Spaces of the Informal Economy: Reimagining Street Trading through Accessibility Distribution Analyses in Lagos

This thesis is submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

Akolade H. Akiyode

School of Geography and Planning, Cardiff University
December 2017

I hereby give consent for my thesis, if accepted, to be available online in the University's Open Access repository and for inter-library loans **after expiry of a bar on access previously approved by the Academic Standards & Quality Committee.**

Signed ………………………………[redacted]… (candidate) Date ………………………14.03.18………[redacted]

Abstract

Street traders operate in and around spaces that facilitate optimal interactions with potential customers - a distribution pattern which coincides with the busiest and most central parts of a city. In Lagos, street trading is ubiquitous and its appropriation of public space is contentious for spatial governance. Attempts at regulation exacerbate the precarious status of street traders and are mostly unsuccessful, and this is due to the limited understanding of the spatiality of street trading. The locations where street trading thrives are thus investigated in this thesis to unravel what aspects of spatiality creates the milieu that encourages their activities - an area of research that has received little attention in recent years. The aim is to contribute to the discourse on inclusive urban practices and policies in developing country cities.

In literature, the determinants of street traders workplace locations are referenced to externalities from locational centrality and potent human activity (Dewar and Watson 1990; Monnet et al. 2007; Skinner 2008b; Skinner 2008a; Dobson et al. 2009). However, this body of work has not employed a systematic analysis in the study of such locations. This gap in research is addressed by using a novel methodological framework known as '*Spatial Design Network Analysis for Street-Based Enterprises*' (sDNA-sBEL), which combines the systematic analyses of multi-scale network accessibility distribution with morphological properties of urban form. As a principle of sDNA-sBEL, open-source data and freeware applications were used to ensure replicability and accessibility to a broader audience.

The sDNA-sBEL analyses identified that the most prolific street trading locations in Lagos have high values of macro-scale betweenness – spaces traversed most frequently while Lagosians take the shortest routes for long distance (inter-city) vehicular journeys. However, other compositional spatial factors must coincide with macro-scale betweenness to sustain street trading.

Acknowledgements

Firstly, I would like to express my sincere gratitude to my supervisors Prof. Alison Brown and Alain Chiaradia for the immeasurable support and guidance throughout my PhD study. The coordination over two time-zones was no easy feat.

I would also like to thank Dr Crispin Cooper for his insightful comments which were incentives to engage more critically with the issues this research sought to address.

My sincere thanks also go to Marga Munar Bauza, Dr Andrea Frank, Dr Louie Sieh, Prof. John Punter and Dr Mike Biddulph, who embraced and supported me early on in this journey - first as a student, and then as a member of the Masters in Urban Design teaching team. To Prof. Aseem Inam, thanks for your many words of advice and understanding.

I would also like to thank my fellow Glamorgan Building basement colleagues for the stimulating discussions we have had in the last four years. To Femi, Kofo, Deolu, and Ladi, thanks for the moral support.

Thank you Mum, Dad, Korede, and Busola for supporting me throughout writing this thesis and my life in general. I simply cannot show enough gratitude to you all, and I only pray that I will somehow be able to repay your support.

Last but not the least, Moji thanks for being there through it all. Without your understanding and support, none of this would have happened.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

Abbreviation	Meaning
BLOE	Business Location Operated Enterprises
BLP	Better Life Program for Rural Women Movement
BtA	Angular Betweenness
BtE	Euclidean Betweenness
CBD	Central Business District
CPT	Central Place Theory
FGN	Federal Government of Nigeria
GIS	Geographic Information System
HBE	Home Based Enterprises
ICLS	International Conference for Labour Statisticians
IE	Informal Economy
ILO	International Labour Organisation
IMF	International Monetary Fund
KAI	Kick Against Indiscipline
LASG	Lagos State Government
LAWMA	Lagos State Waste Management Authority
LCDA	Local Council Development Area
LICs	Lower Income Countries
LEDB	Lagos Executive Development Board
LGA	Local Government Authority
LMIC	Lower-Middle Income Countries
LSDPC	Lagos State Development Property Corporation
MCP	Model City Plan
MOE	Lagos State Ministry of Environment
MPPUD	Lagos State Ministry of Physical Planning & Urban Development
OSM	Open Street Map
RA	Research Assistant
RQ	Research Question
SAP	Structural Adjustment Programme
SBE	Street-Based Enterprise
sDNA	Spatial Design Network Analysis
sDNA-sBEL	Spatial Design Network Analysis for Street-Based Enterprises
SEWA	Self Employed Women's Association

SOE	Street Operated Enterprises
ST	Street Trader
WAI	War Against Indiscipline
WB	World Bank

1 Introduction

1.1 Introduction

To experience urban life in developing country cities typically involves encounters with actors of the informal economy (IE). These encounters can be linked to the involvement of many of the population in informal economic activities and the strategic choices of IE actors workplaces within cities. The scale and distribution of the IE are so seamlessly entrenched in cities of LowerIncome Countries (LICs) that an assumption can be made that such economies will cease to function without the dynamism of the IE. As Koolhaas et al. (2000) argue in the case of Lagos[1], the status quo might seem to display inefficiencies, but the IE is the cog in the machine of the state's economy. Therefore, the strategic management of the IE is vital, as it can be harnessed as a vehicle to reduce poverty and inequality (Rogerson 1997; Chen 2012), and this emancipatory notion spurs the bulk of informal economic development scholarship.

This thesis explores how the spatial structure of the built environment influences the workplace locations of informal economic actors in a rapidly developing city - with Lagos, Nigeria as a case study. The IE actors investigated are those who operate Street-Based Enterprises[2] (Street Traders). The research's motivation is a concern for governing authorities' actions in developing country cities towards the spatial management and development of urban areas, and the consequences of such attitudes for city inhabitants who rely on informal activities for survival. These actions often involve the eviction or relocation of informal economic actors - as consequences of spatial governance interventions. The eviction and relocation of IE actors are widely researched topics, and these studies highlight the adverse socio-economic consequences of these actions (Castells and Portes 1989; De Soto 1989). Therefore, enabling approaches are required to counter these actions to secure the livelihoods and places of work of IE actors. However, the basis of what constitutes an ideal place of work for street trading is limited within

[1] Lagos is a State located in Nigeria - a Lower-Middle Income Country according to the OECD (2016).

[2] Street-Based Enterprises are defined in this thesis as Informal Economic enterprises that conduct parts of their business activities on the street or other adjoining public spaces (see Section 2.2.3).

urban scholarship. Inspired by this shortcoming, this thesis proposes a new and innovative way to study the spatialities of IE actors, as a contribution to the discourse on what constitutes the attributes of locations where street traders thrive. Thus, this research is a step in bridging the gap in knowledge on informal Street-Based Enterprises workplaces within urban spatial governance scholarship.

This research is therefore situated within wider concerns about the role that urban spatial governance paradigms, play in marginalising an important segment of the economies in developing countries. The author is an architect and urban designer, and so, this thesis draws on this background and is written with the intent of developing a rational understanding of the spatial and locational characteristics of street traders as actors in the IE – as they are intrinsic to the urban character of many African cities.

1.2 Research Background

The physical manifestation of the IE and its precarious standing within spatial governance is of concern especially from an urban design and planning perspective. Urban designers and planners are the key professions tasked with defining and managing the quality of built environments (Biddulph 2012), and hence, the policies and plans which displace or relocate informal economic actors[3]. It is therefore logical to assume that to adequately manage and govern the built environment in cities and provide enabling policy for IE actors, a grasp of the underlying spatial issues is essential from an urban design and planning perspective (Simone and Abouhani 2005).

While research has explored the scale and economic contribution of the IE in the developing world (Schneider 2002; ILO 2013), the locational characteristics of spaces where IE actors thrive

[3] If other socio-political power dynamics that shape and influence the built environment are discounted, and the built environment is viewed superficially from a 'town planning' perspective.

have primarily been neglected (Dierwechter 2004; Roy and AlSayyad 2004). A few efforts have attempted to explore IE actors' places of work by mapping locations at a macro-scale (informal market locations in cities) or by assessing micro-scalar physical interventions to identify whether the design of formal markets is suitable for STs (Bromley 1980; Dewar and Watson 1990), but these studies are not very recent. There are many spatial governance recommendations and actions derived from such studies (Lyons and Snoxell 2005; Skinner 2008a; Muiruri 2010), but these mostly do not consider the multiple dimensions and dynamics of urban space required by IE actors. Therefore, the fundamental problems that underpin the spatial location and functionality of IE actors (Swanson 2007; de Pádua Carrieri and Murta 2011) are not adequately addressed by such policies and their ensuing interventions - even though these approaches have been successful in advocating for the recognition of IE actors in urban governance and management decisions.

For example, in South Africa, the 1991 Business Act gave street traders a right to trade within a regime regulated by local level government authorities. In India, the Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act of 2014 proposed demarcation of 'vending zones' based on 'traditional natural market' designations. The vending zones in India, are in turn regulated by 'Town Vending Committees' set up by local authorities. The common theme for the integration of IE actors in urban areas in these policies is a notion of legal empowerment - the issuance of licenses and permits (Brown 2017) - and a need to operate in certain defined and well-connected spaces. Even though such actions are progressive, the responsibility of defining the details of how and what constitutes ideal licensing schemes, trading locations and resettlement plans for STs in the interest of the 'public' are typically undemocratic and are based on the caprices of governing authorities. Such top-level decision making often fails to acknowledge specificity of contexts, and its influences on street trading.

In India, a proposal by SEWA (Self-Employed Women's Association) to temper the whims of spatial governance within the Street Vendors Act suggests amongst other demands, that ST locations within Natural Markets

> Should be preserved and regularised by making schematic plans … In case it is not possible to schematise the[m]… after the consultation with the vendors, the vendor's ... should be fully accommodated in the open plots or adjoining streets within the immediate vicinity of 15 metres (SEWA 2012, p. 2).

The acknowledgement of Natural markets[4] in policy is important, because they are 'places where sellers and buyers have traditionally congregated'. However, blanket recommendations such as those promoted by SEWA, are not feasible in all situations, and the reality is that compromises will have to be found between the space demands of IE actors and those of others with claims on urban space. Therefore, solutions should pursue a balancing act in advocating for equitable rights to spaces for IE actors while ensuring that the needs of all users are met. For instance, equity can be achieved by using creative and innovative solutions which are contextually relevant for space or time-sharing at key locations, or in providing spaces with similar spatial attributes at relocation sites.

This research adopts the ethos of Simone and Abouhani (2005), who suggest that the solution for proper urban management and the reinvention of African cities requires the 'acknowledgement of specific histories, and incorporates the existing local knowledge that currently sustains and recreates informal urban economic social systems'. An exploration of STs' status quo in Lagos is thus conducted, to assess the associated spatialities of their locations. The aim is that the outcome of this research will contribute to spatial governance knowledge for the management of SBEs workplaces and the spatial planning of street trading locations.

Lagos state is explored for several reasons. First, the IE in Lagos State is prolific. With an estimated population of about 17.5 million people - at the last census conducted in 2005 (LASG 2011) - Lagos is the largest urban conurbation in Nigeria, hosting the largest IE in sub-Saharan Africa (Meagher and Yunusa 1996). In the assessment of business activities that operated beyond legal

---

[4] *A market where sellers and buyers have traditionally congregated for the sale and purchase of products or services and has been determined as such by the local authority on the recommendations of the Town Vending Committee*, Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act of 2014

frameworks of the state, the Lagos State Government (LASG) estimated that the informal sector in the state is worth USD 48.2 billion (Akoni and Olowoopejo 2013). The informal sector is considered by the LASG to possess assets locked in a pool of 'dead-capital', and therefore as part of the LASG's development strategy[5], there has been an attempt to regulate and promote informal business activities. The existence of a thriving IE makes Lagos an important city to research and explore issues faced by the IE in developing world cities.

Second, the state government's attitude - as in many other cities in Lower-Income Countries - from a spatial governance perspective is often unsupportive. The IE is not considered to be integral to urban development and regeneration in core areas of Lagos, rather it is seen as a detriment to modernisation of the city. The current governance and management apparatus vacillates from benign, *laissez-faire*, to outright hostility. A prominent case is the eviction of IE enterprises from Oshodi Market in 2009 and the demolition of their stalls and kiosks (Neuwrith 2012; Omoegun 2015). Oshodi Market was situated around a major bus station for inter-city journeys and prominent due to its ease of access to most parts of Lagos, thus making it an attractive hub for IE activities (see Figure 1.2). The demolition of Oshodi Market displaced thousands of IE actors, destroyed daily sources of income, eliminated the character of the area, while also restructuring urban livelihoods, and services for other inhabitants of Lagos who used the services provided by the Oshodi Market. The adoption of such repressive interventions exacerbates social exclusion and the undermining of IE actors (Brown 2006; Skinner 2008b; Lyons and Msoka 2010; Devas 2012). The reason for this attitude to the IE and its spaces is rooted in a 'developmentalism' (Robinson 2002) and modernisation paradigm (Cross 2000), as governments impose an imported image of their cities within the context of a globalised world. Therefore, the process of producing an enabling environment for a 'world class' and global city is often touted as the overarching justification for repressive actions against the IE. A concept Robinson (2002) debunks to be fictional because most cities in poorer countries cannot provide the dynamic functions of command and control Sassen (2005) identifies to be synonymous with global cities.

[5] To implement property and business rights reforms that provide the legal tools and institutions required for citizens to participate in the formal national and global economy, with advice from Hernando de Soto's Institute for Liberty and Democracy (ILD).

The third factor is a familiarity and personal connection to Lagos, as the author lived there for over two decades. Therefore, it is discomforting to witness the repetition of evictions and the repression of IE workers, as these already marginalised members of society are constantly harassed and made to operate from suboptimal locations. By the time this research was being concluded, the street traders at a few of the case study locations[6] had been displaced or relocated to locations less suited for their activities. This thesis, therefore, provides a platform for in-depth engagement with the plight and rationale of STs, and also to raise awareness to alternative strategies for spatial governance in Lagos state.

1.3 Defining the Problem

The IE has a complex and heterogeneous character. Street traders[7] are arguably the most visible component of the IE (WIEGO 2011; Chen 2012), and their activities are the most vulnerable and susceptible to urban spatial management policies and actions. A Street Trader (ST) is someone who operates a Street-Based Enterprise (SBE), often working with at least some degree of informality, providing goods and services, at affordable, convenient, and accessible points to customers (WIEGO 2011). This thesis, focuses on STs as a critical component of the IE, because of the spatially determined nature of their activities and their importance to defining inclusivity for successful and sustainable spatial governance.

STs activities are diverse and vary in scale, temporality, location, and the types of goods and services provided (see Section 2.2.3).

> [Street trading] may be practiced full-time, part-time, seasonally or occasionally. It can be fixed, occasionally mobile, or almost continuously mobile, and it can go on at any or all

[6] Street Traders within areas defined for the case studies as 1) Garage, Ikorodu, 2) Jakande, Lekki and 3) Oshodi.
[7] Street Traders are used interchangeably with "street vendors" in literature.

> times of the day and night. The firms involved can range from one-person microenterprises, through numerous forms of partnership and family business, up to franchisees, pieceworkers and wageworkers of larger off-street businesses. Some street traders are branch operations of off-street stores, sometimes right outside the store, at other times some distance away. Other street traders create their own branch operations, dividing their merchandise and sending some of it with a relative, partner or employee to sell at another location (Bromley 2000, pp. 2).
>
> Goods may be narrowly focused in a few lines, for example tourist souvenirs, newspapers and candy in many North American and European cities, or spread across the whole gamut from cooked foods, groceries and hardware through to clothing and electrical appliances. Shoe-shining, hair-cutting, document typing, and the repair of shoes, clothes, bicycles, motorcycles and cars, are all common street services. In addition, goods or services may be advertised and negotiated on street, but delivered off-street (Bromley 2000, pp. 3).

STs are observed to be attracted to locations that give them maximum exposure to potential customers. Hence, concentrations of STs are often located near activity generators - locations known as ‘traditional natural markets’ in India (Dave and Arora 2015) - derived from what Bass (2000, p. 78) calls the ‘commerce of circumstance’. Examples of such locations include gateways to residential areas (Morales 2000); central business districts (Lewinson 1998; Pena 2000); transport hubs; religious buildings; schools; historic sites; tourist attractions; hospitals and even formal retail establishments (markets, supermarkets, shopping malls). Figure 1.1 shows a congregation of STs in space around a road which serves as an access point to Carter bridge – which is one of the main connections between Lagos Island and Lagos mainland – as an indication of STs taking advantage of busy locations within cities, as base for their operations.


Figure 1-1.: Street Traders located at the foot of Carter Bridge in Lagos. STs here take advantage of the volume of travellers who pass through this location - as it is a major connection between the Island and Mainland areas of Lagos. Source: Author's

By capitalising on cities' vast networks of streets and connected public spaces around activity generators as their operational base, STs generate both negative and positive externalities. The negative externalities are platforms for contestations - as by-products of conflicts between STs and other urban stakeholders - in a contest between the legal structure and status which establish governance powers under which these spaces operate, and the appropriation by STs (Brown 2006). Therefore, the conflict of accommodating STs within urban areas is a core issue influencing their survival within cities (Perera and Amin 1995; Yankson 2000).

> In every city, there are a few 'conflict-zones' where many interest groups are concerned about the high density of street vendors, there are many areas where vendors are not very numerous or problematical and few people care much about exactly how many there are, and there are a few exclusive and elite areas where street vendors are aggressively excluded. The 'conflict-zones' make up less than five percent, and sometimes less than one percent of the urban area, but it is in these areas that most of the tension and conflict associated with street vending is acted out (Bromley 2000, pp. 16-17).

The conflicts in the use of public space in LICs' cities are synonymous to that of informal economic space, as these are *contested spaces* (Brown 2006). Public spaces are collectively valued, have symbolic significance and have asserted claims (Goheen 1998). City inhabitants, therefore, create meaningful public spaces by expressing their agencies, asserting their claims, and using it for their purposes - as a city is an articulation of its inhabitants' ways of being (Jacobs 1961). Read from Zukin's (1995) notion of 'symbolic economies', STs' use of space has become the identity that shapes important public spaces in many developing world cities. The organic nature of this informally derived symbolism is at odds with the pervasive visual aesthetic of contemporary spatial governance - which pursues a coherent, planned and formal image. Therefore, it is no surprise that in many urban centres in developing countries, STs are *persona non-grata,* even though they are simply using their prerogative to appropriate space for their needs.

Where efforts have been made by urban spatial governance to rectify the disturbing imagery of IE activities, this has been conducted through a process which regulates and promotes their activities via the formalisation of street trading spaces. SBEs are typically moved to off-street locations away from the contested conflict zones - to public or private markets - but because of the lack of customers at these new locations, STs often do not relocate, or eventually abandon the new locations[7]. There have however been few successful attempts at relocations and in these cases,

> Even when all existing vendors are moved and stay in the off-street locations, their previous pitches are often grabbed by new vendors who move in to exploit the commercial opportunities associated with a major flow of pedestrians and vehicles. Successful off-street market foundations may do more to increase total commercial activity than to permanently reduce the problems associated with street vending (Bromley 2000, p. 19).

[7] After the demolition of Oshodi Market, many of the STs refused to relocate to the new designated markets built by the Lagos state government.

Figure 1-2 Top-left image - Old Oshodi Market; Top-right image – shops provided in a different location for the relocation of street traders from Old Oshodi Market; Bottom-left image – Ikorodu road with Street traders; Bottom-right image – Shops provided in a different location for the relocation of street traders from Ikorodu road. Source: All Author's except top-left image.

Figure 1.2 shows two cases of spatial interventions to relocate STs by the Lagos State Government as part of regeneration schemes at Oshodi and Ikorodu. The top-left image shows STs' occupation of public space at the old Oshodi market before they were displaced with the intent of relocating some of them to shops in the top-right image. The bottom-left image shows STs' occupation of space along Ikorodu road, and the image of the bottom-right is the alternative location provided for their relocation. The two images on the right have empty stalls because STs refused to relocate to these new 'markets', as they do not possess similar characters to their former locations (as shown in the images on the left of Figure 1.2). These cases are symptomatic of spatial governance interventions and their failures in many developing country cities.

The inappropriate spatial governance responses have been attributed to a prevalence of inadequate contextual responses - a consequence of an insufficient understanding of STs spatialities. This thesis seeks to fill the gap required to understand STs spatialities using systematic urban spatial analysis methods. By contributing to the body of work on SBEs' use of space within developing countries cities, this thesis will key into more general notions which can help create clarity in understanding of how the built environment influences the locations of informal economic actors' workplaces. This thesis, therefore, is a contribution towards attaining the knowledge that is required for sustainable and equitable urban spatial governance.

1.4 Research Aim and Questions

The role and importance of socio-economic variables of the IE has been the focus of much research in Lower-Income Countries (LICs) (see: Onyebueke and Geyer 2011 for a synopsis of research in Nigeria), but there has been limited analysis of the factors that influence the spatial distribution of STs and the accessibility[8] of the services they provide, factors which this research seeks to understand. Skinner (2008b) highlights the necessity and importance of filling this gap, arguing that without such knowledge, those concerned with the creation of sustainable urban systems - which balance the right to work of STs, with the rights of other urban actors - will be unable to develop appropriate policy responses within urban areas.

Using Lagos as a case study, the overarching aim of this research is to understand how the urban spatial structure and the associated distribution of its transport networks, influence the location of SBEs in a LIC city. A central philosophy and secondary aim of the research is to explore new spatial analysis methods that will aid in the understanding of SBEs' spatialities and contribute original knowledge to the location of SBEs. The complexities of such research in developing countries is widely acknowledged (due to inadequate data and insufficient technical capacities) and to mitigate this, open-source data and easy-to-operationalise freeware tools form the basis

[8] Accessibility is the ease of reaching goods, services, activities and destinations, which together are called opportunities. Accessibility can thus be defined as the potential for interaction and exchange (Hansen 1959).

of the spatial analysis in this research. The use of open-source data and freeware applications allowed for the conduct of this research, and ensures that the findings and contributions are accessible to, and replicable in LICs.

The research questions which ensue are identified as follows:

1. What is the significance of the urban informal economy and urban street traders in developing country cities, how is their spatial distribution conceptualised, and how is the informal economy affected by urban spatial governance?

2. How does accessibility distribution influence the relationships - conflicts, competition, and synergies - of urban economic activities, and are there other explanatory spatial factors of urban form which overlay accessibility that affect the locational patterns of SBEs?

3. To what extent is spatial accessibility - assessed through spatial network analysis and detailed locational appraisals - an important factor in defining the locational patterns of SBEs, examined through a case study of Lagos?

4. What are the implications for an improved understanding of spatial activities of SBEs for urban spatial governance in Lagos? What is the value of improved measurement tools in policy and practice outcomes?

1.5 Scope of Study

Understanding the association between the structure of cities and socio-economic activities is a concern that has been extensively investigated, and a relationship between geographic locations and the level of economic activity sustained has been established. Similarly, the spatial structure of the built environment of cities is acknowledged to be shaped by an interplay of diverse actors and institutions. Since these actors and institutions are also constrained by the physicality of their surroundings, urban researchers have been able to link the physical structure of cities with patterns of human behaviour. The scope of this thesis is situated within similar urban research paradigms, to understand the spatiality of STs' workplace locations.

Despite the highly visible presence and the central importance of the IE - of which STs form a significant component - to economies in LIC cities, there is nevertheless, a paucity of empirical studies on the city-wide and local-area spatial distribution of STs. The theoretical underpinnings of most spatio-economic investigations within urban studies revolve around the 'formal' rather than 'informal' economy, presumably because of the complexity of research on the 'grey' realm of economic informality. As complementarities have now been established between 'formality and informality' within economic systems of developing country cities (Castells and Portes 1989), STs workplace locations are explored in this research by employing paradigms that otherwise might be regarded as being only suitable for formal economic space. This thesis, therefore, bridges two fields of studies - those concerned with a) the spatiality of urban informal economic actors and b) spatial analysis - and situates them within a perspective suitable to inform urban spatial governance.

In the past, applying the methods used for locational analysis of the formal economy was challenging because of the paucity of appropriate data, coupled with the lack of efficient and enabling analytical tools. However, the current availability of new forms of data and technological advancements, present an opportunity to study STs' locations in one of the largest urban IEs in Africa by employing a unique method of inquiry - borrowing from formal economic location analysis. What is attempted in this thesis is a new approach to understanding STs' spatialities in LICs, from an urban design perspective.

The study of spatial structure of cities for urban design purposes involves examining the relationship between the morphology of a city's built environment and the connective tissue that its geometry generates. This research focuses specifically on spatial accessibility derived from the layout of road transport networks, as STs are believed to maximise their accessibility by seeking sites of work that are well connected to pedestrian, public transport and road networks in their locational decisions. Consequently, theoretical inclinations concerned with retail location and urban morphology are analysed in relation to the peculiarities of LIC cities, to ground this research.

The outcome of this research aims to present findings that explain why certain locations are attractive to STs, but the research is not intended to establish a predictive notion of places that will potentially host STs. However, if the past locational decisions of STs are understood, this knowledge will aid in guiding future spatial governance policies that include rather than dismiss lower-income IE workers, to contribute towards attaining equitable and sustainable urban areas.

1.6 Structure of Research

Chapter 2 reviews literature on the urban informal economy and street traders in developing country cities, to examine what is understood about their spatiality. The narrative revolves around two streams of scholarship on a) economic development and b) spatial governance. The conceptualisation of the IE as a driver of economic development is examined first. Then the developmental objective of the IE is assessed in the context of urban spatial governance responses, by detailing the outcomes and experiences from a few LIC cities. The chapter highlights a spatial marginalisation of STs and argues that although this is an outcome of a complex interplay of factors, and the control apparatus of urban spatial governance - intentionally or unintentionally - is very influential.

Chapter 3 reviews literature for theoretical and empirical approaches that underpin the understanding of STs workplace locations, within LIC cities. Relationships between urban spatial structures and retail locations are studied, through two themes relative to geographic inequalities and the spatial patterns street network. The chapter points to a mixed-method of research to enable an understanding of the contextual geographies of STs.

In Chapter 4, insights gained from the literature are used to formulate a novel methodology of spatial location analysis - '*Spatial Design Network Analysis for Street-Based Enterprise Locations*' (sDNA-sBEL). The chapter details the development of sDNA-sBEL and explains how to conduct spatial appraisals with it. Other methodological discussions are also detailed.

Chapter 5 is an exploration of urban spatial governance in Lagos. The narrative historically traces the urban development in Lagos, focusing on urban planning policies and road transport network development, and how their association with economic development has shaped the workplaces of STs.

Chapter 6, details macro-scalar accessibility analyses of the road transport network in Lagos using sDNA-sBEL. The relationships between accessibility - assumed to reflect the positions of STs' potential customers - and the geographical distribution of street trading hotspots in the Lagos Megacity region, are explored. Chapter 7, details local scale analyses of eight case-study locations in Lagos identified to be areas with high spatial accessibility that have large concentrations of STs. The analyses conducted, explore the morphological properties of these sites, to reveal associations between the structure of the built environment and the choices of locations for STs.

In Chapter 8, the findings from this research are summarised and with recommendations.

2 The Spatiality of Economic Informality

2.1 Introduction

This chapter explores literature to contextualise the spatial dynamics of informal economic actors' within developing country cities. The discourse revolves around themes of livelihoods, socio-economic impact and marginalisation, socio-political dimensions, governance and regulatory regimes, focusing on their associations with the spatialities of informal economic (IE) enterprises. While scholarship on the IE is vast, the literature reviewed demonstrates a lack of research on the spatiality of IE enterprises workplaces relative to urban spatial governance, and that scant attempts have been made within contemporary discourse to address this shortcoming.

This chapter addresses the first research question, by examining the literature covering the significance of urban IE enterprises and STs, the conceptualisation of their spatial distribution, and how the IE is affected by spatial governance. Based on this literature, it is argued that even though the spatial marginalisation of STs in urban areas is an outcome of a complex interplay of factors, the dynamics of state spatial control mechanisms are highly influential. Two streams of research in the literature underpin this argument. The first deals with the consequences and prospects of the IE as a socio-economic and political concept to deliver economic development in developing country cities. The second theorises and localises the discussions of the IE within a spatial governance framework, to highlight the impacts of planning and management on the spatialities of STs' workplaces. Both streams are intrinsic to each other, and this chapter highlights the relationship between economic development and spatial governance of streetbased enterprises (SBEs), and how these dynamics influence SBEs workplaces. This relationship is of particular importance because the IE has become an economic and socio-cultural norm in developing country cities, and governance policies in these settings tend to discriminate against those who engage in it.

The spatiality of economic informality in African cities is often underpinned by issues of economic marginalisation - a vital theme of the *'Kenyan'* debates from the 1970's and 1980's[9] (Roy and AlSayyad 2003). Not much has been done recently to grasp the spatiality of economic informality within the African context, therefore the assessment of literature hinges on these old debates - also borrowing from Latin American and South Asian studies. This chapter's examination of the contemporary understandings of informality is thus underpinned by notions situated within a broader history of ideas.

The chapter consists of three main sections. Section 2.2 outlines general knowledge on the status of the IE and argues that the IE has been conceptualised as playing a pivotal role in economic development in developing country cities. The importance of street trading as a component of the IE and the spatial challenges that STs face are also discussed. In Section 2.3, empirical and theoretical research that has engaged with issues of accommodating SBEs in developing country cities is explored. Finally, in Section 2.4 - based on preceding insights and critiques - an argument is made for the need to adopt alternative means of engaging with the spatiality of SBEs for economic development.

2.2 The Economic Development Imperative.

Scholarship on the informal economy (IE) is prolific but fragmented, and the multiplicity of the associated conceptual ideas complicate researchers' abilities to have logical discussions (Sindzingre 2006; Kanbur 2009; Meagher 2013). This section applies a holistic approach grounded in an economic development imperative, to establish a consistent basis for discussing the spatiality of street-based enterprises of the IE. The economic development imperative is underpinned by a notion that informal economic systems provide a means of financial sustenance and prosperity for many developing city inhabitants, and thus, there is a need to nurture the IE

[9] The Kenyan debates were mainly on the nature of informal work and dual economies, and they did not directly address spatial dimension of informality in relation to the emerging forms of urbanism.

to support those who are most vulnerable and rely on it as a safety net for survival. First, the nature and role of the IE are discussed with regard to the socio-economic and political dynamics of the modernisation of cities in LICs. Then the basis for how informality was forged as an economic concept is discussed.

2.2.1 The Nature and Role of the Informal Economy

> Two contrasting frames dominate the discussion of informality - one of crisis and the other of heroism … Yet a closer look reveals some striking similarities … [revealed through] a series of transactions that connect different economies and spaces to one another (Roy 2005, p. 148).

Informality is an integral engine of contemporary and liberal 'economic dynamism', as a response to modern capitalist economies (Habib-Mintz 2009, p. 2). Hence, the informalisation of economic activities is an inexplicable and conspicuous reality across many societies - irrespective of their economic development status (Williams and Round 2007a,2007b,2007c) - although the notion of informality within urban areas evokes an association with cities of LICs. While informality also exists in developed country cities, it is less conspicuous as a result of the sophistication and institutional stability of their socio-economic systems (de Soto 2000), as well as the way IE enterprises are manifested in these settings (Williams and Nadin 2010). In developed countries, most IE activities occur beyond the view of the public, whereas in cities such as Lagos, the IE is highly visible (for example in street trading).

In LICs, the socio-economic systems in which the IE operates are often systematically weak, inadequately controlled and poorly stabilised (Gandy 2006; Fourchard 2011). Destabilising factors include globalisation, rapid rates of urbanisation, unstable political structures, poor economic management, erratic infrastructure supply, corruption, weak government support for private sector growth, and internal conflicts and unrest amongst others (Harris and Todaro 1970; Cross 2000; Portes 2008). Since this research relates to the situation of economic informality in

Lagos, Nigeria - defined as a Lower-Middle Income Country by the OECD (OECD 2016) - it is vital to explore how the factors listed above have influenced the IE discourse in LICs.

Modernisation's Quartet : Capitalism, Industrialisation, Globalisation, and Urbanisation

A good point to begin the exploration on the IE is to refer to the socio-economic and political ideology pervasive in LIC economies, as it is impossible to evaluate debates around the economic development potential of the IE without considering such influences. The combination of factors attributed to capitalism, industrialisation, globalisation, and urbanisation occurred concurrently and progressively (Falola and Salm 2004), and their significance is evident in the more recent historical development of many cities worldwide.

The discussions of this quartet in IE scholarship can be traced to the post-World War II era - a period which entrenched neoliberal and capitalist ideologies into the fabric of societies - as many governments sought to facilitate the modernisation of their economies. A centralised model of capital accumulation meant that the predominantly rural and agrarian work-forces in LICs were compelled to migrate to locations of capital input - urban areas - to seek prosperity (Lewis 1954; Harris and Todaro 1970; Mabogunje 1990). In turn, this created a surplus of mostly unskilled urban labour, which often did not match the skills needed for urban employment (where available). At the same time, cheaper mechanisation spurred by the technological advancements from industrialisation and globalisation also reduced the amount of workforce required, which was advantageous to employers, as it allowed production lines run efficiently with labour requirements. Better healthcare also reduced mortality rates, therefore increasing average life expectancy – a trend which increased the world's population.

Urbanisation and Population Growth

Most of the population growth in the last half-century has happened in developing countries in the global South, because countries in Europe, Latin America, and elsewhere in the OECD had already attained high levels of urbanisation. The 2014 edition of *World Population Prospects* suggests that, even though Africa and Asia are urbanising rapidly, they are still home to nearly 90% of the world's rural population (Figure 2-1).

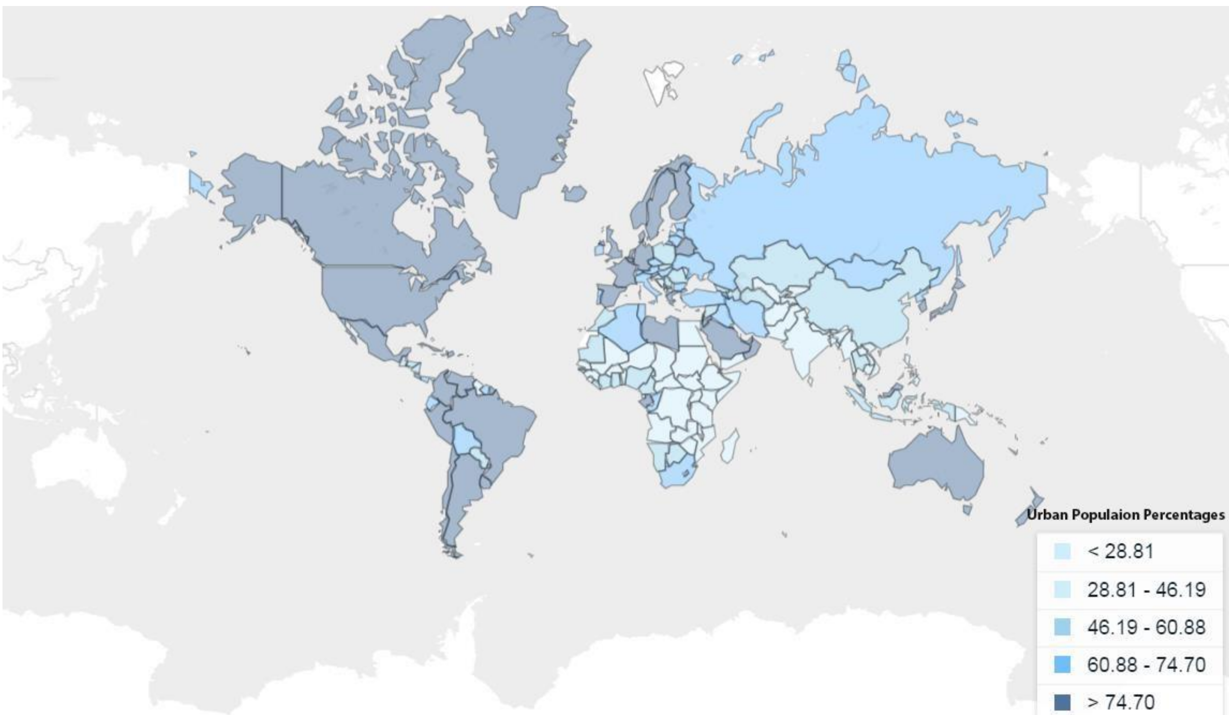


Figure 2-1 Percentage of Urban Population Worldwide. Source: World Bank 2016

Africa and Asia also have the lowest proportion of people living in urban areas (Figure 2-1). Therefore, when the global rural population - estimated to be around 3.4 billion[10] (UN-DESA 2014) - is contrasted with the corresponding world population for the same period, a projection of continued urbanisation in the developing world is evident. The population projections also indicate that the number of people living in urbanised areas worldwide will increase to 66% by 2050 from 54% in 2014, with close to 90% of this increase concentrated in Asia and Africa (UNDESA 2014). Figure 2-2, shows the rate of urbanisation for the decade and a half leading up to 2014, with new 'megacity' status being reached mainly in Africa and Asia. This urbanisation is

[10] The rural population is also set to decline to 3.1 billion by 2050.

occurring mainly as 'informal hyper-growth' according to Hall and Pfeiffer (2013, p. 47), and is making it harder to govern cities, as the available resources (jobs, housing, infrastructure) are unable to meet the needs of the growing urban population.

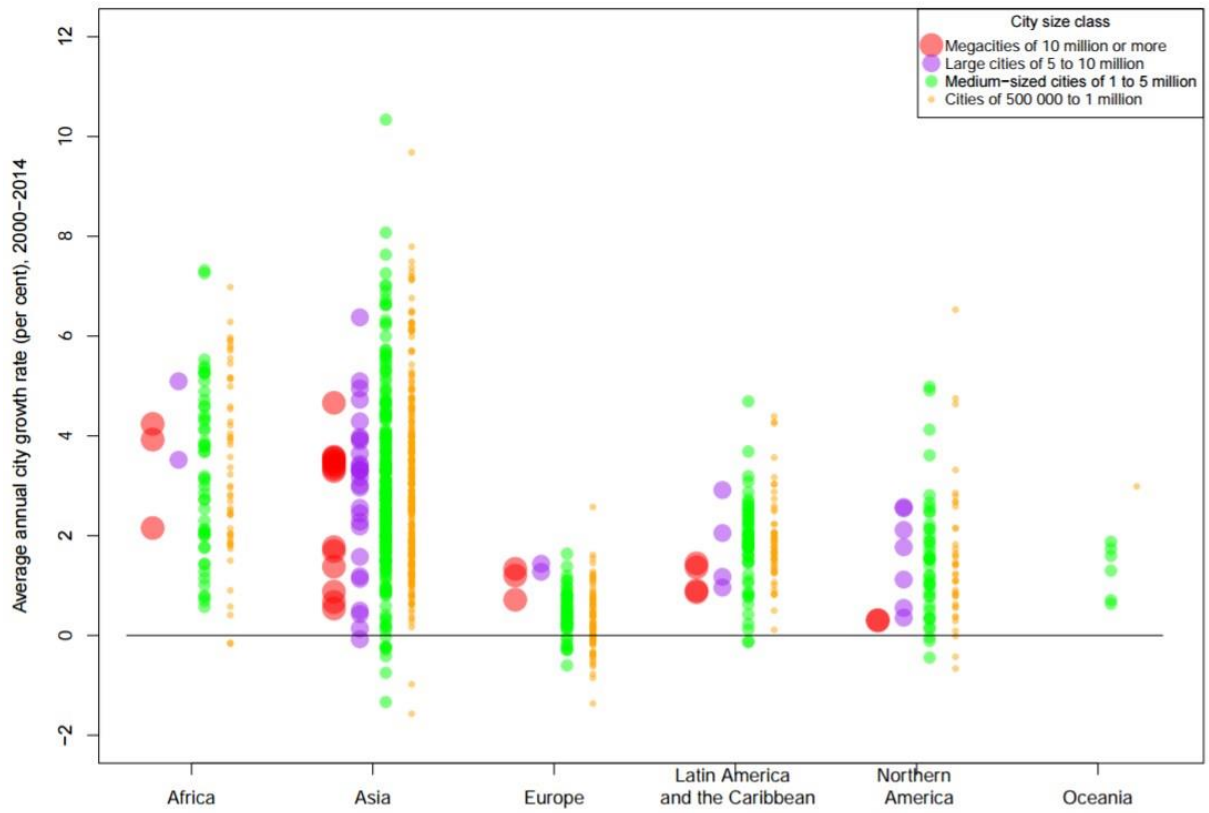


Figure 2-2: The world's fastest growing cities are in Africa and Asia (Source: UN-DESA 2014)

Industrialisation of Economies

From the late 1950's, in developing countries, industrialisation linked to rapid urbanisation was seen as a panacea for economic development, based on the belief that modernisation of economies could be achieved via rapid increments in industrial output (Lewis 1954; Lewis 1977; Omezi 2014). To supplement the industrialisation process, the enactment of *Keynesian* policies which encouraged import substitution as a strategy to fast-track economic development *vis-àvis* industrial and technological advancements was also widespread. By establishing domestic production capacities, state-led initiatives aimed to curtail the import of products and services in economies which were previously extraction economies (Baer 1972). Nationalistic and autonomous tendencies as a political tool of newly independent countries also encouraged this shift in economic structure (Ekundare 1971). These industrialisation strategies, however mostly failed to achieve the levels of economic dividends that were projected.

Economic Liberalisation

The mid-1980s was a tipping point in the informality discourse as many developing countries transitioned from being state-led economies to free-market economics, to cushion the effects of the global financial crises - including a global recession, the Latin American debt crises, and other problems. The World Bank (WB) and the International Monetary Fund (IMF) encouraged poorer governments to implement its neo-liberal economic agenda through so-called Structural Adjustment Programmes (SAPs) as a precondition to secure bailout funds (Portes 1997; Easterly 2005). To promote the liberalisation of markets, SAPs had three main components 1) a reduction of the subsidies provided by states, 2) the removal of import controls, and 3) the reduction of state spending through fiscal austerity and privatisation of public facilities (Meagher and Yunusa 1996). However, many observers have argued that the expected trickle-down economic effect never occurred, and instead, SAPs resulted in a transfer of resources from the poor to the rich (Meagher and Yunusa 1996; Easterly 2005). In many countries, the effects of state cutbacks and retrenchments led to the growth of a private sector no longer protected by the state and rapid increase in informal sector activities (Tokman 1978; Moser 1984; Meagher and Yunusa 1996).

Some have argued that the SAP's failure to cushion the economic crisis was because lowerincome economies were in transition at the time of its implementation, and still in the process of evolving from predominantly traditional modes of economic activities and production to more modern and industrialised modes[11] (De Soto 2000). De Soto based this assumption on a belief that the trajectory of formalisation was the inevitable and natural route to economic development (as elaborated in Table 2.2). A different explanation for the failure of SAPs has been attributed to the

[11] This view is like the Chicago school of urban sociology's opinion for the causes of urban informality. Urban informality is viewed as an incomplete cycle of transformation from rural (indigenous) to urban (modern) activity patterns.

unwillingness of governments to implement austerity measures as stipulated by the IMF due to political expediencies (Van de Walle 2001). Consequently, developing countries were exposed to the global economy and its associated dynamics through SAP programmes, particularly the removal of import controls and their accompanying neoliberal policy emphasis (Harris and Todaro 1970; Cross 2000; Bacchetta et al. 2009). As a result, lower-income economies and the nature of employment were transformed with the increased inflow of foreign direct investments (ILO 2013), diffusion of technologies and innovation systems (Freeman 1995) and cross-regional capital, global value chains (Gereffi et al. 2005) which in turn influenced the structure and markets of the informal economy (Lyons et al. 2008).

Re-Evaluating Modernisation's Quartet

Modernisation initiatives further exposed systematic weaknesses of the state apparatus in LICs, and the fallout is also likely to have contributed to the entrenchment and persistence of informal economic activities. Economic projections based on the experiences from the rebuilding of Europe and Japan after World War II, and the emerging Asian tiger economies of Hong Kong, Singapore South Korea, and Taiwan (Lewis 1954; ILO 1972; Hart 1973), which suggested that trade liberalisation and economic development would foster economic growth and alleviate poverty and job shortages, were not achieved for many LICs. The SAPs mostly failed, and 'there is no evidence … that per capita growth improved with increased intensity of structural adjustment lending' (Easterly 2005, p. 20).

With this failure, the notion of informality as a conduit for economic prosperity[12] was revisited (Roy 2005). The perception of informality - once derided as a crude theoretical construct - started to gain attention based on its usefulness as an analytical tool within academia and economic development contexts[13] (de Soto 2000). The use of the informality paradigm is evident - as it

[12] Not all researchers agree with the emancipatory role informality plays, and are still concerned with the consequences of it workings, as seen in the work of Sir Peter Hall and Ulrich Pfieffer (2013).

[13] This is because Informality captured the reality of livelihoods of a substantial proportion of the world's population

achieved priority in development research agendas - for multilateral agencies such as the International Labour Organisation (ILO), World Bank (WB), United Nations Development Programme (UNDP), and amongst other major development and academic research institutes. The widespread use of informality as a concept has however resulted in a fragmented rhetoric, as different trajectories emerged to depict the links between informality and capitalism, which had implications on the definitions of urban policies (Dierwechter 2001).

The research output on the IE has been extensive in its scope. As an example, Onyebueke and Geyer's (2011) meta-narrative on informality research in Nigeria reflects the range of topics that have been researched - as summarised in Table 2-1. Onyebueke and Geyer's exploration - even though not exhaustive - details the achievements and shortcomings in research from the late 1970s till 2011, and they argue that there is no identified coherence within the policies and programmed interventions derived from these studies. This realisation is profound because a better grasp of the IE will aid in the generation of sustainable policies and strategies for managing their activities within urban areas.

Table 2-1: Informality Research in Nigeria. Source: Reproduced from Onyebueke (2013, pp. 15-16).

Informality Research	**Corresponding Researchers**
1. Delineation, size, structure, and economic performance of the informal sector in Nigerian cities/states	Fapohunda, Reijmerin & Van Dijk 1975; Mabogunje & Filani 1977; Abumere, Arimah & Jerome 1998; CBN 1998; CBN/FOS/NISER 2001a, 2001b; Oduh et al. 2008;
2. Informal sector and Structural Adjustment Programme; entrepreneurship, employment and income-generation; economic development	Fapohunda 1984; Meagher & Yunusa 1996; Akerele 1997; Akinbinu 1998, 2001; Nnazor 1999; Omisakin 1999; Oni 1999; Adekunle 2000; Adeyinka et al. 2006; Meagher 2001, 2007)
3. Informal sector and home-based enterprises; urban land use, environmental sanitation and urban planning	Omuta 1986; Simon 1992; Onyebueke 1998, 2000, 2001; Olokesusi 1999; Okeke 2000; Nwaka 2005; Jelili & Adedibu 2006
4. Informal land delivery; informal (re)settlement and forced evictions	Agbola & Jinadu 1997; Owei & Ikpoki 2006; Ikejiofor 2006; 2009
5. Informal credit and finance	Soyibo 1997; Ademu 2006
6. Informal sector activities as urban/rural livelihood, social capital and networks; gender empowerment	Soetan 1996; Oluremi 2003; Maduka 2006; Meagher 2006; Soyibo 2006; Adedokun et al. 2006; Yunusa 2008; Onyenechere 2011
7. Role of informal sector in waste disposal	Afon 2007; Nzeadibe 2009
8. Informal and formal sector linkages	Meagher & Yunusa 1996; Abumere, Arimah & Jerome 1998; Arimah 2001; Ijaiya & Umar 2004

2.2.2 Conceptualising Economic Informality

So, what is informality in relation to economic activity, and what are the debates that ensued from its (re)conception as a path to economic prosperity? In this section, a scholarly dialectic is discussed to underpin the conceptual perspective adopted in this research.

There have been many different attempts to try and define informality in relation to economic activity.

> Informality is a term that has the dubious distinction of combining maximum policy importance and political salience with minimal conceptual clarity and coherence in the analytical literature (Kanbur 2009, p. 34).

The terminology of 'informality' became common currency in the early 1970s. It initially described a low-income traditional economic sector and small-scale enterprises operating in petty trade, small-scale artisanal production and a range of other casual jobs. The interest on the 'informal' stemmed from the International Labour Organisation's (ILO) employment mission to Kenya in 1972 and British anthropologist Keith Hart's research work in Accra in 1973 (Kanbur 2009), although other studies had earlier described economic informality as traditional modes of economic activities.

The heterogeneous nature of the IE made it problematic for early adopters of this concept to formulate an agreed conceptual definition (Meagher 2013). The plurality was fuelled by counter efforts and debates generated by differing epistemological inclinations regarding the existence and nature of its linkages with 'formality' (Guha-Khasnobis et al. 2006; Sindzingre 2006). More recently, the conceptualisation controversies have waned substantially (Meagher 2013). However, a brief overview of the literature is outlined in the next three sub-sections. It is crucial for this research to explore the evolution of the ideological perspectives and their applications to inform and respond to existing government policies and actions.

Economic Duality: The Formal and Informal Dialectic

> Given the prominence of the formal-informal dichotomy in the development discourse, one might expect to see a clear definition … consistently applied across the entire range of theoretical, empirical, and policy analysis … Instead, it turns out that formal and informal are better thought of as metaphors that conjure up a mental picture of whatever the user has in mind at that time (Guha-Khasnobis et al. 2006, pp. 2-3).

As a precursor to examining debates on economic informality, the pervasive dialectic between formality and informality from a non-paradigmatic perspective is explored here. This duality is often evoked in research (even though not always explicitly implied). Hart (2006) borrowed from Derrida's (1998) 'binary hierarchy', to suggest that being formal is considered as being superior to being informal indicating a clear hierarchical distinction. Hart expresses this dialectical issue from another perspective, using an analogous representation of 'forms', by explaining that;

> being informal refers to behaviour which relatively speaking lacks form. Form is thus what is regular, predictable, reproducible, and recognisable; and it is intrinsic to all social behaviour to some degree. Therefore, when we identify something as informal, it is because it fails to reproduce the pattern of some established form (Hart 2006).

There are obvious consequences for social and economic analysis based on these assumptions of informality, and Hart (2006) further states that:

> The formal economy is the epitome of whatever passes for regularity in our contemporary understanding, here: the institutions of modern nation-states, the more corporate levels of capitalist organisation and the intellectual procedures devised by economists to represent and manipulate the world … While the 'informal' economy is anything which is not entailed

> directly in these definitions of reality … From the standpoint of high civilisation, whatever it cannot control or comprehend is 'informal' – that is, irregular, unpredictable, unstable, even invisible … these forms are usually less powerful and less rigid than those underwritten by state law and immense wealth (Hart 2006).

Therefore, in describing formality and the informality, it is easy to form an impression based on dichotomous conceptions, which is quite misleading. The popularity of the informality paradigm as jargon has therefore not done much service for the analytical precision in its definition, as it implies activities to some extent outside the norm (Hart 2006). This perception portraying informality as an 'inefficient, backward, irrational, and unhygienic form of economic activity' as described by Dewar and Watson (1990) is mostly found in the developing world. Cross (2000, p. 43) termed this as '*formalomorphism'*[14], translated to mean 'the tendency to analyse the problems of the informal sector as if it were a bad copy of the formal'. As a consequence, there have been attempts to manipulate informality to conform to a prescriptive notion of formality resulting in the 'formalisation' discourse (Williams and Round 2007b), which diminishes the rich complexity and social embeddedness of the IE.

The Taxonomy of Informality: Theoretical Inconsistencies and Contradictions

The notion of informality is rooted in the classic work of Lewis (1954), where he employed the term to describe an economic development theory based on a model of dual economic structures that occurred between the modern sector and indigenous traditional sector. Hart's (1973) original definition also bordered on a dual notion, therefore Lewis's (1954) and Hart's (1973) pioneering ideas fed into a Dualist school of thought. Drawing on the extensive theoretical and empirical literature on the IE, two other schools of thought emerge to provide alternative epistemological inclinations, in the Structuralists and Legalists (Moser 1978; Castells and Portes 1989). Chen (2012) highlights a fourth category to this classification to satisfy the Voluntarists

[14] The shift in scholarship and policy from a modernist to post-modernist stance; as a transition from State sponsored crackdowns, to being seen by the state as being able to resolve problems of the formal sector.

notion of informality. The fifth school of thought which is becoming more mainstream is the Social-Capitalist Paradigm.

Dualists view the IE as a sector comprised of marginal income-generating activities for the poor that exists parallel and distinct from the formal sector (ILO 1972; Hart 1973; Tokman 1978). Informality is linked with exclusions from economic opportunities from a dichotomous relationship with the modern capitalist economy. The IE mitigates unemployment for the urban poor by serving as a safety buffer and provides marginal income-generating opportunities. Structuralists view the IE as a constituent of an economic system characterised by close ties with formality (Moser 1978). Drawing on neo-Marxist and sociological philosophies of relationships with the capitalist sectors (Rakowski 1994) and their role in providing cheap labour (Moser 1978; Castells and Portes 1989), IE enterprises are considered as subordinate economic units. They, therefore, lack access to primary resources of production and operate in segments not lucrative enough for the formal firms to realise proper economies of scale.

Legalists view informality as consisting of “micro-entrepreneurs” who avoid prohibitive operational costs, onerous bureaucratic procedures, and regulations associated with procuring legal rights (de Soto 2000). Informality is thus a response to governments’ weak oversight support, regulations, and laws; and in cases where regulatory and legal system are functional, the ensuing hostilities from state-sponsored policies and actions are blamed for making selfemployed workers remain informal. To Voluntarists, the IE consists of entrepreneurs who deliberately choose to operate informally to avoid overhead costs such as taxation and government regulations. This school of thought is sometimes classified as an off-shoot of the legalist school.

These schools of thought are the four most dominant perspectives in the literature (Chen 2012) and embody the debates surrounding the conceptualisation of economic informality. Table 2.2 is a summary the delineation debates between these schools of thought and is adapted from WIEGO (2016).

The social-capitalist paradigm, according to Habib-Mintz (2009) bridges the gaps in conceptualising the 'internal diversity, dynamism, informal organisational, and regulatory processes' of the IE, by highlighting the role that social relations play. Although not captured by Chen's (2012) classification as illustrated in Table 2.2, it is an interesting take on the logic and causal theory within the IE debate. The social-capitalists argue that the IE is structured within 'an alternative and flexible organisational framework, which operates beyond the confines of state's regulatory apparatus, instead of equating economic informality to the absence of regulation'[15] (Meagher 2005, p. 2). As another conceptual understanding of the informal economy, the socialcapitalist paradigm is concerned with describing the internal diversity and dynamism of the IE, and rehashed most of the earlier perspectives documented in Table 2.2. Ultimately, this point of view sits somewhere between the legalist and voluntarist school of thought.

Table 2.2: Informal Economy Debates - The Dominant Schools of Thought Source: WIEGO

	DUALISTS	STRUCTURALISTS	LEGALISTS	VOLUNTARISTS
Introduced by	ILO Mission to Kenya in 1972	(Castells and Portes 1989)	Hernando De Soto in 1989	William Maloney in 2004
Whom they focus on	those engaged in traditional and survival activities	petty traders and producers; subcontracted and casual workers	informal enterprises and entrepreneurs	the self-employed - entrepreneurs and their informal enterprises
How they view the informal economy	As autonomous activities with few (if any) links with the rest of the economy; activities provide income for the poor and a safety net in times of crisis.	As subordinated economic units (informal enterprises) and workers that serve to reduce input and labour costs of large capitalist firms and increase their competitiveness.	As plucky entrepreneurs who choose to avoid formal registration and who need legal rights to convert assets into formal property.	As entrepreneurs who operate informally to avoid taxation, commercial regulations, electricity and rental fees, and other costs of operating formally.

[15] In this light, Meagher Meagher, k. 2007. Manufacturing Disorder: Liberalization, Informal Enterprise and Economic 'Ungovernance' in African Small Firm Clusters. *Development & Change* 38(3), pp. 473 - 503. applied a social network ideology to research IE enterprise clusters in Nigeria, and discovered the existence of a thriving network of production and trading, operating across both ethnic and religious divides, overturning local gender-based divisions of labour, and extending across regional and national boundaries into the global trading sphere.

Causal theory	Exclusion from economic opportunities due to: a) Imbalances between the growth rates of the population and of modern industrial employment; and b) a mismatch between people's skills and the structure of modern economic opportunities.	Informality is due to the nature of capitalism and industrialisation, specifically: a) Attempts to reduce labour costs and increase competitiveness; b) the reaction of formal firms to the power of organised labour, c) state regulation of the economy and global competition.	A hostile legal system that leads to informal activities and informal, extralegal norms. Cumbersome government rules and procedures which creates barriers to formalization and thus stifle the productive potential of informal entrepreneurs.	Informal operators who choose to operate informally – or even criminally – after weighing the costs and benefits of informality relative to formality. Informality is a deliberate choice by entrepreneurs to enjoy benefits of informality.
Characteristics	• ease of entry • reliance on indigenous resources • small-scale operations • labour-intensive • skills acquired informally • unregulated, competitive markets	Focus on relationships of production + activities unregulated by the institutions of society. Informality is: • universal • heterogeneous linked to capitalist/formal firms	A hostile reception, especially from the legal system, leads to informal activities and extralegal norms.	Costs of formality (avoided): payroll taxes and social protection contributions Benefits of informality: way to earn income while avoiding costs of formality
Policy Responses	Governments should create more formal jobs and provide financial and business development services to informal enterprises	Governments should regulate both commercial and employment relations to address the unequal relationship between "big business" and subordinated producers and workers	Governments should simplify bureaucratic procedures to encourage informal enterprises to register and extend legal property rights and convert their assets into capital.	Governments should bring informal enterprises under the formal regulatory environment to increase the tax base and reduce unfair competition by informal enterprises.

Each of the five schools of thought discussed provides a reflective perspective of the IE's logic, causal theory and composition, but none of them adequately captures the embedded and heterogeneous complexities of the IE (Chen 2007; Williams and Round 2007c). On critical examination, many of these theoretical considerations intersect and are inconsistent, and Williams and Round (2007c) argued for a standard interpretation that integrates these perceived contradictions and inconsistencies to achieve a better understanding of the inherent diversity in the informal economy. Some researchers, however, advocate for the abandonment of the formal-informal conceptualisation, as it has outgrown its usefulness (Portes 1994; Hart 2001).

> [There has been a] transformation from a 'modern' economic/political system, which saw … the informal sector as parasitic or at best inefficient, to a 'postmodern', economic/political system in which street commerce is often seen as a source of growth and flexibility (Cross 2000, p. 31).

Research on the IE has produced diverse scholarship. The IE is now considered to refer to noncriminal income-generating activities that operate, at least in part, outside government regulatory and institutional frameworks (Castells and Portes 1989; de Soto 2000; WIEGO 2014). The linkages between formal and informal economies, is also no longer a burning issue, as it is now widely agreed that there is a continuum between them, and the IE is seen to have grown to a large extent as the outcome of decisions made by the 'modern' state governance apparatus. The IE has also been established as a central and dynamic feature of post-modern and contemporary markets and economic development (Castells and Portes 1989; Cross and Morales 2007; Tokman 2007). According to Meagher (2013), recent informed discussions have bordered on more cognate issues regarding the provision of an apt operational definition for statistical and policy purposes. Policy, however, has made attempts to formalise informality which is threatening the very factors that have made the IE successful (Cross 2000).

Informality manifests in diverse ways within different economic contexts and localities, and this has contributed to ambiguities in its conceptualisation and a lack of dependable and comparable data. In literature, a distinction is often implicitly made between the concepts of the '*informal sector'* (enterprises) and the broader concept of the 'informal economy' (both enterprises and labour). A consensus to develop a standard universal statistical representation of the 'informal economy' was adopted at the 15th and 17th International Conference of Labour Statisticians (ICLS) (Hussmanns 2004; Chen 2012; ILO 2013), to suit the agenda of the ILO in conjunction with the Delhi Group (Expert Group on Informal Sector Statistics). The ICLS resolutions defined a framework of agreed measures and statistical outputs, that also allowed country-specific flexibility in methodology.

The 17th ICLS agreed that for statistical purposes, it would be better to present statistics on the informal sector and on informal employment separately (ILO 2013; 44). The ICLS agreement has resulted in a more precise operational and statistical terminology, creating clarity on three related concepts often used interchangeably in describing the broad base of the workforce and activities in the economy about informality, and they are outlined below as described by Chen (2012, p. 8):

- the '*informal sector'* is defined to refer to the production units (enterprises) that take place in unincorporated small or unregistered enterprises. The term 'enterprise' in a broad sense refers to economic units engaged in the production of goods or services for sale or barter. The location of such production activities is not specified and may be undertaken: inside or outside the business owner's home; in identifiable premises; unidentifiable premises; or without a fixed location. Independent street vendors, taxi drivers, and home-based workers are thus all considered to be enterprises in this context.
- '*informal employment'* is a labour approach which refers to employment relations – including own-account workers - without legal and social protection both inside and outside the informal sector (adopted by the Delhi group in 2001 and reviewed in 2003).
- the *'informal economy'* is an all-encompassing terminology which refers to all units, activities, and workers so defined and the output from them.

The ICLS definitions are adopted in this research to differentiate between the: *informal sector, informal employment* and *informal economy* (IE). According to this definition, statistics indicate that informal employment in sub-Saharan Africa ranges from 33% in South Africa to 82% in Mali[16] (excluding agricultural employment); in Latin America and the Caribbean from 40% in Uruguay to 75% in Bolivia; in South and East Asia (excluding China and Thailand) more than 60% (ILO 2013). In Schneider et al.'s (2010) comparative study on economic informality[17], an entirely different methodology which accounts for the 'shadow/criminal' economy (e.g. drugs, money laundering, and others) was used. Schneider et al.'s shadow economy does not fall under the operational

[16] There is no data on the IE in Nigeria in the ILO (2013) report.
[17] Schneider's comprehensive survey is widely cited as a source of data on the informal economy.

definition of the IE as defined for this thesis. Such technicalities indicate the importance of employing caution when dealing with statistics on the IE, as different classification and delineation are employed over time by different organisations and governments, which tends to skew the validity of data.

2.2.3 Places of Work for the Informal Economy

IE enterprises engage in a myriad of activities, and gaining access to operational spaces for work is important for survival (Perera and Amin 1995; Yankson 2000). In turn, understanding the complications that IE workers face in finding and retaining a place of work can serve to support more inclusive urban spatial governance approaches and thus a more sustainable IE. Hence, it is expedient to examine the locational determinants of the IE.

A large proportion of IE enterprises do not access their workplaces legally, although few are formally allocated space by the relevant local authorities or private landowners (Mitullah 2004). The spaces of IE enterprises tend to be located either on streets and road networks, within dwellings, or at a specific location. Perera and Amin (1995) referred to the locations of IE businesses as being: *street-operated-enterprises* (SOE), *home-based-enterprises* (HBE), or as *business-location-operated-enterprises* (BLOE). However, due to the continua within the workplaces in the street economy, Perera and Amin's classification scheme is problematic. For example, to what category does an enterprise that produces goods in either a BLOE or HBE, and then retails the finished product on the street belong? Such an enterprise can fit into any of Perera and Amin's three categories, thereby highlighting the problematic nature of such singular classification, because of the interlinked nature of IE value chains. For this research, an allencompassing terminology - *street-based-enterprises* (SBE) - is preferred, as it captures IE enterprises that conduct any part of their operations (no matter how little) on streets or interconnected open spaces. Subsequently in this research, any enterprise regarded as an SOE, HBE, or BLOE is based and operates exclusively within any of the spatial boundaries of these individual categories.

The occupational groups of SBEs are numerous and can include street traders, waste pickers, road-side artisans, and transport workers, to name a few. Activities of actors that function as SBEs typically involve the production and distribution of goods and services (see Section 1.3). In some locations, many IE actors involved in production are also responsible for the circulation and sale of their finished products (Bromley 2000). However, some enterprises operate within a complex web of specialisation, where - for example - a street trader is part of a network of enterprise that includes, importers, wholesalers, middlemen, transporters, informal (public space) landlords, etc.

Street traders (STs) are arguably the most visible elements of the IE (WIEGO 2011; Chen 2012), and the most populous constituents of SBEs. STs are observed to capitalise on streets and other public open spaces within cities as their operational base. STs often concentrate their retail activities at strategic locations close to heavy pedestrian or traffic flows, which overlap areas with dense populations. In this sense, a ST's niche is in the (re)distribution of goods and services, providing consumers with convenient, accessible retail options and services. The nature of commodities and services offered by STs vary significantly, and sometimes these are specialist and not available in off-street locations (Bromley 2000).

A characteristic feature of STs is that they typically have small 'thresholds'[18], and as a consequence, they become itinerant or change locations frequently to extend their 'ranges'[19] to capture more customers (Dewar and Watson 1990). Therefore, STs choose their workplaces to exploit the economies of market thresholds and ranges (see Section 3.2). STs are either sedentary, temporarily itinerant or continuously itinerant (Bromley 2000). Charmes (2000) applies a classification criterion that distinguishes between sedentary STs with fixed-rudimentary premises, who display goods using makeshift or purpose-built facilities like: tables, stools, porch roofs or shades; and itinerant STs (hawkers) who walk around with their commodities or vend from carts or bicycles. Capturing STs' spatialities is difficult because of their fluctuating locations and temporal character (Roever 2011). Some STs work periodically, sometimes only in the

[18] A threshold is the minimum size of market required to keep a business running.
[19] A range is the average minimum distance that people are willing to travel to procure services or goods.

morning, afternoon, or evening, while it is also common that they work only on weekends or only during certain seasons, for example during festivals (ILO 2002).

> Street traders are a very diverse set of urban informal workers. They work in many different types of public spaces … at different times of the day, on different days of the week, and during different seasons of the year. Some traders move from one vending post to another over the course of the workday, and sometimes a single vending post can be the workplace of several different individual vendors. With so much variation in the time and place they work (Roever 2011, p. 1).

Itinerant STs can increase their market range, and this affords them a degree of flexibility in comparison to sedentary STs, who tend to be more strategic in their choice of workplaces - to enable them to interact with as many potential customers as possible, over a prolonged duration at a single location - although they are limited in the amount of stock they can carry. Sedentary STs are most likely to be located in the vicinity of activity generators, where opportunity landscapes are not in a constant state of flux. In comparison, itinerant STs might favour the occupation of spaces with a different character to sedentary STs, to compensate for market demands which are not fulfilled by other forms of retail operations, for example at road junctions or stretches of road susceptible to traffic congestion. Temporalities of STs are however determined by convenience, as some STs operate within both realms - itinerant and sedentary - depending on circumstances. In conducting research, consideration must thus be made to factor in the subtle differences between the locations of sedentary and itinerant traders. Figure 2.3 below shows factors assumed to affect the location of STs as identified from literature.

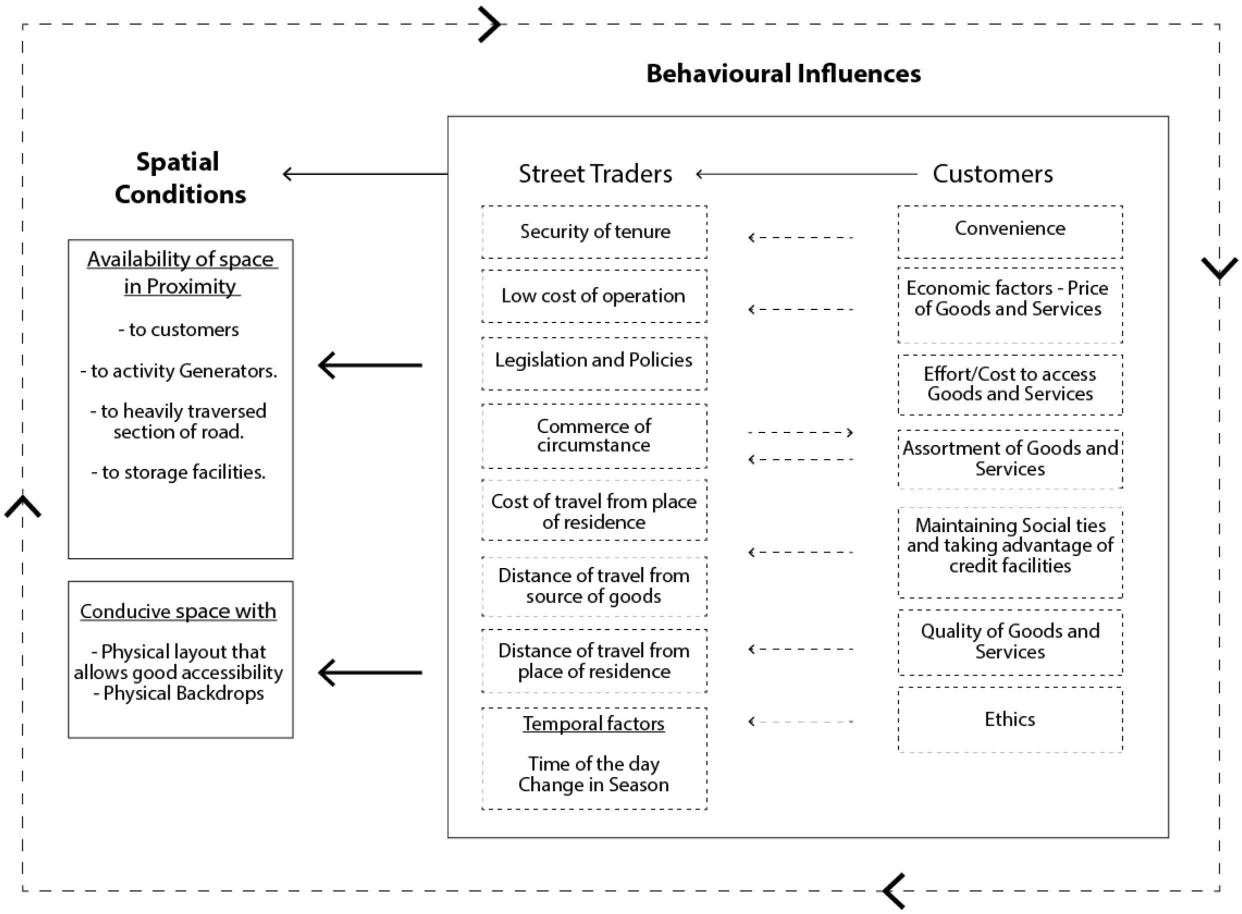


Figure 2-3 ST Location Calculus within Cities, as concluded by present knowledge base.

Contested Spaces

Due to its prominence, street trading has become a target of constant deliberations, and stateled urban management and planning policies often threaten its activities (see Table 2-2 for an overview of common arguments for and against STs).

> The displacement of street traders from public spaces is a common government policy in developing world cities despite widespread arguments that displacements lead to marginalisation of street traders (Omoegun 2015, p. ii).

Intuitively, the right strategy for dealing with the street trading phenomenon would involve appropriate management to harness its economic and employment potential, but that seems to be the reverse of the policies being employed by many governments in the developing world

(Brown 2006; Bromley and Mackie 2009). In 1995, at a meeting of IE advocates and activists, the recognition that STs faced similar problems in most of the world's cities culminated in the drafting of the Bellagio International Declaration of Street Vendors (Streetnet 2003), which argued for the creation of national policies to promote and protect the rights of urban street vendors.

Mitullah (2004, p. 2) identified the common problems which were determined by the Bellagio International declaration as:

> '(i) a lack of legal status and the right to trade, (ii) a lack of space or poor location, (iii) the restrictions on licensing where available, (iv) the cost of regulation, harassment, bribes, confiscation and evictions, (v) a lack of services and infrastructure, and (vi) a lack of representation or voice.'

Mitullah (2004) also illustrates the problematic nature of how spatial governance fails to reflect current realities. In LICs, there are numerous cases of very poor uptake rates at new market locations created to relocate STs. In other cases, outright displacements occur without the provision of alternative spaces for STs to trade.

Table 2-2: Arguments for and against Street Trading in urban areas. Adapted from Bromley (2000 p.4-10).

Arguments for Street Trading	Arguments Against Street Trading

I. Through their transactions, street vendors contribute directly to the overall level of economic activity, and to the provision of goods and services. II. Citizens have constitutional rights to choose their occupations and to engage in entrepreneurial activities. III. Street trading is an actual or potential source of government tax revenues. IV. Street trading serves as a social safety-net, which is much cheaper for governments than establishing a comprehensive welfare system. V. Street trading is a laboratory for entrepreneurship, family business and social interaction. VI. Street trading provides entrepreneurial opportunities to people who cannot afford to buy or rent fixed premises. VII. STs significantly expand the range of places and times where goods and services can be provided. VIII. STs bring life to dull streets. IX. Street trading offers its workers considerable flexibility in hours and levels of activity, and it provides some choices of work locations. It can be practised as an extra job increasing gross income. X. Street trading is a remarkable example of selfhelp and grass-roots initiative.	I. STs gravitate towards congestion, because that is where available demand is concentrated. As a result, through a process of circular and cumulative causation, both street sales and levels of congestion are further increased. II. By contributing to vehicular and pedestrian congestion, STs may cause traffic accidents, reduce accessibility, increase the levels of vehicle-generated air pollution, and impede the flow of emergency service vehicles. III. STs often fail to pay taxes on their earnings, and are "unfair competition" to tax-paying offstreet businesses, undercutting their off-street competitors because they pay less overheads and no taxes. IV. Because STs can leave or relocate their businesses more easily, they have higher opportunity to swindle their customers and avoid official regulation than fixed retail establishments. V. Street trading of food and drink pose major public health problems. VI. STs often include substantial numbers of minors, contravening labour legislation. VII. Through the activity and congestion that they generate, STs provide opportunities for pickpocketing, snatch thefts and armed assaults. VIII. STs are often viewed by urban elites as prominent elements of "disorder".

Table 2-2 above, is a summary of the arguments as discussed by Bromley (2000), where it is evident that it is more rational and beneficial to support STs than exclude them in cities. Arguments for and against street trading differ, and according to Bromley (2000), the arguments against STs are often more trivial than those in favour. The significance of these arguments varies in relation to the contexts, characteristics of the trader, merchandise, and neighbourhood.

2.2.4 Economic Informality Discussions

Section 2.2 has discussed economic informality and its evolving conceptualisation. The debate can be framed as a transition from a modernist to postmodernist outlook on the IE's value for social and economic development. The modernist perspective derided the IE as dual economy, seen as a crude developmental non-starter operating outside the global and neoliberal market economy. The ramifications of state-led modernisation strategies in LICs increased the level of engagement of urban inhabitants in IE activities rather than alleviating issues of unemployment and poverty. Consequently, the postmodernist perspective challenged the negative outlook of informality and conceived the IE as a means to economic development. However, to harness this potential, a formalisation ethic has taken centre stage in the developing world. The perception of the IE and its constituents as detrimental to the outlook of 'modernity' is still reflected in city government policies and actions, which diminishes the ability to harness the positive dimensions of the IE to contribute to economic development and employment.

Economic informality manifests in diverse ways, and street trading is often seen as one of the most conspicuous models of the IE operation. The informal (often illegal) appropriation of 'particular' public spaces as workplaces in cities by SBEs, has resulted in state-led spatial governance to crack down on their activities - as part of the modernisation objective/goal of 'global' cities (see Section 1.3). Access to these often contested public spaces is a defining factor for many SBEs' survival. The linkage between STs' workplaces and their survival is revealed to depend not just on the availability of space. Instead, it is the specific location that is important to STs operations. Therefore, an argument is made in the literature for spatial governance initiatives that are inclusive and that will allow SBEs prosper in suitable types of spaces that meet their spatial requirements.

From the body of work reviewed, there are conflicting views of how to deal with SBEs to achieve economic development, and this dialectic is an indication of a deficiency in knowledge. It is therefore vital to explore spatial governance of LIC cities where STs thrive to identify how the conflicting views of IE space have influenced the planning and management of STs workplaces to fill this knowledge gap. An appreciation of the planning and management of economic space should furnish the development of appropriate responses to support the IE in LICs.

2.3 Spatial Governance and Urban Economic Space

This section explores the literature on how urban spatial governance - through policies, plans and strategies of interventions - influence the workplaces of SBEs. First, a dichotomous perception of urban economic space prevalent in the research on developing country cities is presented. Then in the next four sections, the literature that examines how urban spatial governance traditions are theorised in IE research is discussed to indicate how urban researchers have situated the IE's spatiality within spatial governance frameworks. The body of work in this section, therefore, identifies how this relationship is understood, the gaps in knowledge, and how the existing knowledge can be applied to the context of this research - to answer the research question on how the IE is affected by urban spatial governance.

Due to the complex nature of the IE (see Section 2.2.2) and the arcane state of knowledge on their spatialities (Balbo 1993; Meagher 2013), research of urban space in developing country cities tend to (implicitly) distinguish between the spatialities of the formal and informal economy. The dichotomy in research on urban economic space emerged from the period when most of the research on informality with spatial inclinations were conducted - in the 1970's and 1980's[20] (Roy and AlSayyad 2003).

[20] The discourse on spatial governance in this period was also located within a framework defined by urban experiences in North America and Western Europe, looking in from outside.

> The analytical framework of urban informality [within a spatial and urbanisation praxis] evolved primarily from Latin American research … with debates on issues of state power, economic dependency, and populist mobilisation (Roy and AlSayyad 2004, p.1).

Santos' (1979) attempt at formulating a theoretical framework to analyse the implications of urbanisation and modernisation in developing countries cities, is a classic example of this dualistic approach. Santos (1979) set out to counter the monolithic conceptions of cities and to highlight a discrimination in spatial governance between spaces of the 'lower and upper circuit' (informal and formal) from both economic and social standpoints. Santos points out that during the process of urbanisation, the dynamics of modernisation are integral to the (re)organisation of spatioeconomic relationships in cities. Thus, urbanisation results in the creation of two interrelated market areas that conform to the subsystems of formal and informal economic circuits, and the dynamics of their corresponding territorialities are essential to the way the urban economy functions. Since modernisation is promoted through the state's governance apparatus (see Section 2.2.1), the more modernised elite 'upper' circuit (larger capital investment) is inevitably favoured, rather than the 'lower' circuit (predominantly small-scale informal enterprises). Consequently, urban governance best serves the interests of the upper circuit (Dierwechter 2001). So even though lower and upper circuits coexist in cities, Santos hypothesised that this was most likely an antagonistic relationship - due to the dominant nature of the upper circuit in the control of space.

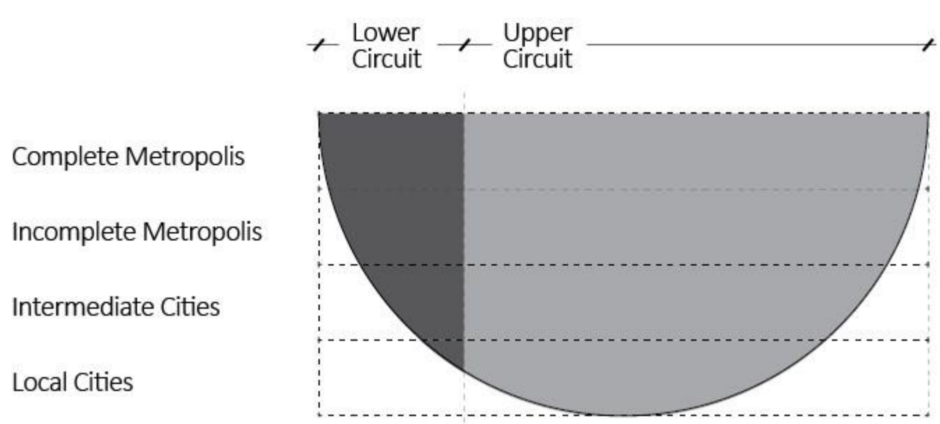


Figure 2-4: Relative importance of the Two Circuits in the Systems of Cities. Source: Santos (1979)

According to Santos, the growth of the upper circuit and lower circuit occurs relative to the size and level of urbanisation in cities, as illustrated in Figure 2-4. This relationship implies that in larger urbanised cities with more significant and influential upper circuits, the urban poor - who have less disposable income - must rely on the lower circuit to access goods and services. As the lower circuit mostly caters to the poorer segment of the population, its importance intensifies in direct proportion to the size of cities and this is a plausible explanation for why in many megacities of today, the lower circuit plays an essential role in the economy. However, the most valuable locations are either absorbed or assigned to formal institutions by the state's spatial planning apparatus in cities, and the IE even though important, must settle for sub-prime locations - that hinder their ability to operate.

Santos also noted that because the upper circuit is vertically integrated[21], an improvement in mobility enhances its hegemony because customers can go beyond their local markets (within the hierarchy of cities). The structure of urban economic space is captured by his statement that:

> The true dialectic between the upper and lower circuits occurs at the local level because the lower circuit has only a local range … the upper circuit's market is nationally or regionally unified, while lower circuit markets in different agglomerations are fragmented (Santos 1979, p. 133).

Within the dual thesis of cities explored by Santos, a need for distinct spaces for IE enterprises is insinuated - as informality generates and requires its economic space. This dualist vision of the economic structure is disputed in informality scholarship, where it is argued that the most appropriate way to view the relationship between informality and formality is to establish a continuum of linkages (see Section 2.2.2). The dual notion of economic space is however still

[21] While the lower circuit is horizontally structured. The lower circuits horizontal structure means that economic activities within the lower circuit mostly can't draw custom from areas beyond its catchment area in comparison to the upper circuit – which can tap on a wide range of customers across different hierarchies of cities. This link between the lower and upper is explained further in Section 3.2.1 – by exploring Christaller's (1933) concepts of economic 'range'.

observed as a policy response for spatial governance in developing world cities (Dierwechter 2002). Four broad agendas reflect the way spatial governance of the IE has been studied in literature, and these are discussed in the next sections - building on Dierwechter's (2000, 2002) assessments of research that link the IE with urban planning practice[22]. First, is the approach that explores how urban governance frameworks influence IE activities in developing countries cities. Second is a school of thought that believes the nature of urban planning is unsuitable to the context of developing countries and argues that the agencies and dynamics created by IE are sufficient to cater to their spatial requirements without the interference of the state. Third, is the approach that is concerned with the outcomes of states' spatial interventions and the negative consequences on the spaces of the IE. The fourth is the school of thought whose concern is focused on the role that spatial governance can play in resolving issues with SBEs spatialities, mostly by studying their spatialities in locations where they thrive.

2.3.1 Spatial Regulatory Frameworks and Urban Governance

This section explores spatial governance in developing countries cities and how it engages with and defines the workplaces of the IE and STs. The literature discussed, reveal how the workings of governmental and legal frameworks influence the spatiality of the IE.

Spatial governance in many developing countries differs, although, it is often administered within a framework defined by a hierarchically structured government system. Spatial governance is conducted through a complex interplay of regulation, persecution, tolerance and promotion, are rarely implemented consistently, and often produce unforeseen consequences (Bromley 2000). Within the regulatory framework, the most important tier of government (and institutions) for intervening in IE activities are those that operate at the urban or district scale - the remit of local

[22] Dierwetchter's studies identified six major ways of how spatial dynamics of IE and planning practise have been linked by urban researchers.

governments. However, in many LICs, legislation is often out of date, and local government lacks either the powers, capacity or resources to update or operate legislation or bylaws. Therefore their ability to manage the urban realm is constrained in situations where there is inadequate regulatory capacity (which is often the case).

In Brown's (2006, pp. 176 -180) discussions on the dynamics of 'contested spaces', she highlights a broad range of policies, regulations and bylaws that determine the activities of STs[23]. Brown also states that

> Urban law affecting street traders is complex, poorly documented and erratically applied. Interpreted and implemented by municipalities, it is often framed at the national level, with roots in international influences ... Bylaws regulating cart-pushers, kiosk owners, hawkers and business licenses, are often colonial relics (Brown 2017, p. 4)

The multiplicity and duplication in legislative powers and laws within the spatial governance apparatus often result in STs being illegal across multiple governance dimensions. In some urban regions STs are unofficially legitimised by the actions of local level governance institutions, who impose daily fees or tolls on them to guarantee their operations. This uncertain legality for STs further compounds their precarious operations. The legislation affecting street trading can include 'constitutions, policing and local government powers, highways, urban planning, bylaws and licensing regulations, market and food hygiene regulations, and hawking and vending regulations' (Brown 2017, p. 4).

As Brown notes, non-state [24] forms of social and economic ordering exist in parallel to statesanctioned regulation. It is, therefore, common for:

---

[23] Examples of Laws specific to STs include: The 1991 Business Act in South Africa; the Street Vendors (protection of livelihood and Regulation of street vending) act of 2014 in India. In Lagos, examples, of laws impinging on STs include the: Environmental Sanitation Law of 2010; Lagos State Street Trading and Illegal Markets (Prohibition) Law of 2003; Lagos State Waste Management Authority Law of 2007; and the Lagos State Road Traffic Law of 2013.

[24] These include customary laws – which are typically associated with traditional laws and social norms of many countries that existed before their usurpation by colonialism and acculturation to Western ways.

> street trade [to be] regulated by a panoply of informal actors including private landlords, religious or ethnic groups, market or welfare associations, unions, savings groups, the police or vigilantes, with extortion and exploitation rife (Brown 2017, p. 4).

and that due to legal pluralism (the coexistence between formal and informal regimes) in the regulatory environment,

> street trading is often illegal across many different strands of law, cost and bureaucratic procedures make licenses unattainable, and lack of rights to trading space make STs vulnerable to eviction (Brown 2017, p. 4).

The outdated spatial regulatory system in developing world cities further exacerbates noncompliance of STs. In many LICs, elements of the regulatory codes are relics of colonialism and often unfit to deal with contemporary urbanity. The notion of spatial order draws on an idealised vision of colonial urban space, at odds with the organic (and chaotic) image of IE activities, which exposes them to conflicts and evictions. STs thus often exist in a 'rights' vacuum. In developing countries, modifications to spatial governance regulations sometimes acknowledge their shortcomings, but as Bromley (2000, p. 20) notes, this approach has been 'overwhelmingly incremental, adding more and more rules without clearing up discrepancies with previous procedures'. In many instances, 'the position and functioning of cities in the world economy' is the foremost ethos of spatial governance (Skinner 2012, p. 195). Thus in many LICs, the rationale for spatial governance is based on '*developmentalism*' (Robinson 2002), using control over public space to achieve economic development.

2.3.2 Spatial Agency and Urban Governance

This section explores a perspective on urban spatial governance which argues that the administrative role of the state and its attempts to spatially corral the IE is unauthentic, unrealistic and pointless.

Informality is seen as a 'heroic entrepreneurial' enterprise, born spontaneously out of states' inability to provide for the masses (Roy 2005). Instead of seeing informality in cities as problems, researchers like Harrison suggests that

> there is a possibility that cities in the south may represent a new, or at least, hybrid form of modernity… through the resourceful responses of its residences to conditions of vulnerability, [African cities are] in the process of becoming something new … Urban practices in the south are not inadequate copies, or distortions, of developments in the North but have their own logic or rationalities and may be considered as unique and creative adaptations of the modern (Harrison 2005, p. 7).

As a critique of urban spatial governance, Balbo (1993) evaluated the colonial and post-colonial consequences of master planning and the role it played in fragmenting the urban structure of developing country cities. According to Balbo, the outcome of spatial governance in the colonial era was in the formation of two sets of autonomous fragments in cities[25]. One typology of fragment was planned with modern infrastructure, while the other was unplanned and left independent of the state. The unplanned fragments mostly participated in indigenous and traditional models of economic activities, and as they were not integrated into states' modernisation drive, their inhabitants had to find ways to adapt to survive. The postindependence period in many LIC cities ushered in a change of strategy (as described in Section 2.2.1). The ideology of spatial governance that viewed the city as a homogenous entity became the model of spatial organisation in cities[26]. The incorporation of the unplanned fragments of cities (which began to be regarded as being 'informal' and 'illegal'), became a central preoccupation of sanitising and bringing order to lower-income cities to achieve development.

[25] The fragmentation of cities to Balbo, is anti-thesis to the ethos of formal master planning which viewed cities as homogenous entities. This is because the Western city which master planning is modelled on typically consists of different parts which participate in forming a single well defined and organised spatial order.

[26] See Post-Independence – A Dual City in Section 5.2.2 for a detailed discussion on this occurrence in Lagos.

To Balbo urban fragmentation does not always have to connote negativity, as the practice of localism in the unplanned city fragments strengthens the IEs ability to thrive. The spatial reengineering of cities to create a unified urban fabric thus diminishes the advantages the IE extracts from fragmented spatial structures in cities. Therefore, Balbo (1993) declared that planning processes are too static to forecast and adapt to the dynamism created by informality. To Balbo, the Western model of spatial governance through master planning is perpetually playing catch-up and incapable of meeting the ever-changing needs and growth trends in LIC cities.

Balbo (1993, pp 23) also suggests that master planning fails because it is a state apparatus which is moulded on the collectively defined interest of governance for all citizens - derived from Western culture. The absence of a nation-building doctrine in LICs means that the state does not represent the entire population and instead, more local/traditional networks fulfil this role through urban fragmentation. Balbo's rhetoric is captured in a somewhat cynical suggestion that since the

> Illegal city offers the rural poor the opportunity of improving the quality of their lives significantly [and] by contrast; it is the quality of life of the rich that is negatively affected… [Then maybe more illegal cities/slums are needed in LICs, so] if spatial fragmentation is one way of achieving greater equity, we need to be very careful in fostering solutions which aim at making the city more integrated, homogeneous, legal (1993, pp. 32-33).

Koolhaas et al.'s (2000) analysis of the self-organising attributes of informality in Lagos, portrays a similar message to Balbo's. In his team's assessment of the dynamism in Alaba Market and Lagos in general, a sceptical image of the value of state's urban governance mechanisms is portrayed. A sanguine notion of initiatives taken by individual actors in ingenious and alternative systems is suggested to be the trajectory for how cities will function in the future, implying that Lagos is a precursor to a new kind of urbanism (Gandy 2005). Koolhaas suggests that

> To write about the African city is to write about the terminal condition of Chicago, London or Los Angeles … Lagos represents a developed, extreme paradigmatic case-study of a city at the forefront of globalising modernity (Koolhaas et al. 2000, p. 653).

Koolhaas and Balbo’s thoughts on the ineffectiveness of planning in supporting the IE is also echoed by Harper (1996). Harper underscores a pervasive lack of understanding for IE enterprises spatialities by urban planners, and instead, suggests that a hands-off approach is more beneficial than even positively intended interventions. The hands-off approach is the underlying belief suggested by the literature discussed in this section as the current state of urban governance is unable to resolve IE issues.

2.3.3 Spatial Governance, Regulation, Promotion and Unintended Outcomes

The perspective in this section is informed by a belief that even though urban governance through planning and management interventions seek to change developing country cities positively, the consequences are often counterproductive and compound the precarious state of the IE. It is believed that the outcomes of states’ spatial interventions (in providing workplaces for IE enterprises) are often ineffective because there are based on formalisation strategies and inconsiderate to the specificities of IEs spatial requirements.

McGee’s (1973) dual structure of economic space [27] suggests that in the face of spatial competition, the complementarities enjoyed between the hierarchies in which economic activities operate inevitably become strained, with the land-use of the more efficient entity absorbing, the less efficient activity. In other words, in the bid for operational spaces in cities, the formal economy inevitably absorbs the IE. As illustrated in Figure 2-5, McGee depicts through a three-phased process how land use is transformed to be dominated by the upper circuit during urbanisation of cities. Thus, McGee argues that for purposeful and effective urban planning to

[27] Picking up Santos’s (1979) notion on economic structure in developing world cities.

occur, spaces for the lower circuit must be recognised in order to manage the inevitable process of absorption.

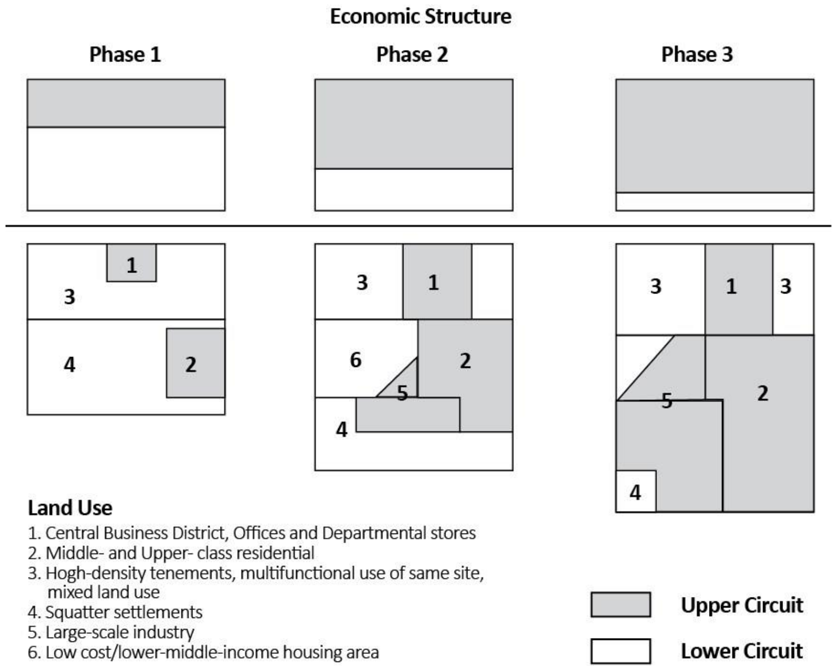


Figure 2-5: McGee's two-circuit land-use model of urban development. Source: McGee (1973). Redrawn by Author.

In some early planning projects, it can be seen that the need to provide 'operational space' for IE actors was considered, and therefore allocations were made in masterplans to accommodate IE enterprises. In Le Corbusier's master plan for Chandigarh, India, the allocation was made for IE enterprises in the plan. Sarin's (1982) study of Chandigarh, however, highlights how the intention of spatial governance had a negative effect on the urban economy for the city's locals. The problem was that the masterplan's prescriptions did not align with the contextual realities of the 'unplanned' IE; instead, it embodied an elitist and modernist vision of what and how Chandigarh as a capital city should function spatially. Thus, the effort to formalise IE enterprises by relocating them to controlled spaces was discriminatory and done in vain - as the SBEs eventually returned to the newly planned streets around the areas they had initially been evicted from - a pattern in many LIC cites.

In another instance, Post's (1992,1995,1996) series of empirical studies on the Sudanese State's planning strategies in Kassala's town centre, highlight how attempts to relocate IE enterprises to new purpose-built markets in decentralised locations were unsuccessful. Post analysed the locational patterns, behaviours and motivators of informality, and found that because IE enterprises operated predominantly as a means for survival rather than for profit maximising reasons, they were unlikely to relocate to new trading locations even if their original locations were suboptimal. Post, therefore, argued that the Sudanese State's spatial management efforts failed because of a failure to incorporate the socio-political realities of Kassala (Post 1996).

Bromley's (1980) exploration in Cali, Colombia compared the failures of state-sanctioned (planned) retail markets, with the successes of unplanned markets. The outcome of his investigations revealed that the planned markets had structural and multi-scalar problems, which were consequences of their locations being unfavourable for retail activities. At the city scale, the planned markets suffered from factors, such as value chain disruptions, loss of customers to STs, due to locational advantages and the inability of the government to regulate STs activities, and transport network patterns and traffic flow. While at the local scale, the service areas of most of the planned markets did not coincide with residential catchment areas, due to their isolated and peripheral locations; additionally, the layout of the built facilities did not satisfy traders' spatial requirements. To Bromley, the unplanned markets succeeded, because of factors such as the social capital generated by the spontaneity and organic complementarities of SBEs, which encouraged agglomerated economies and ensured the viability of businesses - a sharp contrast to the rigidity of the planned markets. Bromley thus concluded that there was a need for responsive planning to acknowledge local contextual dynamics, instead of the superimposition of planning policies from the West, a critique which he termed 'development modernism', echoing Cross's (2000) '*formalomorphism'* thesis[28].

Roy (2005) further argues that informality is a consequence of spatial governance actions. Roy's statement is in reference to modernist planners and architects who she believes mistook physical and visual order as equivalent to social order in the built environment. The top-down mandate of state-sponsored spatial engineering has failed to provide adequate 'operational spaces' for IE

[28] The tendency to analyse the problems of the informal sector as if it were a bad copy of the formal.

enterprises because the spatial requirements of the end users (IE actors) of these have been ignored. The researchers in this perspective insinuate the need to acknowledge spatio-economic behaviour in planning for IE enterprises in cities.

2.3.4 Spatial Governance and Progressive Planning and interventions.

This perspective reasons that the spatial integration of SBEs is achievable via spatial planning and management. The idea of integration questions how urban management and planning can act as the mechanism to permit the optimal functioning of SBEs, with a caveat that steps must be taken to ensure that planning is democratic and respects the intricacies and dynamics of SBEs' spatial requirements at both the macro- and micro-scales. That is to say, a good contextual understanding is a prerequisite for successful spatial governance. Therefore, the researchers in the literature discussed here are advocates for urban planning interventions (to different degrees) as a means to support and facilitate the prosperity of IE enterprises. This literature builds on the previous set of studies, but in this case, a more optimistic outlook is taken. In this body of work, researchers study what makes IE enterprises thrive at '*natural markets'*[29] (Dave and Arora 2015), as a means to inform future prescriptions for spatial governance policies.

To facilitate micro-scale interventions to resolve the menace of accommodating small entrepreneurs/enterprises[30] within the city of Ouagadougou, Burkina Fasso, Van Dijk (1983) argued that it was necessary to incorporate specific spaces for SBE's within masterplans based on their preferences. Van Dijk employed an alternate 'behaviouristic location theory'[31] to test

[29] According to Dave and Arora (2015), the concept of 'natural markets' describes places that street trading activities have traditionally congregated to trade, and this is because of a concentration of potential customers.

[30] Van Dijk's use of small entrepreneurs and enterprises interchangeably was read to depict informal sector activities which involved informal industrial and services (see Van Dijk 1983; p 99).

[31] Van Dijk's behavioural location theory is similar to Alan Pred's (1967) behavioural matrix. Pred postulated that the non-rationality of location choices made by economic decision makers was influenced by access to requisite information for making optimal decisions, and also in their ability to apply the information if and when available. Pred's concept reduced location decisions explicitly to two dimensions: the aptitudes of individuals and the information they possess (Harvey 1969a). These two variables are too partial and therefore insufficient in explaining the highly complex nature of human behaviour (Claus and Claus 1971). However, awareness for more rigorous research which incorporated behavioural postulates into location analysis seems to have been introduced by this strand of research inquiry, even though it was fraught with methodological inadequacies.

assumptions that locational decisions were rationally conceived for survival purposes rather than to maximise profit – thereby eliminating a critical and integral aspect of economic location theories (see Chapter 3.2). Based on this, he concluded that the security of tenure of land was the most crucial factor in the choice of location for small-scale informal entrepreneurs. This notion is also echoed by Perera and Amin (1995), who resolved that the provision of specific (permanent) activity workplaces was the most crucial factor hindering the growth and productivity of the IE, as such deficiencies inhibited their creditworthiness and ability to make capital investments. Other critical factors required according to Van Dijk included the personal relationships with their customers (social capital) and the financial ramifications involved in securing workspace tenure.

Yankson (2000) employed Van Dijk's behavioural thesis in Accra, Ghana to study small-scale production and service enterprises, and argued that because classic industrial location theory models - such as Central Place Theory (discussed in Section 3.2.1) - did not allow for uncertainty, and could not satisfactorily explain spatial behaviours. Yankson's study concluded that the most crucial factor that determined the prosperity of IE actors was their ability to access more extensive markets by their location, a situation which could only be optimised through the government's planning apparatus in providing adequate spaces within industrial clusters to achieve this.

Chadwick (1987) studied urban and regional systems in developing countries, by incorporating a positivist ideology in the development of schematic models to simulate the complexity of the socio-economic relationships and their physical expressions. Chadwick's concern was to understand how a change in cities could be achieved through physical manipulation. He therefore advocated the use of a systems model (explored further in Section 3.2), which allowed for a 'formal' integration of lower-circuit activities as crucial actors in the overall scheme in theorising urban systems in LICs. This modelling ethos was localised to incorporate dynamics relative to the situations being planned for, to assist the limited scope of physical planning (based on Western values and codes). The application of such positivist ethos to modelling in developing countries can also be found in studies conducted by Ghosh (1979,1982), Stine (1962), Hay (1971), Alao

(1972), Symanski and Weber (1973). These scholars - based on economic models - attempted to describe the location of periodic markets in developing countries. Ghosh and Stine's studies specifically aimed to provide the basis for sound planning responses as they argued for the recognition of spaces for traders in *peasant markets* (read as being equivalent to an agglomeration of SBEs).

Mochache (1990) explored the spatial structure of Nairobi, Kenya using Christaller's Central place theory (CPT) to trace market 'thresholds' and 'ranges', as a basis to explain locational decisions to allow for the manipulation of spaces to accommodate IE actors. Mochache's study highlighted factors that encouraged the itinerant behaviours of IE actors within cities, such as demand patterns of goods and income levels variability (Dierwechter 2002). He thus believed that the knowledge of these factors would allow planners incorporate IE actors adequately within urban spaces in Nairobi.

The notion of urban space and IE enterprises has also been explored extensively by scholars who Dierwechter (2000, 2002) regard as the '*Cape-town school'.* These scholars linked the outcomes of apartheid modernist planning with the character and the performance of (informal) small business enterprises (Dewar and Watson 1981; Dewar 1990; Dewar and Watson 1990). Dewar and Watson (1981) highlight two factors that play important roles in the relationship between small businesses and physical context 1) *density* and 2) the *physical structure's access and focus*. By invoking 'retail location theory' type principles (for a detailed description, see Chapter 3.2), the density of low-income areas is linked with market *thresholds*[32]*.* This highlights why with better transportation means and greater accessibility, IE enterprises are compelled to extend their *ranges* - as it exposes them to city-wide potentials and other factors like cheaper and greater variety of goods. Consequently, with less competition in local space economies, monopolies are created, which further encourages the patronage of higher order centres, promoting the leakage of capital.

[32] In locations with high densities, the range of IE enterprises – which are low order in nature - are artificially extended.

The ability to overcome the impedance of distance is a factor that rectifies the distorted consumer behaviours created by high densities in lower order centres, resulting in the '*dissipation of thresholds'* (Dewar and Watson, 1981). Modernist urban planning provisions are thus argued to be compounding this issue; implying that the relationship between the patterns and intensity of movement in cities, influence IE actors' abilities to prosper.

Dewar and Watson (1981) suggest that strategic planning can positively impact the IE at the macro-scale, and they propose a wide range of policy interventions to achieve this. Of particular interest, are measures relating to the spatial structure of cities. Dewar and Watson's (1981 p. 111-133) proposals were based on measures aimed at manipulating IE enterprises' thresholds, conducted through intelligent and sensitive planning; to include the:

I. Increment of densities in local areas where IEs operated.
II. Integration of flow patterns to encourage activities at different scales and intensities to mitigate urban planning's unrealistic provision of: inwardly oriented living areas, commercial hierarchies, land use zoning, and transport network route allocations.

The provision of locations that allow IE actors to benefit from major opportunities in cities is also suggested. Dewar and Watson (1981) however, do not provide a means to determine what sort of ranges and thresholds are required to meet the standards to sustain IE activities in localities. Dewar and Watson (1990) also make a case for minimal interventions in the design of physical facilities for micro-scalar interventions.

2.3.5 Spatial Governance and Urban Economic Space Discussions

This section is a critical assessment of how accommodating SBEs within cities has been approached, and the main shortcoming identified is the incomplete grasp of the contextual spaces of SBEs. The role of state-sponsored planning and management was explored to provide arguments on its positive and negative impacts on IE spaces within cities. The import of this Section (2.3) is that unsuccessful outcomes are given as the reason for spatial governance not to intervene in SBEs spatialities. It is argued that SBEs possess self-organisating potential derived from organic relationships built from networks at the locations they occupy, and therefore an attitude of benign neglect might be the best way to support their economic development. However, the self-organisating potential of SBEs is considered a fallacy by others, because if the urban situation in LICs is normalised and left to chance, the chaotic situation in LIC cities will only be exacerbated (Gandy 2005; Fourchard 2011). This latter concern is valid since the IE does not exist in a vacuum, and the state's actions on 'formal spaces' (if informal spaces are neglected) will still influence the operational spaces of SBEs if their status quo is maintained, suggesting that finding effective measures for their integration within existing spatial governance models is appropriate.

Warwick Junction [33] in Durban, South Africa offers an excellent example of how planning interventions (through regulation and promotion) can produce positive outcomes in the management of SBEs workplaces. Warwick Junction is a vital transport network connector - as the urban gateway to Durban by public road transport and train. The city government conducted the design and delivery of the Warwick Junction project via a grassroots-led consultative approach, and the outcome resulted in the successful integration of SBEs within the regeneration of public urban space. The planning intervention recognised the value associated with the location of the informal markets in the vicinity of Warwick Junction[34] and, rather than relocate the STs to new locations, the STs were retained by renovating the existing market facilities. The integration proposal used evidence-based design interventions - based on the specificities of STs in the different markets at Warwick Junction and their spatial requirements - instead of superimposing design solutions which were not contextually sensitive and relevant. The project used low cost, durable and practical solutions to produce trading spaces and kiosks (with shading

[33] Warwick junction is South Africa's largest transportation and trading hub containing three different markets located along a highway and land adjacent to a train station. It is located at the border of the city centre.
[34] Warwick junction is an outcome of apartheid planning decisions, as it was the sole entry to the Durban city centre for *the black population, and therefore there was a concentration of traffic flows from rural and semi-urban Durban.*

and display facilities), tailor-made storage facilities, and organised the activities and flows of people and goods by providing new widened pedestrian routes (Dobson et al. 2009).

The success of Warwick Junction shows that the overcrowded use of public space by street traders can be tempered through inclusive design and management to accommodate their activities (Skinner 2008b; Dobson et al. 2009). Another reason for the success of the intervention at Warwick Junction is because the original location of the different market areas near pedestrian flows was maintained. In this case, the (remodelled) project maintained the original geolocational (and configurational) characteristics that made it an IE hub – as a point of convergence for different transport modes and as a gateway to Durban.

Warwick Junction offers a model for urban managers faced with the dilemma of whether to exclude or to work with the informal sector (Dobson et al. 2009). Therefore, empirical assessments on ST workplaces and locations - as employed in Warwick Junction's redevelopment - will key into the this research's method, as this evidence-base will allow for the contextual reading of SBEs' spatialities. In addition to this, the adoption of alternative evidence-based perspectives should also key into the means of addressing these challenges.

2.4 The Spatiality of Economic Informality - Conclusion

This chapter discusses how economic informality research has transitioned from a modernist to postmodernist outlook on the IE's value for economic development. The IE is the dominant model of economic activities in developing countries around the world – a trend which is linked with capitalist economies, industrialisation, globalisation and rapid urbanisation. The IE in contemporary thought (which has moved on from the casual theories and dualist conceptualisations of the economy from the 1970's) is a seen as a panacea for poverty alleviation, and the body of work framed within this discourse is vast, but there is no evidence that it has influenced spatial governance policies and strategies to actualise the outcomes it champions. This shortcoming is not surprising, as research which engages with the manifestations of the spaces IE enterprises inhabit is scant - the inability to access operational space has been highlighted as one of the main detriments to the activities of the IE (Perera and Amin 1995; Yankson 2000). Post (1992; 38), argued that it was shocking that 'only a few authors in the informal economy literature have shown an awareness of space'. Four broad agendas on issues of governance, regulatory frameworks, agency and self-determination, anti-interventionism, and interventionism are highlighted to reflect the way spatial governance of the IE has been studied in literature (as discussed Section 2.4), and it is discovered that not much has changed in the state of spatial knowledge on IE spatiality in the three decades since Post's statement. The spatiality of IE actors places of work is still grossly misunderstood and represented within spatial governance narratives.

Dewar and Watson's (1990) research on urban markets in South Africa provides sophisticated assessments of IE enterprises workplaces - by capturing how city planning decisions led to distorted consumer behaviours in newly built suburban communities[35]. To Dewar and Watson, spatial impedance dynamics created by 'modernist' planning decisions influence the appropriation of public space by IE actors. Since the spaces IE actors appropriate are public goods, conflicts often emerge with the legal structure and regulatory status of such spaces – making them contested spaces (Brown 2006). As a response to the pervasiveness of such conflicts and it's influence on a significant population of the urban poor, the provision of alternative workspaces for the relocation of IE is often pursued as a policy by spatial governance (Bromley 1980, Post 1996, Robinson 2002).

The tactic of providing alternative workplaces for STs often fails however, and this is because the locational sensitivities of SBEs are not considered when relocations are planned. Rather than

[35] Due to the dispersed locations of many planned low-income residential enclaves, the densities (potential catchment market) within them are not sufficient to support the nature of goods sold. This is because the goods sold are usually low-order (non-specialist commodities) and therefore, people are unwilling to travel long distances to acquire them. Rather the decision to purchase these sorts of goods is usually based on price-points, and since more central locations can provide better prices (due to competition and scale of economies), people would most likely patronise such places which offer better prices. The new patronage pattern invariably leads to capital flight from the dispersed residential enclaves, which inevitably increases the cost of goods within them – as traders must increase their prices to have sufficient turnover which enable them stay in business.

provide fair and equitable spatial conditions which are responsive to STs' needs, the interventions typically locate new markets in unsuitable locations. As an example, new markets are often situated in off-street locations with less value for interaction with potential customers and far away from where STs live. The reason for inappropriate interventions when attempts are made to regulate and promote IE activities is linked to an inadequate grasp of IE actors spatial requirements. This gap in knowledge emanates from the way IE spatiality is conceptualised in urban spatial governance research. Urban economic space in literature on the Global South is often approached from a 'compositional' perspective - an approach which fragments spatiality into categories of analysis based on an idealised understanding of space (Dierwechter 2000). Dierwechter's critique, suggests the need to map 'contextual rather than compositional geographies' as an alternative approach required to grasp the complexities of IE spatiality.
Dierwechter (2002 p.37) states that

> 'the cities of the informal sector that we need to map ... are [those] that do their best to capture informal sector space as it is, informal sector space as the articulated embodiment of the full world'.

In harmony with Dierwechter's statement, the lessons from this chapter brings to the fore the need for alternative understandings of the ST's workplaces. However, this research departs from Dierwechter's recommendations on how to develop a contextual reading of IE geographies. This departure is not based on discontent, but rather on the need to explore spatial paradigms that are applicable to urban design and planning of cities. This research going forward will revisit some of the ideas (building on the interventionism advocated in Dewar and Watson's work) to capture the alternative geographies of STs, empirically assess the complexities of urban space, and question what is known about SBEs' spatiality.

In conclusion, advocacy for a holistic approach which does not discard the knowledge gleaned from the earlier corpus of work is proposed to bridge the knowledge gap in IE spatiality. The intention is to remodel and incorporate aspects of studies by earlier researchers into a system to conduct objective empirical research, with the belief that cities can be better managed and planned to support SBEs.

3 Location in the Urban Street Economy

3.1 Introduction

From an urban design perspective[36], a sustainably designed and managed built environment is rooted in the actualisation of 'place'. Place in this context refers to a location which provides economic, cultural, and societal meaning - without negating environmental quality or diminishing its usefulness. The 'place of work' chosen by a ST - as an SBE - in cities, embodies unique locational and spatial dynamics that increase the potential for trading transactions to occur. Therefore, to capture the 'contextual geographies' of STs in cities, an understanding of these dynamics at play is essential. This chapter explores literature for theoretical and empirical approaches that can enrich the understanding of SBEs workplace locations required for urban-design, management, and planning purposes.

This chapter addresses the research question on how accessibility distribution influences urban IE activities and explores if there are other explanatory spatial factors of urban form which overlay accessibility distribution that affect the locational patterns of SBEs. To begin to address this question, a brief conceptualisation of how trade as a defining factor of an informal economic transaction occurs, is necessary. According to Penn (2005), for trade to occur an interface which facilitates interactions between entities with matching supplies and demands must be available. To further increase the probability of trade, information is also required to identify the locations of these interfaces where either those with specific needs or those with required goods are located. In the case of STs, the 'interface' is physically constrained by the built environment (the street), and therefore their spatiality is influenced by 'geographic inequalities, spatial patterns of the network of routes, and cognitive capacities [of STs and Customers]' (Penn 2005, p. 27) created by the street networks in cities.

[36] Urban design is a field of study that has a responded to the critiques for the need to acknowledge the consequences of diverse actors and institutions and how they affect the spatial structure of cities. Therefore, urban design acknowledges many of the issues required to resolve the integration of STs operational spaces within cities.

As the street is the place of work for STs (see discussions in Section 2.2.3), the factors that influence the spatiality of locations on streets are explored in this chapter. The division of the economic space into formal and informal entities[37] is avoided in the literature which underpins the exploration. Instead, the chapter takes a strategic approach to understanding the role that urban spatial structures and spatial accessibility play in influencing the location of STs. Three themes relative to 1) the geographic inequalities created by locations, 2) the spatial pattern of transport network routes, and 3) cognitive capacities of customers and STs, are identified to fulfil the needs of this investigation. The literature explored is mostly interdisciplinary. Consequently, significant theoretical concepts are intertwined within the discussions in this chapter, which points towards the need for a mixed methodology to capture the realities of STs workplaces.

Section 3.2 explores a 'retail city' thesis, as a geographical study of the economics of supply and demand as influenced by locations. It details the spatial distributions and efficiencies derived from interactions caused by the choices of locations within cities. Section 3.3 explores a 'codified city' approach, to investigate the patterns of the spatial structure of the built form and its influence on centrality. Section 3.4 provides a conclusion of insights from the literature explored in this chapter and makes recommendations on relevant applications of knowledge gained relative to the aim of this research.

3.2 The Retail City

A plethora of studies have explored spatial distributions and the organisation of economic activities. More recently, there has been something of a gap in research that analyse the spatial manifestations of the IE in low-income countries. In this section, research which links spatial locations with economic activities is assessed to augment the current understanding of STs workplace locations. Although the theories of the retail-city are outdated, they have nevertheless been influential in the body of research which set out to understand the spatial patterns of

[37] Even though it is argued that there are disparities in the dynamics that influence the nature of economic activities along *dualistic* paths, the IE and formal economy are inseparable, because their activities in developing country cities function intrinsically (see Section 2.2 for further discussions).

African markets (which were carried out in the 1980s and 1990s). The application of retail-city theories and its offshoots in Nigeria and other African contexts, particularly to market development, is relevant to this research. The proponents of the retail city explored in this section are based on 'Central Place Theory' by Christaller (1933), 'Spatial Interaction Theory' by Reilly (1931), 'Bid Rent Theory' attributed to Haig (1927), and the 'Principle of Minimum Differentiation' by Hotelling (1929).

3.2.1 Central Place Theory

To explain the hierarchal structure of rural settlements, Christaller (1933) used two-dimensional geometric models (based on a system of orders[38]) to develop his Central Place Theory (CPT). Christaller hypothesised that central functions are provided to all surrounding areas located at lesser distances than the next 'central place', located at the same hierarchical level. Christaller's (1933) aim was to develop a spatial theory for constructing settlement systems with minimal transportation costs to fulfil central functions in Nazi Germany (Barnes and Minca 2013). Using improbable micro-economic assumptions, CPT predicted that with the increased cost of transport, demand declined with distance from the source of supply (Brown 1993). The tenets of CPT are the concepts of 'centralities, thresholds, and ranges' (earlier mentioned in Dewar and Watson's studies (1981; 1990): See Section 2.3.3).

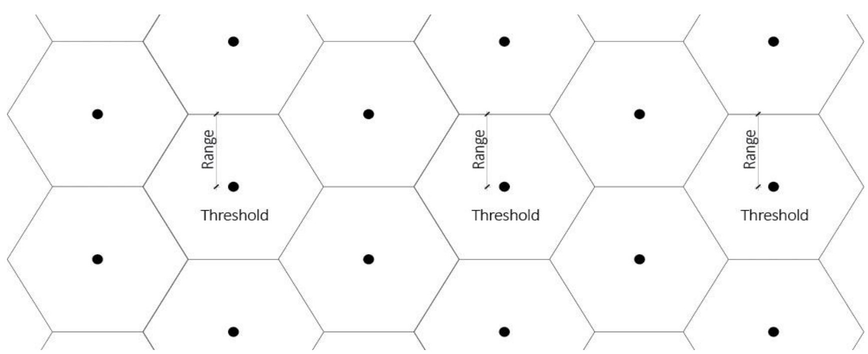


Figure 3-1: Market areas, in Central Place Theory

[38] CPT has three orders, where K is a constant. 1) K = 3 (market principle – these areas in central place hierarchy are three times bigger than the area in the next lowest order); K = 4 (transport principle - these areas in central place hierarchy are four times bigger than the area in the next lowest order); K= 7 (administrative principles - these areas in central place hierarchy are seven times bigger than the area in the next lowest order).

Centrality' depicts the ability of a location to fulfil the central functions of its surrounding area. 'Threshold' is the minimum size of market required to bring a new firm or service provider or city into existence and keep it running, and 'range' is the average minimum distance that people are willing to travel to procure services or goods (Figure 3-1).

August Lösch (1940), developed variations of the "K-value system" to refine Christaller's assumptions on how central places formed hierarchies. Lösch argued that the rotation of networks around central places would result in a pattern where distances between all places become minimised, and therefore the maximum requirements for supplies can be attained locally (Chadwick 1987, p. 97). To Lösch, demand declines with increasing distance due to the impedance that has to be overcome.

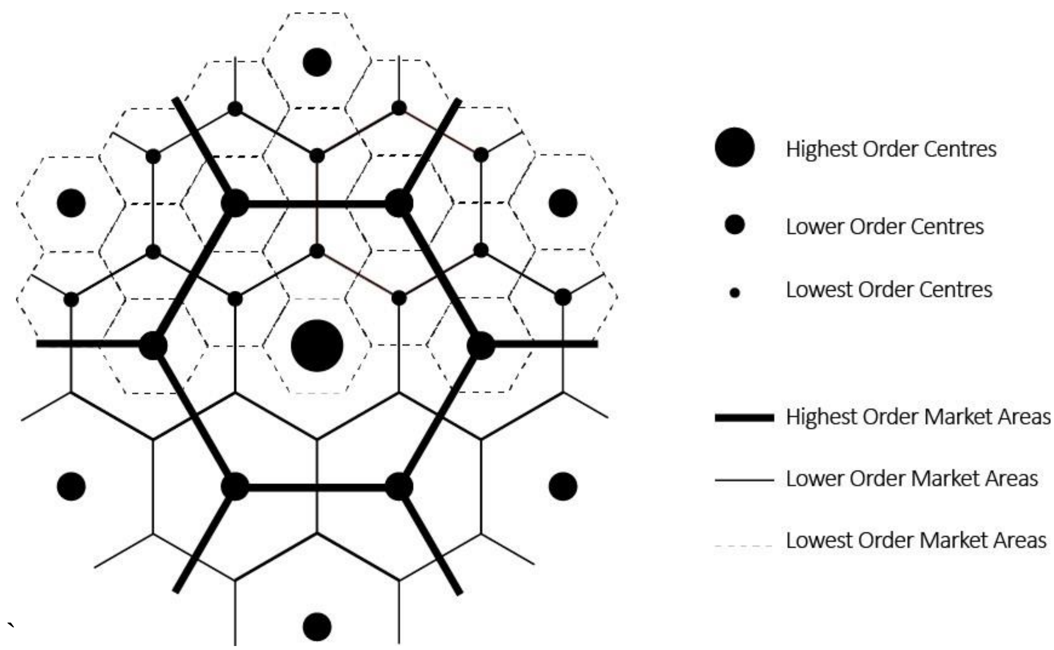


Figure 3-2: Overlapping market areas of hierarchical centres in CPT Source: Reproduced from Christaller's works.

The theories developed by Christaller and Lösch illustrate how a hexagonal lattice structure of markets are formed by the synthesis of ranges and thresholds, where the size of the hexagon is determined by the ranges and the threshold of central locations (Figure 3-1 and 3.2). The order of an activity determines its thresholds, and similar activities generate similar market/trading areas. CPT thus implies that expensive and infrequently purchased - 'high order' - goods have higher thresholds and ranges because customers are willing to travel long distances to purchase them. Less-expensive and frequently purchased - 'low order' - goods have lower thresholds and ranges. For example, CPT can be used to provide a basic explanation for why a favourite snack in Lagos, 'Gala' sausage rolls[39] - which are low order goods - are mainly distributed by STs.

Central Place Theory: Extensions, Interpretations, and Applicability in LICs

The distribution of different market areas produces overlapping market trading areas according to CPT. Hence the superimposition of different market areas for individual orders of goods creates a hierarchy of centres. However, the nature of human interactions and settlements meant that the assumptions of CPT were not realistic, and not well-reflected in the real world[40]. Fujita et al. (2001) - like other critiques - argued that CPT is a descriptive and pedagogical tool, rather than an explanative tool of spatial location in cities. CPT intuitively demonstrates that a trade-off occurs between economies of scale and transportation costs and that their interactions produce spatial economies (Fujita et al. 2001). Notwithstanding, CPT enshrined the concept of centrality in economic location analyses, with ideas of 'ranges and thresholds', which is the most relevant part of CPT to this research on the location of STs.

CPT's restrictive assumptions were relaxed in subsequent elaborations (Berry et al. 1988), and its seminal nature is evident from its influence on the decision making of many retail organisations and retail planning policies for numerous European countries (Brown 1994). A few cases in LICs are also identified where CPT was applied as a prescriptive and descriptive tool to structure cities.

---

[39] Neuwirth's description of marketing and distribution strategies of via informal channels in Lagos highlights how trade liberalisation has allowed formal firms to adapt their retail distribution strategies to take advantage of informality. "Gala" manufactured by UAC - a subsidiary of Tiger Brands a multinational conglomerate - has attained the status of a generic name for sausage rolls and is the most popular snack in Nigeria, simply by being retailed primarily by street traders for over 40 years. See: Neuwrith, R. 2012. The power of the informal economy. In: Conferences, T. ed. *TEDGlobal*.

[40] To create a workable model, the following assumptions were made by Christaller: 1) The existence of a flat and limitless plain, thus neglecting real-world physical occurrences that might influence its outcome, 2) A hinterland that is evenly spread, 3) A transportation scenario that assumes the uniform accessibility, 4) The rational behaviour of customers in patronising the closest centre, and not considering the possibilities of multi-purpose trips.

CPT's application as a prescriptive tool in making planning decisions in 'modernising' Kenya is one of such examples. In the 1980's, the Kenyan government based on CPT's principles, planned for economic development by trying to incorporate poorly integrated rural areas into existing urban systems (Fox 1991). The strategy involved the rationalisation and extension of small urban centres, to become designated service centres to regions. Fox (1991) notes that these strategies were not successful, as they were unable to overcome the regional disjuncture between the colonial and post-colonial space economy when overlaid with Kenya's indigenous economic systems. The regional differences existed because of inequalities in Kenya's urban economic systems caused by colonialism and neo-colonial policy. Fox thus argued that the applications of CPT is not suitable within traditional (non-modern) economic systems. The outcomes in Kenya were similar to those in Zimbabwe and Transkei[41], and highlight cases of the ineffective use of CPT in defining spatiality in the context of economic development policy in these African countries (Fox 1991).

CPT has also been applied as a descriptive tool to conduct studies on the spatial structures LIC cities. CPT was used in its original form (Abiodun 1968; Santos 1979; Mochache 1990; Fox 1991), and as a modified version to reflect the periodicity of markets (Stine 1962; Skinner 1964; Symanski and Webber 1974; Ghosh 1979,1982). These studies were either empirical studies to test the efficacy of CPT's proposals within existing spatial systems, or modelling and simulations studies.

Abiodun (1968) applied CPT to test the validity of its hierarchy in Abeokuta, Nigeria. Abiodun observed a gravitation of new commercial establishments to higher order settlements, which then led to the over-saturation of services in such centres - a feature which she deemed a commonality in unplanned cities. The most critical discovery from her study was that the hierarchical patterns of settlements observed were dissimilar to CPT's fixed 'K' principle postulates. Dewar and Watson's (1981; 1990) studies in South Africa, explained how modernist planning decisions distorted consumer behaviours using CPT's threshold and range as the basis

[41] An autonomous region in South Africa, which was integrated into the Eastern Cape Province in 1994.

(see Section 2.3.4). Dewar and Watson's works are quite crucial to IE spatiality research because they explored alternative ways to develop norms for urban market development within the planning process of cities. However, relatively little has been done to take their work forward.

In trying to link CPT to his 'shared space theory' of urban development (see Section 2.3), Santos (1979) argued for the reformulation of CPT. Santos depicted how the 'two circuits' of the economy had separate thresholds and ranges (Figure 3-3). He reasoned that CPT must recognise two sets of thresholds and ranges to capture the realities of the dichotomous nature of the economies in the LICs (this is linked to an old-fashioned dualist notion of the IE).

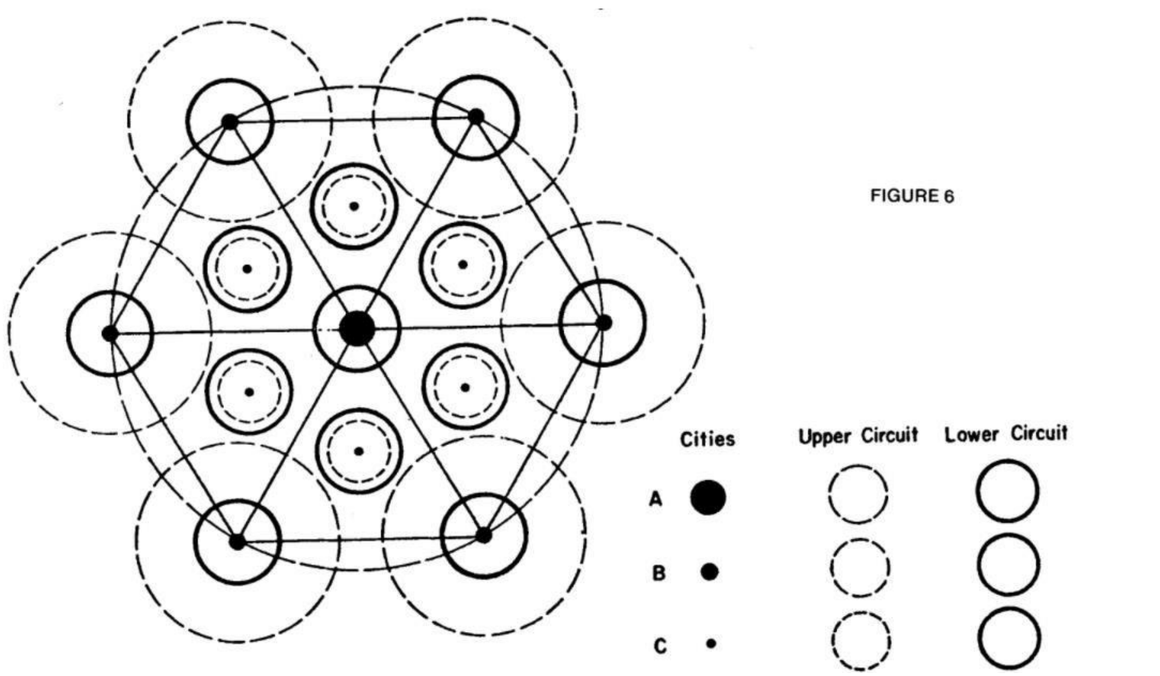


Figure 3-3: Christaller's Hexagon Marketing Principle modified by the existence of two circuits of urban economy in underdeveloped countries. Source: Santos (1985)

Santos also highlights how Lösch's spatial demand cone was difficult to determine in LICs, as it was derived from assumptions of how modernist capital accumulation concentrated consumption possibilities in specific areas, which is inapplicable to most countries. According to Santos, there is also a tendency for technological advancement and mobility to manipulate the range of the upper circuit, because consumers who use motorised transport have the options to go beyond their local markets.

> ‘The true dialectic between the upper and lower circuits occurs at the local level because the lower circuit has only a local range […] the upper circuit’s market is nationally or regionally unified, while lower circuit markets in different agglomerations are fragmented (Santos 1979, p. 133)’.

The adaptations of CPT applied by the studies discussed so far were conceived at a macro-scale, and differentiate between city and regional centres - which in an ideal scenario were assumed to be uniformly distributed and therefore unrealistic. In sum, CPT generated mixed outcomes in its application to study the spatial structure of LIC cities.

Uniformity and Non-uniformity: Periodic Central places

Other extensions like Berry and Garrison’s (1958) tertiary activity model applied CPT’s principles to the internal structure of unevenly distributed urban areas, paving the way for micro-scalar empirical applications. This new perspective was also fraught with similar criticisms as the original form of CPT. However, a useful theoretical construct in explaining the locational activities of SBEs was drawn from this tradition - as employed by researchers who studied the periodicity of central places. This is because according to Zhan (1998, p. 3) ‘mobile trading [street trading] is a form of periodic marketing’.

Stine (1962) developed a model based on his realisation that goods and services typically were not supplied from permanent urban locations (central places) in the developing world (Smith 1980). Stine’s study in Korea, therefore, accounted for travelling merchants and the periodicity of market systems[42]. His approach was influenced by CPT and adopted by several researchers (see: Skinner 1964; Hodder and Ukwu 1969) - for a comprehensive review of periodic markets see Smith (1979,1980) and Berry (1967).

---

[42] Periodic markets operate on a regular scheduled basis within what is termed ‘market cycles’, therefore they do not operate daily.

Stine (1962) applied CPT's concept of minimum and maximum range to his study, with the assumption that in the bid to enhance interactions with consumers and increase profitability, traders opt to become mobile. To Stine, the itinerancy of traders is influenced by the nature of goods and services they provide[43], as itinerant traders typically deal in general commodities with small thresholds and ranges, for example, perishable foodstuff. He also contends that in locations where demand is low, which means that itinerant traders have to reach more consumers[44], as echoed by Dewar and Watson's (1990) findings from South Africa. According to Stine (1962 p. 70), the agglomeration of such factors results in the formation of periodic markets. Stine, further implied that the time that agglomerations of different traders at markets occur must be uncoordinated for optimum performance of periodic markets (sale of goods). This logic is also applied to consumer behaviours to facilitate optimum performance, introducing endogenous factors[45] - albeit in a subtle way. Stine contended that the provision of better transport infrastructure is a factor which would invariably reduce the cost of transport for both traders and consumers, thus, leading to a decrease in the number and frequency of periodic markets. The assumption of improvements in transportation systems in reducing the periodicity of markets, has not been seen in reality. Stine's attempt to explain the causes of itinerancy was partly achieved by the outcome of his research, but he did not satisfactorily explain traders' choices of location.

Skinner (1964; 1965a,1965b) used details from studies on the marketing system in rural China to indicate the relationships between the periodicity of markets and mobility. He drew on hierarchies of places, their central functions and service areas, to discuss the hierarchies of market towns (Smith 1980). Skinner's study classified markets according to their sizes and functionality, to ease the examination of their spatial and temporal arrangements at various hierarchical levels,

[43] The notion of the nature of goods and their corresponding thresholds in most cases is still valid in the 21st century, even though there has been a diversification of the goods being traded by STs, for example: mobile phone covers, hair clips, lighters etc.

[44] The caveat to this assumption of itinerancy being the financial viability of additional revenue potential, which must exceed the costs associated with transportation to new locations, and this is governed by the difference between the outer and inner ranges of the goods being traded.

[45] Externalities that are generated by close proximal locations of retailers, reminiscent of Hotelling's principle of minimum differentiation.

and to study the ensuing patterns of their movements. Skinner thus acknowledged that periodic markets, in comparison to daily markets permit denser distributions of market towns, because such markets were more convenient for agrarian populations with basic transport facilities. Skinner's analysis differed from Stine's as he illustrated how periodicity exploits 'diffuseness of economic roles'[46], and he also dispels the claim that agglomeration hindered the prospects of maximal efficiency for traders (Smith 1980).

Berry's (1967) work elaborated on Stine's and Skinner's discussions. In Berry's case, he highlighted the relevance of cultural influences on the location of periodic markets, and then went on to suggest that the selection of locations was an outcome of the agencies of individual decisions. Berry implies that periodicity and agglomeration occur by chance, and not by the actions of several traders deliberately organising to meet at a specific time and space.

Ukwu's analysis of Ibo periodic markets in eastern Nigeria identified two mutually self-sustaining subsystems of central-places and market-places. Ukwu described how the periodicity of markets and itinerancy of traders sustained each other and in turn, he suggests that 'together they make possible the passive role of the market-place in the exchange process and inhibit the crystallisation of central-place type institutions around market-places' (Hodder and Ukwu 1969, p. 156). The import from Ukwu's assessment revealed market patterns as well as information on market area sizes. However, he stopped short of exploring reasons for the location choices of markets. Hodder in another section of the same book focused on the Yoruba region in southwestern Nigeria. In Hodder's case, he rejected the interpretation of CPT in relation to the periodicity of markets. This rejection was based on his reservation that there was an absence of data to support the claims, a position which he later modified. Hodder's initial rejection was however countered by Alao (1968; 1972) as described in Smith (1980, pp. 14 - 15). For Alao to prove his thesis, Smith notes that he reformulated Stine's theory using a general deductive model which emphasised

[46] When an enterprise plays a dual role of being a producer and a trader simultaneously.

> [1] a modification of the notion of the minimum range so that it could be translated logically into spatial terms and [2] the spatial patterns of markets in equilibrium (Smith 1980, p.15).

Alao believed this ethos was useful in explaining periodicity within a different conceptual framework from Stine's and thus based his arguments around this reformulation.

Symanski and Webber (1974) on the other hand, proposed to use formal economic models – commonly used in developed country contexts - to explain the complexity of periodic market cycles, as a viable means to overcome the simplified nature of research preceding their study. Symanski and Webber observed that the level of activity that took place in many large markets on a major market day could be spread more evenly throughout the week, and support several full-time traders. The reason for this not occurring was due to the involvement of traders in the production of goods they sold[47], and in many cases, this dual role hindered traders' abilities to trade continuously. Symanski and Webber's study thus mainly addressed three characteristics of traditional markets 1) periodicity, 2) the mobility of sellers, and 3) the phenomenon of agglomeration. The conclusions derived from their research do not provide much evidence in better understanding the spatiality related to the periodicity of markets system.

Ghosh (1982) incorporated temporal variables to study patterns of itinerant trading. Ghosh's model indicates that variations in the density and location of marketplaces rise with the increase of relocation costs, which also leads to clustering at centres and differences in consumer-demand intervals. The consequences of clustering at centres invariably create demands at other locations, because consumers are likely to travel shorter distances to visit marketplaces, and the dynamics of demand encourages the drive for more substantial spatial coverage by traders to ensure consumer interactions. Ghosh thus cautions against attributing observed differences in market densities to small population and demand density characteristics, without paying regards to transport costs - which Skinner (1964) failed to incorporate in his study of rural market hierarchies

[47] The influence of the production of goods Symanski and Webber refer to, is certainly no longer the case in LICs.

in China. What Ghosh's model then indicates is that the effects of locational characteristics are also responsible for the frequency of periodicity for market meetings.

Zhan (1998) - as several earlier researchers - argued for a new modelling approach to periodic trading. His analysis used eight classes of spatio-temporal location analysis problems relative to mobile trading. Zhan thus applied a framework based on game theory to simulate periodic marketplaces of competing mobile traders. The outcome of this study did not generate any new outcomes but instead re-affirmed via theoretical models of simulations, empirical findings made earlier by studies[48] about the invalidity of hypotheses on consumers and traders[49].

CPT, Periodicity, and its Inconsistencies

Apart from assuming that populations are evenly distributed, CPT was also predicated on the patronage of nearest-centres via single-purpose shopping trips. Brown (1993, p. 189) identified a host of studies whose empirical bases countered the previous notions and highlight how consumer shopping behaviours are inherently multi-purpose[50]. Multi-purpose shopping reduces transportation costs of customers, and increases demand for retailers, as it replaces multiple single journeys (Ghosh and McLafferty 1984). In turn, externalities are created as activities spill over and encourage agglomeration. This phenomenon seems to contradict the original model of CPT, as an added layer of complexity is created to account for how low-order centres are bypassed for high-order centres with similar offerings. In turn, the ranges of low-order centres are thus lower than higher-order centres in multi-purpose models. This disparity in ranges can be seen to resolve an issue like Santos's (1979) critique of CPT's reliance on single ranges and thresholds within each circuit of the economy - described earlier (see Figure 3-3).

---

[48] Hay and Smith (1980; 1981); Ghosh (1983)

[49] This is read to be predicated on CPT and economic location analysis approaches. (1) Consumer hypothesis is relative to Christaller's CPT. It suggests that proximity in space implies separation in time; which means markets operating on consecutive days are farther apart than markets operating on non-consecutive days. (2) Trader hypothesis is relative to economic location analysis. It suggests traders establish a certain spatio-temporal sequence of periodic markets so that transportation costs are minimized; which means that markets operating on consecutive days are closer in space than markets operating on non-consecutive days.

[50] Multi-purpose shopping is more efficient and realistic, as it reduces time and cost of travel.

The ethos of periodic central places attempted to counter CPT's unrealistic flat assumptions about spatial behaviour within the built environment. However, the role of transportation networks and urban form were not incorporated into its workings. Consumers' mobility patterns - whether to the nearest or most convenient centres - were assessed as straight-line journeys. Therefore, the effects of the morphology of the built environment on travel are not considered, even though CPT implicitly acknowledged that the geometric configuration of the transport networks plays a vital role in the distribution of opportunities via spatial accessibility. Sevtsuk (2010, p. 20) attributed this omission to complexities it introduces into retail economic theory. This has however been accounted more recently with the aid of computer programs, such as GIS Network Analyst (ESRI 2013) and SANET (Okabe et al.), tools which have provided measures to account for how urban form influences variations in accessibility.

3.2.2 Spatial Interaction Theory

Spatial interaction theory has been used to explain the organisation of retail locations in cities. Spatial interaction theory postulates that consumers trade off the appeal of patronising different shopping areas against the deterrent effect of distance (Brown 1994, p. 191), and therefore discards CPT's assumption that consumers always patronise the nearest centres that fulfil their shopping needs. The theory is thus a conceptualisation of consumer patronage within overlapping market areas, and it is based on variables and parameters of population and road distances, in response to localised supply and demand as pioneered by Reilly's (1929, 1931) law of retail gravitation.

Inspired by the gravity formula, Reilly's model accounted for retail behaviours by calculating the point to which customers would be drawn, which thus defined market-area boundaries. As a critique of Reilly's notion, three interdependent conditions are given in literature as being necessary for the realisation of spatial interaction to predict the locational variables (the amount of retail activity) attracted to each location, which are 1) complementarity, 2) intervening opportunity, and 3) transferability (Rodrigue et al. 2013).

Huff (1964) developed a similar model of retail gravitation, as he sought to provide estimates of the trade areas of shopping centres between two cities. Taking behaviour as a premise, Huff suggests that a consumer with alternatives will make a selection that is directly proportional to its utility. The probability (P*ij*) that a consumer located at *i* will choose to shop at store *j* is calculated according to the following formula (Huff 2003).

$$P_{ij} = \frac{A_j^{\alpha} D_{ij}^{-\beta}}{\sum_{j=1}^{n} A_j^{\alpha} D_{ij}^{-\beta}}$$

Equation 3.0

Where A_j is a measure of the attractiveness of store *j*, such as square footage. D_{ij} is the distance from *i* to *j*. α is an attractiveness parameter estimated from empirical observations. β is the distance decay parameter estimated from empirical observations. *n* is the total number of stores including store *j*. This implied that customers could be attracted from other zones[51], and therefore, in Huff's model retail trading areas overlap.

Gravitational models are limited by the subjective derivation of variables which make up study areas, as the size and shape of the spatial zones easily influence the predictions, resulting in what is known as the Modifiable Areal Unit Problem[52] (MAUP). The estimation and interpretation of distance-decay parameters in relation to the spatial structure is a problem with gravity models. According to Chan (2011) the approximation of gravitational models when employed in an urban context, is not sufficient to resolve the complexities created by overlapping market areas. The complexities embodied by IE activities in LICs mean that the variables and calibration required to operationalise such models are nearly impossible to determine. The shortcomings are reflected in how the applications and refinements of spatial interaction theory for retail location analysis have mostly been restricted to the context of shopping centres in developed countries.

[51] This is applied to reflect metropolitan regions, or delimited arbitrarily at other forms of macro-scalar representations.

[52] MAUP occurs when the same areal data are combined into larger geographical units for analysis or when the areal data are amalgamated in different ways at the same geographical scale (Openshaw 1977).

In sum, spatial interaction theory - like CPT - best describes how cities function as equilibrium structures, based on explaining the broad relationships between a system of centres and their trade areas (Davies 1976; Batty 2008), but the subjectivity of its operational variable makes it tricky to implement in the study of IE locations.

3.2.3 Land Use Patterns: The Intra Urban Distribution of Economic Activities

Several long-established theories draw on the concepts of land-use and markets. Von Thünen's (1826) Land Use theory proposed that optimal agricultural land uses were determined by transportation costs to access markets, and when in equilibrium, the spatial organisation of cities took the form of concentric rings. In this model, activities with higher intensity of land use are in the interior rings, while less land intensive processes occur on the fringes of the city. Weber's (1909) transport-cost minimising theory, similarly sought to provide explanations of the optimal location in the production of goods. In Weber's case, he emphasised the importance of the location of an economic entity in relation to the effects of transportation costs associated with its inputs and outputs, the provision of labour and factors of agglomeration.

The essence of Von Thünen's and Weber's postulations was captured in a retailing context by Haig's (1927) theoretical discussions of economic activities, and the role that accessibility plays in central locations. To Haig, the most accessible location was the best for retailing, and the business demand and competition for such prime locations rested on the amount of rent that businesses were willing to pay. The structure of the urban landscape was thus ranked relative to centrality. Within this model, prime locations at centres are secured by activities capable of paying the highest rents, and this declined the further away one went from the centre. The most seminal work to emanate from Haig's postulations was Alonso's (1964) Urban Land Use model, which constructed *bid rent* curves to connote the receptiveness of activities to changing accessibility levels.

The consensus on bid rent as implied by Clarkson et al. (1996) was that its eclectic nature made it too broad to give an accurate reflection of retail locations, because at urban scales its gradients would fluctuate due to environmental geometry. Apart from this geometric issue, applying bid rent's theory to study STs' locational activities would be fundamentally flawed - borrowing from Marxist interpretations of urban economics - as land-use allocation is a derivative of the classpower influences and struggles exerted by capitalist activities. Within such systems, STs have no power in the bidding process due to their inability to access capital, which indicates why they are legally excluded from prime locations. This exclusion underpins the formation of SBEs, and is also indicated by the nature and imbalances of land tenure systems (see Chapter 5.2.1 for how this influenced STs in Lagos).

Also, in the context of the contemporary post-modernist cities, accessibility patterns are in a state of flux. Cities are plagued with traffic congestion, which alters the values of rent gradients against distances to central locations. Bid rent theory's failure to incorporate temporal dimensions to control for such fluctuations suggests that it has limited use in such contexts. Historical precedence also suggests that the distribution of retail activities within locations is also influenced by the activities which have taken place at a location in the past. The bid-rent theory provides a normative explanation for costs associated with being centrally located.

3.2.4 Principle of Minimum Differentiation

Not all economic activities require the same level of accessibility, and this is the premise by which Hotelling's (1929) principle of minimum differentiation was developed. Hotelling's 'stability in competition', suggests that the externalities derived from clustering boost the performance of similar retailing entities. Accordingly, the degree of success in clustering tends to be related to the order of the good. Therefore, higher order retailers exhibit greater tendencies to agglomerate, in comparison low order retail businesses.

Brown (1994 p. 200 - 201) numerous researchers failed to corroborate Hotelling's theory once its assumptions were relaxed to reflect real-world phenomena like consumer demand and transportation costs. In such cases the model predicted the opposite, countering the notion of agglomerated economies. Therefore, the principle of minimum differentiation and its derivatives have been unable to explain agglomerated economies, and the numerous positive externalities that are derived from it.

3.2.5 Retail City Discussions

Theories of the retail-city have evolved over the years, stimulating numerous theoretical and empirical research applications. Adaptations that rectify some of the initial unrealistic assumptions have looked at both developed and developing countries. CPT in particular was used extensively to conduct studies on African cities - possibly because of how easy it was to understand and operationalise. The more recent applications of retail location theory have however focused on planned shopping centres in developed countries, probably because of the limited availability of data to run complex economic models for other types of retail activities (Sevtsuk 2010). Lack of data, therefore, restricts the application of the more recent retail location models to LICs.

Differences between the intended and actual outcomes in the applications of retail-city theories in LICs are observed in the body of work reviewed, and therefore caution is taken on how these theories and its concepts are read. The retail-city models are also applied mainly at regional and city scales, and do not provide a spatially disaggregated reading of urban space.

Nevertheless, several of the conceptual ideas from the retail-city theories can provide a foundation to explore the spatiality of SBEs workplaces. For example, CPT provides a basic understanding of how movements within cities - expressed through non-uniform spatial demand - changes due to distance, suggesting that the impedance of distance is the defining factor for demand. CPT's explanation for the distribution patterns of central places enshrined the concepts of ‘centrality’, ‘ranges’ and ‘thresholds’ into the study of itinerancy and periodicity of markets[53] in the developing world, and is an instrumental candidate for understanding STs spatialities[54]. Spatial Interaction Theory on the other hand helps in the estimation of market boundaries (catchment areas) for retail activities and studying consumer behaviours in space due to the impedance of distance. Bid-Rent Theory helps stratify the economic space to highlight areas of prime value, which starts to indicate how spatial exclusion and marginalisation can occur within cities due to high rent costs as influenced by broad accessibility patterns at high value locations.

Therefore, the theoretical knowledge gleaned from these theories provide a conceptual basis to explain the location and distribution STs and their customers within economic space. These theories are useful conceptualisation of why places and hence networks form where they do.

3.3 The Codified City

The location theories of economic activity discussed in Section 3.2 leave much to be desired as a basis to understand STs’ workplaces for urban design and management purposes. To rectify this shortcoming, an analysis that goes beyond the partial resolution of retail location models is required to capture contextual geographies of STs (as suggested in Section 2.4). Called here the ‘codified-city’, the literature investigates the link between the spatial structure and geometry of built urban form and retail behaviour - at a finer spatial scale. This literature has evolved in line with the complexity of urban modelling and is much more up-to-date than research discussed in Section 3.2. First, the values SBEs and customers attach to space, shoppers motivations, navigation and route choice of travellers - as potential ST customers - are discussed, to provide

[53] The definition of ‘markets’ in the developing world in most of the literature explored are not clearly defined. The interpretation of markets in the developing world for this research, assumes that some of the locations considered to be traditional and periodic markets, will fall under the informality banner; therefore, these locations and their actors will be considered as STs contemporaneously.

[54] There are various shortcomings from unrealistic assumptions that create fluctuation of the results. These include: lack of environment geometry and transport network geometry, differentiated transport modes by speed (that contradicts travel uniformity), spatial unit scale aggregation and shape of the spatial unit (MAUP).

social and behavioural nuances of trading transactions. Accessibility and network studies, configurational studies, and compositional studies are then discussed in the latter parts of this section.

3.3.1 The Value of Space and Location

Variations in centrality (as defined from CPT in Section 3.2.1) create different levels of value (Alonso 1964), and these values are subjectively defined to the needs of the users of a commodity (Webster 2009,2010; Narvaez et al. 2012). The value typically sought by STs in the choice of their operational locations is to increase their income through proximity to customers – by being centrally located within the street network system in cities. The value often sought by STs customers is convenience (Bromley 2000; Bromley and Mackie 2009; Kim 2015) by engaging with STs as activities conducted within multi-purpose journeys.

For trading transactions to occur, the locations of both traders and customers must however be synchronised relative to these values, and this requires some level of environmental cognition. Therefore, the primary decision by one party of either STs or customers, influences the secondary decision of the other and vice-versa (Penn 2005) - although there is a stronger bias from the influence of customers locations in this relationship. Consequently, SBEs are typically located close to locations which are human activity generators (Bass 2000) – locations with lots of potential customers. Thus, the spatial value gained by SBEs and their customers while engaging in trading transactions overlaps with the configuration and composition of the built environment.

Shoppers' Motivations

Operating at locations which provide a substantial number of potential customers is a valuable spatial asset for STs, however, another dynamic important to the occurrence of trading transactions, is that shoppers must be suitably motivated to patronise STs. In marketing literature, shopping patterns are a function of several variables, such as demographic profiles, environmental ambience, modes of transportation, variety and quality of products, and so behaviours tend to vary in different contexts. Stone (1954) further identified shoppers' motivations as being for either economic, personalising, ethical, or apathetic reasons.

Economic shoppers take a careful approach, paying attention to price, assortment, and quality of goods. In this instance, Wingfield and Oduwo's (2017) report on the retail outlook in Nigeria highlights how income influences shopping:

> Shoppers have adapted … to accommodate their wallets, and have also adjusted where and how often they are shopping. There is a trend towards more frequent shopping due to the decline in disposable income. As incomes vary daily, consumers are shopping on an immediate-needs basis, often visiting stores more than once per day due to their fluctuating earnings (Nielson 2017 pp. 12).

Shoppers motivated by personalisation, base their shopping on relationships with traders. Ethical shoppers are those willing to sacrifice lower prices and wider selections of goods, to conform with moral beliefs, while apathetic shoppers, shop out of necessity without specific motivations. Stone's classifications are based on empirical observations of attitudes, feelings, and opinions; and even though the categories were defined for customers in formal shopping centres, they provide a taxonomic structure for general shopping behaviours (for other classifications see: Tauber 1972; Westbrook and Black 1985).

Hornik (1984) and Berry et al. (2002) further highlight how shopping attitudes are relative to time constraints. Shoppers with less time to spare do so at more convenient stores, shop more quickly, take fewer trips, and purchase in larger quantities[55]; while those with more time, shop more frequently and in small quantities (Holman and Wilson 1982). The minimisation of time spent shopping is a crucial consideration to apathetic shoppers; therefore, it is assumed that most customers who patronise STs fall into this category of shoppers – as STs *modus operandi* seek to

[55] Taking fewer trips and purchasing goods in large quantity is contradictory to the reality in LICs. Instead, the opposite occurs, as customers are seen to take more frequent trips and purchasing in smaller quantities due to low levels of disposable incomes.

provide convenience to customers (Bass 2000; Bromley 2000; Donovan 2008). This behavioural pattern is also evident by how primary shopping activities account for 7.9% of all trips in Lagos[56] (Osoba 2015), while the rest are incorporated into commutes and other types of journeys - buttressing the need to acknowledge the effects of multi-purpose journeys (Ghosh and McLafferty 1984; Mulligan 1987), a factor missing from retail-city theories in Section 3.2.

Navigation and Human Wayfinding

It has been observed that transport networks facilitate mobility and play a defining role in the management of daily time budgets in cities, and so exploring this notion might provide a means to explain how, if, and why STs locational decisions are linked to the aggregate behaviours of journeys in cities. So what influences mobility patterns?

Navigation and wayfinding are concepts adopted by researchers to understand travel behaviours and environmental legibility. To conduct coordinated and goal-directed movements through the environment as requirements for navigation, humans apply psychological skills of perception, cognition, and motor behaviour (Montello and Sas 2006). Wayfinding is a component of navigation, and it involves the purposive planning and decision-making processes of choosing destinations and deciding on how to get to them. According to Montello and Sas (2006), the main environmental factors[57] that influence the ease or difficulty of wayfinding while conducting a journey are differentiation, visual access, and layout complexity. Differentiation is created by the visual distinctiveness of elements in the built environment. Visual access expresses how different parts of the environment can be seen from a vantage point; while layout complexity is an expression of built forms morphological fabric.

Based on predefined functional goals of journeys, Allen (1999) also identified three categories of wayfinding tasks and their influences on how humans navigate the environment. To Allen, the

[56] Commuting accounts for 44.3% and business-related trips are at 33.4%.
[57] These factors are related to general wayfinding, and there have been no identifiable attempts in scholarship linking informal retail and wayfinding.

first goal involves travel to familiar destinations, and this refers to routinely conducted journeys between a known origin and a known destination - along routes accustomed to. Second is exploratory travel, which is a journey aimed at discovery of new places or routes - these often end at the same origin. Third, is travelling to novel destinations, which involves travelling to specific destinations, where navigation is conducted with uncertainty and assisted by the aid of received spatial information (e.g. maps, signage and verbal direction). The bulk of journeys in cities fit into the category of routine journeys to familiar destinations (e.g. commutes to work). Referring to earlier defined motives of STs (Section 2.2.3), it is assumed that the bulk of SBEs operations key into routes taken on routine journeys by city dwellers - taking advantage of the aggregation of such journeys. So what routes do people/customers on routine journeys navigate through?

Route Choice

In transport planning research, route choice is studied to appraise the characteristics of transport routes relative to travellers' behaviour. Route choice is premised on the rationality, that individual travellers select the routes that best maximise their needs, by comparing all probable alternatives. Bovy and Stern (2012) postulate that route choice is based on satisfying either of the fastest route (time), shortest route (length), fewest turns, or fewest intersections. These options are all constructed as cognitive maps in human memory (Golledge 1999), and because such mental representations differ from physical maps, the ability to depict routes accurately is relative to levels of complexities they embody (Lynch 1960; Sadalla and Montello 1989; Golledge 1995). Thus, the body of work from environmental cognition hypothesises that navigation and wayfinding are conducted to satisfy the 'least complicated' routes for travellers' en route to new locations; while for familiar journeys, this is a function of 'least time'. The simpler the turns a person has to make on a route, the less complicated it is to navigate through that route, and vice versa. The selection of route choices also differs relative to different transport modes.

3.3.2 Accessibility Distribution and Network Studies

The literature explored in Section 3.3.1 reveals how socio-economic and behavioural interactions influence the occurrence and the location of trading transactions[58]. These ideas provide more nuanced and subjective notions of STs spatiality, and temper the notions of retail-city theories in Section 3.2 (see: Harvey 1969a; Castells 1977) – research which tends to be abstract, provide partial insights, and eliminate engagements with the heterogeneous political and social variables of production and consumption (Krumme 2002). The retail-city theories of land-use highlight how spatial trade-offs invoke different values of centrality (Von Thünen 1826; Alonso 1964; Fujita et al. 2001). More recently, proponents of 'new economic geography' (Krugman 1991; Fujita et al. 2001) have championed a similar approach, by placing the spatio-economic narrative within a 'complexity' paradigm (Martin 1999). In a similar way, but with an emphasis on more detailed spatial levels, built environment professionals and researchers have developed accessibility distribution studies to capture human behaviour based on urban form metrics missing from the economic theories discussed in Section 3.2 (Bhat et al. 2000).

The framing of location within complexity paradigms highlights how the distribution of human activities in cities cannot be examined without analysis of movement patterns (Cresswell 2012). So as crucial components of social and economic differentiation of activity-related patterns, the measurement and determination of accessibility is now a central concept in location research. Therefore as an indicator of a wide range of spatial factors, accessibility distribution analysis offers design and performance accounting framework for Urban Designers, City Planners and Policy Makers (Webster 2010). In research, accessibility analysis has been shown to be capable of assessing: the impacts of land-use and transport interactions (Wilson 2000); the effectiveness of transportation plans and projects against the planning objectives (Larson 1981; Zhang et al. 2015); house prices (Chiaradia et al. 2009; Narvaez et al. 2012a; Chiaradia et al. 2013b; Law et al. 2013; Xiao et al. 2016); retail location (Sevtsuk 2010); health and well-being (Sarkar et al. 2014), and solving optimal location problems for public utilities and services (Cascetta et al. 2013).

Accessibility analysis is defined and used in several ways (Handy and Niemeier 1997; Bhat et al. 2000; Bhat et al. 2002; Batty 2009), and its wide-range of measures include those based on:

[58] In-depth analysis of behavioural influences associated with trading transactions for STs is however complex, and beyond the scope and aim of this research, therefore only spatially inclined perspectives were pursued.

(1) The ease or difficulty of connections facilitated by relative proximities of people in space - via the characteristic topology of the transport network (Hansen 1959; Ingram 1971; Vickerman 1974).
(2) Activity participation, which is regarded as the attractiveness of a particular location as a trip destination - considering temporal factors and indicating land use patterns (Burns 1979; Pirie 1979; Jones 1981).
(3) Integrated systems from a user's viewpoint, the desired activity at destinations, and the link between them (Halden et al. 2005).
(4) An analogy of density. Sevtsuk (2010) draws similarities between density and accessibility, describing density as an expression of the features of built environment per unit area of a location, while accessibility is an expression as seen from a specific location. Thus, suggesting that 'accessibility is the density available within a given radius to a specific location' (Sevtsuk 2010, p. 35).

Components of Accessibility

Two factors are crucial to analyse the literature on spatial accessibility (Batty 2009). First is the scale at which accessibility is defined. The second is a differentiation between how accessibility influences individuals relative to socio-economic activities, and how physical infrastructure[59] influences this in turn. Batty's (2009) concerns are addressed by adopting a framework proposed by Geurs and van Wee (2004), which simplifies the interpretation of accessibility and helps highlight the data requirements of measures and their components. Geurs and van Wee (2004) identified four components which are essential to understanding accessibility (Figure 3-4), which are the: 1) Land-use component, 2) Transportation component, 3) Temporal component, and 4) Individual component.

[59] Physical infrastructure refers to networks of streets and related routes and clusters of land parcels or even buildings.

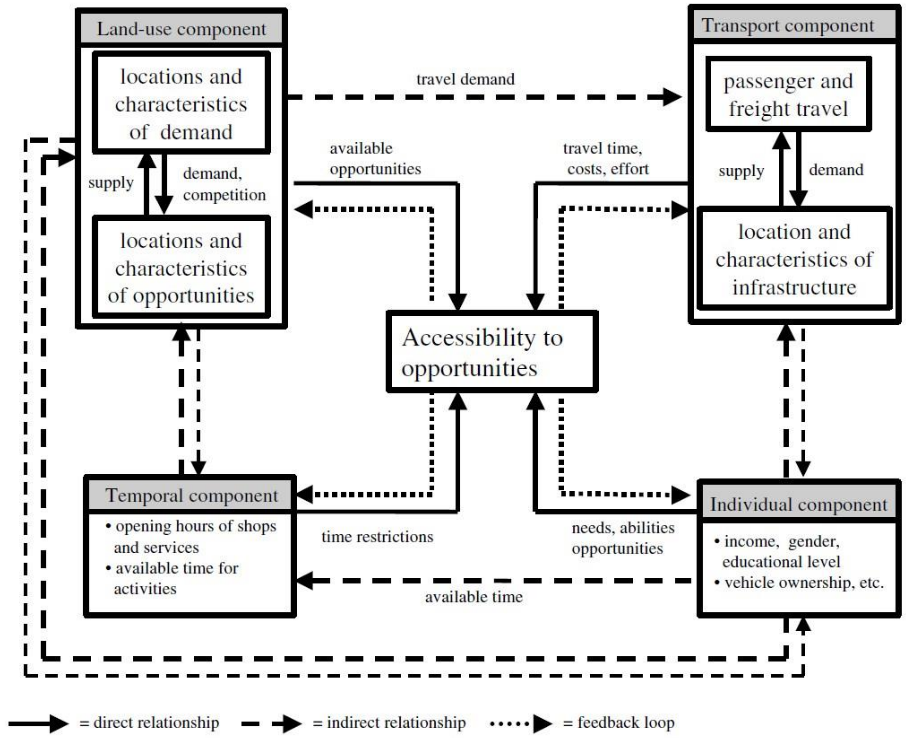


Figure 3-4: Relationships between components of accessibility Source: Geurs and van Wee (2004)

The four components of accessibility relate dynamically (See Figure 3-4), and it is suggested that 'accessibility might influence the components through a feedback mechanism' (Geurs and van Wee 2004, p. 128). The land-use component is a function of the land-use system, it is dictated by the competition created by demand and supply at origins and destinations. The transportation component is an expression of the ability to cover the distance between an origin and a destination using a specific transport mode (which results from a conflict between the supply of infrastructure and demand from passenger and freight travel). Impedance variables are usually built into the transport component (which could be time, costs or effort) and are also influenced by the tension between supply and demand. The Temporal Component reflects the availability of opportunities at different times of the day, and the time available for individuals to participate in specific activities. The Individual Component reflects the requirements, capabilities and opportunities of individuals, as this plays a role in influencing their access to transport and spatially distributed opportunities. In practice, these distinctions are not apparent, because accessibility measures focus on one or more of these components concurrently.

Measures of Accessibility

Accessibility is the 'potential for interaction' (Hansen 1959), (see Section 1.4) and it is a function of both 'proximity and connectivity' (Tal and Handy 2011). Accessibility as proximity quantifies the relational property for pairs of entities to reflect the configurational character of a network. Accessibility as connectivity is a quantification of connections (the directness and multiplicity of routes) - as a reflection of the compositional character of a network. Accessibility is thus a concept that is difficult to define and even more difficult to measure' (Guers and Van Wee 2004, Tal and Handy 2011). Therefore, the criteria for classifying accessibility measures is best adopted relative to a researcher's objectives (Handy and Niemeier 1997). In this section, Geurs and van Wee's (2004) classification is adopted for its clarity, and this is relative to 1) Infrastructure-based, 2) Location-based, 3) Person-based, and 4) Utility-based measures.

The performance and service level of transport is analysed using Infrastructure-based measures - prevalent in transport planning. Location-based measures analyse the level of accessibility to spatially distributed activities - prevalent in urban planning and geography. Infrastructure- and Location-based measures are derived from patterns of location, and usually include an impedance variable and activity (Handy and Niemeier 1997; Kwan and Weber 2008), and are passive accessibility measures. Person-based measures, analyse accessibility at individual levels; for example, activities in which an individual can participate at a given time. Utility-based measures, measure economic and other benefits that people derive from access to spatially distributed activities. Person- and utility-based measures are active accessibility measures. Infrastructure and person-based measures[60] will not be explored here, as they are not relevant to this research. Location and utility-based measures are analysed further below.

Before Location and utility-based measures are analysed, it is essential to highlight the choices of spatial units and impedance variables (separation parameters) used by researchers - as they play a critical role in defining how accessibility distribution is measured. The spatial unit can either be

[60] Person-based measures are similar to Space-time measures, as proposed by Hagerstand (1970). Such measures require large amount of temporal data, and therefore are rare in accessibility studies (Sevstuk 2010).

an area, a point, or part of a network[61]. Impedance variables are either conceived as straight lines between centroids in the areas of interest, between points, or the actual distances measured along a network[62].

According to Chiaradia et al. (2014), these are two main spatial conventions for measuring accessibility distribution, which either measure accessibility: 1) by weighting locations according to their size in relation to an impedance variable (Hansen 1959), or 2) by omitting the size variable and focusing instead on the impedance variable alone (Ingram 1971). For example, Hansen (1959) defined accessibility as the potential opportunities for interaction and weighted locations according to their sizes. In Hansen's model, the spatial unit was area-based (criticised for its susceptibility to the Modifiable Areal Unit Problem - see the Gravity Model discussion in Section 3.2.2), and impedance was measured as a straight line (as-the-crow-flies) distances between the centroid of these areas. Ingram's (1971) model, the area variable is discarded, and accessibility is a function of spatial separation. According to Pooler (1995), Hansen's (1959) work has been seminal in defining how accessibility is studied in transport literature, and there are also other early researchers like Christaller (1933) and Reilly (1931) whose contributions have been applied extensively to study spatial accessibility.

Location-Based Accessibility Measures

There are several location-based measures, but three broad measures are discernible: spatial separation, cumulative opportunities, and gravity measures.

I. Spatial-separation measures focus explicitly on spatial impedance caused by distance, without examining the nature of activities being studied (Pooler 1995). Accessibility is thus measured based on relative locations within a study area (Shimbel 1953; Ingram 1971). This implies that all locations are seen as being equally endowed with this

[61] A Spatial unit is measured with respect to quantities such as employment, retail floor area, population, retail sales, etc.
[62] Spatial separation is measured with respect to distance (Euclidean, Angular, Topological etc.), travel cost, travel time and other similar spatial metrics variables.

measure, which allows for specificity relative to the geometric and topological properties of networks. Its specificity has made it attractive in studying the influence of urban form and will be discussed further later in this section, as it fits the criteria required for this research in its ability to function without descriptive data. Equation 3.1 is a formal specification of this measure as define by Ingram (1971).

$$A_i = \sum_{j=1\ j\neq i}^{n} S_{ij} \qquad i = 1,2,\dots,n$$

Equation 3.1

In Equation 3.1. A_i is accessibility at i, S_{ij} is the distance of separation between locations *i* and *j* accessibility at a location, *and j = (1,2,3, …..n)*.

II. Cumulative-opportunity measures[63] consider the number of potential activities available within a given distance or time threshold, as the basis to measure accessibility. It differs from spatial separation measures with the inclusion of a destination parameter. This measure can be assumed to capture attractiveness within a trip. It is the summation of opportunities within an isochrone and specified formally as:

$$A_i = \sum_j O_{jt}$$

Equation 3.2 In

Equation 3.2. A_i is accessibility at a location i, O_{jt} being a given opportunity that can be reached, within a threshold *t*. It differs from Equation 3.1 with the addition of a destination parameter.

III. Gravity measures[64] account for the possibility of attraction in an area, by weighing opportunities and then discounting them by an impedance factor (Hansen 1959; Ingram

[63] Integral accessibility measure by Ingram (1971) is an example of this type of measure.
[64] Potential accessibility measure

1971; Vickerman 1974). Their application can be traced back to early work with similar approaches (Ravenstein 1885; Reilly 1931). Accessibility is accounted for as the relationship between the attractiveness of destinations, and its value decreases due to the difficulty of getting to destinations (Carrothers 1956). Data requirements are an attraction factor (the size and location of the attractions under investigation), and an impedance factor between zones in the study area. Size as a factor is typically measured with respect to quantities such as retail floor area, population, employment, retail sales; while impedance is measured with respect to distance, travel cost, travel time and other similar, spatial distance variables (Zhang et al. 2015). The gravity measure is specified formally as:

$$A_i = \sum_{j=1\ j\neq i}^{n} S_j exp\left(-bs_{ij}\right) \qquad i = 1,2, \dots, n$$

Equation 3.3.

Where A_i is for accessibility at location i, which varies directly with the sizes S of other locations j and inversely with the impedance function S between i and j.

Utility-Based Accessibility Measures

Utility-based measures are based on random utility theory, which assumes that the probability of a choice decision by an individual depends on the relative utility of that choice, in comparison to the utility of all other choices (Handy and Niemeier 1997). The measure implicitly assumes that individuals will maximise utility when faced with a choice and thus, it invokes a behavioural slant to the study of accessibility to capture the agency of individuals. The utility-based measure is specified formally as:

$$A_n = ln\left[\sum_{\forall\in C_n} \exp(V_{n(c)})\right]$$

Equation 3.4.

Accessibility A_n for an individual, *n*, can then be measured. Where $V_{n(c)}$ is the observable temporal and spatial transportation component of the indirect utility of choice *c* for person *n*, and C_n is the choice set for person *n*.

Summary of Accessibility Measures

In this section, Geurs and van Wee's (2004) framework was adopted. Within this framework, accessibility is determined by the interactions between land-use, transport, time, and individual components. The composition of these relationships means that accessibility at a location is influenced by changes that occur between them. The differences between the ways that some of these measures quantify accessibility is sometimes difficult to identify. As an example, Kwan's (1998) extensive comparative study of accessibility measures revealed that gravity and cumulative-opportunity measures correlate.

The gravity measure - which is common in transport models - is usually defined as impedance based on cost and distance, but it is susceptible to 'cost' data and therefore requires up-to-date empirical data to achieve valid results. The utility measure is useful for modelling user-benefits for individuals, but the results are complicated to interpret. Spatial-separation and Cumulativeopportunity measures, focus on the geometry of urban form and are considered the most straightforward accessibility measure. The validity of Spatial-separation and Cumulativeopportunity measures are often criticised as methods for evaluating social and economic impacts of land-use and transport changes, as they do not adequately incorporate theoretical criteria - such as travel behaviour - considered crucial to accessibility (Pirie 1979; Bhat et al. 2002). However, these measures do not require a lot of data to model, as no assumptions are made about the theoretical criteria., although in accessibility analysis literature, the choices made about the impedance variable (separation parameter) and spatial units is essential to defining how accessibility is measured.

This research focuses on spatial-separation measures, as they engage with a broad range of research interests important to urban designers. Spatial-separation measures describe urban form and have been found to link to other aspects of spatiality (Zhang et al. 2015). The spatialseparation measure is relevant to the urban planning and management approach on which this chapter is based. Its reliance on minimal amounts of data (the absence of a spatial unit component), as well as its explicit focus on urban form, therefore suits the study of urban form in LIC cities.

3.3.3 Configurational Studies

In this section, the network structure of the built environment is studied as a system of relational patterns by linking spatial-separation measures with centrality analysis. This application can be traced to the pioneering studies of Christaller's (1933) CPT, and researchers have applied CPT's mean distance measures to conduct quantitative spatial analysis ever since (Pooler 1995).

Spatial-separation measures operate at fine spatial scales, and to analyse the codified city structure, the convention is further encoded into an adjacency matrix which indicates pairwise relationships between the components of a graph (vertices/nodes and edges/lines). Graph network theory[65] is then used to model the physical connectedness of locations for urban assessments (Batty 2009), and subsequently, the centrality of graphs are analysed. Batty argues that 'to understand space, we must understand flows, and to understand flows, we must understand networks - the relations that occur between objects that comprise the system of the city' (Batty 2013, p. 3). Taylor et al. (2010) take Batty's thesis further by stating that contemporary urban systems - especially intra-urban relationships - are fixed around interactions instead of places. These statements imply that spatial-separation measures go beyond defining urban form, meaning they can also capture complex social relationships – as discussed in Section 3.3.1. The linkages in the literature between centrality, graph theory, and the measurement of accessibility are examined next.

The City as a Complex System

It is best to view cities as systems to understand the use of centrality and graph abstractions in measuring spatial accessibility. Cities are complex systems because they function based on a large

[65] Gross, J. L. and Yellen, J. 2005. *Graph theory and its applications*. CRC press. provide a comprehensive introduction to graph theory.

number of interacting components created by human activities (Wilson 2000). There is an inherent logic, and order, that can be derived from the spatial distribution of the components

within cities (Rodrigue et al. 2013). Different places exhibit varying levels and patterns of activities. According to Alexander (2002), order is based on the idea of centres, which are configured by the spatial structures of the built environment. Alexander suggests that the generative processes of centres play a vital role in defining order and patterns across space. Thus, the structure of cities exhibits a complex organised order of patterns which are as a result of finegrained gradual contributions of individual agent's spatial decisions over time (Jacobs 1961). Even after reconfiguration of the modalities identified to structure the spatial patterns of cities occur (due to technological advancements from modernisation), factors of distance and proximity within space remain evident – meaning their forms and effects have only been reformulated (Agnew 2011).

All complex systems share some common structural properties (Porta et al. 2006b). Watts and Strogatz (1998) call this commonality a 'small-world' property[66], and 'a large number of social, biological and man-made systems can be represented in similar forms of networks' (Porta et al. 2006a, p. 1). Since various variables have been proposed to study complex networks, the more recent spatial accessibility studies - influenced by the seminal work of Wasserman and Faust (1994) - have borrowed from variables created for social network analysis on centrality (Newman 2005; Crucitti et al. 2006b; Porta et al. 2006a; Porta et al. 2006b; Scellato et al. 2006). Hence, the complexities of cities are investigated with centrality - the same instruments used for other classes of self-organised phenomena in nature, technology, and society (Batty, 2005).

[66] In such networks, the average topological distance between couples of nodes is small compared to the size of the network.

Complex systems in cities are studied within codified frameworks of graphs, to model patterns of connections or interactions. A graph's components are codified as vertices/nodes and edges/lines (which connect pairs of nodes), and this codification has a profound impact on how centrality is captured. There are two methods of codification identified in urban studies, which are: the *primal* and *dual* graph representations (Porta et al. 2010). In primal graphs, intersections are turned into nodes and streets into edges. In dual graphs, streets are nodes and intersections are edges. There is no superiority in the use of primal or dual graphs; rather differences are generated from theoretical and empirical application of spatial units and metric conventions within models - as adopted by researchers.

Shimbel (1953) is thought to have proposed the first spatial separation measure on networks, as a means to measure the compactness of a graph. This unweighted definition defined the relative accessibility of a vertex in a graph as:

$$A_i = \sum_{j=1\ j\neq i}^{n} d_{ij} \qquad\qquad i = 1,2,\dots,n$$

Equation 3.5. A_i

is the sum of distances at vertex i. d_{ij} is the shortest path between vertex i and j. Relative accessibility is a measure of farness radius N for a given spatial unit.

To measure the integral accessibility (overall network dispersion), Shimbel defined another measure:

$$A_i = \sum_{i=1}^{n}\sum_{j=1}^{n} d_{ij} \qquad\qquad i = 1,2,\dots,n \quad j = 1,2,\dots,n$$

Equation 3.6.

Shimbel's measure was later applied by Kansky (1963) in transport network analysis, and by Haggett and Chorley (1969) in geography. More recent spatial accessibility studies influenced by this ethos have adapted variables created for social network analysis on centrality. In social network analysis, Bavelas (1950) indicated the importance and prominence of central individuals within a group of people. This was built upon by Freeman's (1978) work on structural sociology, and the centrality indices adopted by urban researchers based on this inclination are *degree* (C_D), *closeness* (C_c), and *betweenness* (C_B) centrality.

Degree Centrality (C_D) refers to being central, as having many people in direct proximity without any intermediaries. Thus, it measures the number of nodes that are connected to a given node (street intersection). It is also known as connectivity and is defined as:

$$C_D(v_i) = \sum_{k=1}^{n} r(v_i, v_k)$$

Equation 3.7.

Where *n* is the total number of vertices (links) of the graph *G* (street network).

Closeness Centrality (C_c) refers to being central, as a minimum cost or time (distances) to all other people within a group. It is based on the concept of minimum distance and measures the smallest number (shortest distance) of links from a node to all other nodes. Closeness radius N (Bavelas 1950) is defined as:

$$C_c(v_i) = \frac{n-1}{\sum_{k=1}^{n} d(v_i, v_k)}$$

Equation 3.8.

Where $d(v_i, v_k)$ is the shortest distance between nodes v_i and v_k

Betweenness Centrality (C_B) depicts being the intermediary in many of the relationships that exist between pairs of actors within a network, thereby influencing the spread of information or connectedness. The betweenness index of a link (street segment) is derived by calculating its shortest paths with all nodes in the graph (the street network system). Closeness centrality specifies how far each node is from all other nodes, betweenness measures to what extent a node is located between paths that connect pairs of nodes[67]. Betweenness centrality (C_B) radius N (Freeman 1978) is defined as:

[67] Within a matrix of shortest paths between all node-pairs, a node's betweenness index is the number of times that the node is traversed in this set of shortest paths.

$$C_B(v_i) = \sum_{j=1}^{n}\sum_{k=1}^{j-1}\frac{p_{ikj}}{p_{ij}}$$

Equation 3.9.

Where p_{ij} is the number of shortest paths from i to j, and p_{ikj} is the number of shortest paths from i to j to pass through k, so $\frac{p_{ikj}}{p_{ij}}$ is the proportion of shortest paths from i to j to pass through k. C_B is also known as "path overlap level" or "stress' (Chiaradia et al. 2012; Zhang et al. 2015). Shimbel defined 'stress' on a vertex as 'the resulting flow potential on the link' which measures the number of shortest paths that pass through a vertex.

There are other measures of centrality that have been defined beyond C_D, $C_{C,}$ and C_B, not discussed, for example, efficiency, straightness, information, reach, gravity Index (for more see: Latora and Marchiori 2001; Sevtsuk 2010, 2012).

From the measures of centrality discussed in this section, the flow potential on a link (its betweenness centrality) is arguably the most useful measure in defining STs' choices of location. A network link with a high value of betweenness centrality can therefore be assumed to embody the spatial properties described earlier in Section 2.2.3 - as the Places of Work for the Informal Economy. Betweenness is thus the measure of centrality that will be used to analyse street networks. In this research, Betweenness centrality is often used interchangeably with 'Betweenness' and 'accessibility'[68].

Betweenness centrality is interpreted as the potential flow resulting from trips between origindestination (O-D) pairs assigned to a single optimal route (Chiaradia et al. 2014, p. 7). The shortest path (geodesic) can be defined by different metrics related to route choice preferences and labelled as: a Euclidean metric (minimising the number of metres travelled along the network), Angular metric (minimising the cumulative angle turned along each route); Topological

---

[68] In literature Closeness Centrality is used interchangeably with the term 'accessibility'. However, in this research Betweenness Centrality is called Accessibility - as it is the measure of used to study flow potential along networks.

metric (minimising the number of nodes), or other travel data (Chiaradia et al. 2014, Cooper 2015). The choice of which metric to use is dependent on the purpose of the analysis being conducted.

In spatial cognition literature (discussed in detail in Section 3.3.1), the use of Euclidean metrics implies a selection of shortest paths - based on human memory - so preferred by agents familiar with a route on a journey. The shortest Angular path requires less cognitive effort and is thus preferred by agents unfamiliar with a given area - because there are less turns to remember (Sadalla and Montello 1989, Golledge 1995, Golledge 1999, Hillier and Iida 2005, Montello and Sas 2006). Euclidean metrics read dispersion well, but are weak in capturing morphology - a limitation from the treatment of turns. The Angular metric captures morphology better (as it reads compaction), but it tends to reflect longer journeys paths. These factors make it arduous to choose which metric best suits the study of centrality.

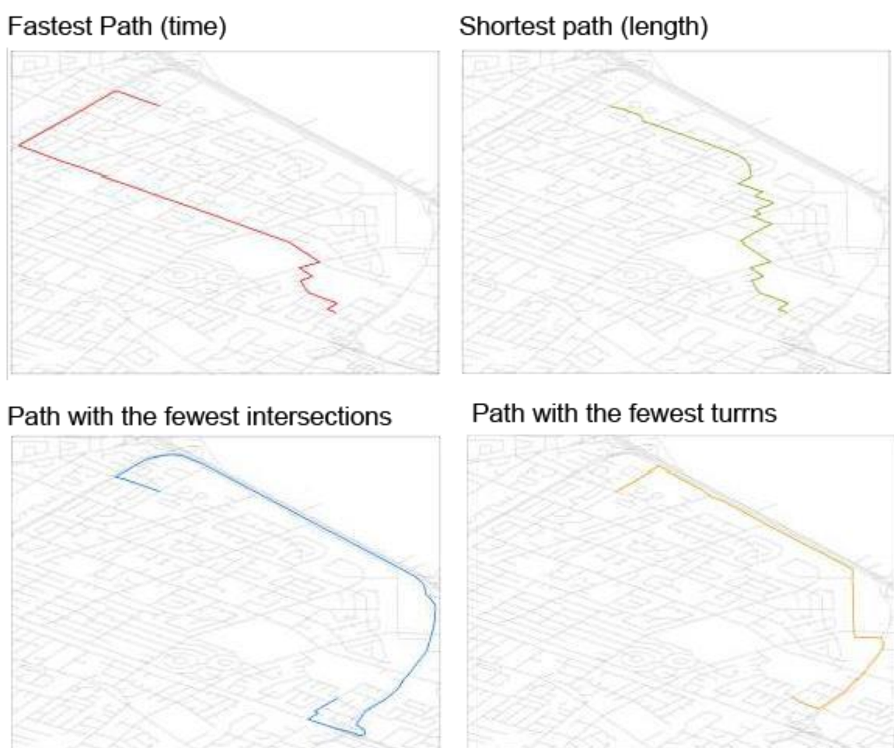


Figure 3-5 O-D shortest paths along networks. Source: Chiaradia et al. 2014

In this section, the different ways researchers have applied the encoded spatial units and metrics of centrality to study the structure of cities are discussed. Space Syntax, Multiple Centrality Analysis (MCA), Urban Network Analysis (UNA) and Spatial Design Network Analysis (sDNA) are discussed here.

Hillier and Hanson's (1984) seminal treatise 'The Social Logic of Space', was for a very long time the only contribution in literature from urban design to the discussions of network analysis. Their theory of space and its methodology for urban analysis using Space Syntax provided the foundation for most of the research output that now links urban form with social activities.

Space Syntax provides a method for partitioning spatial systems as a set of discrete interconnected subspaces to highlight their importance, regarding their relative nearness or accessibility (Sarkar et al. 2014; Klarqvist 2015). Based on Space Syntax's principles, 'spatial adjacency is the fundamental relationship that characterises how structures might be configured in a spatial layout' (Al-Sayed et al. 2014, p. 11). To capture spatial structure of urban space, Space Syntax initially accounted for 'depth' in topological terms as either axial maps or convex maps (Bafna 2003; Al-Sayed et al. 2014).

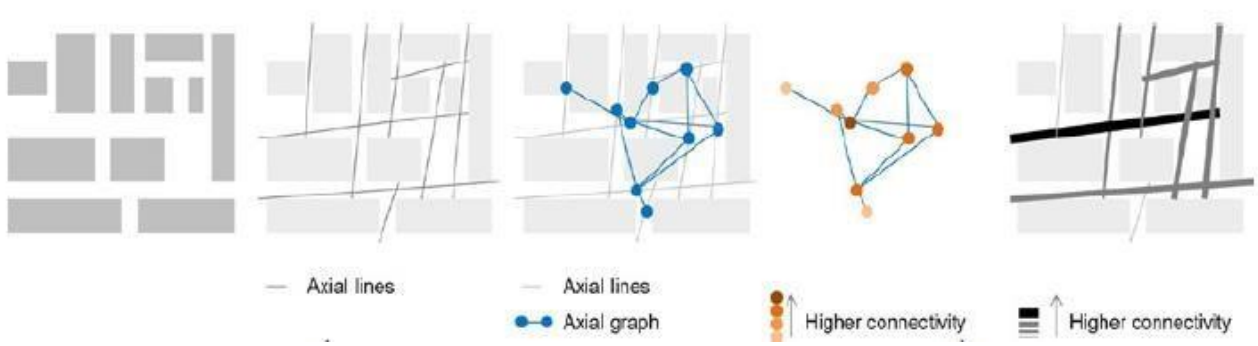


Figure 3-6: The axial representation of Space Syntax. An urban space represented by the fewest and longest axial lines (b), axial lines are represented by a graph (c), the graph Connectivity is highlighted in (d & e). Source: Al-Sayed et al. 2014.

In axial maps, depth is identified as the change in direction between one axial line and another; in convex maps, depth is defined as the least number of syntactic steps (Figure 3-6). Convex maps are commonly used in the analysis of programmatic arrangements of spaces, whereas axial maps are used in the understanding of behavioural characteristics of the spatial settings (Bafna 2003, p. 25). Axial map analysis invokes 'axial lines' - a series of unobstructed movement paths or lines of sights - obtainable from drawing straight lines through street segments of a study area (Hillier and Hanson 1984). Axial lines were devised to allow the conduct of centrality analysis, which focused on establishing correlations between the topological accessibility of streets, and a wide range of sociological phenomena (Batty and Rana 2002; Penn and Turner 2002). However, Ratti (2004) criticised the validity of relying on such subjective interpretations of axial lines as it had no geographical property in structural terms. Another fundamental issue with axial maps is their elimination of geometric properties of streets, i.e. longer and shorter street segments were translated and depicted in a similar and equal manner (Ståhle et al. 2005).

Later developments by Space Syntax researchers - from 2005 onwards (Hillier and Penn 2004; Hillier and Iida 2005; Turner 2007) - have actively sought to address the shortcomings in its methodology, such as those raised by Ratti (2004). Space Syntax has changed from an axial to segment representation. In this new representation, segments are still derived from the axial line but are encoded to be more representative of the road centre line and dependent on the geometry of the street segments (Turner 2007). This disparity in the convention is evident in how a curved link in represented in Space Syntax. A curve is decomposed as a set of small straight segments, which is not representative of a curve.

The underlying analysis in Space Syntax uses 'integration and choice' [69] (closeness and betweenness centrality) to capture spatial adjacency. The only changes from 2005 onwards were the spatial unit and metric conventions. For the ease of representation, the relative structural importance of a street represented by a vertex in a dual graph are then colour coded and reported (Crucitti et al. 2006b). This procedure produces the gradient map which is associated with the outcome of Space Syntax assessments (see Figure 3-7).

[69] Integration is computed with a radius of one turn indicates how many axial lines intersect with a given line. Choice is the number of the intermediate vertices that stand on the shortest path between two vertices. Other syntactic measures include connectivity (degree centrality) and 'control'.

Figure 3-7: Urban layout value map of London Source: Space Syntax i-VALUL

The application of Space Syntax in research has shown correlations between retail activities and spatial accessibility (Ortiz-Chao and Hillier 2007; Chiaradia et al. 2012; Scoppa and Peponis 2015). Scoppa and Peponis (2015) employed fourteen independent variables[70], to study the distribution of retail frontage densities in the CBD of Buenos Aires. Scoppa and Peponis's study revealed that the most potent descriptor of the city's street networks in relation to retail density was *directness* of connections to all other street segments[71]. The researchers thus suggested that shops are most likely to be successful if they had the advantage of being positioned at a street segment which had high 'directness of connections' due to the syntax of spatial configuration - independent from the interactions created by the shop's regular footfall.

Omer and Goldblatt (2016) used Space Syntax for research in Israel to compare the distribution of retail activity in newly planned and older self-organised cities. In the former locations, a weak correlation between retail activity and the street network's integration and their choice centrality measure was deduced, while in the latter, retail activity tended to agglomerate linearly along the

[70] These included: Metric reach, Directional reach, Street width, Metric betweenness centrality, Normalised angular choice, Normalised angular integration, Network distance to centre of the city, Distance from nearest metro station, Distance from nearest railway station, Population and employment densities, Surrounding commercial frontage densities, Land-use zoning.

[71] They also discovered that the extent to which a street segment lies on the shortest routes between all pairs of potential origins and destinations (whether by metric distance or by direction changes), has less influence.

main roads, especially at the cities' historical cores. The explanation for this as derived by Space Syntax was that the older cities' streets had both higher integration levels and centrality values which encouraged through movement. Omer and Goldblatt (2016, p. 19) believe the 'development of retail activity characterised by a relatively higher extent of self-organised urban growth can be essential for planning interventions aimed at improving the function of planned new cities'. They also argue that the incorporation of time-series data is required to produce more accurate descriptions of accessibility. However, this sort of data they refer to is difficult to obtain, hence mostly omitted in spatial models. In the case of IE activities, it is common knowledge that data reliability and availability are significant issues. Such data-reliant applications are therefore inappropriate to studying workplace locations of SBEs in LICs.

Space Syntax has been a primary basis to study human activities and their spatial locations, but due to the shortcomings in the original ethos of the Space Syntax methodology, numerous adaptations and improvements have been proposed over the years. Recent developments now consider Metric and Angular analysis (Batty and Rana 2002; Dalton et al. 2003; Hillier and Iida 2005; Turner 2007). Space Syntax is therefore gradually absorbing the ethos of traditional graph theory analysis, with two trajectories being evident. The first is that a large body of research is being developed under the Space Syntax Laboratory banner at The Bartlett, UCL, London, where counter arguments typically inform new reformulations - which makes it quite challenging to select which best suits the research interest for newcomers. Within the second trajectory of graph network research, some researchers have abandoned the Space Syntax tag and deduced new[72] forms of spatial analysis models.

Link Codification Convention

Geometric measures were re-visited to produce centrality assessments more relevant to urban design requirements, to address some of the underlying issues with Space Syntax. The basis for these indices can be traced back to research by Shimbel (1953), Kansky (1963), and Haggett and Chorley (1969) mostly ignored in developing the Space Syntax methodology. Space Syntax's spatial unit of representing street segments with axial lines is replaced by a standard network representation (a link as the segment of street between two junctions). The renewed application

[72] Alternative forms of urban spatial analysis which build on findings from Space Syntax, but refer to the original codification of graph theory.

of geometric indices are explored next through: Multiple Centrality Assessments by Porta, Crucitti, and Latora (Crucitti et al. 2006a; Porta et al. 2006b); Urban Network Analysis (Sevtsuk and Mekonnen 2012); and Spatial Design Network Analysis (sDNA) by Chiaradia, Cooper, and Webster (2013a).

The Multiple Centrality Assessment (MCA) is a spatial analysis methodology and toolbox, based on primal graph codification[73], metric distances, and the use of several indices of centrality concurrently (Porta et al. 2006b; Porta et al. 2008). The values derived from individual centrality indices are calculated and compared to the phenomenon being studied (and colour coded on a primal graph), to operationalise the MCA methodology.

> MCA maps both node and edge centrality … the centrality of an edge is calculated as the average of its couple of end-nodes. This simple procedure highlights a deep character of spatial networks when represented in a primal way, one edge exchanges with the system only at nodes, so its relational properties as a system's component entirely depends on its end-nodes importance' (Crucitti et al. 2006a, p. 16).

MCA concurrently applies four centrality indices *closeness, betweenness, straightness, and information* to conduct network analysis. To validate this methodology, Crucitti et al. (2006a) conducted a study of 18 1-square-mile samples from planned and self-organised world cities. Crucitti et al. found that MCA's four centrality indices exhibited highly diverse spatial distribution patterns, and supported their notion that no single centrality index adequately captures a complete picture of geographic space.

Porta et al. (2009) applied MCA to study the distribution of retail and service activities on the ground floor of buildings in Bologna. After matching street network and land use data using Kernel Density Estimation[74], they found evidence of correlations between the aggregation of

[73] Though calculating the graph metrics in this form computes the results for nodes (street intersections), rather than edges (street segments), the results can easily be converted to street segments by computing the average value of two adjacent nodes and applying the outcome to the edge that lies between those nodes (Sevstuk 2010, p.44)

[74] According to Scoppa and Peponis (2015 p 358) "*Kernel density estimation functions allow each cell in the raster map to be associated with a value, derived or extrapolated from the values assigned to individual street segments, or parcels, in the original vector database".*

economic activities, and streets with high levels of global betweenness centrality (closeness centralities also correlated, but to a slightly lesser extent). The Bologna study highlights that territorial resources - betweenness centrality and retail activities - are distributed heterogeneously; and this mimics the distribution of centrality in self-organised systems because centrality is not evenly distributed.

Urban Network Analysis (UNA) is a methodology and toolbox (Sevtsuk and Mekonnen 2012) created as a formalisation of Sevtsuk's (2010) methodology. UNA employs a weighted representation of spatial network elements - *built volume* - as its unit of analysis to compute centrality. In essence, it is a combination of graph analysis type measures (Kansky 1963; Haggett and Chorley 1969) and land-use type accessibility analysis (Hansen 1959).

Sevtsuk's (2010) research in Cambridge and Somerville, Massachusetts, calculated the probability of (un-coordinated formal) retail activities being influenced by urban geometry, using a network analysis based on a primal graph codification. Sevtsuk's model (2010, 2012) is similar to Porta et al.'s (2009) Bologna study in the incorporation of 'weighting' as a concept [75] - albeit operationalised differently. Rather than network links, in this case, buildings were the unit of analysis; therefore, a spatial weight matrix [76] was incorporated to reflect spatial adjacency conditions of retail activities. To capture the peculiarities of his research's hypothesis, Sevtsuk derived centrality measures, which he tagged '*Reach, Distance Remoteness, Turns Remoteness, and Intersection Remoteness'*, in addition to the more standard betweenness measure. The outcome of this research validated hypotheses (Sevtsuk 2010 p. 134 - 139), which stated that:

1. *Retail and food establishments in urban settings are spatially attracted to other retail and food establishments, controlling for exogenous location factors.*
2. *Advantages in accessibility that result from favourable proximity to surrounding built volume are positively related to retail location choices, controlling for land use attractions and spatial clustering*.

[75] This is a sentiment of scholars who dismiss the usefulness of spatial separation type measures, especially pervasive amongst transport planners.
[76] This was limited to buildings that zoned for commercial uses.

3. *Advantages in accessibility that result from favourable proximity to residents, jobs, and transit stations, are also positively related to retail location choices, controlling for urban form and agglomeration effects.*

A fourth hypothesis, suggested that 'accessibility to surrounding opportunities is important not only regarding distance but also in terms of the number of turns and street crossings required to reach the destinations', was not validated. It was observed that turns and intersections - as impedance metrics, were not as crucial for retail location choices as distance.

From Sevtuk's description, UNA is only applicable in cases where (weighted) data for the built form is available. In this case, it falls short in its applicability in the situation of SBEs in LICs, as such data is not available – an underlying shortcoming in LIC cities this research aims to overcome, by using tools which rely on minimal amounts of data.

As a response to these shortcomings, Spatial Design Network Accessibility (sDNA) was developed in 2011 at Cardiff School of Geography and Planning and PLACE (Sustainable Places Research Institute) (Cooper and Chiaradia 2015). Chiaradia led sDNA's conceptual development as a response to the issues which plagued Space Syntax which remained unresolved. sDNA is operationalised by standardising the use of network links as its unit of analysis (Chiaradia et al. 2013a; Cooper and Chiaradia 2015). Thus, sDNA uses a link and node convention that encodes a graph's 1) node as an edge/line 2) and a link as node/vertex.

In sDNA, curved links are not segmented like Space Syntax. sDNA can also be operationalised using hybrid metrics. As an example, it can combine Euclidean and Angular metrics to conduct network analysis. From a theoretical perspective, this combination allows for the capture of both cognitive and physical properties of networks (a feature unique to sDNA). sDNA conducts both weighted and unweighted network analyses, and therefore, it captures most of the functional capabilities of both Multiple Centrality Assessment (MCA) and Urban Network Analysis (UNA). sDNA's comprehensive suite of measures[77] makes it extremely flexible and suitable to conduct spatial analysis in situations where data is scarce.

---

[77] sDNA is capable of conducting: centrality measures, network detour analysis, network shape analysis. sDNA generates a systematic accessibility ranking of networks links through a procedure known as 'integral analysis'.

By reconstructing studies earlier done through Space Syntax with sDNA, Chiaradia et al. (2014) highlight how principles from transport and geography disciplines can be used as an alternative to Space Syntax's non-standard way of codifying networks. The outcome of their study on transport networks in London correlated with dataset derived from applying Space Syntax and showed that non-weighted accessibility-centrality indices were able to predict pedestrian flow adequately (a prospect which Space Syntax dismisses). In another application of sDNA, Sarkar et al. (2014) conducted a series of studies using betweenness centrality as the accessibility index to establish a strong correlation between pedestrian movements and its effects on health. sDNA has also been used in mass transport investment option analysis for Shanghai (Zhang et al. 2015), environmental footprinting (Collins and Cooper 2014) and social cohesion studies (Cooper et al. 2014), as well as numerous planning consultancy projects.

A heuristic ethos runs through the methodology for the different measures which are used to conduct accessibility studies discussed in this section. It is observed that these measures are tailored to suit the requirements of research and none has been comparatively established to be the most accurate (as Chiaradia et al.'s 2014 study showed a correlation between Space Syntax and sDNA for example). In Space Syntax, the loss of a notion of the physicality of space due to its codification is not beneficial to the nature of research being conducted. While, UNA and MCA require weighted data to be operationalise. sDNA's use network data, and functionality when there are constraints of data availability, makes it a useful tool to study transport networks relative to SBEs workplaces, and it is thus adopted as the main analytical framework used for this thesis.

3.3.4 Compositional Studies

As an alternative to the quantification of the urban form in cities via configurational measures, urban scholars have also studied the structure of urban form from a compositional perspective. These studies are feature-based representations that convey structural information of the networks in the built environment. Two perspectives are detailed in this section, which are: 1) connectivity measures (Cervero and Kockelman 1997, Dill 2004, Tal Handy 2011) and 2) morphological measures (Muratori 1959; Conzen 1960; Whitehand 1981; Moudon 1997).

Street Network Connectivity Studies

Street network connectivity is a perspective in urban research that studies the structure of the built form at a block level resolution. Knight and Marshall (2014 p.242) state that 'despite the influx of complex street connectivity measures[78], other relatively simple and easy to understand measures continue to dominate planning discourse and regulatory practices [in the USA]'. Connectivity is a measure of 'the quantity of connections in a network, and thus the directness and multiplicity of routes through the network' (Tal and Handy 2012, p. 3). Therefore, an increase in street network connectivity reflects a fine urban grain, makes walking easier, reduces travel distances, and creates more opportunities and alternative routes to reach a destination (Handy et al. 2003). These properties are thus the reason why street network connectivity is used to link travel behaviour (walkability) to urban form and has been used to measure physical (nonmotorised) activity in the evaluation of functional neighbourhood design (Dill 2004). Street network connectivity can thus provide a means to assess a location's economic potential for trading activities, as the walkability of streets in cities is important for vitality and encourages economic activities (Gehl 1971; Jacobs 1993; Gehl 2013).

Street network connectivity measures are simple to operationalise, as they mainly examine the number and configurations of intersections in a network. In essence, these measures are codified in a link-node convention, but do not approach their analysis from a graph theory nexus. Minimal cartographic data is typically required, and standard network data for streets sourced from OpenStreetMap and TIGER road centrelines are usually sufficient to conduct connectivity studies[79] (Tal and Handy 2012). Like other accessibility measures, the validity of connectivity is criticised as an urban measurement concept, due to inconsistencies in its operationalisation - especially in how the layout of study areas are delineated (Stangl and Guinn 2011; Knight and Marshall 2015).

---

[78] See Section 3.3.2

[79] The use of such data becomes more complicated in instances where separate pedestrian networks exist within the area of study. Care must be taken when relying on transport network data, as the data is usually tailored to vehicular networks. In the case of Lagos (and most high density urban area), this is not considered a problem, as the designated of pedestrian routes are minimal, and most align with the vehicular road.

> There is no accepted standard for assessing the connectivity of a street network. Instead, a variety of measures have been developed and applied in research and planning practice (Stangl and Guinn 2011, p.288).

Two broad, interrelated categories for measurement from planning literature can be ascertained from literature to simplify the plethora of measures, i.e. those that are urban block related, and transport-network related. Some of the typical measures of connectivity within these categories are discussed briefly in the next two subsections[80].

Geometric Parameters of Urban Blocks

Block length, block size, block density, and street density are metrics conceptualised to measure connectivity relative to the geometric properties of urban blocks. The use of block length as a connectivity measure is based the concept that shorter blocks equate to more intersections (Cervero and Kockelman 1997; Handy et al. 2003), and therefore result in shorter travel distances and more routes between locations (Dill 2004). Block length is calculated as the mean distance of block faces (Cervero and Kockelman 1997). Unlike block length - which captures the individual length of a block's side - block size captures geometrical footprints on a two-dimensional scale as either areas or perimeters (Siksna 1990,1997; Hess et al. 1999; Handy et al. 2003; Dill 2004). Block density captures the number of blocks in a defined area - as smaller blocks equate to more intersections - and this reflects better connectivity (see: Cervero and Kockelman 1997; Frank et al. 2000). Street density is a measure of (undirected) street lineage per unit square kilometre or mile of a city (Handy 1996) and is calculated as a measure of the relative compactness of streets within a unit area (Knight and Marshall 2015).

Link and Node Parameters

Node density is calculated by dividing the node count (intersections and dead-ends) within a network by the area (Boeing 2017). Intersection density measures the number of intersections (excluding dead-ends) per defined unit area of a city (Cervero and Kockelman 1997; Knight and

[80] For more comprehensive examinations of connectivity measures see the works of Dill (2004) and Marshall and Garrick (2009, 2012).

Marshall 2015). Link-Node Ratio also known as the Connectivity Index (Knight and Marshal 2015) and is an index of connectivity equal to the number of road links divided by the number of nodes within in a study area (Ewing 1996; Tal and Handy 2012).

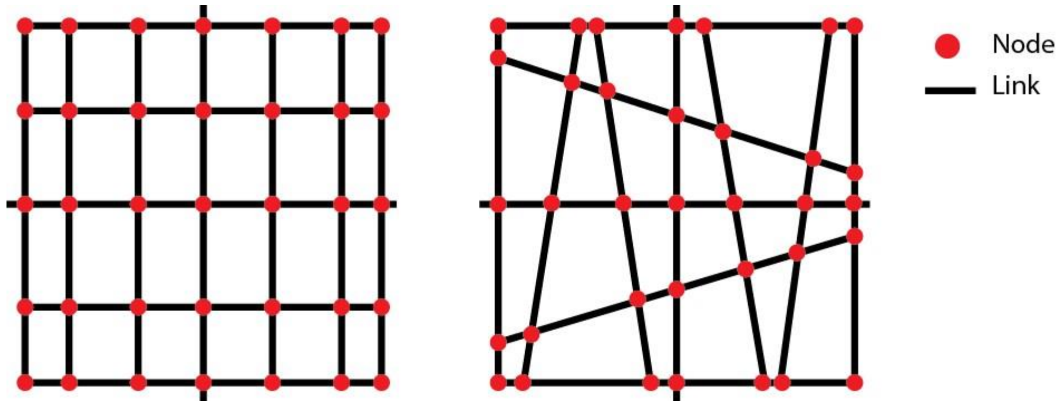


Figure 3-8 Link node Parameters, showing two networks with the same number of nodes, but different geometry.

Street network connectivity metrics have found currency in cities with grid-like layouts patterns, and can be easily 'gamed' (Stangl and Guinn 2011; Cooper et al. 2014; Knight and Marshall 2015) in more complex layouts. Therefore, Cooper et al. (2014 p.2) state that it fails to capture the 'shape of links between the intersections, nor the shape of the intersections themselves'. As Figure 3-8 shows, a network with similar numbers of links, nodes and length can produce different layout consequences.

Morphological Studies

Morphological studies provide a qualitative perspective of the composition of the built form. Urban morphologists generally 'focus on tangible results - the outcomes of ideas and intentions as they take shape on the ground and mould our cities' (Moudon 1997, p. 1). Urban form is understood to be based on three interrelated principles, its: physical elements', their different levels of resolution, and transformation that occur over time (Moudon 1997; Whitehand 2001). Conzen (1960) further devised a tripartite division of the physical elements of urban form. Conzen's division consisted of: the 2-Dimensional form (ground plan comprising the site, streets, plots and block plans of the buildings); the building fabric (the 3-dimensional form); and land and building utilisation (Whitehand 2007). Conzen's perspective on morphology has found currency in many recent morphological studies (Whitehand 2007; Whitehand 2010).

Siksna (1990) conducted comparative analyses on the morphologies of different cities, to highlight how their spatial structures influenced land parcelling, building forms, circulation patterns, and land uses. Siksna's empirical study was based on two hypotheses. First, he suggested that given similar urban processes, differing layouts over time tend to be identically reformulated, and second, was that specific block configurations perform better for both past and present development requirements. Siksna's thus argued that:

> small square blocks (circa 60-80m) performed better than larger blocks because they produced finer-mesh circulation patterns, more potential for lot frontages, more coherent block fabrics and finer-grained, continuous urban fabrics, for both low- and highrise buildings. Circulation meshes spaced at 80-110m were optimum for both pedestrian and vehicular needs, while fine-meshed (50-70m) are optimum for pedestrian (Siksna 1997, pp. 29-30).

Moudon (1986) and Anderson (1993) conducted somewhat similar analyses on the effect of block sizes and derived similar outcomes to Siskna's study. These more detailed studies revealed that the geometric characteristic of urban blocks influenced the nature of activities they hosted. Anderson (1993 p. 112-114) study of Savannah, USA in particular, highlighted the importance of certain plot typologies for retail. Anderson argued that layout geometry was a factor in the topological advantages pf the layout, as blocks situated in well-exposed locations facilitated interactions. Therefore, the location of the commercial district within Savannah inevitably ended up being situated along 'Broughton Street', due to the double loaded condition of the street's frontages. Moudon (1986) in her study showed that the historical evolution of downtown San Francisco was influenced sizes of its city blocks, which dictated the nature of buildings and parcels that ended up within them.

Researchers who view cities as complex systems have also been exploring ways to incorporate Conzen's tradition into their models (Larkham 2006; Stanilov 2010; Yu and Akkelies 2014).
Larkham (2006) and Whitehand (2010) suggest that there are potential complementarities between Conzen's morphological ethos and the network analysis tradition, which thus presents opportunities for research collaborations within these two fields. Researchers have therefore devised innovative approaches to studying urban morphology. For example, Griffiths et al. (2010)

suggested a collaborative approach, noting that Space Syntax's analysis of accessibility of urban road network systems can supplement the analysis of the Conzenian 'street plan'. Griffiths et al. also argued, that analysis conducted with Space Syntax can also be interpreted with historical impetus by infusing morphological data, which would thereby make Space Syntax research more socio-spatially meaningful. In this light, Yu and Akkelies (2014) explore Conzen's physical elements of urban form but use qualitative morphological studies with Space Syntax. Their proposed method was purely quantitative; with *space syntax, spacematrix,* and *mixed-use index (MXI)* used to assess street-network integration, building density, and land-use mixture. Yu and Akkelies, therefore, miss the point of integrating morphological elements into Space Syntax, as their approach ignores the qualitative that morphological studies introduce. Their method is a weighted measure of accessibility discussed earlier like Sevtsuk's (2012) UNA and Porta et al.'s (2008) MCA with Kernel Density Estimation.

The principal value of the morphological tradition is its ability to capture the relationships between physical elements of urban form with subjective notions. The resulting studies from this endeavour - as detailed above - have been exclusively applied to retail land-uses within the built form, and do not take account of informal retail activities on streets. Morphological studies are most useful for local-scale assessments and have no value in reading space at the city scale assessments. There is a lot to gain from using a morphological dimension for the study of the spatiality of the urban street economy. Moreover, it allows for a qualitative approach to capture nuances at the local scale missing from the accessibility and connectivity studies. Therefore, this research will incorporate the morphological tradition to study the compositional characteristics of STs workplaces.

3.3.5 Codified City Discussions

In summary, research classified within the codified city employ measures of 1) centrality, 2) street network connectivity, and 3) morphology as means to understand how the built-form properties of cities influence the human experience of space.

The ethos of the retail-city (Section 3.2) is explored by urban researchers within the codified-city (as discussed in this Section 3.3), by coding complex systems as graphs to model patterns of centralities within networks. Spatial-separation measures are also important because they engage with a broad range of research interests important to urban designers. Also, since they can be operationalised on minimal amounts of data, they, therefore, suit the research of SBEs in LIC cities. In literature, spatial-separation measures have been shown to accurately measure urban form relative to different aspects of spatiality in cities (Zhang et al. 2015). While centrality metrics capture more configurational complexities, street network connectivity measures are more simplistic and are only able to capture geometric properties of the urban form.

Street network connectivity metrics have found currency in cities with grid-like layouts patterns and can be easily 'gamed' in more complex layouts. There are several possible ways of assessing connectivity, and yet there is no consensus to which is the most accurate, and limited discussion as to the relative merits of each (Stangl and Guinn 2011). Therefore, a significant challenge for this research will be to explore which measures of connectivity best capture ST activities.

Morphological studies frame the study of cities within a suite of principles on specific aspects of urban form to be assessed, instead of providing any particular set of metrics. This flexibility opens up an opportunity to choose from a broad palette of tools as a means to reveal more subjective readings of urban form. Since there is no exact prescription of tools, the morphological doctrine provides a template which allows the incorporation of other types of methods to produce suitable readings of built form. As it has been suggested in literature earlier, aspects of accessibility and connectivity studies will be incorporated to buttress morphological findings.

Morphological studies will serve as the framework for local scale assessments.

The codified city as depicted provides a partial basis to understand the distribution of SBEs within cities; even though the ethos of the scholarship is mostly underpinned by metrics which describe the configurational and compositional location of an entity within the built environment.

3.4 Locations in the Urban Street Economy - Conclusion

The literature review in this chapter has identified three factors which are central to the investigation of STs' workplace locations: geographic inequalities at locations; the spatial patterns of the network of routes, and the cognitive capacities of individuals. These factors were explored through the retail and codified cities as the theoretical bases for examining alternative methods of assessing STs' spatialities within LIC cities - which this research seeks to achieve.

The existence of an interface that enables spatial interaction via its 'centrality' is the underlying assumption which frames this chapter, and this is based on the belief that SBEs workplace locations are determined by a need to have access to as many customers as possible by virtue of their locations. Most customers who patronise STs can be classed as apathetic shoppers, because they minimise the amount of time spent shopping by incorporating their engagements with STs within multi-purpose journeys - shopping from/using STs services being secondary functions of these journeys. Therefore, the location of STs' activities are influenced by the location of their customers.

To link customer behaviours and STs' activities, a parameter to measure the routes city inhabitants navigate through is required. In route choice literature, the least complicated route to navigate through (Angular geodesic), is defined to influence wayfinding for those unfamiliar with the location of their destination. While the route which requires the least effort (Euclidean geodesic), is what defines the route of people familiar with their destinations. To model these patterns of interactions in cities, centrality indices are measured applying metaphorical simplifications of real-world places and pathways - as graphs. Due to the peculiarities of LIC cities, a graph convention which requires minimal data input is the most suitable method of analysis, and sDNA as a spatial analysis tool was identified to fulfil this criterion. However, route choices are subjective, and therefore uneasy to determine for a large population - as required for this research. This subjectivity has created uncertainties on which of 'Angular geodesics' or 'euclidean geodesic' parameters is best suited to study travellers journeys at the city scale. In the case of this research, both metrics will have to be tested against the actual locations of STs for inferences to be made.

Even though normative, the retail city thesis pedagogically describes how the inequalities of supply and demand between STs and customers in space are determinant factors in location choices. However, the level of resolution of the retail city (macro-level) is not adequate as a basis to understand SBEs locations for urban design and management purposes; and to supplement this shortcoming the codified city was explored. The codified city explores intricacies of how cities as complex systems are structured by taking account of the structure of the spatial networks created by urban form. The combination of these perspectives will provide a theoretical base to create an innovative method of inquiry - as outlined next in Chapter 4.

4 Research Methodology, Data Collection and Analysis

4.1 Introduction

This chapter provides an overview of the research design for this thesis. The discussion in Chapter 2 examined the consequences of urban spatial governance policies for STs and the problems of integrating SBEs within urban areas in LIC cities. The literature highlighted dynamics between informality and the socio-political economy - a perspective that was discovered to be inadequate to frame the complexities and intricacies to inform effective spatial governance through urban design. The adoption of alternative evidence-based perspectives was thus vital to address the challenges SBEs face in LIC cities (Meagher and Yunusa 1996; Charmes 2006). The complex nature of STs' activities has however made the actualisation of these alternative means problematic to urban researchers, as methodological shortcomings often result in ineffectual bases to draw useful inferences (Charmes 1998). Bearing in mind these difficulties, Chapter 3 explored the ethos of geographical centrality and thus provided a theoretical basis to develop an alternative perspective on STs spatialities. The insights from Chapters 2 and 3 chapters informed the formulation of a new application for network analysis to study SBEs, termed as ***Spatial Design Network Analysis for Street-Based Enterprise Locations*** (sDNA-sBEL). Appraisals conducted with sDNA-sBEL incorporate accessibility distribution metrics, morphological variables, and sociological variables. The combinations of these paradigms uncover context-specific details of STs workplace locations to bridge gaps in knowledge on their spatiality, and thus, provides evidence to inform spatial governance in LICs.

The crux of this chapter is three-fold; 1) to detail the development of sDNA-sBEL, and 2) to explain the processes of conducting spatial appraisals using sDNA-sBEL, and 3) to explain other research parameters which guide this thesis. The documentation of 1), 2), and 3) ensures that sDNA-sBEL is accessible and replicable (De Vaus 2001; Yin 2013). To minimise ambiguities in the structure and theoretical underpinnings in the documentation process, elements of inquiry adapted from Crotty (1998), Cresswell (2012), and Bryman (2008) are used to structure this chapter's narrative. Section 4.2 presents the philosophical basis for this research. Section 4.3 discusses the theoretical perspectives which frame vital concepts, theories, and models to provide an analytical direction for the research. Section 4.4 discusses the methodology used in this research, detailing the research strategy, techniques, and processes - which systematically inform the choice of data and the methods of data collection. Section 4.5 explains the research methodology, data acquisition procedures and challenges faced. In Section 4.6 the procedure for data establishment is detailed. In Section 4.7 ethical considerations for the methodology are discussed. The chapter is summarised in Section 4.8.

4.2 Research Approach

This section brings together relevant knowledge from the literature review. An excerpt from Lefebvre's (1996, p. 103) writings on cities, where he highlights the risks of distinguishing between 'social reality' and material morphologies, serves as the inspiration for this research's approach. Lefebvre's statement is understood to mean that rather than viewing the knowledge claims of the preceding paradigms dialectically, they should be seen from a perspective that examines them relatively.

Spatio-economic theorisation - explored mainly in Chapter 3 - is associated with positivism (Cresswell 2012), because it invokes the manipulation of reality in the identification of regularities and relationships between the constituent elements of the social world (Mill 2005). For the positivists, reality is only observable from a neutral and objective viewpoint (Guba and Lincoln 1994). Therefore, studies with sociological undertones consider the positivist ethos to be controversial, as it is unable to capture human agency and other social dimensions of urban life (Harvey 1969b; Lincoln et al. 2011). Positivism is however useful in identifying correlations and causalities of spatiality as seen in research conducted based on the seminal Space Syntax Theory (Hillier and Hanson 1984) - although some commentators argue against classifying Space Syntax in this light (see: Netto 2016).

In contrast to positivists, the constructivists/interpretivists contend that reality can only be fully understood through subjective interpretations and interventions (see arguments in Section 3.4), meaning that agency plays a vital role in studying a phenomenon (Lincoln et al. 2011). Constructivism is a socially constructed knowledge claim, developed as a subjective reading of reality (Creswell 2013). This approach places emphasis on the diversity of interpretations of knowledge, as it regards truth as being constructed by 'objectivities, realities, and perceptions of the world' (Lincoln et al. 2011). Therefore, research with sociological undertones favours a similar theoretical perspective, as evidenced through research on STs, which tends to be based on this paradigm - along with the *'advocacy/participatory/emancipatory'* knowledge perspective. Within this latter paradigmatic suite, critical reflections on social justice and political undertones are a central basis for inquiry, as the subjects being studied are given a voice and participate in reaching outcomes (Creswell 2013).

However, these different paradigms are never as clearly differentiated when conducting research (Johnson and Onwuegbuzie 2004), and a logical research synthesis tends to fit into any of these inclinations without being excluded from the others. Therefore, advocacy for an approach which suits a researcher's objectives has gained currency (Tashakkori and Teddlie 2003; Johnson and Onwuegbuzie 2004), and so this research adopts a 'pragmatist' philosophical stance, in line with this school of thought.

Consequently, the development of the research in this thesis is underpinned by insights drawn from different research fields, and an interdisciplinary perspective is appropriate to meet the research aim (Porter et al. 2006). An interdisciplinary approach eschews adopting a single philosophical paradigm – as suggested by pragmatists, although such a pragmatist approach may create a basis for epistemic and ontological frictions. Therefore, to counter such concerns, an unbiased standpoint relative to the research objectives serves as a point of convergence. Concerning practical applications, Yin (2013) expressed the dangers of equating the design of a research framework for any particular research method. Lin (1998) also commented on the possibility for research to include elements from different paradigms - a caveat being the need for proper management by the researcher. Lin's argument relates to Denzin's (1970) ideas on 'triangulation'. However, Denzin's conception was extended beyond conventional associations as the combination of methodologies, data, and theoretical inclinations in the study of the same phenomenon. Triangulation in this sense is operationalised by generating and analysing data within a pragmatist paradigm, depicting a mixed-method of conducting research (Johnson and Onwuegbuzie 2004; Denscombe 2014); as the outcome consists of multiple layers that can be tested for inconsistencies, convergences, or contradictions (Charman et al. 2015). Although most contemporary research on STs is situated either within a constructivist or an emancipatory[81] paradigm, this has been pursued without much thought about the potential that can be achieved by incorporating a different stance. Similarly, recent scholarship on retail location analysis tends to apply a (post)positivist paradigm (Creswell 2013).

This thesis seeks to avoid constructing the hegemonic limitations associated with the exclusive use of one stance, and therefore it employs a pragmatist approach as its philosophical underpinning.

4.3 Theoretical Perspective

This section's narrative searches for the most suitable theoretical perspective to match the peculiarities of this research. In contemporary research, IE spatiality is often discussed based on a generalised but restrictive set of causative variables and indicators, such as economic development indices, socio-demographic profiles, and economic specialisation factors amongst others. Such indices emphasise the effects of socio-economic processes but fail to frame the complexities and intricacies required from urban-design, management, and planning perspectives, making it challenging to unbundle the context-specific spatial details that influence STs locational choices. To resolve this methodological shortcoming, indices that are more spatially sensitive are required. As a response, principles emanating from spatio-economic theories are used to supplement the empirical assessments of STs' workplace locations.

Theoretically, the long tradition of Location Theory[82] set the tone for analyses that sought to associate locations with the level of economic activities they support (Chan 2011). Early normative location theories and models hypothetically deduced that well-connected central locations (centrality) increase the potential for interactions between people across a wide spectrum of space. Centrality was also used as a basis to explain how cities evolved as a means of informing future developments. Central locations thus possess spatial attributes in which both

[81] In critical theory, the emancipatory paradigm concerns itself with producing knowledge that can be of benefit to the marginalised and oppressed.
[82] Explored in Section 3.2 as the Retail City theories.

formal and informal economic activities thrive, and this assumption is the theoretical tenet that guides the exploration of STs spatialities for this research. Researchers studying periodic market locations in the global South also applied the concepts of centrality, range and threshold to understand spatial distribution. Contemporary studies concerned with activity distributions in relation to the structure of the built environment, have advanced the principles of location theory and incorporated elements of complex systems theory (Watts and Strogatz 1998; Wilson 2000), social network analysis (Bavelas 1950; Shimbel 1953; Freeman 1978; Portugali 1999) and graph theory (Garrison 1960; Kansky 1963; Huff 1964). Street network connectivity and morphological studies also provide valuable insight into the built form structures of urban environments.

This research found it expedient to work with road centre lines (the link-node convention) (ISO 2011) to study centrality, as a reflection of the structural properties of urban transport networks. The standard street network codification underpins the sDNA methodology, and thus allows the study of the structure of a transport network. Moreover, sDNA analysis can be conducted without origin/destination weighting - which makes the modelling data-light - and therefore much more manageable than in conventional transport network analysis. Cooper and Chiaradia (2015, p. 2) highlight how this modelling convention was the approach employed by Haggett and Chorley (1969) and Kansky (1963). Thus, sDNA's methodological underpinnings allow for the conduct of accessibility distribution analysis using standardised cartographic representations. Such codification of the urban structure measures accessibility relative to street network configurations but have been criticised for not capturing other dynamics of the built form of cities (Yu and Akkelies 2014).

To avoid the 'spatial networks' being overtly deterministic in the analysis of STs spatialities, and to address one of the research questions about what other spatial factors influence STs locations, this thesis explored and developed other parameters of urban form which are incorporated into sDNA-sBEL. The theoretical basis for these additional indicators of urban form is the morphological and urban design traditions (see Chapter 3.3.4), which posit that there are three fundamental physical elements of the urban form: the ground plan, the building fabric, and the land and building use (Conzen 1960; Moudon 1997; Whitehand 2001).

In this research, the assessment of the ground plan (streets, plots, and block configurations) is done using sDNA's centrality metrics. The effect of the built fabric (the 3-dimensional physical form of buildings) and land use on ST locations is approached from a more qualitative perspective - through observations of street trading locations, and standard social science interviews - to provide a better understanding of urban form. Consequently, the research combines these quantitative and qualitative expressions to articulate spatial properties of transport networks, while also considering other aspects of urban form - as advocated by proponents of qualitative GIS (Cope and Elwood 2009).

4.4 Research Design

To prescribe the method of data collection for this research a case study approach was the most appropriate strategy. According to Bryman (2012) and De Vaus (2001), using a case study provides a means to articulate and undertake in-depth analyses of complex multivariate conditions, because of its flexibility of its design - with the use of different methods for both data collection and analyses. Punch (2013) also describes how a case study's research framework allows for 'supplementing and filling-in' of gaps in existing knowledge, and for the actualisation of new knowledge in areas of research which previously had limited understanding.

The application of a case study approach is consistent with past research scholarship on the spatialities of ST activities (see: Mochache 1990; Bromley 1998; Yankson 2000; Swanson 2007; Bromley and Mackie 2009; de Pádua Carrieri and Murta 2011; Onyebueke 2013). In the developing world, researchers often have to rely on primary data, as the availability of reliable sources of secondary data are rare; and in situations where data is available, format incompatibilities for specific purposes are common. A case study framework eases the process of data collection, potentially enhancing the accuracy of research projects, as the insights garnered from the flexibility of data sources can be triangulated to achieve credible and unbiased outcomes. The procedure of triangulation essentially captures the tenets of this research - with the use of quantitative techniques (multi-scale analysis) overlaid with qualitative outcomes - to observe for correlations between multiple data types to generate probable inferences.

Yin (2003), a leading authority in case study research, described the process of case study research as onerous, partly due to a lack of generalised and definitive rules that determine its use. Since there are no definitive guidelines, a variety of methods can be used which incorporate both positivist and interpretivist philosophies. Furthermore, a case study design conveniently integrates a broad scope of investigations from interdisciplinary perspectives, as it facilitates the use of various methods to grasp the subject under investigation as noted by Denscombe (2014). According to Stake (1995) adopting an approach to include several case studies offers a simultaneous means to assess multiple instances of a subject of concern, thus framing a comprehensive appreciation of its associated issues. Therefore, a collective approach underpins the case study method for this research; as the comparisons amongst cases will provide insights into the dynamics and factors that influence STs locational decisions at the city level.

Critics of the application of a case study method argue its inability to fulfil the specific criteria used as the yardstick for excellence in social research, as described in (Zeisel 1981) and (Denscombe 2014). De Vaus (2001) also identified its inability to provide "external validity", i.e. the extent to which results generated from a single or few cases can be generalised. However, this notion of validation is counter-questioned by other commentators like Zeisel (1981) and (Punch 2013), who argued that this short-coming can be controlled by the manner within which the research being undertaken is designed (Denscombe 2014). As an example of such remediation in case study design is in the definition of a case being studied as being representative, with the objective to capture the circumstances and conditions of typical situations that epitomise a broader category of cases (Yin 2013). Hence, the case study approach suits the requirements of this thesis.

For this research, the overall case study was Lagos State, with eight detailed small-area case studies of locations where agglomeration of street trading occur. These detailed case studies allow for contextual and compositional readings of STs' spatiality in diverse locations, to reveal how different street network configurations and compositions influence street trading. The selection of case studies is described in Section 4.5.2.

4.5 Research Methodology

To unbundle STs' spatialities, the theoretical framework adopted allows for the joint representation of multiple knowledge perspectives. To achieve this, sDNA's[83] methodological underpinnings are applied innovatively with additional morphological attribute considerations, to complement the conduct of spatial analysis. This new development and application of sDNA for this thesis, is called 'Spatial Design Network Analysis for Street-Based Enterprise Locations' (sDNA-sBEL). The sDNA-sBEL's methodology operates at two interdependent spatial scales of inquiry: 1) the city, and 2) the local scale. The first accounts for macro-scale assessments, and the second meso- and micro- scale analyses. This section first outlines how sDNA-sBEL's assessments are conceived and operationalised at these scales, the indices used are then discussed, and finally, the data requirements are detailed. Even though the method used in this research might seem complicated, the detailed walk-through provided by this chapter should provide the necessary guidance for its implementation.

Throughout this research, the objective was to minimise data and modelling costs, and actualising this required a lot of experimentation. Cost mitigation is a crucial factor that had to be addressed early on. This was because the costs of acquiring GIS software and data-sets are prohibitive, and this cost barrier would limit the applicability of the sDNA-sBEL methodology in LICs. The mitigate costs, sDNA-sBEL was operationalised using Open-Source data and Freeware applications. This therefore means that the use of Open-Source data and Freeware applications is an important philosophical approach of the thesis, and their use should allow for this research's method to be applied with limited budgets by developing country researchers or advocacy groups supporting STs.

4.5.1 City Scale Assessment

In sDNA-sBEL, city scale assessments are conducted as the first spatial scales of inquiry. The city scale assessments study the macro-scale influence of the structure of the transport network on the formation of '***ST hotspots'***. A ST Hotspot is a concentration of STs at a location[84], and the ST hotspots identified at the city scale are potential detailed case study sites. The assessments are

[83] The simplicity and adaptability of sDNA's to suit the analytical requirements for this research influenced our choice (see Chapter 3.3 for more).
[84] ST hotspot can be thought of as Natural Markets (see Section 2.3.4, for more on Natural Markets).

informed by the relationships between travellers' routes and modal choices - as facilitated by the design and layout of the transport network - relative to ST hotspot locations. The macro-level assessment for this research which is based on centrality analysis of the road network in Lagos state, is detailed in Chapter 6.

For sDNA-sBEL, 'route choice' is assessed to depict how the impedance cost associated with a traveller's trip influences their mobility, and this is premised on the agency of a traveller to make a choice on the route for a journey, based on the most efficient route (see Section 3.4). Such strategies are predicted by navigational preferences which correlate with the quickest (time) or simplest geodesic distances (Hillier and Iida 2005; Turner 2007) - bearing in mind that the incompleteness of information about traffic situations is a significant influence. Within sDNAsBEL, all categories of travellers making utilitarian journeys are assumed to choose routes which offer the least cost and effort - defined by either temporal or remoteness measurement parameters. From this, it can be assumed that the general mobility patterns of the urban populace coincide with routes that have the highest volume of traffic (betweenness) because this represents an aggregation of numerous individual trips. In Section 3.3.1, it was noted that travellers familiar with the route to a particular destination tend to follow Euclidean geodesics (minimising the number of metres travelled along the network), while those unfamiliar would follow Angular geodesics (minimising the cumulative angle turned along each route, minimising complexity) (Hillier and Iida 2005; Montello and Sas 2006; Cooper 2015).

As the knowledge of opportunity landscapes allows STs to maximise market exposure, it can be assumed that ST hotspots are formed along routes which facilitate the least journey costs for their potential customers, because these are the routes most frequently used. This assumption means that finding a way to measure the busiest parts of the transport network should be an integral component of the city scale assessment of sDNA-sBEL. The routes in a network with the highest traffic flows are defined empirically with the aid of the ***betweenness*** analyses (see Section 3.3.2) - which measures the number of shortest paths going through a particular link (the flow potential based on the computation of closeness). Betweenness analyses are therefore employed to study travellers' route choices. There are different metrics of betweenness, and due to the variety of route choice preferences (shortest and/or most direct) (Zhang et al. 2015), Euclidean or Angular metrics are both applied to identify their relationship and define which best suits this research.

This research assumes that patronising STs is a secondary function of utilitarian trips[85], and city residents' interactions (as apathetic shoppers – see Section 3.3.1) with STs will differ relative to the transport mode being used. This difference is due to the range of distances different modes bestow a customer to make decisions about whether to buy from STs (Stine 1962; Dewar 1990). For example, at the macro-urban scale, travellers in vehicles have more possible points of interaction with STs in comparison to pedestrians - due to the more efficient distance to time ratio. Pedestrians, conversely have much smaller distance ranges to make interactions with STs, resulting in a different opportunity dynamic. However, in some scenarios, the transfer cost for pedestrians are less - as there is no extra effort expended in boarding/alighting from vehicles to shop from STs (in situations where there are no itinerant STs available).

The implication is that STs' strategies probably differs in relation to customer demand density, the transport modes being used, and at different locations and spatial scales. Thus, differentiating between transport modes and their influences on choices of STs' location - even though complex - is important, because ST strategies probably do not focus exclusively on a single mode. As accessibility distribution is determined in part by the mode of transport, a multi-scale approach is taken in this research[86]. The multi-scale analysis will help disentangle how travellers' modal choices create different forms of accessibility distribution within the transport network, and thus allow for an evaluation of STs' rationale to service a particular mode of transport. Journey staging further complicates these dynamics, because travellers may combine different transport modes into a single trip. To simplify such concerns, a reference to macro-scale accessibility within the multi-scale model in this research for example, does not mean the trip is conducted exclusively in a vehicle, but rather that the distance travelled is most suitable for cars and would likely include other modes of transport.

[85] In Lagos 77.7% of trips are for commuting to work (Osoba 2015).

[86] We acknowledge that STs capitalise on their inherent temporalities which affords them the flexibility to adjust their locational decisions and service delivery momentarily to suit variations associated with these modes of transportation.

Lastly, because STs operate as either dispersed autonomous entities or as collectives concentrated in specific locations, defining these differentiations is necessary to study the dynamics of their spatialities. At the city scale, a grouping of STs is conceptualised as a ***ST hotspot*** - a term to express the agglomeration of STs. ST hotspots act as SBE 'hubs', and the many places where they occur across the city creates polycentric centres of informal economic activities. Identification of prolific ST hotspots is an important task, as this will enable the research to match ST hotspot locations with the multi-scale betweenness (betweenness at different radii) of the transport network.

Multi-scale betweenness analyses with sDNA disaggregates street networks, and is conducted based on a 'link' convention. A link is a street section between two junctions, or between a junction and a dead end. A street will often be made of several links. In the sDNA-sBEL analysis, ST hotspots were matched with a street link(s) where they are located, instead of considering the whole street. Multi-scale betweenness attributes of the link(s) which host ST hotspots were then analysed to establish possible patterns.

Data required to operationalise sDNA-sBEL's multi-scale assessments at the macro-scale are:

i. Geographic locations of ST hotspots, as indicators of locations that are prolific in hosting STs across a city.
ii. Road network centre-lines that satisfy the requirements of GIS-based computer programs to build a transport network model (Cooper 2016).
iii. Travel distance profiles by modes of transport, as this serves to select the catchment distances to run the betweenness analyses.

The methods to acquire these data are discussed in Section 4.6.

4.5.2 Local Scale Assessments

In addition to the City scale assessment, local scale assessments were conducted at the second level of spatial inquiry. The local scale assessments provide a disaggregated and contextual analysis of how the accessibility distribution and configuration of ST hotspots' host locations, influence the intensities of STs within them. By focusing on the compositional spatial attributes of street networks, the research question which sought to identify other potential spatial factors of urban form configuration in determining the locational patterns of STs is addressed. To undertake these assessments, a basis for measuring the scales at which STs individually and collectively interact with space was required, together with indices representing the morphology of spaces where STs operate. The indices within sDNA-sBEL which address these concerns are detailed in the following sub-sections, and these inform the meso- and micro-scale assessments in Chapter 7 which are based on detailed case studies of eight ST hotspots.

Study Area Boundary Establishment

In sDNA-sBEL, data capture at the local scale is established by taking account of the distribution of **ST events** relative to the street network within a detailed case study site - as a market catchment area. A '***ST event***' is defined as a unit of a ST, as monitored relative to their geolocation within the road network. The market catchment area of a ST Hotspot is also known as the 'core trading area' in this research (a concept which borrows from range and thresholds in Section 3.2.1). A core trading area connotes the critical range of distances people (are willing to) cover to access goods and services. The assumption is that STs operate to fill in gaps created by customer demand density within the boundary of a core trading area. A core trading area, also represents the geographical extent of a ST hotspot, as STs will cease to operate much beyond its boundary. Its determination therefore underpins the assessment of STs at local scales, and provides the contextual impetus for further assessments. Figure 4-1 is an illustration of a core trading area of a ST hotspot.

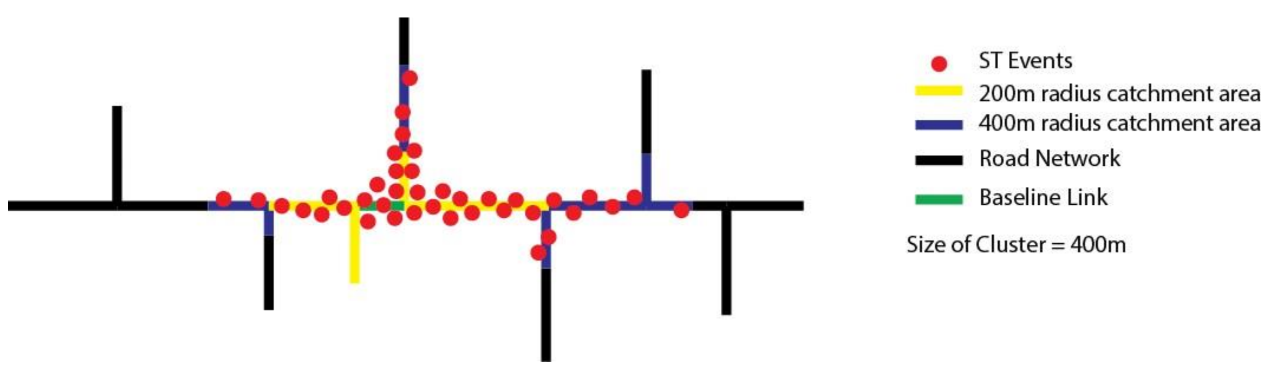


Figure 4-1: A ST Hotspot Core Trading Area, with catchment areas measured as an Iso-distance.

To establish a core trading area for this research, critical distances that represent how STs are distributed are required. These distances will be determined by observing an apparent 'decay' of ST events as it differ relative to context. The '***size of cluster***' represents the furthest (iso)distance measured along transport networks at which STs operations cease to exist relative to a baseline[87] location of an associated ST hotspot (the green link is the baseline link in Figure 4-1). The size of cluster is the assumed effect of separation on entities from favourable conditions which had initially facilitated their existence (a gravitational effect type representation), and should correlate with the distance people are willing to cover to patronise STs within their localities. The size of cluster for individual case studies is determined by using data generated from field surveys, where STs distributions disaggregated as ST events are monitored relative to their positions within the road network. At the identification of the cluster size, the boundaries of Core Trading Areas' are defined for each case study.

Physicality of Local Space

As mentioned earlier, the street network data in sDNA-sBEL is encoded within a link convention from sDNA. Due to the disaggregated nature of the network, properties of streets are analysed both individually and collectively. On-site observations on the morphology of space which the links represent was conducted for the individual analysis of street components. For the collective analysis, *Link Ratio, Junction Ratio, Compactness Index,* and *connectivity* metrics were used. These parameters are explained in more details below.

- Disaggregate Street Network Metrics

For the detailed case studies, network characteristics are assessed based on the morphological attributes of street network links. ST events are observed during the field study to provide additional layers of contextual information. Building on classic urban design principles, the detailed case studies examine the relationship between composition of a street's component and the built environment. In particular, the interface and physical boundaries between streets and

[87] A network link - segment of a street - as identified by key stakeholders, as the location with the highest intensity of STs at case studies

buildings are studied in detail to capture spatiality alternatively to the exclusive use of network analysis. Thus, qualitative research methods are employed to achieve this level of analysis.

Since land uses, urban block structure and betweenness (signifying the potential flow on networks) are assumed to have a relationship, it is also assumed that the locational choices of STs seek to capitalise on the dynamics of this relationship. As the morphologies of urban areas are defined by their block sizes and structures (i.e. the alignment of the building/property line and distance between intersecting roads), the activities on networks between blocks are also influenced by block structures. The effect is that urban blocks with smaller footprints provide better micro-scale permeability, and larger urban blocks are more conducive for meso-macro scale of accessibility (Siksna 1990,1997). Small blocks increase pedestrian accessibility, which influences the vitality of activities on adjoining streets. Conversely, larger blocks discourage pedestrian activity. Additionally, the urban block structure - its two-dimensional form and threedimensional form - define the physical space in which STs operate. Urban block interfaces which are generated by block positions and orientations, provide the backdrop for STs' operations and facilities.

The land uses within urban blocks are also assumed to influence the level of activities on adjacent streets, as well as the function of where and how transport infrastructure is provided. Land uses which generate significant activity, such as bus stations or hospitals typically attract STs. The influence of these attractions may also have a temporal dimension (they may be busier at different times of day), and so should be differentiated on such basis. Thus, different activities sustain pedestrian vitality over different durations - which influences the times and locations at which STs operate.

- Core Trading Area Aggregate Street Network Metrics

Understanding the local level structure within the core trading area of a ST hotspot is vital to address the research question on whether there are other explanatory spatial factors of urban form which overlay accessibility that affect the locational patterns of SBEs. In this section, metrics that capture this concern are investigated.

Local level permeability within the core trading area of a ST hotspot might be relevant to their activities, so the purpose of this section is to enable this research to capture these dynamics. Although sDNA (used for betweenness analysis) provides several measures which can capture the properties of links within a given radius of a street network, the aim here is to explore network constituents from a compositional rather than a configurational perspective. The key difference being that compositional property of a network is a reflection of the quantity and quality of the constituents, and configurational properties reflect the design component of a network. Therefore, the aggregate features are a reflection of how the difference in composition might affect the difference in configuration (design). This is because configurational outcomes compound both composition and configuration - so having some control over composition allows designers to have a better understanding of configurational variables.

This section details the street network metrics used to study the physicality of local space within ST hotspots. Various metrics can be drawn on from urban design literature to characterise the physical properties of urban form and how they influence spatial agencies of people[88] (Dill 2004; Knight and Marshall 2015). Due to the peculiarity of this research, a tailored suite of metrics is proposed to complement the standard metrics available in sDNA (Cooper 2016) and street network connectivity literature (Cervero and Kockelman 1997; Dill 2004; Tal and Handy 2012; Knight and Marshall 2015).

An important criterion in developing these metrics was instead of delineating the boundary area based on a standardised per unit of area of a measurement, e.g. square kilometre, the networks components contained within STs' core trading areas for detailed case studies were used. These metrics should reveal how the difference in the composition of an area might affect its configuration (design). The metrics detailed below (**Link Ratio, Junction Ratio, Compactness Index and Connectivity**) were used to determine whether (and how) the characteristics they represent about street networks, influence STs distributions within sDNA-sBEL.

Link Ratio

[88] Walkability is the concern as the analyses are being conducted at local scales.

Link ratio is the average link length within a catchment area, it is envisaged to reflect street-block interface contiguity. As a spatial metric, it questions whether STs trade along linear sections of streets - does the existence of multiple cross streets which break the linearity of street networks reduce the ability of STs to congregate. Therefore, it is a proxy for reading the interfaces and spaces that contain STs' workspaces without interference from network intersections. Link ratio is premised on the underlying assumption that STs will trade along block boundaries which provide them with sufficient access to customers, provided that ownership and occupancy rights allow, or do not obstruct, trading.

Link ratio is calculated as a ratio of the total network length of the core trading area under investigation, to the number links within its boundary. The programming of this parameter describes the street morphology in a 2-dimensional plane, and therefore it is assumed to be suited best for assessing STs whose locational decisions are determined by the availability of a site or space that can host trading facilities. Appropriate space can in turns give occupants a degree of permanence.

$$\text{Link Ratio} = \frac{\text{Core Trading Area's Network Length}}{\text{Number of Links}}$$

Junction Ratio

Junction ratio is programmed to provide an insight into the texture of the spatial grain of STs core trading areas. It is used because according to Ewing and Cervero (2010), a high frequency of junctions within transport networks correlate with the occurrence of small city blocks. A characteristic of small blocks is increased pedestrian activities and vitality in the urban scene (Jacobs 1961). Such vitality facilitates interactions between users of space, thus potentially creating spaces that encourage the formation of ST hotspots. Junction ratio is calculated as a ratio of the total network length of roads within a ST hotspots core trading area, and the number of junctions within its boundary. Its inclusion as an index is suited to understanding the location decision of both itinerant and sedentary STs and their engagements with the grain of urban blocks.

$$\text{Junction Ratio} = \frac{\text{Core Trading Area's Network Length}}{\text{Number of Junctions}}$$

Compactness index

Compactness index is developed to investigate the efficiency of the network's components within a core trading area - as a reflection of block composition. Compactness can foster efficient access to localities because of spatial proximities, but is dependent on the different configurations within an area. A *convex hull*[89] defines the shape of a core trading area, and compactness is calculated as a ratio of the convex hull's area to the core trading area's network length.

$$\text{Compactness Index} = \frac{\text{Convex Hull of Core Trading Area}}{\text{Core Trading Area's Network Length}}$$

Connectivity

Connectivity is a standard measure, and unlike the preceding measures it was not developed specifically for sDNA-sBEL. Connectivity is used because busy road intersections are often claimed to be the most suitable places for monitoring the influence of spatial accessibility on ST activities (Dewar and Watson 1990; Bromley 2000; Monnet et al. 2007). Therefore, to ascertain the veracity of this notion, '*degree centrality'* - a metric employed in accessibility studies to analyse the dynamics of incident connections to a junction within a network - is explored. *'Line connectivity'* defines *'degree centrality'* within sDNA. In Chapter 3.2.2, it was noted that degree centrality is considered a simple measure (Handy and Niemeier 1997; Kwan 1998), which suggests that it would not provide a useful basis to study the nature of road intersections in relation to STs. This reservation is acknowledged in this research, but it does not remove the need to be aware of the effect of connectivity, and its viability in studying STs' workplaces.

Summary of Local Scale Assessments

[89] The convex hull is a polygonal shape whose shape is derived from by connecting all endpoints of links that define the extent of the Core Trading Area.

In developing the local scale assessment components of sDNA-sBEL, the aim was to outline a set of objective metrics which reflect the possible factors that influence SBEs locational decisions relative to the configuration of the built environment, to contextualise ST spatialities. The metrics outlined were derived to indicate the structure of the built environment within market catchment areas, and are compared across the eight detailed case study areas to ascertain how the disparities between case studies reflect on SBEs distributions and the frequency/intensity of STs' activities. These indices served to guide the nature of data required for the analyses, and the methods to acquire the data to operationalise the analyses are discussed in Section 4.6

4.5.3 sDNA-sBEL: Methodology Overview

sDNA-sBEL is operationalised at two scales to unbundle the relationships between STs and the configuration of the built environment (see Figure 4.2).

For sDNA-sBEL assessments on the city scale,

1. Multi-scale betweenness of the transport network was conducted to relate the transport network's flow potential to different travellers' modal choices. The focus was to identify areas that had high betweenness flow potential for various scales.

2. The locations of prolific ST hotspots, identified from mapped analysis of ST hotspots are overlaid with the outcome from multi-scale betweenness, to identify possible relationships.
    a. First the multi-scale betweenness flow potential of all mapped links are profiled according to macro-, meso- and micro-radii. The macro-scale radii focus on long distance travellers, meso-scale radii on mid-range travellers and micro-scale radii on small-range travellers (all assumed to reflect motorised to pedestrians' journeys).
    b. The different betweenness profiles of the macro-, meso- and micro-radii are then matched with ST hotspots.

3. The overlay analysis was used to select a series of detailed case studies (8 ST hotspots were chosen).

For the local scale analysis in sDNA-sBEL, detailed case study assessments were conducted to identify the compositional characteristics of the area around them. A selection criterion based on geographical distribution was deduced to make selections of ST hotspots in different parts of the city as detailed case studies. The selection was achieved by segmenting the city into sectors along cardinal axes and choosing ST hotspots within each sector - based on a combination of subjective perceptions of the knowledge of STs' activities at these locations and multi-scale betweenness levels. The perceptions of locations which are prolific in accommodating STs in the city are derived from key informants and stakeholders.

The composition of the localities which define the core trading areas of the detailed case studies are then assessed, using both quantitative (link ratio, junction ratio, compactness index and connectivity) and qualitative (observations of morphological attributes of space and interviews with several classes of stakeholders) means of assessments. More detail is discussed later in Chapters 6 and 7. Figure 4.2 below outlines a schematic diagram of the sDNA-sBEL methodology used in this research.

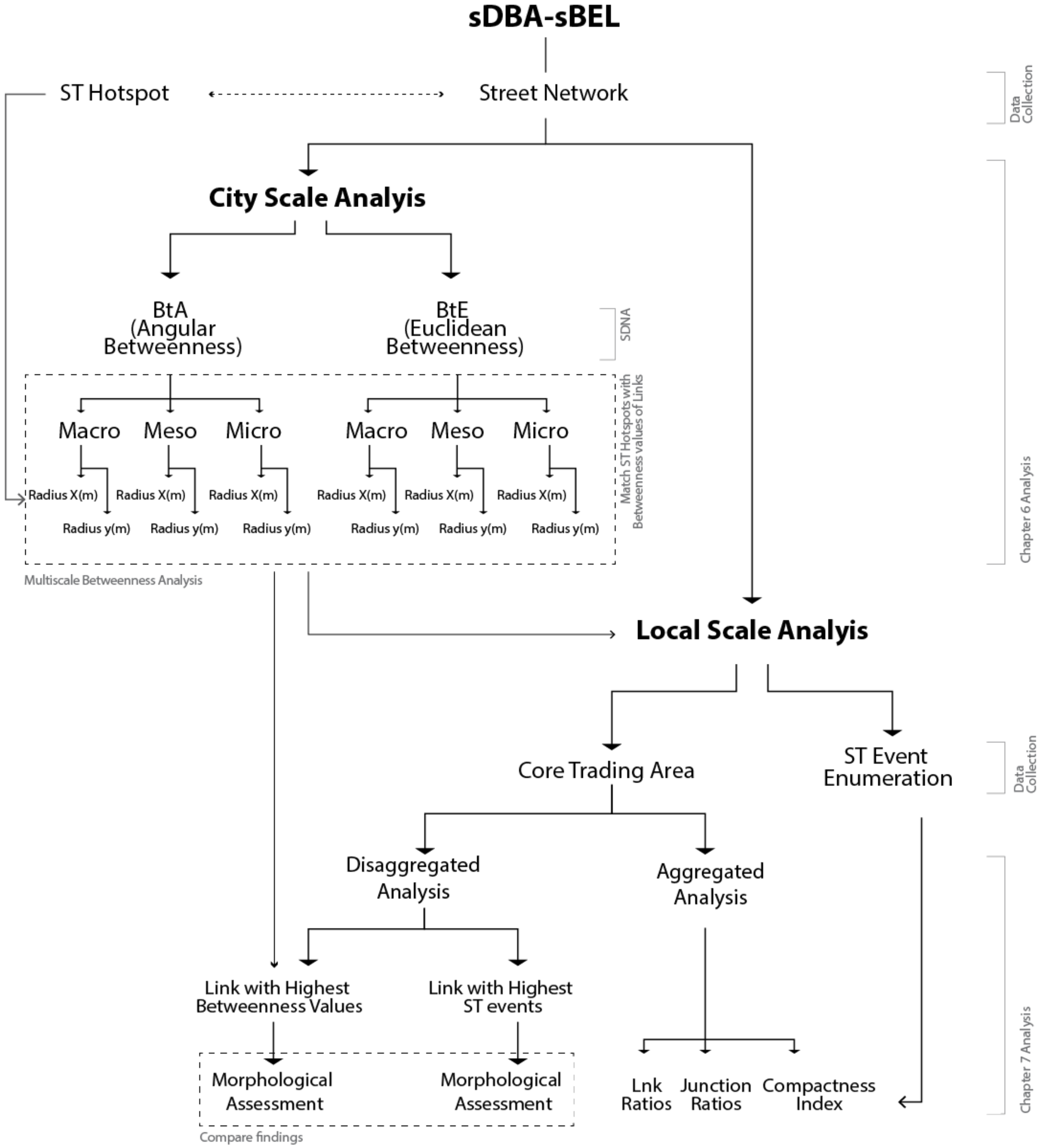


Figure 4-2 sDNA-sBEL schematic diagram

4.6 <u>Data Collection</u>

This section outlines the data required for this research, the limitations, and the approaches to data collection. Scholarship on ST activities typically highlights difficulties of tracking their movements (Dierwechter 2001), and Tripp (1997) contends that this factor has hindered the proliferation of scholarship on ST spatiality. For this thesis, a novel methodology was formulated - sDNA-sBEL - to address this gap scholarship.

An underlying ethos of this research is the use of Open-Source and Freeware applications. Therefore sDNA-sBEL is designed to work using readily available road network centre-line data to study physical form complexes of the built environment, and supplemented with other forms of primary and secondary data used to connote subjective evidence on STs spatialities.

Data Collection Tools

This section lays out the different data collection tools used for the detailed case study research.

PHASE 1

i. *Mapping base:* this involved the review of GIS data available and eventual selection of OpenStreetMap (OSM data).

ii. *Focus Groups*: In an initial scoping visit, focus group sessions were organised to identify ST hotspots locations. This involved tasking groups of respondents to identify locations with high levels of street trading activities on a printed map of Lagos.

PHASE 2

i. Document analysis

Document analysis involved reviewing existing documentation relating to STs and spatial governance in Lagos.

ii. Questionnaires and Interviews

Different questionnaires were prepared and finalised during the project planning phase. The questionnaires that were deployed for key informant interviews were generic, containing comparable questions – for example, they aimed at probing the roles of government agencies in the management of STs. Some predetermined questions were used as prompts to guide the narrative of the interview, but flexibility was still afforded by this method.

Structured interviews were used for two categories of respondents: STs, and other stakeholders affected by street trading, i.e. their customers and city inhabitants who use space near them. Two different questionnaires were used (one for each category), mainly with closed questions due to time constraints.

The structured questionnaire for STs investigated a broad range of factors to analyse: the motivation for their choices of locations; costs associated with the choice of their locations; the impacts of spatiality on their operations; and the political, economic and socio-cultural factors affecting their activities etc. Questionnaires to the other stakeholders primarily sought to investigate their perspectives on the location of STs and how these affected them, i.e. socially, culturally etc. The Questionnaires are given in Appendix 3.

Epicollect (Aanensen et al. 2014) - a mobile phone-based geocoded questionnaire application - was used instead of paper-based questionnaires to aid in field operations. In the spirit of conducting accessible research, Epicollect is a freeware application designed mainly for recording structured questionnaire responses. Various software options were tested, but it appeared that Epicollect was the most efficient method for the collection of quantitative data, and was indeed better than traditional paper-based questionnaires. All that was required was to create a project on the Epicollect server and update the forms with the questionnaires.

iii. *Observations and Mapping*

The use of observational techniques was also employed. To document observations, a combination of recording devices was used, which included: pre-coded activity lists, annotated diagrams, and photographs - as suggested by Zeisel (1981). Observations coincided with the conduct of interviews and were associated with: the layout and morphology of detailed case study areas, including road widths and layout, the relationship of buildings to public space, agglomerated locations of STs, social interactions, and general activity appraisals (Gehl 1971, see also Section 3.4). This provided the researcher with a considerable level of familiarity with the context within which STs worked - a detailed understanding which can only be achieved by being on the ground; supplementing respondents' willingness to communicate and recount a description of their situations.

4.6.1 Lagos as a Case Study

A criterion for fulfilling the replicability of research to ensure validity ascertains that the choice of a study area is indicative of the generalised scenario a phenomenon exhibits within different contexts - to allow for comparisons across the board (Bryman 2001; Yin 2013). While each city is distinct, Lagos faces many of the problems typical of mega-cities of the Global South, and as Koolhaas et al. (2000) described – 'it is a Megalopolis that provides a glimpse to the future of urbanity for cities in the developing world'. The economic and growth structures of Lagos and spatial characteristics of STs can be considered to be relevant to other large mega-cities in LICs at present and in the future. Lagos, therefore, is relevant to a broader category of cases, providing a suitable context for the discussion of STs and their spatialities.

The collective case study approach is adopted and requires a selection of appropriate detailed case studies within Lagos as suitable units of analysis. An *embedded* case study approach was used to derive evidence at sub-unitary levels relative to Yin's (2013) suggestions. The contextualised spaces for ST hotspots were captured at three scales: the macro-level (at metropolitan scale); to the meso-level (catchment areas defined to depict market areas' ranges/thresholds), and then the micro-level (ST events).

4.6.2 Phase 1: Preliminary Data Collection

The data collection task was the determination of case study locations. This entailed the acquisition of both cartographic data for the road network of Lagos state, as the foundational basis for the sDNA-sBEL spatial models and ST hotspot location data. A field study was conducted in January 2015 to acquire data. At this stage data collection was structured around prior work undertaken by Omoegun (2015) who had identified groups and stakeholders relevant to conducting research on street trading activities in Lagos. Omoegun's study provided insights on engaging and manoeuvring the bureaucratic bottlenecks of the numerous ministries and parastatals responsible for the IE and ST activities in Lagos to access data. However, ST hotspot data was not available from any of these sources and therefore was not collected. It was thus time-consuming in the research process to identify and extract appropriate sources of data and took several months in the research process.

LASG GIS enterprise

For the road network data, GIS data samples of different sections of Lagos were acquired from the LASG GIS department. The data samples included were 1000m x 500m map tiles (0.5 square kilometres in area), but there were not suitable for this research. The main problem was that a complete map of Lagos would need to be generated by consolidating about 2,000 individual map tiles - to map the entire city. The financial cost of buying this data from the LASG GIS department was significantly above budget for this thesis. Another factor that negated the use of the LASG GIS data was that, while Lagos had GIS map data available, the availability of governmentadministered cartographic data is rare in developing country cities, and the researcher wanted to develop methods that could be used in other contexts. These two factors made the use of GIS data from LASG GIS inappropriate, as it failed to meet one of the underlying objectives of this thesis, in the provision of an easily-accessible process replicable in localities where spatial data is hard to come by. Therefore, an alternative method for data acquisition was sought, which avoided the difficulties of acquiring data for use in IE research.

OSM data extracts

The other source for transport network data acquisition explored was OpenStreetMap (OSM). OSM is a prominent Open-Source mapping platform that provides open data maps under the Creative Commons Attribution-ShareAlike 2.0 license (CC BY-SA). The use of Open Data is becoming the standard means for public data management, and it is actively being employed to conduct high-quality research around the world. There are potential pitfalls in the use of OSM data, as it is crowd-sourced, and there are minor inconsistencies of data in some regions. However, the OSM repository is being updated and corrected on a daily basis to mitigate its shortcomings (Cooper 2014), and users can easily correct errors before using them.

Numerous online services are available for extracting OSM data, for example, Mapzen metro extracts, Geofabrik downloads, and BBBike. These services provide free, and on-demand paid options of converted OSM file formats, in addition to the native raw data format of OpenStreetMap (file extension "*.osm*"). After several trials, it was found that the preferred data format for this research was the 'SHAPE' file (file extension ".shp"), due to its interoperability with QGIS - the open source GIS software package used to undertake this research. As at the time of harvesting data for this thesis, Mapzen's metro extract provided the most convenient option for accessing SHAPE file data for Lagos.

Network Data Integrity Assessment

To use OSM extracts, the first line of action was to check for network integrity. The commonly encountered errors of data for spatial network analysis are: data with a wrong spatial reference, data with wrong connectivity rules, connectivity errors at key locations, and geometry errors at key locations (Cooper 2016). Several errors were encountered and corrected, which included:

I. The first category of errors included data not having a predefined projected coordinate system (PCS). Therefore the PCS was defined manually to correct this error.
II. The second category of error was about how the street networks are constructed within maps. The universal standard for encoding spatial network data is based on the "*coincident endpoint connectivity rule*" (Cooper 2016). Using this rule, a network is formed by a collection of polylines, and these lines are only deemed connected if they

have coincident endpoints. These errors were corrected in QGIS by running an operation to change the connectivity rules; done by planarizing the map at a one-metre threshold (bridges and tunnels were excluded before this is done).

III. The third category of errors encountered was associated with disconnections and overlapping of nodes at intersections. These errors were addressed using the "prepare" function of sDNA. Other geometry errors identified at key locations were corrected manually, by sketching to add missing network links based on high-resolution satellite imagery.

IV. The fourth category of errors encountered was from the incomplete mapping of road networks in the OpenStreetMap data. The missing roads identified had to be input (drawn) manually in QGIS by overlaying against google maps, to rectify this.

The rectification of the data's integrity was a process which took about five weeks to complete. The most tasking part of this procedure involved updating OSM map data. The issue with the incompleteness of OSM maps, will only get better with time, as there are several voluntary and collaborative mapping initiatives being conducted around the world that actively update OSM maps. Examples include Humanitarian OpeenStreetMap Team and YouthMappers[90].

Spatial Profiling

After the data integrity was deemed suitable, the multi-scale accessibility profile of Lagos was investigated. The operation generated map data which served as the basis for the determination of the betweenness levels of the transport network in Lagos and thus providing the platform for the undertaking of the extended fieldwork, and the collection of contextual data. A selection of these maps is presented in Section 6.2.2 and Appendix 1.

4.6.3 Phase 2: Extended Study and Data Collection

[90] YouthMappers is an international network of university student group chapters dedicated to mapping real-world challenges. It was founded by partners are Texas Tech University, George Washington University, and West Virginia University

Following preliminary investigations, more data collection took place between July and September 2015. This section explains the procedures involved in conducting the extended fieldwork, including project planning, the determination of detailed case sites, ST activity analyses for contextual database generation, and the additional archival data collation. The method to conduct detailed case study assessment was conceived to be empathetic and direct, and this flexibility allowed the researcher to vary the detail of enquiry relative to the situation on the ground.

Archival information in possession of government authorities was assessed as a continuation of documentary studies that has been an intricate part of the research all along. The types of documents analysed included: administrative documents, government publications, letters, meeting memoranda, and minutes of meetings, planning policy documents, strategic city plans (masterplans, model city plans, district plans and local plans). These sources of information were beneficial for providing knowledge of the government's strategy for the city of Lagos.

Different methods of primary data collection were employed. Interviews were indispensable to this research, as they allowed for the collection of data concerned with sociological perceptions. Interviews provided an element of flexibility and simplified the researcher's ability in the field to momentarily grasp emerging patterns and underlying factors which govern human agencies and experiences (Punch 2013; Denscombe 2014).

Semi-structured and unstructured interviews were conducted with key informants, to gather evidence for in-depth understandings of the broader issues which relate to the experience of STs, and other users of public spaces near the case areas. The inclusion of this type of interview significantly enhanced the depth of information collected, as Bryman (2001) suggests they provide an added layer of qualitative evidence (see Table 4.2 for the list of key informants). The interviewees included government and municipal officials, key stakeholders, and urban professionals.

Structured interviews - using questionnaires - were used as the data collection instrument for a) STs, and b) customers and other users of public space. The questionnaires are given in Appendix 3. STs tend to be busy working and often cannot afford much time to talk to researchers, as taking time out to answer questions is a hindrance to their operations. Customers are often in a hurry, and so interviews had to be quite short - as another reason why structured interviews were used (See Appendix 3). Therefore, the interviews were interspersed with observations of STs and other city inhabitants (including customers) as they interacted in space.

Observational techniques were also used on-site, and these were mostly about the physical settings where STs worked. Recording tools used on site included pre-recorded checklists, maps, photographs, notation media, and voice recorders. To observe ST activities in relation to the morphology of the public realm at the detailed case study sites, ST activities were mapped using hand drawings before being reproduced digitally (as seen in Chapter 7). The layout of case studies had to be sketched manually because the OpenStreetMap data extracted for Lagos contained only road centrelines - there were no building, plot, parcel or block footprints. The basemaps used to generate these drawings were based on aerials maps extracted from Google Earth (the aerial maps from OpenStreetMaps were not as up-to-date).

Project Planning and Pilot Study

Issues about the organisation of the research support and resources were addressed during this phase, which included: engaging and training a research assistant; finalising all versions of questionnaires required to conduct of interviews and the design of forms used for data collection (coding and modifying the questionnaire format for Epicollect). Contacts were also (re)established with stakeholders to schedule in-depth interviews.

A research assistant (RA) was engaged for logistical and operational reasons. Working with a single RA ensured that the field study was carefully controlled and supervised by the principal investigator (PI). The employment of just one RA allowed for an efficient process, as modifications to interview questions, and other decisions were made in-situ without being subjected to delays. The choice of the RA considered: gender, age, multilingual proficiencies, and IT literacy as the defining criteria. The RA chosen was of the opposite gender from the PI, which made speaking to certain respondents more relaxed - as it has been observed that sometimes respondents' exhibit biases related to gender, ethnicity, and age in responding to research inquiries. Another factor was in the RA's ability to communicate effectively to non-English speakers, as she was proficient in both Igbo and Hausa - two of the three major languages spoken in Nigeria. Hausa and Igbo are important trading languages, and it was necessary that the research team could communicate with them. IT literacy was also necessary for data collection and management.

To aid in field operations, Epicollect (Aanensen et al. 2014) was used. To deploy Epicollect for field operations all that was required was to create a project on the epicollect server and update the forms with the questionnaires. The downside to epicollect was that its 'form' entry syntax required unique answers, which made a series of Yes/No answers difficult. Form entries are however case sensitive, so using different case combinations for words: "yES, YeS, yeS, Yes, yEs" etc., solved this shortcoming, or the researchers simply used more descriptive phrases as answers. This was not initially considered in designing the questionnaires and was tedious to implement.

A training session was organised with the RA before deployment to site, to cover all eventualities of the research process, especially in the use of Epicollect. A pilot study was then conducted over one-week to troubleshoot potential issues at one of the case study sites, and the responses are:

1. Regarding the use of Epicollect:
    - The app's prolonged usage drained the power of mobile phones - as intermittent breaks frequently occurred during the interviews to allow the ST attend to customers. Mobile power-banks were bought to serve as backup power sources to remedy this. The mobile banks enabled the research team to spend prolonged periods in the field. The average duration for ST interviews was about to 45 minutes; this meant that a maximum of 5 respondents was the daily target.
    - Getting accurate GPS locations required that the mobile devices be stationary for a few seconds/minutes; and, this meant that the app's geo-location had to be continuously refreshed. It was, therefore, difficult to use in interviewing itinerant STs.

2. Low interview response rates: about one out of every five STs approached agreed to be interviewed. This implied that the sampling strategy employed had to control for this.

3. Non-response rates to questions: The type of structured interview questions first used which required some qualitative responses were difficult for STs to answer - a problem associated with low literacy levels. STs often needed prompting to help them understand what sort of responses were required, so providing them with several options as responses to questions helped in the responses. This modification resulted in minimising the non-response rates to questions. Typical responses relative to questions asked were then categorised by the researchers and served as the basis for pre-coded responses - responses which did not fit any categories were designated as "other".

4. Recording interviews: Most STs refused to be recorded in public, due to concerns about a backlash from their counterparts and on-going fear of evictions – they would be seen as providing information to someone which can be used to implicate them. There was also the problem of the audibility of recordings, as the interview sites had a lot of background noise from busy highways.

5. Recording site observations: Some ethnographical observations were undertaken, and recorded in a daily field diary. Information gathered was of the nature of STs workplaces and their activities.

Some of the project planning phases were also used to re-establish links with stakeholders – particularly when a key government official had been moved on, and the researcher needed to contact his/her replacement. The fieldwork was carried out in the early days of a new administration, which had initiated far-reaching staff changes in the LASG's ministries and agencies (as a result of political instability which is discussed further in Chapter 2.2). Unfortunately, this affected the field work, and some key informant interviews which should have informed the field research had to be conducted later.

Sampling strategies

The sampling strategy employed embodied attributes from both non-probabilistic and probabilistic perspectives and is indicated in Table 4.1.

Table 4-1 Sampling Strategy: semi-structured questionnaires in detailed case studies (with STs, customers, other stakeholders)

Method	Population count and activity mapping (area census)	Systematic random sampling of STs	Identification of Key Informants (often through chain referrals)
Target for analysis	STs within case study sites. City inhabitants.	Street traders: Individuals identified at Nth intervals in the interview process, who are willing to voluntarily participate.	Other affected parties: I. politicians and community leaders, II. state representatives, III. NGO workers IV. local entrepreneurs, V. the general public
Tools	Simple census, notation, photographs,	Structured interviews with closed questions	Unstructured and Semistructured in-depth interviews
Location	At detailed case sites	At detailed case sites	At their place of work, or at the case site

A survey exercise similar to Charman et al. (2015) *"small-scale census",* was used to provide information on ST's populations (ST events), their spatial distribution and patterns, and the broad spectrum of locational and temporal dynamics. Wherever dominant characteristics of STs were identified, they were noted for further investigation.

For the street trader surveys, a systematic random sampling strategy was used for every ST at the Nth integer unit relative to the number of traders at each case sites. As observed from the pilot study undertaken, one (1) out of every five (5) STs approached voluntarily agreed to participate in the interview process, indicating a 20% success chance of the Nth ST being a valid entry. The sampling strategy, therefore, anticipated this phenomenon reoccurring and incorporated this variable into the generation of its sample intervals. Gender bias was not controlled within the sampling strategy.

As interview techniques vary relative to research objectives (Kumar 2012); structured interviews, semi-structured interviews, and unstructured open discussions were used. The structured interviews targeted STs, the customers who patronised them and other users of public spaces. In total, **80 structured ST interviews** were conducted, 10 in each detailed case study area. A further

25 structured interviews were carried out with customers and other users of public spaces. Ideally interview numbers should have been higher, but constraints of time meant that this was not possible for this research.

On the other hand, non-probabilistic sampling strategies - both snowballing and convenience sampling, were used for the key informant interviews and convening focus groups. In total **13 key informant interviews** were conducted with urban managers, ST leaders, and other relevant urban actors - as key informants; and formed a significant method for field data collection during the extended field study. A total of **18 respondents** (3 groups of 6 respondents) participated in the focus groups.

Table 4-2 Key Informants Interviewed (Non- Street Traders)

K1	Regional and Master planning department
K2	Regional and Master planning department
K3	Regional and Master planning department
K4	Urban Development
K5	Lagos State Planning Permit Authority
K6	Lagos State Urban Renewal Agency
K7	Kick Against Indiscipline (a state urban management initiative, seeking to clear streets)
K8	Kick Against Indiscipline
K9	Ministry of Commerce
K10	Ministry of Transportation
K11	Ministry of Transportation
K12	Local Council Development Authority
K13	Local Government official

Determination of Detailed Case Sites

The choice of detailed case study sites was based on two different sources of information:

I. The perceptions and knowledge of key informants on ST locations
II. Multi-scale betweenness accessibility levels - as a factor of the city's morphology.

Background knowledge of ST locations was based on interviews and with local municipal authorities, planning officers, and other city inhabitants. This included identification of sites on a map or verbal descriptions where interviewees could not read maps. The focus groups were tasked to identify locations with high levels of street trading activities on a map of Lagos using coloured markers. Three groups of six respondents participated in this exercise; one group consisted of only officials from the KAI brigade[91], while the other groups were a mixture of different individuals with varied jobs. The locations identified from this were input into the spatial model of Lagos as ST hotspots and overlaid with data generated from multi-scale betweenness accessibility within sDNA-sBEL.

The second source of data was from the multi-scale betweenness accessibility analysis. Catchment radii defined at 400m, 6,00m, 1,000m, 2,000m, 5,000m, and 10,000m were used for both Angular and Euclidean betweenness analyses (see Section 6.2 for more detail on how these radii were determined). Locations which indicated higher levels of accessibility across these distances where shortlisted, and matched with ST hotspots identified by the key stakeholders (from the first source of information). To reflect equitable geographical distributions across Lagos, these locations were further analysed to derive the detailed case study sites for investigations.

Cross-sectional assessment of ST activities

To analyse STs' activities contextually, a picture of conditions and opinions at the selected case study sites was required. This was collected through a structured questionnaire with STs at the detailed case study sites. The sampling strategy used to achieve this involved the following. First, the population of ST events at case sites were counted in an area census, which influenced the sampling frame and the sampling method. Data collection then followed with on-site observations and structured interviews.

Structured interviews were conducted with two groups: STs and customers/other users of the public space in ST hotspots. The outcome was the acquisition of a robust data set at the microscalar level of case sites. The use of questionnaires made is possible to use pre-coded answers to minimise the non-response rates to questions; which also provided a quantifiable basis for responses making analysis relatively straightforward. However, there were also demerits of using questionnaires. However, structured questionnaires cannot capture additional

[91] A state taskforce which polices public space often targeting STs. The Kick Against Indiscipline (KAI) is a special environmental enforcement body, set up within the state Ministry of the Environment, dedicated to the eradication of informal activities, particularly street trading

responses which are not pre-coded, and therefore are sometimes criticised for not being able to provide new insights, but because of the complexity of research across eight detailed case studies (and the difficulties of getting around Lagos because of severe traffic delays), they were the most practical method of data collection for this research.

ST census are complicated to undertake because of their fluctuating locations and the temporal character of their activities (Roever 2011). Therefore, the numbers of ST derived from the census are broad indicators and not meant to be representative of the actual number of STs at a location. The quantification of the population of STs operating at the case sites was captured as a crosssectional representation. The choice of a timeframe was based on the researcher's judgement. STs were observed from 11.00am to 1.00pm daily (except on Thursdays – a day set aside for the cleaning of markets that STs strangely adhere to). The time coincided with KAI's timing for enforcement to prohibit ST activities, but the reasoning was that if a location still exhibited high levels of ST activities during the enforcement period, there must be an intrinsic value of trading in such locations. This resilience is therefore why STs continue to operate in the knowledge that they could be arrested. It was also assumed that such locations would contain more STs KAI officers finished for the day and the enforcement abated - this was seen from observations during the data collection process for specific case sites. The researcher considered that resilience could also be a dynamic reflecting that such locations were more valuable to STs at certain times of day, and that value is temporal. To reflect this, a time frame that reflected peak travel times (6.00am till 8.00am, and 5.00pm till 9.000pm) known (from interviews) to be when STs are most active was considered, however, due to safety concerns by the investigators, this could not be fully studied.

4.7 Research Ethics

Abiding by ethical standards is a vital aim of any research project. However ethical dilemmas and concerns are certainties of doing research. As a framework for thinking through these issues, two different dimensions of ethics in research are distinguishable - "*procedural ethics*" and "*ethics in* *practice*" (Guillemin and Gillam 2004). This section focuses on the latter, detailing what was done to maintain ethical standards while conducting fieldwork.

During fieldwork, priority was placed on informing participants about the topic of the research being undertaken, including its purpose and intended possible uses. This was a paramount principle especially for STs, who can be considered as vulnerable actors in public space governance. Consent was also sought from every respondent interviewed. Omoegun (2015) suggested using predominantly verbal consents for all types of respondents, because of issues of anonymity and literacy. Omoegun's perspective was factored in, but this research took the opinion that the decision on what manner of consent sought, would be relative to the situation the researcher encountered conducting the research. Therefore, different methods of attaining consent were used, including verbal consents for STs, and a formally written approach for government officials and some key informants.

Participation by all subjects engaged during the conduct of the field study was voluntary with no coercion. To maintain this voluntary status was however tricky, as in some instances research participants (especially STs) indicated that the researchers had to purchase their goods or patronise their services, in return for their audience. Refusal to patronise STs in some instances resulted in non-cooperation. As a result, the choice to abide by only voluntary participation was a factor which contributed substantially to the non-response rates that occurred during the field work.

Anonymity and confidentiality were also observed through the non-disclosure of identities of the research participants'. These controls were necessary as some of the questions asked were sensitive. To achieve anonymity, the information generated during the interviews with respondents was anonymised. Further to this all information gathered was used strictly for the purposes for which they were collected.

The sampling method for this research aimed to capture the plethora of actors who engage in street trading. However, due to minors being part of the demography of these actors, this posed a challenge to this research. Minors were excluded from all interviews, and this exclusion is believed to have no implications on the inferences made from interviews – as minors formed a small population of STs observed. Gender bias was another factor that was considered and minimised with the sample criteria used for this research.

Risk assessment procedures were integral to the conduct of the fieldworks undertaken during this research. The research procedure was conceived with a modification threshold, which thus allowed some level of flexibility to mitigate unforeseen risks that could occur while in the field. Risks to the research plan encountered during the fieldwork included: non-representative data, non-response to questionnaires/interviews, unavailability of spatial data and inaccuracy of data, and physical danger from working with vulnerable groups who might resort to violence as a form of self-defence.

As an example, the concern for safety from violence was mitigated by conducting all of the fieldwork as a team (with the assistance of a research assistant). Case sites were only visited during the daytime when the presence of many people in public created a perception of safety. However, on arrival at case sites, the ambience of the environment was assessed to make sure it was conducive to work. In situations where the conditions seemed awry, the fieldwork was postponed. The enumeration of ST events was also conducted covertly, not to stir up any unwarranted attention. In three instances (at case sites), gatekeepers were identified coincidentally through rapport created with interviewees. The gatekeepers assured the research team for its safety and subsequently assisted to gain access to locations which might be inaccessible without their help. The combination of these steps culminated in a hitch-free study (safety from violence perspective) for the entire duration of the fieldwork.

Independence and non-partiality of data collected was also a factor. The research protocol included the use of both objective and subjective methods for data collection such as field notes, photographic evidence, voice recordings (for transcription), questionnaires, and different forms interviews.

4.8 Research Methodology, Data Collection and Analysis - Summary

This chapter has provided an overview of the sDNA-sBEL methodology developed for this research. sDNA-SBEL is underpinned by the spatio-economic assessment of centrality combined with morphological and sociological assessments, infused within a pragmatist framework. The methodology is an attempt at formalising the spatial analysis of SBE activities, to enable a better understanding of STs' locational choices, for spatial governance purposes. sDNA-sBEL is grounded in the use of readily available open-source cartographic data and freeware applications while relying on more traditional social research methods of ST analysis as additional sources.

Analyses with sDNA-sBEL are conducted systematically, with inferences from the larger scales of analyses informing the outcomes of the smaller scales. To operationalise these studies, the variables were considered by the nature of their dependency and independence. ST events were considered as the dependent variables; while factors which influenced their locations, like: spatial centrality, spatial variables of road networks and the built environment, were independent of the outcome of location decisions. Other observables such as existing network hierarchy, Bus stop locations, Activity generators; were also incorporated. The relationships between these variables formed the basis for analyses.

5 The Spaces of the Urban Informal Economy in Lagos

5.1 Introduction

Due to large numbers of STs within the IE, it is crucial to integrate SBEs workplaces more equitably to achieve sustainable outcomes from physical management and planning (Simone and Abouhani 2005). As a response to the research question on how spatial governance affects urban informality, this chapter discusses the manifestation of SBEs in Lagos state and the urban governance initiatives that have influenced their spatiality. The narrative is framed to reflect how urban governance approaches have changed over time and aligned with modernist and postmodernist ideologies on the IE (as discussed in Section 2.2). This chapter is an attempt to historically juxtapose the enactment of policies with the socio-political scenery in Lagos. A deterministic approach to planning and structuring the built environment is deduced from the 'modern' socio-political nexus, and as such, the inefficient IE enterprises (SBEs) had no place in the cities. In the 'postmodern' socio-political nexus, the IE is regarded as a potential economic driver; yet, not much has changed regarding the treatment of space for IE enterprises, rather the same 'modernist' ideology persists. The ensuing narrative highlights the paradoxes in sociopolitical ideologies and urban governance policies and actions in Lagos state.

Section 5.2 details urban governance in Lagos and is explored within two timeframes: the pre- and post-independence eras. In Section 5.3 and Section 5.4 the outcome of this chapter is summarised and concluded.

5.2 Urban Governance in Lagos State

Although the state apparatus in developing cities is considered to be systematically weak (Jackson and Rosberg 1982; Van de Walle 2001) it exerts considerable influence on all affairs. The influence is born from the fact that legality is ensured only with the state's patronage. Lagos State exists within a federated government system, where political (Executive, Legislative, and Judicial) power is shared amongst three arms of government – federal, state, and local.

Constitutionally, all levels of government can create laws. However, the Federal and State Governments are the most important arms of government[92] and are accorded virtually the same level of autonomy in the creation of urban planning laws. Since urban planning and management serves as the mechanism for administering spatial governance, a historical review of its plans, laws, and policies at the state level is vital to study the spaces of the IE in Lagos State.

Urban governance in Lagos never really embraced 'strategic spatial planning' *per se*. Instead, it has over the years grappled with management and development control issues and playing catch up to the consequences of rapid urbanisation. The model of urban governance in Lagos also applies a top-down approach, which is both authoritarian and undemocratic (Gandy 2006; Omoegun 2015). This is an outcome of the British colonial legacy (Baker 1974; Mabogunje 1990; Peil 1991; Gandy 2006; Acey 2007; Immerwahr 2007; Bigon 2009), the legacy of undemocratic military governments', democratic political schisms between different levels of the government, and more recently, the state's drive to achieve recognition as a 'global city'. It is thus expedient to view urban governance in Lagos as it aligns with events during Nigeria's pre-independence and

[92] Based on Nigeria's 1999 constitution, the federal government wields the most influence, because of its control over the distribution of revenue from petrodollar. This is because the Nigerian economy is largely dependent on revenue generated from the export of petroleum. While the local government is the least influential, as its powers are most times usurped by the state government.

post-independence eras. The narrative is thus is positioned within legislative, politico-economic, and population growth dynamics.

It is also important to note that the geographical definition of Lagos State changed significantly during this period of review. The growth of Lagos state is illustrated in Figure 5-1.

5.2.1 Pre-Independence - A City of Quarters

The pre-independence era (colonial rule before 1960), was typified by the disruption of the traditional social patterns of the indigenous population, resettlement of freed slaves, development of transport network systems, and colonial acculturation.

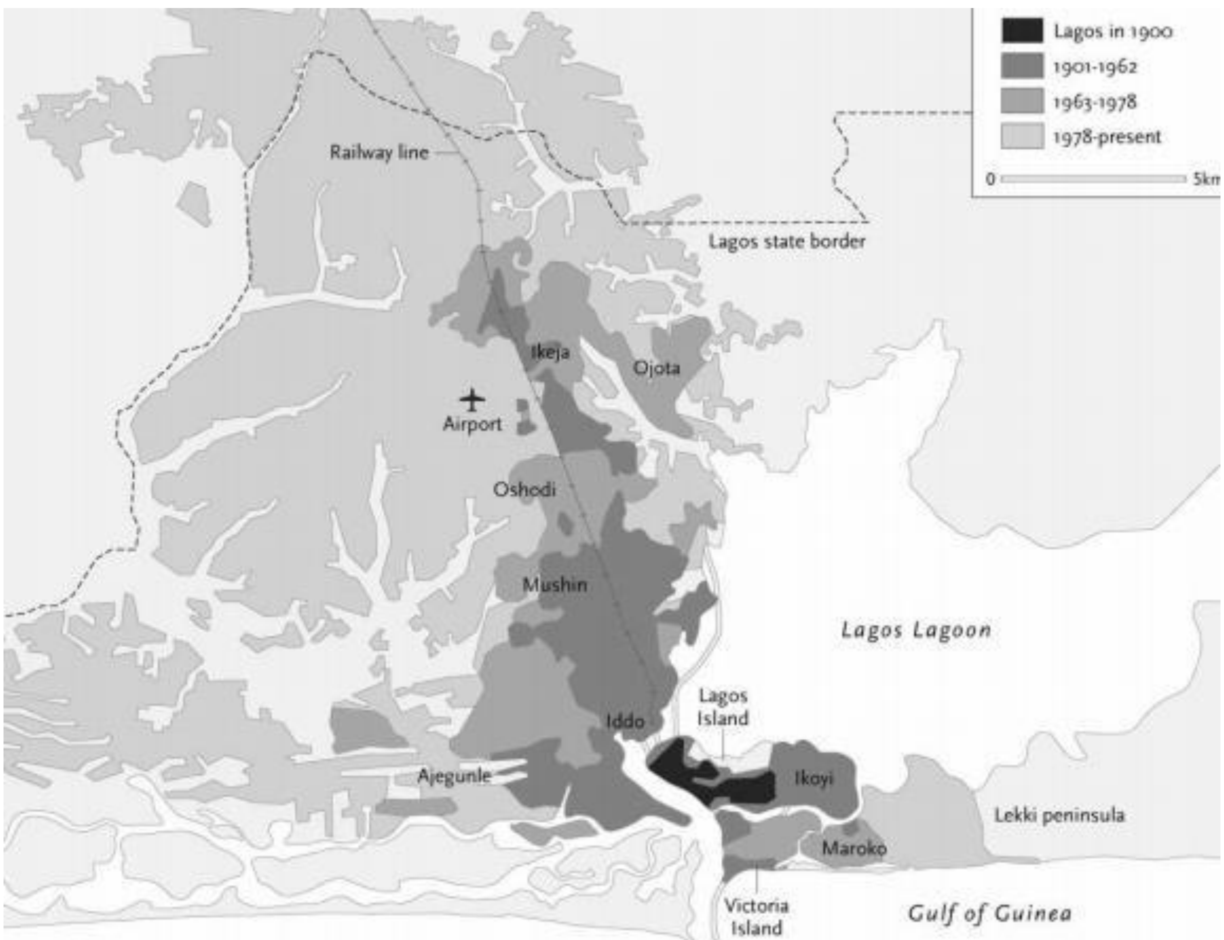


Figure 5-1: The growth of Modern Lagos. Source: Gandy (2006)

Lagos before 1900

Lagos (also known as Eko) before 1900 served as a primary port in West Africa for the Atlantic slave trade (Baker 1974). It also became a regional *entrepôt* for agricultural produce harvested from its hinterland regions, and also for the importation of manufactured goods in the midnineteenth century (Godwin and Hopwood 2012). The annexation of Lagos as a British colony under the 'Treaty of Cession' in 1861, altered the relationships between its morphology and the lifestyles of the inhabitants (Bigon 2005,2009); and this occurred even though there was minimal *formal planning* during this period.

The Lagos colony was characterised by a bifurcated system of urban governance, which catered to European expatriates distinctively from the African repatriates and the indigenous locals. Since the colony was administered as an export economy (Hopkins 1966; Acey 2007), the only (re)investments went into infrastructure required to make the process of resource extraction more productive (Mabogunje 1990). In citing the insalubrious conditions of Lagos, the colonialists took a *laissez-faire* attitude to spatial management within the city (Gandy 2006). The neglect, in turn, allowed the African repatriates and indigenous locals some level of autonomy to build their settlements to meet their needs (Bigon 2005). Hence, the reason pre-independence Lagos is tagged as 'a city of quarters' is that it had a fragmented nature with different character areas created through the agencies of its inhabitants (Figure 5-2).

Figure 5-2: Lagos' four main quarters in 1890's. Based on The National Archives, CO 700/Lagos 5, Plan of the town of Lagos in 1883. Redrawn by the Author.

The formally planned European expatriate quarter had modern infrastructure, while the other quarters were congested and mostly ignored by the city government. The morphologies of the 'other' quarters[93], were a fusion of traditional layout of both the indigenous Yoruba settlements and a Brazilian-styled urbanism (Ross 2015). Vlach (1984) argued that this was a consequence of a complex interplay of acculturation. Bascom (1955, p. 449) described Yoruba towns as urban - typically 'consisting of large, dense, permanent settlement based on farming, craft specialisation and trading'. Traditional Yoruba towns were structurally an enlargement of the Yoruba compound. Alonge (1994, p. 78) described the Yoruba family compound 'as an assemblage of uniform homogenous elements in a rectangular plan, arranged in a linear sequence around a central area which functioned as a space for domestic activities for the whole family'. Gerontocratic social norms were also known factors that ordered the spaces within Yoruba compounds (Boyowa 2005). While the Brazilian-style urbanism - *sobrado* and *terrea* - influence was mostly at the architectural scale with a Portuguese ting (Vlach 1984; Alonge 1994). Trading

[93] The 'others' mostly consisted of the indigenous Yoruba tribe. There were also African repatriates who were either freed Yoruba slaves from Brazil, Cuba and Bahia (known as Agudas) or Yoruba slaves freed from Sierra Leone known as Saros.

occurred in open spaces within these quarters to cater to the need of their inhabitants, and ethnicity ordered this (see Figure 5-2).

> … the Saros lived to the west of the Europeans, while Brazilians [Agudas'] were established along the middle spine of the island, behind both Europeans and Saros. The indigenes gradually spread from their crowded northwest corner along the north coast of the island, and newcomers found room on the periphery and the mainland (Peil 1991, p. 22).

Land required to develop Lagos as a strategic economic hub for the European traders was made available during this period, through the English 'freehold system' introduced in 1861. Land acquired under the auspices of the British colony – as Crown Land - enabled the construction of a modern transportation system (Bigon 2009). The freehold system of transactions on land conferred absolute ownership and the right of alienation, at odds with the existing indigenous customary land tenure system. The customary system vested control over the use of land to traditional rulers who held land in trust for their community, granting patrilineal rights of usage (Braimoh and Onishi 2007). The customary land tenure distinguished between community members and migrants, but still gave access to land and prevented immigrants from resorting to illegal occupation.

On the micro-scale, commercial transactions in indigenous quarters were conducted in designated trading areas within residential enclaves (Mabogunje 1964), as the urban development patterns and land tenure system allowed for allocation of space for trading. On the macro-scale, commercial transactions were enabled by the transport networks built by the colonists to supplement existing trade routes, and these extended from the south to north as Lagos expanded[94] (Olukoju 2005) (Figure 5-1). Daily markets and periodic markets were situated near transport routes (Hodder 1961; Hodder and Ukwu 1969). According to Hodder and Ukwu (1969), the distribution patterns of *periodic* markets surprisingly showed little correspondence either with the distribution of the population or with the distribution size or hierarchy of urban settlements (see discussions on Central Place Theory in Section 3.2.1). Goods were traded informally based on local demand, and competition amongst traders drove prices down, with

[94] The opening of Carter Bridge in 1901. The Lagos Island Steam Tramway opened in 1902, and the Extension of municipal boundary to Apapa and Ebute Metta on the mainland in 1911. Lagos–Kano railway in 1912.

credit incentives extended to regular customers within their social network to encourage patronage.

1900 - 1960

This period saw the establishment of 'formal planning' beyond the European quarters. The Native Rights Promulgation enacted in January 1900, nationalised all land and the administration of urban settlements became the responsibility of the native rulers; while the segregated European quarters and Government Reservation Areas, created under the Cantonment Proclamation of 1904 were administered by the colonialist administration (Omole and Akinbamijo 2012). The 1904 proclamation served as a defining point of change regarding land administration and settlement development.

Later in 1917, the 'Township Ordinance' introduced spatial orderliness into the land use pattern. Planning standards were specified relative to different sections of the city, yet most of the physical planning and infrastructure was concentrated within the European or Government Reservation Areas (Omole and Akinbamijo 2012). This laid the foundations for the general pattern of urban development in Lagos, depicting a dual spatial order of colonial enclaves and native settlements (Nwaka 2005; Immerwahr 2007). Urban planning and housing became instruments of segregation and social policy to ensure that the small community of expatriates remained protected in segregation (Acey 2007), while shortages in housing, water supply, sanitation problems, and other eradicable diseases persisted (Gandy 2005).

With the enactment of the Lagos Town Planning Ordinance of 1928, the colonial government finally took an interest in the overcrowded native quarters, but this was confined to those closest to the European settlements. This response was motivated by the need to mitigate potential threats of disease or fire outbreaks (Immerwahr 2007). Planning was part of an ideology of *modernisation* that centred on cleaning up filth and disease (Acey 2007). This approach included the 'creation of a perimeter building-free zone, measuring at least 440 yards wide around the European quarter, this ostensibly being greater than the distance a disease-bearing mosquito could fly' (Immerwahr 2007, pp. 170-171). The Lagos Executive Development Board (LEDB) was therefore created, and its mandate was to protect Europeans from health risks (Olukoju 2003;

Acey 2007). The LEDB initiated extensive slum clearances and resettlement programmes to this effect – without any city planning or infrastructure development mandate, and it soon became a vehicle for land speculation (Olukoju 2003). The creation of the LEDB:

> introduced a powerful rival structure to the Lagos Town Council so that strategic policymaking was consistently marked by a lack of co-ordination between conflicting and overlapping spheres of jurisdiction. Problems of co-ordination in urban policy-making were exacerbated by the creation of a further raft of autonomous agencies such as the Lagos Drainage and Swamp Reclamation Board (1939), the Lagos Housing Committee (1942) and the Mosquito Control Board (1945) (Gandy 2006, p. 376).

As a preventive measure against the spread of fire within the 'other' quarters, all buildings were also required to be at a set distance from their property boundaries (Ross 2015). This "setback" rule conflicted and altered the existing fabric of Lagos (Figure 5-3).

> [T]he rule effectively outlawed the indigenous Yoruba courtyard pattern, and also the Euro-phillic urbanism that pre-dated British settlement, arriving via repatriated Portuguese slaves (Ross 2015, p. 254).

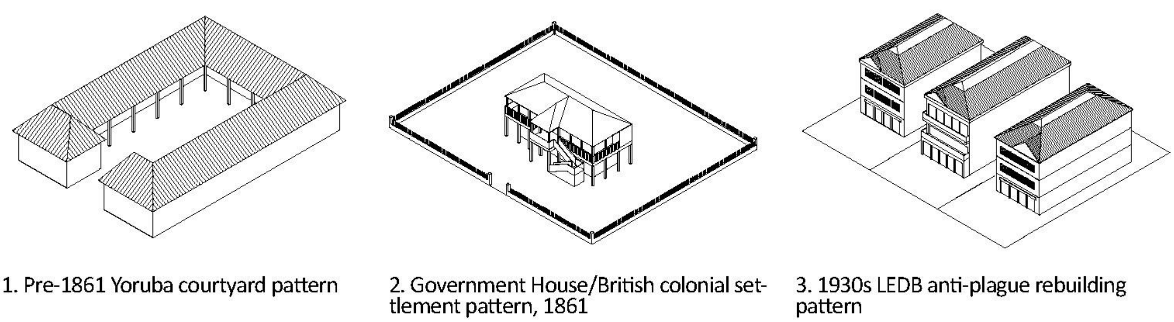


Figure 5-3: Property Boundary Set-Back rule as applied in Lagos. Source: Ross (2015)

The Town and Country Planning Law[95] in 1946 - a reincarnation of Ebenezer Howard's Garden City movement - was the first attempt at systematic planning in Lagos. The provisions for suburban housing beyond Lagos Island mismatched the requirements of its inhabitants, who

[95] The Nigerian Town and Country Planning Law was based on the 1932 British Town planning and Country Act.

consisted of temporarily displaced settlers affected by slum clearances. As seen in the case of Surulere estate - which consisted of detached homes with garages and blocks of flats (for more impoverished residents), with wide streets in zoned residential areas. The estate's regulations confined commercial activities to designated shopping areas. To supplement low wages, the inhabitants appropriated space to accommodate IE enterprises even though this was in contravention of the estate's rules. The predictable result of this prohibition of petty trading and production was that low-income residents, particularly women, were affected negatively.

Continued population growth, extensive housing resettlement and physical development at the fringes of Lagos, led to the further expansion of the city. Lagos, however, lacked a proper public transportation system, and private operators filled the public transport void left by the government[96] (Olukoju 2003). Transport costs were a significant expense to low-income workers, and the patronage of SBEs became more important to many Lagosians, who had neither the time nor the means to patronise proper markets and shops. For those with longer commutes, the ability to bargain for goods in transit saved them precious time (Peil 1991, pp. 86-89). This spurred the transformation of the shopping behaviour for many Lagosians towards apathetic shopping (see Section 3.3.1). Fapohunda (1985, pp. 90) found that most IE enterprises were located within walking distance of their customers to mitigate the effect of spatial separation. Thriving as they did on constant traffic and high population density, STs found these isolated housing estates inhospitable climates – because of the dissipation of thresholds as described Dewar and Watson (1981).

The Macpherson Constitution in 1951 fused the colony of Lagos, into the former Western Region of Nigeria as a federal territory. Lagos was thus an amalgam of two antagonistic governments, and a lack of government coordination compounded the management of the city (Olowu 1990). The precarious state of space management further fostered the growth of 'informal activities', as they thrived on lax regulation and management regimes. SBEs took advantage of newly created public spaces and infrastructure within planned parts of the city for their activities - as well as

[96] To increase patronage by commuters, bus stops were created to increase patronage by commuters (Olukoju 2003), which occurred organically to suit passengers' preferences. This pattern of bus-stops continues to define the public transportation till date.

within informal settlements where they resided. This trend of uncoordinated urban governance continued until independence (Marris 1961).

A summary of the pre-independence situation is aptly summarised by Godwin and Hopwood's comment that:

> although the urban planning interventions were piecemeal, they left much to desire […] the over-all 'fire-fighting' [however] was manageable (Godwin and Hopwood 2012, p. 206).

5.2.2 Post-Independence – A Dual City

> [T]he over-all 'fire-fighting' was manageable until the 1960's when the infrastructure really started to show signs of stress (Godwin and Hopwood 2012, p. 206).

Independence in 1960, ushered in drastic changes in urban governance in Lagos – especially in the relationship between the IE and the State. A socialist doctrine centred around nationalism initially informed this change (Ekundare 1971; Lewis 1977); as there was a need to portray Lagos as a befitting capital city of Nigeria. This was to be achieved by articulating a distinct image independent of colonialism (Gandy 2006; Immerwahr 2007; Omezi 2014). The Federal Government of Nigeria (FGN) approached this objective through medium-term economic planning, proposing a series of National Development Plans in the first two decades after independence. These economic plans provided a framework for regulation and direct actions to promote industrialisation. Funding and jurisdictional complexities between the city and regional government mostly undermined the implementation of these plans in Lagos. However, a priority for infrastructure development was evident, as 'transport and communication got [as much as] 60.5% of the total expenditure' under some of the economic plans (Ekundare 1971, p. 148). Economic informality - a backward non-modern mode - had no place in the FGN's and LASG's post-independence utopia, and as discussed earlier in Section 2.2, the economy was propped up to embrace modernisation through industrialisation instead.

1960 - 1970

To help tackle the chronic overcrowding, traffic congestion, and to plan for the expansion of the city, a UN-assisted report was produced in 1964 – the Metropolitan Lagos study (see: Koenigsberger et al. 1964). The study adopted the socialist objectives as set out by the First National Development Plan (1962 - 1968), and advised on the prioritisation of key urban issues. Besides the provision of road infrastructure, its recommendations were mainly ignored by the FGN (Fourchard 2011; Godwin and Hopwood 2012). Omezi (2014) argues that Koenigsberger et al.'s projections of population growth and the impending expansion of Lagos, necessitated the FGN's decision to prioritise road infrastructure development. In what Omezi termed the 'modernist overlay', a road network system of expressways would thus begin to embody Nigeria's modernity (Omezi 2014). Godwin and Hopwood (2012, p. 206) concur, by stating that 'in the eyes of most Lagosians [Nigerians], a lack of infrastructure is judged by traffic congestion [caused by bad roads], more than lack of water and electricity'. 69% of the transport sector's budget was thus allocated to road infrastructure (Ighodaro 2008). A considerable portion was invested in two major north-south expressways (Figure 5-4), proposed by the 1964 Study as:

> … the artery of transport for Metropolitan Lagos. [The expressways] will bring Agege to the north, as well as huge areas to the east of Victoria Island, to within 30 minutes drive to downtown Lagos. Developments will take place alongside, and to the north and east of its extremities. Lagos will thus be not a circular but an L-shaped metropolis with Lagos Island in the centre at the bend on the south-west corner.' … 'The Western Avenue extended straight southward to join the Second Mainland Bridge, will become an important arterial throughway from Lagos and Apapa northward. It should be widened, and made into a limited access road, joining the Axial Motorway at the interchange at Yaba Roundabout (Koenigsberger et al. 1964: 83).

The new Lagos envisioned by the FGN was thus characterised by an urban image fixated on road infrastructure development, to support regional economic integration. The expressway system was the lifeblood of this industrialisation project, evident in the designation of industrial estate complexes relative to locations they serviced. This period saw the construction of the 'Second Mainland Bridge [Eko bridge], and the Apapa-Ijora-Western Avenue Causeway system' (Omezi 2014, pp. 280-281). To unify the Lagos metropolis and ease vehicular traffic, the Eko Bridge was built to complement the existing Carter Bridge - then the only road access to Lagos Island (seat of the Federal Territory) and the mainland (seat of the Western region). Apapa-Ijora-Western Avenue Causeway system was to ease vehicular traffic in accessing the Seaport complex in Apapa, and the locations of the proposed National stadium and National Theatre (Figure 5-4).

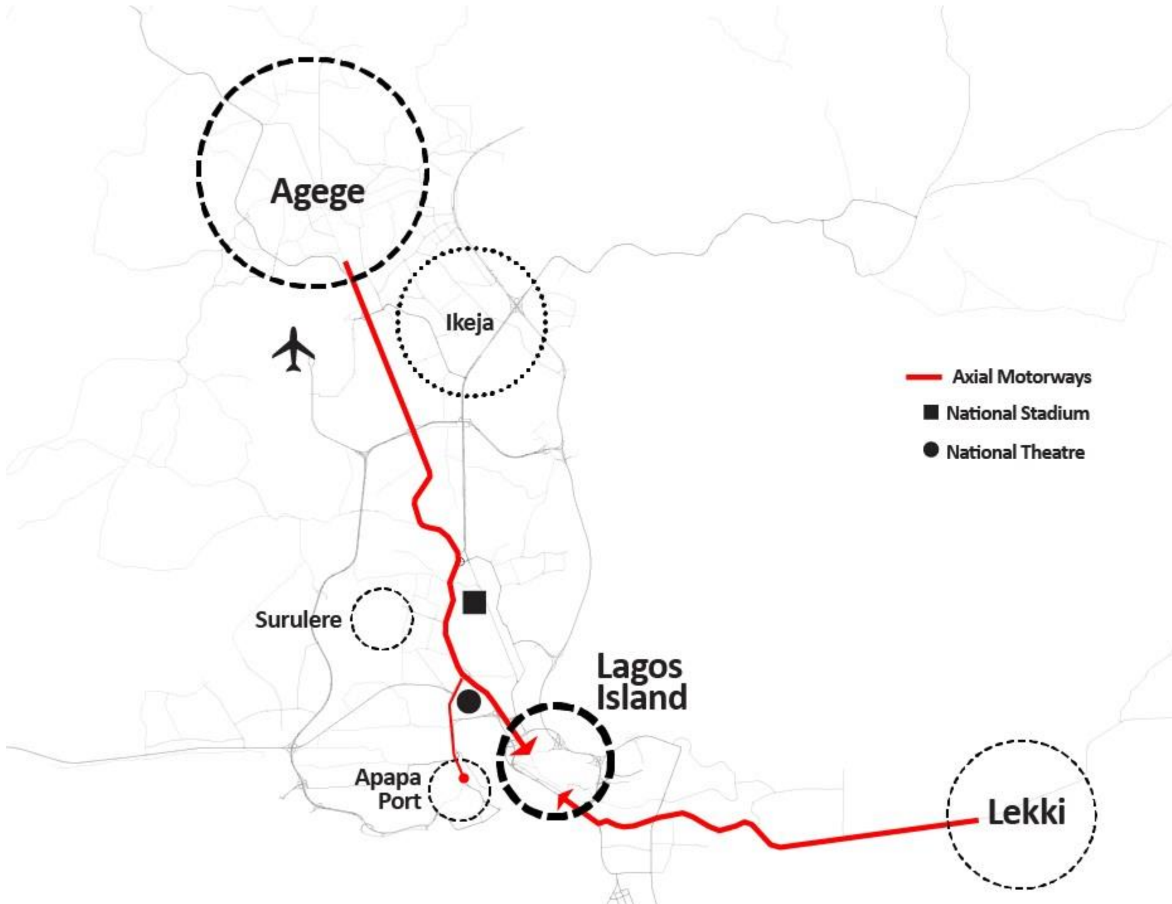


Figure 5-4: L-Shaped Expressway Artery as proposed by Metropolitan Lagos study in 1964. Drawn by Author.

New economic opportunities promised by industrialisation, caused an influx of migrants into Lagos. The construction of extensive intracity expressways, inadvertently spurred uncontrolled ribbon developments, while other underlying urban infrastructure issues persisted (Gandy 2006; Acey 2007; Omezi 2014). Goodwin and Hopwood (2012, p. 206 - 207) highlight the gravity of the housing situation, stating that almost all the wetland vegetation along the axis of the new expressways was exploited for building residential dwellings. Many of the poor settlers found solace in unregulated urban forms - squatter settlements - living close to their workplaces, which were located close to the new expressways, and the IE thrived in these areas

> The origins of some of the most extensive slums in Lagos such as Ajegunle, Mushin and Somolu represent the remnants of the city's failed industrialisation strategy: they are in effect intense concentrations of human labour for which the promise of work and prosperity has never materialised (Gandy, 2006; 381).

With the outbreak of civil war in 1967, the safety offered by Lagos resulted in a further increase in in-migration. The IE's and its low barrier to entry, served as the only source of work for most of the new settlers. This period also coincided with the creation of Lagos State, where the boundary of Lagos was drawn beyond Lagos Island (Figure 5-1), further compounding urban governance issues. Lagos State now consisted of a Federal territory and parts of the defunct Western region, and it:

> … inherited all the problems and liabilities of Greater Lagos and its surrounding areas, … a daunting task of establishing the necessary political, economic, and sociocultural infrastructures to facilitate growth was faced (Filani 2012, p. 14).

1970 – 1974

According to Omezi (2014), the end of the civil war in 1970 ushered in a more confident internationalist and socialist stance by the Nigerian state, a sharp contrast to the preceding period.

> …The civil war forced an internationalising of Nigeria's outlook, fought globally as a sophisticated propaganda battle, the consequence of which was the blurring of the traditional Western-leaning allegiances of the Nigerian state to accommodate a supportive Eastern Bloc (Omezi 2014, p. 283).

Nigeria had been awakened to the problems of international politics in respect of foreign aid and political sovereignty (Ekundare 1971). The Second National Development Plan (1970 – 1974) was thus introduced with an emphasis on regional trade integration with West Africa[97]. Half a billion Naira was allocated to the transport sector, with 69% of this allocated to road infrastructure

[97] Major elements of the First Development Plan were reintroduced.

(Ighodaro 2008). Buoyed by petrodollars and socialist ideology, a Pan-Africanist outlook influenced the decision to host the Second All-Africa Games in 1973[98] and Second World Festival of Black and African Arts and Culture in 1977 (FESTAC 77). The events' venues which were mostly located along a south-west corridor of Lagos provided further impetus to develop the expressway system and infrastructure. The National Stadium in Surulere and the National Theatre in nearby Iganmu embodied modernist architecture and city planning ethos in their design and became national landmarks.

Forced displacements continued, and land tenure for the urban population remained a problem, but due to the delicate social order of post-civil war Nigeria, the FGN did not address this issue adequately (Ekundare 1971). Town planning legislation in the newly created Lagos State was consolidated under the Lagos State Town and Country Law in 1973 (see: Oduwaye 2009, p. 163). There is no indication that this law specifically addressed the issues of incorporating SBEs in urban areas. Instead, the law was widely acknowledged to have been imperfect in meeting the objectives of post-independence Lagos, and its shortcomings were remedied in subsequent re-amendments. The next significant planning law, however, would be the 1998 Lagos State Urban and Regional edict. The law was derived from the 1992 Nigerian Urban and Regional Planning Law and provided a framework for physical planning, empowering each tier of government with specific responsibilities.

1975 - 1980

The Third National Development Plan (1975-1980) continued the theme of infrastructure development, with capital expenditure increasing from 3 billion Naira to 30 billion Naira[99] from the last plan (Lewis 1977). 5.4 billion Naira was budgeted to the transport sector, with 73% of this allocated to road infrastructure (Ighodaro 2008). Emphasis on nation building was still high on the agenda, and persistent urban and political crises culminated in the creation of Abuja in 1975, as the new administrative capital of Nigeria (Elleh 2016). Lagos was considered unfit to play the

[98] Oluwole Village in the Iganmu (central Lagos) was acquired for building Nigeria's National Arts Theatre, displacing local land owners (see: Morka 2007).
[99] This was later revised to N43.3 Billion, however the government was only able to spend N29.43 Billion within the fiscal period of the plan.

dual role of being the capital of the FGN, and that of LASG, partly because of a shortage of land to meet the future physical development of a capital city.

Scarce land and land speculation caused a price bubble (Etuonovbe 2014), compelling the indigenous poor to sell to the middle-class and move to far-flung areas least served with infrastructure (Peil 1991). The Land Use Act in 1978 was promulgated, to resolve the land issue. The act harmonised the customary land tenure system[100] and gave the LASG absolute power to acquire land for urban and infrastructural development. Under the 1978 Act, the Governor of Lagos was given the authority to expropriate rights of occupancy (ownership) to any land for the public interest, and pay compensation when necessary. Consequently, the 1978 Act was discriminatory; and it stripped many low-income citizens of their entitlements, exacerbating the problems it was meant to resolve. Demand for space caused by the rapid rate of urbanisation and lack of access to land which now belonged to the LASG, therefore compounded the informal appropriation of land in Lagos (Morka 2007; Oduwaye and Olajide 2012).

With the Land Use Act in 1978, came numerous masterplans for Lagos. The Wilbur-Smith report and a UNDP assisted 20-year strategic masterplan in 1980, keyed into the Third National Development Plan. This masterplan, however, took too long to implement and did not materialise into any meaningful outcome (Godwin and Hopwood 2012).

1981 – 1984

The Fourth National Development Plan (1981 – 1984), was the first to be formulated by a democratically elected government under a presidential system (National Planning Office 1981). The plan attempted for the first time to mobilise all tiers of the Government (federal, state and local), in a concerted effort to accelerate development - a departure from earlier plans which were FGN determined. The capital expenditure in this plan was projected to be 82 billion Naira. Approximately 11 billion Naira was allocated to the transport sector, with 70% of this allocated to road infrastructure (Ighodaro 2008). Nigeria had positioned itself as a welfare state, and this

[100] This act was predominantly intended to support the agricultural sector revamping and rural development. But it ultimately affected the urban situation.

coupled with the global recession in 1981 plunged Nigeria into debt. Wealth redistribution aimed at improving the standard of living of its citizens keyed into a socialist and modernist outlook. Consequently, the informal economy was not recognised as a driver of economic prosperity.

In 1982, the Jakande Plan - which for the first time was a land use plan for the whole of Lagos - was produced. Jakande's plan was implemented to a certain extent, before a *coup d'état* in 1983. The military junta's reign 'signalled the end of attempts to conceptualise the city's problems in an integrated or strategic way' (Ilesanmi 2010, p. 247). Cash-strapped and in preparation for the relocation of the FGN to Abuja, public investments in Lagos diminished and never fully recovered until the return to democracy in 1999. Peil (1991, p. 175) however noted that about 1 billion Naira was spent on Lagos roads from 1970 – 1980 (see Table 5-1). Carter Bridge was replaced in 1979, and the Third Mainland Bridge was completed in 1991.

Table 5-1 Expressways built or at least started by Governor Jakande (1979 - 1983)

Route	Length (Km)	Lanes
Lekki Peninsula: Victoria Island-Lekki	65	4
Apapa Port - Isolo - Oworonshoki: Links Tin Can Island to Agege Motor Rd, Airport and Ibadan Expressway	28	8
Apapa Wharf - Ikeja: linked to Ikorodu Rd to Jibowu	14	8
Ikorodu Rd: Yaba-Ojota, linked to Ibadan Expressway	13	10
Inner Ring Rd: Island, links 3 bridges, Ikoyi and Victoria Island	11.5	8
Hebert Macaulay Rd: Ebute Metta-Yaba, linked to Ikorodu Rd	6	8
Maryland – Ikeja – Airport	5	8
Iddo – Ijora - Iganmu: crosses Apapa Wharf Rd, linked to Badagry Expressway at Ijora	4.5	8
Obafemi Awolowo Way: Ikeja-Secretariat (Alausa)		8

Source: Reproduced from Adefolalu 1986 in Peil (1991)

A relaxation of planning restrictions on building heights in 1984 caused a development boom of high-rise buildings in nearby Victoria Island, causing companies to abandon Lagos Island for this new location (Godwin and Hopwood 2012). The private equity exodus accelerated the decline of Lagos Island, which also happened around the time the FGN began moving its administrative functions to Abuja. On Lagos Island the informal economy thus became entrenched because:

1. Lagos Island was the traditional business core of Lagos, while still hosting many formal commercial businesses.
2. The point of convergence for the expressway system was designed to be in Lagos Island, which thus became the most accessible location in Lagos.
3. Its morphology was still defined by the Yoruba town layout[101], and it had a large population of low-income dwellers.

Taking stock of the urban situation in Lagos State up to 1984, a mosaic of three different imageries interlinked by an extensive expressway road network is produced:

I. Tropical modernist-inspired urban centre (Lagos Island).
II. Suburban housing developments.
III. Shanty towns.

'Tropical Modernism' was a bold idiomatic hybrid of CIAM's (*Congres Internationaux d'Architecture Moderne*) modernist movement, and was adopted as the official style of government offices and major buildings in Lagos (Immerwahr, 2007). Many of the new government housing estates and apartment complexes, where laid out in styles reminiscent of new towns of the 'British garden city', but the urban centres and sub-urban housing schemes were planned without much consideration for their socio-economic contexts. Their retail structure was based on formally regulated forms (influenced by Colonialism), a departure from the existing hierarchical open-air markets popular with trading in Lagos (Mabogunje 1964). The third urban form was the shanty towns. As the name implies, shanty towns were characterised by unscrupulous unplanned habitable spaces housing a majority of the urban population. A striking feature of the shanty towns was their morphology which had changed into a hybrid urban form distinct from the traditional Yoruba town. The buildings had retailing spaces fixed to the front, which allowed for petty trading and other traditional economic activities (informal smallscale enterprises). The layout of these enclaves maximised the lack of external communal spaces in these densely populated areas.

[101] The Yoruba people place a strong emphasis on community and family. The traditional Yoruba architecture is characterised by the openness and proximity of houses which enables constant social contact.

During this period, economic informality was tolerated to a degree, as it was never the burning issue on the agenda of the governing authorities. The thought was that informal activities would fade away, with the promotion industrialisation (see Section 2.2.1). However, as Gandy (2006) suggests, even if enlightened planning policies were adopted, there would have been difficulties in their implementation, as Nigeria lacked institutional mechanisms and the administrative capacity to cope with the needs of Lagos.

1985 – 1999

The 'modern' Nigeria project in Lagos State was essentially terminated when the development of Abuja commenced. The military junta that came to power in 1983 started economic development planning on a rolling basis; and the Structural Adjustment Program (SAP) of 1986 (see Economic Liberalisation, Section 2.2.1) ensured that infrastructure development was also limited. However, the Third Mainland Bridge in Lagos was completed in 1990, and it was the last intercity expressway built there. The Third Mainland Bridge complemented the North-South-East artery of axial roads proposed by Koenigsberger et al. (1964) and had become the dominant pattern of commuting in Lagos. However, western Lagos remains partially isolated (Godwin and Hopwood 2012). Most subsequent road investments have been remedial works and expansions.
In December 1991, the seat of government was formally transferred from Lagos to Abuja.

As the military junta which overthrew the civilian government in 1983 did so on the pretext to reduce corruption and instil discipline on the populace, SBEs - symptoms of indiscipline - were not tolerated. Under the junta, the treatment of SBEs took a repressive turn (Nwaka 2005). In 1984 the Street Trading and Illegal Markets Prohibition Act was enacted, alongside the War Against Environmental Indiscipline (WAI) campaign[102]. These stipulated harsh punishments to both STs and buyers, from monetary fines to imprisonment. SBEs goods were confiscated and all illegal structures were demolished. An edict supplemented the Street Trading and Illegal Markets Prohibition Act in 1996 and 2003 and mostly made the punishments for contraventions more severe. 'The setback code - a relic from the colonial era - became a tool to enforce the prohibition

[102] A precursor to the Kick Against Indiscipline (KAI) taskforce ()

of street trading, as it was illegal to conduct any form of activity within the setback zone - frontage of buildings [and property] - is economically the most dynamic part of a city' (Ross 2015, p. 255). The LASG thus defined traders and activities are not located on streets, but within road setback spaces (see: Figure 5-5), as street traders.

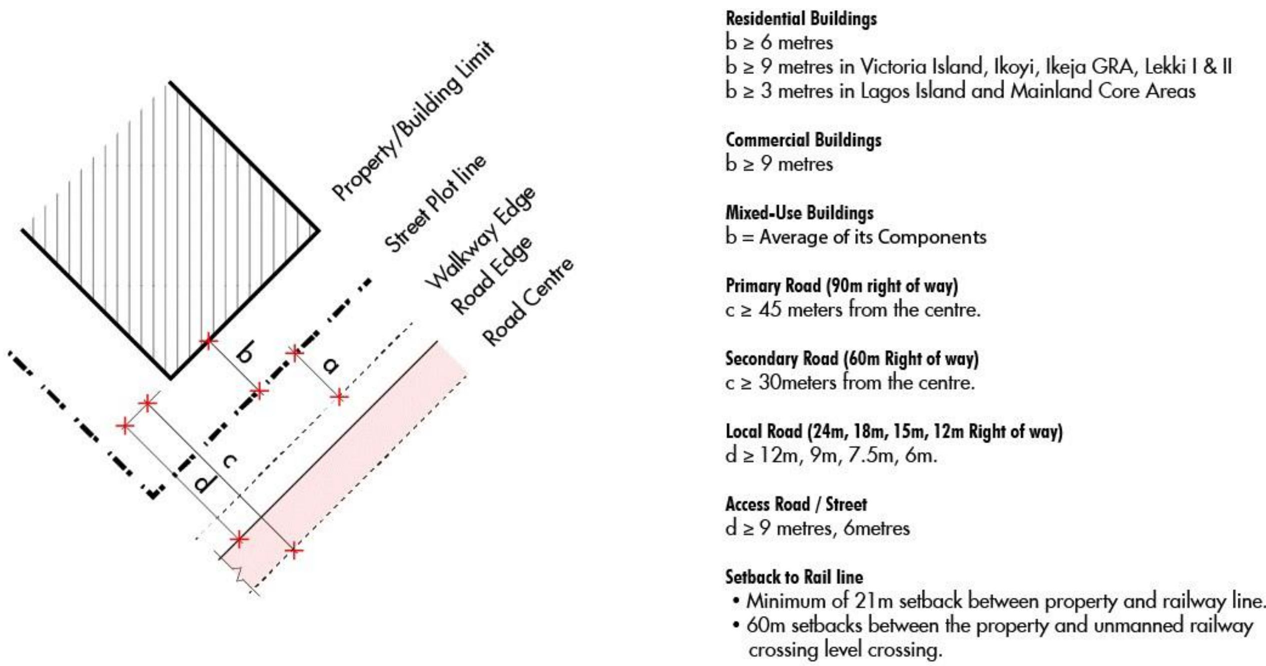


Figure 5-5: Street Set-back Code in Lagos. Source: Adapted from LASG Urban and Regional Planning Law 2005. Drawn by Author

The government launched the Better Life Program for rural women movement (BLP), to cushion the effect of SAP's. One of the BLP's objectives was to encourage self-sufficiency and income generating activities (Dibua 2006), and this was achieved by creating a mechanism for rural farmers to access urban markets directly - cutting out middle-men - for the sale of agricultural produce. According to Tinker (1997), the BLP's success reinvigorated weekend and night markets. Such periodic markets promoted by the BLP are traditionally popular amongst the Yorubas in Lagos (Hodder and Ukwu 1969) and are primarily SBEs. Due to their popularity Local Governments Authorities (LGA), eventually started designating street sections to these trading activities, thus, legitimising the use of streets for periodic trade.

LGAs were empowered to identify sites for periodic trading under the 1992 Nigerian Urban and Regional Planning Act. The law provided a framework for physical planning, empowering each tier of government with specific responsibilities. The law empowered state governments to establish independent Urban and Regional Planning Boards, and Local Planning Authorities. However, LASG did not fully implement this law until 1998, when the 1973 Town and Country Law was re-enacted as the Lagos State Urban and Regional Law. This law was re-enacted in 2005, and again in 2010.

1999 - 2017

The re-emergence of democratic structures and institutions in 1999, coincided with the expiry of the Lagos Masterplan 1980-2000. The position of urban governance within the duration of the masterplan can be regarded one of crisis management, as a review of the masterplan stated that

> *"[it] was not implemented. Instead, the experience had been of significant distortions in many parts of the plan […] far-reaching resulting in lopsided population distribution, high cost of infrastructure development, drainage obstructions, environmental and sanitation challenges, traffic congestion and numerous other problems."* (Presidential Task Force on Lagos Mega City, 2006, p.13.)

The abysmal implementation of the Lagos Masterplan 1980-2000 was because of a panoply of political and economic factors - as detailed in earlier sections. By 1999, the infrastructure deficit was widespread but more pronounced in low-income areas, either shanty towns which grew up as ribbon developments along the expressways or located on the fringes of the city (except for Lagos Island[103]). Prime locations near the expressway network had either been allocated for commercial and high-income enclaves or appropriated informally by squatters. The pervasive infrastructure deficit encouraged Lagosians - both rich and poor - to resort to self-help, as they stopped relying on the LASG's support (Gandy 2006). In this context, the IE is a symptom of failed governance, as it provides services at the local level to bridge gaps left by the government.

To tackle the urban crisis of informal settlements and lack of basic services, the LASG established the Ministry of Physical Planning and Urban Development (MPPUD) to streamline urban management. MPPUD's statutory responsibilities include:

[103] Slum clearances were never fully carried out around the traditional quarters on Lagos Island for political expediency. Hence, the reason why the area maintained its historical morphology.

I. Initiation, formulation and implementation of Physical Planning, Urban Development and Urban renewal policies and programmes.
II. Preparation of Regional Plans, Master Plans, Model City Plans (MCPs), Local Action and Development Plans.
III. Evaluation, Relocation and Regularisation of Urban based Developments and Activities – including Markets and Informal Sector.
IV. Supervision of agencies: Lagos State Physical Planning Permit Authority (LASPPDA), Lagos State Building Control Agency (LASBCA), Lagos State Urban Renewal Agency (LASURA)

Political antagonism between the democratically elected LASG and the FGN - both from different political parties - culminated in Lagos State being denied its share of the federal budget allocations in the early 2000s. The LASG then sought to maximise its Internally Generated Revenue (IGR) to enable it to govern and rectify the infrastructure deficit. As most tax revenues accrue from formal enterprises, often located in commercial and high-income areas, inadvertently, these areas became the priority for urban governance. Increased IGR via business taxation was however not sufficient to fund the infrastructure deficit. Therefore, a public-private partnership (PPP) model was adopted to develop infrastructure. Two notable projects are the state-wide Lagos Urban Transport Project (LUTP), and area-specific Lekki-Epe Toll Road Concession Project.

The Lagos Urban Transport Project (LUTP) was initiated in 2002 to improve urban transport, and the project was implemented in two phases. The Phase 1 objectives (2002-2010) included building local capacity, road network efficiency improvements, and bus service enhancements. The Lagos Metropolitan Area Transportation Authority (LAMATA) was thus established to coordinate, regulate and plan integrated transport policies (World Bank 2016). LAMATA has developed a 30-year Strategic Transport Master Plan for Lagos (Figure 5-6 shows the BRT system) to integrate all parts of the city efficiently.

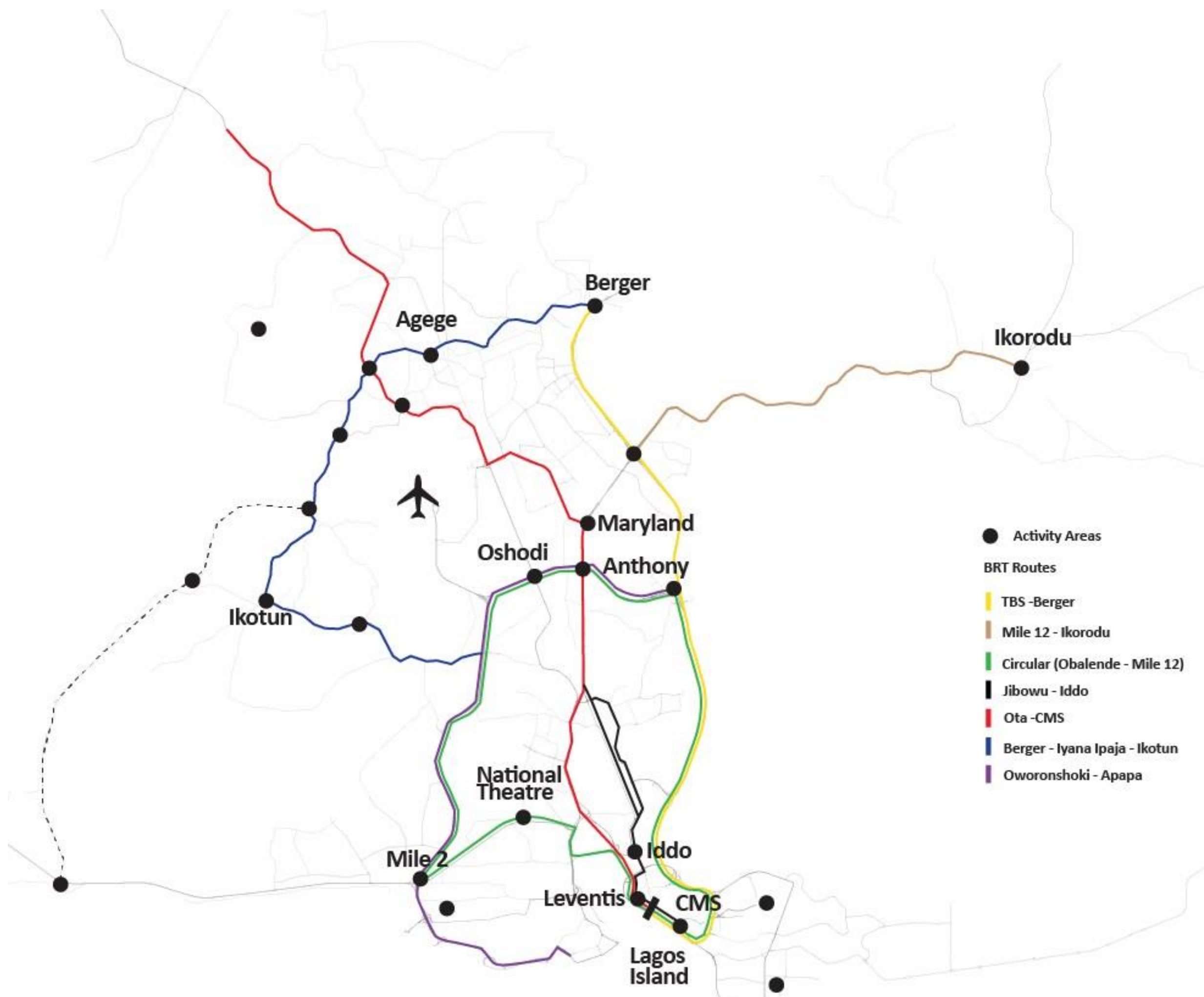


Figure 5-6: Proposed BRT Line for Lagos 2020. Reproduced from LAMATA. Redrawn by Author.

By 2017, about 35 kilometres of Bus Rapid Transit line system (BRT), and the first phase of an urban rail network has been integrated into the existing road network (see Appendix 2). The Lekki-Epe expressway PPP is also an essential component of the LASG's drive to increase tax revenue. The project is the gateway to the Lekki Free Trade Zone (LFTZ) and a new commercial district in the South-eastern part of Lagos (part of Lekki Model City Plan). Even though these projects will improve the transport situation, they also have consequences for SBEs - especially those situated on road set-backs (see Figure 5-5) who have been either relocated or displaced (Bass 2000; Ikioda 2016). For SBEs along the Lagos-Ikorodu expressway, LAMATA provided alternative market locations for relocation, but the STs refused to move - due to the remoteness of the location, amongst other factors, while along the Lekki axis there is no record of alternative locations being provided for displaced STs. To prevent SBEs' infractions along these corridors, the LASG uses a joint team of the Lagos State Environmental and Special Offences Task Force, and the Kick Against Indiscipline (KAI) force[104]. This approach is similar to the way that postregeneration displacements of STs at the Oshodi Market area have been policed since 2009 - Omoegun's (2015) work provides a detailed discussion on displacements in Oshodi (see also Case Study 6 in Appendix 2).

The growth of the geographical limits of metropolitan Lagos by 1999 had spread into bordering states (Ogun State), especially along the north-south expressway corridor. The Lagos Megacity Region is a new term of reference for this contiguous urban conurbation. In 2006 a presidential committee, led by Professor Akin L. Mabogunje defined the boundary of the Lagos Megacity Region to include 20 LGAs from Lagos State and 4 LGAs from Ogun State and set up the Lagos Megacity Authority (Godwin and Hopwood 2012). The 10-year implementation plan in the report identified 28 activity areas, which were to be comprehensively planned as nodal centres (Figure 5-6). There are however no records which indicate if any of the recommendations from this plan have been pursued, but the Megacity slogan has stuck.

At the state level, the Lagos State Model City Development Authority Law was enacted in 2009. To this effect, the MPPUD has developed location-specific planning guidance, called Model City Plans (MCPs). The MCPs are long-term (20-year) planning documents and have been criticised for their inability to accommodate the ever-changing dynamics of a rapidly developing city like Lagos. Consequently, less than five years after approval, the Ikoyi-Victoria Island MCP and Ikeja MCP were reviewed in 2015 and 2017 respectively. These reviews show a willingness of the MPPUD to be flexible in accommodating the ever-changing dynamics of Lagos. However, they also reflect an underlying tendency of urban governance - through the MCPs - to further marginalise the urban poor. For example, in the first version of the Ikoyi-Victoria Island MCP, there are no provisions in the plan for SBEs who operate in this locality, which is probably consistent with other MCPs. This points to a grim reality that in the Lagos Megacity, there is no place for STs and their SBEs. This neglect is buttressed by the fact that the LASG is operating under the Lagos State Development Plan 2012-2025, which only acknowledges the IE in its budget projections as a means for generating taxes. An aggressive taxation and revenue drive is already being conducted

[104] The Kick Against Indiscipline (KAI) is a special environmental enforcement body, set up within the state Ministry of the Environment, which (like the former WAI) is virtually dedicated to the eradication of informal activities, particularly street trading

by the Lagos Inland Revenue Service (LIRS), but there are minimal returns for IE enterprises in urban spatial governance policies and strategies - which further marginalises IE actors.

Within the strategies in MCPs - the current planning guidance - the spatial allocation for SBEs (where existent) are not cognisant with the realities of their spatial requirements. Instead what is being done is the designation of formal markets, which is a tactic that has proved incapable on numerous occasions in the past (Sarin 1982; Balbo 1993). There are also multiple laws which impinge on STs, such as: Environmental Sanitation Law of 2010; Lagos State Street Trading and Illegal Markets (Prohibition) Law of 2003; Lagos State Waste Management Authority Law of 2007; and the Lagos State Road Traffic Law of 2013 (see Section 2.3.1 for discussions on legal pluralism).

5.3 Truncated Modernity

Spatial structures of cities change over time (Sassen 2005) and this results in the active (re)production of new spaces (Lefebvre 1992). The catalysts for the reconfiguration of modalities shaping cities and their urban structures are due to changes in economic relationships between urban actors. Technological advancements have also facilitated changes by providing more efficient means of interactions through transportation and communication (Jacobs 1961; Castells 2008; Kaufmann 2011). Modernism and technological evolution in the case of transportation have 'eliminated frictions once imposed by location and distance on human interaction and on the flow of goods, capital, and information' (Gieryn 2000, p. 463), altering the dynamics relating to material interactions. The impacts of technological transformations on urban landscapes are most evident in the processes of urban concentration and decentralisation (Castells and Hall 1994), which is an indication of the ability of technology to either connect or disconnect functions and activities of cities as urban actors take advantage of varying degrees of connectivity (Castells 2008).

Taking an excerpt from De Soto's (2000) description of the effects of globalisation on the economies of transitional LICs, it can be assumed that more recent technological advancements (the internet, mobile phones, e-commerce) will play a subdued role, or will have a totally different effect on the spatiality of IE activities in comparison to their impact on the economies of the developed world. So, is it valid to assume that the spatialities of cities in LICs are still predominantly centred on relations facilitated by transport parameters? This opens a potential new avenue for research on the activities of informality in LICs, but is beyond the concern of this thesis.

As discussed in this chapter, the urban growth in Lagos has aligned with the opportunities created by the expressway system which has had differing consequences for different income groups of the urban population. The middle-higher income population occupy parts of the city that are fully integrated within this network. In contrast, areas not fully integrated (for example, the Western parts of Lagos) are inhabited by a predominantly lower-income population. Public investments (mostly delivered through privatised finance – for example Public Private Partnerships Schemes) also show a pattern of bias relative to these sectoral divisions - the BRT system and LFTZ as examples. As a consequence of privatised infrastructure development, this also means that STs will be more heavily policed and prohibited from using these areas.

Viewed from a modernist nexus, there are also disparities in how different local government authorities (LGAs) and the LASG deal with STs in Lagos. It is observed that there is a higher tolerance shown to SBEs in lower-income areas compared to higher-income areas. The management of ST activities is conducted centrally at the state level, and at the local government level. The binary management apparatus has a conflicting ethos. As an example, most STs pay some form of a levy to operate in spaces to LGAs which gives them a pseudo-legal status; yet, these levies do not guarantee their legality, and only serve as a revenue-generating mechanism for LGAs – as the LASG does not recognise STs as legal occupants of such spaces. This disparity is facilitated in part by the ideological differences between the two tiers of government (corruption is also a defining factor). At the state level, the government’s concern is the portrayal a befitting city that matches its economic status of as an economically viable state - a vision where informal enterprise has no place - while at the local government level, STs are seen at revenue generating entities.

Urban planning strategies and policies are produced at the state level, and this tends to deliver exclusionary outcomes (Bascom 1955; Mabogunje 1990; Gandy 2006; Acey 2007; Immerwahr

2007), as economic activities which do not fit within the modern/formal conception are marginalised. This bias is influenced by the overarching influence of vested layers of interests (both political and economic). Consequently, the reality for poor urban dwellers is that they cannot easily extract value (legally) within such systems, exacerbating the problems they face. This scenario means that the urban poor can access functional workspace by operating elsewhere beyond the focus of regulatory control, or illegally occupying spaces in high-value locations. As STs need large numbers of small transactions (Fafchamps and Minten 2002), access to a large customer base is essential (Dewar and Watson 1990), often driving STs to settle for high-value but more contested locations. These spaces are typically located in proximity to well-connected locations within the transport network, and considered as public nodes (by the authorities). The occupation of these locations by SBEs creates externalities (both negative and positive), thus providing scope for conflict of interests between those operating an often outdated or biased regulatory structure, and the emergent economies of the urban poor (Brown 2006).

5.4 Chapter Conclusion and Summary

A series of historic events in spatial governance, from colonial bias against the indigenous community, the SAPs, the economic policies of the both the military, and more recent democratic governments which seek to position Lagos amongst the world's megacities, have systematically undermined the urban poor and contributed to the proliferation of SBEs.

Lagos State has grown from a settlement confined to a tiny fishing Island to now encompass an urban conurbation which extends into its neighbouring state (Figure 5-1). The Lagos Megacity region's development has occurred mostly as 'urban sprawl', which with the lack of strategic city planning keyed into the transport infrastructure of the partially executed 'modernist' state project. Since the distribution of benefits within a city is mostly facilitated by its underlying transport network (Sarkar et al. 2014), it is no surprise that the transport network influences the spatial patterns of the IE within Lagos.

Urban management and development are unable to keep with the rapid urbanisation. Therefore, the behaviour of Lagosians has evolved to compensate for the realities of a rapidly urbanising city with massive infrastructure deficit - to become what Gandy (2006) calls a *self-service city*.

Economic transaction behaviour has evolved for both customers and traders, evident in the proliferation of STs across the city. There is a complex co-existence between spatial governance, city inhabitants and STs. STs are considered appropriate in specific areas, but inappropriate in others - SBEs are better tolerated in lower-income areas, in comparison to higher income areas.

Legal regulations are cumbersome and predicated on old standards which are often discriminatory. Where re-enactments to laws have occurred, they have been conducted incrementally, with the addition of more rules without clearing incongruities and issues from earlier versions (Bromley 2000). Institutionally, there is no synergy between different levels of government. The local government authorities (LGAs) – which are the closest level of governance to citizens - are not adequately empowered. In areas where SBEs are tolerated and licensed by LGAs, the LASG through the KAI, often do not recognise this arrangement.

In sum, a complex mix of persecution, tolerance, regulation and promotion has defined the LASG's containment strategy on street trading - borrowing from Bromley's (2000) discussions.

6 Street-Based Agglomeration Economies and Road Network Configurations

6.1 Introduction

This chapter is the first of a two-part analysis, which aim to provide an alternative evidence-based perspective on ST hotspot locations and inform better spatial governance in LICs. This chapter details the results of studies conducted at **the city scale**, aimed at exploring relationships between the multi-scale accessibility of the road transport network and the distribution locations that are prolific in hosting SBEs in Lagos State. To achieve this, the potential spatial interactions that are facilitated by the positions of STs' customers are examined as the determinants of SBEs locational decisions. To study these interactions within the sDNA-sBEL model, it is assumed that other relevant and associated factors[105] that might also influence such transactions are available and accounted for. The results thus allow this chapter to address the research question which sought to understand to what extent spatial accessibility is an important factor in defining the locational patterns of SBEs in Lagos.

Section 6.2 explores metrics of betweenness[106] (see Section 4.5.1) to identify the implications in their application towards understanding the flows of people along the road transport network in Lagos. Section 6.3 categorises the constituent links of the road network relative to their betweenness values to assess the patterns formed and their relationships with the locations of ST hotspots - i.e. where concentrations of STs occur. Section 6.4 examines the performance of the road network - as defined by statutory classifications - to ascertain possible relationships between the network and the location of ST hotspots. Finally, Section 6.5, links the findings from this chapter to make conclusions. The results from the studies showed that segments of the road network with the highest values of Angular macro-scalar accessibility, coincided with the highest percentage of ST hotspots in Lagos. Therefore, it was concluded that ST hotspots at a city-wide scale are likely to concentrate their activities in locations with a high volume of vehicular traffic.
The term 'ST event' is used as the unit measure of an individual street trader, identified by conducting a head count of STs during fieldwork; while, 'ST hotspot' is an observed unit of agglomerated street trading events identified from focus group interviews with key stakeholders.

[105] (1) Goods and services to be traded (2) Interested shoppers (3) financial ability to trade, and so on.
[106] Betweenness = 'betweenness centrality', assumed to facilitate the most possibilities for interactions between STs and customers – based on modelling the flow potentials of passengers along transport networks.

6.2 Analytical Metric for Commuters Flows along Transport Networks

In this section, the results from assessments of betweenness for both Euclidean (BtE) and Angular (BtA) metrics are presented. The studies were conducted to identify the most accurate basis to study relationships between the mobility of people within the road transport network system in Lagos as proxies for potential customers of STs, and the locations of ST hotspots[107]. A twopronged approach is used to identify which metric of betweenness is best suited to identify this association, by categorising the accessibility levels of each link in the road network to allow for comparisons between them. The purpose for this identification is because in literature there is a cognitive differentiation made between Euclidean and Angular geodesics (Euclidean for people familiar with journey routes and Angular for people that are not familiar with journey routes). However, the literature fails to acknowledge that the shortest Euclidean path might also be the least Angular path. Viewed from an urban design lens, the morphology of space at different radii may have a telling influence and change BtE and BtA's ability to study flow potentials[108]. This assessment follows Zhang et al. (2015) who advocated for such comparisons to identify underlying disparities and similarities morphological contextual conditions that may fluctuate at various spatial scales, due to uncertainties of which metric is best suited in different urban contexts. As different transport modes facilitate different forms of spatial centralities (Xiao et al. 2016), betweenness centrality is investigated on a multi-scale basis using defined analytical distances which represent passengers' average journey distances.

6.2.1 Travel behaviour, Modal Split and Trips Length in Lagos

In this section, travel behaviour is detailed to establish analytical distances of passenger's journeys for multi-scale betweenness studies. In Lagos, 95% of all trips are road-based (Osoba 2015), and road-based public transportation accounts for 77% of all passenger trips in Lagos (LUTP 2002). Osoba's (2015) study showed that single-purpose trips to work and business-related activities accounted for 77.7% of all road journeys and 7.9% of trips were shopping activities.

---

[107] From literature it has been established that betweenness accessibility provides the most accurate basis to study the location of economic activities.

[108] Euclidean metric measures accessibility by minimising the number of metres travelled along the network, Angular metric measures accessibility by minimising the cumulative angle turned along each route.

Ibitayo's (2012) modal share research indicated that *Molue* (big buses) accounted for 10.8% of journey stages, *Danfos* (minibuses) 28.4%, private cars 20.1%, *Taxis* 7.8%, and *Okadas* (passenger-carrying motorcycles) at 24%. *Keke Napep* (auto-rickshaws) and walking and were the least used at 2.5% and 6.4% respectively. Other modes like *kabu-kabus* (shared taxis) and Bus Rapid Transit system (BRT) are however not accounted for by Ibitayo (2012). Mobereola (2009) estimated that the 'BRT lite' bus system accounted for 200,000 commuter journeys daily - which is relatively low in a city the size of Lagos - and its operation is projected to have reduced the reliance on other means of transportation. Highlighting that private car trips have declined by 1.1% in 2009 (Mobereola 2009), and *Molues* which feature in Ibitayo's journey stage data have been phased out.

In Lagos, passengers using public transport experience high rates of modal changes across multiple journey stages, even for trips with relatively short distances. Typically, the longer a trip the higher the chances are for several journey stages. *Okadas* and *Keke-Napeps* either act as means of transport for the first or last stage of a journey, or are the main modes of commuting[109]. According to Alade (2009), the average daily trip distances in Lagos is 12,000m (this figure accounts for all modal changes). The breakdown of the average travel distance from Alade's study indicates that 50.4% of daily trips were less than 5,000m, 18.3% were between the 5,000m to 10,000m range, while 15.7% of daily trips were between 11,000m and 20,000m, and 15.6% were above 20,000m. This means that 70% of trips are less than 10, 000m.

The average distance commuted on BRT buses is 5,000m (Orekoya 2010), and the mean distance commuters were willing to travel to access a BRT bus stop was 365m - with a majority (61%) of these trips being less than 200m (Olawole 2012). The modal share for commuting to BRT bus stops are 24.5% for walking, 36.5% by *Okada*, and 39% by *Danfo*. Olawale's study also revealed that most BRT users would instead use other modes besides walking, to get to bus stops. It is interesting to note that the average daily trip distance in Lagos not too far from London's

[109] Okadas and Keke-Napeps predominantly cater to short single journey trips, or as intermediaries' modal stages. In most instances, they are used to reach locations not plied by other transport modes, and also to beat traffic congestion - as a time saving measure. No data on the average distances travelled using *Okadas* and *Keke-Napeps* in Lagos was found. Reference to other cities was used for benchmarking purposes. It was tricky to extrapolate data, due to contextual dynamics which influence the behavioural tendencies of commuters, but studies on autorickshaws from cities in Asia indicate that the average daily journeys were: 12.8km in Dhaka and 5.25km in Mumbai.

(12,000m in the former while the latter is between 14,000 to 16,000m) - the similarity is surprising as these two cities have very different layouts, levels of accessibility and infrastructure.
In Rio de Janeiro, the average distance for a single trip is also similar at 12,300m (Moovit 2017).

Alade's study also highlights a relationship between socioeconomic status and the distance travelled. Trips above 10,000 m are mostly commutes to formal places of work, and thus typically not made by people in the informal economy. Informal economic actors (as low-income earners) or self-employed people tend to live close to their place of work and activity centres in order to minimise the cost of travel within the city (see Section 7.5 for a more detailed description). The outline of the transport situation in Lagos sets the scene for the rest of this chapter.

6.2.2 Multi-scale Accessibility in Lagos

The analytical distances - referred to here as '*radii'*[110] - are classified relative to the average journey stages of the main transport modes in Lagos which ranged between 150m to 600m for pedestrians, from 1,000m to 2,000m for *Okada*s and *Keke-Napeps*, from 1,000m to 5,000m for Danfos, and from 5,000m and above 10,000m for private automobile trips. Based on this data, macro-scale accessibility was classified as the travel of 5,000m and above, meso-scale accessibility was between 1,000m and 2,000m, and micro-scale accessibility was between 150m and 600m. With these values, multi-scale BtE and BtA assessments were conducted on the road network of Lagos.

[110] Analytical distances are prefixed with '**R**' to connote that they are radii. R400 means a 400m radius distance.

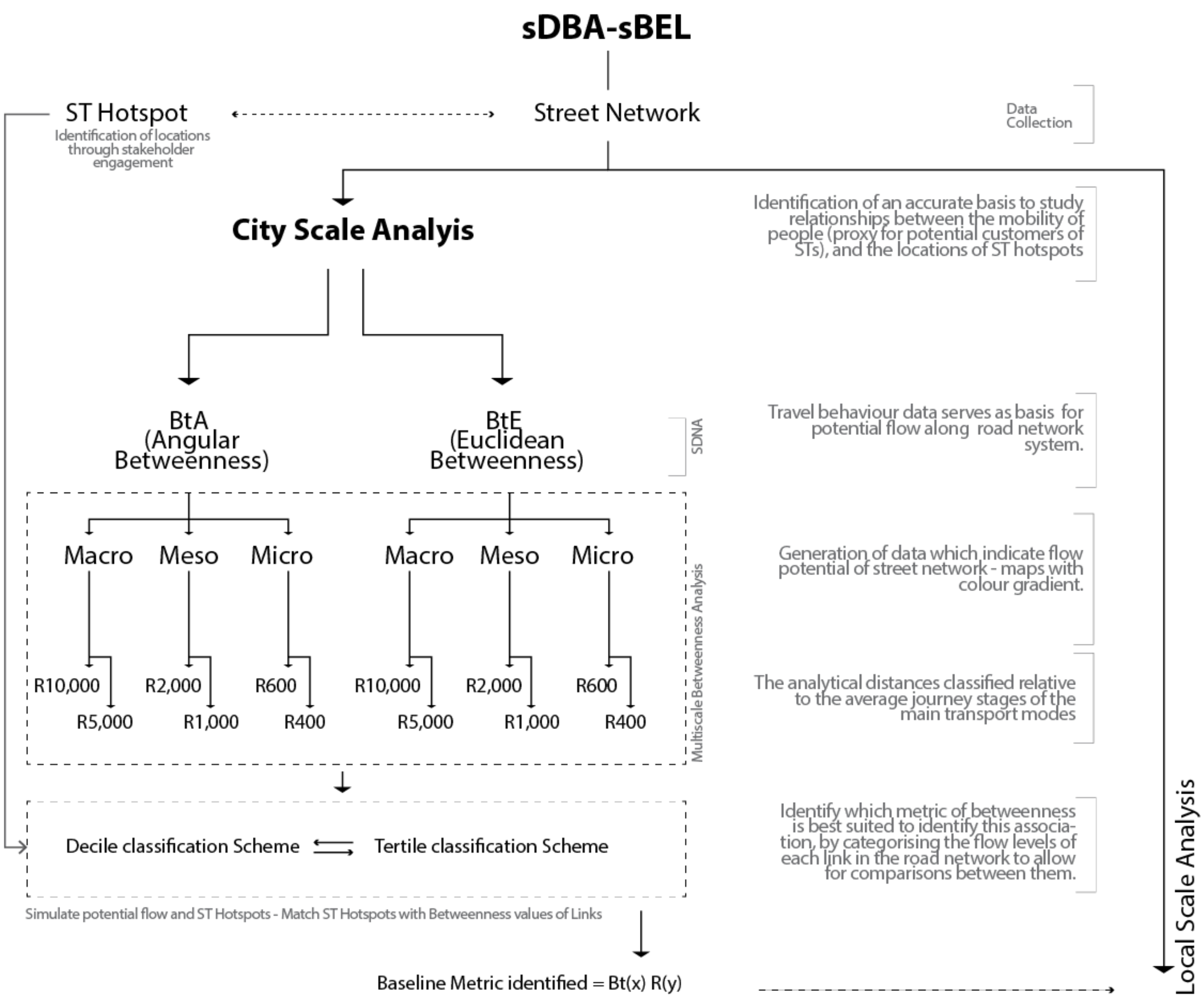


Figure 6-0: Schematic diagram of city scale assessment conducted in sDNA-sBEL

Figure 6-0 provides a guideline of the processes involved to undertake the analysis at the city scale in this chapter.

Results from multi-scale BtA (Angular Betweenness) and BtE (Euclidean Betweenness) assessments within the sDNA-sBEL model are indicated in Table 6.1 for the statistical distribution of their values, and cartographically in Figure 6-1 (BtA R400), Figure 6-2 (BtE R400), Figure 6-3 (BtA R5,000), and Figure 6-4 (BtE R5,000) for visual representation.

Table 6-1: BtE and BtA variable descriptions for the transport network in Lagos

	Min	Median	Max	Mean	St. Dev
BtA R400	0.00	35.55	1612.31	69.21	98.25
BtE R400	0.00	34.33	1317.77	65.11	89.66
BtA R600	0.00	94.63	4630.74	199.66	310.22

BtE R600	0.00	91.70	4619.42	187.03	272.70
BtA R1,000	0.00	305.61	24564.36	785.35	391.59
BtE R1,000	0.00	312.60	22245.80	722.23	1143.87
BtA R2,000	0.00	1296.00	133035.91	4720.57	9420.35
BtE R2,000	0.00	1483.94	102510.00	4279.10	7300.94
BtA R5,000	0.03	7814.06	1539248.63	50647.13	121805.35
BtE R5,000	0.03	10067.00	1517450.00	46414.00	93829.00
BtA R10,000	0.33	27539.90	16038064.00	307789.69	921084.79
BtE R10,000	0.33	37310.80	14087300.00	294597.00	716372.00

The description of the values represented in Table 6-1, show variations in BtA and BtE for the different radii assessed. It is evident that the distribution of multi-scale betweenness accessibility between the two metrics is unevenly distributed. The data values indicate that BtA has higher levels of accessibility in comparison to BtE for the same set of links [111]. The statistical representation in Table 6-1 is aggregated and provides little insights to support the contextual readings for this research. It however, provides something an expected outcome, as Euclidean geodesics are more dispersed in comparison to Angular geodesics which are more concentrated at all scales.

[111] This is expected as BtA tends to cluster geodesics onto a smaller set of links.

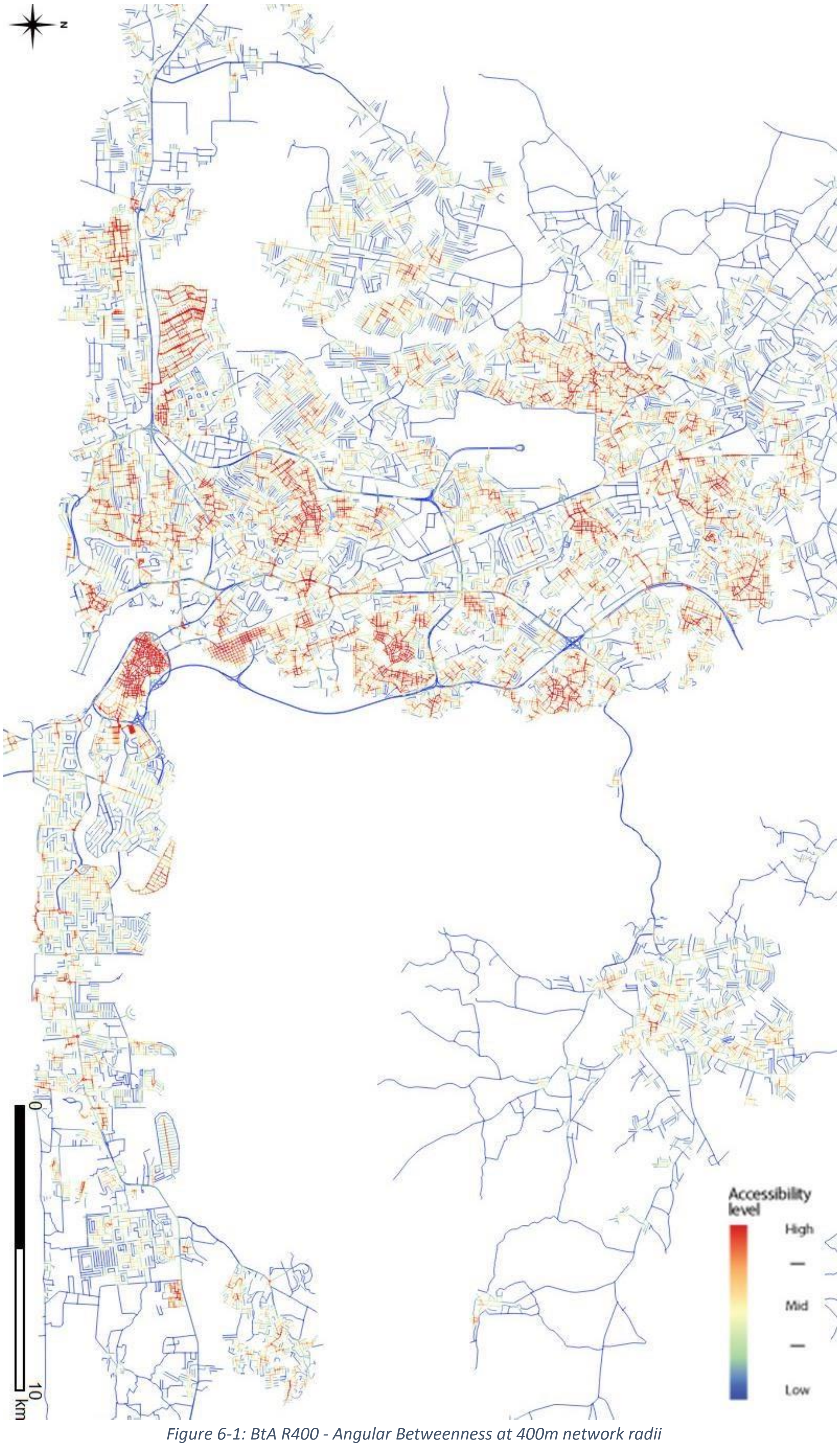


Figure 6-1: BtA R400 - Angular Betweenness at 400m network radii

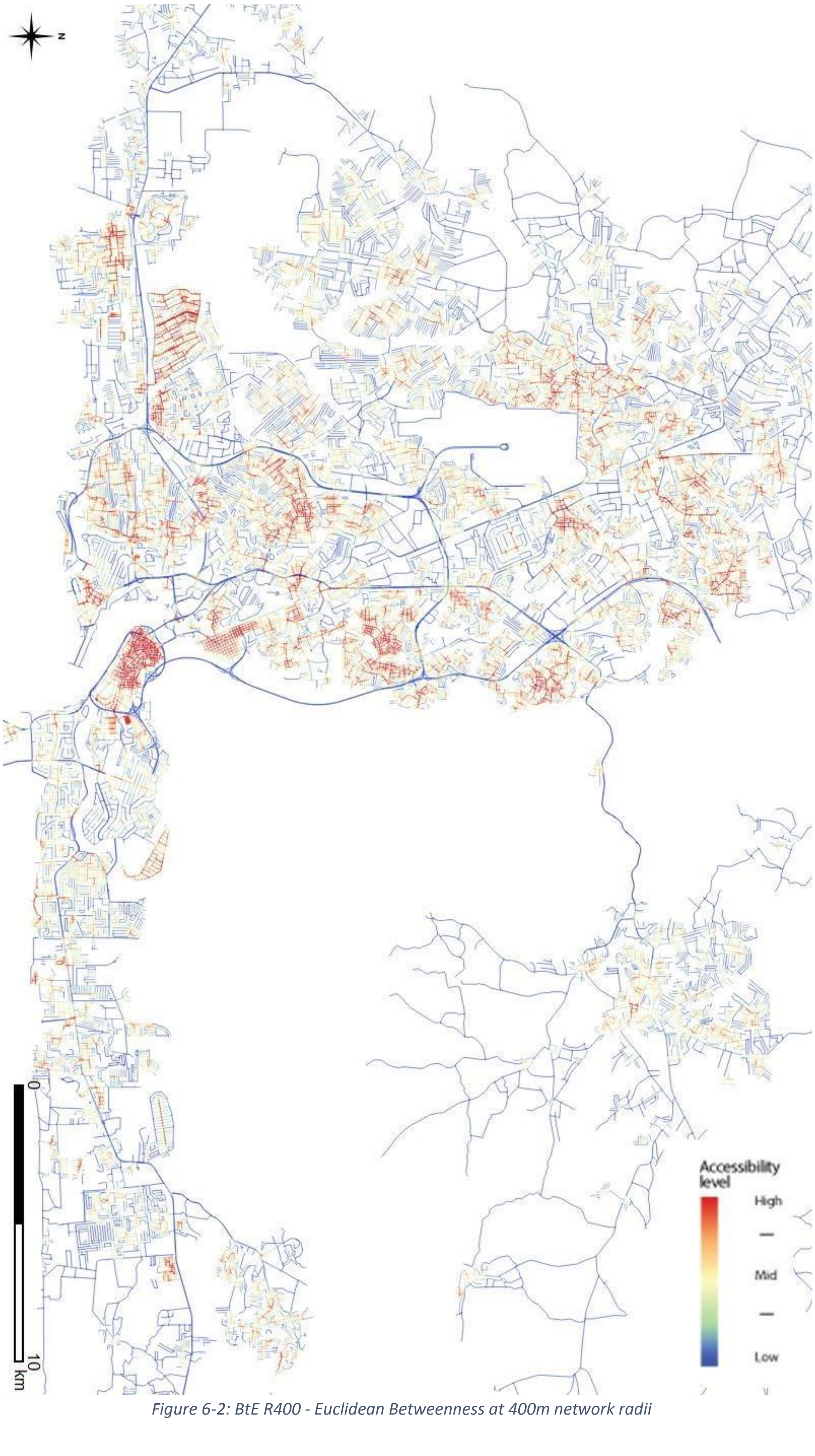


Figure 6-2: BtE R400 - Euclidean Betweenness at 400m network radii


N
0
10
km
Accessibility level
High
Mid
Low

Figure 6-3: BtA R5,000 - Angular Betweenness at 5000m network radii

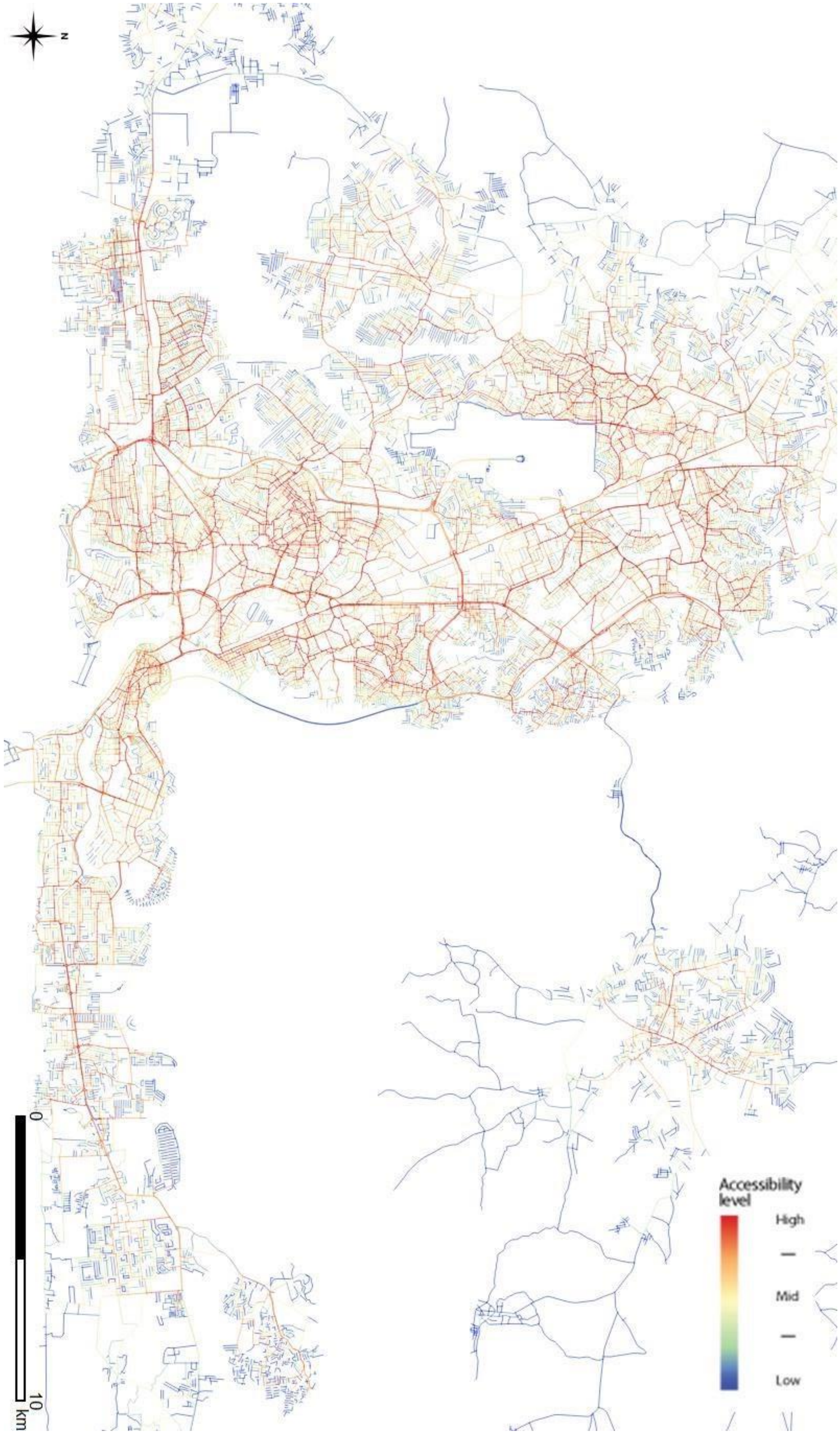


Figure 6-4: BtE R5,000 - Euclidean Betweenness at 5000m network radii

Figure 6-1 to Figure 6-4 provide different representations of the accessibility data in Table 6-1 (for 400m and 5,000m radius). As discussed more fully in Sections 4.5.1 and 4.6.3, the cartographic data are road-centre lines which were extracted from the OpenStreetMap repository. Before the spatial profiling (BtE and BtA analysis) which generated the maps in Figure 6-1 to Figure 6-4, the integrity of the road data was checked for errors. Several errors were identified and corrected[112]. The most fundamental error identified was the unequal mapping of links within the study area - as this would result in a biased the reading of accessibility. Therefore, the missing road links that could be identified by the author were corrected, by editing the data in QGIS. However, the author acknowledges the possibility that there are still many missing links even after a painstaking effort to correct the data. Therefore, the BtA and BtE analyses are biased to the correctly mapped areas.

The colour gradient in Figure 6-1 to Figure 6-4 indicates the accessibility levels of links within the transport network, with Red (hot) being the most accessible, and Blue (cold) the least accessible. A comparison between these maps shows very slight disparities between the patterns for BtA and BtE. However, it gives no reading on which metric is most appropriate for this analysis; and therefore, such cartographic representations of accessibility are useful for making quick appraisals, but fall short of empirical detail.

From Table 6-1 it seems that outcomes of the BtA and BtE analyses are different, with BtA simulating more concentrated flows and BtE more dispersed flows at all scales. Consequently, Table 6-1 and Figure 6-1 to Figure 6-4, did not provide a sufficient basis to make a selection between BtA and BtE as the metric that best suits the objectives of this research. Thus, to assess disparities and commonalities between BtA and BtE attributes, further studies were conducted. These studies subcategorised the road network system based on the multi-scale accessibility values of their constituent links (similar to Zhang et al.'s (2015) classification scheme) and were structured according to a decile and tertile classification scheme.

[112] OSM cartographic data is prone to errors due to its crowd-sourced nature.

1. *A decile classification* scheme: this divided BtA and BtE values into ten equal subcategories, to portray a fine level of resolution for the accessibility values of network segments within the transportation system - see Table 6-2.

Table 6-2: The decapartite hierarchical distribution of road network links

Decile	Accessibility distribution range	Value
Q1	0 - 10%	Lowest
Q2	10% - 20%	
Q3	20% - 30%	
Q4	30% - 40%	
Q5	40% - 50%	
Q10	90% - 100%	Highest

2. *A tertile classification* scheme: this divided BtA and BtE values of the transport network into three equal sub-categories, to mirror the statutory road network classification in Lagos (T1= *Trunk C* - local roads; T2= *Trunk B* – secondary roads; T3= *Trunk A and F* - major roads) - see Table 6-3.

Table 6-3 The tertile hierarchical distribution of road network links

Tertile	Accessibility distribution range	Value
T1	0 – 33.3%	Lowest
T2	33.3% - 66.6%	
T3	66.6% - 100%	Highest

The two classification schemes (outlined in Table 6.2 and 6.3) are captured in Table 6-4, to reflect the associations between BtA and BtE attributes of the transport network in Lagos. 99.8% of network links that fell within the upper range of the median value (the 50th percentile) for BtA R400, coincided with links which were in the 50th percentile of BtE R400. For other radii levels at R600, R1,000, R2,000, R5,000 and R10,000; 99.4%, 99.1%, 98.2%, 97.3% and 97.4% of links in the 50th percentile of BtA coincided with links in the 50th percentile of BtE.

Table 6-4: Overlap between BtA and BtE profiles of links in the road network system

Percentile	R 400	R 600	R 1000	R 2,000	R 5,000	R 10,000
Top 50%	99.80%	99.40%	99.10%	98.20%	97.30%	97.40%
Top 33.3%	99.30%	99.00%	97.90%	95.10%	92.50%	92.00%
Top 20%	98.20%	97.10%	95.80%	91.30%	86.80%	84.30%
Top 10%	97.30%	96.00%	93.40%	87.00%	78.00%	75.00%

A trend observed with the increase of radii values across each classification segment was that the coincidence between links with similar accessibility attributes reduced with direct proportionality; R10,000 had the lowest percentage of coincidence for BtA and BtE, while R400 had the highest percentage. The reductions witnessed appear most significant for the top 10% (90^{th} percentile), and this variance will possibly influence the reading of accessibility. The values in Table 6-4 indicate some level of commonalities between BtA and BtE as metrics for representing betweenness accessibility in Lagos.

Table 6-4 shows that the top level BTA have much less overlaps with BtE. From the point of view of STs it is important to see which is better at accounting for their location. The correlations observed between BtA and BtE are more defined for the transport modes in Lagos, in comparison to Zhang et al.'s (2015) findings in Shanghai. Zhang et al.'s findings led them to suggest that either of BtA and BtE, could be used as proxies to assess accessibility. The similarities between BtA and BtE in Lagos gives credence to the uncertainties expressed in earlier research about which metric of betweenness best correlates with spatial behavioural patterns. Based on the variations witnessed in the studies conducted in this section, there was a 22% variation between BtA and BtE at R 10,000 (a trend which reduced relative to smaller radii).

There are different scenarios possible from this trend:

I. Micro-scale BtA and BtE would produce similar results in analysing networks in Lagos.
II. Macro-scale BtA and BtE would produce significantly different readings in analysing networks in Lagos.

As stated in Section 3.3.3, the Euclidean metric reads betweenness in a more dispersed way in comparison to the Angular metric – which is more compact, and could have policy implications when exploring network design in cities. It is therefore plausible to assume that either of the metrics could be adopted for this research because how ST hotspots respond to the dynamic of these betweenness metrics, is unknown. Therefore, the validity of BtA and BtE will be tested using the multi-scalar profiles defined in this section, against the actual occurrences of ST hotspots (identified using cognitive maps[113] derived from focus groups with key stakeholders) to ascertain the impact of these subtle differences to the observed situation in Lagos.

6.3 Simulated Potential Flows within Transport Networks and ST hotspots

In this section the potential flows within the transport network is simulated to study ST hotspots. The prevailing understanding of SBEs is that to thrive, their workplaces should enable them the greatest possibilities of interacting with potential customers, and thus sections of the transport network with high volumes of passenger flows (coincidences in passenger trips) should provide a location for ST hotspot. 111 ST hotspots were identified from focus groups conducted during the field work. In turn, this section explores the relationship between actual these ST hotspots and locations with high multi-scale betweenness accessibility - which models passenger behaviours for the main transport modes in Lagos. From the previous section, the discussion on the choice of which betweenness accessibility metric was best suited for analysis was inconclusive, so, in this section both BtA and BtE are assessed empirically.

To operationalise the studies conducted in this section, the 111 ST hotspots identified within Lagos were overlaid against the transport network of Lagos within the sDNA-sBEL model in QGIS (Figure 6-5). Spatial queries were then initiated, which identified ST hotspots that coincided with network links relative to hierarchical distributions of the multi-scale BtA and BtE values profiled in Section 6.2.2. The results from these procedures provided the basis to match ST hotpots with flow potentials of road network segments. Links without ST hotspots were not profiled within the assessments, because the total number and location of ST hotspots in Lagos is not known, which

[113] The cognitive maps were developed to reflect the ideas of behavioural geography (see more in Section 3.4).

would have led to an untrue test with biased outcomes. Therefore, the statistical sensitivity and specificity were not diagnosed.

Figure 6-5: Map of Lagos road network showing the 111 ST Hotspots (black dots) overlaid with BtA R5,000.

Based on the classification scheme of accessibility distribution defined earlier in Table 6-2, it was discovered that: 41%, 56%, 76%, 89% and 91% of ST hotspots recorded at the R400, R1,000, R2,000, R5,000, R10,000 respectively, were located on links which fell within the upper median for BtA. These values indicate that there was a significant increment in the occurrence of ST hotspots, relative to higher network radii values for BtA (Figure 6-6).

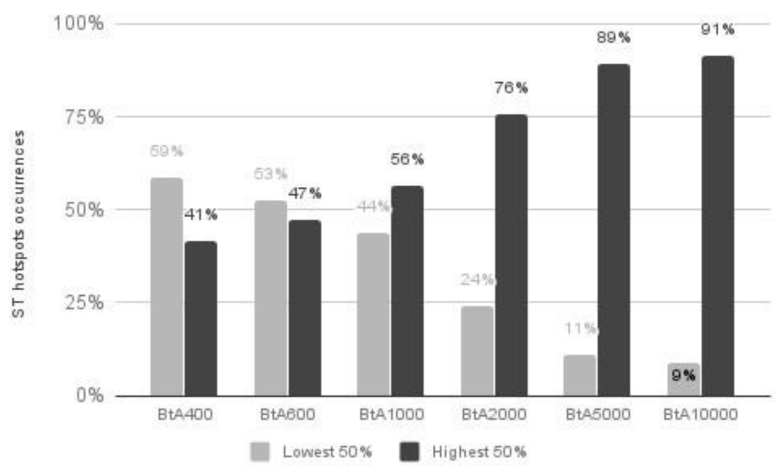


Figure 6-6: Distribution of ST hotspots in relation to multi-scale BtA

For BtE, a similar trend occurred where: 44%, 58%, 69%, 86%, and 89% of ST hotspots recorded at R400, R1,000, R2,000, R5,000, R10,000 respectively were located on links which fell within the upper median of accessible locations (Figure 6-7).

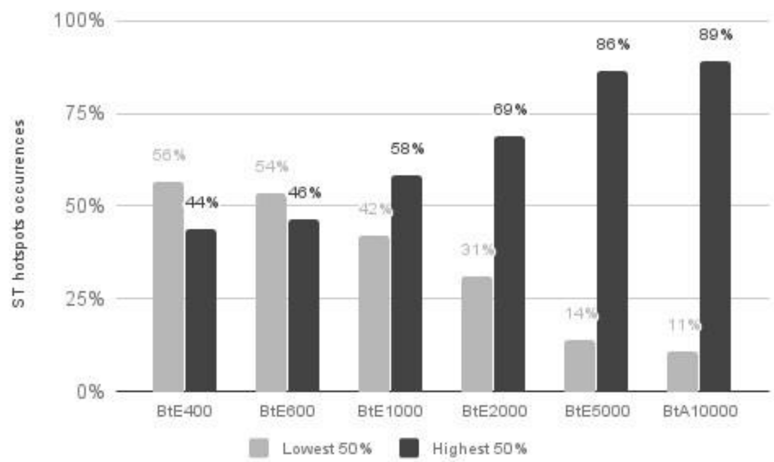


Figure 6-7: Distribution of ST hotspots in relation to multi-scale BtE

The outcomes of the distributions for both accessibility metrics (see Figure 6-8), indicates a marked decrease in the occurrence of ST hotspots in the lower median range. A relationship between the increment in radii distances for both metrics of multi-scale betweenness accessibility, and the occurrence of STs hotspots are also evident.

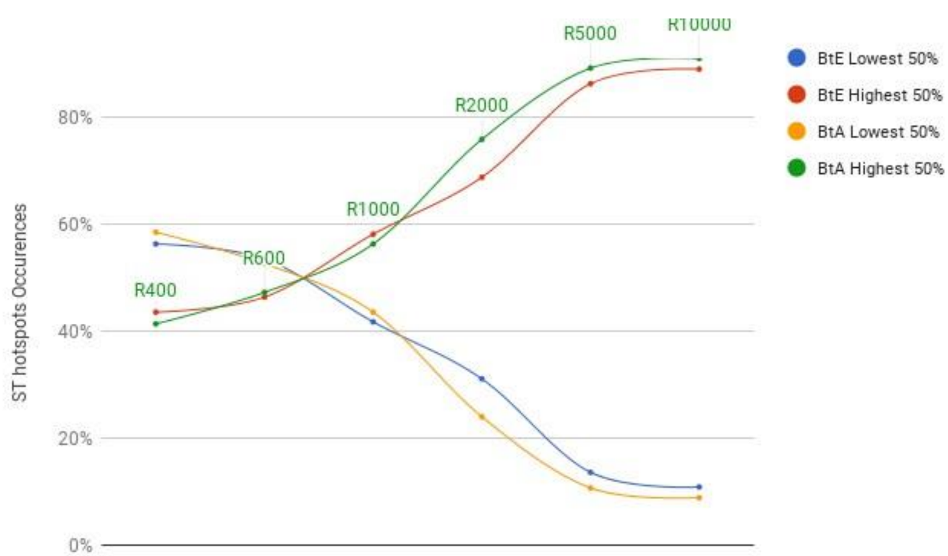


Figure 6-8: Distribution of ST hotspots in relation to multi-scale BtA and BtE

The distribution trends for both BtA and BtE values relative to ST hotspots were also studied to depict finer details of their relationships. Figure 6-9 and Figure 6-10 indicate that most ST hotspots occurred on links that fell within the T3 - based on the statutory road classification in Table 6-3. R400 and R600 for BtA and BtE, do not show significant variations between T1 and T3.

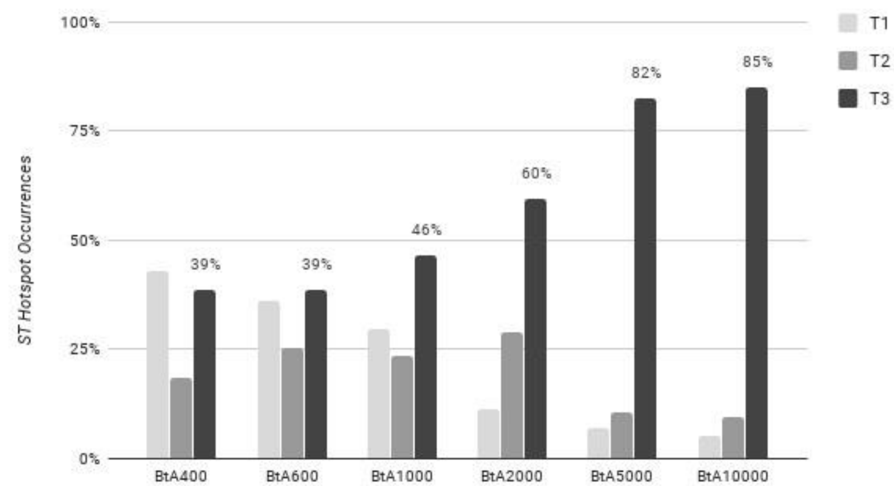


Figure 6-9 Distribution of ST hotspots in relation to multi-scale BtA

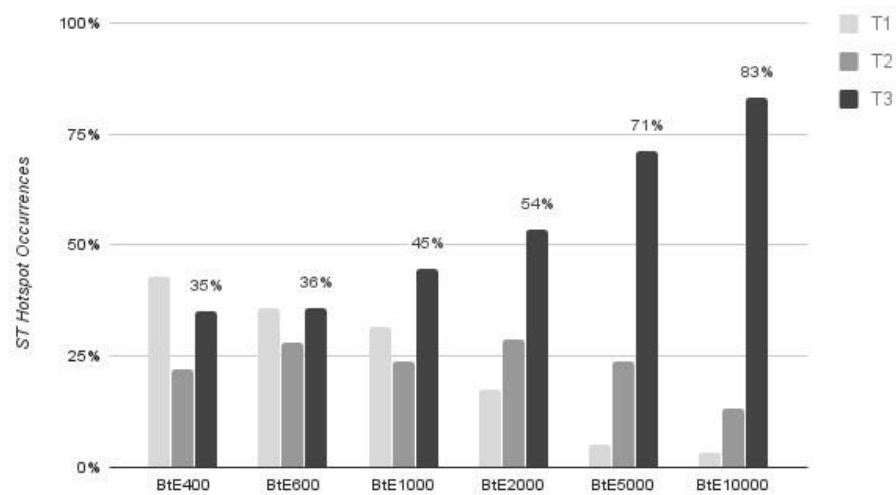


Figure 6-10 Distribution of ST hotspots in relation to multi-scale BtE

In Figure 6-11 and Figure 6-12, trends for both BtA and BtE decile distribution values relative to ST hotspots showed that ST hotspot fluctuated in a varied but fairly uniform manner. The 10th decile (Q10) hosted the most significant number of ST hotspots at the macro-scale (vehicular accessibility).

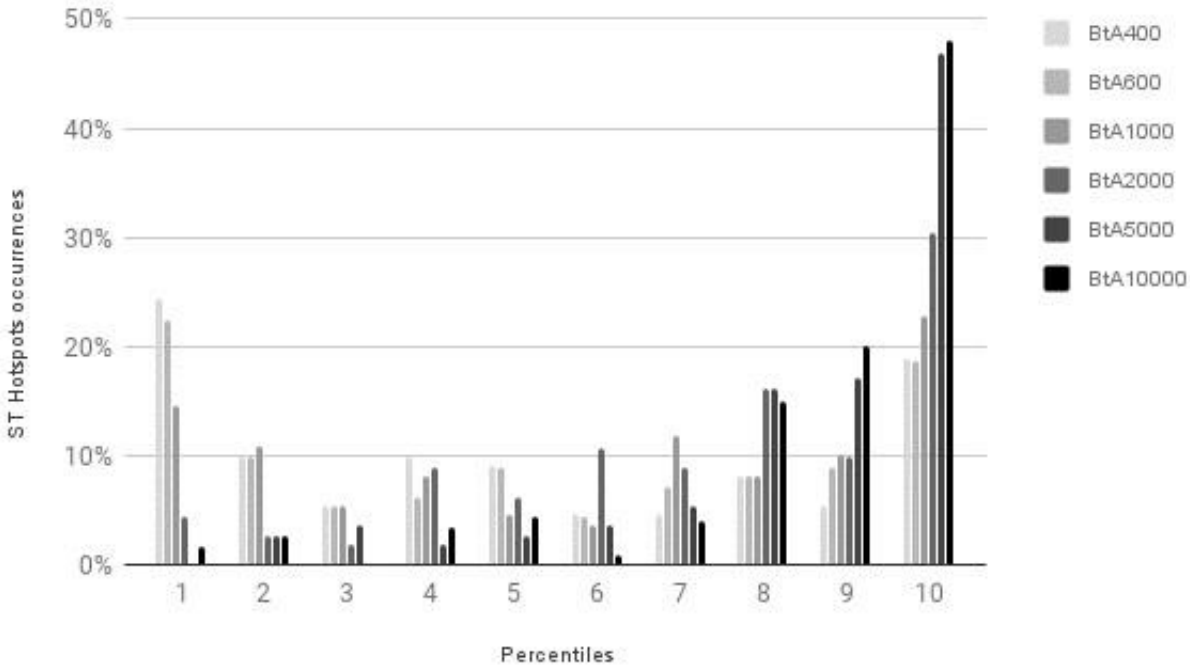


Figure 6-11: Distribution of ST hotspots in relation to multi-scale BtA

For both R400 and R600 (micro level - pedestrian accessibility), ST hotspot occurrences were less frequent along the mid-range of the distribution (Q2, Q3 ... Q9), but peaked at the two extreme ends i.e. Q10 and Q1 - the highest and least accessible link categories respectively, suggesting that pedestrian accessibility supported ST hotspots at both its peak and when it was at its lowest levels. This is a paradox, and it is explored later in this section. While for R5,000 and R10,000 (macro level – vehicular accessibility), Q1 had no ST hotspots, this was a clear contrast to R400 - where 25% and 27% of the recorded ST hotspots for BtA and BtE respectively occurred at Q1 (Figure 6-11 and Figure 6-12). For R5,000, a spike in ST hotspot occurrences is evident relative to increments along the decile tiers, which suggests that ST hotspots occur mutually at locations with higher levels of accessibility, and peaked at Q10.

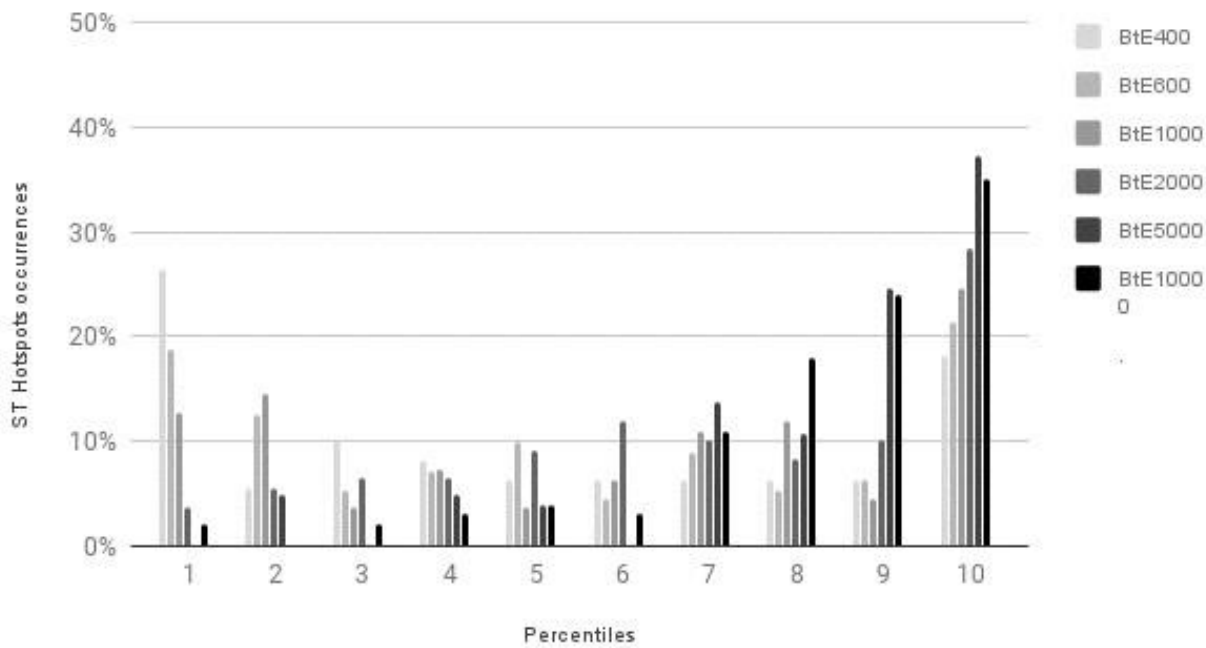


Figure 6-12: Distribution of ST hotspots in relation to multi-scale BtE

Another observation from Figure 6-11 and Figure 6-12 is that Q1 R400 and Q10 R5,000 respectively had the highest occurrences of ST hotspots, and this verifies a permeability notion from morphological studies (see Section 3.3.3), which suggests that network links with low accessibility values based on a micro-scale accessibility metric, should show some similarities to links with high accessibility levels based on a macro-scale accessibility metric. This conclusion suggests that the most accessible locations based on micro-level accessibility metrics are synonymous to city blocks with small footprints (Jacobs 1961; Siksna 1997), because such morphological attributes influence pedestrian movements. Conversely, small sized city block footprints translate to low levels of accessibility when applying macro-level accessibility metrics as described by Chiaradia et al. (2013b).

To give further insights, the least accessible links at a micro-scale (R400) were explored to monitor potential correlations with the most accessible links at a macro-scale (R5,000) - as they both hosted the highest number of ST hotspots. In other words, links in Q1 for R400 were explored to monitor if they coincided with links in Q10 for R5,000 (expressed for only BtA). The outcome indicated that 10.3% of the links in Q1 R400 coincided with links in Q10 R5,000; which indicates a minimal correlation between these categories. It was also observed that 14 ST hotspots occurred on the links which correlated between for Q1 R400 and Q10 R5,000, and this respectively represented 52% and 27% of the ST hotspots which occurred on them individually. This suggests some form of relationship between the links which hosted ST hotspots at these two scales which hosted ST hotspots, especially for Q1 R400, as most of its ST hotspots coinciding with Q10 R5,000.

On the other hand, 42.8% of the links in Q10 of R400 coincided with Q10 R5,000. This finding indicates that 90% of the ST hotspots recorded at Q10 R400 also coincided with Q10 R5,000; while 37% of ST events recorded at Q10 R5,000 coincided with Q10 R400. This correlation between the distribution of links occurring within Q10 across both R400 and R5,000 is more pronounced in comparison to Q1 R400 and Q10 R5,000 and is a paradox. Ultimately, micro-scale and macro-scale accessibility are not mutually exclusive and overlaps occurred between network links relative to the assessment metric utilised. This suggests that a single radius is incapable of adequately representing the relationships of betweenness accessibility and ST hotspots. The table below shows the relationships between multi-scale accessibility values of links for Q10[114].

Table 6-5 Coincidences between Links situated in Q10 for multi-scale Betweenness

	R400 R600	**R400 R1,000**	**R400 R2,000**	**R400 R5,000**	**R400 R10,000**	**R1,000 R5,000**
BtE	94%	83%	70%	45%	38%	58%
BtA	93%	81%	64%	42%	35%	56%

Table 6.5 indicates that Q10 R400 and Q10 R1,000 had 81% of their links in common, while Q10 R400 and Q10 R5,000 had 42% in common. This commonality between links shows why ST hotspots values fluctuate relative to scalar levels employed to analyse betweenness accessibility (Figure 6-13).

[114] Q10 was assessed specifically because it hosted the highest number of ST hotspots at all scale level.

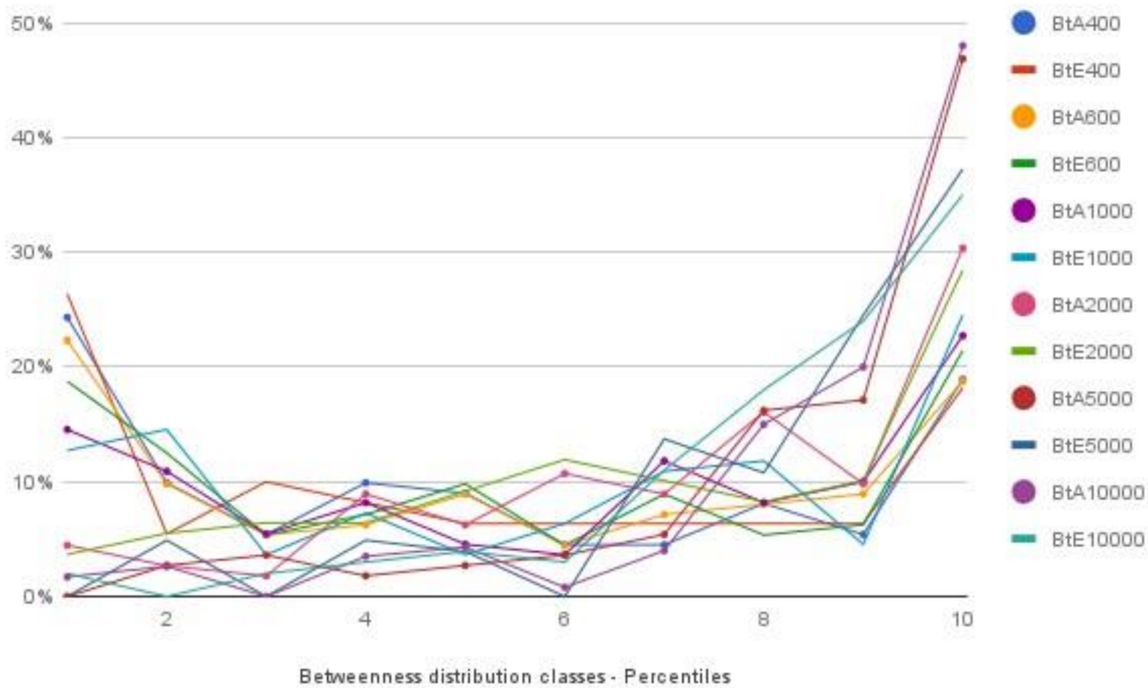


Figure 6-13: Distribution of ST hotspots in relation to multi-scale BtE and BtA

The conclusions from these studies are that:

1) Q10 across the multiple scales analysed accommodated the most ST hotspots, and this was most pronounced for macro-scale accessibility. The most accessible links of the road networks at a macro-scale provided the best fit with observed ST hotspots at the citywide scale, and therefore served as the baseline metric used in further research.

2) In relation to the metric of betweenness accessibility best suited to employ for this research, the Angular metric (BtA) provided the best fit. This was because BtA consistently gave better correlation to the highest occurrences of ST hotspots than BtE. For example, 46% of ST hotspots coincided with BtA R5,000, while only 37% of ST hotspots coincided with BtE R5,000.

6.4 Accessibility and Transport Network hierarchy

In this section, the performance of the road network in Lagos is analysed. The road hierarchy used in Lagos State Government's Highway Code was used for the road network classification. The purpose of studying the road classifications as a framework was to ascertain if and how its current configurations have influenced the formations of ST hotspots (beyond socio-political factors highlighted in Section 2.3 and Chapter 5). The analysis in this section was also conceived to test the outcomes sDNA-sBEL's multi-scale betweenness accessibility assessments against the road hierarchy classification in Lagos - as a basis to validate its accuracy.

The road network system in Lagos is categorised by a three-tiered hierarchy into Trunks A[115], B, and C (see Figure 6-14). These hierarchies are defined according to two criteria: 1) the function of the road and expected level of vehicular traffic (which vary), 2) governance control - depending on which government level is responsible for its construction and maintenance.

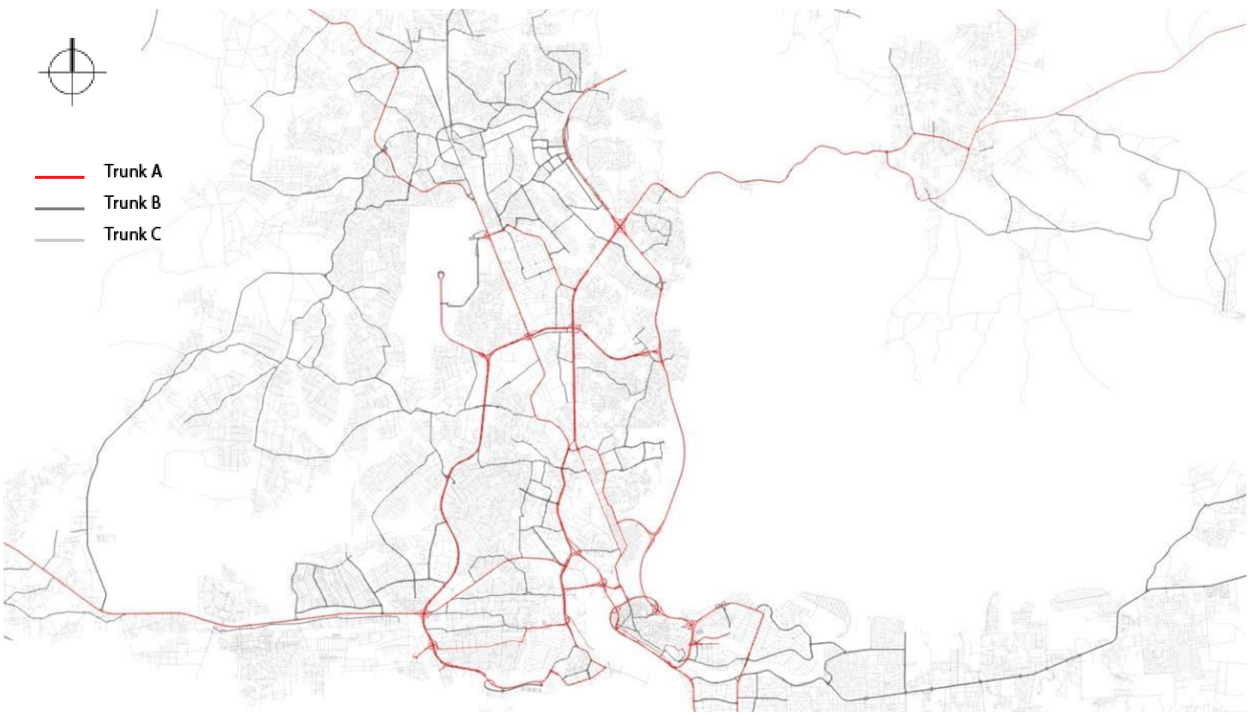


Figure 6-14: Road Hierarchy in Lagos. Source: Author's

The main inter-city roads are Trunk A (and F) roads, and typically fall under the jurisdiction of the Federal Government of Nigeria. Trunk A roads serve the Lagos Megacity region mainly along the North-south axis of the city, catering for the bulk of intra-state and inter-state vehicular traffic (Section 5.2.2 explains the politics of road infrastructure development in Lagos). Trunk A roads

[115] Trunk F roads are now considered part of Trunk A roads.

are connected directly to Trunk B roads, which serve as the main highways for the redistribution of intra-city traffic, and function as secondary collector roads. The LASG is mostly responsible for Trunk B roads. Trunk C roads are local feeder roads, operated by LGAs and LASG, which connect to residential areas, areas of production and markets. If these road hierarchies function optimally, they should provide a good proxy for exploring the distribution of ST hotspots[116]. Using this assumption, the assessment of the existing road hierarchy and distribution of ST hotspots - drawn from the cognitive mapping exercises done during focus group sessions with key stakeholders - produced the result displayed in Table 6-6.

Table 6-6: ST hotspots recorded on existing road network hierarchies

Road Type	ST hotspots
Trunk A (and F)	41%
Trunk B	43%
Trunk C	16%

Of the 111 ST hotspots identified in this research, 41%, 43%, 16% were located respectively on Trunk A, Trunk B and Trunk C roads (Table 6.6), suggesting that ST hotspots are more likely to be found on Trunk A and B roads. Further to this assessment, an analysis which linked the existing road hierarchy with multi-scale BtA was implemented as a means of validating the application of sDNA-sBEL.

To measure multi-scale accessibility against the existing road network hierarchies, a classification which allowed for comparisons of similar attributes was used. This classification scheme used the Tertile distribution (Table 6.3), to categorise road network segments according to multi-scale BtA data - which shows the passenger flow potential along road segments - to examine how this matched the Trunk road classification. The outcome is presented in Table 6.7.

[116] It is acknowledged that there are large variations of traffic levels for the same road category.

Table 6-7: Road hierarchy relative to tripartite classification of BtA network link values[117]

	R400			**R600**			**R1,000**			**R2,000**			**R5,000**			**R10,000**		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
A	48%	28%	21%	46%	31%	22%	37%	35%	28%	19%	37%	44%	10%	20%	**70%**	7%	18%	**75%**
B	27%	27%	47%	21%	28%	50%	16%	25%	**58**%	10%	19%	**70**%	6%	13%	**81**%	5%	14%	**81**%
C	33%	34%	32%	33%	34%	32%	34%	34%	31%	36%	36%	28%	37%	37%	25%	38%	36%	25%

From Table 6.7, it is observed that most of the constituent links of Trunk A roads coincided with the network links with the highest accessibility values (T3) according to the macro-level accessibility metrics, i.e. 70% and 75% respectively of Trunk A roads coincided with R5,000 and R10,000. The Trunk B road links, coincided with the category of network links which had the highest accessibility values (T3) for both the meso- and macro-levels i.e. R1,000, R2,000, R5,000, R10,000. The Trunk C road links, however, did not seem to correlate with the accessibility values derived from the BtA analysis.

The analysis findings suggest that the macro-level radii employed in this research for the BtA analysis, accounts well for the links of road networks which are optimised for interstate and intrastate vehicular journeys in Lagos. ST hotspots were most likely to occur on links of roads used for long distance vehicular journeys as reported in the travel modes and modal split. These roads also carry the largest volume of passengers daily, therefore supporting the proposition that STs workplace locations had a positive relationship with journey route choices. Yet the analysis also showed that ST hotspot were often well integrated with a background local market with high level of local BtA, suggesting variations in the profile of ST hotspots.

So which predicts the location of ST hotspots better, the statutory road hierarchy or betweenness analysis using sDNA? A comparison between the tertile classification of multi-scale betweenness and road network hierarchy provides an answer. Table 6-7 indicates a level of correlation between macro-scale BtA and Trunk A roads, so these two classifications serve as the basis for comparison (moreover, they also host the highest numbers of ST hotspots). BtA R5,000 and BtA

[117] Each multi-scale BtA category in this classification contained approximately a third of the range of links based on their accessibility levels, where: T1 represented 0 - 33.3%; T2 represented 33.3 - 66.7%; and, T3 represented 66.7 - 100%.

R10,000 coincided with 82% and 85% (Figure 6-8), while Trunk A coincides with 41% of ST hotspots (Table 6-6). Therefore, BtA predicts ST hotspot location better than the road hierarchy.

6.5 ST Multi-Scale Location Findings

This chapter set out to determine the relationships between accessibility facilitated by the road transport network and the location of ST hotpots in Lagos. Betweenness was used as a measure of multi-scale road network accessibility, to analyse how the spatial conditions of "*in-between*" locations potentially influenced physical interactions within the road network system. From the results of the studies conducted, it was established that locations with high macro-level betweenness values seemed likely to facilitate effective interactions between STs and potential customers. The use of sDNA for multi-scale betweenness analysis therefore provides an empirical means to predict spatial attributes of the built environment which may influence the formation of ST hotspot, as previous studies on ST locations have not explored the phenomenon from this perspective.

As there are different approaches to defining betweenness, this research had to explore which metric would best suit its basis. sDNA's flexibility as a spatial analysis tool - as an integral component of the sDNA-sBEL methodology - provided a platform which eased the implementation of the analysis. The metrics explored - Euclidean and Angular - showed slight variations in their ability to assess the road network of Lagos. However, the Angular metric (BtA) showed a slightly more consistent relationship with the occurrence of ST hotspots, and therefore it was selected as the basis for further studies. The outcomes from the numerous studies conducted suggested that Angular betweenness at a macro-scalar level (BtA R,5000 and BtA R10,000) was the most suitable metric for studying ST hotspots in Lagos, as road segments that ranked in the top 10% most accessible links based on BtA R5,000 and BtA R10,000 (Q10) had the highest number of ST hotspots occurrences. However, the distribution of ST hotspots across other radii also displayed patterns which suggested that ST hotspots were influenced by accessibility at more local scales. This suggests that network segments which were accessible at multiple scales therefore possess intrinsic attributes that potentially influence the formation of

ST hotspots. This observation was not explored in this section due to the macro-spatial resolution of the analysis, but is addressed in the next chapter where disaggregated spatial studies are conducted.

It was also discovered that Trunk A, F and B roads which catered for medium to long distance vehicular journeys, also correlated with ST hotspots. These roads also coincided with the most accessible links at R2,000, R5,000 and R10,000; showing a correlation with the radii levels which represented non-pedestrian journeys derived from studying commuters' modal choices and trip behaviours in Lagos.

The study of road hierarchies suggested that ST hotspots have been established relative to locations that people pass on journeys which average 2,000m or above. Reflecting on the earlier description of how most single trips in Lagos involve multiple stages and modes[118], this aligns with average distance travelled using a single mode of transport which was in the 5km region. Therefore, it plausible to suggest from a macro-spatial scale assessment that STs were capitalising on locations where passengers changed transport mode (journey stages) while on a trip.

Most of the ST hotspots identified were located at public transport interchanges along major distribution routes (Trunk A, F, and B roads)[119]. In many cities such as Lagos which have grown rapidly, the mass transit deficit encouraged informal transport systems (Olukoju 2003). The location of public transport interchanges at points of interests therefore organically developed relative to the informal nature of the transport system, whose inefficiencies require and encourage multiple journey stages to complete a single trip. At the point of interchange, it can be assumed that ST hotspots have seized on the potential to target customers - as this provides a large market of potential customers; hence, the correlation between ST hotspots and public transport interchanges. This occurrence is explored further in the next analytical chapter at a local scale.

---

[118] A study on commuters who patronise *Danfos* indicated that in a single journey, 16.7% of the study's respondents made a single stop, 18.8% made two stops, 18.1% made three stops, 12.3% made four stops, while as many as 34.1% of the respondents stopped five times. Overall, 65% of the respondents indicated that they make at least three stops (Ibitayo 2012).

[119] The mean distances between bus-stops on major arterials/primary routes were 600m, and 200m for other local routes.

There are concerns about the findings from the analyses not being generalisable, because the analyses relied on samples of ST hotspots identified from focus groups with key informants and other respondents, rather than trying to capture all locations of ST hotspots in Lagos. During the data collection, participants also noted that their knowledge of street trading locations was imperfect due to a consensus that STs occurred practically almost everywhere in Lagos, and so the respondents felt it was impossible to identify their locations without making omissions. The ST hotspots are therefore a reflection of the knowledge of the key informants, and may be biased by their cognition of street trading locations in Lagos. This perceived shortcoming was not considered a problem on the path of this research, as it was expected that the ST hotspots identified was a partial representation of STs in Lagos. Therefore, the identified ST hotspots suffice as proxies for detailed contextual investigations at sub-spatial levels that would be needed to better understand variations in ST hotspot occurrences.

The outcome of the studies conducted in this chapter validated the usefulness of employing network accessibility analysis to study ST hotspots, and has provided a reflection of how the transport network is configured, and how this plays a significant role in defining how and where SBEs operate with high frequencies in Lagos. This is because STs thrive due to the convenience they provide to their customers and take advantage of being able to provide location-based services expediently to fulfil demand gaps by being located in spaces along the transport network that are '*in-between'* locations. Macro-scale BtA is very useful in predicting ST hotspots locations.

7 Core Trading Area Analysis

7.1 Introduction

A proposition of this research is that context-specific meanings and perspectives should refer to both objective and subjective notions of spatiality, to ascertain the locational patterns of SBEs **at local scales**. Therefore, in this chapter, objective and subjective paradigms examine the spatial attributes of SBEs locations at local scales that encourage the formation of ST hotpots. The approach is a response to the research question that queries the importance of spatial accessibility in defining urban informal economic activities, and an exploration of explanatory factors of urban form that influence the locational patterns of SBEs. As outlined in Chapter 4, eight ST hotspots (see: Table 7.1 and Figure 7.2) were selected as case studies in Lagos State to conduct this analysis.

Section 7.2 first justifies the selection of cases studies, and Section 7.3 discusses the logical structure of the case study assessments. Section 7.4 discusses five case studies in detail. Section 7.5 discusses the outcomes from these local-level cases, reflecting on the inherent commonalities and contradictions of STs' spatial settings within the different case studies, and their relationships with spatial accessibility. In Section 7.6, the conclusions provide a basis to conceptualise STs' workplace decisions influenced by urban spatial structures and the distribution of transport networks, to explore their inherent spatial accessibility.

7.2 Articulation of Street Traders' Spatialities

The local scale analyses in this chapter are extensions of the multi-scale betweenness studies in Chapter 6 which showed that macro-level accessibility[120] provided the best fit in detecting relationships between citywide accessibility (as a proxy for travel patterns) and ST hotspots in

[120] BtA R5,000 and BtA R10,000, i.e. Angular Betweenness accessibility measured at 5,000 and 10,000 metres, which are representative of automotive/vehicular journeys.

Lagos. For the BtA R5,000 metric, 46% (52) of the 111 ST hotspots recorded occurred relative to links recorded in its 90th percentile (Q10). The 90th percentile represents the 10% most accessible links and these links were observed to host the most ST hotspots (see Figure 6-11 and Figure 6-12). Figure 7-0 provides a guideline of the processes involved to undertake the analysis at the local scale in this chapter.

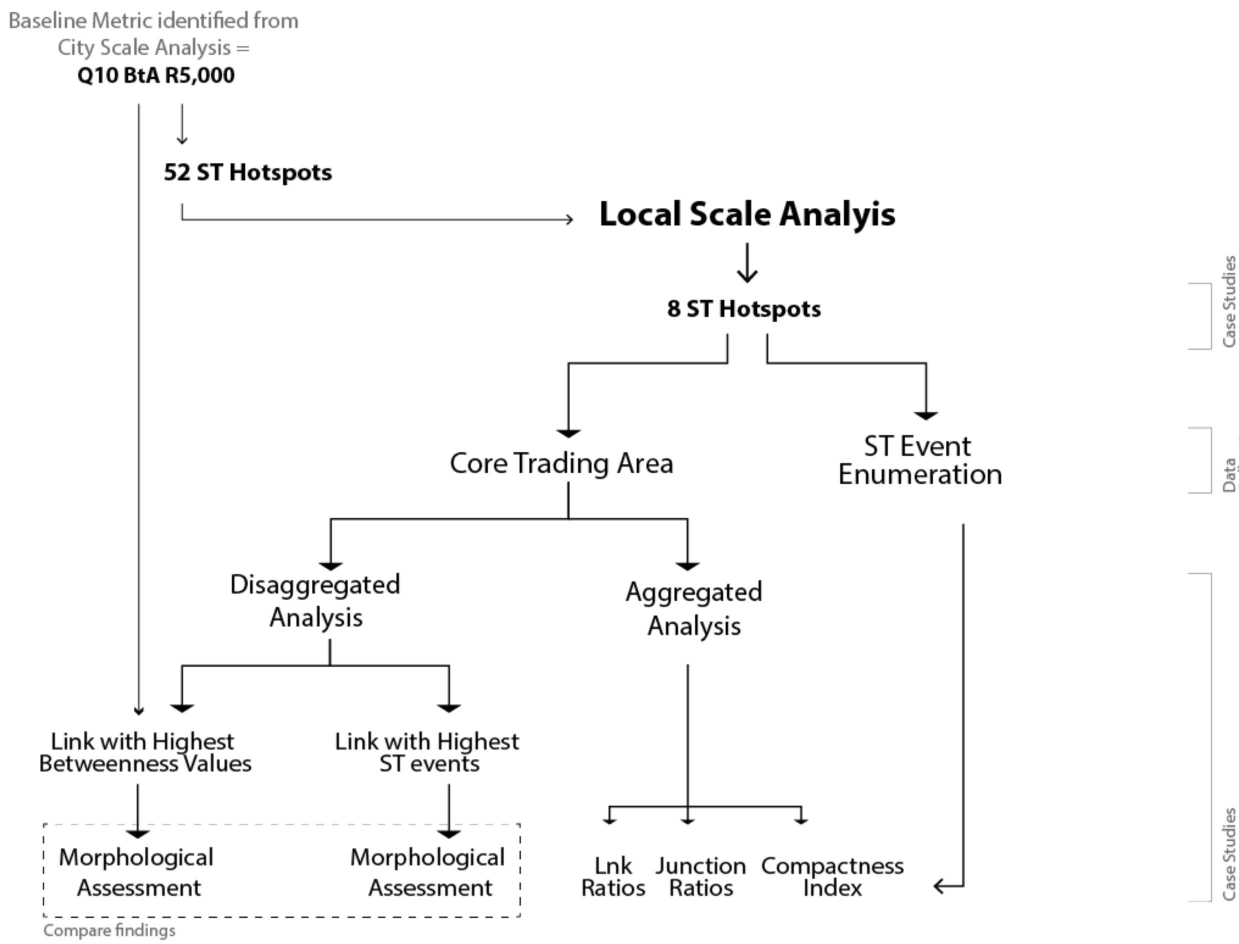


Figure 7-0: Schematic diagram of local scale assessments of core trading areas conducted in sDNA-sBEL

Ideally, detailed assessments of these 52 ST hotspots associated with Q10 of BtA R5,000 should have been conducted, to get a clear understanding of their spatiaities, but this was not feasible within the scope of this research because of time restrictions. Therefore, eight detailed case studies of ST hotspots were selected to reflect a balanced geospatial distribution of ST hotspots across Lagos, and in this chapter five are presented in detail (see Table 7.1).

Table 7-1 Case studies segmented relative to Q10 of different BtA levels.

R400, R1,000, R2,000, R5,000	*R5,000, R10,000*

Pen cinema, Agege	Oshodi
Under-Bridge, Ikeja	Ikotun
Jakande, Lekki	Mile 2
Garage, Ikorodu	
Eko	
Cases Studied in Chapter 7	See Appendix 2

The five case studies were selected because of commonalities in their multi-scale BtA attributes (Table 7.1). The baseline links of these selected cases all fell within the top 10% most accessible links (Q10) for R400, R1,000, R2,000, and R5,000; signifying high accessibility to several transport modes, and STs located on them would potentially have access to a wide range of customers (who use different transport modes). The other three cases fell within Q10 for only R5,000 and R10,000 - distances suited only for vehicular journeys - and thus provide less useful evidence for the multi-scale analysis (see Appendix 2 for a summary of the three cases).

In addition to findings from the five detailed case studies, insights from the three cases in Appendix 2 are referred to in the chapter where relevant, as they add to the conclusions of this research. Some of the case study assessments bore similarities in some respects, and therefore references to their distinct characters are emphasised to avoid repetition within this section.

7.3 Framework for Local Scale Spatial Assessments

This section explains the logical structure for the articulation of STs' spatialities at local scales and guides the analysis of each case study.

The first task for local scale assessment was the identification of the 'size of cluster' (i.e. the distance beyond which ST events ceased to exist relative to a ST hotspot's baseline link). To simplify the analytical procedure, a 'baseline link' within the core trading area of the ST hotspot was selected as a basis to define the catchment area. The reason for this selection was because the data from focus groups engaged to identify ST hotspots during fieldwork was inconsistent, as it most times highlighted multiple locations in close proximity as the location of ST hotspots. The decision for this reductive selection had no influence on the outcome of the analysis, as the other links identified as constituents of the ST hotspot, were all captured within the different catchment radii analysed. A similar procedure is undertaken for all case studies in this research.

Field surveys were then conducted within catchment areas defined by incremental distances of 200m radii along the road network, i.e. progressively at 200m, 400m, 600m, 800m and 1,000m relative to the occurrences of ST events and their spatial distribution in the case study areas. The determination of the size of cluster helped define the ‘core trading area’ of a ST hotspot.

For the meso-level assessments, spatial attributes of sub-networks within the core trading area were analysed using metrics from sDNA-sBEL (see methods’ description in Section 4.5.2), to reveal if there were relationships between their network configurations and ST event distributions. At the micro-scale, attributes of individual network segments (links) within the core trading area provided the basis for assessments, by questioning:

- What BtA values and spatial attributes did the link(s) with the most substantial number of ST events possess, and were these properties unique to these link(s)?
- What BtA values did links with few ST events possess, and were these lower than links where more STs congregated?
- Where multiple links exhibited similar BtA values but did not host similar frequencies of ST events, what were the critical spatial attributes that caused these disparities?

These concerns are fundamental to addressing the research question that sought to determine the extent to which spatial accessibility is a crucial factor in defining the locational patterns of SBEs. The conduct of comparative morphological assessments dealt with these concerns and required the identification of:

i. The links with the highest BtA R5,000 values - to detect possible influences or anomalies caused by these links. In the case where outliers[121] existed, such cases were treated uniquely.

[121] Outliers are Links whose values are positioned beyond two Standard Deviations from the mean within the distribution.

ii. The BtA values of the link that hosted the highest frequency of ST events. Where the link with highest BtA value and the link which hosted the highest frequency of STs were the same[122], the link whose BtA value ranked as the next highest was selected in this scenario for comparisons.

The comparative morphological assessments focused on the spatial properties of links and their relationship to ST events. The analysis was done between the pairs of links with: a) the highest BtA value and b) the most substantial number of ST events (or the second largest number of ST events where a) and b) coincide). Similarly, the geometric properties of the subnetworks of catchment areas within core trading areas and across the different case studies were analysed. In addition, given the urban design genesis of this thesis, the morphology of the core trading areas of each case study site was analysed to explore the relative importance of the spatial attributes of each site and their relation to the ST activities - as a comparison to the configurational (betweenness) attributes analysed through the sDNA-sBEL modelling.

7.4 Case Analyses

This section outlines the results from assessments of eight case studies in Lagos. Five of the case studies are detailed here, as their spatialities exhibited unique characteristics, and provide a compelling basis to discuss STs locations in Lagos (these are Locations 1 to 5, in Figure 7.2). The summary of the other three case studies (which are Locations 6 to 8, in Figure 7.2) can be found in Appendix 2.

[122] The former was considered as a factor which influenced the onset of decay (as STs were attracted to it and gained spatial advantages from being in spatial proximity, and this influence subsided the further the distance of separation from this link along the network was).

Figure 7-1 Map of Lagos showing the locations Case Studies. Source: Author's

7.4.1 Case Study 1 - Pen Cinema

Pen Cinema (Location 1, Figure 7-1) is in a predominantly low-income area in Agege Local Government Area (LGA). The ST hotspot was distributed on segments of the Oba Ogunji Road (East-West corridor), the Iju-Ogba Road (North-South corridor), and the adjacent railway embankment. The north-south oriented railway line severs connections along the west-east axis of Agege LGA. A segment of Oba Ogunji Road acts as a level-crossing - as an essential connection - so it experiences high vehicular traffic throughput. SBEs were distributed relative to this pattern of movement along the west-east corridor. From the baseline location (link)[123], it was observed that SBEs were mainly located within a 400m catchment distance from this link (see blue highlights in Figure 7.2).

[123] To simplify the analytical procedure, a 'baseline link' within the core trading area of the ST hotspot was selected as a basis to define the catchment area (for a detailed explanation, see Section 7.3).

Figure 7-2 Map of Pen Cinema - showing 200m (red) and 400m (yellow) network catchment areas

Local-scale spatial assessments were conducted based on the framework outlined in Section 7.3 for the articulation of ST spatialities. Within the first 200m catchment, 405 ST events were observed to be distributed throughout the area. An additional 200m network range was explored, to ascertain how much further away ST activities existed around the baseline link at Pen Cinema. Within the expanded catchment area, 220 more STs were observed, but there was a significant decline in ST activities mid-way through the 200m-400m catchment area, suggesting that 'decay' in ST event frequencies had set-in. Beyond the 400m catchment, there was a sharp cut-off of ST events, suggesting that there was little advantage being near Pen Cinema beyond the cluster size which suggested that, if ST agglomerations existed, they would be influenced by factors not associated with Pen Cinema. Thus, the threshold and attraction to the baseline link at Pen Cinema for STs did not exceed a 400m network radius.

In total, 625 STs were observed in the area defined as the core trading area for SBEs at Pen Cinema. 77% of these STs were sedentary and operated with temporary or semi-permanent trading facilities, of these 53% used tables (wooden and plastic), 9% displayed goods on fences or from structures erected against fences, while 15% used the surface of any suitable floor space

- walkways and setbacks - to display goods and services. The remainder of the STs recorded were itinerant - 21% of these were hawkers, and 2% used push carts.

Figure 7-3: Sedentary STs located on the road offset, operating with temporary trading facilities.

STs at Pen Cinema

Structured interviews were conducted with 10 STs at Pen Cinema to provide a first-hand account of their experience. The selection of STs was based on a random sampling strategy detailed in the methods chapter. The interviews were recorded using Epicollect - a mobile phone-based geocoded questionnaire application to capture data[124]. As noted in Chapter 4, this thesis sought to use Open-Source software where possible and Epicollect was appropriate as it is a freeware. The procedure for conducting interviews at Pen Cinema was replicated in all the other case studies.

The interviews revealed that access to potential customers was the main reason why STs were located at Pen Cinema. This was followed by tenure agreements on their operating spaces – a factor STs associated with the ability to define their terms of occupation, and the low financial cost implications incurred in the use of these spaces. The proximity of workplaces to their residences was also a notable response. Most STs lived within walking distance of Pen Cinema and therefore said that they incurred minimal transport costs to get to work. Most of the STs interviewed were women - who tend to work in lower paid sectors of street trading (Bass 2000) - which is probably related the low-income status of the surrounding area.

[124] See Chapter 4.5.2 for more on Epicollect and Appendix 3 for the questionnaire template.

According to the interviews with STs, there was a low turnover of STs workplaces because STs preferred to operate for prolonged periods at the same locations, and move voluntarily only if better locations become available in the vicinity. The low turnover of work space is expressed by a female trader interviewed, who said:

> This location was initially temporary. I was not making enough profit at my former location to afford my shop's rent, so I came here because this location provides me with enough customers to stay in business. However, I want to move because it is not safe to sell so close to moving cars, but no new location - which is better located and where KAI will not also arrest me - has become available in the last three years of working here (Female Trader, Oba Ogunji Road, Selling non-perishable goods).

To secure tenure on new working spaces - as first entrants or when relocating - STs indicated that social ties were necessary. This was expressed by a male trader who said:

> Access to use this space to work is based on my relationship with Alhaji [another ST in the vicinity] … I use this space [an informal makeshift stall made from corrugated roofing sheets] because it is close to his shop, and he has a right to it [which he bestowed on me]. I do not pay rent to use space … I even help others sometimes, like this man here [he was accommodating another ST who sells second-hand electronics]. His business does not disturb my own (so there is nothing to lose), and I have someone to talk to. (Male Trader, Balogun Road, Selling traditional and orthodox stimulants).

The STs interviewed were typically non-specialist SBEs mostly involved in retailing consumer goods (sourced from nearby markets). Despite the proximity to existing markets, STs could markup their prices and still attract customers through the convenience they offered (the price paid for goods were most times determined by a customer's ability to haggle). The target customer base was diversified with pedestrians being the primary target, and the STs claimed to have regular customers – mostly those whom they saw daily due to their location on the roadside. The busiest periods for STs coincided with peak commuting times in the morning and evening, and STs, therefore, focused their activities on these times.

Storage facilities were not standard, as supplies were sourced frequently from close locations. Moreover, the intensity of ST activities was not large enough to require specialised storage facilities, as most SBEs had small quantities of goods that could be stored where they worked or taken home at the close of business; as in the case of this trader who said:

> I typically hawk food within an area which is about 30 minutes walking distance from my house [the point of preparation]. This is because I cannot keep the food for too long – if not it will go bad – I therefore must take out small quantities to sell, and return home when it has finished to prepare more… I have regular customers in different places, so I do not pass the same route every time… (Female Trader, Oba Ogunji Road, Selling readymade meals).

The main problems STs faced at Pen Cinema was from the KAI enforcement officers, who routinely harassed, arrested, or confiscated their goods. The STs interviewed claimed not to be aware of other conflicts generated by their activities. This claim was corroborated by informal conversations and interviews with residents in the area, who thought of SBEs as being a positive part of the area's character due to the convenience their activities provided. The interviews with STs helped provide a general understanding of the motivations for their location choices; however, the responses and outcomes were consistent with well-known motivations for locational decisions. Therefore, in the next section, additional layers of information on the spatial attributes which made these locations attractive were explored, to complement the studies on ST locations at Pen Cinema.

Street Network Indices and Block configuration at Pen Cinema

As varied intensities of ST events were observed within the core trading area at Pen Cinema, an initial 200m catchment area is analysed relative to a 400m catchment area. This section explores the influences of spatial attributes of these catchment areas on STs, as depicted by the values in Table 7.2.

The urban tissue in the core trading area at Pen Cinema is coarse, with various sizes of urban blocks and plots - most suitable for accommodating residential or small-scale business uses. The core trading area mainly consists of mixed residential land uses. The plot sizes are noticeably smaller than the typical plot allocation in Lagos (which is standardised to about 648 square metres), and there are sprouts of illegal structures used for commercial activities occupying the frontages of most buildings and road setbacks. It was however noticed that the frontages of the three commercial banks and a fast-food retailer were devoid of such illegal structures, instead, STs here used temporary facilities, while itinerant STs loitered around these locations. The absence of STs at these locations was because property owners controlled these spaces, and preventing STs from using them. This dynamic is an indication of synergies between property owners and the SBEs located at their frontages.

From Table 7.2, it is observed that the link ratio[125] and junction ratio[126] for the 400m catchment area reduced in comparison to that of the 200m subnetwork. Within the 200m catchment area, a new link and junction occurred at every 51m and 127m, while within the overall 400m catchment area new links and junctions occurred every 64m and 146m. These figures suggest that the further the distance of separation from the baseline link at Pen Cinema, the larger the footprints of city blocks, which also suggests the lowered potential for pedestrian activity. The network efficiency also witnessed a similar outcome, as the 400m catchment area was less compact than the 200m catchment area.

Table 7-2: Spatial attributes of the road networks in Pen Cinema's core trading area[127]

Case 1	Lnks.	Jnc.	Net. Area	Net. Len	Conn.	Lnk Rat.	Junc. Rat.	C.I	ST Cov.	% Cov.
200m	30	12	41090	1526	42	51	127	27	1103	72
400m	57	25	182690	3649	86	64	146	50	1343	37

Taking account of the observed distribution of STs, 72% of the street network within the 200m catchment was occupied by STs. This suggests that the dispersal of STs beyond the 200m catchment might not have been due to over-saturation, but because of the influence of other

[125] A proxy for city block interface dimensions, which is an average of link lengths within the core trading area.
[126] A proxy for city block footprints.
[127] Lnk (Number of Links); Jnc (Number of Junctions); Net. Area (Network Area); Conn (Network Connectivity); Lnk Rat (Link Ratio); Jnc Rat (Junction Ratio); C.I (Compactness Index); ST Cov. (ST Network Coverage).

factors of advantage to STs within the broader 200m - 400m catchment area. Figure 7-4 further indicates the association between Pen Cinema's network configuration and the dispersion of STs relative to the defined network indices. If all STs observed at Pen Cinema were located within the initial 200m catchment area, their total street network coverage would not thoroughly saturate the 200m network (Figure 7.3). From the distribution patterns of STs, the indices employed to measure the spatial attributes of the core trading area show a relationship between the reductions in values of link ratio, junction ratio, and compactness index from the 200m to the 200m-400m catchment areas, with the reduction of ST events at Pen Cinema.

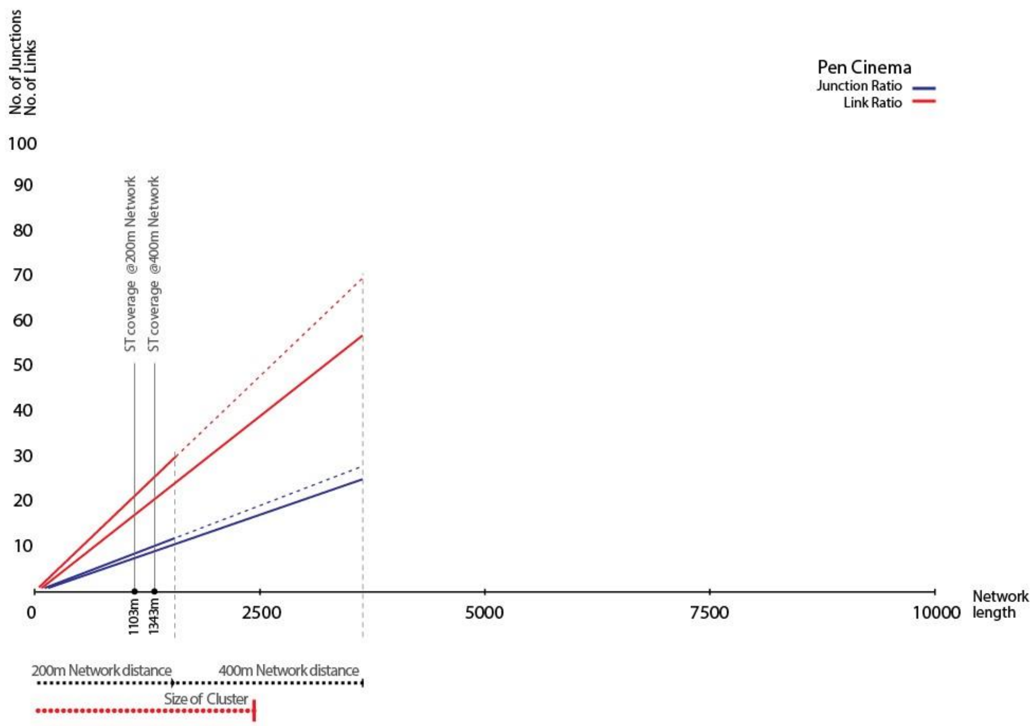


Figure 7-4: Street Network Indices of Pen Cinema's Core Trading Area.

Attributes of Street Segments

In this section, comparisons are made between the most accessible link based on the BtA R5,000 metric, and the link with the highest frequency of STs events. Table 7-3 indicates the distribution of the BtA values for links within Pen Cinema's core trading area. Each column has a colour scheme that is calibrated to the minimum, maximum, mean and standard deviation of each BtA radius. Therefore, the table should be read according to this structure for all the BtA radii. Table 7-3 is calibrated relative to BtA R5,000 - in a descending order - and the colour graduation (red - yellow - blue), indicates the BtA distribution from the maximum value to the minimum value for the links within the core trading area. The height of the columns within the table reflects the number of links within the catchment area of the core trading area (the height of similar themed tables at other detailed case studies, can be compared to give an insight into the composition of network constituents of core trading areas).

Table 7-3: BtA values for the core trading area at Pen Cinema

Pen cinema	R400	R600	R1,000	R2,000	R5,000	R10,000
BtA Min	5	15	67	335	2211	7541
BtA Max	927	1721	5781	55558	1539250	16038100
BtA Mean	175	404	1507	14014	319439	2824260
St Dev	220	469	1762	16961	438874	4325450
St Dev + Mean	395	873	3269	30975	758313	7149710
2(St Dev)+mean	615	1342	5031	47936	1197187	11475160

BtA Min *= Minimum value of BtA for 400m catchment area from baseline link (the core trading area);* ***BtA Max*** *= Maximum value of BtA for 400m catchment area from baseline link;* ***St Dev*** *= Standard deviation of links BtA values for 400m catchment area.*

In Table 7-3, the number of links with high flow potential (above the mean value - yellow), are similar to the number of links with BtA values below the mean in BtA R5,000. It is observed that there is also a concentration of deep-red profiles, which indicates that there are numerous links with values close to the maximum value of BtA R,5000 for the distribution. Thus, meaning that the core trading area at Pen-cinema has many links with a high flow-potential.

The spatial attributes of the catchment area that define ST core trading area at Pen Cinema are studied by considering the properties of individual street segments, to enable the assessment of STs spatialities relative to the surrounding built environment. The most accessible street segments relative to BtA R5000 were Lnk 34233, Lnk 34234, Lnk 34225, and Lnk 12977 - which are all outliers. Outliers are the most accessible links within core trading areas with BtA values which ranked beyond two Standard deviations from the mean value of the distribution (see the second row in Table 7-3).

From the survey of STs conducted during the field work, the segment of street network tagged Lnk 34233 hosted the highest number of STs (Figure 7-5). Since Lnk 34233 was both an outlier and it hosted the highest number of ST events - the recommendation for how to manage the occurrence of multiple outliers described in Section 7.3 was applied. Therefore, the outlier with the least ST events - Lnk 12977 - was analysed relative to Lnk 34233 to judge the spatial attributes that distinguished these two links in influencing the occurrence of ST events on the street segments they both represent (Figure 7-5).

Figure 7-5: BtA R5,000 accessibility map of Pen Cinema. Showing the 200m and 400m Catchment areas

Lnk 34233 had a connectivity value of 4, due to its neutral position between urban blocks, while Lnk 12977 had a value of 7, as it was located at a busy road intersection (see the top right panel in Figure 7-5 and Figure 7-7). The variation in connectivity values between Lnk 34233 and Lnk 12977 was significant considering the values recorded for the core trading area ranged from a minimum of 3 to a maximum of 7. Therefore, if a relationship existed between STs activities and connectivity values of links, a lowered connectivity value would be the determinant, as the link with the higher connectivity value did not host a higher number of ST events.

Even though Lnk 34233 and Lnk 12977 were outliers of BtA R5,000, they, however, hosted varied intensities of ST activities, and this indicated that being an 'outlier' did not guarantee a correlation with a link's ability to host STs activities. This is evidence that relying exclusively on the analysis of BtA values for individual links is a limited as a basis to determine the location of SBEs. It is thus necessary to examine other attributes of the urban form via morphological assessments, to make comparisons between these links.

Morphology of Street Segments

Lnk 34233 was flanked by two blocks, while Lnk 12977 was flanked by a block and open space (Figure 7-7 and 7-7). The block interfaces (edges) that framed Lnk 34233 acted as physical backdrops that SBEs appropriated and used for their operating facilities to, which thus produced trading space like an arcade. To achieve integration within the urban fabric, SBEs encroached upon road setbacks and sidewalks and thereby caused pedestrians and vehicles to share the road space. This creates safety concerns for pedestrians, but inadvertently acts as a traffic-calming measure, and encourages unrestricted pedestrian movements from either side of the urban blocks, which was advantageous to STs and customers alike. Figure 7-7 shows the location of STs relative to Lnk 34233, where it is observed that STs inhabit the spaces designated to sidewalks, road setbacks and the road for their workspaces. Most sedentary traders are located on the walkways and setbacks, while itinerant STs occupy the space on the road.

Figure 7-6. Link 34233 - High level of Pedestrians activities unencumbered by vehicular traffic flow.

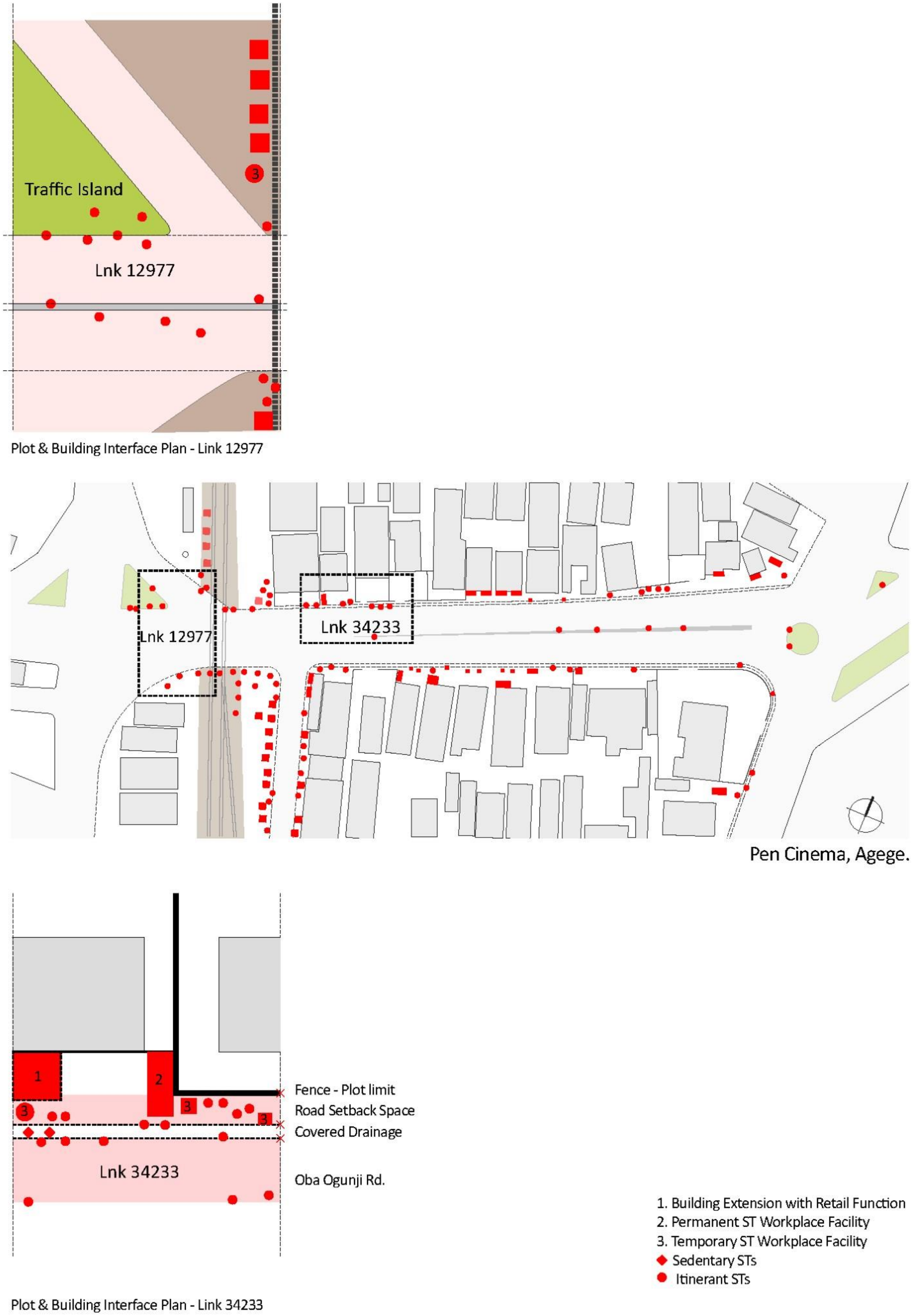


Figure 7-7: Plot and Building Interfaces, Road Setbacks, and ST locations at Pen Cinema, Agege.

Most of the ground floor uses of buildings fronting onto Lnk 34233 were commercial - predominantly retail - which also complemented STs activities. This land use pattern of the area is believed to be a result of organic evolutions - as property owners have taken advantage of the accessibility of the location, which is very similar to the motivation for SBEs locational choices.

Lnk 34233 is now a designated mixed-use corridor within the proposed 'Agege Model-City Plan' (part of LASG's location-specific planning guidance discussed on page 183), acknowledging the character of blocks frontages which have organically been appropriated for commercial purposes.

Figure 7-8: Railway line crossing Link 12977, which created an undefined physical interface.

The open space and block which flanked Lnk 12977 created a different ambience and typology of space to Lnk 34233 (Figure 7-6). Figure 7-8, shows a point where a railway crosses Lnk 12977 creating undefined physical interfaces. Another observation was that the setback on Lnk 12977 in comparison to Lnk 34233 was more generous (Figure 7-6). Therefore, the closely spaced double-loaded enclosure of block interfaces which seemed to have encouraged STs occupation of Lnk 34233 was not reproduced here. The open space - a traffic island - provided ample and a potentially uncontested space from property owners with no adjoining properties, but was sparsely populated (relative to other locations in its vicinity). Most STs observed on Lnk 12977 were itinerant, with a few sedentary STs who operated with basic temporary facilities, because of the transient nature of the space. Walls and fences also act as safety barriers, so KAI officers only approach STs from positions were STs can see them. The limited availability of walls or fences for STs display goods can be regarded as a reason for the limited intensity of ST activities.

Case Study 1 Pen Cinema: Main Findings

The street segments at Pen Cinema that are outliers of BtA R5,000 are all located within the first 200m catchment of its core trading area. Therefore, if an assumption is made that BtA R5,000 is the primary spatial determinant of ST events, this means that there are no other links that provide extremely high levels of macro-level 'betweenness' accessibility to compete in attracting ST events beyond the 200m catchment within the core trading area. Based on this logic, spatial proximities to outliers might explain why ST events abruptly reduced beyond the 200m catchment. However, the disparity in STs occupation of the street segments which Lnk 34233 and 12977 represented (both outliers) was an indication that other spatial attributes influenced these street segments attractiveness to STs, and therefore it is impossible to state that STs locations are exclusively BtA R5,000 dependent.

SBEs showed a preference to the street segment (Lnk 34233) which was enclosed by urban blocks that acted as physical backdrops and channelled pedestrian traffic along a defined path; while the street segment (Lnk 12977) which did not possess a defined physical edge did not sustain as many SBEs.

Another interesting observation was that there seemed to be a shared value of accessibility between outliers and adjacent street segments (with lower BtA values), as the latter hosted a high frequency of SBEs. This phenomenon was observed at the street segments adjacent to Lnk 34233 - the section of the railway line and its embankment, and the link which ran parallel to the railway line (Figure 7-5). The accessibility value of the railway line was not accounted for in this research[128], while the parallel street segment to the railway line had a mid-range BtA R5,000 value, thus suggesting that there was a possibility that advantages were derived from being in proximity to Lnk 34233[129]. The parallel street segment also fulfilled the necessary physical conditions to host STs - which in this case was the availability of defined trading space, pedestrian routes, and walls and fences to provide additional trading surfaces for SBEs operations.

The conclusion of the research on Pen Cinema case study is that street segments with ample amounts of open space either from road setbacks or due to the width of the street encouraged encroachment by STs. Even after the broad accessibility criteria had been met, the detailed urban morphology - as described in the assessment of Lnk 34233 - was an important predictor of which areas sustained SBEs.

7.4.2 Case study 2 - 'Under-Bridge', Ikeja

---

[128] Railway lines do not form part of the network that define the daily travel patterns of the inhabitants of Lagos.
[129] The most accessible link based on BtA R5,000 at Pen cinema – the most extreme outlier.

‘Under-Bridge’ is near a road intersection of a mixed-use corridor and a flyover within Ikeja LGA, hence its colloquial name (Location 2, Figure 7-1). The ST hotspot occupied a relatively large area which consisted of segments of Obafemi Awolowo Way, Oba Akran Avenue, and Kodesho Street (Figure 7-9).

Figure 7-9: Map of Ikeja Under-Bridge - showing 200m (red), 400m (yellow) and 600m (blue) network catchment area.

Surveys of STs activities identified that the core trading area was within a 600m catchment area from Under-Bridge. Within the catchment area *‘grey zones’*[130] were identified, and for analytical clarity, ST events were recorded as being either within or beyond them. The grey zones consisted of Ipodo Street - an informal market which occupies a single street segment - and the streets of Computer Village, which included several street segments located within an IT accessories’ market[132].

Excluding the grey zones, there were 713 ST events within the 200m catchment area, while with the inclusion of grey zones, the number increased to 1,847. At an increased 400m catchment, an additional 752 ST events were observed - predominantly located within Computer Village - and their distribution extended to the edges of the 200m-400m catchment, suggesting the need to capture a larger catchment area. 35 STs were within the 400m - 600m catchment area, which indicated a decline in ST events and the onset of decay. In total 2,634 ST events were recorded

[130] Extra-legal economic enclaves that existed and functioned without hindrances to their activities by the government, a sharp contrast to the situation of more general STs locations. [132] Computer Village is the largest IT market in Africa

within the core trading area, 82% of these were sedentary, and they operated with temporary and semi-permanent facilities depending on the type of enterprises.

STs at Ikeja Under-Bridge

The structured interviews revealed that proximity to potential customers was the primary motivator for SBEs locational decisions at Under-Bridge, followed by the right to use their operating spaces and the associated security of tenure. These factors, however, took on different meanings relative to the locations of SBEs within and beyond grey zones.

A common trend across both categories of locations (grey and non-grey zones) was a low turnover rate of operating spaces, as STs mostly worked for long periods at the same locations or within the same area. The few who changed locations moved to better positions vacated by other STs. Another common trend noticed was that STs were willing to commute daily to work and with the incurred transport cost, as most of them did not live near the case study because living expenses in the surrounding area were unaffordable for many STs. STs also indicated that they had built up a customer base, which was a critical factor that discouraged them from relocating.

SBEs were required to pay either rents and levies[131], or just the latter to secure tenure. Itinerant STs did not pay rents, but all STs interviewed said they paid local government levies. SBEs within grey zones typically did not pay rents, as most of them operated either from temporary facilities or as storefront appendages linked to formal retail establishments. Beyond the grey zones it was common for STs with relatively permanent workplace facilities to pay rents to the landlords of properties adjoining their operating space, as expressed by traders interviewed:

> I have a shop within the shopping complex behind us, but to have easier access to people passing on the road, I rent this space from my landlord, and that is the case for a lot of people working on this side of the street. We all pay rent to use these spaces. (Male Trader, Obafemi Awolowo Road, Selling Books).

[131] Levies are fees imposed officially and unofficially for various licenses and reasons.

> I don't pay rent oh (*sic*)! This place is not legal, and KAI comes to disturb us, why should I pay rent? (Female Traders, Kodeosho Street, Making and Selling Food on the Site).

> My brother has a shop in Computer Village, and I consider that as my shop also. Why should I pay rent to sell on the street close to my shop? We already pay many levies to the association here, and who will collect rent from everyone here? (Male Trader, Ola Ayeni Street, Selling Software Packs in Computer Village).

Gender distribution of STs was not revealed to be linked to locations but depended on the type of enterprise engaged in. Male STs dominated Computer Village, as the nature of enterprises required some capital outlay; while female STs dominated the other locations including the grey zone of Ipodo Market, and mostly operated low capital-intensive enterprises.

SBEs in Computer Village tended to have a significant customer base and were not so fussed about their choices of locations. STs elsewhere relied on close proximities to customers and relied more on locations with good access to passers-by, and those interviewed said that there was a strong possibility that pedestrians and passengers who passed them daily would eventually patronise them, and these sorts of patrons formed their largest customer base. It was, therefore, crucial for STs beyond the grey zones to be positioned strategically to optimise potentials for interactions.

> I chose this location because people are going and coming from computer Village walk past here from the bus stop. The lady I work for - as many of us located at different locations close to the numerous entry points of Computer Village - tries to take advantage of all the people that go there daily (Female Trader, Kodeosho Street, Selling Snacks).

The diverse nature of SBEs meant diverse sources of supplies. The STs within Computer Village mostly bought merchandise from nearby stores, and many of these SBEs were appendages (franchisees) to formal business enterprises. Most, therefore, did not require specialist storage space. Specialised storage spaces for STs were however still available within Computer Village, due to the large scale of the commercial operations. STs beyond the grey zones mostly required specialist storage spaces, which could be rented from nearby property owners, and these were located within walking distance of the trading area.

> We need storage that is close to where we sell; this is very important for the smooth running of this business. This is because we cannot display all our goods at once, in case KAI comes to arrest us. Also at night when we are going home, we need where to store our goods. People rent shops and convert them to use as storage - that is the business they run… So, we pay for storage on daily basis, sometimes we do not need the storage, especially when stock is running low, then we just take whatever is left over home instead (Two Male Traders, Kodeosho Street, Selling Clothes)

The number of hours worked by STs varied. Those located beyond the grey zone worked over 10 hours a day on average, which was longer than those in Computer Village who at a maximum worked during the regulated trading hours of stores, between 8.00am to 6.00pm daily (10 hours).

The hindrances to SBEs beyond the grey zones was from enforcements by KAI, as STs claimed they did not have conflicts with other road users. This claim was however not corroborated by other city inhabitants, who found activities of STs at Under-Bridge as having both negative and positive effects on their experience of the space. Adverse effects arose because of the obstruction of pedestrian and vehicular traffic flow caused by STs, sanitation problems, and safety concerns associated with their loitering (perceptions of crime from their activities), while the positive effects resulted from the convenience in accessing the goods and services, STs provided.

As suggested by the interviews conducted with STs, the factors which influenced SBEs locations were relative and dependent on their trading location. Even within the two different grey zones, it was difficult to generalise about the activities of STs, as they had different characters and *modi operandi*.

Street Network Indices and Block configuration at Under-Bridge

The spatial indices in Table 7.4 indicate the street network attributes of the core trading area relative to the spatial distribution of STs at Under-Bridge. The 200m and 400m catchment areas had similar link ratio values with a new link at 85m and 86m respectively, which increased to 98m for the 600m catchment area. This increment in average block interface lengths coincided with the reduction of ST activities. Junction ratio increased consistently relative to larger catchment areas, where a new junction occurred at 170m, 202m, and 215m respectively, which also coincided with the reduction of ST activities. Network efficiency changed from a low value at 200m catchment area to a higher value at the 400m catchment area, then back to a low value at the 600m catchment areas. The inconsistency in the pattern of network efficiency - which relates to the compactness of the subnetworks - was contradictory, and did not provide a basis to draw inferences on relationships for this case study.

Table 7-4 Spatial attributes of Under-Bridge catchment area's road network

Case2	Lnks.	Junc.	Net. Area	Net. Len	Conn.	Lnk. Rat.	Junc. Rat.	Net. Eff	ST Cov.	% Cov.
200m	26	13	155022	2211	39	85	170	70	2211	100
400m	59	25	229176	5050	76	86	202	45	4090	81
600m	119	54	659062	11622	169	98	215	57	4205	36

The distribution of STs covered 100% of the network segments within the 200m subnetwork, and 81% of the 400m catchment area (Figure 7.9). Even though ST events occurred throughout the 200m and 400m catchments, their occurrences were not evenly distributed as specific segments of the network had higher intensities of activities. What spatial factors influenced the preference for agglomeration around specific segments within the saturated networks? These concerns are explored in the next section as the indices employed in this section are aggregated and do not capture such dynamics.

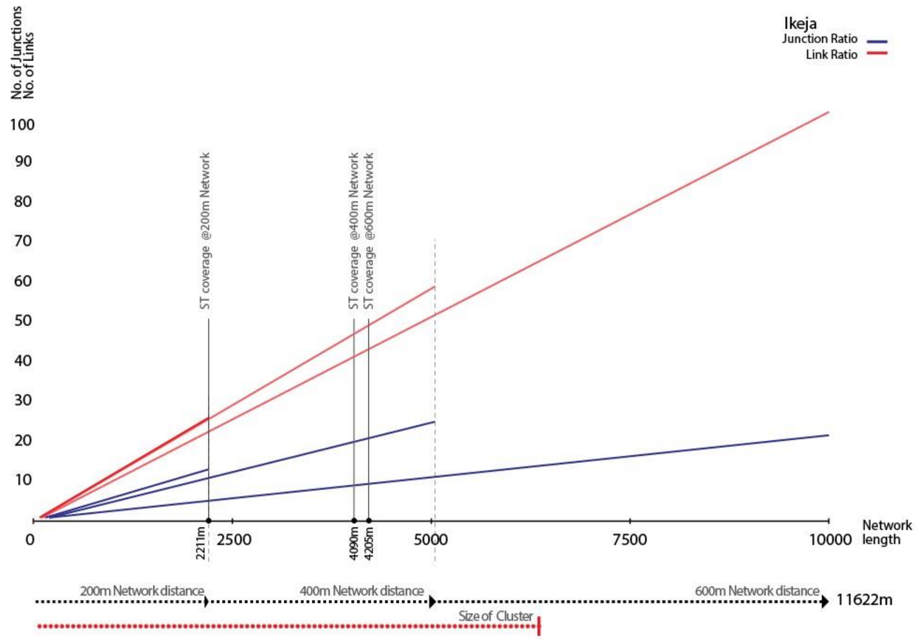


Figure 7-10: Street Network Indices of Ikeja Under-Bridge's Core Trading Area.

Attributes of Street Segments at Ikeja Under-Bridge

With the exclusion of grey zones, the link with the highest frequency of ST events was Lnk 12064, while with the inclusion of grey zones it was Lnk 12075. However, the BtA R5000 values of Lnk 12064 and Lnk 12075 did not rank amongst the most accessible links within the core trading area. Four other links ranked as outliers and out of these Lnk 12061 had the highest BtA R5000 value. Therefore, studies were conducted to analyse attributes that differentiated Lnk 12064, Lnk 12075, and Lnk 12061 (Figure 7-11) from each other in relation to their abilities to host ST activities; i.e. the link with the most ST events excluding and including grey zones, and the link with the highest accessibility value for BtA 5000.

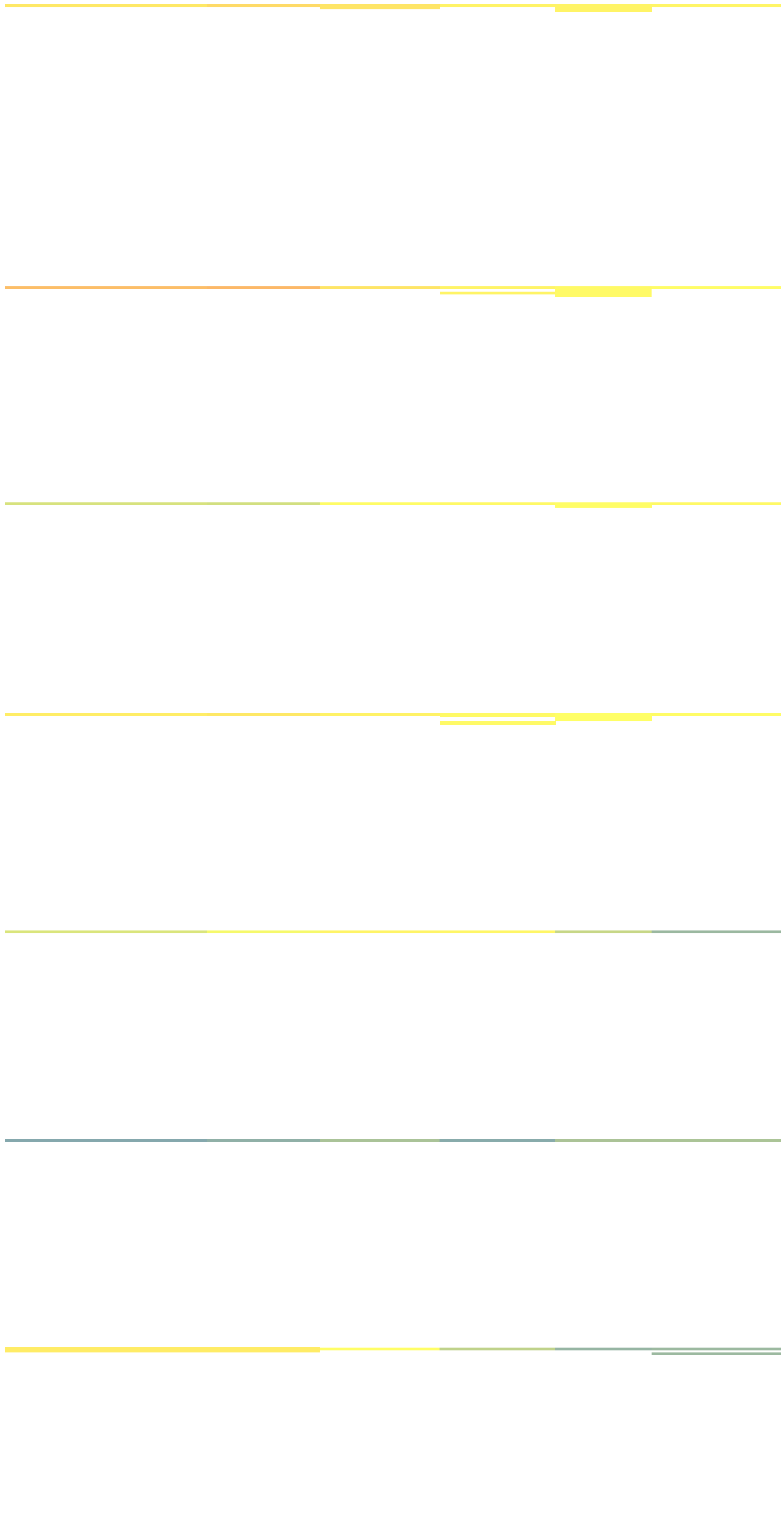
Table 7-5 indicates the distribution of the BtA values for links within the ST hotspot's core trading area. A high number of links with low values of flow potential for BtA R5,000 (blue-coloured band) is observed in the table, which suggests that the core trading area at Under-Bridge has many links with a low flow-potential at a macro-scale - an indicator of small block areas (see Figure 7-12).

Table 7-5: BtA values for 600m core trading area at Ikeja- Under-Bridge

Under-bridge, Ikeja	R400	R600	R1,000	R2,000	R5,000	R10,000
BtA Min	5	19	69	233	880	2957
BtA Max						
BtA Mean	663	2364	12254	64659	458870	4969260

St Dev
St Dev + Mean
2(St Dev) + mean

137	434	1863	9501	70193	489928
130	426	2267	12437	95091	919761
267	860	4130	21938	165284	1409689
397	1287	6396	34376	260375	2329450



BtA Min *= Minimum value of BtA for 600m catchment area from baseline link (the core trading area);* ***BtA Max*** *= Maximum value of BtA for 600m catchment area from baseline link;* ***St Dev*** *= Standard deviation of links BtA values for 600m catchment area.*

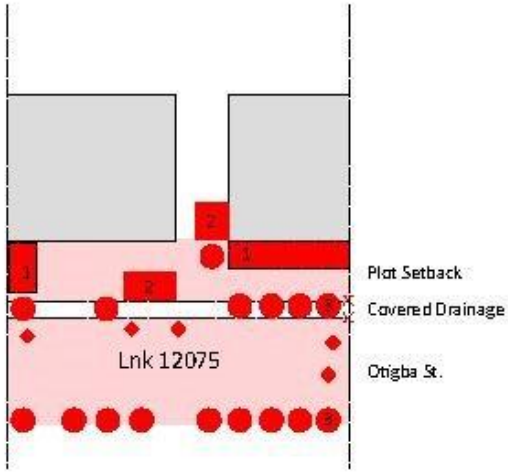
Figure 7-11 BtA R5,000 accessibility map of Under-Bridge. Showing the 200m, 400m, 600m Catchment area

Morphology of Street Segments

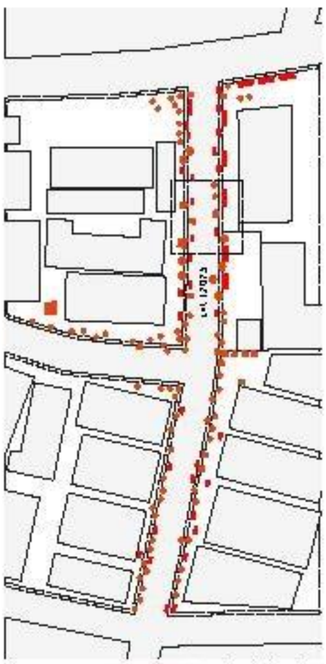
The street segment with the highest frequency of ST events within the grey zones - Lnk 12075 - was flanked by urban blocks occupied by retail land uses. The retail units had direct contact with the street as there was no boundary fence[132]. The edge condition of the block – with the absence of fences - also meant that SBEs could not use the vertical surfaces of the blocks because the retail units had taken control of their frontages. Therefore SBEs on Lnk 12075 mostly used temporary on-street physical facilities to conduct their business.

The segment of the street Lnk 12075 represented had a width similar to most local distributors in Lagos. There was limited vehicular traffic because SBEs commandeered the entirety of the road to set up shop, blocking access to cars. The absence of sidewalks further compounded the congestion of activities on the street (Figure 7-12). In effect, Computer Village has organically been transformed into a pedestrian-only zone, which is encouraged by its fine urban grain.

[132] A common physical feature of urban blocks in Lagos that restricts interaction at street level with land uses.



Plot & Building Interface Plan - Link 12075



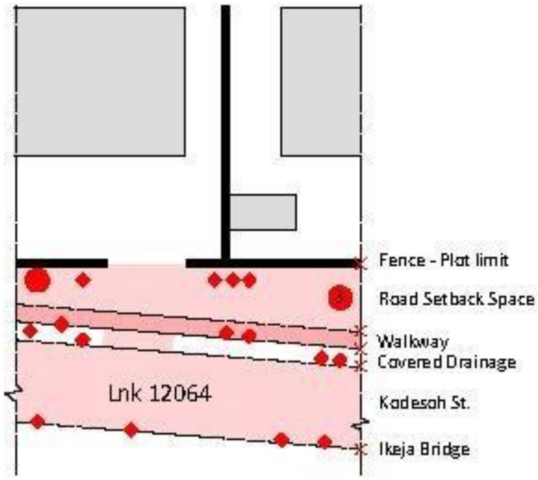
Lnk 12075 - Otigba St.

1. Building Extension with Retail Function
2. Permanent ST Workplace Facility
3. Temporary ST Workplace Facility
- Sedentary STs
- Itinerant STs

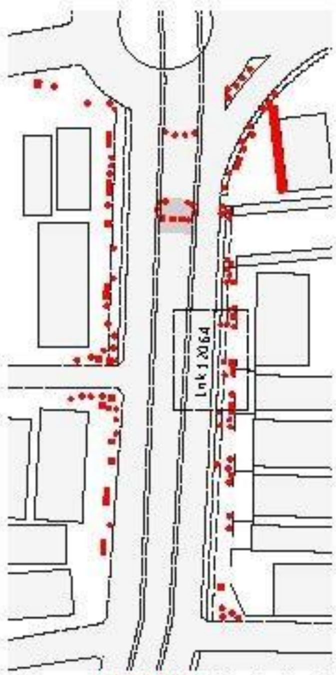
Figure 7-12 Plot and Building Interfaces, Road Setbacks, and ST locations at Computer Village – Ikeja Under-Bridge

The street segment with the highest intensity of ST events excluding the grey zones - Lnk 12064, was flanked to its east by a block, and on the west by an open space beneath a bridge (Figure 7-13). The block's boundary provided an anchor for make-shift operational spaces for SBEs - mainly retail units. On the eastern boundary, most of the SBEs observed were sedentary, and operated from semi-permanent facilities that encroached upon road setbacks, extended over the drain gully, and obstructed the pedestrian sidewalks. On the western boundary, the open space under the bridge functioned as a public transport terminal (*Danfo* station for mini-buses) and contained a few sedentary and itinerant STs. The road reserve along Lnk 12064, which linked the block and open space, was about 6 metres - accommodating two vehicle lanes - and led to a roundabout at its northern end facilitating multiple network intersections. The narrow road width and proximity to several activity generators contributed to the high pedestrian flows and the intensified occupation of ST events on this link.

The outlier, Lnk 12061, formed one section of a dual carriageway and was flanked to its east by a block, with semi-permanent structures housing small shops built along the boundary (Figure 7-14). These facilities did not encroach on road setbacks, despite generous setbacks (probably because this space was regulated). On the western boundary, a median strip and a network link carrying vehicular traffic in the opposite direction separated the blocks. The STs on this link were predominantly itinerant (hawkers), and targeted customers in vehicles caught up in the traffic congestion emanating from Ikeja Under-Bridge (from Lnk 12064). A low pedestrian footfall was also noticed, which might have been a contributing factor to the STs being mostly itinerant.



Plot & Building Interface Plan - Link 12604

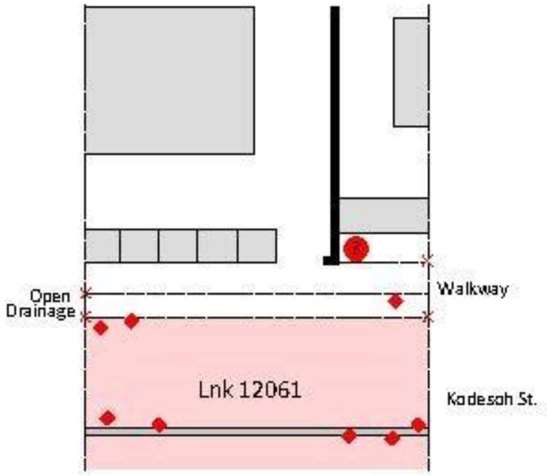


Lnk 12064 - Kodesoh St.

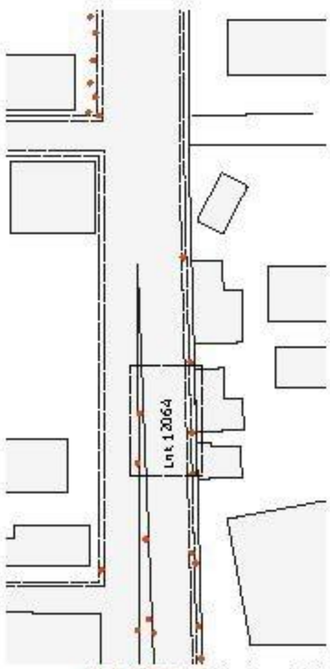
1. Building Extension with Retail Function
2. Permanent ST Workplace Facility
3. Temporary ST Workplace Facility

◆ Sedentary STs
● Itinerant STs

Figure 7-13 Plot and Building Interfaces, Road Setbacks, and ST locations at Ikeja Under-Bridge



Plot & Building Interface Plan - Link 12601



Lnk 12061 - Kodesoh St.

1. Building Extension with Retail Function
2. Permanent ST Workplace Facility
3. Temporary ST Workplace Facility
◆ Sedentary STs
● Itinerant STs

Figure 7-14 Plot and Building Interfaces, Road Setbacks, and *ST locations at Ikeja Under-Bridge*

Case Study 2 Under-Bridge: Main Findings

Lnk 12075, Lnk 12064, and Lnk 12061 all had a connectivity value of 4, and the non-variation indicates that the connectivity did not provide readings on the relationship between SBEs and their locational decisions at Under-Bridge.

At Under-Bridge, the links with the highest intensities of STs were all located within the first 200m catchment, while the locations of the outliers were beyond this area. If outliers of BtA R5,000 influenced STs as suggested from the outcome of Pen Cinema, then the relative locations of the outliers create polycentric nodes of attractions for STs, and would thereby influence the shape of the dispersed trading area at Under-Bridge. However, outliers must also have conducive physical attributes to attract high intensities of SBEs. The outlier studied - Lnk 12061 - hosted few SBEs, probably due to other unconducive physical properties of the street segment and its adjacent urban form. Therefore, encouraging SBEs to inhabit nearby locations that provided them with physical conditions required, while still being able to take advantage of the BtA R5,000 properties of Lnk 12061. The notion that the BtA properties of links were not exclusive, but that they also influenced nearby links - mostly contiguous links - is supported. The question is to what extent does this influence exist? This notion of influence via contiguity was particularly evident for Lnk 12064 as it was contiguous to Lnk 12061 and harnessed its high BtA R5,000 value.

On the contrary, the street segment with the highest intensity of SBEs within grey zones (Lnk 12075) did not share any close spatial relationship with an outlier; and in this case, other factors outweighed the reliance on high values of macrolevel BtA. The STs on this street segment capitalised on the collective advantages of being located within an activity generator (Computer Village), coupled with both the layout configuration[133] and the interface conditions of the urban blocks in this location. There is also the case for the specialist services provided at Computer Village which were high order with large ‘ranges’ (Christaller 1933), attracting customers at the city scale which outweighed the need for accessibility at the micro-scale. Computer Village, therefore, provided specialist services, where the activities of SBEs differed significantly from those elsewhere at Under-Bridge and was not influenced by the same locational attributes.

[133] The urban blocks sizes and the plot sub-division varied slightly in the core trading area at Under-Bridge. The plots in Computer village are typically oblong shaped and oriented with access from the road on the shorter side. This orientation even though not the most efficiently exposed the plots to the street for retail and commercial purposes (as there was no boundary fence).

Due to the dynamism of the grey zones, this case study provided a unique insight into ST activities. However, the analysis also provided insights into why the grey zones, which had no encumbrances from legal and enforcement constraints, failed to host all the STs operating around their vicinity. It was deduced that the following factors might also have influenced STs choice of trading locations:

i. The availability of space within grey zones was not sufficient to accommodate the STs which operated beyond their confines, i.e. demand outweighed the supply of space.
ii. Exclusions were generated due to incompatibilities with the specialised nature of enterprises that operated within the grey zones (these dynamics were not captured by the research methods).
iii. STs chose to locate beyond grey zones to have better opportunities for interacting with customers as influenced by betweenness accessibility.

For the first point, even though specific segments within the network were overcrowded with ST activities, there was still room to accommodate more STs within the grey zones. Therefore, SBEs locations beyond the grey zones were not a function of the lack of space within the grey zone. Second, the type of enterprise undoubtedly played a large part in defining their locations - for example, most SBEs in Computer Village were specialist. Therefore their customer base was different and made it difficult to mix with SBE activities from the surrounding area. Third, STs beyond the grey zone depended on chance encounters, which increased with higher levels of multi-scale BtA, while those in grey zones took advantage of proximities to activity generators. It was however noticed that the sizes of blocks were advantageous to all categories of STs, independent of their locations, as the small footprints of blocks meant these locations were easily accessible by foot.

7.4.3 Case study 3 - Garage, Ikorodu

'Garage' is at Ikorodu LGA, a peri-urban area on the north-eastern boundary of Metropolitan Lagos (Location 3, Figure 7-1). "Garage" is a colloquial name that signifies its spatial function as a public transport hub. Garage is within the vicinity of the Oga Roundabout which connects various intercity arterials - the Lagos-Ikorodu Road, the Ikorodu-Sagamu Road, and TOS Benson Road (Figure 7-15). The case study area at Garage was confined to a 400m catchment area, with a total of 3,886 STs. The spatial attributes of this network are represented in Table 7.6.

Within an initial 200m catchment, 3,312 ST events were recorded. 90% of them were sedentary and operated with temporary or semi-permanent facilities, of this 59 % operated from the floor (walkways, road setbacks, median strips), and 31% from tables with parasols. Beyond the 200m catchment area, 574 more ST events were observed before the onset of decay, and 98% of these STs were sedentary and operated from semi-temporary facilities. These numbers show a sharp decline in ST activities and signified that there was no incentive for STs to operate much beyond a 200m catchment from Garage.

Figure 7-15: Map of Garage, Ikorodu - showing 200m (red) and 400m (blue) network catchment area.

STs at Garage, Ikorodu

At Garage, from the structured interviews of 10 STs, it was clear that access to potential customers was the primary motivator for SBEs locational decisions, while tenure security and flexibility were secondary factors. As SBEs targeted a customer base of passers-by, taking advantage of proximity to pedestrian flows was crucial and thus influenced where STs located. With regards to tenure, there was a high turnover of SBEs workspaces at Garage. The 10 STs interviewed had worked or relocated from other locations within the vicinity, mostly between 1 to 3 years. There was no significant pattern of their responses to suggest if the high turnover rate occurred voluntarily or involuntarily, as the dynamics of spaces in the area had frequently evolved within this period. From observations, the involuntary relocations were due to the changing conditions of the built environment around the case study area, influenced by construction of the BRT service route by LAMATA; while voluntary relocations were motivated by the availability of better trading locations within the case study area.

> We have all had to move several times because of this BRT construction going on. The market the government provided is in a ditch and far away from customers, why would I relocate there? (Female trader, Ikorodu road, selling jewellery).

Levies and rents were paid to secure tenure. Levies were collected officially by the Ikorodu LGA and unofficially by *Agberos*[134]. However, the payment of rental fees for operating spaces was compulsory only to sedentary STs who were in spaces where rights to ownership could be claimed; for example, in front of shopping complexes, houses, and banks.

All STs interviewed lived near Garage, as the area is a residential suburb which provides affordable accommodation[135]. The STs at Garage had a fairly even gender mix across the area, although the traders' enterprises were often gender-specific; male STs engaged mainly in enterprises which required some capital outlay (durable goods - second-hand electronics), while female STs traded in less capital-intensive enterprises (consumer goods - perishable products and second-hand clothes). The source of STs' stock was mostly from other areas within Metropolitan Lagos, which created incurred extra transport expenses for transport costs. Therefore, STs tended to stock sufficient supplies sufficient for extended periods (usually for about a week), using storage facilities located within walking distances from ST locations.

> I must use storage because I buy stock in bulk from Eko once in a week. Even with the transport cost, it is still cheaper this way … the BRT now makes the journey faster and easier (Female Trader, Ikorodu Road, Selling Provisions).

Hindrances to ST operations at Garage was mainly from KAI's enforcement, and the ongoing construction works (which had been going on for about two years as at the time of the field study). STs also complained about having to pay multiple levies to the LGA and *Agberos*. The

[134] Touts (also known as area boys) - they are loosely organised gangs, who extort money and perform other "odd jobs" in return for compensation. They work in connivance with traditional rulers, landowners, or on their own accord.
[135] Living expenses in Ikorodu are cheaper than most parts of Lagos, and there are also large swaths of informal settlements.

legality and purpose of these levies could not be established during fieldwork because all attempts to get clarity were rebuffed. The receipts issued to STs were ambiguous - suggesting that corrupt practices by LGA officials also influenced ST location decisions. Some of the STs argued that their status should be considered legal since they paid "taxes" in the form of levies to the LGA. On the contrary, in an interview with the LGA, officials argued that levies paid were registration fees that went into the maintenance of the public realm where the STs worked and did not equate to taxation, and therefore STs could not be considered as being "legal". This claim by the LGA was countered by STs who said they made separate contributions for waste disposal and maintenance of the public realm. There were apparent disconnects and tensions about the status of STs between these parties, an ambiguity caused by corruption, weak regulation and lax enforcement.

From the interviews it was clear that STs at Garage believed their activities did not create any conflicts; this was however not consistent with the opinions of other road users from conversations and interviews, who found the activities of STs to have both negative and positive influences on space. The negative influences included traffic congestion caused by STs, sanitary problems, safety concerns and the perceptions of crime. Traders who rented shops within formal retail facilities in the surrounding area, also complained that the STs constituted a nuisance because they had an unfair advantage in reaching customers and hindered their profitability. Therefore, many traders with stores had either abandoned their stores within the shopping complexes or used their store as storage facilities while they also traded in the street.

> We also had to start trading in the street, and it is only fair that the Government removes everyone from the street before we return to our shops (Male and female traders, Ikorodu Road, Selling Shoes and Clothes).

Street Network Indices at Garage, Ikorodu

The spatial attributes of the 400m catchment area, in comparison to the 200m subnetwork, had a lower junction ratio, link ratio, and network efficiency. The decreases in values of these metrics suggested that SBEs located in close spatial proximity to the baseline location at Garage, operated within an area with smaller block footprints, smaller block interface lengths, and a more compact network. These factors potentially increase the possibilities for STs to interact with customers over shorter distances because of the reduced distance that customers had to cover to reach SBEs.

Table 7-6: Spatial attributes of Garage's Catchment Area's road network

Case3	Lnks.	Junc	Net. Area	Net. Len	Conn	Lnk. Rat.	Junc. Rat.	Net. Eff	ST Cov.	% Cov.
200m	8	4	77591	956	12	120	239	81	530	55
400m	41	19	396907	4818	60	118	254	82	1750	36

Street trading in the Garage area was quite dispersed. ST events within the entire 400m trading area covered a total network length which was 183% of the total network length within the 200m subnetwork (Figure 7.15). However, STs occupied only 55% of the 200m subnetwork; this, therefore, showed that the dispersion of STs was not because of the saturation of the 200m network, but because external factors influenced STs locating in the larger catchment area. The graph below (Figure 7.15) indicates the distribution of SBEs relative to network distances and the association with link and junction ratio. The indices employed to measure the spatial attributes of the core trading area shows a relationship between the reductions in values of link ratios, junction ratios, and network efficiency from the 200m to 400m catchment areas, with the reduction of ST events.

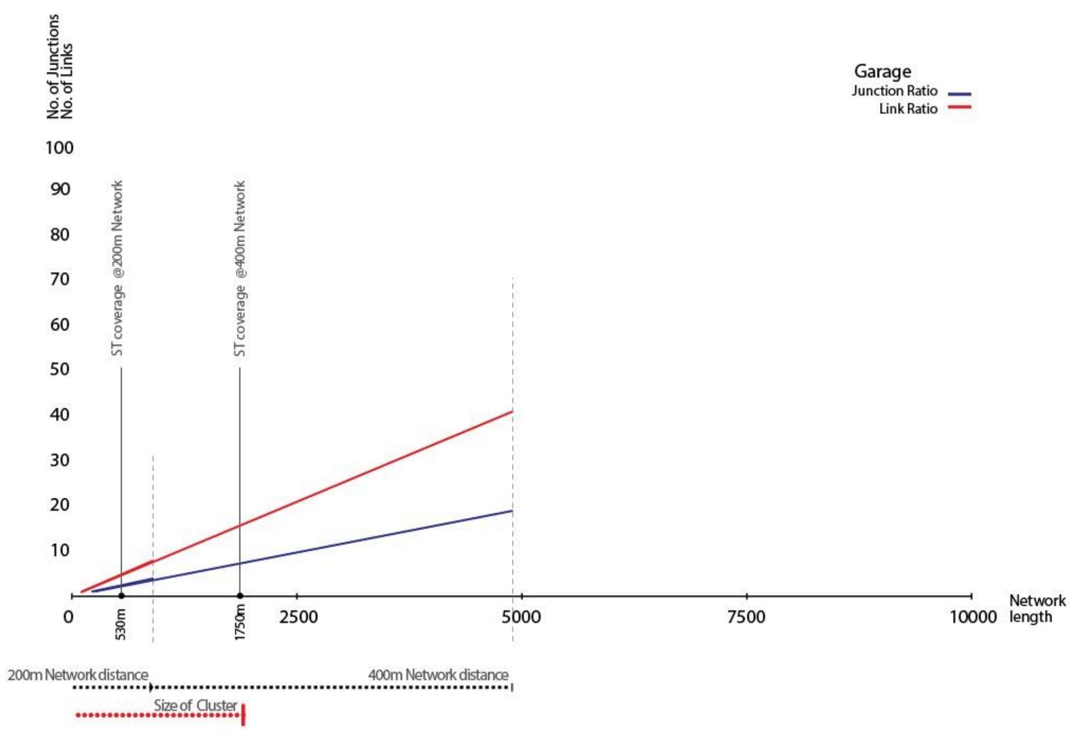


Figure 7-16: Street Network Indices of Garage - Ikorodu's Core Trading Area.

Attributes of Garage's Street Segments

The segment of street represented by Lnk 24618 hosted the highest number of ST events; its BtA R5,000 value, however, had a low rank (Table 7.7). On the other hand, the link with the highest BtA R5000 value - Lnk 45054 - was an outlier and hosted a significantly lower intensity of ST events in comparison to Lnk 24618. These links were analysed to highlight the disparities between their spatial attributes in relation to the occurrence of ST events on them.

Table 7-7: BtA values for 400m catchment area at Garage, Ikorodu

Garage, Ikorodu	R400	R600	R1000	R2000	R5000	R10000
BtA Min	5	11	83	200	552	738
BtA Max	351	852	3979	26818	426578	1405830
BtA Mean	110	252	1094	8111	91865	267054
St Dev	91	208	917	7618	113862	386657
St Dev + Mean	200	460	2011	15729	205727	653711
2(St Dev) + mean	291	669	2927	23348	319589	1040368

BtA Min *= Minimum value of BtA for 400m catchment area from baseline link (the core trading area);* ***BtA Max*** *= Maximum value of BtA for 400m catchment area from baseline link;* ***St Dev*** *= Standard deviation of links BtA values for 400m catchment area.*

Table 7-7 shows that there is a high occurrence of links with high values of BtA R5,000 and R10,000 values within the core trading area. The occurrence suggests that the core trading area has numerous links that have flow potential for long distance journeys - not surprising as the Garage is a major transit point for intra- and inter-state journeys.

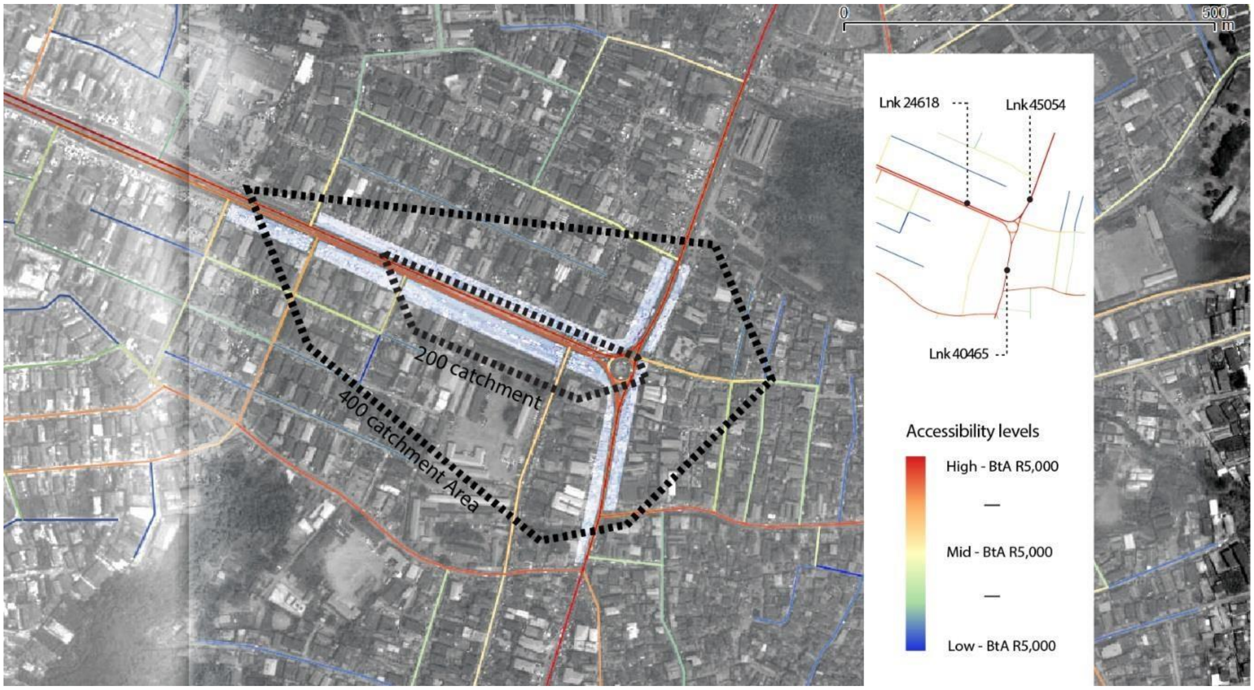


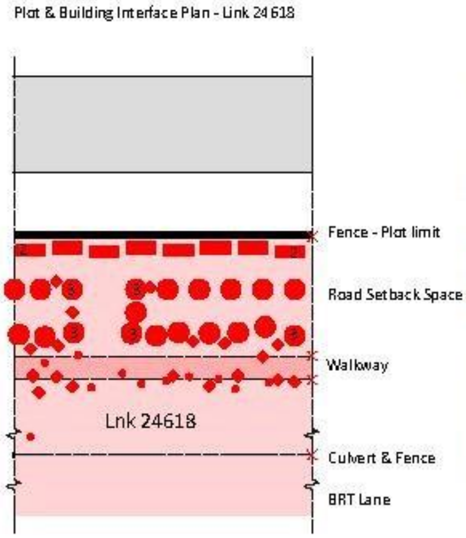
Figure 7-17: BtA R5,000 accessibility map of Under-Bridge. Showing the 200m, 400m Catchment area

Morphology and STs at Garage, Ikorodu

Lnk 24618 is a segment of the Lagos-Ikorodu Road, located opposite the BRT bus station at Garage (Figure 7.18). The road segment was flanked by block boundaries, separated by a broad road segment (the width ranged between 60 to 70 metres), which included a median strip and a service slip road. The block to the south of Lnk 24618 had a varied edge character. A substantial portion of this was a boundary fence used by STs to display goods and support their facilities with minimal access constraints from adjacent owners. However, the STs interviews shows that STs on the remainder of the blocks' frontage had to pay rental fees to secure tenure. Negotiations with the owner or occupier of buildings determined how STs could use this portion of the block frontage.

A sizable portion of the northern interface of Lnk 24618 was a BRT bus-stop. The bus-stop had a mesh wire fence, as a barrier to control pedestrian movements and to discourage STs from encroaching on the road. STs took up space within the building setback between the barrier and the block behind it - using the BRT bus stop's fence as a backdrop for their activities. A few STs violated this arrangement and were located within the bus-stop and on the street segment, but this was more controlled than the southern boundary of the road.

The SBEs operating on Lnk 24618 were mostly sedentary and made use of temporary or semipermanent operating facilities arranged in a pattern of parallel rows - made possible because of the leeway of the setback. The operations of SBEs on Lnk 24618 varied relative to the time of the day, as they took turns to locate in prime positions. During the day, STs at the front row were in prime positions, as they were in direct contact with people passing through Lnk 24618, and their positions obstructed pedestrian movement along the sidewalks. The secondary row was positioned directly against the boundaries of adjacent urban blocks. Thus, a kind of arcade between the two rows stalls was created, which allowed for pedestrian movement. This aisle compensated for the sidewalks that had been blocked and allowed access to the second row of STs. During the evenings (when KAI's enforcement operations subsided) most of the STs situated in the secondary row, relocated to the roadside (Lnk 24618) to gain access to more customers.



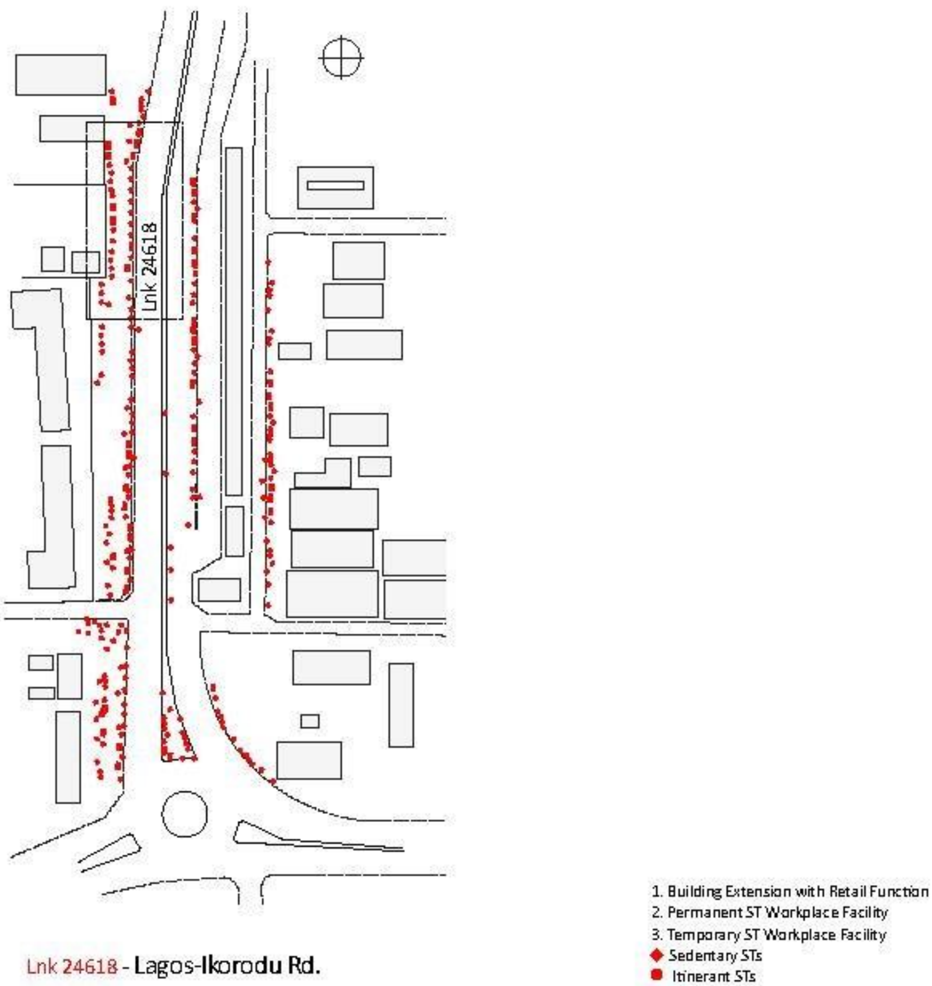
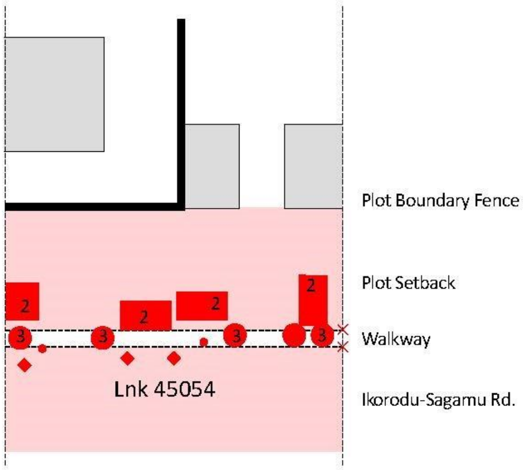
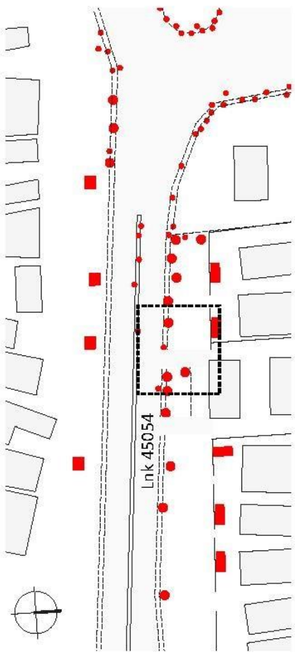


Figure 7-18: Plot and Building Interfaces, Road Setbacks, and ST locations at Garage – Ikorodu



Plot & Building Interface Plan - Lnk 45054



Lnk 45054 - Ikorodu-Sagamu Rd.

1. Building Extension with Retail Function
2. Permanent ST Workplace Facility
3. Temporary ST Workplace Facility
◆ Sedentary STs
● Itinerant STs

Figure 7-19: Plot and Building Interfaces, Road Setbacks, and ST locations at Garage – Ikorodu

Lnk 45054 was flanked by blocks with similar edge conditions, which were about 40 metres apart (Figure 7.18). SBEs located here were predominantly sedentary and operated from temporary and semi-permanent facilities, which mostly encroached on sidewalks and drainage covers. Lnk

45054 had differing levels of SBEs on its two sides, with the western boundary hosting more STs than the east, because the western boundary fronted onto activities at Garage, and this contiguity allowed for an overflow of activities onto Lnk 45054; which was further encouraged by the broad setbacks. In contrast, the eastern block's boundary was disconnected from the vitality around Garage. The disconnection occurred because of the physical and psychological 'barrier effect' Lnk 45054 had due to its width and heavy traffic flow, which discouraged any interaction between the two sides of the road. As reflected in the flow of pedestrians which was skewed to the western interface, the wide single carriageways seemed to discourage SBEs.

Case study 3 Garage: Main Findings

At Garage, it was evident that high values of BtA R5,000 were not the most crucial factor that attracted SBEs to locations, as Lnk 24618 did not rank amongst the most accessible segments, but still hosted the highest amounts of STs in comparison to Lnk 45054 which had significantly fewer numbers of STs. Link 24618 and 45054 had connectivity values of 4, which meant they had the same character of junction intersections. The non-variation in link connectivity values and the different occurrences of STs meant that this metric did not provide a means to study the occurrence ST events for Garage.

The 'barrier effect' which was caused by the width of the road played an intriguing role in influencing ST events. In the case of Lnk 24618, even though it had high intensities of ST events on both sides; it was evident that these activities were disassociated from each other, as the width of the road and the fence built behind the BRT station severed any potential interdependencies. For Lnk 45054, this effect was also noticed, as ST events were located only on one side of the road.

7.4.4 Case study 4 - Eko

Eko (Lagos Island) is the traditional commercial centre of Lagos (Location 4, Figure 7-1). Eko services significant aspects of the supply chain (manufacturing, wholesale and retail business channels), and is also the central business district of Lagos State. Its dual identity makes it a popular destination with a high daily flux of people, who work and trade there either formally or informally. Eko historically has had contentious issues with its governance (see Section 5.2), which has made the area conducive to informal activities. SBEs are located in sectors relative to the nature of their enterprises and distributed in many streets across Eko. The formal economic activities (financial institutions and office spaces) are also located in sectors but concentrated at locations parallel to the Lagos marina. Eko's economic and environmental conditions are encouraged by land-owning families and their proxies because the *status quo* is lucrative for revenue generation.

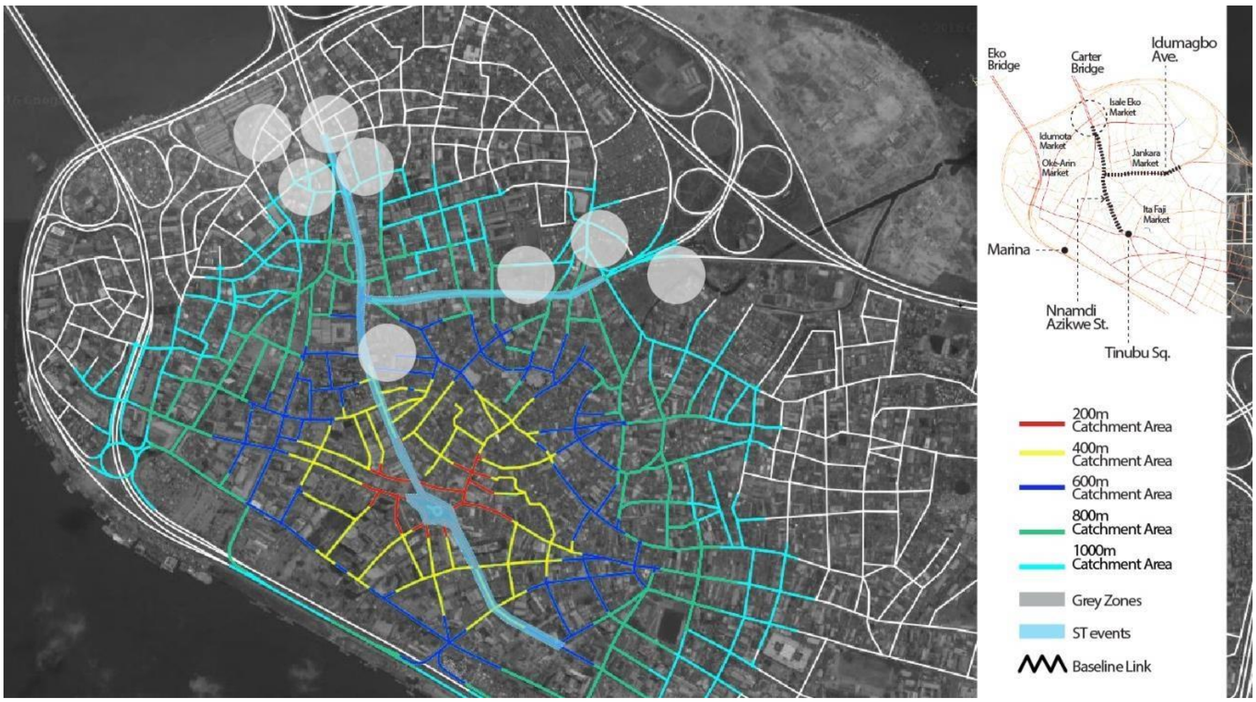


Figure 7-20: Map of Eko showing the road network within a 1,000m catchment area from Tinubu Square

The baseline location of the ST hotspot is Tinubu Square – a landmark in the Western part of Eko (see Figure 7-19). The prevalence of many market areas created intersecting and blurry 'grey zones', and therefore STs were observed to be distributed across almost the entirety of Eko, which resulted in the inability to determine what the size of cluster was relative to Tinubu Square. A threshold distance of 1,000m was defined for the catchment area to be studied defined due to the limited capacity for this research[136]- to resolve the problem with the identification of the size of cluster. The associated spatial attributes of the constituent road networks in this area are represented in Table 7.8.

[136] There is a need for further research on Eko to capture more associated nuances of its spatialities, however such an analysis is beyond the scale and detail of this study.

Despite limiting the catchment area to a 1,000m radius, the exploration of the spatial attributes of Eko was further narrowed down to a set of links within this network for detailed studies. The links analysed were a contiguous set of links which were constituent segments of Nnamdi Azikwe Street. The links hosted 1,450 ST events, 87% of which were sedentary and operated predominantly from semi-temporary facilities, taking up practically all available spaces along Nnamdi Azikwe Street. However, some of the ST events fell within a grey zone, 'Idumota Market'. These dynamics influenced the nature of the analysis conducted in Eko.

STs at Eko

It was observed that SBEs tended to cluster by type of enterprise, which made it easier for potential customers to find them, amongst other advantages derived from operating within 'agglomerated economies'. From the 10 ST interviews conducted in Eko this observation was corroborated, as STs regard access to space in the specific enterprise sector was the predominant factor that influenced SBEs locational choices.

According to the interviews, STs indicated that their target customers were pedestrians[137]. However, prime access to random customers (what Bass (2000) called the '*commerce of circumstance'*) was not such a definitive factor that influenced the choice of locations, because STs felt there are enough potential customers to keep them in business - so long as they are located within sectors of their specific enterprises.

> Anybody who comes here to buy a specific type of good knows where to go. For example, if you want to produce official documents, you go to the area called *Oduwole*. So, for any Trader to be successful, they must align themselves with others who provide similar goods and services (Male Trader, Nnamdi Azikwe, Selling Clothes).

Tenure guarantee was also identified as a crucial factor - especially for sedentary STs, due to the very low turnover of operational spaces and the scarcity of space within specialist enterprise sectors. Officially, levies were paid to the LGA/LCDA and many other agencies, as expressed by a Trader:

---

[137] Car park spaces and vehicular access is limited within Eko, so the best way to get around is on foot, *okadas* or on *Keke-Napeps.*

> I pay different taxes to the Lagos Inland Revenue Services [LIRS] - Radio and TV license fees, Lock-up fees - and must display my receipts on the walls of my shop (as you can see everyone here does) to avoid harassment. Can you tell me how and why I am considered informal? (Male Trader, Nnamdi Azikwe, Selling Shoes).

Agberos collected daily levies to guarantee STs tenure to operational spaces. These unofficial levies can be considered as rent, and the payment of rent to secure tenure for operating spaces applied to all STs to some extent, and not just those located in spaces where rights to ownership by an official authority were claimed.

The proportion of male and female STs was similar, even though females seemed more visible because most were itinerant STs. Most of the itinerant STs were indigenous and residents of Eko. According to a female ST interviewed on Nnamdi Azikwe Road:

> The Yoruba women [itinerant STs] are mostly responsible for constituting a nuisance. As they feel because they are indigenous and it is their forefathers land, so they can use any space to trade [not respecting the leeway afforded to STs by the LGA/LCDA to operate in the area].

This concession identified is 'undocumented', and suggests that STs can operate if their positions do not encroach on sidewalks or obstruct the flow of pedestrians.

> Early in the morning before 7.00am what occurs here is a different scenario. This whole stretch of road [Nnamdi Azikwe Road] will be occupied by STs displaying their wares on the road and blocking all access … this is where people from all over Lagos come to get their second-hand clothes which just arrived from Europe. The *Abgeros* are responsible for organising who gets allocated space, and rent is paid to this effect ... (Male Trader, Nnamdi Azikwe, Selling Clothes).

The hindrances to SBEs activities was mainly from a special enforcement unit - the CBD Task Force which is like KAI but focuses exclusively on controlling ST activities in Eko. The CBD Task Force harassed continuously, confiscated, detained, and extorted money from STs. The *Agberos'* were also culpable for disrupting SBEs activities if they did not pay levies. STs believed their activities in this area did not cause any conflicts of interests, but instead they provided convenience to the many customers in the CBD.

Street Network Indices and Block configuration at Eko

Within the core trading area at Eko (Table 7.8), it is observed that link ratios increased slightly, and junction ratios reduced slightly. Network efficiency varied slightly across all scales. The reading of these indices suggest that block sizes and their interface dimensions remain fairly consistent at different spatial scales; therefore, it can be assumed that the spatial advantage derived from the street network is evenly distributed throughout Eko (Figure 7.20). This consistency - especially at the larger scales - was unlike the other case study sites, which may have been a factor which encouraged STs to occupy such a wide area.

Table 7-8: Spatial attributes of Eko's Catchment Area's road network

Case 4	Lnks.	Junc	Net. Area	Net. Len	Conn	Lnk Rat.	Junc Rat.	Net. Eff	ST Cov.	% Cov.
200m	40	18	172887	3251	59	81	181	53	n/a	n/a
400m	110	57	454695	9482	187	86	166	48	n/a	n/a
600m	217	120	984246	19369	393	89	161	51	n/a	n/a
800m	371	205	1838550	33813	677	91	165	54	n/a	n/a
1000m	574	319	2554587	50674	1061	88	159	50	n/a	n/a

The coverage of STs on networks within the entire 1,000m core trading area was not identified (as noted earlier on Page 262), because was beyond the scope manageable for this research. STs occupied 100% of the selected network segments studied within the 1,000m core trading area. Inferences on how this influenced the larger dispersion of SBEs in Eko is however unknown.

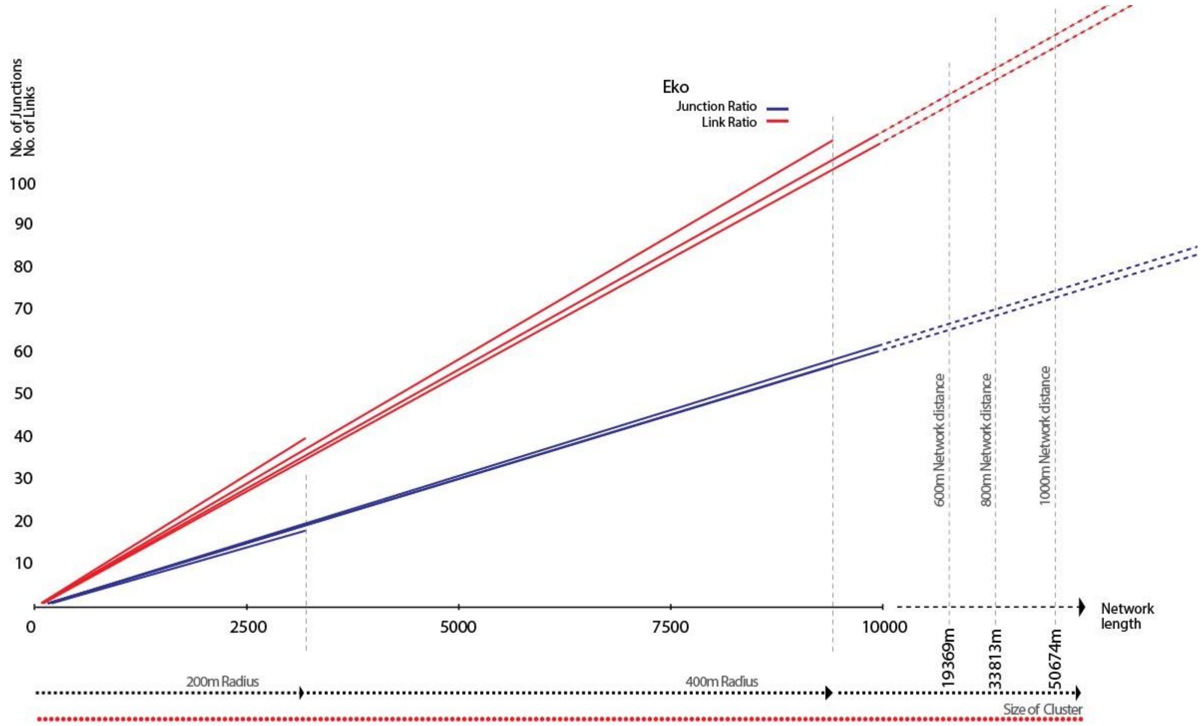


Figure 7-21: Street Network Indices of Eko.

In Figure 7-21, junction and link ratio values hardly deflect with longer network lengths, an indication that the block sizes across the core trading area (which covered the most of Eko) had a consistent urban grain. The values of link ratio (average link length), also showed that Eko had a fine urban grain. This is not surprising as Eko is the traditional core of the city, whose grain was developed relative to the Yoruba traditional compound layout (see more detailed description in Section 5.2.1).

Attributes of Street Segments at Eko

The links analysed within the core trading area were a contiguous set of links and they were all outliers. Three links were analysed: Lnk 762 - outlier within the grey zone (Idumota Market) with the highest intensity of STs; Lnk 32918 - outlier beyond grey zone with highest the highest intensity of STs; Lnk 11335 - outlier with the least ST events. These links were analysed to highlight the disparities between their spatial attributes in relation to the occurrence of ST events on them.

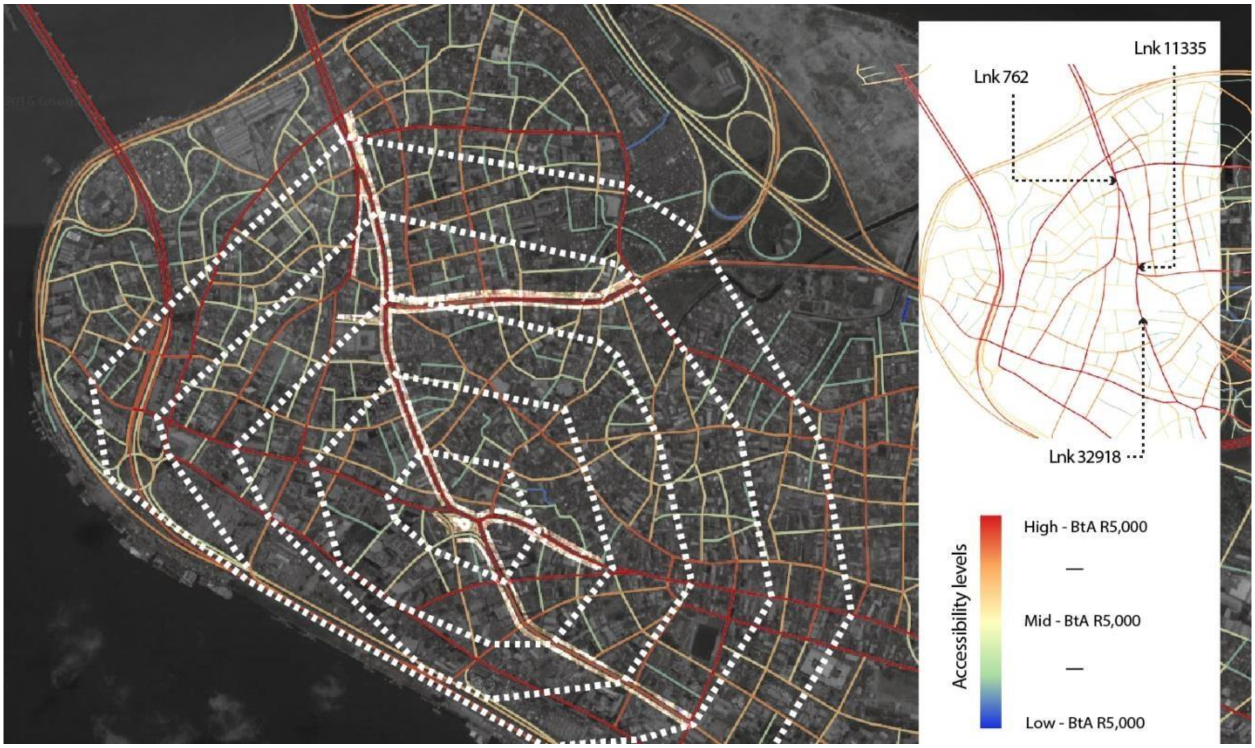
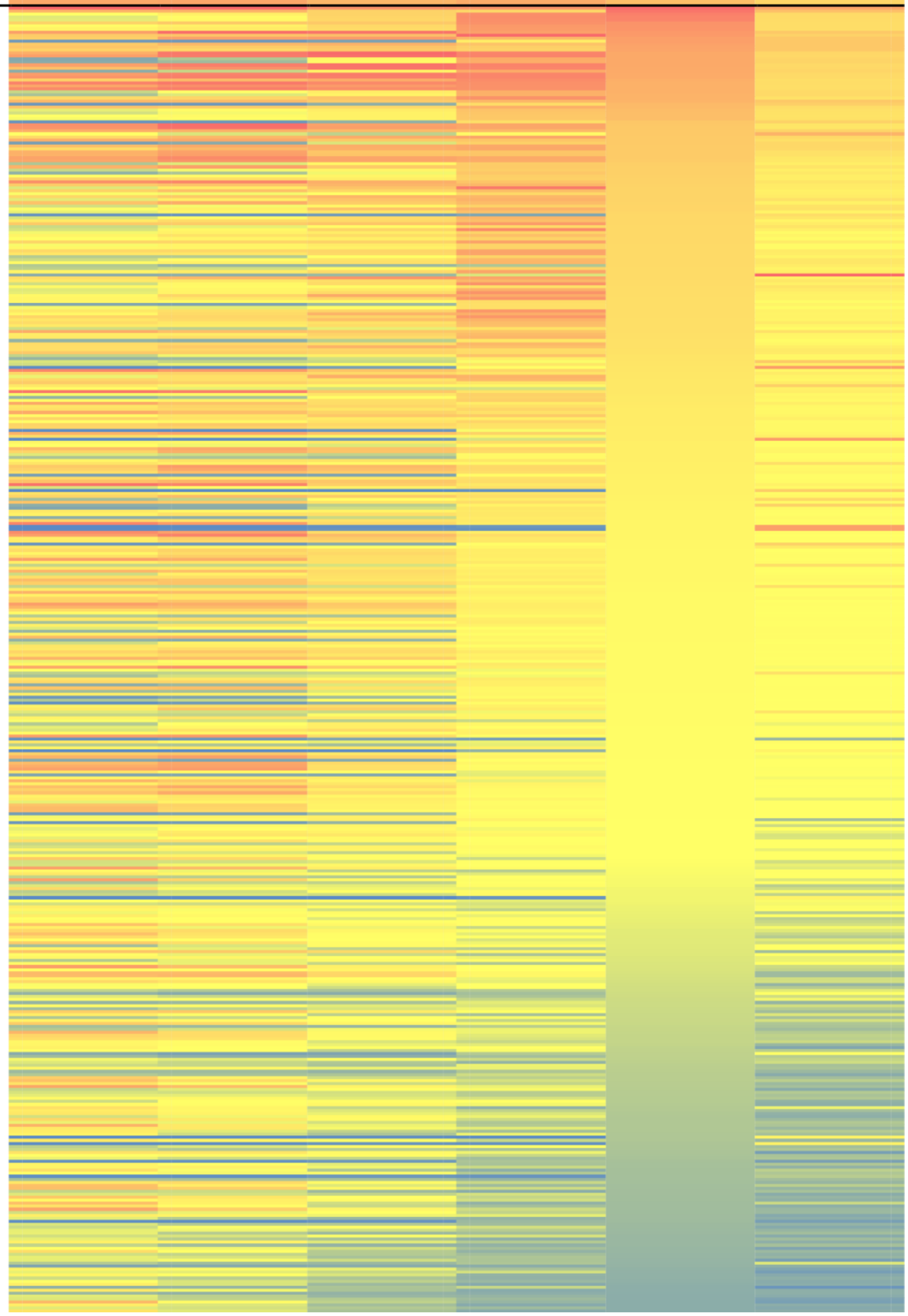
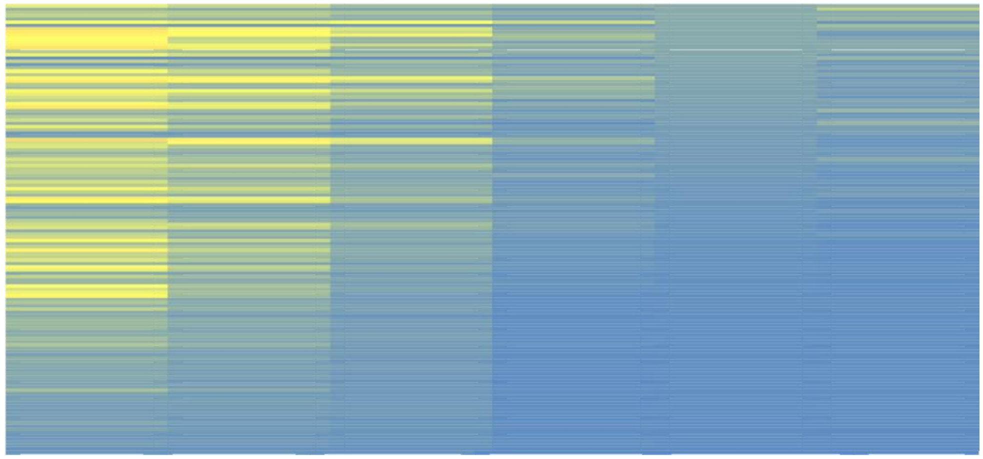


Figure 7-22 BtA R5,000 accessibility map of Eko.

Table 7-9: BtA values for selected links within 1000m catchment area at Eko

Eko	R400	R600	R1000	R2000	R5000	R10000
BtA Min	0	1	34	568	1466	5336
BtA Max	1302	4631	24564	99523	658882	5594780
BtA Mean	359	1181	4486	17164	75310	362889
St Dev	260	979	4454	20828	112757	640603
St Dev + Mean	619	2160	8940	37991	188067	1003492
2(St Dev) + mean	879	3139	13395	58819	300824	1644095



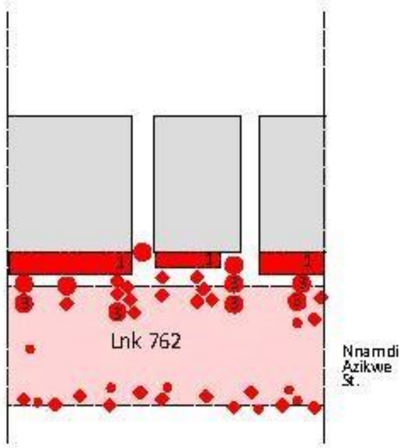


__BtA Min__ = Minimum value of BtA for 1,000m catchment area from baseline link (the core trading area); __BtA Max__ = Maximum value of BtA for 1,000m catchment area from baseline link; __St Dev__ = Standard deviation of links BtA values for 1,000m catchment area.

Table 7-9 shows the distribution of BtA for all links within the core trading area at Eko. Table 7-9 differs significantly in size from similar themed tables for other case studies. The disparity is because of the large number of links contained within the core trading area defined for Eko. BtA R5,000 values for links are evenly distributed, either side of the mean (yellow band). However, there are a significant number of links (red band) with values close to the maximum value of the BtA R5,000 and beyond the outlier qualifier - which signifies a high number of outliers. A high number of outliers signifies that there are numerous links with high flow potentials, and this can be assumed to be a reason why Eko sustains a large number of markets and commercial activities.

Morphology of Links at Eko

Lnk 762 was flanked by closely spaced mixed-use blocks with minimal setbacks. The ground floors were occupied by retail units that fronted the street segment and thus created parallel active edges (Figure 7-23). The blocks were also built as terraced units which gave maximum exposure to the adjoining street segment. The setbacks were occupied by both retail units within these blocks - which had extended their operational spaces into road setback - and by SBEs. The encroachment of the retail units into the road meant that the activities of these otherwise formally designated retail enterprises transitioned into the realm of SBEs, and competed with the latter - more typical categories of informal SBEs.



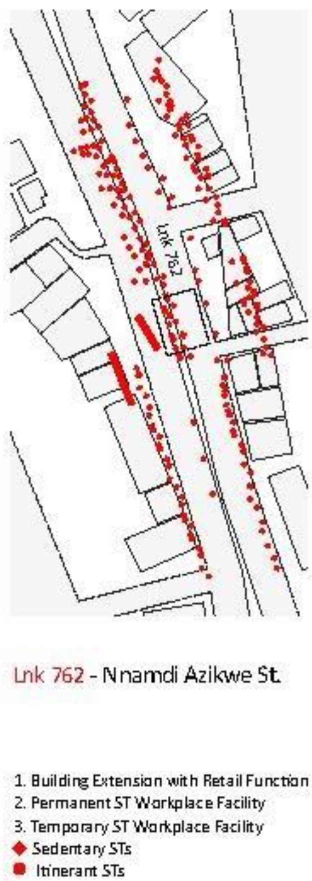
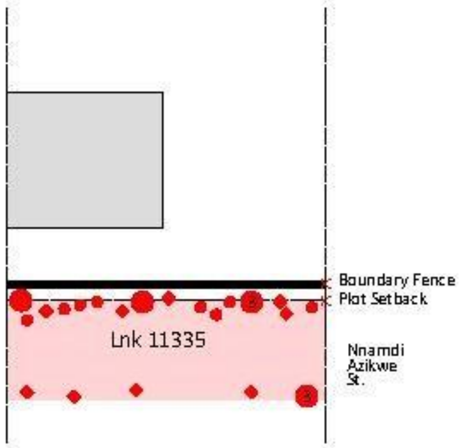
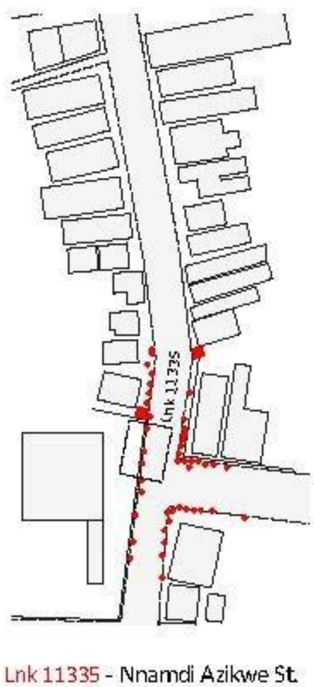


Figure 7-23: Plot and Building Interfaces, Road Setbacks, and ST locations at Eko

Lnk 11335 was flanked by institutional land uses - Tom Jones Memorial Hall and Library, and the Lagos State Development and Property Corporation (LSDPC) House - and so ownership rights were exerted more stringently on block boundaries with the help of KAI and the CBD Task Force (Figure 7-24). Boundary fences were erected which hindered STs' ability to operate at the same intensities as other parts of Eko, as the setback space available was limited. The edge conditions of the block-street interface, reduced amount of setback space, and the land use of the block, are factors considered to have influenced the reduced activity of ST events on this street segment.

Lnk 32918 was flanked by a block with an inactive edge to its west - the boundary fence of a brownfield development parcel which functions as a public car-park - and to its east by the boundary fence of the Lagos Central Mosque (Figure 7-25). The SBEs on the western edge operated from temporary and semi-permanent facilities located on the setbacks and the adjacent road segment. Those on the eastern boundary were mainly sedentary and used temporary facilities placed on setbacks, displaying their wares on the boundary fence of the mosque without using any specific tables or kiosks. The Mosque was both a prominent landmark and a generator of pedestrian activity which attracted large numbers of pedestrians at certain times. The dynamics created by the Mosque was probably why Lnk 32918 hosted the highest ST events beyond the grey zones, as STs sought to take advantage of the footfall of worshippers and its visibility as a landmark. Lnk 32918 though an outlier, had a relatively lower BtA R5,000 value in comparison to the other outliers assessed at Eko.





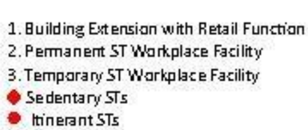


Figure 7-24: Plot and Building Interfaces, Road Setbacks, and ST locations at Eko

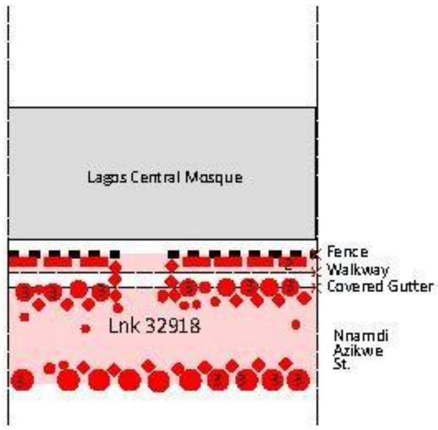


Figure 7-25: Plot and Building Interfaces, Road Setbacks, and ST locations at Eko

Case Study 4 Eko: Main Findings

Eko had ST events distributed almost everywhere within the defined boundary of analysis, and this was attributed to several factors, with the most significant morphological factor being the fine-grained structure of its urban blocks. The associated potential for pedestrian accessibility and permeability was reflected in the junction ratios and link ratios, which remained similar for both the small and larger catchment areas studied relative to the baseline link at Tinubu Square. STs seemed to take advantage of the fine urban grain, as they acknowledged that their target customer base was pedestrians because walking was the most convenient way to navigating through Eko.

In the core trading area of Eko, specific street segments were more prolific in hosting STs even though STs were ubiquitous everywhere. The prolific street segments showed up as outliers of BtA R5,000, and they were contiguous segments of Nnamdi Azikwe Street and Idumagbo Avenue. The former was analysed within the body of this research, and a cursory look at the latter indicated that it hosted 2,113 STs. The STs that operated from Idumagbo Avenue thrived even though access to the road was difficult due to its state of disrepair, which might have affected the ability of people to gain access to STs. Idumagbo Avenue[138] provides evidence to further support the association highlighted between SBEs locations and outliers of BtA R5,000. For both sets of contiguous links that were outliers of BtA R5,000 in Eko (Nnamdi Azikwe Street and Idumagbo Avenue), there were disparities in the number of ST events hosted by individual segments, and this was relative to the fulfilment of other spatial characteristics necessary to facilitate ST activities. As an example, outliers located close to activity generators had higher frequencies of ST events.

Eko is densely populated with markets, with about 52 markets in the entire CBD area. The overlapping boundaries of these markets influenced the distribution of SBEs, because STs tend to locate beside established markets to take advantage of the footfall they attract. It is also interesting to note that STs still exploit their ability to provide convenient services (even though they are numerous markets in close proximity) by marking up prices by as much as 60%. It is common knowledge that the best bargains are gotten when purchasing goods and services from 'inside'[139] instead of from SBEs. This exploitation is evident in the situation of Lnk 762 with its

[138] A street which had similar features to Nnamdi Azikwe Street with contiguous outliers, with parts which coincided with with a grey zone (Jankara Market).

[139] 'Inside' refers to the patronising traders located in proper markets

proximity to both Idumota Market and Idumota bus station - activity generators with high footfalls. Lnk 762 was also constantly congested because of stationary *Danfos* (mini-buses) - a consequence of traffic backlog from the Idumota Bus Station, which obstructed vehicular movement and increasing the attractiveness of this location to STs.

7.4.5 Case study 5 - Jakande

Jakande is in Lekki at the south-east of Lagos (Location 5, Figure 7-1). The ST hotspot inhabits a segment of road connected to the 5th roundabout along the Lekki-Epe road (Figure 7-26). Lekki is a convenient commute for many due to its proximity to the main economic centres around Lagos Island. This proximity and other factors like the availability of large parcels of land for development - a scarce commodity in Lagos - and investments in infrastructure by LASG and private developers, has spurred its rapid development in the last two decades. A deficit in lowcost housing around Lekki and the availability of undeveloped land parcels has also led to the formation of informal settlements and IE activities around Jakande.

STs at Jakande were confined to a 200m catchment area, and the spatial attributes of the road networks within this area are represented in Table 7.10. A total of 133 ST events were observed, and 80% of them were sedentary. 43% of the sedentary STs operated from semi-permanent facilities - shacks made with wooden planks, while the other 56% operated directly on the bare floor along walkways and the road.

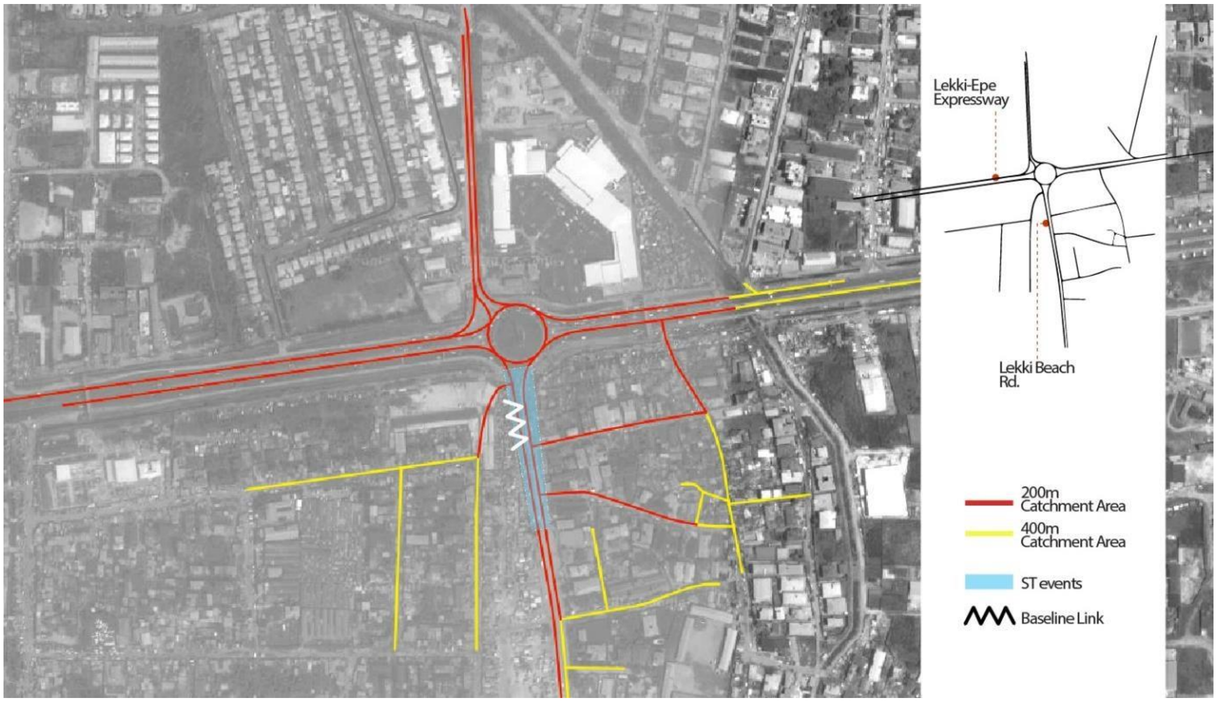


Figure 7-26: Map of Jakande, Lekki showing the road network within its core trading area

STs at Jakande

The primary determinant of STs' workplace locations at Jakande was the proximity to potential customers. Tenure of operating space was equally important due to the limited availability of prime spaces and the threats of displacements. STs interviewed acknowledged that displacement was inevitable, based on past experiences at other locations within Lekki. A signal to the impending displacement was evidenced in the erection of fences which ran parallel to the LekkiEpe Expressway, intended to restrict pedestrian access to STs' activities that set up shop by the side of the road (see Figure 7-27). The fencing has effectively stopped many of STs trading along the setbacks parallel to the Lekki-Epe Expressway, but some STs have adapted their activities to ensure that they are visible to potential customers. The fence funnels pedestrian movement through a single access point (Figure 7-30) - which is shared with cars at the Lekki-Epe expressway's 5th roundabout, and this is the point of concentration for most STs within the area.

Figure 7-27: Fence erected along Lekki-Epe expressway. Traders are selling reinforcement bars used for building construction – which are specialist commodities.

The SBEs at Jakande were both specialist and non-specialist and this influenced their operational strategies. Non-specialist SBEs had low thresholds and relied on being at locations where it was convenient to interact with customers; these SBEs provided essential services that the area lacked[140]. These STs targeted customers who lived in the vicinity of Jakande who passed their locations regularly. On the contrary, STs whose enterprises and services had larger thresholds and less easily-moved goods (durable goods such as building materials in Figure 7-27) depended on visibility to reach potential customers and were located away from the most hotly contested spaces at the most accessible locations.

All STs interviewed lived in the informal settlements close to Jakande. The home-to-work proximity, however, did not correlate with the gender distribution pattern identified in other case studies as most STs at Jakande were male. Specialised storage facilities were not common here, as most STs who required any form of storage used their houses for this purpose.

Street Network Indices at Jakande

[140] In recognition of the retail facility deficit and the untapped consumer base around Jakande in Lekki, a new shopping mall was under construction opposite the area where STs were located at the time this research was conducted. It will be interesting to study the effect the shopping mall has on STs and consumer behaviours in Lekki post-completion. The fact that SBEs intuitively recognised the potential of Jakande as a prime retailing location, further supports the notion of the sensitivity of their location decisions.

Within the core trading area, a new link and junction occurred at every 177m and 367m respectively. Since decay occurred within the limit of the 200m catchment area, there was no basis to make comparisons for the network attributes within this case study. However, a cursory look at similar values of network indices for other case studies indicates that in comparison the street network at Jakande was more widely spaced (except in Oshodi – one of the examples in Appendix 2). Therefore, it is assumed that the spatial setting for SBEs at Jakande operated with larger block interfaces and footprints than the other case studies.

Table 7-10 Spatial attributes of Jakande's Catchment Area's road network

Jakande	Lnks.	Junc	Net. Area	Net. Len	Conn	Lnk Rat.	Junc Rat.	Net. Eff	ST Cov.	% Cov.
200m	27	13	696217	4771	40	177	367	146	650	13

STs occupied 13% of the total network area within the core trading area, which is a very low level of dispersion within the network available (Figure 7-28).

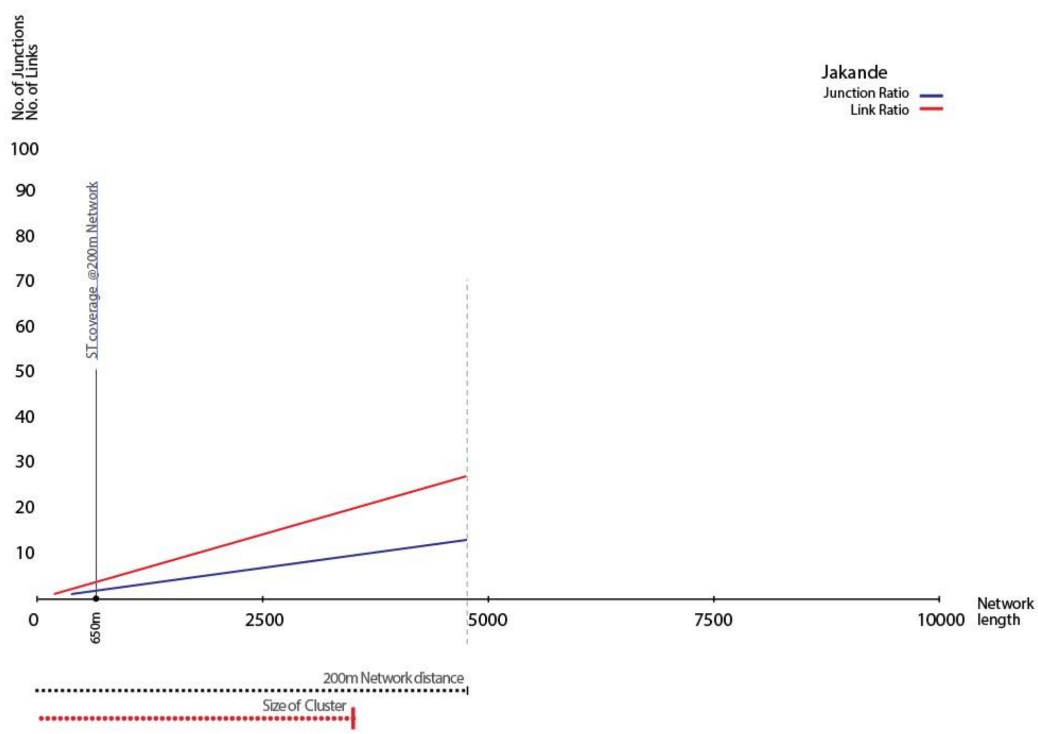


Figure 7-28: Street Network Indices of Jakande, Lekki.

Attributes of Street Segments Jakande

Lnk 25738 ranked as the most accessible segment of the network, while Lnk 8941 hosted the highest number of STs within the core trading area at Jakande.

Table 7-11: BtA values for selected links within 400m catchment area at Jakande

Jakande	R400	R600	R1000	R2000	R5000	R10000

BtA Min	6	11	29	397	1641	3511
BtA Max	248	862	3189	25275	263836	1806320
BtA Mean	297	297	1161	9080	107129	527476
St Dev	70	223	874	7036	93204	593887
St Dev + Mean	367	520	2034	16116	200333	1121363
2(St Dev) + mean	437	743	2908	23151	293537	1715250

BtA Min *= Minimum value of BtA for 400m catchment area from baseline link (the core trading area);* ***BtA Max*** *= Maximum value of BtA for 400m catchment area from baseline link;* ***St Dev*** *= Standard deviation of links BtA values for 400m catchment area.*

Table 7-11 shows the distribution of links within the core trading area at Jakande. For BtA R5,000 and R400, the value of 2 standard deviations above the mean, exceeds the maximum value – an occurrence which tends to happen when there's a bunch of high values and a tail off to the left of a distribution. The effect of this skewness is not known.

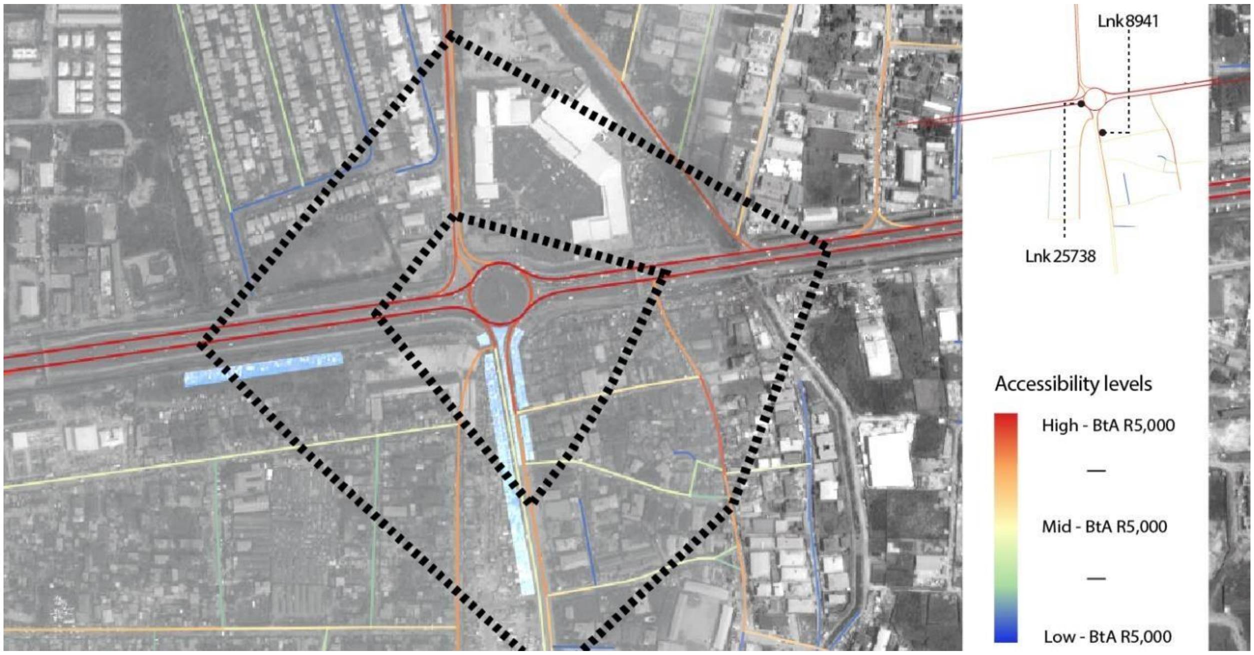
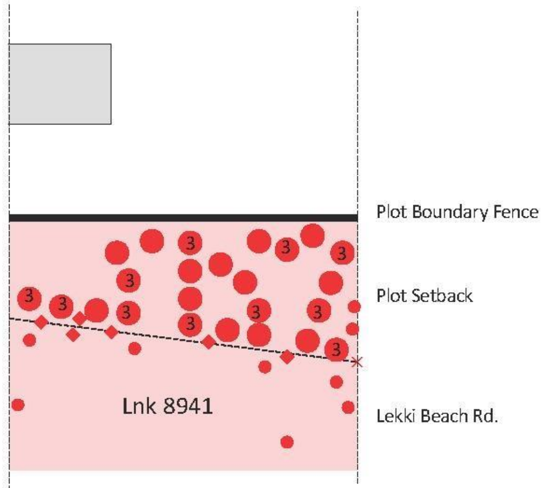
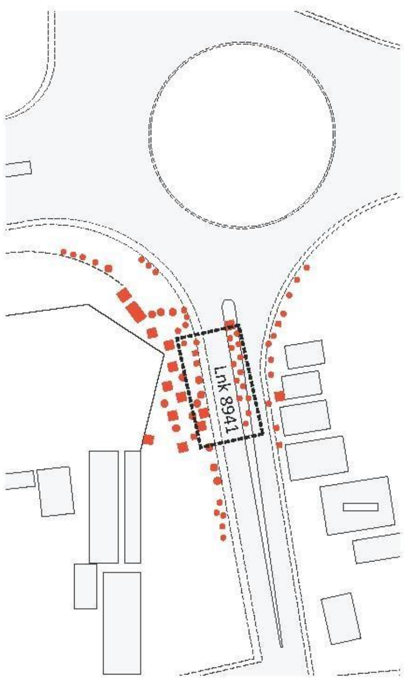


Figure 7-29 BtA R5,000 accessibility map of Jakande. Showing the 200m, 400m Catchment area



Plot & Building Interface Plan - Link 8941



Lnk 8941 - Lekki Beach Rd.

1. Building Extension with Retail Function
2. Permanent ST Workplace Facility
3. Temporary ST Workplace Facility
◆ Sedentary STs
● Itinerant STs

Figure 7-30: Plot and Building Interfaces, Road Setbacks, and ST locations at Jakande, Lekki

Link 25738 was a segment of a roundabout, and due to the unsuitability of its physical setting, no STs were observed to operate on it. The road segment which Lnk 25738 represented had a high volume of vehicular traffic and was an 'island' surrounded by pockets of open space which would have discouraged interaction between STs and potential customers.

Lnk 8941 had the highest frequency of ST events. There was a variance in the edge conditions of the urban blocks which flanked Lnk 8941. One edge hosted retail spatial programmes, and informal settlements occupied the other. SBEs operational facilities located on the street segment consisted of both temporary and semi-permanent structures.

Case Study 5 Jakande: Main Findings

The outcome from studies of STs at Jakande confirmed the findings of the other case studies which indicated that BtA was an essential factor influencing STs workplaces, but that suitable operational spaces needed other spatial attributes to enable the formation of ST hotspots. The Jakande case study also demonstrated that SBEs did not necessarily have to be located on links which were outliers (or had high values of BtA), but being in spatial proximity - on contiguous links - to these links was enough to allow them to gain advantages of accessibility.

7.5 Review of Case studies

This section is a systematic review of the case studies. It explores the broader conclusions on the spatialities of SBEs workplaces in Lagos, and relevant information from the three case studies in Appendix 2 is also included. The analysis here compares the characteristics of core trading areas at ST hotspots to distil common trends. The following synthesis draws on the mixed-method of inquiry, for a critical reflection on the role urban spatial structures and spatial accessibility plays in influencing the location of SBEs in the five case studies above and the three in Appendix 2 - Oshodi, Ikotun, and Mile 2.

Interview findings

To gain first-hand knowledge of STs' experiences and to provide more information on factors that influenced their locational decisions, interviews were conducted with 10 STs for each case study. Numbers of interviews were relatively small, and many of the responses about locational decisions were similar, so the results are not presented for each case study area, but were used mainly to add depth to the researcher's understanding of the ST hotspots from the analytical and observational analyses.

The most consistent factor influencing locational decisions about SBEs workplaces from these interviews was the need to interact with as many potential customers possible. The proximity to target markets for STs is reflected in their resilience and reluctance to relocate from specific locations, even after numerous attempts at relocations and evictions by the LASG. Security of tenure was also discovered to be a key determinant for STs locational decisions. STs preferred workplaces which gave them the ability to dictate their tenure without formalised or legal arrangements. So, even though most SBEs paid some form of a levy to secure tenure, it was more convenient and cost-effective to pay these levies on a daily or weekly basis, rather than monthly or yearly - as required by more formal arrangements.

From the data collected during field studies, being sedentary was the most popular mode of operation for SBEs. Sedentary SBEs thrived on both the availability of appropriate space which guaranteed interactions with potential, often regular, customers and on the security of tenure to such spaces. It was also observed that the edge condition of space (within blocks and plots) adjacent to network segments was critical. Spaces without physical boundaries, for example, open spaces or undeveloped land parcels without boundary fences, tended to have fewer sedentary STs located around the network segments which define their boundaries. It was found that sedentary STs use fences or walls as display areas or part of a shelter, so they tended to operate on the network segment rather than dispersing into the open spaces. It may also be that the fences provide more protection from eviction from behind. For example, at the case study in Mile 2 and Jakande, there was ample space for more STs to use as workplaces, but only a few SBEs occupied these spaces; this contrasted with other cases such as Under-Bridge, with less available space but more STs.

Itinerant STs cater to a transient target market. Therefore their choices of workplaces were more flexible and relied less on the tenure and morphological conditions of space. Instead, itinerant STs sought spaces with excellent accessibility, and moved between locations relative to the flows of passengers at various times of the day, to take advantage of traffic congestion to sell to car drivers and passengers. Busy network intersections (high value of connectivity in sDNA-sBEL), which are posited by Monnet et al. (2007) to influence the locations of SBEs - as they provide high visibilities to STs while creating a potential pool of demand from travelling customers - did not show a definite relationship at most case studies. Although STs appeared to take advantages of traffic backlogs at busy intersections, it was observed at the ST hotspots analysed that this was not a function of connectivity at busy nodes, but the volume of traffic passing through a network segment. The findings in this research in no way invalidate the assumptions made by Monnet et al. (2007), but due to the nature of data programmed for use in sDNA-sBEL, this claim could not be substantiated.

BtA characteristics

BtA profiles of core trading areas revealed interesting insights into the configuration of street networks. In Table 7-12, the BtA R400 profile of the core trading area at Eko has the highest value - signifying high micro-level flow potential (pedestrian flow) and fine urban grain. The ease of pedestrian flow might be a reason why STs are dispersed over an extensive area (see Section 7.4.4). In comparison, the BtA R400 profile for Mile 2 (appendix 2) has the lowest value and this can be attributed to its core trading area being located in a sparsely built urban fabric. In Table 7-14, BtA R5,000 of Mile 2 has the highest value - signifying high macro-level flow potential (vehicular flow). Multi-scale BtA therefore provides a predictive metric to determine the potential of ST hotspots.

Table 7-12: BtA R400 profiles for all Detailed Case Studies

BtA R400	BtA Min	BtA Max	BtA Mean	St Dev	St Dev + Mean	2 (St Dev) + mean
1. Pen cinema	5	927	175	220	395	615
2. Ikeja Under-Bridge	5	663	137	130	267	397
3. Garage, Ikorodu	5	351	110	91	200	291
4. Eko	0	1302	359	260	619	879
5. Jakande	6	248	297	70	367	437
6. Oshodi	0	135	41	29	70	99
7. Ikotun	0	52	22	15	37	52
8. Mile 2	4	38	13	14	27	41

Table 7-13: BtA R5,000 profiles for all Detailed Case Studies

R5,000	BtA Min	BtA Max	BtA Mean	St Dev	St Dev + Mean	2(St Dev) + mean
1. Pen cinema	2211	1539250	319439	438874	758313	1197187
2. Ikeja Under-ridge	880	458870	70193	95091	165284	260375
3. Garage, korodu	552	426578	91865	113862	205727	319589
4. Eko	1466	658882	75310	112757	188067	300824
5. Jakande	1641	263836	107129	93204	200333	293537
6. Oshodi	2151	264577	104598	75838	180436	256274
7. Ikotun	1933	401703	154017	170000	324017	494017
8. Mile 2	69359	1149660	644813	426517	1071330	1497847

Morphological characteristics

As a consistent methodology was employed to conduct the assessments of all the cases studied, pitfalls of validity and reliability noted by Ewing and Cervero (2010) as being attributable to the meta-method of review, had been pre-emptively mitigated. A caveat, however, applies to Eko, because of exceptions associated with the data used for this case study. Eko's core trading area was more extensive than this research could map, and therefore the frequencies of STs could not be captured entirely. Furthermore, the count of STs made by the researcher in Eko seemed low, based on other observations made during the field studies. So even though Garage was recorded to have the highest number of ST events (Table 7-14), the author considers that the numbers were higher in Eko. This serves as a shortcoming of the data used, which was caused by constraints time limitation within this research - as described in Chapter 7.4.4.

Urban block configurations within core trading areas were studied with street network connectivity indices prescribed for sDNA-sBEL. These indices accounted for network configurations relative to catchment area sizes of core trading areas to highlight their relationships with ST distributions. An overview of the spatial indices produced for the eight cases studied, and their corresponding core trading areas using sDNA-sBEL are presented in Table 7-14.

Table 7-14: Summary of spatial indices in the 8 Case Studies.

		EventsST ZonesGrey	Trading Area	Cluster Size	Cov.%	RatioJnc.	RatioLnk.	Net Eff.	Conn.	Outliers	
1.	Pen Cinema, Agege		400	290	37	146	64	50	86	YES	NO
										YES	YES
2.	Under-Bridge, Ikeja		600	430	36		98	57	169	YES	NO
					36						
3.	Garage, ikorodu	675	400	300		254	118	82	60	YES	YES
		2,634								NO	NO
4.	*Eko	3,886								YES	NO
5.	Jakande, Lekki	3,563								NO	NO
6.	Oshodi		1,000	n/a	n/a	159	88	50	1,061	NO	NO
7.	Ikotun	133	200	120	13	367	177	146	40		
8.	Mile 2	797	400	380	20				47		
		1311	200	190	39		200 23 / 231 148		14		
		119	200	120	56	739	295	8	6		

From Table 7-14 junction and link ratio are highest for Pen Cinema, Under-Bridge, Garage, Eko and Jakande. These locations were the 5 detailed case studies selected initially due to the high multi-scale BtA profiles of the baseline link – which suggested flow potential across multiple transport modes (see Section 7.2). It was also observed that the enlargement of catchment areas coincided with a decrease in junction and link ratios, and with the reduction of ST events. The junction ratio at Eko was an exception, as it increased relative to larger catchment areas without seeing a reduction of ST events (Table 7-15 and 7-16). In essence, the enlargement of catchment areas coincided with smaller block footprints in Eko, and this might explain why ST event distributions did not show signs of decay at Eko in comparison to other cases.

The values of junction and link ratio at the size of cluster for all core trading areas (Table 7-14) indicates that Jakande, Oshodi, Ikotun, and Mile 2 were lower in comparison to the other cases. This signifies that these cases had urban blocks with large footprints, and out of these locations decay occurred at less than 200m for all except Oshodi. These four locations shared similar locational characteristics as they were located along expressways, and not integrated within finegrained urban fabrics. This occurrence is significant because it shows a relationship between the block sizes and the spatial distribution of SBEs.

Table 7-15: 200m Catchment area Spatial Indices for detailed Case Studies

	Net.	Net.	Lnk	Junc.	ST

200m Catchment Area	Lnks.	Jnc.	Area	Len	Conn.	Rat.	Rat.	C.I	Cov.	% Cov.
1. Pen Cinema	30	12	41090	1526	42	51	127	27	1103	72
2. Under-Bridge, Ikeja	26	13	155022	2211	39	85	170	70	2211	100
3. Garage, Ikorodu	8	4	77591	956	12	120	239	81	530	55
4. Eko	40	18	172887	3251	59	81	181	53	n/a	n/a
5. Jakande	27	13	696217	4771	40	177	367	146	650	13
6. Oshodi	25	13	34760	4928	40	197	379	7	1005	20
7. Ikotun	11	4	377980	2538	14	231	635	148	986	39
8. Mile 2	5	2	12100	1477	6	295	739	8	830	56

Table 7-16: 400m Catchment area Spatial Indices for detailed Case Studies

400m Catchment Area	Lnks.	Jnc.	Net. Area	Net. Len	Conn.	Lnk Rat.	Junc. Rat.	C.I	ST Cov.	% Cov.
1. Pen cinema	57	25	182690	3649	86	64	146	50	1343	37
2. Under-Bridge, Ikeja	59	25	229176	5050	76	86	202	45	4090	81
3. Garage, Ikorodu	41	19	396907	4818	60	118	254	82	1750	36
4. Eko	110	57	454695	9482	187	86	166	48	n/a	n/a
5. Jakande	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6. Oshodi	42	21	201320	8413	67	200	400	23	1682	20
7. Ikotun	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8. Mile 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = Core Trading areas with cluster sizes less than 200m

The edge condition of block boundaries - how a block interfaces with street network segments - is also crucial to defining STs spatialities. Block configurations which created an arcade-like setting with linear trading opportunities on each side of network segments tended to have higher intensities of STs, as the double-sided enclosure channelled people along defined paths, and gave customers more choice over short distances. SBEs can harness externalities gained from being near other STs, as customers are more likely to browse goods due to the more extensive variety of options available. This also means that STs which occupy such spatial settings can attract customers from both sides of the network segment. This spatial layout was observed at Pen Cinema, Under-Bridge and Eko but was only effective for reasonably narrow network segments, as wide network segments tended to suffer from the 'barrier effect'. This effect was observed at

Garage, where a wide road and heavy vehicular traffic deterred pedestrians from crossing the road to compare products (there were also fences to prevent people crossing the road). The SBEs at street segments with a barrier effect usually catered to customers on only one network edge (or had another trading site set-up over road and employed another ST to run it).

Even though the core trading areas hosted varied intensities of ST events, a common attribute observed was proximity to public transport interchanges (bus-stops). The modal share of public transport users in Lagos (Ibitayo 2013; Alade 2009) indicated that most commuters break single trips in multiple journey stages. Since 77% of all daily journeys are conducted by public transport, well-connected public transport interchanges in Lagos (with high betweenness centrality levels) experience very high numbers of users. This presented a basis to deduce a relationship between public transport interchanges and SBEs workplaces. The size of STs' clusters were explored, to define spatial boundaries for data capture in case studies. The average size of cluster for ST events was 260m for all cases, excluding Eko[141]. When considered against the average distance inhabitants in Lagos walked to access BRT bus-stops (as a proxy for *Danfos* and all other public transport means) - which was a maximum of 365m (see Section 6.2.1), a relationship can be established between pedestrian behaviour and STs distribution around public transport interchanges. It is assumed that distances beyond 260m from network segments that hosted public transport interchanges did not support STs because potential customers were not willing to walk further than this distance to access goods after alighting from public transport while commuting.

Under-Bridge and Eko were the only ST hotspots with core trading areas which exceeded a 400m catchment area. A probable explanation for the wider distribution of ST events in these two cases is that they had 'grey zones'[142] within their defined boundaries. It was observed that the location of grey zones created polycentric areas of ST activities in close proximity, which influenced the dispersion of ST events over broader areas; which contrasts with the monocentric nature of core trading areas at the other cases studied. This led to the conclusion that without the influence of

[141] The size of cluster for Eko was not determined for this research, see Section 7.4.4 for further explanation.
[142] Pseudo-legal areas where STs are not subjected to public access route usage restrictions - see Section 5.2.2 for more detail.

polycentricism, there is a possibility that core trading areas for STs would be confined to a catchment area of less than 400m along network links.

Grey zones

Grey zones were identified because STs could colonise vacant or under-used land, due to the absence of harassment and displacement by LASG's law enforcement officers, particularly the KAI task force and CBD Task Force in Eko. However, other reasons could explain why STs thrived in grey zones, including their spatial configuration, the nature of how the frontages of buildings, plots, and blocks interfaced with the street level, and the development of specialist economic sectors in these areas. The spatial configuration of the grey zones at the case study areas had fine-grained urban textures, and because such morphologies encourage pedestrian mobility, they favoured vitality and spatial interactions at street level. Additionally, the land uses within the buildings and blocks interacted directly with the street without intervening physical boundaries such as property fences which are common in Lagos. Property setback distances were also minimal within the grey zones (for more on setbacks see Figure 5-5). Another commonality associated with the grey zones was that the trading sectors in each were relatively homogeneous because the density of activities allowed these areas to draw on a wider range/catchment than typical SBEs so that they could attract customers from areas beyond their localities. Therefore, the prosperity of STs within grey zones did not rely on casual interactions with customers facilitated by local scale spatial proximities, and thus this influenced the dispersal of STs beyond 400m network radii. The reason for the formation of grey zones could be linked to any of these factors. It was concluded that the grey zones within the case studies were special activity zones and did not reflect the reality of generalised STs spatialities because they had multiple layers of spatial attributes which dynamically influenced STs.

Outliers

Eko had multiple network segments that were outliers of BtA R5,000. With the assumption that outliers (very high levels of betweenness) were attractors of STs, this occurrence would have also created multiple overlapping areas of ST event agglomerations. It was however observed that network segments which were outliers of BtA R5,000 did not always host the highest intensities of STs, mainly because of unfavourable morphological conditions, which did not match the spatial requirements of STs. If a link that was adjacent to an outlier had the necessary morphological conditions, STs were usually located on this link. This made a strong case for contiguity and the transfer of influence between adjacent links within networks.

The coverage of STs within catchment areas at case studies provided an indication of their distribution patterns, and since this was less than 40% of the size of cluster for all cases, this indicated that networks were not saturated with STs and there was scope for more STs. The catchment subnetworks provide a more precise indication of this occurrence, with only core trading areas and grey zones within the initial 200m appearing to be saturated with ST activities catchment area.

7.6 Core Trading Area Findings

The synthesis of interviews with 80 STs on their spatialities mostly aligned with Mitullah's (2003) generalisations[143] which highlighted how STs work in hostile environments without necessary infrastructure and services, such as storage facilities, sanitary services, water, and electricity. Other problems STs faced include lack of investment capital, insecure tenure at their workplaces, corruption, heavy taxation, confiscation of goods and regular evictions by urban authorities (Mitullah 2003). It was therefore crucial to shed light on STs spatialities through the supplementary analytical perspective of this research - as an alternative to methodologies typical in literature which focused more on the design of their workplaces.

More importantly, sDNA-sBEL provided a method of studying ST locations in urban areas with limited data availability and resources. From the outcomes of research conducted based on sDNA-sBEL, STs' workplace choices were found to be determined by being situated close to their target market, and these locational decisions were interpreted by studying the flow of people along the road transport network - with the application of accessibility studies. sDNA-sBEL conceptualised SBEs workplaces as locations which are centrally located, and act as the most critical intermediate locations when people take the shortest angular paths on utilitarian trips.

[143] Mitullah's focus was not on spatiality *per se,* rather it was an assessment of constraints to business growth in the informal economy. Even though this theme was interested in the economic aspects of STs, it highlights some of the typical responses derived from interviewing STs on their choices of workplaces.

The main findings from this chapter are that:

Point 1

In discussing the spatialities of SBEs, it is imperative to make differentiations which reflect their temporalities, as this has a significant impact on the way STs interact with their workplaces. SBEs thrive in locations situated close to their target market which has a combination of desirable physical, spatial, regulatory and socio-political attributes, although this differed slightly between sedentary and itinerant STs.

The highest intensities of sedentary STs were hosted by the road network segments that had physical conditions providing a dynamic combination of the following spatial attributes: I. Close spatial proximities to activity generators

II. Availability of road setback as operating space
III. Abutment to buildings, plots, and blocks with commercial land uses on the ground floor
IV. Abutment to buildings, plots and blocks with frontages/edges that directly interfaced with streets
V. High values of multi-scale betweenness accessibility.

Itinerant STs do not necessarily need the spatial attributes listed above, but high values of multiscale betweenness accessibility was a significant determinant in their location. The urban block configuration's influence on pedestrian mobility was also important.

Point 2

There is a tendency for the formation of ST hotspots near human activity generators. Public space around public transport interchanges was observed to host prolific ST hotspots, and this was no surprise because of the deregulated and organic nature of the urban transport system in Lagos (Olukoju 2003). The locations of transport interchanges in Lagos are defined by passenger demands and align with places of interests, such as religious buildings, schools, office complexes, and formal markets. Therefore it is assumed that the concentration of SBEs near public transport interchanges is an attempt to capture the intermediate aspects of journey stages that occur at these locations. It is also telling that with the high levels of pedestrian activities at transport interchanges, the size of cluster of ST events at most case studies was within the range of distance Lagosians' were willing to walk (which is 365m - see more in Section 6.2.1). A connection can thus be made between the distribution of STs within core trading areas, and distances pedestrians are willing to walk to switch to transport modes on a multi-stage trip, as indicated in Olawole's (2012) study. However, having high values of micro-level accessibility alone (suitable for exclusive pedestrian trips) is not sufficient to generate ST hotspots - this is not the case for macro-level accessibility.

Point 3

STs core trading areas are usually confined to a 400m catchment area around street segments with high values of multi-scale BtA. The core trading areas are extended if there are activity generators in proximity, as polycentric market areas are created. The expansion of core trading areas through polycentricism was also observed to have been caused by grey zones – evident in the distribution of ST events at Eko and Under Bridge, Ikeja.

Point 4

As junction ratio and link ratio are inversely proportional to block size and block interface length, core trading areas that experienced reduced values of these connectivity variables with the enlargement of their catchment areas did not sustain STs.

8 Final Discussions and Conclusion

8.1 Introduction

This chapter concludes this thesis. The research conducted in earlier chapters aimed to provide empirical evidence towards an understanding of the locational decisions of IE actors that operate as SBEs. The exploration stemmed from the belief that due to the cultural, social, and economic importance of IE activities, there is a need to understand the factors which underlie the occupation of space by STs in the public realm of LIC cities - where urban management and planning policies often stymy IE actors ability to operate and evictions are commonplace. This research, therefore, argues that rather than urban governance in LIC cities promoting agendas that marginalise, stigmatise or remove STs, the focus should be on finding ways to support the productivity and efficiency for STs at locations where their activities are viable.

The scope of IE actors in this thesis is deliberately restricted to STs (as SBEs) because their activities are the most visibly threatened. STs are intrinsic components of traditional economies, neoliberal urbanity and capitalist economic systems (Bromley 2000). Lagos is chosen as the area of investigation because it is symptomatic of the spatial issues SBEs' face in LIC cities. Lagos thus provides an appropriate setting to explore the research questions, 1) as a rapidly urbanising city with an abundance of STs and a massive IE, 2) with a government that employs repressive tactics in the management of the IE. The findings in this research are specific to the case study sites in Lagos, and therefore the methodology employed may produce different findings in other contexts - an occurrence which was already evident in the disparities between the assessments of case study sites within Lagos - but a core philosophy of the research, was to use open-source data and (free) software, so that the research could be replicated elsewhere.

From the many difficulties facing SBEs, access to operating space is one of the most contentious. This research engaged this spatial problem, by analysing how the distributions of SBEs workplaces - located within the urban public realm - are influenced by centrality of locations within the street network and the spatial structure of the built environment.

The methodology proposed is a mixed method of research which allows for the capture of both subjective and objective facets of STs workplaces. sDNA - the analytical tool on which the accessibility distribution analysis is based - allows for the conduct multi-scale betweenness analysis. Urban form-based connectivity and morphological means are used to capture other built environment variables, and sociological tools capture agencies of STs, city inhabitants, government officials and other key stakeholders. Using this methodology, and in the light of the research aim and questions, the thesis seeks to make academic and conceptual contributions across six main areas.

i. The knowledge of SBEs' spatiality is vital to support and inform urban management and planning policies and strategies, to achieve equitable, inclusive, and sustainable urban planning in LIC cities. Some work was done in the late 1980s and early 1990s to this effect, but this has not been updated to reflect the contemporary realities of urban governance. The research addresses this gap.

ii. The approach adopted is unique in trying to develop a spatial and analytical frame that gives an objective description of the locational choices of STs, moving beyond the observational bases of past analysis. To do this, it draws on core bodies of literature, including i) debates on the economic rationale of STs and older work on their spatial distribution, and ii) retail and spatial analysis theory. An urban design perspective is woven through these two bodies of literature.

iii. Insights garnered from this literature were then tailored to fit the research aim, and culminated in the formulation of a methodological approach known as sDNA-sBEL (Spatial Design Network Analysis for Street Based Enterprise Location). Thus the research is has developed a new application of sDNA - a spatial analysis application developed at Cardiff University - to developing country settings.

iv. The research is original in combining sDNA analysis with more conventional qualitative data collection and small-scale morphological analyses more typical of urban design research and IE research. The underpinning analysis draws on urban scholarship concerned with the dynamic relationships between economic activities, and the configurational and compositional structure built environment. While other studies have acknowledged a relationship between activity generators (as areas of business opportunities) and STs' choice of locations, the associations were mostly established on aspatial and normative bases. This study applies a systematic analytical approach to study the workplace choices of STs, to provide an alternative perspective with the use of sDNAsBEL methodology, which was specifically developed for the purpose of this research. sDNA-sBEL combines computational spatial analysis with more traditional social and geographical analyses to develop an approach with wide applicability.

v. The research has policy relevance, as existence of an objective analytical frame can then provide a powerful counter to current urban management approaches that seek to 'tidyaway' STs, often leading to eviction, and see them as not part of the framework of large
LIC cities.

vi. sDNA-sBEL is also novel in the potential for replicability in other settings, now the 'teething' problems of using this methodology have been established. A central component of the research was to develop a method that could be replicated in developing country contexts, and to mitigate the paucity of reliable spatial data and expense of computer applications in LICs. Thus one of the aims of the research was to operationalise sDNA-sBEL's accessibility analysis with readily available open source data and freeware analytical tools. The outcomes from explorations using sDNA-sBEL within Lagos illuminates some of the spatially determined influences for STs' workplace locations in a rapidly urbanising city. The research thus adds generalizable methods to help understand how the urban spatial structure and its transport networks influence SBE location in an LIC city.

8.2 Findings

This section synthesises the findings of this thesis. The discussion is organised around the research questions of this research (see Chapter 1.4), and outlines how these concerns are answered, what policy implications may be, while also discussing the limits of this study and recommendations for future research.

Insights from Chapters 2, 3 and 5 provide the framework and theoretical basis for addressing the Research Question 1:

1. What is the significance of the urban informal economy and urban street traders in developing country cities, how is their spatial distribution conceptualised, and how is the informal economy affected by urban spatial governance?

In Chapter 2, themes of livelihood, socio-economic marginalisation, socio-political dimensions, governance and regulatory regimes are critically assessed by focusing on their associations with the spatiality of the IE. The potential of the IE to deliver economic empowerment for the working poor, and contribute to urban economic development, was examined as the conceptual framework through which much literature on the IE is examined. The IE is observed to provide an economic means of survival for a large population of the urban poor, however, the means by which the IE operates does not tally with the 'modernised' ethos of a contemporary global cities – a status that many LIC governments pursue. A critical assessment of urban governance policy actions and strategies in literature and in Lagos (Chapter 5) based on 'modernism', showed that state-led planning and management interventions in the activities of the IE on the contrary, has not spurred economic development.

The position of urban governance on SBEs vacillates from benign neglect to outright hostility, and the debates in Section 2.3 highlight the different positions urban researchers have taken about the most appropriate way to deal with SBEs in cities. It was noted that STs activities often produce negative externalities (along with positives), compounding the already strained urban infrastructure in LIC cities. Therefore, the most reasonable and compelling consensus is that spatial governance has to find a way to accommodate the IE in these cities while mitigating negative externalities. In Lagos and many LIC cities, the strategy adopted for the provision of workplaces for STs embodies Cross's (2000) notion of '*formalomorphism'* - where state-led interventions are conceived merely as the provision of formal markets for relocations at offstreet locations, or outright displacements. Such tactics fail most times because contextual sensitivities for which STs activities thrive are ignored (Bromley 2000). In Chapter 5, the existing legal regulations in Lagos are found to be still based on old, cumbersome, and discriminatory standards.

The success of the Warwick Junction project in South Africa provides a rear exemplar of positive outcomes from state-led spatial intervention to improve the working conditions of STs, and this was achieved through the application of contextually relevant and inclusive urban design strategies. The Warwick Junction project was a regeneration initiative for a collection of informal markets which were located proximally to a central transport node. A fundamental principle for the spatial intervention was to maintain the original location of the existing markets – which was close to a busy transport hub.

From literature, the busiest parts of cities are observed to be the most likely places to find STs. This relationship has however been deduced from normative reasoning or with simple observational mapping of IE actors activities, with little effort to objectively analyse how and why such locations are prolific hosts of STs. Such understandings of space have proved insufficient for spatial planning and management purposes. Some analytical work to address this shortcoming was done by Dewar and Watson (1981, 1990) - South African academics who sought establish appropriate urban planning and design approaches to accommodate IE - but this has not been updated, and was based mainly on neighbourhood and small-scale analyses. Dewar and Watson's (1981) implicit application of the concepts of *centrality, ranges, and thresholds* to assess informal retail (market) locations however provides a basic understanding of how accessibility distribution within road transport networks influence urban markets. These concepts can be traced to Christaller's Central Place Theory, were also applied to study periodic markets in LICs, and can also be applied to STs.

Building on Dewar and Watson's work, alternative means for assessing SBEs spatiality was explored by employing spatial accessibility distribution as an urban performance parameter. Even though spatial accessibility distribution assessments has mostly been employed in relation to formal retail (economic) enterprises, it was considered to be applicable to informal economic activities. The rationale for retail behaviour for all business enterprises was assumed to be based on a similar objective, which is to operate without running at a loss[144] (in the case of IEs some commentators argued that their motivation might not always be about profit maximisation). Also, because the operations of the IE and formal economy have been established to be intrinsic (Castells and Portes 1989; Tokman 2007), and therefore it is expected that their use of space in cities will be interrelated.

Other similar but fundamental retail location theories and theoretical developments of complex spatial systems and graph theory, were also explored. From the insights of the literature in Chapter 3, it was concluded that the configuration of street networks and the resultant spatial accessibility distribution conditions can play a critical role in understanding the locations and spatial distributions of economic actors. It was also concluded that sDNA provides an appropriate freeware application (as a computational assessment tool) through which the analysis required could be undertaken.

The theoretical scope drawn from Chapters 2 and 3 provided the framework for analysis of the empirical evidence which provided the means to address Research Question 2:

2. How does accessibility distribution influence the relationships - conflicts, competition, synergies, of urban economic activities, and are there other explanatory spatial factors of urban form which overlay accessibility that affect the locational patterns of SBEs?

In Chapter 4, the author developed a new application of sDNA analysis, named sDNA-sBEL, which was defined to contextually capture the situations at ST hotspots - using the formal study of betweenness centrality combined with the study of other urban form parameters/metrics (street connectivity and morphology), overlaid with socio-political circumstances. The sDNA-sBEL methodology determined the 'multi-scale betweenness flow potential' for the road network, with data sourced from OpenStreetMap. Network links identified to have high flow potential, were then mapped against observed concentrations of STs. The spatial analysis was combined with more conventional qualitative social science interviews with STs, and morphological studies

[144] For economic activities to operate sufficiently, exposure to target markets (demand) is essential. From a spatial point of view, being in a 'central' location provides the required dynamics to cater to demand landscapes.

of ST hotspots (concentrations of STs), to analyse eight detailed case studies of ST concentrations in Lagos.

In Chapter 6, the formation of ST hotspots was observed to occur around parts of streets/roads (baseline links) that had high values of multi-scale betweenness (e.g. R600 and R5,000), because these locations were simultaneously accessible to potential customers using different modes of road transportation (with varying levels of accessibility). There are however disparities in the formation of ST hotspots when network links possess high values of a particular scale of betweenness. Having high values of macro-scale betweenness alone seemed sufficient to generate ST hotspots, however high values of micro-scale betweenness alone (suitable for exclusive pedestrian trips[145]) was not sufficient to generate ST hotspots. The reason is that high values of macro-scale betweenness (for example BtA R5,000) creates the potential to expose STs to a large pool of customers travelling on more extended trips within broader areas in the city. High values of micro-scale betweenness (for example BtA R400 or BtA R1,000) create the potential to expose STs to a pool of customers conducting local scale journeys - as pedestrians. The demand for SBEs activities at local scales is often insufficient to justify the formation of ST hotspots, a point made by Dewar and Watson (1990) about how low-order activities require high residential densities (as a proxy for the demand of potential customers) within immediate area to flourish. High values of macro-scale accessibility compensate the demand required by the loworder of activities in which SBEs engage[146].

Euclidean (BtE) and Angular (BtA) metrics of multi-scale betweenness were also explored in relationship to ST hotspots. In literature, the BtA metric is considered to biased to simulating more concentrated flows and BtE more dispersed flows. In Chapter 6, links with high values of macro-scale BtA (the 90th percentile) coincided with the most ST hotspots. This finding suggests that ST hotspots are more likely to be hosted around locations with concentrated flows.

[145] Pedestrian journey stages are intrinsic to trips in Lagos, so what is being referred to is trips that consist of a 100% pedestrian share.
[146] In the design of urban areas, re-configuring a street segment within an area's road network so that it attains a higher value of macro-level accessibility, can compensate for the shortcomings of insufficient densities by exposing such a location to a wider reach/pool of customers.

84% of the 111 ST hotspots identified in this research, were located on Trunk A, F, and B roads (Table 6-6), which correlates with the most accessible links of BtA R2,000, R5,000, and R10,000 (Table 6-7). Roads classified as Trunk A, F, and B mostly form part of the expressway system discussed in Chapter 5.2 - which are relics of modernist ideology which took root in postindependence Lagos. Therefore, ST hotspot locations can be seen to have a relationship with the expressways when considered from the results of macro-scalar assessments of Lagos.

Thus, accessibility distribution can be seen to '*influence the relationships - conflicts, competition, synergies, of urban economic activities*' as a response to the research question. The use of multiscale BtA analysis might, therefore, provide an empirical means to predict centrality attributes of the transport network at a city-wide scale which influence ST hotspot formations.

The Research Question 2 also questioned if there *'are there other explanatory spatial factors of urban form which overlay accessibility that influence locational patterns of SBE'?*

BtA analysis within sDNA-sBEL imposed an adjusted topology on street network data, and based on this, street network systems components (Links and Nodes) were analysed in Chapter 7. At a disaggregated (individual) level, the composition of the spatial structure was explored via morphological means - and this provided an alternative and complementary basis for the quantification of urban form. At an aggregated level - as defined by ST hotspots' core trading areas - *Link ratio, Junction ratio, and Compactness Index* are indices that are programmed to provide a sense of the urban fabric from network connectivity assessments within sDNA-sBEL. Data from these indices were combined with sociological data to conduct the meso- and microscalar assessments.

The main findings in Chapter 7 are that, in addition to macro-scale flow potential of a link, ST hotspots thrive in locations situated close to their target market which have a combination of favourable spatio-physical, regulatory, and socio-political attributes. The spatio-physical attributes which were of concern required that the:

i. Network links had high values of macro-level Angular betweenness (BtA R5,000), as these locations exposed STs to larger market areas, because the range of micro-level market catchment areas was in most instances unable to sustain a ST hotspot. This according to Dewar and Watson, is because the densities in such areas could not support the low-order enterprises STs engage in.

ii. Spatial context had a mixture of usable road setback space, block boundaries as physical backdrops which create arcade-like settings, and proximity to activity generators. A location that had all these attributes had a high possibility to host STs.

It was also discovered that STs core trading areas were typically confined to a 400m catchment area around street segments with high values of BtA R5,000. This catchment area would, however, increase if there were activity generators (e.g. markets, bus interchanges) within the vicinity of this catchment area - as polycentric market areas were created.

Research Question 3 asked:

3. To what extent is spatial accessibility an important factor in defining the locational patterns of SBEs, examined through a case study of Lagos?

This relationship was studied by considering the consequences of the road transport network system in Lagos in Chapter 5. It is discovered that accessibility has had far-reaching influences on urban activities in Lagos. Lagos's urban growth pattern has mostly occurred as ribbon development, along the road network. Due to the strong North-Southeast orientation of the road system, the patterns of mobility in Lagos State are skewed towards the Island area (Lagos and Victoria Islands) (see: Figure 5-4). The consequences at the two extremities of *the L-Shaped expressway artery*, reveals how accessibility distribution has influenced urban growth in Lagos.

On the Northern end of this axis, the expansion of the limits of the Megacity region to its periphery is being enabled by accessibility. The urban areas to the North are mostly occupied by a low to middle-income population; with many of its inhabitants commuting to other parts of the city for work. Retail behaviours here, have adapted to embrace the convenience of STs. The observations from the BtA analysis in Chapter 7, are magnified by the commuting patterns here; as ST hotspots form around locations whose centrality enables STs to capture a large pool of commuters and passengers. As found to in Section 5.3, LGAs in such areas mostly tolerate STs by licensing them, while the LASG turns a blind eye to their activities.

The South-eastern axis has also experienced a rapid rate of development, as new opportunity sites for housing development in areas previously inaccessible, are being integrated into the road transport network system. Alternative financial models for both private developments and public infrastructure are drivers of urbanisation. The Lekki Free Trade Zone (LFTZ) as an example is being developed along this axis and will contain: a new Sea Port, Airport, Medium and Light Industries. The future consequences of the LFTZ will further spur the biased pattern of development within Lagos, to the adjoining areas around Lagos Island. The cost of urbanisation in this area is the displacement of squatter settlements and STs to accommodate new development. The tolerance to SBEs by the LASG is much lower along this axis. The occurrences of ST hotspots along this axis is significantly lower than other parts of the city. Accessibility distribution as observed in Lagos influences urban activities on multiple levels, creating complex synergies and consequences for urban governance.

The final research question is:

4. What are the implications for an improved understanding of spatial activities of SBEs for urban spatial governance in Lagos? What is the value of improved measurement tools in policy and practice outcomes?

As indicated from literature and discussed in other chapters throughout this thesis, a better understanding of the spatial activities of SBEs should enable more nuanced approaches for urban governance policies and strategies. The overarching aim of this research was to understand how the urban spatial structure and the associated accessibility of its transport networks, influence the location of SBEs in an LIC city. In relation to this aim, the research has:

I. Developed a new methodology that gives an objective basis on which to assess why ST hotspots form.
II. The methodology demonstrates that ST hotspots are likely to form at locations with high flow potential at macro-scale.

III. At local-scale the picture is more complicated and depends on the proximity of a traffic generator, and the physical layout of the built environment.

IV. Nevertheless, when STs are removed from locations with high levels of accessibility, the economic and trading potential of that site is lost. This also has implications for those displaced who will have lost their livelihoods and may not easily be able to relocated.

Figure 8-1 provides a graphical representation of the findings from this research. The graphic indicates the validity of some of the behavioural assumptions which influence STs workplace location derived from literature. The graphic also indicates the spatial conditions which influence STs locations as derived from this research, replacing the assumptions made at the start of this thesis in Figure 2-3.

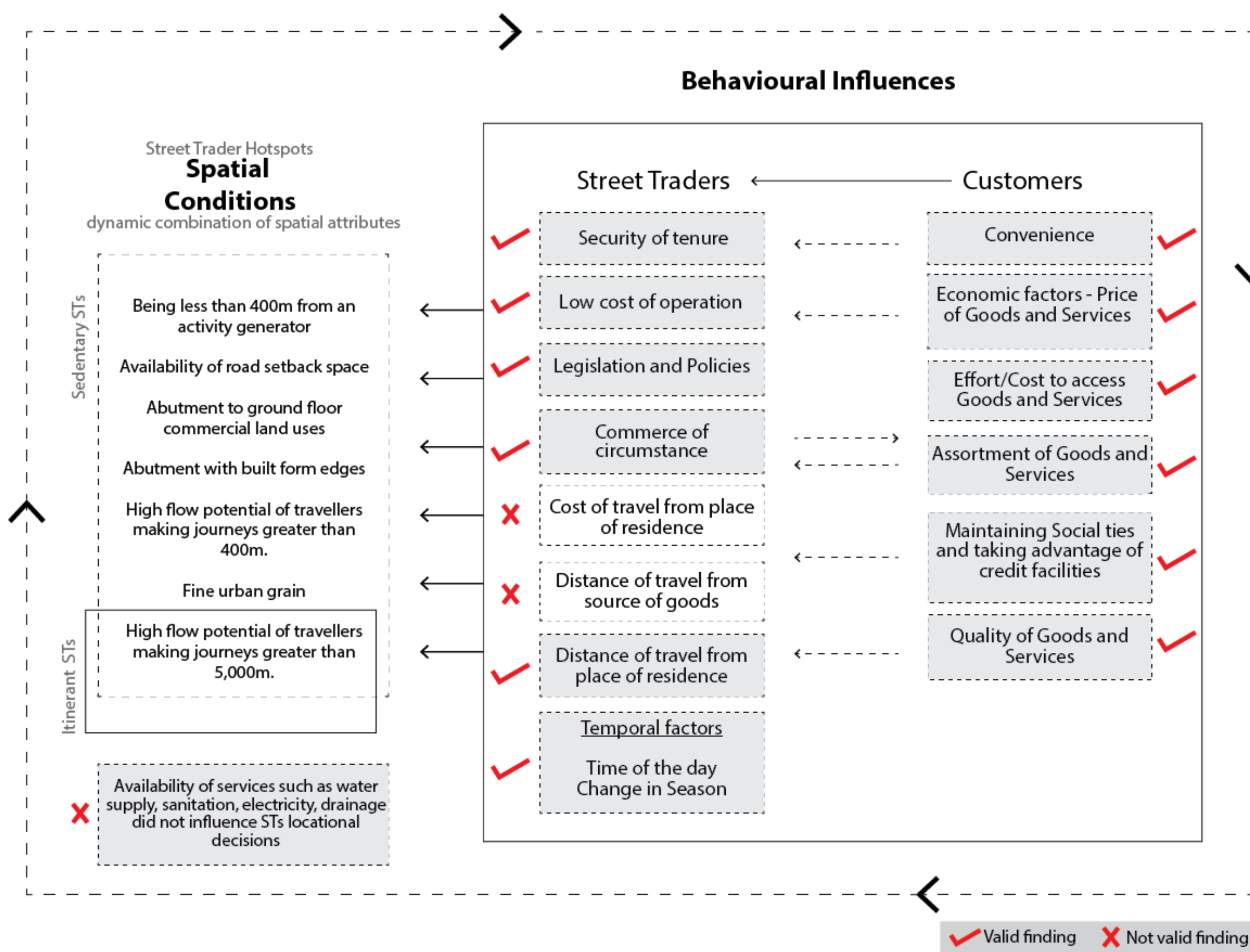


Figure 8-1 ST Location Calculus findings

8.3 Propositions and Recommendations

In this section, recommendations that will contribute to improved planning and management of urban spaces to deal with SBEs workplaces are presented. As discovered, the attempts to manage the workplaces of SBEs has mostly been ineffective. However, what is attempted here is not a complete overhaul of earlier recommendations, but instead, it builds on elements which have attained some level of success (even though there are very few of such), incorporating the extra layers of understanding derived from this research. Two broad but integrated categories of approaches are proposed, as discussed subsequently.

Policy and Design Strategies.

1. Planning Philosophy

It is essential that the planning and management mechanisms in LICs adopt a different philosophical approach to the IE and STs. Rather than view them as abnormalities, SBEs should be viewed as an evolution of indigenous practices in response to the modern capitalist economy. Therefore, spatial governance must recognise the importance of STs and adopt innovative policy actions and strategies which are cognizant of the complexities of local realities - through democratic processes. With the exception of the inclusion of STs in upgrading plans in Durban (Dobson et al. 2009) there are relatively few examples of such an approach.

The interests and opinions of STs regarding the use of urban space should be integral to this process as a form of collective action, through a rights-based framework as recommended by Omoegun (2015). In Lagos, this is particularly important, as ‘consultation’ exercises with stakeholders of the IE are conducted as a box-ticking exercise, and approached from a top-down perspective of sensitisation rather than being collaborative and democratic.

2. Integrated Governance

For collaborative and democratic planning and management to be effective, integrated approach to spatial governance also needs to be adopted. Mechanisms which enable both vertical and horizontal collaborations are required to achieve this. Vertical integration will facilitate the establishment of connections between different hierarchies within governance (especially important are at the local and state level); while, horizontal integration will occur between ministries, departments, and municipalities which function at the same governance hierarchy. This integration will facilitate proper dissemination of policies, and minimise contradictions and duplications. The effective implementation will resolve the disparities between local and state governance levels. However, integrated governance should be established without creating more bureaucratic bottlenecks - a factor that legalists have argued to enable the IE (Chapter 2).

3. Local Capacity Generation

The resolution of urban planning and management should be geared towards more local scales of interventions. To achieve this, local level governance (LGA) should play more active roles in spatial governance policy generation and implementation processes. However, for this to be feasible, local level professional capacities and effective and representative ST organisations will have to be developed. Synergies can then be formed that will key into horizontal and vertical collaborative model of spatial governance.

4. Urban Design Addendum

Spatial interventions which respond to SBEs use of public space as workplaces should be approached with urban design tactics which are evidence-based and contextually relevant. Based on the evidence garnered from this research using sDNA-sBEL, these interventions need to consider:

Design for Movement: By the manipulation of street network patterns to sustain the multi-scale flow of travellers through locations where SBEs operate. Thus, a dynamic mixture of pedestrian and vehicular thoroughfare should be a paramount criterion (see Section for 6.5 for specifics). The movement pattern intervention does not have to be fixed at all times of the day. Instead, adaptive traffic control and management systems can be put in place at specific periods of the day to achieve this.

Design for Visibility and Interaction: Being visible is an important feature of STs locational decisions. Therefore, making considerations on how to stage STs operational facilities to mimic this element of STs spatiality is essential. Maintaining eye-level contact with customers is also crucial for STs. Therefore, vertically stacked spaces which are not accessible directly from the street level should be avoided when providing alternative spaces for STs. An arcade-like horizontal formation of stalls on set-back spaces can provide a spatial layout to fulfil these requirements, as it facilitates interaction opportunities for customers and STs alike, without negating traffic flow. Side-walks and set-back spaces with varying widths will have to be considered to accommodate STs facilities.

Design of Street Interface: The backdrop and the shelter provided by boundary fences, are physical elements of the built environment that are advantageous to STs. Therefore, incorporating display units and canopies (to shelter from the elements), will create a visual uniformity that improves the aesthetical quality of STs operational spaces, and simultaneously providing dignified workspaces. The contiguity of these elements should however not exceed a network distance of 400m, as this is the effective core trading area for STs - beyond this.

Accommodation strategies should consist of a mixture of temporary and permanent proposals for the allocation of STs spaces (an adequate licensing/regulatory scheme has to be integral to success). For temporary allocations, measures such as the closure of streets can be proposed; in such cases, STs would be allowed to operate at scheduled durations (Night markets, cordoned off streets, etc.). For semi-permanent proposals, shared spaces which are not solely dedicated to street trading should be incorporated into design strategies. For example, footpaths, sidewalks and set-back spaces can be utilised. For permanent proposals, the allocation of land will be dedicated solely to street trading. The spatial configuration of public transport interchanges (especially along arterials) is a prime site for permanent accommodation of STs.

Policy Implications

a) Harnessing ST hotspots as Special Local-Level Activity Hubs

Innovative integration strategies should be a priority, instead of spatial interventions being geared towards the relocation of STs. This will facilitate the creation of local level economic activity hubs, which have the essential facilities required to meet aesthetic and hygiene standards. Warwick Junction market project is a prime example of how urban design interventions can support STs. Dobson et al. (2009) described how streets were redesigned to concourses to match the requirements of STs.

With imagination such integration strategies are often physically feasible. Where relocations of STs cannot be avoided, this should be to locations which are spatially equitable - not to off-street market locations without a customer base. Integration of human activity flows that encourage the emergence of activity spines at different scales should be pursued. In such cases, methodologies such as that developed in this thesis (sDNA-sBEL) can be used for spatial assessments and for design interventions. Other dynamics affecting relocation, like the tenure of ST sites should also be considered, which can compensate to a certain degree for social network disruptions – a factor that can't be replicated through spatial determination.

b) Evolving Planning Codes

An urgent overhaul of restrictive and archaic planning codes is required. For example, in Lagos, the most notable is the set-back code. The law outlaws the use of road setbacks, which are spaces considered by Kim (2015) to be the most economically viable spaces in LIC cities. The continued existence of this law will severely restrict any attempt to integrate SBE workplaces within the public space in Lagos. Licensing STs can also be effectively implemented with a less restrictive set-back code - as is the practice of many LGs.

8.3.1 Methodological Improvements

This research is an initial attempt at unbundling the spatial factors that influence the locations of STs using a novel methodology - sDNA-sBEL. Shortcomings were identified in its workings, but due to the limited scope of this thesis, further explorations to rectify them were not possible. In future research endeavours, it will be practical to rectify the issues discussed subsequently for methodological improvements.

- One-way vehicular traffic data was not incorporated into the accessibility analysis conducted. The one-way data issue, however, is not required for pedestrian accessibility analysis. Therefore its influence would only be at the macro-scale accessibility (which depicted vehicular journeys). The influence of this omission on the assessments conducted is not known. This was a shortcoming which resulted from the cartographic data extracted from OpenStreetMap, so even though OpenStreetMap provides a convenient data source, care should be taken to check for potential data omissions and other errors.

- In the determination of core trading areas, a 200-metre radius was used to define the progression of catchment areas (Chapter 4.4.2). This distance was defined for convenience relative to average walking pedestrian distances. However, shorter distances can also be defined to capture the size of cluster in core trading areas at a finer scale.

- The spatial indices defined to study the compositional attributes of core trading areas need further improvements.

- The study was conducted using data from field studies which lasted only three months. So, the comparative assessments of ST's locations did not capture the differences between spatial attributes of new and old locations of displaced or relocated STs. With the use of longitudinal data - gathered over more extended periods, such nuances can be captured. Capturing the locations of itinerant STs was also arduous, and therefore more advanced methods for capturing mobile agents should be explored.

- Comparisons between off-street formal markets - allocated to relocated STs by spatial governance initiatives - should be analysed against STs' old informal locations. Such comparisons will give added layers of data to understand STs locational decisions.

8.3.2 Recommendations for Future Research

The case study approach adopted in conducting this research limits the ability to generalise the findings. The factors which influence STs' locations are thus likely to vary in different contexts. However, the practicality of the processes as presented for conducting appraisals of ST locations in this research should enable for the ease in its adoption elsewhere.

Building on the findings from this research to deepen the knowledge of the subject, future research would seek to test several of the findings made about the spatiality of STs workplaces through minor urban design interventions. These interventions can be temporary installations, which mimic the spatial conditions and physicality of spaces where STs thrive. The selection and implementation of case sites should be conducted by way of randomised control trials, to reduce the incidence of bias in research.

Appendices

Appendix 1

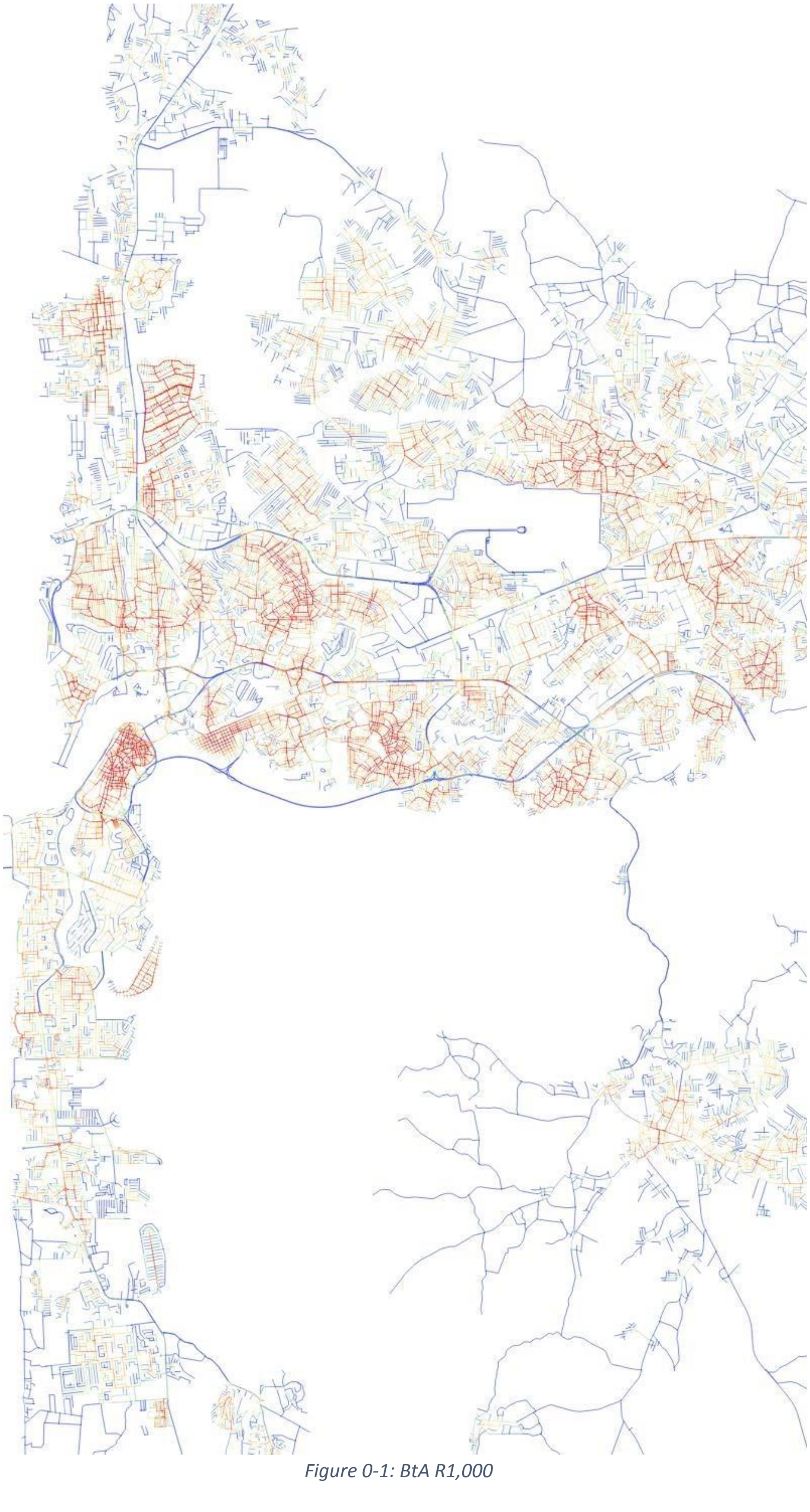


Figure 0-1: BtA R1,000

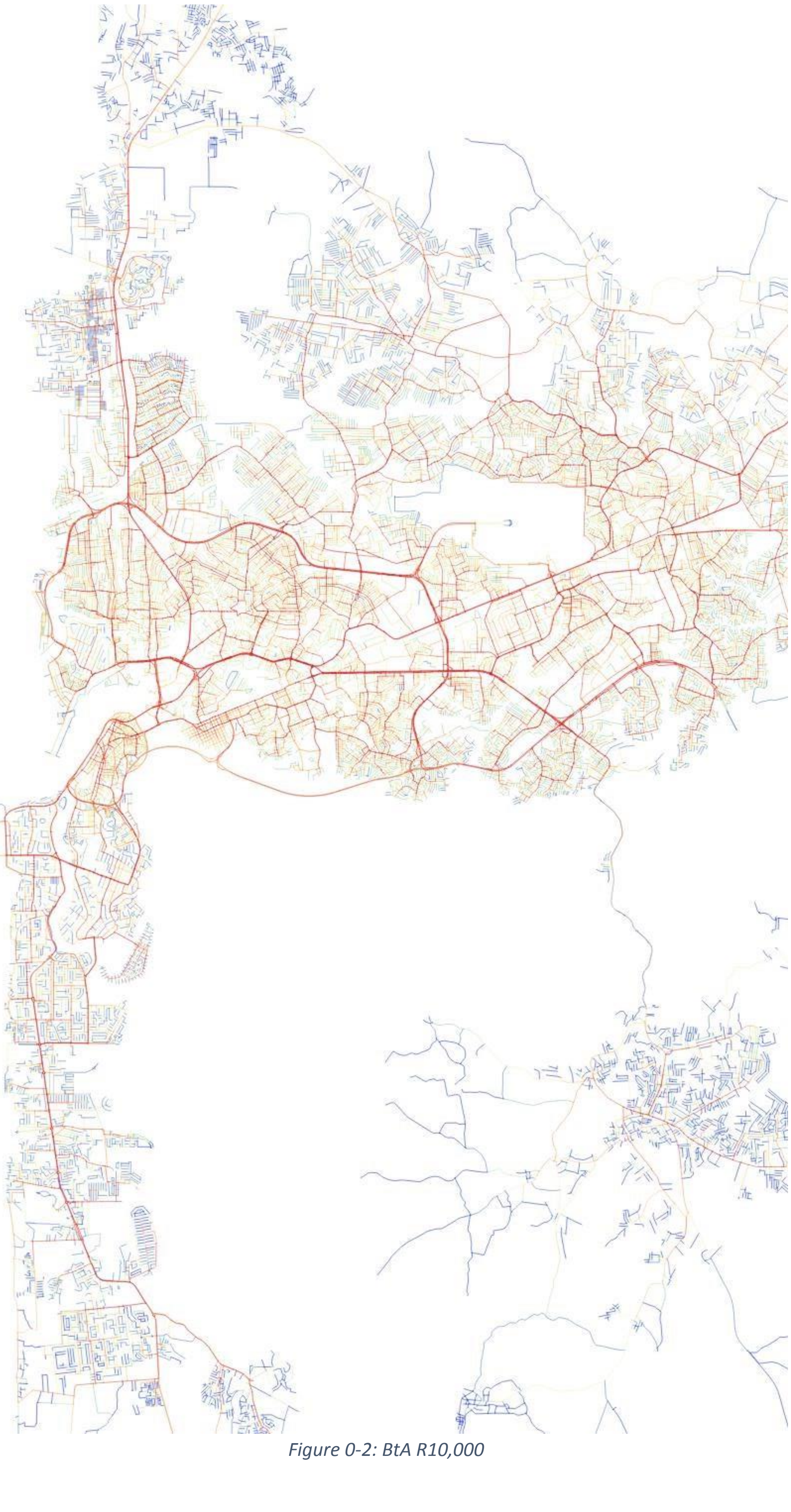


Figure 0-2: BtA R10,000

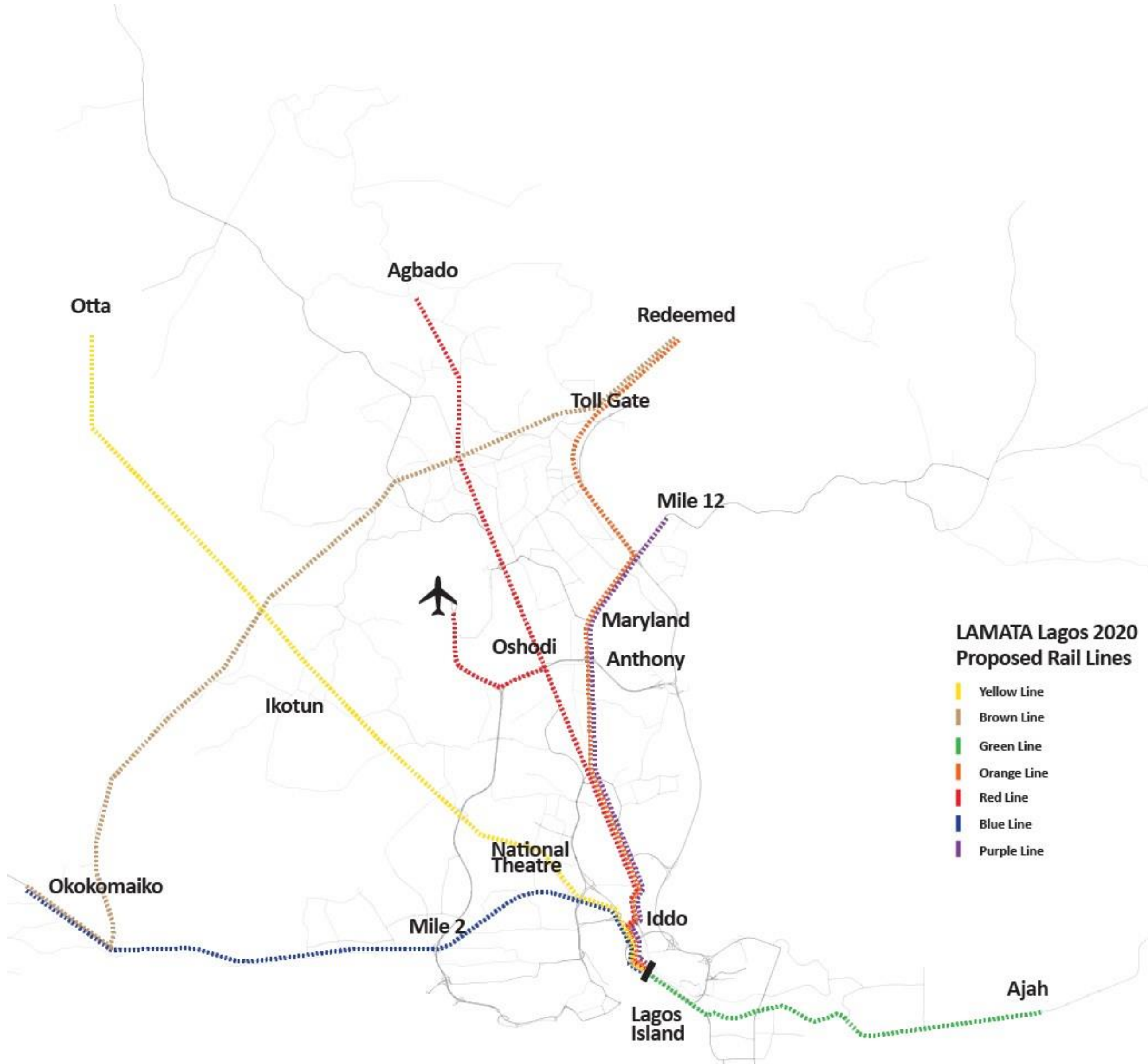


Figure 0-3 Proposed Rail Lines for Lagos 2020. Source: LAMATA

Appendix 2

Case study 6: Oshodi

The environs of Oshodi Bus Stop was the former location of the most extensive informal market in West Africa (Location 6, Figure 7-1). Omoegun (2015) noted that before the area's regeneration and the displacements of STs in 2009, Oshodi Bus Stop and its market area (Old Oshodi) hosted about five million commuters and traders daily. The vitality and vibrancy of Old Oshodi was an outcome of its strategic and central location within the transport network system of Lagos, with two expressways - the Agege Motor Road and the Oworonshoki-Oshodi-Apapa Expressway -

converging with a railway terminal at this location. At Old Oshodi, the most significant concentration of ST events occurred along the Agege Motor Road and the adjoining "open" spaces - road setback and railway embankment - within its vicinity (Omoegun 2015). STs activities at Old Oshodi were configured to create as a linear market typology (Koolhaas et al. 2000).

Based on the data gathered during field studies, the ST hotspot at present-day Oshodi is located along the boundary of Owonifari Market (an electronic market which has since been demolished after the collection of data used for this research). On observation, the core trading area did not exceed a 400m catchment area, and the associated spatial attributes of the constituent road networks at this scale are represented in Table 0-1.

Within the first 200m catchment of the service area, 243 ST events were observed (65% sedentary, 35% itinerant). There was a strict enforcement against street trading by KAI, and this made the majority of the STs close to the baseline link itinerant, while the majority of the sedentary STs were located towards the edges of the 200m catchment area - within streets located off the expressway. Between the 200m - 400m catchment, 554 more STs were observed and 95% of these were sedentary. These STs operated mostly with temporary facilities (wooden tables and displaying their merchandise on the floor directly). Similar to observations within the 200m catchment area, these STs were all located on streets within blocks some distance away from the primary access routes - mostly beyond the extents of where the KAI officers were willing to prohibit trading at. The number of STs increased exponentially towards and beyond the edges of the 200m catchment area, before dropping off towards the edges of the 400m catchment area.

ST at Oshodi

Taking account of the entirety of the 400m trading area in comparison to the 200m catchment area, link ratio remained practically unchanged, while the junction ratio slightly decreased (see Table 0-1); and these coincided with a sustained presence of STs events within off-street locations before a sharp cut off. However, it seemed the distribution of STs within the off-street locations was artificially caused by KAI's enforcement along the main access routes close to the location of the former Oshodi market**.** STs within the boundaries of inner blocks mostly relocated to better locations (along the expressway, close to the transport interchange) after enforcements had reduced in the evenings. This was because the nature of enterprises STs engaged in was low order, and they relied on being close to a large pool of customers to thrive (a possibility created by being close to the Oshodi bus-stop).

A majority of STs operated from temporary facilities and there was also a high turnover of space - as consequences of the prohibition to street trading. STs worked long hours daily and tended to operate from multiple locations within the boundaries of the catchment area. Gender distribution indicated that there were mainly female STs operating at Oshodi, and the majority of them lived close to their workplaces. A pattern identified to be related to the availability of low-income settlements close to Oshodi, and the dual role female STs play as homemakers and supplementary earners of income.

Table 0-1: Spatial attributes of Oshodi catchment area's road network

	Lnks.	Jnc.	Net. Area	Net. Len	Conn.	Lnk Rat.	Junc. Rat.	C.I	ST Cov.	% Cov.
200m	25	13	34,760	4928	40	197	379	7	1005	20.4
400m	42	21	201,320	8414	67	200	400	23	1682	20

Attributes of Street Segments at Oshodi

A few outliers existed within the core trading area at Oshodi and from these, Link 11597 - a road segment connecting Agege Motor Road to the Oworonshoki Expressway - had the highest value. There were no ST events on Link 11597, and this was attributed to the unconducive physical nature of space around the link. The link was flanked by two pockets of open spaces; to the north, an open space created by a cloverleaf interchange which was used as a *Danfo* depot, and to its south was the boundary fence of a large mostly undeveloped plot of land. The spatial uses of these adjoining spaces did not provide the vitality to encourage the habitation of STs. Link 11597 also had a slight gradient with steep banks and therefore was unconducive for STs.

Lnk 9434 adjoins the Agege Motor road and hosted the most STs at the case study. The actual representation of the physical conditions at this street segment was evolving when this study was conducted, as road construction was ongoing. Minimal setbacks from the road and most developments had no boundary fences. Therefore, the blocks fronted directly onto the street.

The buildings within most of these blocks were purpose-built retail facilities which took advantage of this interaction with the street. Space around the construction zone hosted a handful of sedentary STs, who were biding time till they relocated to the main roads after monitoring by KAI had subsided.

Table 0-2: BtA values for 400m catchment area at Oshodi

Oshodi	R400	R600	R1000	R2000	R5000	R10000
BtA Min	0	0	23	197	2151	12125
BtA Max	135	282	987	7143	264577	5428320
BtA Mean	41	106	415	2621	104598	1624950
St Dev	29	106	268	1719	75838	1440110
St Dev + Mean	70	213	683	4340	180436	3065060
2(St Dev) + mean	99	319	951	6059	256274	4505170

BtA Min *= Minimum value of BtA for 400m catchment area from baseline link (the core trading area);* ***BtA Max*** *= Maximum value of BtA for 400m catchment area from baseline link;* ***St Dev*** *= Standard deviation of links BtA values for 400m catchment area.*

Table 9-2 shows the multi-scale BtA profiles of all links within the core trading area of Oshodi. The gradient pattern in the BtA R5,000 column shows a large proportion of links (>50%) have BtA values above the mean. The distribution of links with high flow potential reflects why Oshodi is a popular location for STs.

Oshodi Main Findings

The actions of KAI caused STs to retreat to locations that were not optimal in fulfilling their needs for interactions with customers, but which still provided them with adequate conditions to conduct their activities on a temporary basis. The temporary areas had small block sizes, and the buildings fronted directly onto the street. STs co-located with formal retail spatial programs (shopping complexes) during the day and relocated to the main roads to boost their opportunities to interact with customers in the evenings. Hinting that being in proximity to customers was the primary determinant of STs locations here.

The situation on Link 11597 also indicated that outliers of BtA R5,000 without specific physical attributes were not attractive as operational spaces to ST events.

Case study 7: Ikotun

The ST Hotspot at Ikotun is located in the vicinity of the intersection of the Ikotun-Idimu Road, the Ijegun-Ikotun Road, and the Ikotun-Egbe Road (Location 7, Figure 7-1). Ikotun is a densely populated low-income area, and the roads listed above are the primary routes which distribute vehicular traffic into its surrounding residential areas. These roads converged to create a *defacto* commercial centre, with: banks, schools, a post office, fuel stations, a BRT bus stop, the Ikotun LCDA office, and the Ikotun Market located along them.

At Ikotun, STs were confined to a 200m catchment area, and the spatial attributes of the constituent road networks within this area are represented in Table 0-3. There was a total of 1,311 ST events observed, and 78% of them were sedentary. 50% of the sedentary STs operated from semi-temporary facilities like tables, another 45% operated directly on the ground surface along walkways and on the road, while the remaining 5% were affixed to the fences of blocks.

Table 0-3: Spatial attributes of Ikotun's catchment area's road network

	Lnks.	Jnc.	Net. Area	Net. Len	Conn.	Lnk Den	Junc. Den	Net. Eff	ST Cov.	% Cov.
R200	11	4	377,980	2,538.10	14	231	635	148	986	38.8

Within the 200m catchment area, a new link and junction occurred at every 231m and 635m respectively. Considering a sharp cut-off of STs occurred within the limit of the initial 200m catchment area, there was no basis to make comparisons of network attributes within this case study. Therefore, a comparison with metrics from other case studies at this scale was done which indicated that the values in Ikotun were higher. This implied that ST events at Ikotun operated within a spatial setting with considerably larger city block footprints and interfaces, in comparison to Under-bridge, Agege, Eko, and Ikorodu.

STs at Ikotun

From the interviews with STs at Ikotun, it was found that there was a low turnover of STs. STs indicated that they mostly found their workplaces satisfactory to their needs and therefore operated there for long term. The primary determinant of STs workplace locations was the ability to interact with the maximum number of potential customers. Most STs lived near the case study site, and this proximity was also a factor which influenced their choice of location. The proximity of workplace to home was reflected in the gender distribution of STs, as most them were female. Being in proximity to their residences also influenced how STs used storage spaces - as they used their residences for storage purposes, instead of renting specific storage space.

The nature of enterprises engaged in were predominantly of low-order, and this, therefore, meant that patronage was limited to a customer pool of people who passed through the site on a daily basis, or by serendipitous circumstances. Consequently, the peak productivity for ST activities coincided with peak commuting times (6.00am to 9.00am and 5.30pm to 9.00pm).

Tenure was partially guaranteed for STs who paid levies to LCDA officials and *Agberos* daily, as this prevented them from harassments and confiscations. These dues were in addition to a specific levy collected periodically by the LCDA - known as the 'lock-up' fee, which was applicable to sedentary STs with operational facilities which exhibited a form of permanence. The lock-up fee covered trading permits, TV and Radio licenses, etc. Sedentary STs were further subjected to the payment of rent if their facilities were located where a right to ownership was exercised. There was however a disparity in the payment regime of levies, as a small number of STs were treated preferentially and exempted from most of these payments - because of the social capital they possessed (either as relatives or friends to someone in power). Therefore, at this location, the STs who had no social network found it harder to operate at Ikotun because they were frequently harassed, and this constituted the principal hindrance to ST activities here.

Spatial Attributes of Ikotun

The core trading area at Ikotun was confined to a 200m catchment area. Link 44121 hosted the highest number of ST events and was the only outlier within the distribution, while Link 15257 ranked as the next most accessible link for BtA 5000 (Table 0-4). Therefore, a comparative assessment of the spatial attributes between the pair of links, was conducted to unbundle the underlying differences between them which influenced the habitation of STs.

Lnk 44121 was flanked by development blocks whose interfaces interacted actively with the street, due to the absence of boundary fences. The distance between block interfaces range from between 30 to 40 metres, similar to Lnk 44121 but in this case, the distance included the property offset between the built developments within the blocks, instead of a measure of distances between boundary fences. Therefore, the width of the road segment appeared narrower, and thus created a double-loaded corridor of retail activities with no noticeable effect of severance effect here. There was an equitable spread of ST activities on the two sides of the link, with pedestrian flows occurring on both sides. The ST events used both permanent and semitemporary operational facilities, with a good mixture of both sedentary and itinerant STs. The morphological properties of Lnk 15257 was similar to Lnk 44121.

Table 0-4 BtA values for 400m catchment area at Ikotun

Ikotun	R400	R600	R1000	R2000	R5000	R10000
BtA Min 200m	0	7	56	413	1933	5765
BtA Max 200m	52	149	751	10414	401703	3769510
BtA Mean 200m	22	73	346	3903	154017	1484320
St Dev 200m	15	43	197	3258	170000	1616350
St Dev + Mean 200m	37	116	543	7161	324017	3100670
2(St Dev) + mean 200m	52	159	741	10420	494017	4717020

***BtA Min** = Minimum value of BtA for 200m catchment area from baseline link (the core trading area); **BtA Max** = Maximum value of BtA for 200m catchment area from baseline link; **St Dev** = Standard deviation of links BtA values for 200m catchment area.*

Table 9-4 shows the multi-scale BtA profiles for links at Ikotun. The core trading area had few links (as seen by the height of columns in Table 9-4). The few links was a consequence of the core trading area being mostly located on a street segment with few side roads. The links within the core trading area at Ikotun with high macro-scale BtA profiles hosted most of the STs.

Case study 8 - Mile 2

The ST hotspot at Mile 2 was located on the lower-level of the cloverleaf interchange between Lagos-Badagry expressway and Apapa-Oshodi expressway (Location 8, Figure 7-1). The former is an arterial to the Badagry-Seme border[147], while the latter connects the city's main seaport to other parts of the city; both are heavily plied corridors for vehicular traffic, and notorious for being congested (also see Section 5.2.2 on the consequences surrounding the development of the arterials in Lagos).

ST events did not exceed a 200m catchment area, and the spatial attributes of the constituent road network of this catchment area are represented in Table (9-5) below. Within the core trading area, 119 STs were observed (54% sedentary and 46% itinerant). There was a new link and a new junction at every 295m and 739m respectively within the core trading area, and a comparison of these metrics with other case studies at a similar scale indicated that the values at Mile 2 were the highest. Therefore, it is assumed that ST events at Mile 2 operated within a spatial setting with much larger urban block interfaces and footprints.

Table 0-5: Spatial attributes of Ikotun's catchment area's road network

	Lnks.	Jnc.	Net. Area	Net. Len	Conn.	Lnk Den	Junc. Den	Net. Eff	ST Cov.	% Cov.
R200	5	2	12,100	1477.31	6	295	739	8.19	830	56.2

STs at Mile 2

STs were dispersed due to the availability of ample space, and therefore they did not form intensities like the other case studies. The operations of the majority of the STs enterprises at Mile 2 were especially suited to meet the demands created by the public transport terminal located nearby, and passengers stuck in traffic. The former category consisted mainly of serviceoriented enterprises that were sedentary, which included: artisans, mechanics, vulcanizers, payphone operators, and food vendors. The latter were itinerant STs engaged in retailing consumer goods to passengers. Therefore, the primary determinant of STs choice of location here was being in a position to take advantage of proximities to interact with their potential customers.

[147] A route which connects Nigeria to the Republic of Benin.

From the interviews with STs, issues associated with tenure played a subdued role in influencing ST events here in comparison to other case study areas. Levies were paid to secure tenure to informal facilitators, which guaranteed STs tenures – mostly affecting sedentary STs. There was a low turnover of STs, and since there was an oversupply of space, securing space was not an issue here.

Spatial Attributes of Mile 2

The spatial attributes of the core trading area at Mile 2 was explored by making comparisons between STs occurrences and BtA values of the constituent links within the 200m catchment area (see Table 0-6).

Link 2964 had the highest BtA R5,000 value, and it had a few STs which were mostly itinerant. Hawkers took advantage of the customers, as space was not exactly convenient space to set up operational facilities as the road has a slight slope (similar to Oshodi). While Link 2967 had the highest frequency of STs. It was a segment of the Lagos-Badagry expressway which serves as a lay off (service lane). Capturing the extent/state of the physical infrastructure here was problematic due to the ongoing infrastructure works which were realigning the roads and setbacks. However, the elements of the former state were still visible, as the link was flanked to the north by a residential scheme and to its south by the dual carriageway.

Numerous semi-permanent physical facilities in the form of 20ft shipping containers were arranged along the boundaries of the residential estate to accommodate the STs. STs with semitemporary operational facilities were also present in a linear form in front of these containers.

Table 0-6 BtA values for 400m catchment area at Mile 2

Mile 2	R400	R600	R1000	R2000	R5000	R10000
BtA Min	4	9	99	4791	69359	315848
BtA Max	38	87	538	12947	1149660	8543040
BtA Mean	13	33	250	7183	644813	4803460
St Dev	14	32	184	3362	426517	3488680
St Dev + Mean	27	65	434	10545	1071330	8292140

2(St Dev) + mean	41	97	618	13907	1497847	11780820

***BtA Min** = Minimum value of BtA for 200m catchment area from baseline link (the core trading area); **BtA Max** = Maximum value of BtA for 200m catchment area from baseline link; **St Dev** = Standard deviation of links BtA values for 200m catchment area.*

Table 9-6 shows the distribution of the multi-scale BtA profiles for links within the core trading area at Mie 2.

Appendix 3

QUESTIONNAIRE FOR STREET TRADERS (Basis for Epicollect forms)

- **Introduction**

I am Akolade Akiyode, a PhD researcher. I am researching street traders' workplaces in Lagos State, mainly focusing on how the structure of urban transport networks influence the choices of locations.

Observed Details

1. **Gender** Male - Female
2. **Type of enterprise** Goods - Services - Hybrid (Goods & Services)
3. **Type of service provided** Tire repairers – Mechanics – Artisan – Gambling & Betting – Others – N/A
4. **Types of goods traded** Perishable goods – Imported Non-perishable goods – Locally manufactured Non-perishable goods – Pre-paid Phone Recharge vouchers – Newspapers and Magazines - Others - N/A
5. **Location** Along roadside (curbside, pavements) – On the road – Road Intersections - HBEE (home based enterprise extension) – Vacant Plots - Others
6. **Nature of Physical facility** Temporary – Semi-temporary – Permanent – N/A
7. **Spatial Temporality** Itinerant – Sedentary – Predominantly Itinerant - Predominantly Sedentary

Biodata

8. **Age**: Below 18, 18-24, 25-34, 35-54, Above 55
9. **Nationality:** Nigerian - Other (Details) ……………………………………………………………..
10. **Geo-Political Region:** North Central - North East - North West – South East – South South – South West
11. **Religion:** Christian – Muslim – Traditional – N/A
12. **Are you a resident of Lagos?** No - Yes
13. **Have you always been resident in Lagos?** No – Yes – N/A
14. **How long have you worked in Lagos for?** Less than a year – 1 to 3 years – 3 to 6 – 7 to 10 years – More than 10 years
15. **How long have you worked this job for?** Less than a year – 1 to 3 years – 3 to 6 – 7 to 10 years – More than 10 years
16. **Have you done other jobs prior to becoming a street trader?** No – Yes
17. **What was the nature of your former job(s) and employment status if yes?** Informal – formal – N/A
18. **Are you searching for other jobs while working this Job?** No – Yes
19. **Have you received any form of special training to develop your abilities?** No – Yes – N/A
20. **What is highest level of formal education you have received?** Primary - Secondary - Tertiary (university, Polytechnic, college of education)
21. **What informed your choice to become a Street trader**? Limited availability of formal jobs - Entrepreneurial drive – Hobby – Ease of access.

Business and Trading dynamics/variables

22. **What informs your choice of the business activity to undertake as a Street Trader?** Consumer/market needs - Affordability of (Ease of access) capital to start off – Previously acquired skillset – Random selection
23. **Who are your targeted customers?** Pedestrians - Vehicle users - Both
24. **Who are your main customers?** Pedestrians - Vehicle users – Both
25. **Do you have regular customers?** No – Yes - N/A
26. **Do you extend credit to your customers?** No – Yes - N/A

27. **On what days do you work?** Monday – Tuesday – Wednesday – Thursday – Friday – Saturday - Sunday
28. **What are the busiest days of the week?** Monday – Tuesday – Wednesday – Thursday – Friday – Saturday - Sunday
29. **How many hours do you work daily?** 1 to 3 – 4 to 6 – 7 to 10 – More than 10
30. **When are your busiest periods of the day?** 6am to 9am – 10am to 1pm – 2pm to 5pm – 6pm to 10pm – 11pm to 5am
31. **How many people patronise you on a typical day at work?** Less than 10 – between 10 and 20 - between 30 and 40 – more than 40

Economic Profile and Information

32. **Is this your only means of earning money for survival?** No – Yes – N/A
33. **Are you self-employed?** No – Yes – N/A
34. **Is this your preferred work location?** No – Yes – N/A
35. **Are your total earnings on a typical day from this location suitable to meet your needs?** No – Yes – N/A
36. **What are your total earnings on a typical day from your preferred location?** Less than 1000 - 1000 to 5000 – 5000 to 10000 – 10000 and above – N/A
37. **Do you always make a profit?** No – Yes - N/A
38. **Do you pay taxes to the government?** No – Yes – N/A
39. **Do you receive any support or incentives from the government for your work as a street trader?** No – Yes – N/A
40. **What form of support do you receive from the government?** Water – Power supply - Storage Facilities - Waste Disposal – Sanitary Facilities – Security -N/A
41. **Do you have a bank account?** No – Yes – N/A
42. **Do you have any borrowings?** No – Yes – N/A
43. I**f yes, from where/whom?** Family – Cooperative – Financial institution - N/A
44. **How do you source the stock/materials for business?** Wholesaler – Retailer – Other street vendors – other - N/A
45. **Do you use a storage facility?** No – Yes - N/A

46. **How often do you use the storage facility?** Daily – Twice weekly – Thrice weekly **47. Is the storage facility nearby?** Walkable – Not Walkable – N/A

Space and Contextual Information

48. **Do you have a specific travel pattern to your workplace?** No – Yes - N/A
49. **What is your typical travel pattern to work from home?** Home to work – Home to storage/source of stock to work – Home to work to storage/stock to work – N/A
50. **How long does it take to travel between source of goods/storage facility and workplace?** Less than 1 hour – 1 to 2 hours – 3 to 4 hours - More than 4 hours
51. **Does the time taken to access storage or stock affect your choice of workplace location?** No – Yes - N/A
52. **Does the distance traversed to access storage or stock affect your choice of workplace location?** No – Yes - N/A
53. **How much does it cost to travel between the source of goods/storage facility and workplace?** 0 to 50 Naira – 50 to 100 Naira – 100 to 150 Naira – 150 to 200 Naira – More than 200 Naira
54. **Does the transportation cost associated with the journey from source of goods/storage facilities influence your workplace location?** No – Yes - N/A
55. **How long is the journey time from home to location of work?** Less than 1 hour – 1 to 2 hours – 3 to 4 hours - More than 4 hours
56. **How much does it cost to travel from home and work?** 0 to 50 Naira – 50 to 100 Naira – 100 to 150 Naira – 150 Naira to 200 Naira – More than 200 Naira
57. **Does this transportation cost associated with the journey from home to work influence your workplace location?** No – Yes - N/A
58. **How long have you been working from this location?** Less than a month – 1 to 6 months – 7 to 12 months – 13 months to 24 months – More than 24 months
59. **Do you make any payments to secure this location's availability?** No – Yes - N/A
60. **Who do you make payments to?** Local authority – Law enforcement agencies - Trade Union – Area boys – Traditional rulers – Landlords Others – N/A

61. **Have you previously worked informally in any other location(s)?** No – Yes – N/A
62. **Did you make any payments to secure your previous location's availability?** No – Yes - N/A
63. **Does your present location suit your needs in comparison to your previous site(s)?** No – Yes - N/A
64. **Do you consider the tenure of this location permanent?** No – Yes - N/A
65. **Would you prefer to trade from a more secure location with shelter and storage facilities (or a formal shop)?** No – Yes – N/A

Associational Contextual Information

66. **Do you belong to any trade associations?** No – Yes - N/A
67. **How active is the union you belong in ensuring the status of your workplace and occupation?** Very Effective – Moderately Effective – Not Effective – N/A
68. **Are you associated with any NGO's or civil society groups?** No – Yes – N/A
69. **Have you ever been consulted by any government authorities on issues regarding your occupation of this space?** No – Yes – N/A
70. **Do you have any form of Identification?** No – Yes – N/A
71. **Which government officials do you encounter most often?** Local govt. market managers – Taskforce/Law enforcement agents – Police - Others – N/A

Problem-related questions

72. **Are you aware of any illegality associated with trading from this location?** No – Yes – N/A
73. **How is the prohibition of your activities communicated?** Written notices – Word of mouth – Trade Unions and associations – Others - N/A
74. **Are you aware of any penalties associated with trading from this location (apart from confiscation etc.)?** No – Yes – N/A
75. **Do you think commercial activities should be undertaken along the street, sidewalks, and other unoccupied open spaces within the city?** No – Yes – N/A
76. **Do you have the same rights to these spaces as every other city dwellers?** No – Yes – N/A
77. **Are there any particularly powerful traders and landlords?** No – Yes – N/A
78. **How do you go about resolving your collective problems as traders?** Contact govt.

authorities - Resolve it communally without govt. assistance – Other means - N/A

79. **What problems have you experienced as a street trader?** Harassment - Evictions - Confiscation of goods – Relocation – Fines – OTHERS - No specific problems experienced
80. **Generally, with whom do you have problems/conflicts with most often in association with using this space?** Local government authorities – Police - State government authorities - Other street traders - Market managers - Neighborhood residents – N/A
81. **What are the main advantages of being a street vendor here?**...

Prospective/Outlook

82. **What would most help your workplace?** Security of tenure – Access to financial services – Formalization - Access to business-related infrastructure – Government regulation – Security - Others
83. Is there anything else you would like to say about your work?

………

Can I contact you for further participation or for you to know the outcome of this research project?

Name…………….............................……… **Mobile No/Email**…………………………………….

INTERVIEW SCHEDULE FOR CITY INHABITANTS

 Introduction

I am Akolade Akiyode, a PhD researcher. I am researching street traders workplaces in Lagos State, mainly focusing on how the structure of urban transport networks influence the choices of locations. Street trading in this context refers to economic activities undertaken by individuals and groups, which involves the sale of legal goods and services, within public and private spaces; spaces that are appropriated in unconventional ways, for the exercise of such activity.

- **Biodata**

1. **Gender** Male - Female
2. **Age:** Below 18, 18-24, 25-34, 35-54, Above 55
3. **Nationality** Nigerian - Other (Details) …………………………………………………………..
4. **Geo-Political Region** North Central - North East - North West – South East – South South – South West
5. **Religion** Christian – Muslim – Traditional – N/A
6. **What is the highest level of education you have received?** Primary - Secondary - Tertiary
7. **Where is the Location of your residence?** Vicinity of interview – other parts of the city – outside Lagos – N/A
8. **Occupational Status** Employed (formal) - Employed (Informal) - Self-employed (formal) - Self-employed (informal) – Unemployed – N/A

- **Political, Social, Economic, and Spatial contextual Information**

9. **How often do you patronise Street traders?** Every day - Weekly - Monthly
10. **Do you patronise Street traders' services more often near your home?** No – Yes - N/A
11. **Do you patronise Street traders' services more often near your place of work?** No – Yes - N/A
12. **Do you feel you patronize Street traders' services more often in transit?** No – Yes - N/A

13. **Is your patronage of Street traders influenced by your location?** No – Yes - N/A
14. **Do you patronize any Street trader regularly?** No – Yes - N/A
15. **Is patronage a factor of your locational proximity to the said street trader?** No – Yes - N/A
16. **Is patronage a factor of an established relationship with the said street trader?** No – Yes - N/A
17. **Are the activities of street traders of any benefit to you?** No – Yes - N/A
18. **Is patronizing street traders' a more convenient option than other more formal forms of trading and services (time value)?** No – Yes - N/A
19. **Is patronizing street traders' a more convenient option than other more formal forms of trading and services (monetary value)?** No – Yes - N/A
20. **Are the activities of street traders a nuisance on a personal level to you when near your home?** No – Yes - N/A
21. **Are the activities of street traders a nuisance on a personal level to you on the city scale?** No – Yes - N/A
22. **Do you think the activities of street traders are a major urban management issue for the state government?** No – Yes - N/A
23. **Do you think street trading activities are well managed by the government?** No – Yes - N/A
24. **Do you think commercial activities should be undertaken along the street, sidewalks, railway track, and other easily accessible public spaces?** No – Yes – N/A
25. **Do you advocate for the restriction of commercial activities to designated spaces within the city e.g markets, shopping complexes and malls?** No – Yes – N/A
26. **Do you think that street traders that violate the restriction of their activities to designated spaces within the city should be forcibly relocated?** No – Yes – N/A
27. **Do you approve of the governments' present methods of ensuring the compliance of street traders with the use of public space?** No – Yes – N/A

Additional Information

Is there anything else you would like to say about street trading/trading in publicly accessible spaces?

Bibliography

Aanensen, D. et al. 2014. *EpiCollect+: linking smartphones to web applications for complex data collection projects [v1; ref status: indexed]*.

Abiodun, J. 1968. Central Place Study in Abeokuta, South Western Nigeria. *Journal of Regional Science* 8(1), pp. 57 - 76.

Acey, C. 2007. Space vs. Race: A Historical Exploration of Spatial Injustice and Unequal Access to Water in Lagos, Nigeria. *Critical Planning* 14,

Agnew, J. 2011. Space and Place. In: Agnew, J. and Livingstone, D. eds. *Handbook of Geographical Knowledge*. London: Sage.

Akoni, O. and Olowoopejo, M. 2013. N7.62trn informal sector booms in Lagos. *Vanguard*. Available at: http://www.vanguardngr.com/2013/05/n7-62trn-informal-sector-booms-in-lagos/ [Accessed: 13/05/14].

Al-Sayed, K. et al. 2014. Space syntax methodology. Bartlett School of Architecture, UCL.

Alade, W. 2009. Trip Length Characteristics In Lagos Metropolis. University of Lagos.

Allen, G. 1999. Spatial abilities, cognitive maps, and wayfinding: Bases for individual differences in spatial cognition and behavior. In: Golledge, R.G. ed. *Wayfinding behavior: Cognitive mapping and other spatial processes*. Baltimore: Johns Hopkins University Press, pp. 46 - 80.

Alonge, M. M. D. 1994. *Afro-Brazilian Architecture in Lagos State: A Case for Conservation.* University of Newcastle.

Alonso, W. 1964. *Location and Land Use*. Cambridge, MA: Cambridge University Press.

Anderson, S. 1993. Savannah and the issue of precedent: city plan as resource. In: Ralph, B. ed. *Settlements in the Americas: Cross-cultural Perspectives*. Newark, Del: University of Delaware Press.

Bacchetta, M. et al. 2009. Globalisation and informal jobs in developing countries. Joint study of the International Labour Office and the Secretariat of the World Trade Organization. .

Baer, W. 1972. Import Substitution and Industrialization in Latin Amercia: Experiences and Interpretations. *Latin American Research Review* 7(1), pp. 95-122.

Bafna, S. 2003. Space Syntax: A Brief Introduction to Its Logic and Analytical Techniques. *Environment and Behavior* 35(1), pp. 17-29. doi: 10.1177/0013916502238863

Baker, P. H. 1974. *Urbanization and political change: the politics of Lagos, 1917-1967*. Cambridge Univ Press.

Balbo, M. 1993. Urban planning and the fragmented city of developing countries. *Third World Planning Review* 15(1), p. 23.

Bank, W. 2016. *Nigeria - Lagos Urban Transport Project*. Washington, D.C: Available at: http://wwwhttp://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/wds.worldbank.org/external/default/WDSContentServer/WDSP//
Barnes, T. J. and Minca, C. 2013. Nazi spatial theory: The dark geographies of Carl Schmitt and Walter Christaller. *Annals of the Association of American Geographers* 103(3), pp. 669-687.

Bascom, W. 1955. Urbanization Among the Yoruba. *American Journal of Sociology* 60(5), pp. 446-454. doi: 10.2307/2772532

Bass, L. E. 2000. Enlarging the street and negotiating the curb: Public space at the edge of an African market. *International Journal of Sociology and Social Policy* 20(1-2), pp. 74-95. doi: 10.1108/01443330010789089

Batty, M. 2008. Cities as Complex Systems: Scaling, Interactions, Networks, Dynamics and Urban Morphologies. *Working Paper Series*. London: UCL

Batty, M. 2009. Accessibility: in search of a unified theory. *Environment and Planning B: Urban Analytics and City Science* 36(2), pp. 191 - 194. doi: doi:10.1068/b3602ed

Batty, M. 2013. The New Science of Cities. MIT Press.

Batty, M. and Rana, S. 2002. Reformulating space syntax: the automatic definition and generation of axial lines and axial maps. *Centre for Advanced Spatial Analysis Working Paper* 58,

Bavelas, A. 1950. Communication patterns in task-oriented groups. *Journal of the Acoustical Society of America* 22, pp. 723-730.

Berry, B. J. L. 1967. *Geography of market centers and retail distribution*. Prentice-Hall Englewood Cliffs, NJ.

Berry, B. J. L. et al. 1988. *Market centers and retail location: theory and applications.* . Englewood Cliffs, NJ Prentice-Hall.

Berry, L. L. et al. 2002. Understanding service convenience. *Journal of Marketing* 66(3), pp. 1-17.

Bhat, C. et al. 2000. Urban accessibility index: literature review. *Center of Transportation Research, University of Texas at Austin, Springfield*, Bhat, C. et al. 2002. *Development of an Urban Accessibility Index: Formulations, Aggregation, and Application*

Biddulph, M. 2012. The problem with thinking about or for urban design. *Journal of Urban Design* 17(1), pp. 1-20.

Bigon, L. 2005. Sanitation and street layout in early colonial Lagos: British and indigenous conceptions, 1851–1900. *Planning Perspectives* 20(3), pp. 247-269.

Bigon, L. 2009. Urban planning, colonial doctrines and street naming in French Dakar and British Lagos, c. 1850–1930. *Urban History* 36(3), pp. 426-448.

Boeing, G. 2017. Measuring the Complexity of Urban Form and Design.

Bovy, P. H. and Stern, E. 2012. *Route Choice: Wayfinding in Transport Networks: Wayfinding in Transport Networks*. Springer Science & Business Media.

Boyowa, A. C. 2005. Changing urban housing form and organization in Nigeria: lessons for community planning. *Planning Perspectives* 20(1), pp. 69–96. doi: http://dx.doi.org/10.1080/0266543042000300546

Braimoh, A. K. and Onishi, T. 2007. Spatial determinants of urban land use change in Lagos, Nigeria. *Land Use Policy* 24(2), pp. 502-515. doi: http://dx.doi.org/10.1016/j.landusepol.2006.09.001

Bromley, R. 1980. Municipal versus Spontaneous Markets? A Case Study of Urban Planning in Cali, Colombia. *Third World Planning Review* 2, pp. 205-232. doi: http://dx.doi.org/10.3828/twpr.2.2.1138k2780342180h

Bromley, R. 2000. Street vending and public policy: a global review. *International Journal of Sociology and Social Policy* 20(1/2), pp. 1-28. doi: doi:10.1108/01443330010789052

Bromley, R. D. F. 1998. Informal Commerce: Expansion and Exclusion in the Historic Centre of the Latin American City. *International Journal of Urban and Regional Research* 22(2), pp. 245-263. doi: 10.1111/1468-2427.00138

Bromley, R. D. F. and Mackie, P. K. 2009. Displacement and the New Spaces for Informal Trade in the Latin American City Centre. *Urban Studies* 46(7), pp. 1485-1506.

Brown, A. 2006. *Contested Space: Street Trading, Public Space, and Livelihoods in Developing Cities*. ITDG Publishing.

Brown, A. 2017. *Rebel Streets and the Informal Economy: Street Trade and the Law*. Taylor & Francis.

Brown, S. 1993. Retail Location Theory: Evolution and Evaluation. *The International Review of Retail, Distribution and Consumer Research* 3(2), pp. 185 - 229.

Brown, S. ed. 1994. *Central Place Theory: Sixty Years on*. *Contemporary marketing history: proceedings of the Sixth Conference on Historical Research in Marketing and Marketing Thought, held May 22-25, 1993 at the JW Marriott Hotel, Lenox Square, Atlanta, GA.* Michigan State University.

Bryman, A. 2008. Of methods and methodology. *Qualitative Research in Organizations and Management: An International Journal* 3(2), pp. 159-168. doi: doi:10.1108/17465640810900568

Bryman, A. 2012. *Social Research Methods*. Oxford: Oxford University Press.

Burns, L. D. 1979. *Transportation, temporal and spatial components of accessibility*. New York: Pergamon Press.

Carrothers, G. A. 1956. An historical bedew of the gravity and potential concepts of human interaction. *Journal of the American Institute of Planners* 22(2), pp. 94-102.

Cascetta, E. et al. 2013. A New Measure of Accessibility based on Perceived Opportunities. *Procedia - Social and Behavioral Sciences* 87, pp. 117 - 132.

Castells, M. 1977. *The urban question: a Marxist approach*. MIT Press.
Castells, M. 2008. The Networked City. In: Pflieger, G. et al. eds. *The Social Fabric of the Networked City*. Oxford: Routledge.

Castells, M. and Hall, P. 1994. *Technopoles of the World: The Making of 21st Century Industrial Complexes*. New York: Routledge.

Castells, M. and Portes, A. 1989. World underneath: The origins, dynamics, and effects of the informal economy. *The informal economy: Studies in advanced and less developed countries* 12,

Cervero, R. and Kockelman, K. 1997. Travel demand and the 3Ds: density, diversity, and design. *Transportation Research Part D: Transport and Environment* 2(3), pp. 199–219.

Chadwick, G. F. 1987. *Models of urban and regional systems in developing countries : some theories and their application in physical planning*. Oxford; New York (N.Y.) [etc.]: Pergamon Press.

Chan, Y. 2011. *Location theory and decision analysis*. Springer.

Charman, A. J. et al. 2015. Small area census approach to measure the township informal economy in South Africa. *Journal of Mixed Methods Research* 11(1), pp. 36 - 58.

Charmes, J. 1998. *Street vendors in Africa: data and methods*.

Charmes, J. 2000. Informal Sector, Poverty and Gender: A Review of Empirical Evidence. Washington, D.C: World Development.

Charmes, J. 2006. A review of empirical evidence on time use in Africa from UN-sponsored surveys. *Gender, Time Use, and Poverty in Sub-Saharan Africa*, p. 39.

Chen, M. A. 2007. Rethinking the Informal Economy: Linkages with the Formal Economy and the Formal Regulatory Environment. *DESA Working Paper*. United Nations.

Chen, M. A. 2012. The Informal Economy: Definitions, Theories and Policies. In: (WIEGO), W.i.I.E.G.a.O. ed. *WIEGO Working Papers*. Manchester.

Chiaradia, A. et al. 2013a. sDNA a software for spatial design network analysis. . *Specifications, Cardiff University*.

Chiaradia, A. et al. eds. 2014. *Network geography and accessibility*. *Proceedings of the 12th Transport Practitioners' Meeting.*

Chiaradia, A. et al. 2013b. Compositional and urban form effects on residential property value patterns in Greater London. *Proceedings of the ICE - Urban Design and Planning* 166 (3), pp. 176 –199. Available at: http://www.icevirtuallibrary.com/content/article/10.1680/udap.10.00030.

Chiaradia, A. et al. 2012. Compositional and urban form effects on centres in Greater London. *Proceedings of the ICE - Urban Design and Planning* 165, pp. 21-42. Available at: http://www.icevirtuallibrary.com/content/article/10.1680/udap.2012.165.1.21.

Chiaradia, A. J. et al. eds.*Daniel, K. et al.* 2009. *Residential Property Value Patterns in London: Space Syntax spatial Analysis*. *7th International Space Syntax Symposium.* Stockholm, Sweden., Stockholm: KTH.

Christaller, W. 1933. *Die zentralen Orte in Süddeutschland*.

Clarkson, R. M. et al. 1996. UK supermarket location assessment. *International Journal of Retail & Distribution Management* 24(6), pp. 22 - 33.

Conzen, M. R. G. 1960. Alnwick, Northumberland: A Study in Town-Plan Analysis. *Transactions and Papers (institute of British Geographers)* 27, pp. iii–122. doi: http://doi.org/10.2307/621094

Cooper, C. 2016. Spatial Design Network Analysis (sDNA) version 3.3 Manual. Cardiff University.

Cooper, C. and Chiaradia, A. 2015. sDNA: how and why we reinvented Spatial Network Analysis for health, economics and active modes of transport. *23rd GIS Research UK.* University of Leeds, October 31, 2015.

Cooper, C. H. V. 2015. Spatial localization of closeness and betweenness measures: a selfcontradictory but useful form of network analysis. *International Journal of Geographical Information Science* 29(8),

Cooper, C. H. V. et al. 2014. Measuring the impact of spatial network layout on community social cohesion: a cross-sectional study. *International Journal of Health Geographics* 13(1), p. 11. doi: 10.1186/1476-072X-13-11

Cope, M. and Elwood, S. 2009. *Qualitative GIS: A Mixed Methods Approach*. SAGE Publications.

Cresswell, T. 2012. *Geographic Thought: A Critical Introduction*. Wiley.

Cross, J. 2000. Street vendors, and postmodernity: conflict and compromise in the global economy. *International Journal of Sociology and Social Policy* 20(1/2), pp. 29-51. doi: doi:10.1108/01443330010789061

Cross, J. and Morales, A. 2007. *Street entrepreneurs: people, place, & politics in local and global perspective*. Routledge.

Crotty, M. J. 1998. *The Foundations of Social Research: Meaning and Perspective in the Research Process*. SAGE Publications Ltd.

Crucitti, P. et al. 2006a. Centrality in networks of urban streets. *Chaos: an interdisciplinary journal of nonlinear science* 16(1), p. 015113.

Crucitti, P. et al. 2006b. Centrality measures in spatial networks of urban streets. *Physical Review E* 73(3), p. 036125.

Dalton, N. et al. 2003. To tame a TIGER one has to know its nature: extending weighted angular integration analysis to the descriptionof GIS road-centerline data for large scale urban analysis.

Dave, J. and Arora, K. 2015. Interventions by the Self Employed Women's Association (SEWA) in Ahmedabad, India. *Inclusive Cities Project*. WIEGO.

Davies, R. 1976. *Marketing Geography (RLE Retailing and Distribution): With special reference to retailing*. Methuen.

de Pádua Carrieri, A. and Murta, I. B. D. 2011. Cleaning up the City: A Study on the Removal of Street Vendors from Downtown Belo Horizonte, Brazil. *Canadian Journal of Administrative Sciences / Revue Canadienne des Sciences de l'Administration* 28(2), pp. 217-225. doi: 10.1002/cjas.207

De Soto, H. 1989. *The other path*. Harper & Row New York.

de Soto, H. 2000. *The Other Path: The Economic Answer to Terrorism*. United states: Harper & Row.

De Vaus, D. A. 2001. *Research Design in Social Research*. Sage Publications (CA).

Denscombe, M. 2014. *The good research guide: for small-scale social research projects*. McGraw-Hill Education (UK).

Denzin, N. K. 1970. *The research act: A theoretical introduction to sociological methods*. Transaction publishers.

Derrida, J. 1998. *Of Grammatology*. Johns Hopkins University Press.

Devas, N. ed. 2012. *Urban Governance, Voice, and Poverty in the Developing World.* Taylor & Francis.

Dewar, D. 1990. *The structure and form of metropolitan Cape Town : its origins, influences and performance*. Cape Town: The Urban Problems Research Unit, The Urban Foundation Western Cape.

Dewar, D. and Watson, V. 1981. Unemployment and the Informal Sector: Some Proposals. Cape Town: Citadel.

Dewar, D. and Watson, V. 1990. *Urban markets: developing informal retailing*. Routledge London.

Dibua, J. I. 2006. *Modernization and the Crisis of Development in Africa: The Nigerian Experience*. Ashgate.

Dierwechter, Y. 2001. *The spatiality of informal sector agency: Planning, survival and geography in Black Metropolitan Cape Town.* London School of Economics and Political Science.

Dierwechter, Y. 2004. "Dreams, bricks, and bodies: mapping 'neglected spatialities' in African Cape Town". *Environment and Planning A* 36(6), pp. 959 - 981.

Dill, J. ed. 2004. *Measuring network connectivity for bicycling and walking*. *83rd Annual Meeting of the Transportation Research Board, Washington, DC.*

Dobson, R. et al. 2009. *Working in Warwick: including street traders in urban plans.* Durban, South Africa: School of Development Studies, University of KwaZulu-Natal.

Donovan, M. G. 2008. Informal cities and the contestation of public space: The case of Bogotá's street vendors, 1988—2003. *Urban Studies* 45(1), pp. 29-51.

Easterly, W. 2005. What did structural adjustment adjust?: The association of policies and growth with repeated IMF and World Bank adjustment loans. *Journal of development economics* 76(1), pp. 1-22.

Ekundare, R. 1971. Nigeria's second national development plan as a weapon of social change. *African affairs* 70(279), pp. 146-158.

Elleh, N. 2016. *Architecture and Politics in Nigeria: The Study of a Late Twentieth-Century Enlightenment-Inspired Modernism at Abuja, 1900-2016*. Taylor & Francis.

ESRI. 2013. ArcGIS Desktop 10.2.

Etuonovbe, A. 2014. Securing land title for women in Nigeria : a professional perspective.

Ewing, R. and Cervero, R. 2010. Travel and the Built Environment. *Journal of the American Planning Association* 76(3), doi: http://dx.doi.org/10.1080/01944361003766766

Ewing, R. H. 1996. Pedestrian-and transit-friendly design.

Fafchamps, M. and Minten, B. 2002. Returns to social network capital among traders. *Oxford Economic Papers* 54(2), pp. 173-206. doi: 10.1093/oep/54.2.173

Falola, T. and Salm, S. J. 2004. *Globalization and urbanization in Africa*. Africa World Press.

Filani, M. O. 2012. *The changing face of Lagos: From vision to reform and transformation*. Nigeria:

Fourchard, L. 2011. Lagos, Koolhaas and Partisan Politics in Nigeria. *International Journal of Urban and Regional Research* 35(1), pp. 40-56. doi: 10.1111/j.1468-2427.2010.00938.x

Fox, R. 1991. The use of central place theory in Kenya's development strategies. *Tijdschrift voor economische en sociale geografie* 82(2), pp. 106-127.

Freeman, C. 1995. The 'National System of Innovation' in historical perspective. *Cambridge Journal of Economics* 19(1), pp. 5 - 24.

Freeman, L. C. 1978. Centrality in social networks conceptual clarification. *Social Networks* 1(3), pp. 215-239. doi: http://dx.doi.org/10.1016/0378-8733(78)90021-7

Fujita, M. et al. 2001. *The Spatial Economy: Cities, Regions, and International Trade*. MIT Press.

Gandy, M. 2005. Learning from Lagos. *New Left Review* 33, p. 37.

Gandy, M. 2006. Planning, Anti-planning and the Infrastructure Crisis Facing Metropolitan Lagos. *Urban Studies* 43(2), pp. 371 - 396.

Garrison, W. L. 1960. Connectivity of the Interstate Highway System. *Papers in Regional Science* 6(1), pp. 121-137. doi: 10.1111/j.1435-5597.1960.tb01707.x

Gehl, J. 1971. *Life between buildings: using public space*. Island Press.

Gehl, J. 2013. *Cities for people*. Island press.

Gereffi, G. et al. 2005. The governance of global value chains. *Review of International Political Economy* 12(1), pp. 78-104. doi: 10.1080/09692290500049805

Geurs, K. T. and van Wee, B. 2004. Accessibility evaluation of land-use and transport strategies: review and research directions *Journal of Transport Geography* 12, pp. 127 - 140.

Ghosh, A. 1979. Changes in the Spatial Efficiency of Periodic Markets. *Tijdschrift voor economische en sociale geografie* 70(5), pp. 293 - 299. doi: 10.1111/j.1467-9663.1979.tb01887.x

Ghosh, A. 1982. A Model of Periodic Marketing. *Geographical Analysis* 14(2), pp. 155-166. doi: 10.1111/j.1538-4632.1982.tb00064.x

Ghosh, A. and McLafferty, S. 1984. A model of consumer propensity for multipurpose shopping. *Geographical Analysis* 16(3), pp. 244-249.

Gieryn, T. F. 2000. A Space for Place in Sociology. *Annual Review of Sociology* 26, pp. 463-496. doi: 10.2307/223453

Godwin, W. J. G. and Hopwood, G. 2012. *Sandbank city: Lagos at 150*. Yaba, Lagos: Kachifo.

Goheen, P. G. 1998. Public space and the geography of the modern city. *Progress in Human Geography* 22(4), pp. 479 - 496.

Golledge, R. G. ed. 1995. *Path selection and route preference in human navigation: A progress report*. *International Conference on Spatial Information Theory.* Springer.

Golledge, R. G. 1999. *Wayfinding behavior: Cognitive mapping and other spatial processes*. JHU press.

Griffiths, S. et al. 2010. The persistence of suburban centres in Greater London: combining Conzenian and space syntax approaches. *Urban Morphology* 14(2), pp. 85 - 99. doi: http://discovery.ucl.ac.uk/150358/

Gross, J. L. and Yellen, J. 2005. *Graph theory and its applications*. CRC press.

Guba, E. G. and Lincoln, Y. S. 1994. Competing paradigms in qualitative research. *Handbook of qualitative research* 2(163-194),

Guha-Khasnobis, B. et al. 2006. Introduction. In: Guha-Khasnobis, B. et al. eds. *Linking the Formal and Informal Economy: Concepts and Policies*. Oxford: Oxford University Press.

Habib-Mintz, N. 2009. To what Extent can the Informal Economy Concept Adequately Explain the Dynamism of the Non-Formal Sector in Developing Countries?'. *Journal of International Business and Economy* 10(1), pp. 1-19.

Haggett, P. and Chorley, R. J. 1969. *Network analysis in geography*. Edward Arnold.

Halden, D. et al. 2005. Accessibility Analysis Literature Review'. *Measuring Accessibility as Experienced by Different Socially Disadvantaged Groups*. University of Westminster: Transport Studies Group

Hall, P. and Pfeiffer, U. 2013. *Urban future 21: a global agenda for twenty-first century cities*. Routledge.

Handy, S. et al. 2003. *Planning for Street Connectivity: Getting from Here to There*.

Handy, S. L. and Niemeier, D. A. 1997. Measuring accessibility: an exploration of issues and alternatives *Environment and Planning A* 29(7), pp. 1175 - 1194.

Hansen, W. G. 1959. How Accessibility Shapes Land Use. *Journal of the American Institute of Planners* 25(2), pp. 73-76. doi: 10.1080/01944365908978307

Harris, J. R. and Todaro, M. P. 1970. Migration, unemployment, and development: A two-sector analysis. *American Economic Review,* 60(1), pp. 126– 142.

Harrison, P. ed.*Richardson, T. et al.* 2005. *Everyday life and spatial governance*. *Everyday Life and Spatial Governance.* Sheffield, Department of Town and Regional Planning, University of Sheffield.

Hart, K. 1973. Informal Income Opportunities and Urban Employment in Ghana. *The Journal of Modern African Studies* 11(1), pp. 61-89. doi: 10.2307/159873

Hart, K. 2006. Informal Economy. *The Memory Bank* [Online] 17th November 2006. Available at: http://thememorybank.co.uk/papers/informal-economy/ [Accessed: 01/08/2014].

Harvey, D. 1969a. Behavior and Location: Foundations for a Geographic and Dynamic Location Theory, Part 1 by Allan Pred *Geographical Review* 59(2), pp. 312-314.

Harvey, D. 1969b. *Explanation in geography*. Edward Arnold.

Hess, P. et al. 1999. Site design and pedestrian travel. *Transportation Research Record: Journal of the Transportation Research Board* (1674), pp. 9-19.

Hillier, B. and Hanson, J. 1984. *The Social Logic of Space*. Cambridge: Cambridge University Press.

Hillier, B. and Iida, S. 2005. Network and Psychological Effects in Urban Movement. In: Cohn, A.G. and Mark, D.M. eds. *Spatial Information Theory*. pp. 475-490.

Hillier, B. and Penn, A. 2004. Rejoinder to carlo ratti. *Environment and Planning B: Planning and Design* 31(4), pp. 501-511.

Hodder, B. 1961. Rural periodic day markets in part of Yorubaland. *Transactions and Papers (institute of British Geographers)* (29), pp. 149-159.

Hodder, B. W. and Ukwu, U. I. 1969. *Markets in West Africa. Studies of markets and trade among the Yoruba and Ibo*. Ibadan: University of Ibadan Press.

Holman, R. H. and Wilson, R. D. 1982. Temporal equilibrium as a basis for retail shopping behavior. *Journal of retailing* 58(1), pp. 58-81.

Hopkins, A. G. 1966. The Lagos Strike of 1897: An Exploration in Nigerian Labour History. *Past & Present* (35), pp. 133-155. doi: 10.2307/649969

Hornik, J. 1984. Subjective vs. objective time measures: A note on the perception of time in consumer behavior. *Journal of consumer research* 11(1), pp. 615-618.

Huff, D. L. 1964. Defining and Estimating a Trading Area. *Journal of Marketing* 28(3), pp. 34-38.

Huff, D. L. 2003. Parameter Estimation in the Huff Model. *ArcUser*, pp. 34 - 36. Available at: http://www.esri.com/news/arcuser/1003/files/huff.pdf.

Hussmanns, R. 2004. Measuring the informal economy: From employment in the informal sector to informal employment Geneva: Policy Integration Department, Bureau of Statistics, International Labour Office.

Ibitayo, O. O. 2012. Towards effective urban transportation system in Lagos, Nigeria: Commuters' opinions and experiences. *Transport Policy* 24, pp. 141–147.

Ighodaro, C. 2008. Road Infrastructure and Economic Growth in Nigeria. *International Conference on Transport Infrastructure.* Beijing, China.

Ikioda, F. 2016. The impact of road construction on market and street trading in Lagos. *Journal of Transport Geography* 55, pp. 175-181. doi: https://doi.org/10.1016/j.jtrangeo.2015.11.006

Ilesanmi, A. O. 2010. Urban sustainability in the context of Lagos mega-city. *Journal of Geography and Regional Planning* 3(10), p. 240.

ILO. 1972. *Employment, incomes and equality*. Geneva:

ILO. 2002. *Women and Men in the Informal Economy: A Statistical Picture, 1st edition*. Geneva: International Labour Organization.

ILO. 2013. Measuring informality: A statistical manual on the informal sector and informal employment Geneva: International Labour Organization.

Immerwahr, D. 2007. The Politics of Architecture and Urbanism in Postcolonial Lagos, 1960–1986. *Journal of African Cultural Studies* 19(2), pp. 165-186.

Ingram, D. R. 1971. The concept of accessibility: A search for an operational form. *Regional Studies* 5(2), pp. 101-107. doi: 10.1080/09595237100185131

ISO. 2011. ISO, 14825 Intelligent transport systems *Geographic Data Files (GDF)* Vernier: International Organization for Standardization.

Jackson, R. H. and Rosberg, C. G. 1982. Why Africa's weak states persist: the empirical and the juridical in statehood. *World politics* 35(1), pp. 1-24.

Jacobs, A. B. 1993. *Great Streets*. Mit Press.

Jacobs, J. 1961. The Death and Life of Great American Cities.

Johnson, R. B. and Onwuegbuzie, A. J. 2004. Mixed methods research: A research paradigm whose time has come. *Educational researcher* 33(7), pp. 14-26.

Jones, S. R. 1981. Accessibility measures: A literature review. Transport and Road Research Laboratory.

Kanbur, R. 2009. Conceptualising Informality: Regulation and Enforcement. *Indian Journal of Labour Economics* 52(1), pp. 33-42.

Kansky, K. J. 1963. *Structure of transportation networks: relationships between network geometry and regional characteristics*. University of Chicago.

Kaufmann, V. 2011. *Rethinking the City: Urban Dynamics and Motility*. Routledge.

Kim, A. M. 2015. *Sidewalk City: Remapping Public Space in Ho Chi Minh City*. University of Chicago Press.

Klarqvist, B. 2015. A space syntax glossary. *NA*.

Knight, P. L. and Marshall, W. E. 2015. The metrics of street network connectivity: their inconsistencies. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability* 8(3), pp. 241-259. doi: 10.1080/17549175.2014.909515

Koenigsberger, O. et al. 1964. *Metropolitan Lagos*. New York:

Koolhaas, R. et al. 2000. *Mutations*. ACTAR.

Krugman, P. 1991. Increasing Returns and Economic Geography. *Journal of Political Economy* 99(3), pp. 483 - 499.

Krumme, G. 2002. *Location-Theoretical Traditions and Significant Concepts*. University of Washington. Available at: http://faculty.washington.edu/krumme/450/traditions.html#urban [Accessed: 02/08/2014].

Kwan, M.-P. and Weber, J. 2008. Scale and accessibility: Implications for the analysis of land use–travel interaction. *Applied Geography* 28(2), pp. 110-123.

Kwan, M. P. 1998. Space-time and integral measures of individual accessibility: a comparative analysis using a point-based framework. *Geographical Analysis* 30(3), pp. 191-216.

Larkham, P. J. 2006. The study of urban form in Great Britain. *Urban Morphology* 10(2), p. 117.

Larson, R. C. 1981. Urban Operations Research. In: Odoni, A.R. ed. Englewood Cliffs, N.J: Prentice-Hall.

LASG. 2011. *Population*. Available at: http://www.lagosstate.gov.ng/pagelinks.php?p=6 [Accessed: 14 November, 2013].

Law, S. et al. eds.*Kim, Y.O. et al.* 2013. *Measuring The Influence Of Spatial Configuration On The Housing Market In Metropolitan London*. *Ninth International Space Syntax Symposium.* Seoul: Sejong University,

Lefebvre, H. 1992. *The Production of Space*. Wiley.

Lefebvre, H. 1996. *Writings on Cities*. Cambridge (MA): Blackwell.

Lewinson, A. S. 1998. Reading Modernity in Urban Space: Politics, Geography and the Informal Sector of Downtown Dar Es Salaam, Tanzania. *City & Society* 10(1), pp. 205-222. doi: 10.1525/city.1998.10.1.205

Lewis, A. O. 1977. Nigeria's third national development plan, 1975–80: An appraisal of objectives and policy frame. *The developing economies* 15(1), pp. 60-79.

Lewis, W. A. 1954. Economic Development with Unlimited Supplies of Labour. *The Manchester School* 22(2), pp. 139-191. doi: 10.1111/j.1467-9957.1954.tb00021.x

Lin, A. C. 1998. Bridging Positivist and Interpretivist Approaches to Qualitative Methods. *Policy Studies Journal* 26(1), pp. 162-180. doi: 10.1111/j.1541-0072.1998.tb01931.x

Lincoln, Y. S. et al. 2011. Paradigmatic controversies, contradictions, and emerging confluences, revisited. *The Sage handbook of qualitative research* 4, pp. 97-128.

LUTP. 2002. Lagos Urban Transport Project. Washington D.C.: The World Bank.

Lynch, K. 1960. *The Image of the City*. Harvard U.P.; Oxford U.P.

Lyons, M. et al. 2008. The ‘third tier’of globalization: African traders in Guangzhou. *City* 12(2), pp. 196206.

Lyons, M. and Msoka, C. T. 2010. The World Bank and the Street: (How) Do ‘Doing Business’ Reforms Affect Tanzania’s Micro-traders? *Urban Studies* 47(5), pp. 1079-1097.

Lyons, M. and Snoxell, S. 2005. Creating Urban Social Capital: Some Evidence from Informal Traders in Nairobi. *Urban Studies* 42(7), pp. 1077-1097. doi: DOI: 10.1080/00420980500120865

Mabogunje, A. L. 1964. The Evolution and Analysis of the Retail Structure of Lagos, Nigeria. *Economic Geography* 40(4), pp. 304-323. doi: 10.2307/142383

Mabogunje, A. L. 1990. Urban Planning and the Post-Colonial State in Africa: A Research Overview. *African Studies Review* 33(2), pp. 121-203. doi: 10.2307/524471

Marris, P. 1961. *Family and social change in an African city: A study of rehousing in Lagos*. Routledge.

Martin, R. 1999. Critical survey. The new 'geographical turn' in economics: some critical reflections. *Cambridge Journal of Economics* 23(1),

McGee, T. G. 1973. Hawkers in Hong Kong: A study of planning and policy in a third world city. University of Hong Kong: Centre of Asian Studies.

Meagher, K. 2005. Social capital or analytical liability? Social networks and African informal economies. *Global Networks* 5(3), pp. 217-238. doi: 10.1111/j.1471-0374.2005.00116.x

Meagher, k. 2007. Manufacturing Disorder: Liberalization, Informal Enterprise and Economic ‘Ungovernance’ in African Small Firm Clusters. *Development & Change* 38(3), pp. 473 - 503.

Meagher, K. 2013. Unlocking the Informal Economy: A Literature Review on Linkages Between Formal and Informal Economies in Developing Countries. *WIEGO Working Paper No. 27.* WIEGO.

Meagher, K. and Yunusa, M.-B. 1996. Passing the Buck: Structural Adjustment and the Nigerian Urban Informal Sector. *United Nations research institute for social development discussion paper* 75, p. 51.

Mill, J. S., 1806-1873. 2005. Auguste Comte and Positivism.

Mitullah, W. V. 2003. Street Vending In African Cities: A Synthesis Of Empirical Findings From Kenya, Cote D’ivoire, Ghana, Zimbabwe, Uganda And South Africa. *Background Paper for the 2005 World Development Report*. Washington, DC: World Bank.

Mitullah, W. V. 2004. A review of street trade in Africa. Cambridge, MA: Women in Informal Employment: Globalizing and Organizing (WIEGO).

Mobereola, D. 2009. *Africa’s First Bus Rapid Transit Scheme: The Lagos BRT-Lite System*. Program, S.S.A.T.P.

Mochache, J. M. H. 1990. *Urban Informal Sector Activities in Nairobi: A study Towards Urban Planning Policy.* University of Cambridge.

Monnet, J. et al. 2007. Street Trade and Mobility Services : the Crossroads in Mexico City. . *Cybergeo: European Journal of Geography* (371),

Montello, D. R. and Sas, C. 2006. Human factors of wayfinding in navigation.

Moovit. 2017. *Moovit Public Transit Index*. Available at: https://moovitapp.com/insights/en/Moovit_Insights_Public_Transit_Index-commute-distance [Accessed: 22-10-2017].

Morales, A. 2000. Peddling Policy: Street Vending in Historical and Contemporary Context. *International Journal of Sociology and Social Policy* 20(3/4), pp. 76-98.

Morka, F. C. 2007. *A place to live: A case study of the Ijora-Badia community in Lagos, Nigeria*.

Moser, C. 1984. The informal sector reworked: Viability and vulnerability in urban development. . *Regional Development Dialogue* 5(2), pp. 135-178.

Moser, C. O. N. 1978. Informal sector or petty commodity production: Dualism or dependence in urban development? *World Development* 6(9–10), pp. 1041-1064. doi: http://dx.doi.org/10.1016/0305http://dx.doi.org/10.1016/0305-750X(78)90062-1750X(78)90062-1

Moudon, A. V. 1986. *Built for Change: Neighborhood Architecture in San Francisco*. MIT Press.

Moudon, A. V. 1997. Urban morphology as an emerging interdisciplinary field. *Urban Morphology* 1(1), pp. 3-10.

Muiruri, P. 2010. *Women street vendors in Nairobi, Kenya: A situational and policy analysis within a human rights framework*. African Books Collective.

Mulligan, G. F. 1987. Consumer travel behavior: Extensions of a multipurpose shopping model. *Geographical Analysis* 19(4), pp. 364-375.

Muratori, S. 1959. *Studi per una operante storia urbana di Venezia*. Instituto poligrafico dello Stato, Libreria dello Stato.

Narvaez, L. et al. 2012. Configurational Economies: The Value of Accessibility in Urban Development. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies* 3(3),

Narvaez, L. P. et al. eds.*Greene, M. et al.* 2012a. *SPACE SYNTAX ECONOMICS: decoding accessibility using property value and housing price in Cardiff, Wales*. *Eighth International Space Syntax Symposium.* Santiago, Pontificia Universidad Catolica: Chile,

Netto, V. M. 2016. 'What is space syntax not?' Reflections on space syntax as sociospatial theory. *Urban design international* 21(1), pp. 25-40. doi: 10.1057/udi.2015.21

Neuwrith, R. 2012. The power of the informal economy. In: Conferences, T. ed. *TEDGlobal*.

Newman, M. E. J. 2005. A measure of betweenness centrality based on random walks. *Social Networks* 27(1), pp. 39-54. doi: http://dx.doi.org/10.1016/j.socnet.2004.11.009

Nwaka, G. I. 2005. *The urban informal sector in Nigeria: towards Economic development, environmental health, and Social harmony.* Global Urban Development. May 2005.

Oduwaye, L. 2009. Challenges of Sustainable Physical Planning and Development in Metropolitan Lagos. *Journal of Sustainable Development* 2(1), pp. 159-171.

Oduwaye, L. and Olajide, O. 2012. Incorporating informality into urban and regional planning education curriculum in Nigeria. *Stads-en Streeksbeplanning= Town and Regional Planning* 2012(60), pp. 31-37.

OECD. 2016. The DAC list of ODA recipients. *Effective for reporting on 2014, 2015 and 2016 flows*. Paris: The Organisation for Economic Co-operation and Development Publishing.

Office, N. P. 1981. *Fourth National Development Plan, 1981-85*. Nigeria: Available at: https://books.google.co.uk/books?id=i5U1AQAAIAAJ

Okabe, A. et al. A Spatial Analysis along Networks Tokyo, Japan.

Olawole, M. O. 2012. Accessibility to Lagos Bus Rapid Transit (BRT LITE) Bus Stops: An Empirical Study. *CODATU XV.* Addis Ababa.

Olowu, D. 1990. *Lagos State: governance, society & economy*. Malthouse Press.

Olukoju, A. 2003. Infrastructure Development and Urban Facilities in Lagos, 1861-2000. *Dynamiques africaines*. Ibadan: Institut français de recherche en Afrique, Institut français de recherche en Afrique.

Olukoju, A. 2005. Actors and Institutions in Urban Politics in Nigeria: Agege (Lagos) Since the 1950s. In: Schareika, N. ed. Mainz, Germany: Johannes Gutenberg-Universität.

Omer, I. and Goldblatt, R. 2016. Spatial patterns of retail activity and street network structure in new and traditional Israeli cities. *Urban Geography* 37(4), pp. 629-649. doi: 10.1080/02723638.2015.1101258

Omezi, G. 2014. Nigerian Modernity and the City: Lagos 1960–1980. In: Diouf, M. and Fredericks, R. eds. *The Arts of Citizenship in African Cities: Infrastructures and Spaces of Belonging*. New York: Palgrave Macmillan US, pp. 277-295.

Omoegun, A. 2015. *Street trader displacements and the relevance of the right to the city concept in a rapidly urbanising African city: Lagos, Nigeria, .* Cardiff University.

Omole, F. K. and Akinbamijo, O. B. 2012. Land development and planning laws in Nigeria: The historical account. *Journal of Law, Policy & Globalization*,

Onyebueke, V. and Geyer, M. 2011. The informal sector in urban Nigeria: Reflections from almost four decades of research.

Onyebueke, V. U. 2013. *Policy Implications of the Spatial and Structural Relationships of the Informal and Formal Business Sectors in Urban Nigeria: The Case of Enugu (1990-2010).* Stellenbosch University.

Orekoya, T. 2010. The Bus Rapid Transit System of Lagos, Nigeria. *United Nations Forum on Climate Change Mitigation, Fuel Efficiency & Sustainable Urban Transport,*. Seoul.

Ortiz-Chao, C. and Hillier, B. eds. 2007. *In search of patterns of land-use in Mexico City using logistic regression at the plot level*. ITU Faculty of Architectur.

Osoba, S. B. 2015. Travel Characteristics and Commuting Pattern of Lagos Metropolis Residents: an Assessment. *The Indonesian Journal of Geography* 47(1), p. 40.

Peil, M. 1991. *Lagos : the city is the people*.

Pena, S. 2000. Regulating informal markets: informal commerce in Mexico City. *International Journal of Sociology and Social Policy* 20(9/10), pp. 37-67.

Penn, A. ed.*Nes, A.v.* 2005. *The Complexity of the Elementary Interface: Shopping Space 5th International Space Syntax Symposium.* Delft,

Penn, A. and Turner, A. 2002. Space Syntax Based Agent Simulation. In: Schreckenberg, M. and Sharma, S.D. eds. ***Pedestrian and Evacuation Dynamics***. Berlin< Germany: Springer-Verlag, pp. 99 - 114.

Perera, L. A. and Amin, A. T. M. N. 1995. Feasibility of accommodating informal sector enterprises in local government areas: A case study of Colombo, Sri Lanka',. *Regional Development Dialogue* 16, pp. 198 - 209.

Pirie, G. H. 1979. Measuring accessibility: A review and proposal. *Environment and Planning A* 11(3), pp. 299 - 312.

Pooler, J. A. 1995. The use of spatial separation in the measurement of transportation accessibility. *Transportation Research Part A: Policy and Practice* 29(6), pp. 421-427. doi: http://dx.doi.org/10.1016/0965-8564(95)00013-E

Porta, S. et al. 2006a. The network analysis of urban streets: A dual approach. *Physica A: Statistical Mechanics and its Applications* 369(2), pp. 853-866. doi: http://dx.doi.org/10.1016/j.physa.2005.12.063

Porta, S. et al. 2006b. The network analysis of urban streets: A primal approach. *Environment and Planning B: Planning and Design* 33(5), pp. 705-725.

Porta, S. et al. 2008. Multiple centrality assessment in Parma: a network analysis of paths and open spaces. *Urban design international* 13(1), pp. 41-50. doi: 10.1057/udi.2008.1

Porta, S. et al. 2010. Networks in Urban Design. Six Years of Research in Multiple Centrality Assessment. In: Estrada, E. et al. eds. *Network Science*. London: Springer, pp. 107-129.

Porta, S. et al. 2009. Street centrality and densities of retail and services in Bologna, Italy. *Environment and Planning B: Planning and Design* 36(3), pp. 450-465.

Porter, A. L. et al. 2006. Interdisciplinary research: meaning, metrics and nurture. *Research Evaluation* 15(3), pp. 187-195. doi: 10.3152/147154406781775841

Portes, A. 1997. Neoliberalism and the sociology of development: Emerging trends andunanticipated facts. *Population and Development Review* 23(2), pp. 229-259.

Portes, A. 2008. Migration and Social Change: Some Conceptual Reflections. *Theorizing Key Migration Debates.* Oxford University.

Portugali, J. 1999. *Self-Organization and the City*. Springer.

Post, J. 1992. Small-scale economic activity and town planning in Kassala, Sudan. *Third World Planning Review* 14(1), p. 53.

Post, J. 1995. Space for small enterprise–a case study of Kassala, Sudan. *Small Enterprise Development* 6(4), pp. 34-42.

Post, J. 1996. The politics of urban planning in the Sudan. *Habitat International* 20(1), pp. 121-137.

Punch, K. F. 2013. *Introduction to social research: Quantitative and qualitative approaches*. Sage.

Rakowski, C. A. 1994. *Contrapunto: The Informal Sector Debate in Latin America*. New York: State University of New York Press.

Ratti, C. 2004. Urban texture and space syntax: some inconsistencies. *Environment and Planning B: Planning and Design* 31, doi: 10.1068/b3019

Ravenstein, E. G. 1885. The laws of migration. *Journal of the statistical society of London* 48(2), pp. 167-235. doi: 10.2307/2979181

Reilly, W. J. 1931. The Law of Retail Gravitation. New York.

Robinson, J. 2002. Global and world cities: a view from off the map. *International Journal of Urban and Regional Research* 26(3), pp. 531-554.

Rodrigue, J. P. et al. 2013. *The Geography of Transport Systems*. Routledge.

Roever, S. 2011. *How to Plan a Street Trader Census*. WIEGO. Available at: http://www.wiego.org/publications/how-plan-street-trader-census

Rogerson, C. 1997. Globalisation or informalisation? African urban economies in the 1990s. In: Rakodi, C. ed. *The urban challenge in Africa: Growth and management of its largest cities*. Tokyo: United Nations University, pp. 337-370.

Ross, L. 2015. On the Materiality of Law: Spatial and Legal Appropriations of the Lagos Set-Back. *Architectural Theory Review* 20(2), pp. 247-265.

Roy, A. 2005. Urban informality: toward an epistemology of planning. *Journal of the American Planning Association* 71(2), pp. 147-158.

Roy, A. and AlSayyad, N. eds. 2003. *Urban informality: Transnational perspectives from the middle East, latin America, and south Asia.* Lexington Books.

Roy, A. and AlSayyad, N. 2004. *Urban informality : transnational perspectives from the Middle East, Latin America, and South Asia*. Lanham, Md. : Berkeley, Calif.: Lanham, Md. : Lexington Books ; Berkeley, Calif. : Center for Middle Eastern Studies, University of California at Berkeley.

Sadalla, E. K. and Montello, D. R. 1989. Remembering changes in direction. *Environment and Behavior* 21(3), pp. 346-363.

Santos, M. 1979. *The shared space : the two circuits of the urban economy in underdeveloped countries*. London: Methuen

Sarin, M. 1982. Urban planning in the third world: The Chandigarh experience.

Sarkar, C. et al. 2014. *Healthy Cities: Public Health through Urban Planning*. Edward Elgar Publishing Limited.

Sassen, S. 2005. The Global City: introducing a Concept. *Brown Journal of world Affairs* XI(2),

Scellato, S. et al. 2006. The backbone of a city. *The European Physical Journal B - Condensed Matter and Complex Systems* 50(1-2), pp. 221-225. doi: 10.1140/epjb/e2006-00066-4

Schneider, F. 2002. Size and Measurement of the Informal Economy in 110 Countries around the World. *Workshop of Australian National Tax Centre.* Canberra, Australia.

Schneider, F. et al. 2010. Shadow Economies All over the World: New Estimates for 162 Countries from 1999 to 2007 The World Bank - Development Research Group.

Scoppa, M. D. and Peponis, J. 2015. Distributed Attraction: The Effects of Street Network Connectivity upon the Distribution of Retail Frontage in the City of Buenos Aires. *Environment and Planning B: Planning and Design* 42(2), pp. 354-378. doi: doi:10.1068/b130051p

Sevtsuk, A. 2010. *Path and place: a study of urban geometry and retail activity in Cambridge and Somerville, MA.* MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

Sevtsuk, A. and Mekonnen, M. 2012. Urban Network Analysis Toolbox. *International Journal of Geomatics and Spatial Analysis* 2(22), pp. 287-305.

SEWA. 2012. SEWA's suggestion on "Central Law for Street Vendors". *Memorandum submitted to Secretary Ministry of Housing on Poverty Alleviation on 3/5/2012.*

Shimbel, A. 1953. Structural parameters of communication networks. *The bulletin of mathematical biophysics* 15(4), pp. 501-507. doi: 10.1007/BF02476438

Siksna, A. 1990. *A comparative study of block size and form:(in selected new towns in the history of western civilization and in selected North American and Australian city centres)*. University of Queensland.

Siksna, A. 1997. The effects of block size and form in North American and Australian city centres. *Urban Morphology* 1(1), pp. 19-33.

Simone, A. and Abouhani, A. 2005. *Urban Africa : Changing Contours of Survival in the City*. Dakar: CODESRIA.

Sindzingre, A. 2006. The Relevance of the Concepts of Formality and Informality: A Theoretical Appraisal. In: Guha-Khasnobis, B. et al. eds. *Linking the Formal and Informal Economy: Concepts and Policies*. Oxford: Oxford University Press, pp. 58 - 74.

Skinner, C. 2008a. *Street Trade in Africa: A Review*. Available at: http://wiego.org/sites/wiego.org/files/publications/files/Skinner_WIEGO_WP5.pdf

Skinner, C. 2008b. The struggle for the streets: processes of exclusion and inclusion of street traders in Durban, South Africa. *Development Southern Africa* 25(2), pp. 227-242. doi: 10.1080/03768350802090709

Skinner, C. 2012. Street Trading Trends in Africa: A Critical Review. In: Bhowmik, S. ed. *Street Vendors in the global urban economy*. Taylor & Francis, pp. 184-207.

Skinner, G. W. 1964. Marketing and social structure in rural China. *Journal of Asian Studies* 24(1), pp. 3 - 44.

Skinner, G. W. 1965a. Marketing and Social Structure in Rural China Part II. *The Journal of Asian Studies* 24(2), pp. 195-228. doi: 10.2307/2050562

Skinner, G. W. 1965b. Marketing and Social Structure in Rural China, Part III. *The Journal of Asian Studies* 24(3), pp. 363-399. doi: 10.2307/2050342

Smith, R. H. T. 1979. Periodic market-places and periodic marketing. *Progress in Geography* 3(4), pp. 471-505. doi: doi:10.1177/030913257900300401

Smith, R. H. T. 1980. Periodic market-places and periodic marketing. *Progress in Geography* 4(1), pp. 1-31. doi: doi:10.1177/030913258000400101

Stake, R. 1995. *The art of case study research*. Thousand Oaks, CA: Sage.

Stangl, P. and Guinn, J. M. 2011. Neighborhood design, connectivity assessment and obstruction. *Urban Design International Journal* 16(4), p. 285.

Stanilov, K. 2010. Bridging the gap between urban morphology and urban modelling. *URBAN MORPHOL* 14(2), pp. 123-124.

Stine, J. H. 1962. Temporal Aspects of the Tertiary Production Elements in Korea. In: Pitts, F.R. ed. *Urban systems and Economic Developments*. Eugene, Oregon: UNiversity of Oregon Press.

Stone, G. P. 1954. City shoppers and urban identification: observations on the social psychology of city life. *American Journal of Sociology* 60(1), pp. 36-45.

Streetnet. 2003. Streetnet news.

Ståhle, A. et al. eds. 2005. *Place Syntax: Geographic accessibility with axial lines in GIS*. *Fifth international space syntax symposium.* Techne Press.

Swanson, K. 2007. Revanchist Urbanism Heads South: The Regulation of Indigenous Beggars and Street Vendors in Ecuador. *Antipode* 39(4), pp. 708-728. doi: 10.1111/j.1467-8330.2007.00548.x

Symanski, R. and Webber, M. J. 1974. Complex Periodic Market Cycles. *Annals of the Association of American Geographers* 64(2), pp. 203-213. doi: 10.2307/2562510

Tal, G. and Handy, S. 2012. Measuring nonmotorized accessibility and connectivity in a robust pedestrian network. *Transportation Research Record: Journal of the Transportation Research Board* (2299), pp. 48-56.

Tashakkori, A. and Teddlie, C. 2003. *Handbook of Mixed Methods in Social & Behavioral Research*. SAGE Publications.

Tauber, E. M. 1972. Why do people shop? *The Journal of Marketing*, pp. 46-49.

Taylor, P. J. et al. 2010. External Urban Relational Process: Introducing Central Flow Theory to Complement Central Place Theory. *Urban Studies* 47(13), pp. 2803 - 2818. doi: 10.1177/0042098010377367

Tinker, I. 1997. *Street foods: Urban food and employment in developing countries*. Oxford University Press.

Tokman, V. 1978. An exploration into the nature of informal-formal sector relationships. *World Development* 6(9–10), pp. 1065-1075.

Tokman, V. E. 2007. Modernizing the informal sector. *UN/DESA Working Paper* 42, pp. 1-13.

Tripp, A. M. 1997. *Changing the Rules: The Politics of Liberalization and the Urban Informal Economy in Tanzania*. University of California Press.

Turner, A. 2007. From axial to road-centre lines: a new representation for space syntax and a new model of route choice for transport network analysis. *Environment and Planning B: Planning and Design* 34(3), pp. 539-555.

UN-DESA. 2014. *World Urbanization Prospects: The 2014 Revision*. New York: Nations, U. Available at: https://esa.un.org/unpd/wup/publications/files/wup2014-highlights.Pdf

Van de Walle, N. 2001. *African economies and the politics of permanent crisis, 1979-1999*. Cambridge University Press.

Van Dijk, M. P. 1983. Locational Behaviour Of Small Entrepreneurs In Ouagadougou, Upper Volta, As A Basis For Spatial Planning Of Economic Activities. *Tijdschrift voor economische en sociale geografie* 74(2), pp. 96-106. doi: 10.1111/j.1467-9663.1983.tb01503.x

Vickerman, R. W. 1974. Accessibility, attraction and potential: A review of some concepts and their use in determining mobility. *Environment and Planning A* 6(6), pp. 675-691. doi: 10.1068/a060675

Vlach, J. M. 1984. The Brazilian house in Nigeria: the emergence of a 20th-century vernacular house type. *The Journal of American Folklore* 97(383), pp. 3-23.

Von Thünen, J. H. 1826. *Der Isolierte Staat in Beziehung auf Landschaft und Nationalökonomie*. New York: Pergamon Press.

Wasserman, S. and Faust, K. 1994. *Social Network Analysis: Methods and Applications*. Cambridge University Press.

Watts, D. J. and Strogatz, S. H. 1998. Collective dynamics of /`small-world/' networks. *Nature* 393(6684), pp. 440-442.

Webster, C. ed. 2009. *Pricing Accessibility: Urban form, missing markets and the efficient allocation of property rights over shared urban resources*. *7th International Space Syntax Symposium.* KTH Royal Institute of Technology, Stockholm, Sweden,

Webster, C. 2010. Pricing accessibility: Urban morphology, design and missing markets. *Progress in Planning* 73(2), pp. 77-111. doi: http://dx.doi.org/10.1016/j.progress.2010.01.001

Westbrook, R. A. and Black, W. C. 1985. A motivation-based shopper typology. *Journal of retailing*,

Whitehand, J. 2010. Minding the Gaps: Linking different approaches to built-form studies. *The Journal of Space Syntax* 1(2), p. 363.

Whitehand, J. W. R. 1981. *The urban landscape: historical development and management*. Academic Press.

Whitehand, J. W. R. 2001. British Urban Morphology: the Conzenian tradition. *Urban Morphology* 5(2), pp. 103 - 109.

Whitehand, J. W. R. ed.*Kubat, A. et al.* 2007. *Conzenian Urban Morphology and Urban Landscapes*. *6th International Space Syntax Symposium.* Istanbul, Faculty of Architecture, Istanbul Technical University, Istanbul.

WIEGO. 2011. *Street Vendors*. Women in Informal Employment: Globalizing and Organizing. Available at: http://wiego.org/informal-economy/occupational-groups/street-vendors [Accessed: 10 april].

WIEGO. 2014. *The Informal Economy*. http://wiego.org: WIEGO. Available at: http://wiego.org/informal-economy/about-informal-economy [Accessed: 18/11/2014].

Williams, C. and Nadin, S. 2010. Entrepreneurship and the Informal Economy: An Overview. *Journal of Developmental Entrepreneurship* 15(4), pp. 361–378. doi: http://dx.doi.org/10.1142/S1084946710001683

Williams, C. C. and Round, J. 2007a. Entrepreneurship and The Informal Economy: A Study of Ukraine's Hidden Enterprise Culture. *Journal of Developmental Entrepreneurship* 12(1), pp. 119-136.

Williams, C. C. and Round, J. 2007b. Rethinking Livelihood Strategies in East-Central Europe: Some Lessons from Ukraine. *Journal of Contemporary European Studies* 15(2), pp. 201-214. doi: 10.1080/14782800701499913

Williams, C. C. and Round, J. 2007c. Re-thinking the Nature of the Informal Economy: Some Lessons from Ukraine. *International Journal of Urban and Regional Research* 31(2), pp. 425-441. doi: 10.1111/j.1468-2427.2007.00730.x

Wilson, A. G. 2000. *Complex Spatial Systems: The Modelling Foundations of Urban and Regional Analysis*. Prentice Hall.

Wingfield, A. and Oduwo, G. 2017. *Navigating the New Normal in Nigeria*. Company, T.N.

Xiao, Y. et al. 2016. Urban configuration, accessibility, and property prices: a case study of Cardiff, Wales. *Environment and Planning B: Urban Analytics and City Science* 43(1), pp. 108 - 129. doi: https://doi.org/10.1177/0265813515600120

Yankson, P. W. K. 2000. Accommodating informal economic units in the urban built environment: petty commodity enterprises in the Accra Metropolitan Area, Ghana. *Third World Planning Review* 22(3), doi: http://dx.doi.org/10.3828/twpr.22.3.p4507l68258554v1

Yin, R. K. 2013. *Case Study Research: Design and Methods*. SAGE Publications.

Yu, Y. and Akkelies, v. N. 2014. Quantitative tools in urban morphology: combining space syntax, spacematrix and mixed-use index in a GIS framework. *Urban Morphology* 18(2),

Zeisel, J. 1981. *Inquiry by Design: Tools for Environment-Behavior Research*. BrooKs/Cole Publishing Company.

Zhan, F. B. 1998. A Family of Spatio-temporal Location Analysis Problems of Mobile Trading. *Papers in Regional Science* 77(1), pp. 1-18.

Zhang, L. et al. 2015. A Configurational Accessibility Study of Road and Metro Network in Shanghai, China. In: Pan, Q. and Cao, J. eds. *Recent Developments in Chinese Urban Planning: Selected Papers from the 8th International Association for China Planning Conference, Guangzhou, China, June 21 - 22, 2014*. Cham: Springer International Publishing, pp. 219-245.

Zukin, S. 1995. *The cultures of cities*. Cambridge, MA: Blackwell.