and therefore not subject to public sharing in Kisumu. The study resorted to income cohorts to allow respondents to give their indicative income levels. However, even this is distorted by the fact that many residents of the city have multiple and unreported sources of incomes due to the vibrancy of the informal economy in the city. This limits the study in terms of presenting an accurate picture of income-specific aspects of travel behaviour.

Another problem was generated by the poor participation of women in the survey. Their poor participation was mainly because majority of them were homemakers and therefore did not make regular trips out of home. This made them reluctant to talk about their travel behaviours. Only about 60 women participated in the survey although they were housewives. But again, some women could simply not participate because they were busy with household chores when the survey was carried out. Probably other qualitative aspects of transport-related social exclusion would have emerged if more women of different occupations would have participated in the survey.

Lastly, the interval of data on the changes in travel behaviour was also problematic. This data was collected at intervals of 5 years from 1999. Data that is collected on a yearly basis would have been more useful for the analysis presented in chapter 5. However, it was not

practical to collect this because the study relied on recall capacity of its respondents. It would have particularly been difficult to have accurate recollection of travel behaviour for every year over a span of fifteen years. The data that was finally obtained presented a difficulty in understanding the changes that might have taken place in the intervening periods between the data points. The implication of this is that the travel behaviour changes presented in this dissertation are only specific to the data points.

7.6 General conclusions

As already mentioned, the central objective of this dissertation was to find out whether and the extent to which the concept of social exclusion could offer a complementary framework for identifying the need to support cycling in Kisumu. The study investigated three dimensions of transport that resulted from the current approaches to transport planning to find their relationship with the exclusion of cyclists. These dimensions included the conditions of street spaces and traffic, transport policies, and changes in transport-related policies. To move the investigation forward, the study conceptualised social exclusion as the constrained ability to participate in normal mobility and accessibility due to the disadvantaged socio-economic statuses of cyclists. This conception was based on Sen Amartya's understanding of social exclusion in its wider sense.

Three key findings emerged from the study:

i) *The conditions of street spaces and traffic restrict cycling the most relative to the other modes*. These conditions include poor street surface conditions, speeding motorised transport, careless driving, narrow streets, and dangerous road junctions. They either restrict cycling individually or in combination with each other;

ii) *Policies that deliberately target cycling have not focused on facilitating its use for the sake of transport*. Rather, these policies focused on promoting the mode as a means for income generation among unemployed youths. The implication of this policy focus is that the need to facilitate cycling is easily lost when motorcycling that is deemed to offer better means of employment emerges. At the same time, cycling has responded to policies that did not directly target it. The most conspicuous of these is the policy that sought to expand access to university education. This policy has seen a rise in the number of students who prefer to use bicycles to commute to various universities campuses that have since located in Kisumu. Most relevant for this dissertation is that despite the changing use of bicycles from public to private use, the mode remains unattended to by both policy and practice.

iii) *The auto-oriented focus of transport planning and development policies conceals the need to facilitate the modes other than the car*. Due to this orientation, both transport infrastructure and service planning have ignored the need to facilitate alternative modes such as cycling that are typically used by the poor majority.

These findings converge to show that cycling has systematically remained a neglected mode by planning. This neglect happens against the backdrop of various efforts that seem to focus on promoting its use. The neglect aggravates the social exclusion of cyclists from the streets and from access to socio-economic opportunities such as schools, markets, jobs, and healthcare.

Furthermore, the neglect restricts the freedom of choice to cycle for residents who are not necessarily poor but nonetheless willing to use the mode.

Given the central objective of this study, the evidence provided and the implication of this evidence for problematizing the disadvantage that faces cycling in Kisumu, this study draws the following conclusions.

Social exclusion presents an opportunity for problematizing the disadvantages that face cycling

This study has demonstrated that the predominant model of transport planning in Kisumu focuses on facilitating motorised transport. This model specifically creates transport infrastructure and traffic regulations that only cater for the needs of motoring. Similarly, spaces on the streets are also functionally allocated to facilitate the use of the automobile. But while this model focuses on motoring, the reality in Kisumu shows that over 48% of the households lives below the poverty line and can hardly afford the recurrent cost of motorised transport. Moreover, the slum areas where over 60% of the residents of the city lives are not catered for in terms of transport infrastructure and service. These realities lead one to wonder the inclusiveness of the current orientation to transport planning. Transport planning in this case not only fails to cater for the needs of the poor; it also thwarts their efforts to address this disadvantage generated by planning. Efforts by the poor to bridge this transport gap through cycling are specifically thwarted by poor cycling conditions that are created and sustained by the extant model of transport planning. This inhibits the use of bicycles from the streets and from accessing socio-economic activities. The model of transport planning evidently disadvantages the lower income groups that predominantly uses the bicycles. An understanding the transport-related social exclusion that this group suffers due to the current model of transport planning can therefore help expose their plight. This, in addition to the need to support the mode that they use.

Present criteria for transport evaluation is out of touch with principles of inclusive transport

The need to facilitate cycling will remain an elusive one so long as transport decisions are solely supported by its current tools. This study has demonstrated that the predominant use of tools such as the Cost-Benefit Analysis is at variance with the principles of inclusive transport. These principles are espoused by the New Urban Agenda (UNCHSUD, 2016), Sustainable Development Goals (UNDP, 2015), and the 'Share the roads' programme of the United Nations Environment Program (Kim & Dumitrescu, 2011). The shortcoming of the Cost-Benefit Analysis as it is presently used is that it leads to the prioritisation of motorised transport projects. At the same time, the tool only identifies the need to support cycling for potential of the mode to generate income rather than for its role in enabling accessibility. On the other hand, the Social Impact Assessment that holds potential to address the social concerns in transport has been shown to be reactive to motorisation. It has been demonstrated in this dissertation that the present use of the tool only mitigates the social concerns such as involuntary displacement that are expected from motorised transport infrastructure. This orientation limits the usefulness of the tool to proactively champion the social concerns such as the need to address transport-related social exclusion.

Transport planning in Kenya in general and Kisumu specifically is founded on unclear vision

The discussion presented in this dissertation casts doubt on whether transport planning in Kisumu is rooted on any clear vision that takes cognizance of its unique spatial and socio-economic realities. The evidence presented demonstrates that the city is simply adopting plans that have been conceived in the capital city and other cities that are viewed to be 'modern'. While drawing inspirations from 'best practices' is not a bad idea, adopting these plans wholesome without tempering them with the demands of the local realities is problematic. Evidence discussed in this dissertation demonstrates that this wholesome adoption of ideas that are generated from other cities is gradually creating an elitist city that is out of touch with the local realities in Kisumu. These realities are predominantly characterised by high incidences of poverty, which is the main driver of cycling in the city. However, one should not lose focus of the strong cycling culture of the city and the opportunities offered by its medium size. The city can build upon the opportunity presented by its small size to consolidate its cycling culture before it grows big and complex. The persistent exclusion of cycling concerns from policy, infrastructure, and service shows that transport planning in Kenya in general and Kisumu specifically is not founded upon a clear vision that captures the local realities. The emphasis placed on motorised transport projects that are identified by the Kenya Vision 2030 plan negates the opportunity presented by the Integrated National Transport Policy to clarify this vision. Specifically, the objectives of transport planning to improve safety, connectivity, and accessibility that the transport policy identifies are all reduced to concerns of motoring by the vision document. It therefore remains difficult to tell what transport planning in the city seeks to achieve beyond building roads.

Social exclusion of cyclists hinders the contribution of cycling to sustainable transport

Cycling has been argued to hold the potential to contribute positively to transport objectives that focus on reducing traffic congestion, transport-related pollution, and improving accessibility to destinations. This dissertation has highlighted evidence that confirms that the mode has contributed positively to these objectives in cities that have positively embraced it (e.g. Pucher & Buehler, 2008). Despite its active use in Kisumu, cycling and its users are excluded from the streets and from access to destinations. This dissertation has demonstrated that the factors that exclude the active cyclists of Kisumu are the same factors that have discouraged potential cyclists from using the mode. The implication of this inattention to cycling is that the opportunity held by the mode to herald sustainable transport in Kisumu is lost. As pointed out in the previous section, Kisumu has a rich cycling culture that is supported by its relative small and uncomplex spatial size. However, the city is unable to build upon the opportunities presented by these internal strengths to make its transport sustainable. Evidence discussed in this dissertation shows that this inability is due the current modernist orientation of transport planning in the city.

Transport-related social exclusion remains less understood and researched in medium-sized sub-Saharan African cities

This dissertation has demonstrated that the unique socio-economic conditions of sub-Saharan African cities expose them to another dimension of transport-related social exclusion. This dimension mainly relates to the revelation that over 60% of the residents of some of these

cities comprises of the urban poor who can hardly afford the recurrent cost of motorised transport. Kisumu itself has 48% of its residents living below the poverty line. Aside from poverty, urbanisation in these cities is characterised by the growth of slums and peri-urban settlements where basic transport infrastructure is demonstrated to be lacking or of poor quality. Moreover, motorised transport service is hardly accessible to residents of these settlements – either because they cannot afford it or because it is not feasible to offer due to poor road conditions. Despite these conditions that evidently create a transport disadvantage, there is still little research attention directed to medium-sized cities of sub-Saharan Africa. The implication of this paucity of research is that these cities continue to implement policies that worsen the already disadvantaged position of their urban poor.

Current indicators of transport-related social exclusion are insufficient to reveal the situation in sub-Saharan African cities

This dissertation raises doubt about the adequacy of the current indicators of transport-related social exclusion to reveal the situation in sub-Saharan African cities. Transport-related social exclusion is currently classified as suppressed ability to travel due to disadvantaged socio-geographical location of residential places, limited access to the car and public transport, and socio-demographics such as gender, age, and even race. While almost all these indicators identify with the situation in sub-Saharan African cities, they are nonetheless exhaustive. Sub-Saharan African cities present a unique case because exclusion here is largely a product of their poverty situation. Cyclists in this case remain invisible users of street spaces largely because they are poor and use a mode that is generally seen as inferior. The current indicators of social exclusion are insufficient to reveal the transport-related social exclusion that is generated by the modes that people use, the socio-economic status of travellers, and even their places of residence.

Critical urban theory offers an opportunity for interrogating transport-related injustices

The discussion developed in this dissertation reveals that transport planning as it is currently practiced in Kenya and other sub-Saharan African cities is biased to facilitating motorisation. This bias is supported by tools of transport evaluation and the biased modernist philosophy of planning that does not address the local realities. At the same time the outcome of transport planning in terms of the functional allocation of spaces on the streets to various modes, traffic regulations, and transport service are all skewed against non-conventional modes such as cycling. This dissertation has demonstrated that all these conditions generate the social exclusion of cyclists. The existence of many cyclists whose accessibility needs remain unattended raises questions regarding whose interest the extant transport planning exists to address. This dissertation demonstrates that the critical urban theory offers a useful opportunity for challenging such planning models that subjugate cycling. The theory offers a frame for reasoning that existing cycling in Kisumu can have a chance to equally determine how the streets of the city are functionally designed. This reasoning is consistent with the tenets of the right to the city concept and the social quality theory that have been discussed in this dissertation. Moreover, the critical theory offers a standpoint from which one can challenge the persistent lack of provision of quality transport infrastructure to slums and peri-urban settlements of Kisumu.

Existing disadvantaged social position is not the sole predisposition to social exclusion

The results presented in this dissertation also lead to the conclusion that existing disadvantaged social positions do not solely predispose all cyclists to social exclusion. The study found out that there existed cyclists who were not necessarily from low socio-economic backgrounds although they were still excluded from the streets nonetheless. This finding extends the idea that cycling receives unclear policy attention because of its inferior social presentation (e.g. Khayesi et al., 2010; Pochet & Cusset, 1999). In this context, this current study hypothesises therefore that social exclusion can also occur due to the perceived low socio-economic status of the excluded.

Conflicting institutional visions aggravate social exclusion

This dissertation has also presented the existence of visions that evidently pull apart in as far as addressing the transport challenges of Kisumu is concerned. In this context, local transport development agenda seem to be set largely by the Kenya Vision 2030 plan despite its weaknesses. The discussion has shown that this economic development blueprint is based on visions that are sometimes out of touch with the local development challenges. Due to its prioritisation by the State, this economic development blueprint has overshadowed all other policies that could probably result in more inclusive transport plans. The discussion presented in this dissertation has singled out the Integrated National Transport Policy, which remains largely ineffective despite its good intentions for cycling. Aside from the two contradicting policies, there are also key reforms such as those availed in the Kenya Constitution relating the different forms of rights. However, these constitutional provisions lack a clear institutional arrangement to interpret them in terms of what they mean for cycling.

7.7 Recommendations

The original contribution of this dissertation is twofold. First, it directly conceptualises transport-related social exclusion through the active exclusion of cyclists from street spaces. This conception enables the actual conditions that cause transport-related social exclusion to be assessed. By conceptualising transport-related social exclusion in this manner, this dissertation enriches the current discourse on this topic by extending its limits beyond lack of ownership of the auto or location in disadvantaged residential neighbourhoods among other indicators that are presently used to evaluate it. Secondly, this dissertation exposes how underlying social exclusion that characterises the auto-centric transport planning in sub-Saharan African cities generates development priorities, policies, and conditions of street spaces and traffic that exclude cyclists. These conditions not only actively limit cyclists from using the street spaces; they in effect limit their access to socio-economic opportunities using the mode most affordable to them. The conditions thus comprise the barriers to accessibility as conceptualised in Section 2.5 (see Figure 2-2). Tackling them should forms the basis upon which the need to create street spaces and traffic conditions that support cycling should be negotiated. Specifically, minimising these conditions that exclude cyclists should form a core criteria for evaluating transport infrastructure development, traffic regulations and transport service planning.

By and large, the findings of this study are relevant for institutions and researchers that are interested in formulating inclusive urban transport policies. The findings highlight the concerns that transport planning should tackle to make a contribution to inclusive cities that are

contemplated by the New Urban Agenda (UNCHSUD, 2016), the Sustainable Development Goals (UNDP, 2015) and the ongoing campaigns for shared road spaces (Kim & Dumitrescu, 2011; Murguía, Regina, Orvañanos; Odero et al., 2009). The following recommendations are put forward to make these findings relevant for the formulation of inclusive urban transport policy.

Make social inclusion an explicit objective of transport planning

It has been demonstrated that transport planning in Kisumu lacks a clear vision in terms of what it seeks to achieve beyond building modern roads that match international standards. While it is assumed that economic growth and reduced traffic congestion will automatically follow the ongoing infrastructure development, there is hardly any mention of the need to address the kind of exclusion that this study exposes. Evidence from other cities has shown the limitations of this focus on supplying infrastructure to match the growing demand for motorisation in the hope that it can solve all transport challenges (Banister, 2002; Banister & Berechman, 2001). This evidence shows that the expansion of infrastructure ultimately triggers new demand for infrastructure, unless such expansions are augmented with other strategies that manage that demand. At the same time, the premium placed by sub-Saharan African cities on motorised transport infrastructure development has also been faulted for being at variance with poverty and other realities in these cities (e.g. Watson, 2014).

The above evidence suggests that the sustainability of the current efforts to improve transport will remain elusive unless these efforts are anchored on clear visions that are harmonious with the local realities as opposed to just building roads. Achieving this sustainability calls for unambiguous statement of the objectives of efforts to improve transport service, policies, and infrastructure development. With specific reference to the revealed exclusion of cyclists, this dissertation recommends that the inclusion of cyclists should be made one of the explicit objectives of transport planning. Doing this would enable transport planning in Kisumu and other medium-sized sub-Saharan African cities to be responsive to the infrastructure needs of their active yet neglected cyclists. Moreover, making the inclusion of cyclists an explicit objective of transport planning should also enable these cities to consolidate their rich cycling culture that is currently neglected by their transport planners.

This recommendation is relevant to the department charged with transport in Kisumu County. This department is responsible for what the Kenya Constitution identifies as county roads (Government of Kenya, 2010a, Fourth Schedule). The recommendations are also relevant to the department charged with roads at the national government since some of the national roads that are under its jurisdiction (Government of Kenya, 2010a, Fourth Schedule) also double up as local roads in Kisumu. These departments need to recognise that a failure to cater for cycling in their plans leads to the exclusion of cyclists. As such, they should aim to bridge this exclusion by formulating plans that incorporate the needs of cyclists.

Broaden the scope of accessibility as presently conceived

There is also a need to broaden the conception of accessibility that the national transport policy identifies. It is evident from the priority accorded to the Kenya Vision 2030 plan that this accessibility is narrowly conceived only in terms of motorised transport (Government of Kenya, 2007). This premium placed on motorisation disfavours non-motorised modes such as

cycling from the benefits of efforts by the State to expand transport infrastructure and service (see Government of Kenya, 2009). The emphasis on motorisation specifically aggravates exclusion in a city like Kisumu where only a few people travel by motorised modes. There is thus a need expand this conception of accessibility to incorporate accessibility by bicycles and other modes. The ultimate focus should be to improve the conditions of the streets and traffic thereupon to make it easy to reach destinations by cycling and other modes besides the motorised ones. Doing so should recognise the interdependence between land-use and transport.

This recommendation is relevant to various state departments. First, to the departments charged with transport at county and national government levels, there will be need to focus on allocating the road reserves in ways that accommodate modes beyond the motorised ones. There should be a departure from the current approach where the road reserves are solely allocated to motorised modes alone. This recommendation calls for the revision of the road design manual that this dissertation identified to be the basis of this biased functional allocation of road spaces. The new road design manual should recognise and provide spaces for cycling and other modes. Secondly, this recommendation is also relevant to the departments that formulate and enforce traffic laws. These are the national assembly and the traffic police department at the national government and the county assembly and inspectorate department at the county government levels. The national assembly will need to revise the Traffic Act to positively recognise cycling as a mode of transport alongside the other modes that this Act presently recognises. This recognition should involve a clear statement of traffic regulations that address the needs of cycling and explicit identification of traffic offenses against cyclists by motorists. This law should also identify traffic regulations that guide safe cycling. The current Traffic Act has been identified in this dissertation to suppress rather than facilitate cycling. There will also be a need to review the by-laws that prohibit cycling from the city centre of Kisumu. Besides, the County Government will need to formulate by-laws that guide the harmonious use of street spaces by both the motorised modes and non-motorised modes. Such by-laws will require a well-informed city inspectorate department to enforce. Lastly, the departments charged with physical planning and housing creation will also need allocate and develop housing in ways that enhance accessibility to destinations as well as existing transport corridors.

Temper the present tools of transport evaluation with indicators of social inclusion

This dissertation has demonstrated that the present tools of evaluating transport decisions are inadequate to identify the relevance of creating infrastructure and traffic regulations that support cycling. These tools specifically overlook the need for transport to address the challenge of social exclusion that is caused by the mismatch between transport planning and the realities of sub-Saharan African cities. There is hence a need to broaden the scope of these tools to enable them capture the realities of exclusion in these cities. While this dissertation recommends that social inclusion should be made an explicit objective of transport planning, the question that remains however is how this recommendation can be actualised. Social inclusion itself has been described as a complex and multifaceted concept that cannot be measured directly (Atkinson & Marlier, 2010; Pooley, 2016). Nonetheless, the concept can be measured through indicators that point the factors that limit people from the full participation in social processes (Atkinson & Marlier, 2010). The present study found out that infrastructure

and traffic conditions such as narrow streets and careless driving excluded cyclists. Considering these findings, it is necessary that proposed transport projects are evaluated for how they address these concerns that exclude cyclists as well. In other words, transport decisions should satisfy the Cost-Benefit Analysis criteria without compromising the need for inclusive spaces that accommodate cyclists as well. At the same time, the Social Impact Assessment needs to be made more proactive rather than reactive as is presently the case. The implication of this recommendation is that the design of transport projects should proactively aim to achieve social inclusion rather than simply focus on mitigating social impacts such as involuntary displacement that they presently emphasise.

This recommendation is relevant to institutions that are involved in evaluating and financing transport infrastructure projects. Among these are the county and national governments and their development partners. Similarly, this recommendation is relevant to researchers who are interested in how transport decisions can be evaluated to make them address the needs of inclusive cities that are envisaged by the New Urban Agenda and other urban development targets.

Politicise the exclusion of cyclists

It is evident from the discussions presented in this dissertation that cycling as a mode of transport has not had any political support in Kisumu. What appears to have been support from the politicians is revealed to have been an effort to encourage cycling for its economic rather than mobility use. Consequently, this political support has rapidly waned off with the emergence of motorcycles. It is shown in the dissertation that motorcycles have worsened the exclusion of the poorest who can only afford to commute by bicycles. But at the same time, the dissertation gives evidence of a rising private ridership of bicycles. Besides, other innovative uses of bicycles have also emerged. A case in point is the Bikeventures, a private business entity which runs a bike-sharing programme besides organising city tours with the bicycles.

Despite this new trend in the use of bicycles, the mode remains invisible to State planners and policymakers. What is even more interesting is that cyclists and potential cyclists only complain about lack of provision for the mode yet they are unable to organise themselves to voice this concern to the State. Given the contradiction presented by the resilience of cycling amid its invisibility from policy, this dissertation recommends the politicisation of cycling. In other words, the conditions identified in this dissertation to hinder cycling should be packaged to form a basis for political debate for them to elicit the kind of political attention they deserve. This recommendation draws attention to what has been referred to as the *[transport]* problem of the city rather than *[transport]* problem in the city (Leven, 1968, p. 108, cited in Harvey, 2009, emphasis added). While a study like the present one can identify social exclusion as the problem that faces cycling in the city, it cannot nonetheless tackle the skewed structural distribution of opportunities that underlies this problem. The latter is the problem of the city and is a problem of political decision (Böhm et al., 2006).

This recommendation is relevant to the users and potential users of bicycles, civil societies that are engaged in inclusive cities and right to the city. These stakeholders should organise themselves in a clear way to petition the State to provide for cycling. At the same time, the recommendations are also relevant to the legislators at the county government of Kisumu. Being the representatives of the residents at the lowest unit of political representation, the

legislators should offer the link between the challenges that face cycling and the policies that are articulated at the county assembly.

Recognise insurgent appropriation of street spaces by cyclists as a valid indication of an unmet demand

The official response of the State to cycling in Kisumu has been to ban the mode from places where it is deemed to pose traffic safety problems or to project what State agents view as a bad image of the city. This ban has been effected through clauses contained in the *non-motorised and motorised cycles by-laws* (Municipal Council of Kisumu, 2009). While the regulations contained in these by-laws are meant largely to guide the safe operations of *boda boda*, they have nonetheless been misused by agents of the city authority to arrest and detain *boda boda* operators and even to confiscate their bicycles. Private cyclists are never spared at such times either. These attitudes of the State demonstrate its lack of commitment to accommodate cycling on the street spaces. Despite this attitudes of the State towards cycling, both private and commercial cyclists *(boda boda)* have continued to defiantly use the streets and sections of the city where they are restricted from. This defiance is often out of lack of alternative routes in the case of private cyclists or lack of alternative concentration of customers in the case of *boda boda* operators. Rather than view this insurgent appropriation of street spaces by cyclists as something negative, the city authority should instead take it as a valid indication of an unmet demand. In fact, it is because of lack of facilities and supportive traffic regulations that cyclists pose what the city authority views as traffic problems. In this regard, there is a need for the city authority to recognise that cycling is itself 'traffic rather than an obstruction to traffic' (Furness, 2010). Transport infrastructure and service planning should hence positively embrace this insurgency rather than try to suppress it. This recommendation is in line with the demands of planning that is based on insurgent citizenship as proposed by Holston (1995), Holston (2008), and Miraftab (2009).

This recommendation is relevant to the departments in charge of city planning, and transport planning at the county government of Kisumu. These bodies need to formulate plans that accommodate rather than suppress cycling. At the same time, the recommendation is relevant to the county assembly that is charged with formulating various by-laws. In the context of cycling specifically, there is a need to revise the existing by-laws to make them facilitative rather prescriptive as they currently are. This recommendation is also relevant to transport research and training. There is a need to recognise cycling as a valid travel mode and to train future planners and engineers to accommodate it.

Clarify the institutional framework within which to tackle the exclusion of cycling

Despite the existence of a multiplicity of State institutions whose mandates impact on cycling, none of these institutions has a clear focus on facilitating the mode. Instead, their competing mandates and priorities flatten the little effort that have been initiated to provide for infrastructure and traffic needs of cycling.

To begin with, the present study shows that the opportunity presented by the national transport policy to address the inclusion of cycling is discounted by the priority that is accorded to the Kenya Vision 2030 plan. There is currently no feedback mechanism between the Integrated

National Transport Policy and the Kenya Vision 2030 plan to ensure that the Vision is updated with emerging demands that it did not contemplate at its initiation.

At the same time, while some national roads that are under the mandate of the national government double up as local roads in Kisumu, there is no clear framework to ensure that they are designed to address the demands of local roads. As such these roads are designed as highways, yet they are expected to serve local transport needs. Evidence provided in this dissertation shows that the current design of these highways-cum-streets poses a danger in using them. This danger is exemplified by the difficulties in making turns at Nyamasaria and Riat centres following the redesign and upgrade of the roads.

Lastly, none of these institutions whose mandates impact on cycling seems to committed to the mode. The most conspicuous of this lack of commitment is the lack of mention of the mode in the strategic plan for the ministry in charge of transport in Kisumu. Empirical evidence adduced by this study shows that the strategic plan euphemises the term *boda boda* to refer motorcycles not pedal bicycles. This annexation of the term, which originally referred to pedal bicycles creates the impression that the strategic plan is concerned with cycling when the reality is that it draws further from the mode. The implication of this usage is that the basic data to support planning for cycling is not available even if the State were to prioritise the mode. It is therefore difficult for the ministry to tackle the concerns of cycling in a systematic way. At the same time, the strategic urban development plan of Kisumu only identifies the need to accommodate cycling but fails to recommend concrete strategies for doing so. This lack of clarity renders cycling vulnerable to being ignored by the institutions that are supposed to address its concerns.

Considering the confusion created by the present institutional arrangement describe above, there is an evident need to clarify the institutional framework within which cycling exclusion is to be tackled. This dissertation recommends the formation of a unit that is explicitly charged with non-motorised transport planning. This unit should be charged with the coordinating data collection, planning, prioritisation, budgeting, and implementation of non-motorised transport projects including cycling. The national transport policy should be amended to create room for this unit. At the same time, the revision of the Kenya Vision 2030 under the medium-term planning framework should recognise and actualise this proposed arrangement. Similarly, the County government of Kisumu should also revise the strategic plan for its transport ministry as well as the city's strategic urban development Plan with a view to making them responsive to this proposed institutional framework.

Transport-related social exclusion is more than the exclusion of cyclists

Although addressing the exclusion of cyclists would play an important role in realising inclusive transport in Kisumu, cycling is by no means the only excluded mode. This dissertation found out that pedestrians were equally excluded from the street spaces of Kisumu. In addition, there were also street vendors who claimed the same spaces that were typically assigned to cyclists and pedestrians. It would be difficult to address the exclusion of cyclists without addressing the exclusion of these other claimants to space that would otherwise be assumed to be for cycling. There is hence a need to understand how the users of this space relate and the different possibilities for their co-existence or separation.

7.8 Final remark

The central objective of the current study has been to find out if social exclusion can form a basis for arguing the need to support cycling in medium-sized sub-Saharan cities. The study finds that transport in these cities is characterised by high levels of absolute poverty, limited access to private cars, and active cycling all of which remain invisible to transport planning and policy. This invisibility aggravates the marginalisation of the poor who constitute the majority of cyclists in medium-sized sub-Saharan cities such as Kisumu. Empirical evidence gathered by the study reveals various elements of transport-related social exclusion that can be ameliorated if transport planning in these cities explicitly focused on tackling this form of exclusion. In this regard therefore, the evaluation of transport projects should pay attention to this exclusion in order to identify infrastructure conditions and traffic regulations that are sensitive to the needs of cyclists.

The previous section identified a number of strategies through which infrastructure conditions and traffic regulations that support cycling could be achieved. Based on the conception presented in Figure 2-2, I present the need to challenge and eliminate the conditions that hinder accessibility for cyclists (and users of other excluded modes) as the framework through which inclusive transport planning in sub-Saharan African cities should be formulated. In other words, transport planning should not simply assume that the extant auto-oriented street conditions and traffic regulations that it creates are sufficient to address the travel needs of all socio-economic groups that live in these cities. This is because these conditions generate the exclusion of cyclists and users of other modes that this dissertation identifies. Accordingly therefore, transport planning should proactively create infrastructure conditions and traffic regulations that deliberately recognise and enable cycling and other excluded modes to participate in mobility to access destinations. At the same time, policies that generate these conditions also need to deliberately focus on enabling the use of these excluded modes. To actualise this proposed framework, accessibility modelling should explicitly evaluate the extent to which these conditions of street spaces impede the ease of getting to destinations for the excluded modes. In this case, the impedance imposed by these conditions to accessibility corresponds to their relative contribution to hindering accessibility as revealed in Table 4-3.

Although the study focused on Kisumu, its findings and conclusions are nonetheless relevant to other sub-Saharan African cities given the similarities that characterise their transport situation. The findings and conclusions of the study are also relevant in the context of cities of Latin America and Asia. Researches from these cities show that cyclists face similar exclusion from the streets (Gwilliam, 2003; Pardo, 2009; Pucher et al., 2005). The mode is effectively banned in Indonesia (Gwilliam, 2003), while in India, there is hardly any infrastructure to support its use (Pucher et al., 2005). In Bogota, the commercial use of the mode is illegalised although it still takes place nonetheless (Pardo, 2009). All these conditions limit the ease of reaching destinations by bicycles thereby leading to the marginalisation of travellers who can only afford to use the mode. The findings of this study further point to the possibility of a hidden social exclusion that only remains unknown because it has not been explored in European, American and Australian cities. It would for instance be interesting to find out how new immigrants and student communities cope with the high cost of transport in cities where cycling is poorly facilitated while the cost of public transport is unsubsidised.

7.9 Recommendations for further studies

The findings and arguments of this dissertation support the assertion that the social exclusion of cyclists hinders their accessibility to destinations. The study shows that this accessibility is hindered by a lack of provision of facilities that support cycling. At the same time, the multiplicity of claimants to the space that is typically used by cyclists further hinders accessibility. Lack of designated spaces for cycling and the presence of street vendors and pedestrians on the edge of the road thus imposes a physical barrier to cycling. The scope of the current dissertation could however not permit it to model how this accessibility is hindered by these barriers that it identifies. Neither could this scope permit the study to explore the relationship between these competing claimants to the same street spaces and the implications of this relationship for the ease of cycling on these spaces. This study also reveals that the government is focused on building light rails under the Kenya Vision 2030 plan. This focus presents both an avenue for further exclusion of cyclists and an opportunity for cycling to play a feeder role to the railway system at the same time. However, the study explored neither of these scenarios in detail. Lastly, the study poses that similar transport-related social exclusion could be rife but hidden in the context of European, American and Australian cities. However, this investigation is outside its scope. In view of these uncertain possibilities, the study makes the following recommendations for further research.

i. Accessibility modelling to find out how conditions such as narrow streets, poor road surface conditions, and unsafe street intersections that have been identified in this dissertation to restrict cycling impact on the ease of reaching destinations for cyclists. It would also be of interest to find out how different transport-related policies targets can be assigned weights in order to enable them feed into these accessibility models;
ii. A qualitative investigation of what exclusion from the street spaces mean to the excluded users of these spaces;
iii. Long term studies on travel behaviour change and its policy drivers to enable accurate evaluation of how policy impacts on travel behaviour change;
iv. An investigation of the possibilities for cycling to play a feeder role to motorised modes, Bus Rapid Transit, and the light railway systems that are currently being developed and proposed for development in various sub-Saharan African cities;
v. An examination of the relationship between street vendors, cyclists, and pedestrians in terms of their space requirements and the possibilities for their coexistence or otherwise;
vi. The possibilities of related transport exclusion among new immigrants and student communities in cities of the Global North that neither have cycling infrastructure nor subsidised public transport.

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Appendices

Appendix i: Household interviews schedule

Household interview

Serial No.	ZN___/TAZ___ /HH____
Weather today	
Interviewer's name	

The purpose of this questionnaire is to understand the demand for transport infrastructure, especially for daily travelling e.g. to and from work & school and the determinants of modal choices. **All survey information is confidential.**

Background information

A. Household background information *(Skip if respondent is not the head of the household)*

1. Name of household head (optional)……
2. How many people permanently live in your household? ☐ How many of these members are below the age of 10? ☐
3. Which of the following best describes the tenure structure of the house you live in?

   ☐ Rented house (Owned by Govt) ☐ Rented house (Owned by private investor) ☐ Owner-occupier ☐ Others (Specify)……

4. Since when (year) have you lived in Kisumu? ☐ Have you changed houses since you started living in Kisumu? Yes ☐ No ☐

4.1. If yes, how many times have you changed houses in the last 15 years? ☐

5. What was the **MAIN** factor that you considered before you moved to a new house in each case?

	Case 1	Case 2	Case 3	Case 4	Case 5
Month/ year of movement					
Moved from/to *(Name of estate)*					
Factor(s) considered before moving to new residence? *(Rank if respondent gives more than one main factor)*					
Transport cost to school					
Transport cost to work					
Affordability of house					
Availability of house					
Others (specify)……....					

6. Which of the following modes of transport is available to the household and is actually used by any member of the household for personal transport?

	Bicycle	**Apiko**	**Private car**	**Others (specify)**……
Please **Tick** if available and indicate how many	☐☐	☐☐	☐☐	☐☐

B. Respondent's background information *(Only persons who permanently live in the household including household head)*

Name of respondent (optional) ……

Gender ☐ Male ☐ Female

Age (years) ☐ 10 - 13 ☐ 14 - 18 ☐ 19 - 24 ☐ 25 - 30 ☐ 31 - 40 ☐ 41 - 50 ☐ 51 - 60 ☐ 60+

Marital status ☐ Married ☐ Single ☐ Widowed ☐ Divorced

Relation to head of household ☐ Head ☐ Child ☐ Partner (wife/husband) ☐ Grandchild ☐ Relative (*any relative that is not a member of the nuclear family*)

Total years spent in formal education (e.g. 6 years) ☐

Level of education ☐ None ☐ Primary ☐ Secondary ☐ Artisan ☐ College ☐ University

Main occupation ☐ Student ☐ Employee ☐ Self-employed ☐ Not employed ☐ Housewife ☐ Retiree

Nature of occupation ☐ Full-time ☐ Part-time ☐ Casual (irregularly)

Title of occupation (*Please specify as accurately as possible e.g. teacher, mechanic*)……

Name of place of residence …… Name (s) of place (s) of occupation …… ……...……..

C. Travel mode choice and use

7. Briefly describe your **MAIN** daily travel destinations and the mode of transport you use in the table below.

Place of occupation/ activity (*Exact name of destination*)	Main mode of transport to place of occupation/ activity	Who owns mode? (Self, household head, operator, hired)	Who rides or drives? (Self, member of household, operator)	How many times per week do you travel to this place of occupation/ activity?

8. What factors do you consider when choosing the mode of transport to the destinations you indicated above? (*mention options only when respondent can't answer question)*

		Please indicate destination (s)			*Please indicate destination (s)*
Amount of fare	☐		Social status	☐	
Distance between home and workplace/ school	☐		Route flexibility of mode	☐	
Speed	☐		Parking availability at trip end	☐	
Amount & weight of goods to carry	☐		Mode availability	☐	
Weather	☐		Others (specify)	☐	
Comfort	☐			☐	

8.1. In general, when you pair the factors you mentioned in Q8 above, which one do you consider **MORE** when choosing your daily mode of travel?

	Fare	Distance	Speed	Weight (goods)	Weather	Comfort	Social status	Flexibility	Parking	Mode availability	Others
Fare											
Distance											
Speed											
Weight (goods)											
Weather											
Comfort											
Social status											
Flexibility											
Parking											
Mode availability											
Others											

9. Approximately how long does it take you on foot to reach the nearest public place where you can get the following modes of transport?

	Ngware	**Apiko**	**Tuk tuk**	**Matatu**	**Others (specify)**
Length of time *(minutes)*					

9.1. Approximately how long do you normally have to wait at the stage before the next matatu comes?

	Home to place of occupation	**Place of occupation to home**
Waiting time *(minutes)*		

9.2. Approximately how long do you normally have to wait after boarding a matatu before it starts the journey?

Home to place of occupation	**Place of occupation to home**

10. How frequently do you use the bicycle as the **MAIN** mode of transport?

- ☐ Daily/ almost daily
- ☐ Less than a week per month
- ☐ 1 week to 2 weeks per month
- ☐ More than 2 weeks per month but not for a whole month
- ☐ Almost never
- ☐ Never — Have you ever used the bicycle? ☐ Yes ☐ No — If yes, for what purpose?
- ☐ Others (specify)

11. If the bicycle is used as a secondary mode of transport, what is it used for?

12. What are the **MAIN** reasons why you use the bicycle?

- ☐ It is affordable
- ☐ It is the only available mode
- ☐ Route flexibility/trip-chaining
- ☐ Healthy (exercising)
- ☐ Environmentally clean
- ☐ It is faster compared to other alternatives I have
- ☐ My home is not far from place of occupation
- ☐ Others (specify)

12.1. When you compare each pair of the above reasons why you use the bicycle, what is the **MAIN** reason in each case?

	Affordability	Availability	Route Flexibility	Healthy	Env. Clean	Speed	Distance	
Affordability								
Availability								
Route Flexibility								
Healthy								
Env. clean								
Speed								
Distance								

13. What factors make it difficult for you to cycle to the destinations you mentioned in Q7? (*Ask this question to both cyclists and non-cyclists - Multiple answers possible*)

Lack of riding skills ☐	Bad weather ☐	Destination too far from home ☐	Inappropriate type of bicycle ☐
I don't have access to bicycle ☐	Physical disability/ health impairment ☐	Cycling is slower ☐	Any other (specify) ☐
Cycling is not safe ☐	Age ☐	Unfavourable terrain ☐	☐
Cycling not socially appealing ☐	Poor infrastructure ☐	Exposure to car pollution ☐	

13.1. What is the **MAIN** reason why you say cycling is not safe? *(Ask this question only to respondents who say that cycling is not safe)*

Too many cars on the road	☐	Speeding cars	☐
Too many motorcycles on the roads	☐	Speeding motorcycles	☐
Too many *tuk tuks* on the roads	☐	Speeding *tuk tuks*	☐
Too many pedestrians on the roads	☐		
Weak traffic regulations in favour of cycling	☐		
Uncontrolled/ dangerous junctions	☐		

13.2. When you compare each pair of the above challenges that you identified, which one makes it **MORE** difficult to cycle?

	Lack of riding skills	No access to a bicycle	Cycling is not safe	Not socially appealing	Bad weather	Disability/ health impairment	Age	Poor infrastructure	Destination far from home	Cycling is slower	Unfavourable terrain	Exposure to car pollution	Inappro priate bicycle	Any other
Lack of riding skills														
No access to a bicycle														
Cycling is not safe														
Not socially appealing														
Bad weather														
Disability/ health impairment														
Age														
Poor infrastructure														
Destination far from home														
Cycling is slower														
Unfavourable terrain														
Exposure to car pollution														
Inappropriate bicycles														
Any other														

14. Apart from your daily destinations, are there other destinations that you have wanted to cycle to but you were limited because of the factors you identified in Q 13 above?

☐ Yes

☐ No

14.1. Which destinations are these, what activities would you want to do there and what are the particular limiting factors to cycling to each destination?

Destination	Activity	Limiting factor (s)

D. Changing travel patterns & trends

15. Since when have you lived in Kisumu? _____ & since when have you lived in the current neighbourhood in particular? _____

16. Please describe your main occupation during the following periods, where you did your occupation, where you lived and the main mode of transport to place of occupation during each period.

15 years ago (NDP/KANU merger)	**10 years ago (1st referendum)**	**5 years ago (2nd referendum)**
Name of occupation	*Name of occupation*	*Name of occupation*
Name of place of residence	*Name of place of residence*	*Name of place of residence*
Name of place of occupation	*Name of place of occupation*	*Name of place of occupation*

- ☐ *Walking*
- ☐ *Ngware (self)*
- ☐ *Ngware (passenger)*
- ☐ *Apiko (Self)*
- ☐ *Apiko (passenger)*
- ☐ Private car
- ☐ *Matatu*
- ☐ *Tuk tuk*
- ☐ Others (Specify) ……

NB: Indicate the 'name of place of occupation' together with the name of the place where the respondent picked public transport to place of occupation if place of occupation was outside Kisumu and the respondent used public transport. Consequently, the mode of transport here should be the mode that was used to travel to-from the place where the respondent picked public transport.

Ngware = pedal bicycle; Apiko = Motorcycle; Matatu = Omni bus; Tuk tuk = rickshaw

16.1. If you changed from bicycle as the **MAIN** mode of transport to other modes, what reasons do you give for this?

☐ I no longer have access to a bicycle	☐ Availability of mode I have shifted to	☐ Inappropriate bicycle types
☐ Cycling is banned from the city centre	☐ Fewer bicycles operators	☐ Unfavourable weather conditions
☐ Cannot cycle anymore (health, age…)	☐ No secure bicycle parking at destination	☐ Cycling is not socially appealing
☐ It's no longer safe to cycle *(See Q13.1)*	☐ No secure bicycle parking at home	☐
☐ Place of occupation is now far	☐ Improved income	☐

16.2. Of the above reasons you have given, which one **BEST** explains why you shifted from using the bicycle to the mode you changed to?

_____

17. If you have never used the bicycle as the **MAIN** mode of transport, what reasons do you give for this? *(Skip if Q 16.1 is answered)*

☐ I do not have access to a bicycle	☐ Availability of mode I use	☐ Unfavourable weather conditions
☐ Cycling is banned from the city centre	☐ Fewer bicycles operators	☐ I do not know how to cycle
☐ Cannot cycle due to health, age…	☐ No secure bicycle parking at destination	☐ Cycling is not socially appealing
☐ Cycling is not safe	☐ No secure bicycle parking at home	☐
☐ My place of occupation is far	☐ Inappropriate bicycle types	☐

17.1. Of the above reasons you have given, which one **BEST** explains why you have never used the bicycle?

_____

17.2. What would motivate you to cycle (*for non-cyclists*)/cycle more than you currently do (*for active cyclists*)?

☐ Having my own bicycle	☐ Cycling knowledge/ skill	☐ Unfavourable weather conditions
☐ Cycling-friendly traffic rules/regulations	☐ More operators	☐ Appropriate bicycle types for my condition
☐ Having bicycles for physically-challenged	☐ Secure bicycle parking at destination	☐ Cycling is not socially appealing
☐ Improved safety	☐ Secure bicycle parking at home	☐ Living close of place of occupation

17.3. For what purpose (s) would you **actually** cycle? ☐ Work ☐ School ☐ Visiting friends ☐ Shopping ☐ Exercise ☐ None ☐ Others (specify) .....

17.4. What is the maximum length of time that you would cycle if the limitations you identified in Q16.1 or 17 above were not there?

20 ☐ Minutes
30 ☐ Minutes
40 ☐ Minutes
1 ☐ hour

18. If you changed from other modes to bicycle, what reasons do you give for this?

☐ Affordability
☐ Only means I can afford
☐ Cycling is faster than previous mode
☐ Place of occupation is near my place of residence
☐ I now have access to a bicycle
☐
☐ I am now able to cycle
☐
☐ Environmental concerns
☐

18.1. Of the above reasons you have given, which one **BEST** explains why you shifted from other modes to the bicycle?

_____

19. If there was no change from bicycling, what reasons do you give for this?

☐ Affordability
☐ Only means I can afford
☐ Cycling is faster than other modes
☐ Place of occupation is near
☐ I have my bicycle
☐
☐ Am able to cycle
☐
☐ Environmental concerns
☐

20. Of the above reasons you have given, which one **BEST** explains why you have never changed from using the bicycle?

_____

E. Potential for use among children

21. Would you allow your children to use bicycle to school under the current conditions? *(Ask this question to the household heads with children only - refer to Q 13 to guide respondent)*

☐ They already do ☐ Yes, all ☐ Yes, only some, which ones? _____

☐ No

21.1. If 'yes, all' why are they not cycling at the moment?

21.2. If none or only some can be allowed to cycle to school, what reasons do you give for your answer?

21.3. If none or only some can be allowed to cycle to school, would you allow them to use the bicycle to school if the concerns you mentioned in question 21.2 above were corrected?

☐ Yes

☐ No

21.4. How would you prefer them to use the bicycle to school?

☐ Cycle themselves

☐ Travel as passengers

21.5. What reason do you give for your answer to question 21.4 above?

F. Quality of cycling infrastructure

22. While travelling between your main daily origin and destination, does the following factor present a significant hindrance to using the primary mode that you use on the route that you regularly use?

hindrance	If yes, where or between what junctions?	What do you do in such a situation?
☐ Narrow roads		☐ Avoid section ☐ Change travel time ☐ Travel slowly ☐ Travel normally
☐ Difficulty in crossing junctions		☐ Avoid junction ☐ Change travel time ☐ Travel slowly ☐ Travel normally
☐ Poor road surface conditions		☐ Avoid section ☐ Change travel time ☐ Travel slowly ☐ Travel normally
☐ Difficult drivers		☐ Avoid section ☐ Change travel time ☐ Travel slowly ☐ Travel normally
☐ High volumes of pedestrians along routes		☐ Avoid section ☐ Change travel time ☐ Travel slowly ☐ Travel normally
☐ High volumes of cars, motorcycles & *tuk tuks* along route		☐ Avoid section ☐ Change travel time ☐ Travel slowly ☐ Travel normally
☐ Speeding cars, motorcycles & *tuk tuks*		☐ Avoid section ☐ Change travel time ☐ Travel slowly ☐ Travel normally
☐ Bad road shoulders *(worn out, hawkers or kerbs)*		☐ Avoid section ☐ Change travel time ☐ Travel slowly ☐ Travel normally
☐ Lack of bicycle storage facilities		Where do you park instead?
☐		How do you tackle the problem?

23. When you pair the above problems that you encounter while travelling, which one presents you with **MORE** challenges?

	Narrow roads	Difficulty in crossing junctions	Poor road surface conditions	Difficult drivers	High volumes of pedestrians along routes	High volume of cars…	Speeding cars…	Bad road shoulders …	Lack of parking facilities	
Narrow roads										
Difficulty in crossing junctions										
Poor road surface conditions										
Difficult drivers										
High volumes of pedestrians along routes										
High volumes of cars…										
Speeding cars…										
Bad road shoulders…										
Lack of storage facilities										

24. When you look at Kisumu in general, how would you describe the ease of cycling in the city?

- ☐ Very easy
- ☐ Somewhat easy
- ☐ Neither easy nor difficult
- ☐ Somewhat difficult
- ☐ Very difficult

25. Does the quality of transport infrastructure and service in Kisumu affect your quality of life? ☐ Yes ☐ No

25.1. If yes, how does it affect the quality of your life?

25.2. Given the quality of transport infrastructure and service, are you satisfied with your quality of life? ☐ Yes ☐ No

26. What improvements to cycling infrastructure and conditions to cycling would make it easier for you to use the bicycle in Kisumu?

Suggested improvement	Any specific place? (give name)

27. Approximate what would you say is your own net monthly income (Ksh.) ☐ Nil ☐ < 10,000 ☐ 10,001 – 19,000 ☐ 19,001 – 29,000 ☐ 29,001 – 38,000 ☐ 38,000 – 50,000 ☐ 50,000 – 100,000 ☐ >100,000

28. Occupation of the household head (if respondent is not the head) ……

Thank you for your time & cooperation! ☺

Appendix ii: Observation checklist

- What are the physical conditions of the streets (widths, surface quality, quality of road shoulders, provision for cycling, traffic control etc.)
- What are the differences in quality of the streets between the zones delineated by this study?
- How do different mode users relate on the streets? What is the relationship between different modes and cyclists?
- What are the different uses of the bicycle?

Appendix iii: Expert interview checklist

Expert of NMT/ Government officials at CGK

- The challenges that face planning for cycling in Kenya general and Kisumu specifically
- The challenges that face cycling in Kisumu and its spatial dimension,
- Government commitment to providing for cycling in the wake of the emergence of commercial motorcycling
- Relationship between the emergence of Kisumu as a university city and cycling
- Government plans to accommodate cycling under the on-going transport infrastructure improvement programme
- Opportunities and challenges presented by the Kenya Vison 2030 and the Integrated National Transport Policy for local transport planning and cycling planning in particular
- The extent of multi-modal infrastructure planning and planning for cycling in particular, future plans and strategies to encourage and accommodate cycling.
- Trends in Government commitment to supporting cycling
- The changing patterns of cycling with the emergence of other modes – particularly the motorcycle
- Relevance of cycling in the wake of increasing commercial motorcycling
- Strategies that could encourage cycling
- Plans in place to encourage and accommodate cycling under the on-going transport infrastructure improvement programme

Appendix iv: Monthly average temperatures and precipitates for Kisumu

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec		
Max. Temp (° C)	30.6	30.8	30.4	28.8	28.2	27.9	27.7	28.2	29.4	30.5	30.1	29.9	Average	29.4
Min. Temp (° C)	23.8	24.1	24.1	23.4	22.8	22.2	21.9	22.2	22.8	23.8	23.7	23.5	Average	23.2
Precipitation (mm)	79	84	169	213	167	85	85	81	90	95	139	101	Total	1388
Sunshine hrs (h/d)	8.6	8.7	8.5	7.7	7.8	7.5	6.9	6.9	7.6	7.7	7.3	8.2	Average	7.8
Rainy days (d)	7	10	11	17	13	8	7	8	8	10	13	9	Total	121
Humidity (%)	64	65	67	75	76	74	71	69	67	65	68	66	Average	68.9

Source: Data from Kenya Meteorological Department – for the period 1938-1990

Appendix v: Household and individual response rates according to sub-zones

Zone II

Sub-zone	No. of households	Household response rate (%)	Expected No. of individual respondents	Actual No. of individual respondents	Individual responses rate (%)
1	40	100	95	62	65.26
2	40	100	77	53	68.83
3	32	80	65	43	66.15
4	14	35	24	15	62.50
5	30	75	75	37	49.33
6	16	40	44	25	56.82
7	17	42.5	50	28	56.00
8	21	52.5	68	32	47.06
9	13	32.5	29	16	55.17
10	40	100	97	52	53.61
11	34	85	74	46	62.16
12	39	97.5	87	62	71.26
13	34	85	73	45	61.64
14	35	87.5	75	49	65.33
15	14	35	34	19	55.88
16	40	100	98	58	59.18
17	15	37.5	27	22	81.48
18	38	95	95	54	56.84
19	32	80	74	48	64.86
20	27	67.5	74	38	51.35
21	30	75	74	41	55.41
22	30	75	70	39	55.71
23	16	40	48	18	37.50
24	21	52.5	54	42	77.78
25	40	100	97	53	54.64
26	39	97.5	86	48	55.81
27	21	52.5	52	27	51.92
28	36	90	85	46	54.12
Zone II total	804	71.79	1,901	1,118	58.81

Appendix v: Household and individual response rates according to sub-zones – cont'd

Zone 1

Sub-zone	No. of households	Household response rate (%)	Expected No. of individual respondents	Actual No. of individual respondents	Individual responses rate (%)
29	4	10	7	7	100.00
30	9	22.5	15	13	86.67
31	9	22.5	11	11	100.00
32	3	7.5	13	5	38.46
33	2	5	3	3	100.00
34	7	17.5	14	9	64.29
35	24	60	55	39	70.91
36	8	20	18	12	66.67
37	19	47.5	39	27	69.23
38	20	50	46	36	78.26
39	22	55	57	41	71.93
40	1	2.5	2	2	100.00
41	20	50	45	26	57.78
42	30	75	84	37	44.05
43	5	12.5	12	6	50.00
44	47	117.5	95	66	69.47
45	23	57.5	58	40	68.97
46	34	85	81	49	60.49
47	16	40	35	21	60.00
Zone I total	303	39.86	690	450	65.22
Zone III					
48	40	100	103	80	77.67
49	37	92.5	102	64	62.75
50	40	100	89	65	73.03
51	30	75	80	38	47.50
52	42	105	110	69	62.73
53	40	100	100	57	57.00
54	10	25	22	11	50.00
55	30	75	82	42	51.22
56	40	100	99	54	54.55
57	38	95	110	61	55.45
58	28	70	68	40	58.82
59	8	20	23	16	69.57
Zone III total	383	79.79	988	597	69.57
Study area total	**1,490**	**63.14**	**3,579**	**2,165**	**60.49**

Modelling the exclusion of cycling relative to other modes

1.1. Preliminary model screening

Data Information

		N
Cases	Valid	2165
	Out of Range[a]	0
	Missing	0
	Weighted Valid	2165
Categories	Mode	5
	Do narrow roads (NR) pose a significant hindrance?	2
	Does difficulty in crossing junctions (RJ) pose a significant hindrance?	2
	Do poor road surface conditions (RC) pose a significant hindrance?	2
	Do difficult/ careless drivers (CD) pose a significant hindrance?	2

a. Cases rejected because of out of range factor values.

Convergence Information

Generating Class	Mode3*NR*RJ*RC*CD
Number of Iterations	1
Max. Difference between Observed and Fitted Marginals	.000
Convergence Criterion	.250

K-Way and Higher-Order Effects

			Likelihood Ratio		Pearson		Number of
	K	df	Chi-Square	p-value	Chi-Square	p-value	Iterations
K-way and Higher Order Effects[a]	1	79	2448.756	.000	3340.885	.000	0
	2	71	1139.540	.000	1486.679	.000	2
	3	49	190.321	.000	198.253	.000	6
	4	21	16.726	.728	15.077	.819	6
	5	4	2.542	.637	2.199	.699	6
K-way Effects[b]	1	8	1309.216	.000	1854.206	.000	0
	2	22	949.219	.000	1288.426	.000	0
	3	28	173.595	.000	183.177	.000	0
	4	17	14.184	.654	12.878	.744	0
	5	4	2.542	.637	2.199	.699	0

df used for these tests have NOT been adjusted for structural or sampling zeros. Tests using these df may be conservative.
a. Tests that k-way and higher order effects are zero.
b. Tests that k-way effects are zero.

Partial Associations

Effect	df	Partial Chi-Square	p-value	Number of Iterations
Mode3*NR*RJ*RC	4	1.964	.742	6
Mode3*NR*RJ*CD	4	2.795	.593	5
Mode3*NR*RC*CD	4	4.178	.382	7
Mode3*RJ*RC*CD	4	1.548	.818	7
NR*RJ*RC*CD	1	3.170	.075	4
Mode3*NR*RJ	4	62.700	.000	6
Mode3*NR*RC	4	18.301	.001	6
Mode3*RJ*RC	4	12.007	.017	6
NR*RJ*RC	1	4.579	.032	6
Mode3*NR*CD	4	5.864	.210	6
Mode3*RJ*CD	4	6.979	.137	6
NR*RJ*CD	1	.158	.691	6
Mode3*RC*CD	4	18.395	.001	5
NR*RC*CD	1	7.832	.005	5
RJ*RC*CD	1	9.798	.002	6
Mode3*NR	4	94.807	.000	5
Mode3*RJ	4	264.549	.000	6
NR*RJ	1	144.281	.000	5
Mode3*RC	4	93.677	.000	6
NR*RC	1	11.739	.001	6
RJ*RC	1	1.729	.188	6
Mode3*CD	4	53.550	.000	5
NR*CD	1	1.761	.184	5
RJ*CD	1	32.867	.000	5
RC*CD	1	15.413	.000	6
Mode3	4	461.259	.000	2
NR	1	22.599	.000	2
RJ	1	9.452	.002	2
RC	1	237.886	.000	2
CD	1	578.020	.000	2

Convergence Information[a]

Generating Class	Mode3*RJ*RC, Mode3*NR*RJ, Mode3*NR*RC, Mode3*RC*CD, NR*RC*CD, RJ*RC*CD
Number of Iterations	0
Max. Difference between Observed and Fitted Marginals	.000
Convergence Criterion	.250

a. Statistics for the final model after Backward Elimination.

Goodness-of-Fit Tests

	Chi-Square	df	p-value
Likelihood Ratio	33.147	31	.363
Pearson	31.622	31	.435

1.2. Stepwise model selection

Step Summary

Step[a]			Effects	Chi-Square[c]	df	p-value	Number of Iterations
0	Generating Class[b]		Mode3*NR*RJ, Mode3*NR*RC, Mode3*RC*CD, NR*RC*CD, RJ*RC*CD, Mode3*RJ*RC, NR*RJ*RC	28.369	30	.551	
	Deleted Effect	1	Mode3*NR*RJ	62.710	4	.000	5
		2	Mode3*NR*RC	19.255	4	.001	5
		3	Mode3*RC*CD	23.255	4	.000	4
		4	NR*RC*CD	10.382	1	.001	5
		5	RJ*RC*CD	12.565	1	.000	5
		6	Mode3*RJ*RC	12.282	4	.015	6
		7	NR*RJ*RC	4.778	1	.029	5
1	Generating Class[b]		Mode3*NR*RJ, Mode3*NR*RC, Mode3*RC*CD, NR*RC*CD, RJ*RC*CD, Mode3*RJ*RC	33.147	31	.363	
	Deleted Effect	1	Mode3*NR*RJ	61.591	4	.000	5
		2	Mode3*NR*RC	15.353	4	.004	6
		3	Mode3*RC*CD	23.134	4	.000	5
		4	NR*RC*CD	10.867	1	.001	5
		5	RJ*RC*CD	11.533	1	.001	6
		6	Mode3*RJ*RC	11.919	4	.018	6
2	Generating Class[b]		Mode3*NR*RJ, Mode3*NR*RC, Mode3*RC*CD, NR*RC*CD, RJ*RC*CD	45.067	35	.119	
	Deleted Effect	1	Mode3*NR*RJ	65.472	4	.000	5
		2	Mode3*NR*RC	36.340	4	.000	5
		3	Mode3*RC*CD	24.325	4	.000	6
		4	NR*RC*CD	10.695	1	.001	6
		5	RJ*RC*CD	12.782	1	.000	6
3	Generating Class[b]		Mode3*NR*RJ, Mode3*NR*RC, Mode3*RC*CD, NR*RC*CD, RJ*RC*CD	45.067	35	.119	

a. At each step, the effect with the largest significance level for the Likelihood Ratio Change is deleted, provided the significance level is larger than .010.

b. Statistics are displayed for the best model at each step after step 0.

c. For 'Deleted Effect', this is the change in the Chi-Square after the effect is deleted from the model.

Convergence Information[a]

Generating Class	Mode3*NR*RJ, Mode3*NR*RC, Mode3*RC*CD, NR*RC*CD, RJ*RC*CD
Number of Iterations	0
Max. Difference between Observed and Fitted Marginals	.086
Convergence Criterion	.250

a. Statistics for the final model after Backward Elimination.

Goodness-of-Fit Tests

	Chi-Square	df	p-value
Likelihood Ratio	45.067	35	.119
Pearson	43.210	35	.161

1.3. Calculating the residuals

Backward Elimination Statistics

Step Summary

Step[a]			Effects	Chi-Square[c]	df	p-value	Number of Iterations
0	Generating Class[b]		Mode3*NR*RJ, Mode3*NR*RC, Mode3*RC*CD, NR*RC*CD, RJ*RC*CD, Mode3*RJ*RC, NR*RJ*RC	28.369	30	.551	
	Deleted Effect	1	Mode3*NR*RJ	62.710	4	.000	5
		2	Mode3*NR*RC	19.255	4	.001	5
		3	Mode3*RC*CD	23.255	4	.000	4
		4	NR*RC*CD	10.382	1	.001	5
		5	RJ*RC*CD	12.565	1	.000	5
		6	Mode3*RJ*RC	12.282	4	.015	6
		7	NR*RJ*RC	4.778	1	.029	5
1	Generating Class[b]		Mode3*NR*RJ, Mode3*NR*RC, Mode3*RC*CD, NR*RC*CD, RJ*RC*CD, Mode3*RJ*RC, NR*RJ*RC	28.369	30	.551	

a. At each step, the effect with the largest significance level for the Likelihood Ratio Change is deleted, provided the significance level is larger than .050.

b. Statistics are displayed for the best model at each step after step 0.

c. For 'Deleted Effect', this is the change in the Chi-Square after the effect is deleted from the model.

Convergence Information[a]

Generating Class	Mode3*NR*RJ, Mode3*NR*RC, Mode3*RC*CD, NR*RC*CD, RJ*RC*CD, Mode3*RJ*RC, NR*RJ*RC
Number of Iterations	0
Max. Difference between Observed and Fitted Marginals	.086
Convergence Criterion	.250

a. Statistics for the final model after Backward Elimination.

Cell Counts and Residuals

Mode	Do narrow roads pose a significant hindrance?	Does difficulty in crossing junctions pose a significant hindrance?	Do poor road surface conditions pose a significant hindrance?	Do difficult/ careless drivers pose a significant hindrance?	Observed		Expected		Residuals	Std. Residuals
					Count	%	Count	%		
Walking	Yes	Yes	Yes	Yes	39.000	1.8%	45.473	2.1%	-6.473	-.960
				No	22.000	1.0%	16.688	0.8%	5.312	1.300
			No	Yes	34.000	1.6%	33.230	1.5%	.770	.134
				No	15.000	0.7%	14.610	0.7%	.390	.102
		No	Yes	Yes	44.000	2.0%	42.764	2.0%	1.236	.189
				No	37.000	1.7%	37.075	1.7%	-.075	-.012
			No	Yes	29.000	1.3%	29.327	1.4%	-.327	-.060
				No	11.000	0.5%	11.834	0.5%	-.834	-.242
	No	Yes	Yes	Yes	29.000	1.3%	25.851	1.2%	3.149	.619
				No	11.000	0.5%	12.988	0.6%	-1.988	-.552
			No	Yes	13.000	0.6%	15.246	0.7%	-2.246	-.575
				No	5.000	0.2%	3.915	0.2%	1.085	.548
		No	Yes	Yes	36.000	1.7%	33.912	1.6%	2.088	.359
				No	37.000	1.7%	40.249	1.9%	-3.249	-.512
			No	Yes	13.000	0.6%	11.203	0.5%	1.797	.537
				No	2.000	0.1%	2.640	0.1%	-.640	-.394
Bicycle (self)	Yes	Yes	Yes	Yes	190.000	8.8%	186.268	8.6%	3.732	.273
				No	47.000	2.2%	48.967	2.3%	-1.967	-.281
			No	Yes	109.000	5.0%	109.986	5.1%	-.986	-.094
				No	21.000	1.0%	21.778	1.0%	-.778	-.167
		No	Yes	Yes	56.000	2.6%	50.442	2.3%	5.558	.783
				No	24.000	1.1%	31.326	1.4%	-7.326	-1.309
			No	Yes	35.000	1.6%	34.045	1.6%	.955	.164
				No	7.000	0.3%	6.187	0.3%	.813	.327
	No	Yes	Yes	Yes	90.000	4.2%	91.010	4.2%	-1.010	-.106
				No	32.000	1.5%	32.754	1.5%	-.754	-.132
			No	Yes	34.000	1.6%	33.375	1.5%	.625	.108
				No	5.000	0.2%	3.860	0.2%	1.140	.580
		No	Yes	Yes	74.000	3.4%	82.278	3.8%	-8.278	-.913
				No	80.000	3.7%	69.954	3.2%	10.046	1.201
			No	Yes	20.000	0.9%	20.586	1.0%	-.586	-.129
				No	1.000	0.0%	2.185	0.1%	-1.185	-.802
Bicycle (operator)	Yes	Yes	Yes	Yes	60.000	2.8%	63.107	2.9%	-3.107	-.391
				No	10.000	0.5%	8.838	0.4%	1.162	.391
			No	Yes	47.000	2.2%	44.413	2.1%	2.587	.388
				No	14.000	0.6%	14.640	0.7%	-.640	-.167
		No	Yes	Yes	20.000	0.9%	18.827	0.9%	1.173	.270
				No	7.000	0.3%	6.229	0.3%	.771	.309
			No	Yes	9.000	0.4%	10.705	0.5%	-1.705	-.521
				No	3.000	0.1%	3.238	0.1%	-.238	-.133
	No	Yes	Yes	Yes	28.000	1.3%	26.898	1.2%	1.102	.213
				No	6.000	0.3%	5.157	0.2%	.843	.371
			No	Yes	13.000	0.6%	16.727	0.8%	-3.727	-.911
				No	5.000	0.2%	3.221	0.1%	1.779	.991
		No	Yes	Yes	18.000	0.8%	17.168	0.8%	.832	.201
				No	5.000	0.2%	7.776	0.4%	-2.776	-.996
			No	Yes	8.000	0.4%	5.148	0.2%	2.852	1.257
				No	.000	0.0%	.910	0.0%	-.910	-.954

Motorcycle	Yes	Yes	Yes	Yes	107.000	4.9%	104.659	4.8%	2.341	.229
				No	11.000	0.5%	13.108	0.6%	-2.108	-.582
			No	Yes	28.000	1.3%	28.228	1.3%	-.228	-.043
				No	5.000	0.2%	5.006	0.2%	-.006	-.003
		No	Yes	Yes	15.000	0.7%	17.930	0.8%	-2.930	-.692
				No	8.000	0.4%	5.305	0.2%	2.695	1.170
			No	Yes	4.000	0.2%	4.958	0.2%	-.958	-.430
				No	2.000	0.1%	.807	0.0%	1.193	1.328
	No	Yes	Yes	Yes	29.000	1.3%	27.516	1.3%	1.484	.283
				No	3.000	0.1%	4.718	0.2%	-1.718	-.791
			No	Yes	9.000	0.4%	7.943	0.4%	1.057	.375
				No	.000	0.0%	.823	0.0%	-.823	-.907
		No	Yes	Yes	21.000	1.0%	21.895	1.0%	-.895	-.191
				No	10.000	0.5%	8.869	0.4%	1.131	.380
			No	Yes	4.000	0.2%	3.868	0.2%	.132	.067
				No	.000	0.0%	.368	0.0%	-.368	-.606
Private car,	Yes	Yes	Yes	Yes	44.000	2.0%	43.373	2.0%	.627	.095
Matatu & tuk				No	5.000	0.2%	4.519	0.2%	.481	.226
tuk			No	Yes	13.000	0.6%	12.398	0.6%	.602	.171
				No	3.000	0.1%	4.712	0.2%	-1.712	-.789
		No	Yes	Yes	22.000	1.0%	24.156	1.1%	-2.156	-.439
				No	7.000	0.3%	5.946	0.3%	1.054	.432
			No	Yes	20.000	0.9%	20.684	1.0%	-.684	-.150
				No	9.000	0.4%	7.214	0.3%	1.786	.665
	No	Yes	Yes	Yes	7.000	0.3%	8.846	0.4%	-1.846	-.621
				No	2.000	0.1%	1.262	0.1%	.738	.657
			No	Yes	8.000	0.4%	6.457	0.3%	1.543	.607
				No	1.000	0.0%	1.433	0.1%	-.433	-.362
		No	Yes	Yes	111.000	5.1%	107.628	5.0%	3.372	.325
				No	34.000	1.6%	36.271	1.7%	-2.271	-.377
			No	Yes	139.000	6.4%	140.473	6.5%	-1.473	-.124
				No	29.000	1.3%	28.618	1.3%	.382	.071

Goodness-of-Fit Tests

	Chi-Square	df	p-value
Likelihood Ratio	28.369	30	.551
Pearson	26.865	30	.630

Modelling the exclusion of cycling on its own

1.4. Preliminary model screening

Data Information

		N
Cases	Valid	1078
	Out of Range[a]	0
	Missing	0
	Weighted Valid	1078
Categories	Do narrow roads (NR) pose a significant hindrance?	2
	Does difficulty in crossing junctions (RJ) pose a significant hindrance?	2
	Do difficult/ careless drivers (CD) pose a significant hindrance?	2
	Do high volumes of pedestrians (VPED) along routes pose a significant hindrance?	2
	Do speeding motorised modes (SPM) pose a significant hindrance?	2

a. Cases rejected because of out of range factor values.

Design 1

Convergence Information

Generating Class	NR*RJ*CD*VPED*SPM
Number of Iterations	1
Max. Difference between Observed and Fitted Marginals	.000
Convergence Criterion	.299

K-Way and Higher-Order Effects

			Likelihood Ratio Chi-Square		Pearson Chi-Square		Number of Iterations
	K	df		p-value		p-value	
K-way and Higher Order Effects[a]	1	31	2062.545	.000	3087.759	.000	0
	2	26	1353.119	.000	1924.552	.000	2
	3	16	14.513	.561	14.396	.569	17
	4	6	2.483	.870	1.847	.933	8
	5	1	.000	.997	.000	.997	3
K-way Effects[b]	1	5	709.426	.000	1163.207	.000	0
	2	10	1338.606	.000	1910.156	.000	0
	3	10	12.030	.283	12.549	.250	0
	4	5	2.483	.779	1.847	.870	0
	5	1	.000	.997	.000	.997	0

df used for these tests have NOT been adjusted for structural or sampling zeros. Tests using these df may be conservative.

a. Tests that k-way and higher order effects are zero.

b. Tests that k-way effects are zero.

Partial Associations

Effect	df	Partial Chi-Square	p-value	Number of Iterations
NR*RJ*CD*VPED	1	.000	.992	4
NR*RJ*CD*SPM	1	.659	.417	7
NR*RJ*VPED*SPM	1	.495	.482	5
NR*CD*VPED*SPM	1	.000	.997	3
RJ*CD*VPED*SPM	1	.293	.588	4
NR*RJ*CD	1	4.171	.041	6
NR*RJ*VPED	1	.017	.898	8
NR*CD*VPED	1	.183	.669	8
RJ*CD*VPED	1	.000	1.000	9
NR*RJ*SPM	1	.148	.700	10
NR*CD*SPM	1	.733	.392	5
RJ*CD*SPM	1	.591	.442	10
NR*VPED*SPM	1	.595	.441	10
RJ*VPED*SPM	1	.032	.858	8
CD*VPED*SPM	1	.966	.326	9
NR*RJ	1	11.487	.001	15
NR*CD	1	.009	.925	18
RJ*CD	1	.256	.613	15
NR*VPED	1	31.383	.000	16
RJ*VPED	1	2.961	.085	13
CD*VPED	1	291.461	.000	15
NR*SPM	1	.250	.617	16
RJ*SPM	1	660.875	.000	7
CD*SPM	1	1.252	.263	15
VPED*SPM	1	10.837	.001	14
NR	1	53.883	.000	2
RJ	1	111.717	.000	2
CD	1	287.555	.000	2
VPED	1	15.234	.000	2
SPM	1	241.037	.000	2

Convergence Information[a]

Generating Class	CD*VPED*SPM, NR*VPED*SPM, RJ*VPED, NR*RJ*CD, NR*RJ*SPM, NR*CD*SPM, RJ*CD*SPM
Number of Iterations	0
Max. Difference between Observed and Fitted Marginals	.000
Convergence Criterion	.299

a. Statistics for the final model after Backward Elimination.

Goodness-of-Fit Tests

	Chi-Square	df	p-value
Likelihood Ratio	2.705	10	.988
Pearson	1.896	10	.997

1.5. Stepwise model selection

Step Summary

Step[a]			Effects	Chi-Square[c]	df	p-value	Number of Iterations
0	Generating Class[b]		NR*RJ, NR*VPED, CD*VPED, RJ*SPM, VPED*SPM	19.189	21	.573	
	Deleted Effect	1	NR*RJ	42.350	1	.000	2
		2	NR*VPED	45.231	1	.000	2
		3	CD*VPED	334.612	1	.000	4
		4	RJ*SPM	750.703	1	.000	2
		5	VPED*SPM	80.592	1	.000	2
1	Generating Class[b]		NR*RJ, NR*VPED, CD*VPED, RJ*SPM, VPED*SPM	19.189	21	.573	

a. At each step, the effect with the largest significance level for the Likelihood Ratio Change is deleted, provided the significance level is larger than .010.

b. Statistics are displayed for the best model at each step after step 0.

c. For 'Deleted Effect', this is the change in the Chi-Square after the effect is deleted from the model.

Convergence Information[a]

Generating Class	NR*RJ, NR*VPED, CD*VPED, RJ*SPM, VPED*SPM
Number of Iterations	0
Max. Difference between Observed and Fitted Marginals	.192
Convergence Criterion	.299

a. Statistics for the final model after Backward Elimination.

Goodness-of-Fit Tests

	Chi-Square	df	p-value
Likelihood Ratio	19.189	21	.573
Pearson	20.508	21	.489

1.6. Calculating the residuals

Backward Elimination Statistics

Step Summary

Step[a]			Effects	Chi-Square[c]	df	p-value	Number of Iterations
0	Generating Class[b]		NR*RJ, NR*VPED, CD*VPED, RJ*SPM, VPED*SPM	19.189	21	.573	
	Deleted Effect	1	NR*RJ	42.350	1	.000	2
		2	NR*VPED	45.231	1	.000	2
		3	CD*VPED	334.612	1	.000	4
		4	RJ*SPM	750.703	1	.000	2
		5	VPED*SPM	80.592	1	.000	2
1	Generating Class[b]		NR*RJ, NR*VPED, CD*VPED, RJ*SPM, VPED*SPM	19.189	21	.573	

a. At each step, the effect with the largest significance level for the Likelihood Ratio Change is deleted, provided the significance level is larger than .010.

b. Statistics are displayed for the best model at each step after step 0.

c. For 'Deleted Effect', this is the change in the Chi-Square after the effect is deleted from the model.

Convergence Information[a]

Generating Class	NR*RJ, NR*VPED, CD*VPED, RJ*SPM, VPED*SPM
Number of Iterations	0
Max. Difference between Observed and Fitted Marginals	.192
Convergence Criterion	.299

a. Statistics for the final model after Backward Elimination.

Goodness-of-Fit Tests

	Chi-Square	df	p-value
Likelihood Ratio	19.189	21	.573
Pearson	20.508	21	.489

Cell Counts and Residuals

narrow roads	difficulty in crossing junctions	careless drivers	high volumes of pedestrians	speeding motorised transport	Observed Count	Observed %	Expected Count	Expected %	Residuals	Std. Residuals
Yes	Yes	Yes	Yes	Yes	299.000	27.7%	295.749	27.4%	3.251	.189
				No	1.000	0.1%	1.206	0.1%	-.206	-.187
			No	Yes	104.000	9.6%	110.087	10.2%	-6.087	-.580
				No	2.000	0.2%	1.845	0.2%	.155	.114
		No	Yes	Yes	2.000	0.2%	2.512	0.2%	-.512	-.323
				No	.000	0.0%	.010	0.0%	-.010	-.101
			No	Yes	88.000	8.2%	85.156	7.9%	2.844	.308
				No	2.000	0.2%	1.427	0.1%	.573	.480
	No	Yes	Yes	Yes	24.000	2.2%	24.984	2.3%	-.984	-.197
				No	30.000	2.8%	32.051	3.0%	-2.051	-.362
			No	Yes	14.000	1.3%	9.300	0.9%	4.700	1.541
				No	52.000	4.8%	49.052	4.6%	2.948	.421
		No	Yes	Yes	.000	0.0%	.212	0.0%	-.212	-.461
				No	1.000	0.1%	.272	0.0%	.728	1.395
			No	Yes	5.000	0.5%	7.194	0.7%	-2.194	-.818
				No	35.000	3.2%	37.943	3.5%	-2.943	-.478
No	Yes	Yes	Yes	Yes	84.000	7.8%	79.394	7.4%	4.606	.517
				No	1.000	0.1%	.324	0.0%	.676	1.189
			No	Yes	79.000	7.3%	73.541	6.8%	5.459	.637
				No	1.000	0.1%	1.232	0.1%	-.232	-.209
		No	Yes	Yes	.000	0.0%	.674	0.1%	-.674	-.821
				No	.000	0.0%	.003	0.0%	-.003	-.052
			No	Yes	48.000	4.5%	56.886	5.3%	-8.886	-1.178
				No	.000	0.0%	.953	0.1%	-.953	-.976
	No	Yes	Yes	Yes	11.000	1.0%	16.336	1.5%	-5.336	-1.320
				No	21.000	1.9%	20.956	1.9%	.044	.010
			No	Yes	17.000	1.6%	15.131	1.4%	1.869	.480
				No	71.000	6.6%	79.810	7.4%	-8.810	-.986
		No	Yes	Yes	.000	0.0%	.139	0.0%	-.139	-.372
				No	1.000	0.1%	.178	0.0%	.822	1.949
			No	Yes	14.000	1.3%	11.705	1.1%	2.295	.671
				No	71.000	6.6%	61.736	5.7%	9.264	1.179

Goodness-of-Fit Tests

	Chi-Square	df	p-value
Likelihood Ratio	19.189	21	.573
Pearson	20.508	21	.489

Appendix viii: Composition of respondents according to income levels of household of origin

Household income (<=)	Number of respondents	Percentage of respondents	Cumulative percentage
10,000	603	27.9	27.9
19,000	360	16.6	44.5
20,000	220	10.2	54.6
29,000	287	13.3	67.9
30,000	47	2.2	70.1
38,000	121	5.6	75.7
39,000	91	4.2	79.9
40,000	4	0.2	80
48,000	99	4.6	84.6
49,000	7	0.3	84.9
50,000	40	1.8	86.8
57,000	32	1.5	88.3
58,000	29	1.3	89.6
60,000	12	0.6	90.2
67,000	19	0.9	91
69,000	16	0.7	91.8
76,000	6	0.3	92.1
77,000	3	0.1	92.2
79,000	23	1.1	93.3
88,000	11	0.5	93.8
89,000	3	0.1	93.9
98,000	3	0.1	94
100,000	49	2.3	96.3
100,001	11	0.5	96.8
108,000	5	0.2	97
110,000	4	0.2	97.2
110,001	4	0.2	97.4
119,000	4	0.2	97.6
119,001	2	0.1	97.7
120,000	4	0.2	97.9
129,000	4	0.2	98.1
129,001	5	0.2	98.3
138,000	4	0.2	98.5
139,000	4	0.2	98.7
150,000	4	0.2	98.8
150,001	2	0.1	98.9
170,000	6	0.3	99.2
200,000+	17	0.8	100.0
Total	**2165**	**100**	

Appendix ix: The influence of income levels on mode choice against cycling

Income level of the household where respondents belong	**<10,000**		**10,001 – 19,000**		**38,001-50,000**		**over 100,000**	
Modal change/ reason for change (2014 only)	**B**	**p-value**	**B**	**p-value**	**B**	**p-value**	**B**	**p-value**
From cycling to other modes								
Intercept	-2.14	0.00	-18.96	1.00	-2.12	0.00	-18.67	1.00
Cycling is no longer safe	-1.39	0.16	15.46	1.00	-0.64	0.37	0.06	1.00
My place of occupation is now far to cycle	-1.46	0.46	-0.04	1.00	0.33	0.71	17.28	1.00
Ready availability of mode I shifted to	0.96	0.14	18.08	1.00	0.84	0.20	0.00	1.00
Cycling is not socially appealing	1.57	0.04	-0.04	1.00	0.45	0.61	0.00	1.00
It is easier and less expensive to walk because my daily destination is now not far from home	-0.42	0.58	-0.04	1.00	-0.71	0.45	17.98	1.00
Poor infrastructure	40.49	.	18.26	1.00	-16.11	1.00	0.00	1.00
Others (Lack of riding skills, unfavourable weather, slow speed of bicycle)	-1.83	0.77	-0.04	1.00	0.23	0.76	16.59	1.00
I no longer have access to a bicycle (reference category)	0b	.	0b	.	0b	.	0b	.
New non-cyclists (making a choice for the first time)								
Intercept	-3.65	0.00	-3.09	0.00	-20.22	1.00	-19.08	1.00
Cycling is no longer safe	0.83	0.50	-17.79	1.00	16.77	1.00	15.98	1.00
My place of occupation is now far to cycle	-0.12	0.96	-17.85	.	0.04	1.00	0.11	1.00
Ready availability of mode I shifted to	0.08	0.96	-17.55	1.00	0.07	1.00	0.00	1.00
Cycling is not socially appealing	1.33	0.40	-17.85	.	0.05	1.00	0.00	1.00
It is easier and less expensive to walk because my daily destination is now not far from home	0.56	0.66	-17.85	1.00	-0.07	1.00	-0.44	.
Poor infrastructure	12.23	.	2.40	0.13	-0.19	.	0.00	1.00
Others (Lack of riding skills, unfavourable weather, slow speed of bicycle)	5.99	0.00	-17.85	.	16.72	1.00	17.00	1.00
I no longer have access to a bicycle (reference category)	0b	.	0b	.	0b	.	0b	.
The reference category is: Never cycled.								
b This parameter is set to Zero because it is redundant								
(-2 Log likelihood) intercept only	**91.53**		**50.48**		**51.35**		**21.92**	
final	**231.88**		**11.27**		**28.12**		**9.14**	
Pseudo R-Square (Nagelkerke)	**0.00**		**0.43**		**0.10**		**0.38**	
N	**236**		**152**		**377**		**69**	
p-value		**indeterminate**	**0.00**		**0.57**		**0.54**	

Appendix x: The influence of the changing preferences and generational change on mode choices

Age group	14-18		19-24		25-30		31-40		41-50		51-60		60+	
Modal change in 2009 / reason for change	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**
From cycling to other modes														
Intercept			-1.61	0.04	-20.95	0.00	-2.12	0.00	-19.47	0.00	-18.54	1.00	17.53	1.00
Cycling is no longer safe			-0.18	0.86	19.89	0.00	0.91	0.20	18.00	0.00	18.54	1.00	-17.53	1.00
My place of occupation is now far to cycle			2.30	0.11	20.95	0.00	-0.37	0.76	0.04	1.00				
Ready availability of mode I shifted to			1.97	0.03	20.42	0.00	2.08	0.00	18.46	0.00	18.54	1.00		
Inappropriate type of bicycle			1.61	0.32	20.95	0.00	22.18	0.00	38.09	1.00				
Cycling is not socially appealing			2.30	0.11	19.34	0.00	0.73	0.46	0.50	.				
It is easier and less expensive to walk because my daily destination is now not far from home			0.51	0.60	20.66	0.00	1.02	0.16	18.55	0.00	0.00	1.00	0.00	1.00
Poor infrastructure			-18.11	1.00	22.05	.	1.02	0.26	19.98	0.00				
Others (Lack of riding skills, unfavourable weather, slow speed of bicycle)			-18.54	.	2.69	1.00	2.53	0.02	18.91	.	0.00	1.00	-35.06	1.00
I no longer have access to a bicycle (reference category)			0b	.	0b	.	0b	.	0b	.	0b	.	0b	.
New non-cyclist (making a choice for the first time)														
Intercept	2.57	0.01	0.69	0.07	-0.38	0.29	-2.12	0.00	-0.92	0.27	-19.93	1.00	-1.10	1.00
Cycling is no longer safe	16.18	1.00	0.85	0.07	1.43	0.00	2.62	0.00	0.65	0.49	18.83	1.00	1.10	1.00
My place of occupation is now far to cycle	16.18	1.00	1.25	0.27	0.38	0.63	1.02	0.22	0.11	0.92				
Ready availability of mode I shifted to	16.18	1.00	-0.34	0.59	0.11	0.83	1.62	0.02	-0.79	0.49	0.83	.		
Inappropriate type of bicycle	-2.57	0.14	0.41	0.74	1.77	0.13	22.18	.	19.54	1.00				
Cycling is not socially appealing	16.18	.	0.69	0.56	0.56	0.43	1.14	0.21	2.02	0.16				
It is easier and less expensive to walk because my daily destination is now not far from home			-1.10	0.07	-1.41	0.09	-1.06	0.37	-1.39	0.30	0.00	.	0.00	.
Poor infrastructure	16.18	1.00	0.83	0.18	4.31	0.00	3.32	0.00	0.92	0.43				
Others (Lack of riding skills, unfavourable weather, slow speed of bicycle)	16.18	1.00	0.26	0.69	3.47	0.00	4.65	0.00	0.58	0.57	0.00	.	-17.53	1.00
I no longer have access to a bicycle (reference category)	0b	.	0b	.	0b	.	0b	.	0b	.	0b	.	0b	.
(-2 Log likelihood) intercept only	**11.20**		**101.02**		**167.56**		**181.00**		**66.45**		**11.98**		**10.48**	
final	**3.31**		**45.60**		**47.16**		**53.15**		**36.23**		**5.56**		**3.01**	
Pseudo R-Square (Nagelkerke)	**0.48**		**0.24**		**0.38**		**0.36**		**0.28**		**0.45**		**0.76**	
N	**65**		**256**		**312**		**338**		**111**		**14**		***7***	
p-value	**0.34**		**0.00**		**0.00**		**0.00**		**0.02**		**0.60**		**0.28**	

Appendix xi: Changes in modal choices against cycling analysed according to gender of the respondents

	2004				2009				2014			
Gender	**Females**		**Males**		**Females**		**Males**		**Females**		**Males**	
Modal change/ reason for change	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**
From cycling to other modes												
Intercept	-0.81	0.18	-2.85	0.00	-2.53	0.00	-2.23	0.00	-3.11	0.00	-2.09	0.00
Cycling is no longer safe	-1.39	0.11	0.94	0.24	1.49	0.06	0.88	0.15	0.29	0.71	-1.03	0.06
My place of occupation is now far to cycle	0.41	0.71	1.24	0.20	1.97	0.04	0.38	0.64	1.17	0.22	-0.83	0.34
Ready availability of mode I shifted to	0.34	0.68	2.85	0.00	2.09	0.01	2.19	0.00	1.84	0.02	1.37	0.00
Inappropriate type of bicycle					2.53	0.04	3.32	0.01				
Cycling is not socially appealing					1.55	0.12	0.97	0.31	-0.07	0.96	1.10	0.05
It is easier and less expensive to walk because my daily destination is now not far from home	-1.59	0.10	1.24	0.11	0.82	0.34	1.93	0.00	0.67	0.42	-0.20	0.70
Poor infrastructure	1.22	0.27	4.24	0.00	0.22	0.86	2.45	0.00	-16.99	1.00	-2.16	0.43
Others (Lack of riding skills, unfavourable weather, slow speed of bicycle)	0.12	0.91	2.16	0.01	-17.80	.	1.53	0.03	0.47	0.71	-0.11	0.85
I no longer have access to a bicycle (reference category)	0b	.	0b	.	0b	.	0b	.	0b	.	0b	.
New non-cyclist (making a choice for the first time)												
Intercept	-0.25	0.62	-1.39	0.00	-0.82	0.02	0.08	0.73	-20.78	0.00	-3.19	0.00
Cycling is no longer safe	0.91	0.10	2.30	0.00	1.52	0.00	1.03	0.00	17.85	0.00	-0.13	0.87
My place of occupation is now far to cycle	0.54	0.56	1.39	0.01	1.07	0.08	-0.46	0.28	17.74	0.00	-1.12	0.50
Ready availability of mode I shifted to	0.37	0.60	2.20	0.00	-0.05	0.92	-0.08	0.82	16.38	0.00	-0.86	0.39
Inappropriate type of bicycle					1.74	0.06	1.71	0.12				
Cycling is not socially appealing					0.82	0.18	0.17	0.75	0.00	1.00	1.10	0.23
It is easier and less expensive to walk because my daily destination is now not far from home	-2.84	0.01	-0.73	0.28	-1.07	0.08	-1.43	0.00	0.05	1.00	-0.39	0.66
Poor infrastructure	2.60	0.00	5.46	0.00	2.26	0.00	2.26	0.00	19.69	0.00	-9.81	0.96
Others (Lack of riding skills, unfavourable weather, slow speed of bicycle)	2.16	0.00	3.24	0.00	2.74	0.00	1.02	0.01	19.94	.	1.75	0.01
I no longer have access to a bicycle (reference category)	0b	.	0b	.	0b	.	0b	.	0b	.	0b	.
The reference category is: Never cycled.												
b This parameter is set to Zero because it is redundant												
(-2 Log likelihood) intercept only	**111.06**		**205.93**		**188.99**		**224.42**		**93.47**		**170.14**	
final	**40.87**		**45.44**		**58.00**		**67.85**		**35.27**		**135.57**	
Pseudo R-Square (Nagelkerke)	**0.33**		**0.43**		**0.31**		**0.25**		**0.19**		**xx**	
N	**217**		**365**		**448**		**660**		**448**		**599**	
p-value	**0.00**		**0.00**		**0.00**		**0.00**		**0.00**		**0.00**	

Appendix xii: Changes in modal choices in favour of cycling analysed according to gender of the respondents

	2004				2009				2014			
Gender	**Females**		**Males**		**Females**		**Males**		**Females**		**Males**	
Modal change/ reason for change	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**	**B**	**p-val**
From other modes to cycling												
Intercept	-2.08	0.01	-2.57	0.00	-1.53	0.00	-1.16	0.00	-3.40	0.00	-2.83	0.00
Cycling is faster than walking	2.14	0.01	2.97	0.00	3.32	0.00	2.67	0.00	3.00	0.00	2.86	0.00
I now have access to a bicycle	2.08	0.10	1.84	0.02	0.27	0.77	0.60	0.03	2.61	0.00	0.75	0.03
I am now able to cycle									3.40	0.00	2.14	0.00
Location within a cycleable distance	-18.17	.	0.89	0.36	1.53	0.08	-0.86	0.28	0.63	0.60	-0.73	0.49
Route flexibility and less prone to fatal accidents									0.69	0.56	0.03	0.98
Less prone to fatal accidents compared to motorcycle-taxis					2.22	0.09	0.46	0.44				
Increased distance to place of occupation is far to walk					3.14	0.01	2.54	0.03				
Others (ability to cycle, route flexibility and susceptibility to fatal accidents)	0.98	0.38	1.75	0.06								
It is affordable compared to other faster alternatives (ref. category)	0b	.	0b	.	0b	.	0b	.	0b	.	0b	.
New cyclist (making a choice for the first time)												
Intercept	-1.16	0.02	0.00	1.00	0.89	0.00	0.88	0.00	-4.50	0.00	-3.52	0.00
Cycling is faster than walking	0.65	0.33	0.81	0.02	-1.40	0.07	-1.19	0.01	-15.04	1.00	-0.20	0.81
I now have access to a bicycle	3.04	0.00	0.35	0.32	0.75	0.12	-0.59	0.00	2.10	0.15	0.23	0.65
I am now able to cycle									-15.56	.	0.75	0.50
Location within a cycleable distance	0.47	0.64	-0.58	0.25	-1.18	0.14	-2.20	0.00	-14.96	1.00	0.66	0.43
Route flexibility and less prone to fatal accidents									-14.95	1.00	0.72	0.39
Less prone to fatal accidents compared to motorcycle-taxis					1.06	0.34	-0.88	0.06				
Increased distance to place of occupation is far to walk					0.50	0.67	1.07	0.32				
Others (ability to cycle, route flexibility and susceptibility to fatal accidents)	0.07	0.95	-0.59	0.35								
It is affordable compared to other faster alternatives (ref. category)	0b	.	0b	.	0b	.	0b	.	0b	.	0b	.
The reference category is: Not changed from cycling.												
b This parameter is set to Zero because it is redundant												
(-2 Log likelihood) intercept only	**56.35**		**77.60**		**133.55**		**228.39**		**55.73**		**197.86**	
final	**25.35**		**38.80**		**34.62**		**48.19**		**19.66**		**41.13**	
Pseudo R-Square (Nagelkerke)	**0.31**		**0.13**		**0.46**		**0.23**		**0.31**		**0.23**	
N	**96**		**329**		**198**		**790**		**178**		**900**	
p-value	**0.00**		**0.00**		**0.00**		**0.00**		**0.00**		**0.00**	

Appendix xiii: The influence of income levels on mode choice in favour of cycling

Income level of the household where respondents belong	**<10,000**		**10,001 – 19,000**		**38,001-50,000**		**over 100,000**	
Modal change/ reason for change (2014 only)	**B**	**p-value**	**B**	**p-value**	**B**	**p-value**	**B**	**p-value**
From other modes to cycling								
Intercept	-3.21	0.00	-2.75	0.00	-2.38	0.00	-17.91	1.00
Cycling is faster than walking	3.34	0.00	2.75	0.00	2.11	0.00	-0.40	1.00
I now have access to a bicycle	0.95	0.10	0.90	0.18	0.64	0.24	17.50	1.00
I am now able to cycle	2.92	0.00	2.75	0.02	2.05	0.01		
Location within a cycleable distance	-15.75	1.00	-14.04	0.99	0.44	0.62		
Route flexibility and less prone to fatal accidents	-16.30	1.00	1.84	0.07	-0.39	0.73	0.00	1.00
It is affordable compared to other faster alternatives (reference category)	0c	.	0c	.	0b	.	0c	.
New cyclists (making a choice for the first time)								
Intercept	-3.90	0.00	-19.64	0.99	-22.04	1.00	-18.60	1.00
Cycling is faster than walking	-16.83	1.00	16.65	1.00	0.23	.	17.91	1.00
I now have access to a bicycle	1.13	0.15	15.22	1.00	19.00	1.00	0.46	1.00
I am now able to cycle	-16.37	.	0.24	.	20.10	1.00		
Location within a cycleable distance	1.34	0.29	-0.14	1.00	0.07	.		
Route flexibility and less prone to fatal accidents	2.20	0.04	0.30	1.00	-0.05	.	0.00	.
It is affordable compared to other faster alternatives (reference category)	0c	.	0c	.	0b	.	0c	.
The reference category is: Not changed from cycling.								
b This parameter is set to Zero because it is redundant								
(-2 Log likelihood) intercept only	**112.59**		**56.17**		**59.08**		**9.91**	
final	**25.65**		**19.57**		**24.15**		**3.75**	
Pseudo R-Square (Nagelkerke)	**0.31**		**0.24**		**0.20**		**0.55**	
N	**367**		**208**		**238**		**11**	
p-value	**0.00**		**0.00**		**0.00**		**0.41**	

Publications and conference presentations

Alando, W., Brussel, M., Zuidgeest., Durgi, D., (2013, September 12-14th). *Exploring the utility of a spatially-constrained accessibility measure in integrating urban cycling and land-use in Pune, India*. Paper presented at the 14th N-AERUS Conference. Urban futures: Multiple visions, paths and constructions? Enschede, The Netherlands

Alando, W. (2016, July 18-20th). *The Changing Face of Transport in Kisumu, Kenya: implications for the resilience of pedal cycling*. Paper presented at the 17th International Planning History Society Conference: History Urbanism Resilience, Delft, The Netherlands

Alando, W. (2016, November 17-19th). *Understanding transport exclusion in the Global South: The case of cycling in Kisumu, Kenya*. Paper presented at the 17th N-AERUS Conference: Governing, planning and managing the city in an uncertain world: Comparative perspectives on everyday practices, Gothenburg, Sweden

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Alando, W., Scheiner, J. Zuidgeest, M. (submitted). The changing transport conditions and their implications for pedal cycling in Kisumu, Kenya