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**Urban Informality and Infrastructure Planning:
The Study of Hong Kong SAR and Lagos Metropolis for
Sustainable Urban Design Strategies**

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Both developing and developed cities are facing significant challenges in sustainable development regarding economic, environmental, and infrastructure aspects. This research investigates urban informal settlement and infrastructure planning (UISIP) in the metropolises of Hong Kong and Lagos and identifies sustainable urban design principles to achieve sustainable urban development. Through adopting the concepts of urban informality, circuit of culture, pro-poor, sustainability and tactical urbanism, this study suggests that there is no significant relationship between UISIP with regard to achieving sustainable urban development in the metropolises of Hong Kong and Lagos. The study proposes a tactical urbanism approach for UISIP design, which integrates sustainable urban design and planning principles with sustainable socio-economic and environmental design strategies. The proposed design guideline outlines specific policies for reforming social, economic, and environmental design in community participatory design.

URBAN INFORMALITY AND INFRASTRUCTURE PLANNING: THE STUDY OF HONG KONG SAR AND LAGOS METROPOLIS FOR SUSTAINABLE URBAN DESIGN STRATEGIES

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A thesis submitted in partial fulfilment of the requirements for the degree of

Doctor of Philosophy

May 2018

Certificate of Originality

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Name: _____SOYINKA Oluwole Abayomi_____

Dedication

This thesis is dedicated to God Almighty for making everything possible for the completion of this program and may HIS name alone be praised forever. AMEN!

Abstract

Urban challenge such as economic, environmental and infrastructure is a sustainable development challenge and is a significant menace in developing and developed city. It encompasses important global challenges such as poverty, food, housing, energy, education, health, security, water, and governance. Considering the severity of this problem around the world, studies and practices in urban studies have focused on achieving sustainable development with global emphasis on urban informal settlement and infrastructure planning (UISIP). In conjunction with several other global agencies, UN-Habitat (issue paper III, article 22 and 18) found informal settlement and urban infrastructure including energy and basic services as a significant threat towards achieving sustainable urban development. The evidence from independent research institutes such as Ove Arup and Rockefeller Foundation, as well as several other studies also support this perspective. The challenge of UISIP manifests differently in different regions, with varying nature and severity. Thus, a comprehensive but specific dynamic approach is needed to improve this issue in different areas.

Several studies have been carried out in this research area, which has different perspectives, findings, and recommendations. However, evidence from the literature review in this research reveals a dearth of studies on the relationship that exists between UISIP vis-à-vis achieving sustainable urban development. Few studies discussed this issue separately despite the argument that there is a relationship that exists between UISIP and sustainable development. Some studies explained UISIP and sustainable development by focusing on developed or developing cities, which impedes the capacity for comprehensive understanding of the causes of this challenge, while other studies addressed it from the context of urban planning, urban renewal, and design without considering sustainability, despite its severity in hindering sustainable development. Considering this research gap and the statement of the problem, which is theoretical and practical based on the evidence from the literature review, this study asks how UISIP can be designed, and integrated towards achieving sustainable urban development in the areas studied.

To that end, this study investigates UISIP in Hong Kong and Lagos metropolis and develop sustainable urban design principles as a guideline towards achieving sustainable urban development. The following objectives are adopted to achieve the aim of this study: 1) investigate UISIP characteristics in the selected study areas of Hong Kong and Lagos metropolis, 2) assess the professional perspectives of UISIP in the study areas, 3) examine the relationship that exists between UISIP vis-à-vis the concept of sustainability in the study areas, and 4) establish sustainable urban design principles for UISIP in the study areas. Adopting the concepts of urban informality, circuit of culture, pro-poor, sustainability, and tactical urbanism, the hypothesis tested in this research states that there is no significant relationship

between UISIP with regard to achieving sustainable urban development in Hong Kong and Lagos metropolis. Case study methodology (exploratory design research methods), mixed method data collection with triangulation techniques, multi-stage sampling techniques, and mixed method data analysis were used in this research. The choice of cases of Hong Kong and the city of Lagos utilised literature, practical evidence criteria, government verdicts, and pilot studies conducted. The triangulation techniques of data collection and analysis were adopted as a strategy to ensure the validity and reliability of this study. Triangulation techniques involve the use of more than two techniques in data collection and analysis from both the primary and secondary sources of data.

The findings reflect that UISIP takes shape differently with the varying threat. UISIP challenge is associated with several factors among which sustainability (social, economic, environmental, and administrative) factors are significant in the study areas. The findings also reflect that there is a relationship between UISIP and sustainable development factors. Based on the findings in the study areas, the theoretical framework/determinants of UISIP relationship with sustainability, which include several elements, indicators, and design considerations was proposed. Also, the findings in Hong Kong show that socio-economic and environmental factors have significant positive or adverse effects on the proliferation of UISIP vis-à-vis sustainable urban development. However, there is not enough evidence to state that infrastructure influences urban informality in the study area. That is, the condition of infrastructure does not necessarily create an urban informal settlement. In Lagos, the findings are similar to those seen in Hong Kong with regard to the socio-economic and environmental relationships, while infrastructure condition is more critical for the proliferation of urban informality with regard to sustainable development.

The study proposes integrated sustainable urban design principles that involve integrating urban planning and design principles with the principles of sustainability, which include a tactical urbanism approach for UISIP design, inclusive design approach, sustainable socio-economic and environmental design strategies. The proposed design guideline also includes specific policy reform in social, economic, and environmental design, and a community participatory design approach in the study area.

Publications[1]

Journal Papers

Siu K.W.M and **Soyinka O.A**. Open space availability and practices: cognitive strategies for quality open space in Hong Kong public housing estates. *Design Principles and Practices Journal.* **(Accepted)**

Soyinka O.A and Siu K.W.M (2018). Urban informality, housing insecurity, and social exclusion; concept and case study assessment for sustainable urban development. *City, Culture, and Society*. https://doi.org/10.1016/j.ccs.2018.03.005

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Conference Papers

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Soyinka. O.A, Spencer. B, Siu K.W.M, Hou. J, and Heland, L. (2018). Urban informal settlements and infrastructure for sustainable urban design: investigating the correlates and mitigation strategy. *9th International Conference on Applied Human Factors and Ergonomics.* Loews Sapphire Falls Resort, Universal Studios Orlando Resorts, Orlando Florida, USA 21-25st July 2018.

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[1] This thesis includes parts of this publication as phases, paragraphs, short and longer sentences that are identified with footnotes and reference appropriately.

Soyinka. O.A, Spencer. B, Heland. L, Hou. J and Siu K.W.M. (2018). Design for inclusive society: investigating homelessness and urban informal settlements in Seattle, United States. *49th Environmental Design Research Association International Conference. Theme: Social Equity by Design; Designing Connection Through Community.* Oklahoma City, Oklahoma, USA June 6-9th 2018.

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Abbreviations

ETHOS	European Typology of Homelessness and Housing Exclusion
DFID	Department for International Development
DIY	Do-It-Yourself
GDP	Gross Domestic Product
GNI	Gross National Income
GRA	Government Reserved Areas
HBEs	Home Based Enterprise
HKSAR	Hong Kong Special Administrative Region
INEC	Independent National Electoral Commission
LGA	Local Government Areas
LASURA	Lagos State Urban Renewal Authority
LASURB	Lagos State Urban Renewal Board
MDG	Millennium Development Goals
MPPUD	Ministry of Physical Planning and Urban Development
MTR	Mass Transit Railway
NBS	National Bureau of Statistics
NPC	National Population Commission
PRC	People's Republic of China
SA	South Africa
SAR	Special Administrative Region
SARS	Severe Acute Respiratory Syndrome
SCS	Squatter Control Survey
SDGs	Sustainable Development Goals
SME	Small and Medium Enterprise

UHS	Urban Informality, Housing Insecurity, Social Exclusion
UIEA	Urban Informal Economic Activity
UISIP	Urban Informal Settlement and Infrastructure Planning
UNDP	United Nations Development Programme
UN-Habitat	United Nations Human Settlements Program
URA	Urban Renewal Authority
VGC	Victoria Garden City
WHO	World Health Organization

Part 1
Research Overview

Our progress as a global nation cannot be swifter than our progress in research. This includes the conception, planning, design, and the implementation of our investigation to improve our global environment for sustainability.

John F. Kennedy

Chapter 1
Research Background

_____

> *"Research is increasingly perceived as not just responsible for the organisation of investigation, but also for the sharing of knowledge and expertise in a credible and convincing way."*
>
> *Christopher Palmer*

Synopsis

This chapter discusses the research overview. It presents the research background and the statement of the research problem. It describes the menace of UISIP from the theoretical and practical perspectives. The discussion includes the research gap, research question, aim and objectives, the hypothesis tested, research justifications, research scope, the definition of terms, study areas, and the research structure, to create the foundation needed for this study.

1.1 Introduction

The challenge of urban sustainability with regards to informal settlement, and infrastructure planning is a global phenomenon, and it manifests differently in different countries. Although the challenge is more evident in developing countries, this does not refute its presence in the developed nations (Tanasescu, Wing-tak, & Smart, 2010). Considering the significance of this challenge, UN-Habitat (agenda III) and several other international organizations have identified UISIP challenges, such as homelessness, street sleepers, access to basic services and facilities, transport, and mobility as part of the most significant obstacle facing sustainable development (UN-Habitat, 2015a). The agenda III issue paper, under the sixth sub-theme "Urban Housing and Basic Services", states that it is pertinent to address these challenges with the approach of making our environment habitable for all (UN-Habitat, 2015a).

Thus, interest in this research is essential because of the severity of UISIP problems in global urban centres and the need to resolve these issues in the area studied. This study is necessary for developing sustainable urban design guidelines for improving UISIP based on the study of (developed and developing cities) Hong Kong and Lagos metropolis. The objectives are to investigate the characteristics of UISIP, assess the relationship that exists between UISIP and the study areas and the concept of sustainability, and develop specific approaches for sustainable urban design in the study areas.

1.2 Statement of Research Problem

The study of UISIP has continuously drawn the interest of researchers, government agencies, and non-governmental agencies all over the world. However, the review of (Adetokunbo & Emeka, 2015; Agunbiade, 2013; Jiboye, 2011; Lamina, 2015; Lawanson, 2011) in Nigeria, (Alan, 2001; Alan & Wing-Shing, 2005; Tanasescu et al., 2010) in Hong Kong, and (UN-Habitat, 2015a, 2015d; UN Habitat, 2013) among other studies describe these issues and their threat to urban development. These studies find the challenges of UISIP to be physical (practical) and theoretical challenges with limited study in developed and developing cities, despite the severity of these challenges.

The challenges of UISIP are diverse and require a comprehensive dynamic approach (Tanasescu et al., 2010; UN-Habitat, 2015a). Although several studies have been carried out

on UISIP, evidence from the literature review of these research reveals a dearth of earlier studies on the relationship that exists between UISIP and achieving a sustainable settlement. These previous studies discussed urban planning, urban renewal, and design perspectives separately, without considering a sustainability approach in a developed and a developing city to enhance comprehensive understanding of the strategies to improve issues relating to UISIP (Cuthbert & McKinnell, 1997; Hernández, Kellett, & Allen, 2010; Tanasescu et al., 2010).

Lamina (2015) assessed infrastructure inequalities in the city of Lagos using Ikeja Local Government Area (LGA) as the study area and examined the public infrastructure inequalities on water and waste management services. Lamina's research revealed that a substantial percentage of the metropolis' residents do not have access to public infrastructures such as water and waste management, and where access is available provisions are of inferior quality and at exorbitant cost. The study highlights several factors inducing an unequal distribution of infrastructure in the study areas, including income, residential densities, and management structures. The findings reflect that there are significant relationships between the household's residential location and the facilities provided in the study area, at significant level 0.000. Lamina (2015) only researched infrastructure inequalities within the three different densities of Lagos metropolis without considering the influence of infrastructure in the study area.

Agunbiade (2013) studied the importance of land administration for housing production in Nigeria and Australia. The study investigates inter-agency integration and its effects on the delivery of land for housing production. The research proved that land is a resource that is not managed efficiently or effectively. The research assumption was based on indications that several separate but interrelated agencies and issues are involved in land administration. This means that there exist ineffective and inefficient integrated agencies across land administrative functions in relation to land tenure, land value, land use, and land development, which impede land delivery for housing production. The study adopts a comparative approach between land administration in Lagos, Nigeria (land tenure) and Australia to develop an institutional framework for housing production. The research considered the link between the institutional structure, the collaborative process, and the contextual factors needed for efficient land delivery. The efficiency of land tenure, land administration, and their effect on infrastructure vis-à-vis sustainable development were not discussed.

Lawanson (2011) assessment of home-based economic enterprise in residential areas of the city of Lagos reiterates that a significant percentage of the Nigerian population, particularly in this metropolis, is poor, with informal economic activities constituting the primary source of socio-economic development, physical development, and general livelihood of the nation. The study presents an assessment of the informal economic sector among low-income earners of the metropolis and the inherent relationships that are part of this sector. This research found that there are significant spatial variations in the relationship between poverty and socio-economic conditions. The study highlights that over 80% of enterprises are unregistered family home-base survival entities and are informal trade operators. Most of the study's respondents reported being unsatisfied with the government's formal financial institutions and relying on trade and social groups. Lawanson (2011) assessed informal sector economic enterprise, the operations of home-based enterprise (HBEs) in relation to government policy, poverty alleviation schemes, socio-economic and environmental conditions in residential areas of Lagos without considering infrastructure availability and planning adequacy of this informal sector for sustainable developments. Residential areas were not highlighted and how the informal residential affected urban development but discussed the economic aspect.

In Hong Kong, the general perspective of the menace of UISIP is also evident with practical and theoretical facts. Several studies have discussed these issues with closer perspectives to this research (structure and building, and infrastructure) but with a dearth of literature in developed and developing cities and sustainable development focus. Rufina Wu and Canham (2009) described this menace from the informal rooftop communities in Hong Kong and highlighted the condition of living but without discussing infrastructure and sustainable development strategies. Kennett and Mizuuchi (2010); Tanasescu et al. (2010) discussed the challenge of UISIP from the perspective of a case study from two different developed countries respectively but without considering the developing countries which impede the capacity of a comprehensive approach of improving the condition of the challenge. While the study of Kennett and Mizuuchi (2010) explore the nature and dynamics of homelessness, housing insecurity and social exclusion in Hong Kong and Japan, the study of (Tanasescu et al., 2010) described the characteristics of UISIP as top and bottoms illegal housing in Hong Kong and Canada. These two studies agreed that UISIP is associated with several factors, a threat to urban development, condition of living and support further studies in this area to have a

comprehensive understanding of the challenge but did not discuss infrastructure and sustainability perspectives.

Considering the significant practical and theoretical element of the research problem highlighted in the summary of the literature of (Alan, 2001; Alan & Wing-Shing, 2005; Ananya, 2012; Jianfa, 2005; Kennett & Mizuuchi, 2010; Lai, 2015; Rufina Wu & Canham, 2009; Srinivas, 2005; Tanasescu et al., 2010; UN-Habitat, 2015d) and (UN Habitat, 2013), to mention only a few studies, the UISIP can be described as critical, and there is a lack of literature relating to the relationships between UISIP with regard to strategies for improving urban sustainability. The challenge of UISIP is a topical urban study and the focus of urban researchers globally also proves the significance of this statement of research problem and the need to study this area to achieve sustainable development. Therefore, to improve the condition of UISIP challenges which are worldwide, physical, theoretical, and a dearth of literature on sustainable development in a developed and developing cities, this research investigates infrastructure planning in selected informal settlements of Hong Kong and the city of Lagos to develop an approach for achieving sustainable development. Based on the lack of studies, the practical relevance of this issue, and the need to enhance this challenge, this study bridges the following gap in knowledge.

1.3 Research Gap

While there are several studies on infrastructure, informal settlement, and sustainable development, this research finds the following gaps in knowledge based on the review of prior literature, and practical evidence of these challenges from the site investigation in the studied area. The following gaps are found as having a dearth of studies and practical solutions to improve the difficulties of UISIP, which are critical in achieving a sustainable settlement. This research bridges the gaps in knowledge described below:

i. The relationship that exists between informal settlement and infrastructure;

ii. The studies of informal settlement and infrastructure planning design vis-à-vis sustainable development factors in developed and developing cities;

iii. Urban design guidelines/strategies for improving urban obstacles to achieving sustainable urban development.

This research bridges these gaps in knowledge and contributes to academic research and professional practices through theory and strategy developed. This includes comprehensive and specific area approaches to improving sustainable urban development. The study of a developed and a developing city the presents data, information, and literature for further studies in this area of research. Design concepts, strategies, and framework for further studies and archetype strategies to improve the issues of UISIP are also developed in this study. The identified research gaps raised a research question whose answer is essential for bridging this gap in knowledge.

1.4 Research Question

The research question is:

> What is the relationship between informal settlement and infrastructure planning design and achieving sustainable urban development in Hong Kong and Lagos metropolis?

This research question is further divided into four sub-questions, as follows:

a. What are the characteristics of informal settlement and infrastructure in the study areas?

b. What is the influence of informal settlement on infrastructure (and vice versa) in the study areas?

c. What is the situation of informal settlement and infrastructure in Hong Kong and the city of Lagos with relation to sustainability perspectives?

d. How can UISIP be designed and integrated to achieve sustainable urban development in the study areas?

1.5 Aim and Objectives

1.5.1 Aim

This study aims to investigate urban informality and infrastructure in selected settlements of Hong Kong and the city of Lagos to develop sustainable urban design principles as a guideline towards achieving sustainable urban development.

1.5.2 Objectives

The following objectives are pursued to achieve the aim of this study:

i. To investigate UISIP characteristics in the selected study areas of Hong Kong and Lagos metropolis.

ii. To assess the urban practitioner's (professionals) perspective of UISIP in the study areas.

iii. To examine the relationship between UISIP vis-à-vis sustainability concepts in the study areas.

iv. To establish sustainable urban design principles for UISIP in the study areas.

Objective 1: To investigate UISIP characteristics in the selected study areas of Hong Kong and Lagos metropolis

Objective 2: To assess the urban practitioner's perspective of UISIP in the study areas.

Objective 3: To examine the relationship between UISIP vis-à-vis sustainability concepts in the study areas.

Objective 4: To establish sustainable design principles for UISIP in the study areas.
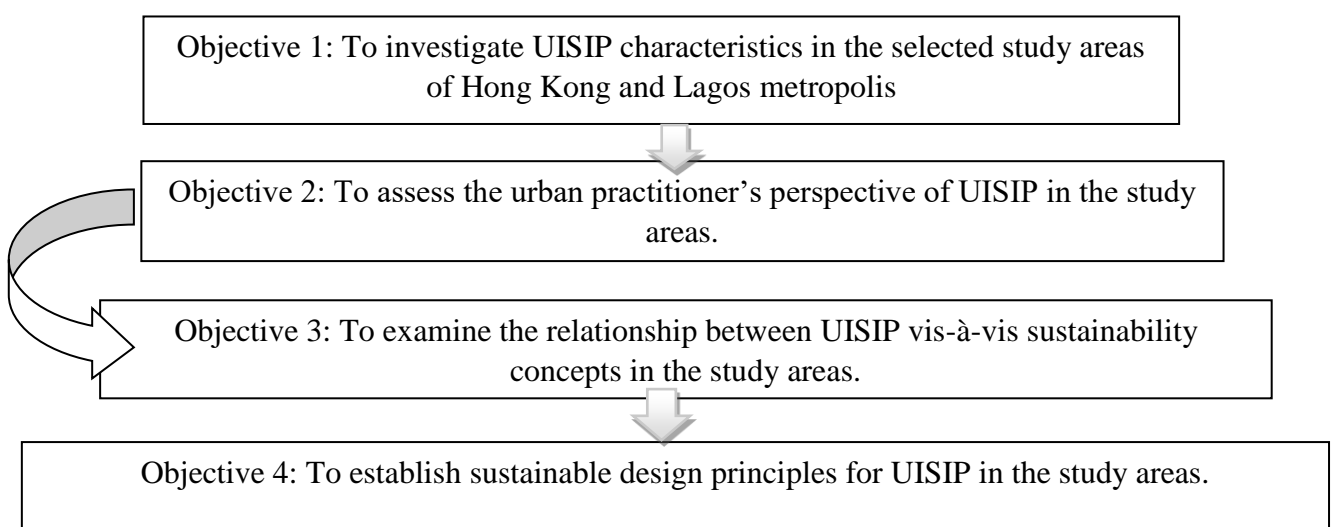
Figure 1.1 Objectives operational synthesis
Source: Author (2016).

The framework for achieving these objectives, the data collection strategy, the method of data analysis, and the expected result are illustrated in Figure 1.2, below:
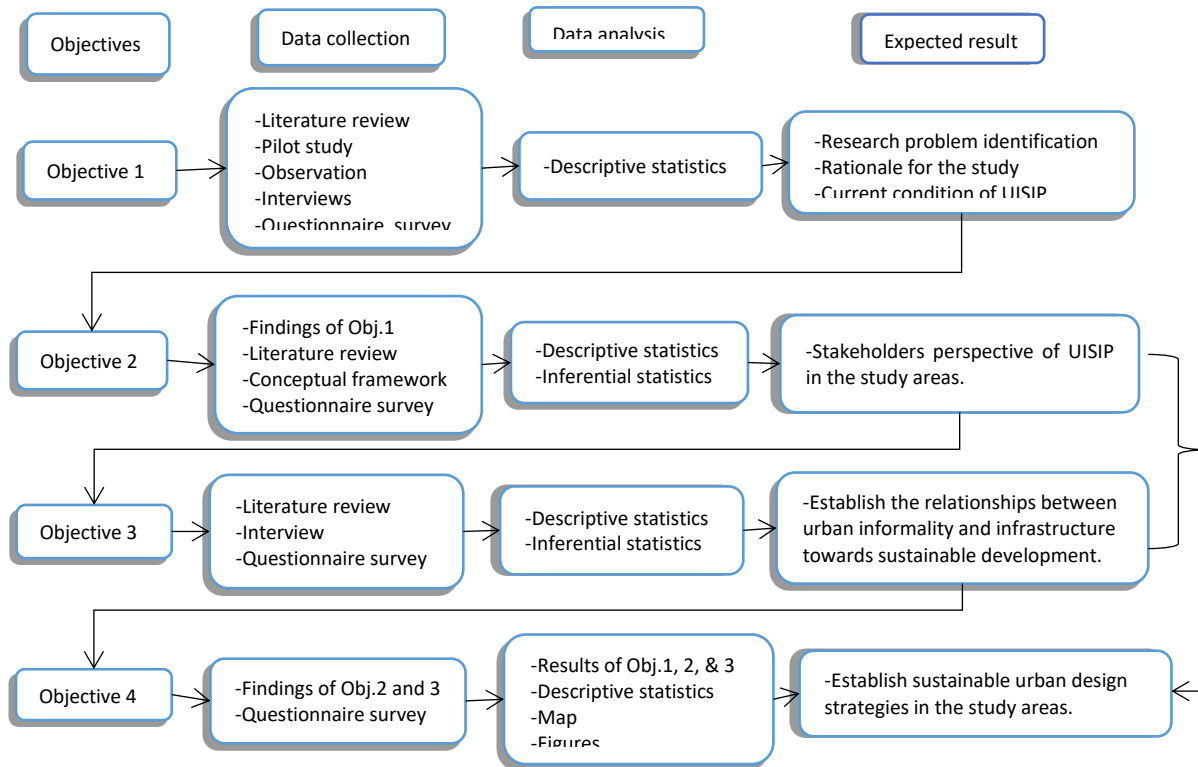
Figure 1. 2 Overall flowcharts of objectives of the research
Source: Author (2016)

The operational synthesis of these objectives as shown in Figure 1.1 and 1.2 reflects that objective 1 of the study is to investigate the condition of urban informal settlement within the study areas. This serves as a platform for effective reference in objective 2, and the other objectives studied; objectives 2 and 3 are based on the investigation result of objective 1. Objective 2 involves the assessment of the stakeholder's perspectives of urban informal settlement and infrastructure characteristics. The third objective examines the relationship that exists between UISIP vis-à-vis sustainable urban development in the study area. The construct of objective 4 synchronises with objective 1, 2, and 3 to establish sustainable urban design principles. This creates the basis for developing sustainable approaches for discussing the challenges of UISIP in Hong Kong and Lagos through design strategies.

1.6 Hypothesis

The research hypothesis tested in this study is:

H_0: There is no significant relationship between urban informal settlement and infrastructure planning design with regard to achieving sustainable urban development in Hong Kong and Lagos.

This primary research hypothesis is divided into four sub-research hypotheses using different testable variables in the study, which are as follows:

a.

H_0: There is no significant relationship between average monthly income and housing condition with regard to urban informal settlement.

b.

H_0: There is no significant relationship between construction materials and types of building with regard to urban informal settlement.

c.

H_0: There is no significant relationship between health infrastructure and road infrastructure with regard to urban informal settlement.

d.

H_0: There is no significant relationship between average monthly income and housing environmental condition.

1.7 Significance of the Study

1.7.1 Significance of the Study: Global Perspectives

The challenges of housing quality, inadequate infrastructure, urban informality, climate change, urbanisation, and environmental degradation are global phenomena. Thus, the goals of achieving environmental sustainability, smart cities, and city resilience in our rapidly growing urban centres are global challenges worthy of study (ARUP, 2014). Considering the severity and the global impact of these issues, UISIP is identified among other elements as the most critical areas of global concern by UN-Habitat (issue paper III) and other research organisations (UN-Habitat, 2015a).

In the UN-Habitat issue paper III, 2015, sub-theme six, stakeholder countries and researchers state that the urban challenges described above are pertinent in Africa and need urgent attention all over the world to achieve sustainability goal. The identification of UISIP challenges as a global issue by the issue paper III, and sustainability agenda is not the only rationale for the global significance of this research. The recent yearning to resolve the challenge that is evidence in everyday living is also a valid justification for global concern at this point (Gerhard & Arie, 2012; Roy, 2012; Tyler, Reed, MacClune, & Chopde, 2010)

Bridger (2015) review of "uneven growth" exhibition at the Museum of Art also emphasise that cities are growing exponentially around the issues of inequalities, injustice and social exclusion for majority of urban resident which record vast growth of informal settlement. In 2030 world urban population will approximate eight billion with two thirds living urban areas and two third of this urban dwellers will be living slum condition according to UN which is also increasingly known as urban informal settlement. Considering this challenge MoMA architecture and design in collaboration, Australian Museum of Applied Arts and six team of researchers extablished this challenge significant in six cities (Hong Kong, Istanbul, Lagos, Mumbai, Rio de Janeiro and New York) and gave 14months to investigate tatical approaches to the challenge of urban growth and inequality (Bridger 2015).

1.7.2 Significance of the Study: Why Hong Kong and Lagos Metropolis

This research is relevant to the study areas because it is theoretical, practical, and is physically visible in the study areas. Despite the settlement and infrastructure development of Hong Kong about these issues (from the 1960s to late 1980s and 1990s), the challenges of informal settlement still exist in Hong Kong. The focus of this thesis is relevant from a literature perspective, with several improvement strategies needed for the everyday physical challenges that are experienced in urban centres and particularly in the study areas. This is significant because this thesis contributes to current academic knowledge regarding the physical, practical, and critical needs of informal settlement and infrastructural challenges from the study area perspective.

This study provides information and sources of data and literature for further studies in improving the problems associated with UISIP through global strategies through the study of a developing city and a developed city country. This gives a distinct perspective on the

challenges of UISIP by creating a comprehensive concept that can be adopted for urban development in all countries of the world. This research is essential because it bridges the gap in knowledge that exists between infrastructure and informal settlements and achieving a sustainable settlement, it gives a basis for further literature study, and presents data for designing and planning of informal and infrastructure settlements. Information on the influence and relationship between infrastructure and informal settlement in achieving sustainable development in developed and developing cities is essential for improving this challenge.

The significance of infrastructure in environmental sustainability, city resiliency, and improving the quality of housing is quite high. Thus, this study is necessary, as it propose strategies for improving the urban environment through these identified approaches at this time. This research is essential for Hong Kong and Lagos metropolis considering the issue of infrastructure as it affects urban informal settlement and these study areas. The evidence of UISIP because of the metropolitan nature of the study areas, the significance of urbanisation in both study areas, and the commercial strength of the two metropolitan cities also justifies the need for this research.

The similarities and the differences between the two metropolitan cities also support and encourage this research perspective towards sustainable development approaches. The developed and developing cities' economic and social perspectives, physical development (both vertical and horizontal) structures, and geographical differences are also rationales for this investigation because a study with such varying sample cases presents a broader perspective for understanding the research issues. Tanasescu et al. (2010) emphasise the need for a study that utilises both a developed and a developing country as sample cases to improve current academic knowledge and approaches to solving these challenges:

> "The tendency to examine illegal housing in developing and developed nations separately and with distinct approaches have impeded our capacity for reasonable and more holistic understandings of the process that gives rise to the housing illegality" (Tanasescus et al., 2010, pg. 478).

The research of (Tanasescu et al., 2010) and the information stated above provide sound evidence supporting the need for this research. The importance of this research for the development of human habitats and achieving sustainable development cannot be

overemphasised based on the global need for such research. The unique nature of this thesis and its study of both developed and developing cities regarding UISIP also creates space for this research. The scope of this research includes critical areas that help academic knowledge, and without this research, the approach to resolving UISIP challenge will still be conventional, with little or no contribution to sustainable development. Considering the interdisciplinary and multidisciplinary nature of this research, there is a need to delimit the area/scope of this study to specific but comprehensive recommendations for discussing sustainable development challenges. Thus, Section 1.8 below discusses the research scope and context of this study.

1.8 Scope of Study

Urban informality is a broad topic with different perspectives. It is also referred to as an urban informal settlement, squatting, and illegal settlement, among other terms. UISIP are complex terms and are multifaceted in the definition. They are described with different definitions and uses by different professionals. Thus, the description of the scope of this study on content (e.g. coverage relating to forms, perspectives, and areas of discussion) and context (e.g. location, case study area) is necessary to clarify the emphasis of this study. The scope delimitation is essential because of the complexity of the term and the different perspectives of the study. Also, the scope of coverage in content and context is discussed in this section to guide the reader about this thesis discussion.

In terms of content, this study's scope includes the investigation of infrastructure planning in selected informal settlements of Hong Kong and Lagos. The examination of the influence of infrastructure vis-à-vis urban informal settlement and the development of strategies for achieving sustainable development. How is urban informal settlement defined and applied in different professional use, how is this study referring to urban informal settlement according to the literature review criteria for conceptualising, defining, and measuring UISIP. This also includes the conceptualisation and definition of urban informal settlement based on physical domain, social, legal, and political/administrative domain, which is necessary for adequate discussion and conclusions in this study. The term "infrastructure" is complex in the description, meaning, and uses. It is mostly described from the economic, social, and physical infrastructure perspectives. Therefore, considering this complexity, this study adopts the scope of study definition for a focus discussion.

The research scope regarding content also includes UISIP and the influence that exists between these elements in selected settlements of Hong Kong and Lagos. This also includes the literature's perspective on socio-economic and physical characteristics of residents in relation to informal settlements and infrastructures in the study areas. Table 1.1 below presents the thesis research scope delimitations on content.

Table 1.1 Urban informality and infrastructure research scope

Urban informality scope		
Urban informality status/domain	**Features/condition**	**Inequality/exclusion**
Physical status/domain	Living/job insecure	Economic inequality/exclusion
Social status/domain	Haphazard housing	Social inequality/exclusion
Legal status/domain	Housing insecurity	Environmental inequality/exclusion
Administrative status/domain	Squatter, squalor, tenant, and slum	Political inequality/exclusion
	Cage housing	
	Homeless	
	Roofless	
	Street sleepers	

Infrastructure classification scope				
World Bank (1994), classified infrastructure as an umbrella term for social overhead capital			Social infrastructure	Physical infrastructure
Public activities work and transport system			• Healthcare	• Water supply
• Power	• Roads	• Urban and interurban railways	• Governance structures	• Sanitation facilities
• Telecommunications	• Major dams and canals		• Public or communal structures	• Drainage
• Piped water supply		• Urban transport		• Urban roads
• Sanitation and sewage	• Irrigation	• Ports and waterways		• Solid waste disposal facilities
• Solid waste collection	• Drainage	• Airports		• Land management
• Pipe gas				

Source: Author (2016)

The research scope in terms of context is the delimitation of the specific location(s) of the study areas in Hong Kong and Lagos. These areas serve as the research case studies, adopted based on the theoretical and practical relevance of the areas to the thesis's focus of study. These study areas and the specific settlement sampled were also chosen based on the definition of the urban area discussed in the definition of terms in this thesis to effectively capture urban informality perspective of this study. The areas adopted are significant urban areas with relevant prior studies and practical evidence of the challenges related to the study perspectives.

The context/case study areas of Hong Kong and Lagos were adopted to understand the issues present in the two areas, find their challenges, and extract sustainable development approaches that can be applied to other developing countries with the same obstacles. These two former British colonial metropolitan cities were also adopted as the context of study because of the

relevance of their past, present, and probable future relevance to the focus of this study. The context of the study areas, location, and population distribution are presented in Table 1.2 for further discussion.

Table 1.2 Hong Kong and Lagos population figures

Lagos Case Study Areas and Population Figures from 2006 census projected @ 3.2 to 2015			Hong Kong Case Study Areas and Population Figures		
Region	Local Government Areas	Population Figures	Region	Districts	**Population Figures**
Lagos island region	Lagos Island	1,141,667	New Territories	Island District	144,500
	Eti-Osa	1,305,865		Kwai Tsing District	501,900
				Sai Kung District	448,600
Lagos mainland region	Ojo	1,250,110		Sha Tin District	648,200
	Amuwo-Odofin	697,032		Tai Po District	**302,300**
	Alimosho	2,717,945		Tsuen Wan District	301,600
	Agege	1,371,654		Tuen Mun District	489,000
	Ifako-Ijaye	988,277		Yuen Long District	595,100
				North District	303,300
	Ikeja	861,340	Kowloon	Kowloon City District	**402,300**
	Oshodi-Isolo	1,506,399		Kwun Tong District	639,900
	Mushin	1,754,648		Sham Shui Po District	**388,300**
	Surulere	1,692,038		Wong Tai Sin District	424,500
	Ajeromi-Ifelodun	1,905,717		Yau Tsim Mong District	313,600
	Apapa	693,597	Hong Kong island	Central and Western District	248,600
	Lagos Mainland	853,779		Eastern District	579,400
	Shomolu	1,361,110		Southern District	270,500
	Kosofe	1,240,936		Wan Chai District	**150,400**
Total		**21, 342,114**	**Total**		**7, 152,000**

Sources: Adapted from (Hong Kong, 2014; Nigeria Lagos State Government, 2013b)

The research scope for Hong Kong covers the three regions of the Special Administrative Region (SAR) (New Territories, Kowloon, and Hong Kong Island) to allow for a proportionate sample of the metropolis. Four districts were selected from the three regions at 20.0% of the 18 districts, namely: Tai Po District in the New Territories, Kowloon City District and Sham Shui Po District in the Kowloon Peninsula, and Wan Chai District on Hong Kong Island. The distribution of the specific sampled locations in Hong Kong and Lagos is described in Table 1.3, and the map of the study areas is discussed in detail in Section 2.3.2, Case Study Area. Table 1.3 presents a further description of the research context delimitations.

Table 1.3 Hong Kong and Lagos: study area delimitation

Hong Kong, SAR			
New Territories	**Kowloon Peninsula**		**Hong Kong Island**
Tai Po District	**Kowloon City District**	**Sham Shui Po District**	**Wan Chai District**
• Tai Po Market	• Hung Hum	• Sham Shui Po	• Wan Chai North
	• Homan Tin	• Shek Kip Mei	• Wan Chai South
Lagos, Nigeria			
Island Region of Lagos		**Mainland Region of Lagos**	
Eti-Osa LGA	Obalende area	**Lagos mainland LGA**	Iwaya
	Ilado/Eti-Osa Environs		Makoko
	Badore	**Ikeja LGA**	Ipodo/Seriki Area
			Alausa/Oregun/Olususun

Source: Author (2016)

The context in Lagos metropolis includes one LGA in the island region and two LGAs in the mainland region of the metropolis. The LGA adopted in the island region includes the Eti-Osa LGA with the settlements sampled including the Obalende area, Ilado/Eti-Osa environs, and Badore, respectively. The two LGAs in the mainland region of the metropolis include Lagos Mainland LGA and Ikeja LGA with the settlement case study including Iwaya, Makoko, Ipodo/Seriki-aro area, and Alausa/Oregun/Olususun, respectively. The study area in Lagos as shown in Table 1.3 and Figure 2.5 in Section 2.3.2 shows the distribution of the study area in Lagos as bisecting the whole metropolis.

These study areas in Hong Kong and Lagos were adopted as the case study areas based on the literature review, the theoretical evidence, and the practical justifications of these areas in relation to the study aim and the spatial distribution necessary to allow adequate representation for this research aim. These study areas were also selected based on site visits, reconnaissance studies, and conducting the pilot study in these locations. The scope of these study areas was further based on the definitions of terms of this study areas as urban areas with informal settlement, and infrastructure issues in relation to this thesis (Lawanson & Fadare, 2015; Rufina Wu & Canham, 2009; Tanasescu et al., 2010). Further discussion is provided in the definition of terms section (Section 1.9) and the study area section (Section 2.3.2).

1.9 Definition of Terms

Urban: There are no universally accepted definitions for the term "urban", and it is often defined in different forms and from the different professional point of view. However, the result of literature search identifies the basis of urban definition, which is also adopted in this study,

as a geographical area with a certain population, non-dominant agrarian, government administrative offices, infrastructure development, and legal declaration as an urban area (Agbola & Agunbiade, 2009; Oduwaye, 2009). For example, in Nigeria, urban areas are defined as a geographical area with a population of 20,000 people or above, government offices with non-dominant agricultural occupation, and availability of necessary facilities and services – or any area declared by the government as an urban area.

Informality/Informal Activity: Informality/Informal activity are terms used in diverse ways and within different contexts, which are furthermore used interchangeably with different related professional terminologies to mean non-taxed and non-regularized activity. The term informality are also commonly used to describe, illegality, "haphazardness", lack of order, survival instinct, irregularity, and non-formality (Ali & Sulaiman, 2006; Cuthbert & McKinnell, 1997; Srinivas, 2005). In this study, the word "informality" is used interchangeably with "informal settlement" to refer to "inadequate" conditions within the context of the physical, social, economic, environmental, and legal domain.

Urban Informality/Urban Informal Settlement: According to (Kennett & Mizuuchi, 2010), urban informality/urban informal settlement is defined within the context of homelessness, housing insecurity, and social exclusion as being *roofless*, *houseless*, *living in insecure housing,* and *living in inadequate housing*. The definition of urban informal settlement according to (UN-Habitat, 2015d) states that it is the residential area where: 1) there is no security of tenure regarding the land, the dwelling area, or the inhabited space. The occupants range from squatting to unorganised rental sheds or structures; 2) neighbourhoods lack or are cut off from necessary facilities, services, and city infrastructure; and 3) housing does not necessarily follow the current planning or building regulation and is often situated within geographical or environmentally hazardous areas.

The definitions above are closely related to the summary of the literature reviewed from (Alan & Wing-Shing, 2005; Aluko & Amidu, 2006; Caroiyn, 2005; Chan, Tang, & Wong, 2002; Chiu, 2002; Inam, 2015; Jianfa, 2005; Laurence & Fulong, 2005; Lee & Chan, 2008; Lefebvre, 1991; Nwokoro et al., 2015; Opuenebo & Mabale, 2006; Rufina Wu & Canham, 2009). All this literature defines urban informality/urban informal settlement from the physical, social, and legal domain. Therefore, in this study, urban informality and informal settlement are

conceptualised, defined, and measured based on these criteria. See Figure 1.3 below for more details, and the content and context in which urban informal settlement is discussed in this study.

Definition Domain
Physical status
Social Status
Legal Status
Policy Status

Factors
Inequality/Exclusion (IE)
Economic IE
Social IE
Environmental IE
Policy/Political

Features/Condition
Living/Job Insecurity
Squatter Settlement
Housing Insecurity
Cage Housing
Homelessness/Rooflessness
Street Sleepers
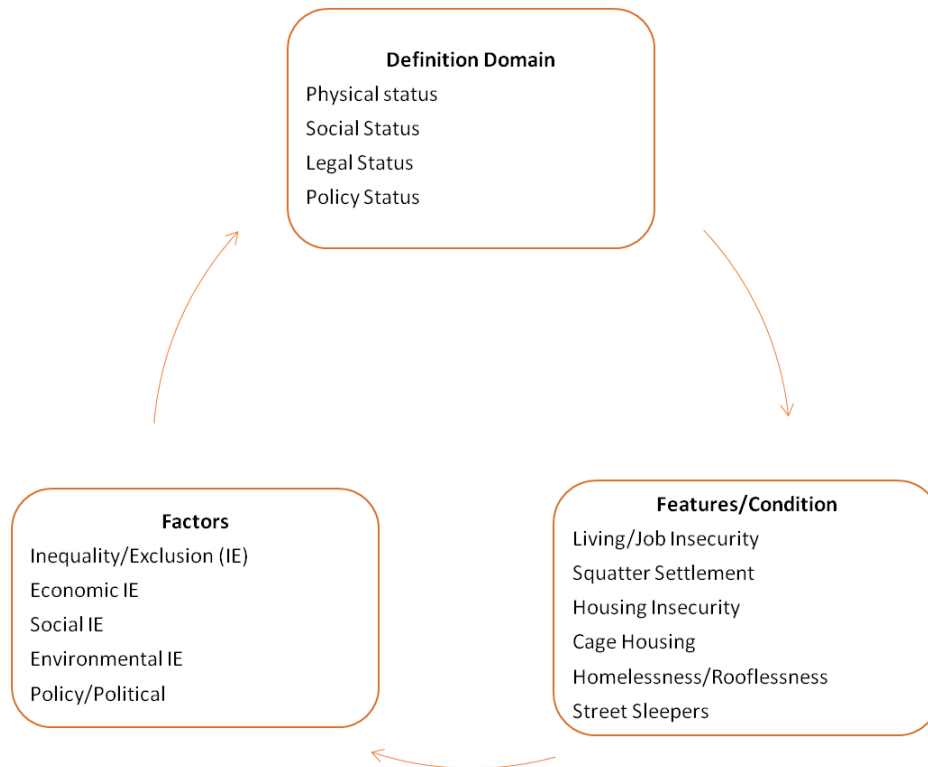
Figure 1.3 Conceptualising, defining, and measuring informal settlement
Source: Author (2016)

Pro-poor: The pro-poor concept is described by different studies as vulnerable (poor) oriented development activities. This does not refer to activities that are sub-standard, inferior, or. of low quality, but rather to those that are oriented towards less privileged people, are people driven, or concern human development and people's accessibility to services. This includes less expensive programs, activities, and people's access to amenities (for use and development) with little to no profit orientation (Lawanson, 2007; Majale, 2001).

Infrastructure: Infrastructure is a term that is part of complex professional jargon. It is used in different forms and is inclusive of several sub-related words. (Ijaiya & Akanbi, 2009), defines infrastructure as facilities and services that include: utilities and services, roads, water systems, telecommunications, and others. The common criteria used in the definition of infrastructure derived from the literature review include a totality of the network of structures

that connect the environment, the economy, social and political settings to achieve an adequate, effective, functioning environment (Aigbokan, 1999; Choguil, 1996a, 1999; Ijaya & Akanbi, 2009; Taylor 2015).

The definition of infrastructure from the studies reviewed (Fox 1994, Jacobson and Tarry 1995 in (Ijaiya & Akanbi, 2009), (Choguill, 1996a; UN-Habitat, 2015a, 2015b), and other literature describes infrastructure as the combination of functioning facilities and services that enhance adequate human habitats. Although infrastructures are classified in different forms and defined with different terminologies, the general keywords in infrastructure definitions include facilities and services functioning to enhance the social, economic, physical, and political stability of a settlement.

Pro-poor Infrastructure: Pro-poor infrastructure planning from the interpretations above is the provision of necessary facilities, services, and utilities for the effective functioning of the environment, which support the interest of all residents and are accessible by all at an affordable cost.

1.10 Thesis Structure

This thesis is structured into five parts, namely: Part 1, the research overview (Chapters 1 and 2, the research background and study area); Part 2, research framework (Chapters 3 and 4, literature review and conceptual framework); and Part 3, research methods (Chapters 5 and 6, the research methods and data presentation). Part 4 discusses the research case study (Chapters 7 and 8, which includes the case study in Hong Kong and Lagos based on the objectives), while Part 5 includes the discussion and conclusion (Chapters 9 and 10, strategy recommendations and conclusion). Figure 1.4 presents the research structure schematically in a thesis flowchart.
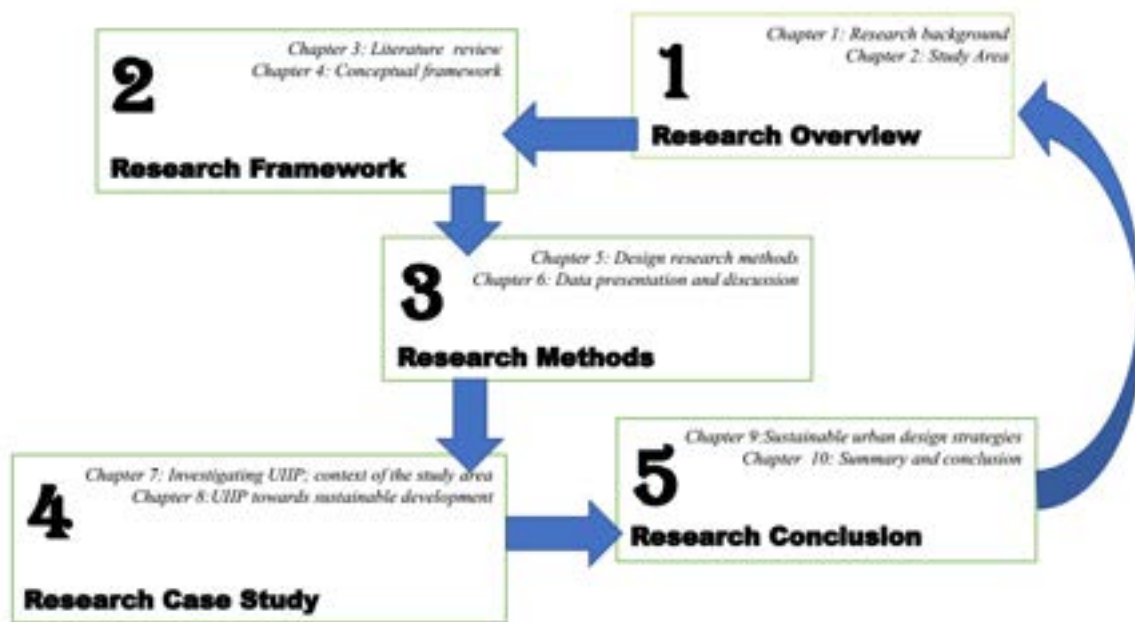
Figure 1.4 Research structure
Source: Author (2016)

In line with the research structure, the overall thesis flowchart presented above describes the thesis chapters as follows:

Chapter 1: Introduces the research background within the scope of study (content and context). This highlights the research problem statement, the significance of the study, and the aim and objectives of the study as a basis for other chapters in this thesis. This chapter is built on the theoretical and practical evidence of the study and strongly relates to Chapter 2.

Chapter 2: Presents the study area context and background to promote further research activities within the adopted study areas. This is also necessary to guide the reader's understanding of the selected study areas regarding scope, demographics, and other relevant characteristics.

Chapter 3: Discusses the evidence from the literature review from a global perspective in the context of the research and highlights the UISIP factors/determinants relevant to this study based on past studies. This has a strong connection with Chapter 4, and both chapters connect the research background and framework to figure out the research design method in Chapter 5.

Chapter 4: Describes the conceptual framework adopted in this thesis in relation to the literature review and presents the perspectives and fundamental ideas of the subjects of study. This chapter also outlines the underlying viewpoints, the idea behind each subject element of the study, and how the concept can be described and operationalised in the study.

Chapter 5: Explains the design research methods, the standpoints, reflexivity, and positionality utilised in this study. The study adopts a case study design research methodology (exploratory qualitative and quantitative design methodology), mixed method data collection (triangulation techniques of qualitative and quantitative data collection), and mixed method data analysis (exploratory design of qualitative data analysis results building into quantitative data analysis and results, followed by interpretation).

Chapter 6: Presents and discusses the data collected based on the study subject and the context of sustainability factors. This is necessary to position this thesis with regard to the scope of the study and present the hypothesis stated in the thesis.

Chapter 7: Discusses the case study findings of the investigating UISIP design in the study area. This is discussed within the context of the thesis objective, specifically addressing objectives 1 and 2, which serve as a platform for other objectives.

Chapter 8: Discusses objective 3 of this study and answers the research question about the relationship between UISIP and sustainable urban development.

Chapter 9: Addresses objective 4, one of the significant aspect of the study, and this thesis' contribution to existing knowledge by highlighting the sustainable urban design strategies identified in the study based on the findings and other objectives of the study. This also serves as the recommendation section of the thesis, based on the investigation and findings in the study area.

Chapter 10: Presents the summary and conclusion of the study. This chapter reintroduces the objectives and discusses the study findings and recommendations. It highlights the contribution to existing knowledge, the limitations of the research, and areas of future study.

Figure 1.5 shows the overall flowchart of the study chapters and the graphical relationship that exists between these in the thesis.

```
┌─────────────────────────────────────────────────────────┐
│                       Chapter 1                          │
│                  Research background                     │
└─────────────────────────────────────────────────────────┘
                             │
                             ▼
              ┌──────────────────────────────┐
              │          Chapter 2           │
              │          Study areas         │
              └──────────────────────────────┘
              │                              │
              ▼                              ▼
┌──────────────────────┐        ┌──────────────────────┐
│      Chapter 3       │        │      Chapter 4       │
│   Literature review  │        │ Conceptual framework │
└──────────────────────┘        └──────────────────────┘
              │                              │
              ▼                              ▼
              ┌──────────────────────────────┐
              │          Chapter 5           │
              │    Design research methods   │
              └──────────────────────────────┘
                             │
                             ▼
              ┌──────────────────────────────┐
              │          Chapter 6           │
              │  Data presentation and       │
              │        discussion            │
              └──────────────────────────────┘
              │                              │
              ▼                              ▼
┌──────────────────────┐        ┌──────────────────────┐
│      Chapter 7       │        │      Chapter 8       │
│ Investigating UIIP;  │        │ UIIP towards         │
│ context of the       │        │ sustainable          │
│ study area           │        │ development          │
└──────────────────────┘        └──────────────────────┘
              │                              │
              ▼                              ▼
              ┌──────────────────────────────┐
              │          Chapter 9           │
              │ Sustainable urban design     │
              │         strategies           │
              └──────────────────────────────┘
                             │
                             ▼
┌─────────────────────────────────────────────────────────┐
│                      Chapter 10                          │
│                Summary and conclusion                    │
└─────────────────────────────────────────────────────────┘
```

Figure 1.5 Overall flow chart of the thesis
Source: Author 2017

1.11 Chapter Summary

This research background presents the thesis perspectives and finds UISIP as sustainability and global challenge posing significant threats to sustainable urban development. It describes the research gap, aim, and objective of the study. The research question investigates the relationship between UISIP design with regard to achieving sustainable urban development. The research question was further divided into four sub-questions, which identified three significant research gaps regarding: 1) the relationship that exists between informal settlement and infrastructure towards urban development; 2) the study of informal settlement and infrastructure planning design vis-à-vis sustainable development factors; and 3) the design strategies for improving the challenges of UISIP and achieving sustainable urban development. These research questions and gaps generate the research objectives, and the hypothesis tested in the study.

The hypothesis tested states that there is no significant relationship between UISIP design with regard to achieving sustainable urban development. This hypothesis was also divided into four measurable sub-hypotheses, which include variables of urban informality, infrastructure, and sustainable development. The significance of this study from the global perspective and study area context was discussed, and the dearth of research regarding these perspectives (UISIP vis-à-vis sustainability) was identified as being globally significant with critical consequences. The scope of the study in content and context was described to investigate UISIP design in selected areas of Hong Kong and Lagos to develop strategies for sustainable urban design. This chapter also discussed the research structure, which includes different parts of the study and the overall flow chart of the thesis. While the research structure consists of five parts: Part 1 as the research overview, Part 2 as the research framework, Part 3 as the research methods, Part 4 as the research case study, and Part 5 as the research conclusion, the thesis itself consists of 10 chapters.

Chapter 2
Study Area

_____

The tendency to examine illegal housing in developing and developed nations separately with distinct approaches has impeded our capacity for a more holistic understanding of the process that gives rise to the housing illegality.

(Tanasescu et al., 2010)

Synopsis

A description of the study area is essential to introduce the context of this thesis within a geographical location and relating to significant characteristics. The study area adopted is Hong Kong SAR of China and Lagos metropolis, Nigeria. These areas were chosen based on a review of academic literature and practical evidence (see also Sections 1.7 and 1.8) with regards to the study perspectives. This chapter discusses the geographical location and the general characteristics, physical structures, and land use in the study areas.

2.1 Introduction

The study areas for the spatial investigation of UISIP in this thesis are Hong Kong and Lagos metropolis. The two study cases were selected for this study after considering the nature, characteristics, and the influence of urban informal settlement in these areas in relation to developing an approach for sustainable urban development.

Hong Kong was chosen based on its history of urban informality (Kowloon City Walled), and the current nature and structure of urban informality and infrastructure in the region. The literature and practical evidence of this squatter and slum settlement in Hong Kong reflect the need for improvement strategies. Although the situation is improving, the challenge of open space, public housing, and/or accommodation can still be seen in Hong Kong, making it suitable for this study (Rufina Wu & Canham, 2009). Similarly, Lagos was adopted as a case study because of its history of urban informality, as well as its current and potential capacity for future sustainable development despite its present conspicuous urban informal challenges. It is also chosen for this study to create a strategy for development in Lagos metropolis and other developing countries of the world (Oduwaye, 2009). The study found the historical, geographical, spatial, land use, and general characteristics of the area and other relevant details as the basis for study area selection based on the reconnaissance survey and pilot study of the areas. A detailed discussion about these areas as the case studies are presented below.

2.2 Hong Kong as Study Area

Hong Kong means "fragrant harbour" and a country with large bodies of water and steep slopes. The coastal city and the SAR of the People's Republic of China (PRC) are located on the southern coast of China and is believed to have originated from the lineage of the erstwhile Chinese empire during the Qin Dynasty in (221-206 BC). The Hong Kong administrative system or political structure operates within the quasi-constitutional document of Hong Kong Law and has its own legislature and Chief Executive Officer as the head of the SAR. The country's sovereignty was given to the PRC in July 1997, after over a century of rule as a British colony. Thus, Hong Kong became a SAR of the PRC with autonomy on several issues, except for foreign treaties and security matters. The early residents of the country in the 19th century (between the Chinese imperial era and the colonial era) initially had strong fishing,

trading, and salt production industries, as well as engaging in other activities that are supported by Hong Kong's coastal advantage and agrarian occupation. Its present role as a financial centre and service industry serving China and Asia has it prehistoric era to the Chinese imperial era and the colonial era, as an industrial, manufacturing, and commercial centre. The global community identified Hong Kong during this prehistoric era to Chinese imperial era as an industrial centre (producing textiles, among other goods) before it emerged as a service industry area, military port, shipping centre, and began providing other strategically important services.

The country's Gross Domestic Product (GDP) is supported by an estimated 33% of foreign investment capital, and it had a Gross National Income (GNI) per capita of $319,871 and Net International Investment Position (NIIP) of $6,398,765 flow in the year 2014. Its economy is based on its service industry, tourism activities, and foreign investment (Hong Kong, 2015). Hong Kong is rich in traditional culture originating from China with several celebrated religious (Confucian, Buddhist, Taoist, Catholic and Muslim) activities and non-religious festivals with public holidays (Wikipedia, Word Web, Google search, (Chiu, 2002; Hong Kong Planning Department, 2015; Hong Kong , 2014, 2015; Ng, Chen, Wang, &Yuan, 2012).

Despite of the treasured position of Hong Kong with regard to economic prosperity, as a renowned international services provider, a tourist destination, an urbanized environment with several globalized characteristics, technological affluence, and its celebrated public housing provision (the second largest in the world), there still exists a poor population with insufficient housing conditions in Hong Kong (Rufina Wu & Canham, 2009). The prosperity of the country comes with challenges that are rooted in the wide disparity between the rich and the poor, as well as other factors that influence urban informality.

2.2.1 Geographical Location and General Characteristics

Hong Kong is located at 22º19'42" N and 114º11'30" E on the southern coast of China with an estimated population of 7,152,000, and 1,110 sq. km of land area covering the three main geographical areas or territories. These include the New Territories, the Kowloon Peninsula, and the Hong Kong Island. The identified case study areas include these three areas and four Districts within the three territories: Tai Po District, Kowloon City District, Sham Shui Po

District, and Wan Chai District. These areas were adopted to allow adequate representation of Hong Kong and to allow a conveniently practicable research area of this study. The Tai Po District case study area was selected as a district under the New Territories region with approximately 148.05 sq. km (57.16 sq. mi) of land area, a total population estimated at 293,542 at a density of 2,000/sq. km (5,100/sq. mi). There are several areas under the Tai Po District such as Cham Pai, Hin Pai, and Kung Chau, but the study case area adopts the Tai Po market area and its environs (Hong Kong, 2014, 2015) and the Hong Kong Home Affairs Department http://www.had.gov.hk/en/18_districts/my_map_15.htm .

The Kowloon City District is one of the four districts selected for this study with an estimated population of 402,300 and land area of about 9.9 sq. km (3.85sq mi) and approximately 36,000/sq. km (94,000/sq. mi) population density (Hong Kong Planning Department, 2015; Hong Kong, 2014, 2015). The Kowloon City District includes the following areas: Hung Hum, Kai Tai Airport, Homan Tin, Ma Tau Wai, Kowloon Tong, To Kwa Wan, Whampoa, and Kowloon city. However, this study selected Hung Hum and Homan Tin using a multi-criteria selection method (evidence from academic literature, the nature of land use, and characteristics or elements of informal settlement) relevant to the study.

The third case study area is Sham Shui Po, which has approximately 9.48 sq. km (3.66 sq. mi) of land area, a total population of 365,540, and a density of about 39,000/sq. km (100,000/sq. mi). Sham Shui Po is an area characterised by several informal economic activities, and it is also an area with a high concentration of people during working hours. There are several areas within the Sham Shui Po District, such as Shek Kip Mei, Sham Shui Po, Cheung Sha Wan, Lai Chi Kok, and Yau Yat Chuen, among others, but this study adopts Sham Shui Po and Shek Kip Mei for this study.

The last district adopted in this study is the Wan Chai District, which is located on Hong Kong Island at 22º16'47" N 114º10'18E. Wan Chai is identified as having high street life, numerous bars and strip clubs, a red-light district, and as a popular area for tourists. These places are identified with beautiful treasure areas, but the district has some older areas with significant urban informality challenges. The Wan Chai district is estimated to occupy about 9.8 sq. km (3.8 sq. mi) of total land area, with a population of about 155,196 and a density of 16,000/sq. km (41,000/sq. mi).

These locations were chosen as case studies by considering the nature, characteristics, and effect of informal settlement in these areas, in combination with the evidence presented by academic literature and the reconnaissance and pilot studies. This study also discusses the physical structure of the land use in Hong Kong to further support the relevance of these areas for this research.

2.2.2 Physical Structure and Land Use in Hong Kong

The summary of Hong Kong's physical structure and land use (particularly in the selected case study areas) is discussed here in relation to the research topic and according to the literature reviewed. The physical structure of Hong Kong's urban environment can be described as a western compact urban area with high skyscrapers and as a highly dense western urban area. The architecture of the area partially reflects Chinese influence, but the remnants of the British colonial government in buildings and urban characteristics can still be seen in the country. Hong Kong's physical structure, according to (Rufina Wu & Canham, 2009), is highly urbanised and developed. It enjoys economic prosperity but is identified as having one of the world's highest disparities between rich and poor. Hong Kong has one of the world's highest concentrations of skyscraper apartments, with structures as high as 70 stories in buildings for middle to high-income earners. The region also experiences a high level of illegal rooftop buildings, inadequate housing supply compared to demand, housing insecurity, homeless residents, street sleepers, and urban informal settlement. Figure 1.6 describes the land use distribution of the SAR with land area analysis.

Land Area Analysis
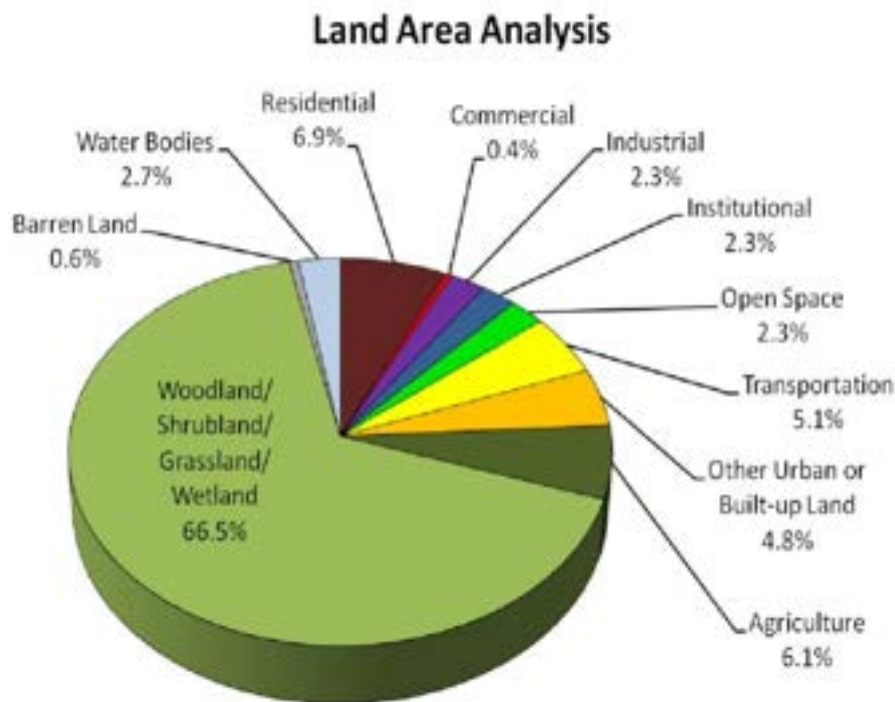
Figure 2.1 Hong Kong land use analysis description
Source: Planning Department, The Government of the Hong Kong SAR (2015).
http://www.pland.gov.hk/pland_en/info_serv/statistic/landu.html.

The Hong Kong land use analysis above better summarises the opportunities and anomalies present in Hong Kong's physical structure. The land use challenges of the region originated from the land constraints, with 66.5% of Hong Kong's territory comprised of woodlands, shrubland, grassland, and wetlands, which continue to constrain the land development of the country. Barren land amounts to 0.6% of Hong Kong's territory, water bodies compose 2.7%, residential land comprises 6.9%, commercial land occupies 0.4%, industrial land amounts to 2.3%. There is 2.3% of land that is open space, transportation takes up 5.1%, other urban or built-up land comprises 4.8%, and agriculture utilises 6.1% of available land. These constraints create high costs for housing, high housing demand, and because of high-income disparity, urban informality, and homeless increases. These land use challenges and issues with urban informality are further intensified by urbanisation, globalisation, and the strong economic influence of Hong Kong, which has resulted in an increased population and subsequently, highly urbanised areas. The physical structure of and land use in Hong Kong and the sq. km covered by each region of the country is presented below:

Table 2. 1 Hong Kong major areas land coverage

Land Areas of Hong Kong	Sq.km		
	2005	**2009**	**2010**
Hong Kong Island	80.5	80.6	80.6
Kowloon	46..9	46.9	46.9
New Territories and islands	976.6	976.9	976.9
Total	**1104.0**	**1104.4**	**1104.4**

Source: The Hong Kong home affairs department and
http://www.pland.gov.hk/pland_en/info_serv/statistic/landu.html
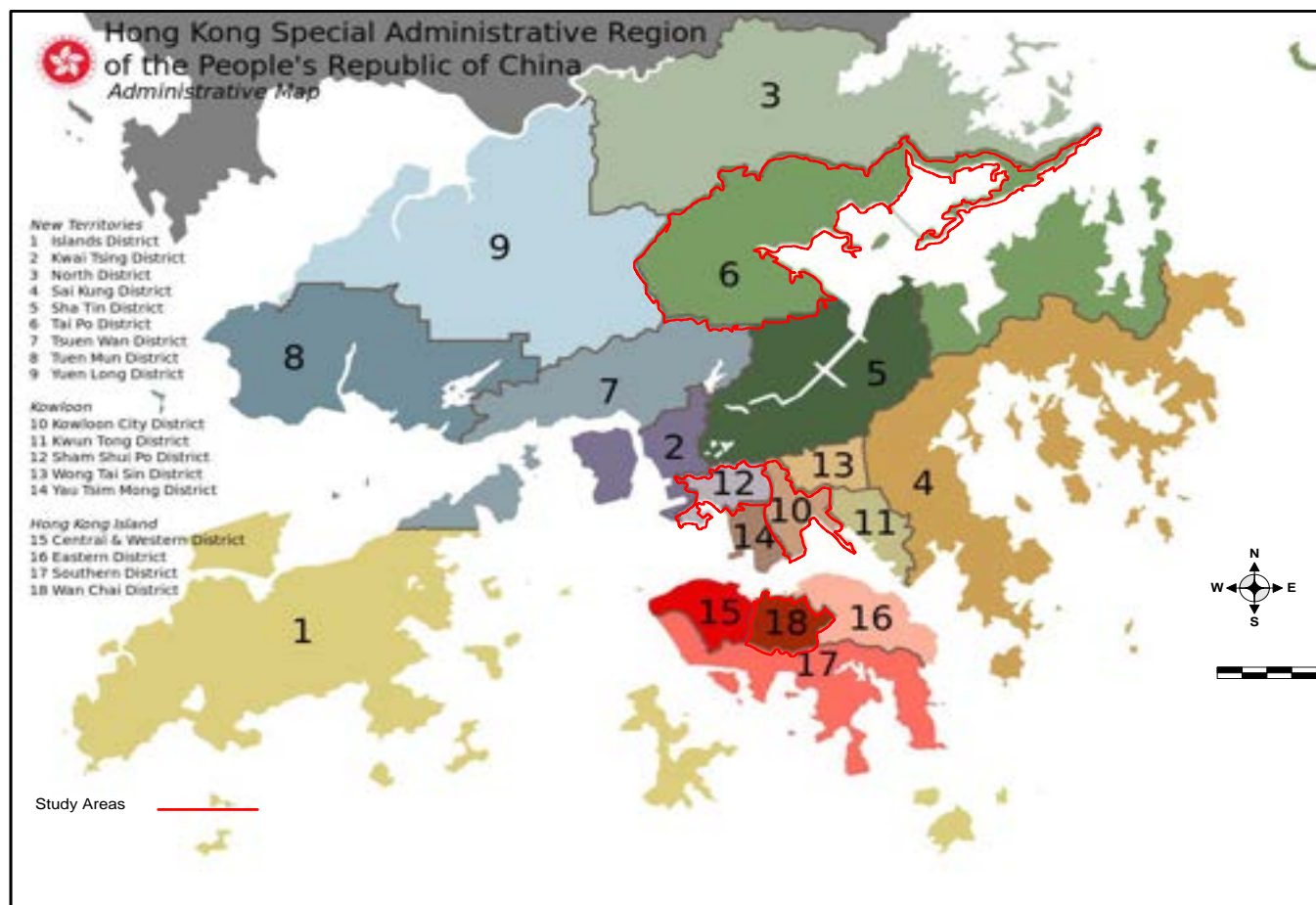
Figure 2. 2 Map of Hong Kong highlighting the study areas
Source: Adapted from https://commons.wikimedia.org/wiki/File:Map_of_Hong_Kong_18_Districts_en.svg#/media/File:Map_of_Hong_Kong_18_Districts_en.svg April 2016.

2.3 The City of Lagos Nigeria as Study Area

In the 1950s, only 15% of the population in Africa lived in cities. This figure rose by 13% to reach 28% in the 1980s, and then to 34% in 1990s. This number is expected to reach 50% by the year 2020, and 60% by 2030 (UN Habitat, 2013). Lagos Nigeria's former Capital Territory of Nigeria and Africa's economic capital had a population of 1.4 million in 1963, which rose to 3.5 million in 1975. Its current population stands at over 17 million and is projected to reach 24 million by 2020. The name "Lagos" originated from the merger of the words "Lagoon Area." The coastal city gained its independence from the British colonial government on 1 October 1960, when the country became the Federal Republic of Nigeria, and the city of Lagos became the central seat of its administration (south-western region), during the six-regional system of administration, before the use of the state. The metropolitan state became the first capital territory during the rule of the military government and before the nation's capital was moved to Abuja on 12 December 1991. The growth rate of Lagos' population is now between 6% and 8%, compared to 4% to 5% for the country and 2% for the global population. It is the second most populous city in Africa after Cairo and is estimated to be the fastest-growing city on the continent and the seventh fastest growing in the world, with a population increase of about 600,000 people per annum. Lagos' population is growing 10 times faster than that of New York and Los Angeles, with grave implications for settlement development, urban sustainability, and settlement infrastructure delivery. At its present growth rate, the UN had estimated that Lagos will be the third largest mega-city in the world by the year 2015, after Tokyo and Bombay (Mustapha, 2002).

2.3.1 Geographical Location and General Characteristics

The coastal city of Lagos, currently the fifth largest city in the world, is situated between 6°23" N' and 6°41" N' and 2°42" E' and 3°42" E with a geographical area of 3,577 sq. km (Salau & Lawanson, 2010). The growing concern for Africa, Sub-Saharan Africa, Nigeria, and Lagos is because of the nature, extent, and significance of UISIP in this part of the world. Lagos is a mega-city in one of the most populous and fast-growing developing countries in the world, with one of the most rapidly urbanising areas globally and is Nigeria's most populous conurbation. Its growth has been phenomenal, both demographically and spatially from a population of about 25,000 in 1866 to 665,000 by 1963. Lagos' population reached over 10

million in 1995, thus attaining mega-city status from the UN, and topped 17 million according to the most recent (2006) population census. Despite the economic potential and other strengths of the metropolis because of this rapid population growth, Lagos is described as having inadequate and incommensurate infrastructure and facilities that can support or can sustain its development (Agbola & Agunbiade, 2009).

2.3.2 Physical Structure and Land Use in Lagos

The overview of the physical structures and land use in Lagos metropolis, particularly the case study areas (Eti-Osa LGA, Epe LGA, Lagos Mainland LGA, and Ikeja LGA) reflect land use activities such as residential, commercial, recreational, industrial, and institutional uses, with evidence of sprawl and chronic urban informality. Some of these areas are properly zoned in different areas for high-income earners, government officials, and politicians, but most other areas have mixed uses with compact and highly dense haphazard building arrangement. Lawanson and Fadare (2015) describes the physical structure and composition of the land use in the metropolis as an area where

> "The rich reside in picturesque gated communities and Government Reservation Areas, while the poor are confined to the slums and squatter settlement[s], largely unserved by basic infrastructure and social facilities" (Lawanson & Fadare, 2015).

The statement of (Lawanson and Fadare 2015) simply describes the typical physical structure of land use and the city. The typical land use on the islands (Eti-Osa and Epe LGA) include residential estate such as Lekki phase1 and 2, Dolphin Estate, Ikoyi GRA, Chevron Estate, Ikota, and VGC. The land use on the mainland which include Ikeja GRA, Ogba GRA, navy cantonment quarters, police quarters, private and public built housing to mention just a few. Other land use includes administrative areas, churches, schools, public buildings (e.g. St. Leo Catholic Church, Lagos State Ministry), commercial services such as banks, markets and offices. The diverse composition of the metropolis explains the reason for the rapid urban centre decay, sprawl, and obsolete environments with a haphazard structure that deface the metropolitan state and even cause environmental nuisance for the picturesque gated houses.

The physical structure of the study area can be described as a failure, considering the physical characteristics of the region. The present physical attributes of the area include urban blight with evidence of shanty structures, haphazard building arrangements, environmentally polluted

or degraded areas, and a high rate of homeless citizens. The infrastructure supporting living conditions in Lagos is in complete disarray and total collapse, with no good roads, poor drainage, scarcity and exorbitant costs for potable water and electricity. This has paralysed the economy of the metropolis and the country. Furthermore, noteworthy features of physical structure and land use in the areas studied, especially in the mainland areas (Lagos Mainland LGA and Ikeja LGA), are spread and sprawl development that faces many environmental challenges such as flooding, traffic jams, pollution, and several other problems. Some parts of the areas and their structures are characterised by obsolescence and blight, and slum packed environments that are always flooded during the rainy season. Issues of street trading, un-coordinated parking by both private and public drivers, and the general rush of the urban population are features of all the LGAs. Figure 2.3 and the map below reflect the physical characteristics of the metropolis through the geographical location, physical structures, land use, and general features of the area. Residential use takes up 52% of the territory, transport and circulation uses 18%, institutional and specialised use is 14%, industrial use comprises 8% commercial use 5%, and open space and recreation constitute 3%.
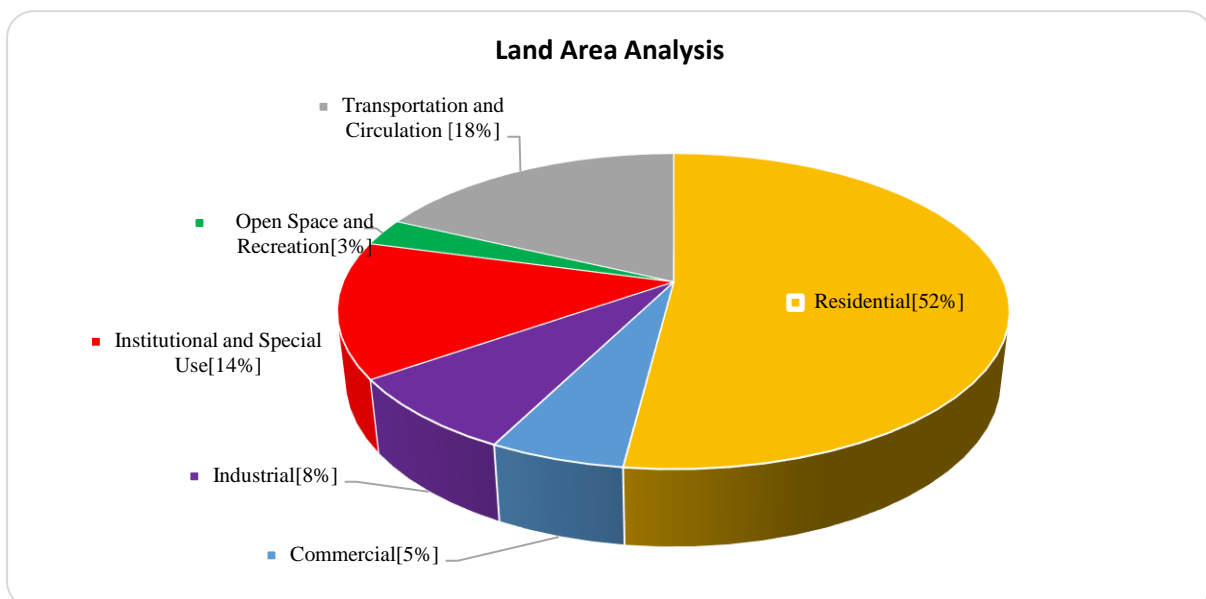
Figure 2.3 Physical structures and land use in Lagos metropolis
Source: Adapted from Lawanson (2011)

These study areas were selected based on all these physical and land use factors and the identified challenges that are relevant to this thesis. The choice of the areas considered the evidence of the literature of urban informality, infrastructure challenges, and practical relevance of these challenges to the study areas, the aim of this study, the reconnaissance survey

and the pilot studies conducted. The two study cases (Hong Kong and Lagos metropolis) were selected for the investigation to support the understanding of the nature, characteristics, and influence of urban informal settlement and infrastructure, and to develop a strategy for sustainable urban development.
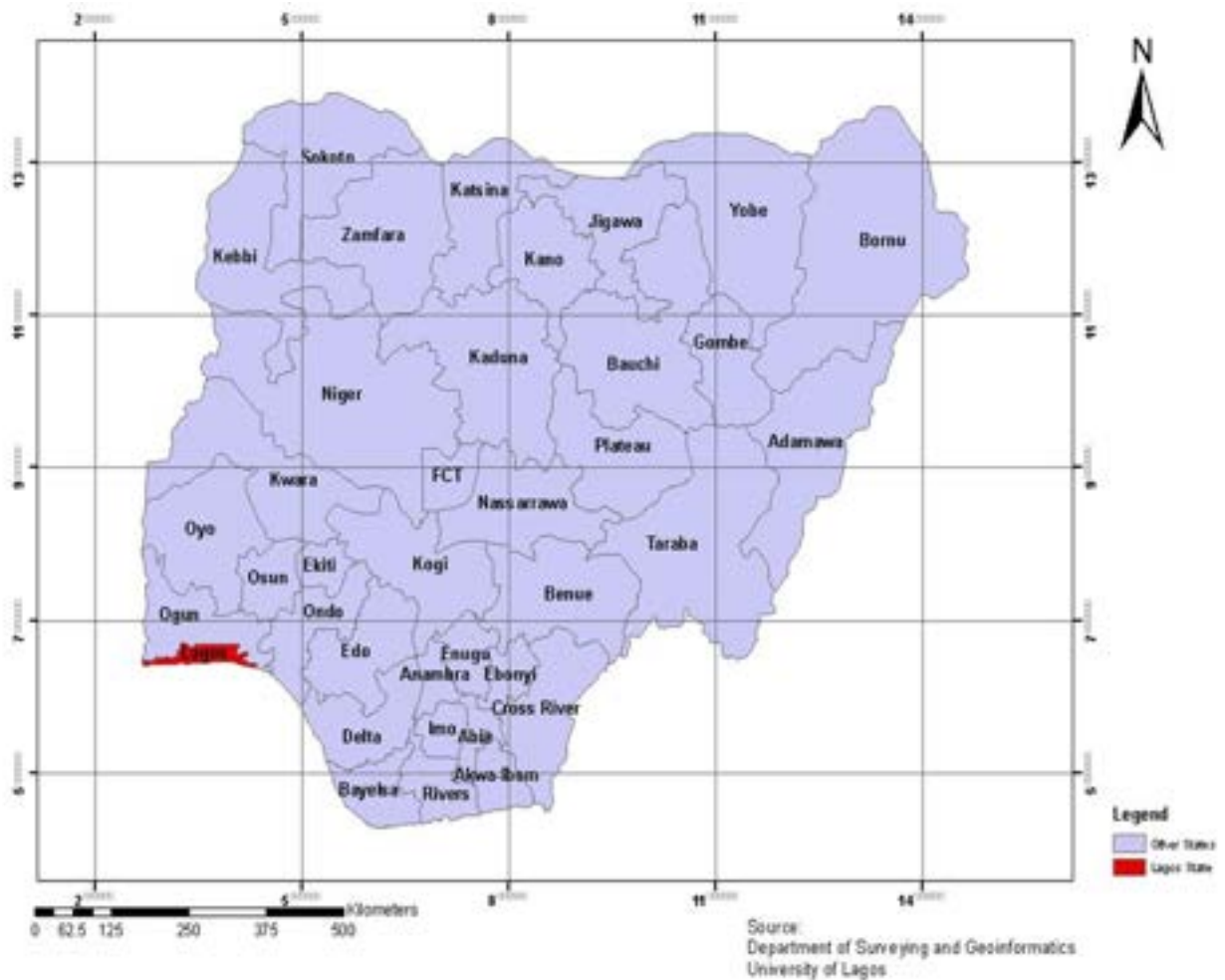
Figure 2. 4 Map of Nigeria highlighting Lagos metropolis
Source: Lawanson (2011)

Map of Lagos Metropolis Showing the Study Areas
Figure 2.5 Map of Lagos metropolis highlighting the study areas
Source: Adapted from (Lawanson, 2011; Soyinka, 2014)

The process of this thesis and its operational synthesis in this identified study areas are discussed in Section 1.10.

2.4 Chapter Summary

Hong Kong is an SAR of China, located within $22^{o}19'42"$ N and $114^{o}11'30"$ E on the southern coast with an estimated population of 7,152,000, and 1,110 sq. km of land area covering three main geographical areas or territories: The New Territories, the Kowloon Peninsula, and Hong Kong Island. Within these three territories, there are 18 districts, and this study adopts three regions, four districts and eight study sites within the four selected districts (see Section 1.8). The land use challenges of the region include the region land constraints, with 66.5% of the area made up of woodlands, shrubland, grasslands, and wetlands, which constrain the land use development of the country. The land distribution constraints in the SAR lead to exorbitant cost for housing, high housing demand and owing to the wide gap between the rich and the poor, there exists increasing urban informality and homeless. The issue of UISIP in Hong Kong dates as far back as the colonial period, and more significantly to early 1990 with the Kowloon Walled City. Several attempts, efforts, and resources have been deployed by both the

government and the urban studies professionals to improve this issue, with significant improvement being made. However, the challenge of urban informality persists.

Lagos metropolis is the coastal city of Lagos state, one of the largest cities in the world with about 30.0% formal house ownership and over 55.0% informal house ownership (UN Habitat, 2013). The metropolis is located within the latitudes 6°23" N' and 6°41" N', and longitudes 2°42" E' and 3°42" E' with a geographical area of 3,577 sq. km. Lagos has over 17 million residents with about 65% depending on the informal sector. The land use distribution of the city is characterised by 52% residential use, 18% transport and circulation use, 3% open space and recreation use, 14% institutional and specialised use, 8% industrial use, and 5% commercial use. The cause of UISIP in the metropolis is identified as resulting from economic development and land administration, among other factors, without any significant differences between formal and informal settlement. Urban informality in Lagos is evidenced by reports in academic literature and seen in physical characteristics such as haphazard urban development without adequate infrastructure provision and management (Oduwaye, 2013). This issue is also attributed to several other elements, including economic, social, and environmental factors, as well as land use management policies.

Part 2
Research Framework
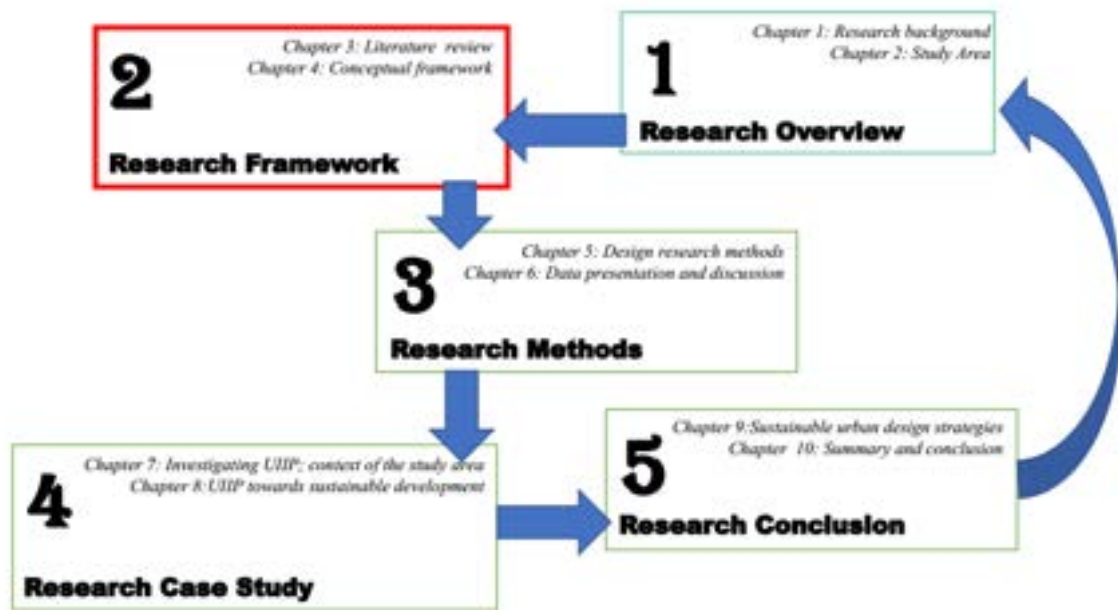
The significance of any research to advance knowledge is fundamentally based on its literature perspective in relation to other literature. This is the ability of a research to confirm its standpoint through literature.

Anonymous

Chapter 3
Literature Review

Reviewing literature is not stamp collecting. A substantial literature review does not just summarise the literature, but discusses it critically, finds methodological problems, and points out research gaps.

(M Pautasso 2013).

Synopsis

This chapter presents the literature perspectives on urban challenges, urban informal settlement, poverty, infrastructure, pro-poor infrastructure, and infrastructure planning within the global context, in Hong Kong, and in the city of Lagos. The purpose of this chapter is to create a literature basis for discussing what has been done, what is yet undone, and to find what this research will contribute. This is also necessary to develop a theoretical framework that best achieves the aim of this thesis. Thus, this chapter discusses the literature perspectives of this research from the global context, the study areas, and established the research gap that motivated further investigation in this study.

3.1 Introduction

Urban challenges are commonlydescribed as inadequate urban conditions of living, which vary in different countries across the world. Urban challenges are reflected in insufficient essential facilities and services, the high cost of housing with a substandard quality of living, street sleepers, illegal housing, and traffic and transportation issues, to name just a few aspects. Urban challenges are sustainability challenges, and they are not particular to developing countries – they are also a serious issue in developed countries with different literature perspectives (Norman & Susan, 2012; Vinit, 2012; Ziegler, 2007). The review of (Alan, 2001; Alan & Wing-Shing, 2005; Ali & Sulaiman, 2006; Ananya, 2012; Carolyn, 2005; Chiu, 2002; Dehaene & De Cauter, 2008; Hernández et al., 2010; Hussmanns & du Jeu, 2002; Jianfa, 2005; Kennett & Mizuuchi, 2010; Lai, 2015) among other works describe the challenges of UISIP as significant issues from different perspectives in various countries.

UISIP challenges are serious, and are associated with several other urban sectors such as economic, social, environmental, housing, transportation, and government sectors in different urban areas (Adeyinka, Omisore, Olawuni, & Abegunde, 2006; Douglas, 2016; Vinit, 2012). UISIP is a sustainability issue because it is a threat to the sustainability concept and induces several sustainability problems. UISIP operation and association are most evident in social, economic, and environmental problems, which constitute the primary trio of sustainability.

Sustainability is a professional term that is relevant to all professions but carries different meanings. Boyko, Cooper, Davey, and Wootton (2006) contend that there are over 70 definitions of sustainability. Per the "World Commission on Environment and Development 1987", they define sustainability as present use that does not compromise future generational use. This definition includes social, environmental, and economic uses. Considering these issues, the severity UISIP and its association with several other urban challenges constitute a sustainability challenge. This chapter discusses the perspective of academic literature in relation to sustainability and the study areas.

3.2 Urban Informality

Urban activities around the globe are defined as either formal or informal activities that operate on land. Urban activities are mostly regarded as formal activities they are regulated and taxed,

while informal activities are otherwise non-regulated, non-taxed, and with haphazard and chaotic conditions of operation, among other factors (Abid, 2015; Douglas, 2016). Urban informal activities are considered significant in the built environment because of their direct relationship with sustainable development (Abid, 2015). Urban informal activities are a phenomenon that intersect different disciplines and are usually described in different ways, with different intended meanings (Roy, 2005). These activities include various human actions within a given geographical area that are non-regulated, non-taxed, and include social, economic, and physical activities, among others. It is a cluster of several urban unregulated, non-taxed activities (economic, social and physical) that do not only include economic activities (Lawanson & Fadare, 2015; Nwokoro et al., 2015).

Similarly, urban informality is the non-regulated urban financial (monetary or commercial), housing (structures or settlements), social, and political activities that cluster together to benefit from each other regardless of proximity, and their consequential effects on other land use types (Becker, 2004). This agglomeration creates both strength and weakness for sustainable urban development. The strengths and weaknesses of these activities have been discussed from several research perspectives globally with conclusions describing informal activities as a critical challenge despite its strength (Abid, 2015; Douglas, 2016; Ziblim, 2013).

The effects of urban informality are diverse and influenced by several factors, such as population growth (uncontrolled urbanization), socio-economic factors (unemployment, wide disparity between the rich and the poor), unequal distribution of resources, and administrative challenges (political and policy issues), to mention only a few (Cobbinah, Erdiaw-Kwasie, & Amoateng, 2015; Lawanson, 2011). Rockwood and Tran (2016) discuss the challenges facing rural-urban migrant workers in Vietnam. The study concludes that rural-urban migration statistics creates a high demand for affordable workforce housing and living condition[s] in Vietnam.

The understanding that land is limited and is an irreplaceable finite resource also contributes to the issues surrounding urban informality (UN Habitat, 2013). This issues on land create intense competition between different land use categories with a significant effect on the quality of the built environment. The competiton on land create diverse needs of an urban informal activities with complex urban challenges such as squatter settlements, squalor, and urban slums (Agbola & Agunbiade, 2009). The socio-economic challenges of the wide gap

between the rich and the poor contribute significantly to these issues and affect the quality of the neighbourhood. This creates high social exclusion for urban dwellers with low capacity to afford healthy, conducive, and habitable environments, which consequently affects their health (Lawanson & Fadare, 2015).

It should be noted that these challenges and several others are visible in various urban centres, which exhibit haphazard building arrangements, shanty structures developed with either temporary or permanent materials, littered environments, traffic jams and other issues (Marjit & Kar, 2009; Wang, Chau, Ng, & Leung, 2016). Although governments intervene in land allocation and development control of competing land uses, informal settlement is often excluded (Nwokoro et al., 2015). Failure to provide designated spaces for informal settlement activities with its non-regulated forms of operations and desperation for survival forces these activities to operate on roadsides, public places, and residential areas, which has significant effects that must be assessed when devising sustainable development strategies.

3.2.1 Urban Informality as a Challenge

Despite the benefits of urban informality, its activities still constitute a great challenge for the quality of the built environment and physical planning activities in most developing and developed countries (Adeyinka et al., 2006; Roy, 2012). It is often described as an urban challenge because it generates more detriment than benefit, including urban sprawl, incompatible land uses, structure alteration, shanty structure development, urban landscape alteration, general land use degradation, and land value depreciation (Deden, 2007; Okeke, 2000). Thus, over the years, there has been a constant conflict between urban managers' efforts to keep their cities clean and the urban informal activities (Deden, 2007). These conflicts of interest are attributed to several issues, such as population growth, infrastructure, socio-economics, physical planning, and political systems.

The challenges of urban informality manifest in different forms (Hernández et al., 2010). One study described these as the consequences of collapse, varying urbanism with a multifaceted phenomenon that takes bizarre shapes in African, Asian, and Latin American cities and other regions. The study describes urban challenges in these regions and states:

> "…the physical manifestation of the city is reversed, and the 'static' or formal city is most often situated in the temporal landscape of the 'kinetic' city" (Hernández et al., 2010).

Tanasescu et al. (2010) also find urban informality as a global challenge and describe the presence of urban informality in every country of the world as a growing concern. This study further emphasises the need for a comparative study of informality, housing insecurity, and homelessness in developed and developing countries to improve strategies for solving this global challenge. This study states categorically that:

> "The tendency to examine illegal housing in developing and developed nations separately with distinct approaches has impeded our capacity for a more holistic understanding of the process that gives rise to the housing illegality" (Tanasescu et al., 2010).

3.2.2 Urban Informality as a Strength

Contrary to the popular perspectives of urban informality, several researchers have broadly recognised the importance of informal activities for the built environment and sustainable urban development (Abumere et al., 2008; Osalor, 2011; UN-Habitat, 2015d). Their studies conclude that urban informality drives the global market and supports the efficient functioning of formal economic activities. They argue that the workforce in informal economic activities comprises the vast proportion of workers in major export industries, mostly those engaged in labour-intensive operations, with machines, or with portable technologies such as those in the textile and footwear industries. Falowemo (2009) notes that informal economic activities create 10 jobs for every 1 job provided by formal economic employment in Lagos. The informal sector has become a dominant source of job creation and a source of opportunity in both rural and urban areas. Evidently, there is a large urban workforce in informal economic activities with a good percentage established in residential areas because of lower transport costs, shop rent, and other charges, which allow the owners to benefit from operating within their residential areas (Lawanson, 2011).

Aside from job creation and supporting the formal sector, informal activities also influence the socio-economic and physical development of urban development, with the sector accounting for about 75% of gross national product and 90% of new trades (Lawanson, 2011; Osalor, 2011). Nigeria is the largest country in Africa to survive on informal economic activities. This stems from its massive population of over 150 million people and decades of unimpressive financial performance, with evidence of unemployment of over 12.0% and rising poverty levels (Central Bank of Nigeria, 2009). Urban informality has been identified as the equaliser of the

economic crisis in the metropolis, functioning through survival activities that create alternative products with local materials and maintain or balance inflation. Urban informality supports the local economy by providing cheap labour and cheap by-products for the formal economy, which increases income and reduces the overhead expenses of the formal economy. These benefits are not only socio-economic (e.g. job creation and economy stabilisation) but also relate to the physical environment in several ways, including the provision of local materials for housing production and urban development strategies for sheltering the urban poor, migrant workers, and underprivileged citizens.

Schneider (2002) describe urban informality from the perspective of being economic, social, and concerning security of survival. The study shows that its significance in global urban centres is important, stating that:

> "The average size of [the] informal economy as a percentage of the official GNI in the year 2000 in developing countries is 41%, in transition countries 38% and in OECD countries 18%. A large burden of taxation and social security contributions combined with government regulations are the main determinants of the size of informal economy" (Schneider, 2002, pg.1).

While the studies of (Hernández et al., 2010; Jabareen, 2014; Soyinka & Siu, 2017b; Tanasescu et al., 2010) have described urban informality as a global urban challenge, the studies of (Jabareen, 2014; Lawanson, 2011; Schneider, 2002) have also identified its strength as a global urban catalyst.

3.3 Urban Informality: The Study of Asia

The challenge of urban informality within the context of Asia and East Asia (i.e. China, Japan, and Hong Kong) is discussed in this section to present a broader perspective of the issues in Hong Kong. Urban informality and its causes are discussed in relation to a planning approach towards solving these problems in East Asia. Urban development challenges and informal settlement in Hong Kong are also described from the perspective of the neo-liberal context of the SAR of the PRC. Discussing Hong Kong in the wider context of China and East Asia.

According to Kennett and Mizuuchi (2010), informality, housing insecurity, and the concept of homelessness is evident in Asia and East Asia and is particularly refers to as social exclusion in China, Hong Kong, and Japan according to their studies. This is one of the conclusions of

the study of (Kennett & Mizuuchi, 2010) on nature and dynamics of informality, homelessness, housing insecurity, and social exclusion in relation to institutional policy response in East Asia. The study of the three fastest growing economies in Asia (i.e. China, Hong Kong, and Japan) reveals that despite dynamic economy formation and transition towards market socialism, not all areas have benefited from the nations' vigorous economic growth. Kennett and Mizuuchi (2010) further emphasise that although economic growth and development is being achieved in these countries, it is not helping all elements of the society, nor has this growth been sustained across all their region. Although sustaining the economy and benefiting all the communities varies between these nations in intensity, depth, and development, one element that is certain and common to all three of these economies is that increasing wealth is accompanied by a widening gap of inequality, a new form of social class systems, and segregation between citizens. This widening gap presents obvious disparities between high-income and low-income earners, and skilled and unskilled (the well-educated and the less well educated) labour with a consistent gap increase by the day in their wages and way of life (Kennett & Mizuuchi, 2010).

The studies of (Alan, 2001; Alan & Wing-Shing, 2005; Ananya, 2012; Chiu, 2002; Kennett & Mizuuchi, 2010; Lee & Chan, 2008; Rufina Wu & Canham, 2009; Tam, 2012) also support the statement of (Tanasescu et al., 2010), and find that the underlying forces of informal settlement and homelessness are more complex, multi-dimensional, and connected with broader structural and socio-economic change in China, Hong Kong and Japan. Although informal settlement, housing insecurity, homelessness, and social exclusion were invisible in Asia until the early 1980s, the painful recovery from the fiscal crisis of 1997, economic stagnation, and the "Severe Acute Respiratory Syndrome" (SARS) epidemic of 2003 brought about these challenges with their numerous effects in Asia, especially in Hong Kong. Income disparity increases, the issue of job insecurity, poor working conditions, and inadequate welfare systems were features of these cities during this period, as the increase in dynamics of economic insecurity, informality, housing insecurity, and homelessness transformed East Asia. One horrible aspect of the UISIP challenge is the gradual inclusion of children and women as part of the vulnerable population. This gradual inclusion further makes the issue of informality in these regions complex. Poverty in China now includes families with the following characteristics: no stable income, no capacity to work (for various reasons), and no family support (Kennett & Mizuuchi, 2010; Tanasescu et al., 2010).

Institutional strategies, policy intervention on the part of both governmental and non-governmental organisations (NGOs), grassroots organisation, and international organisation have all been working to combat these challenges and reduce their effects. However, it is clear that these challenges are far from being resolved, and have only migrated from the visible areas to the invisible areas of these regions (Tam, 2012). The different welfare systems, and employment such as the contract jobs and part-time jobs put in place, have been unable to discuss the new conditions of economic insecurity and affordable housing challenges associated with these East Asian countries. The government of Hong Kong is tackling these challenges and creating strategies for supporting competitive economic growth by repositioning the nation to include service-oriented and post-industrial economic elements. China and Japan are implementing a plan for global market integration (globalisation), privatisation, reconstruction of state-owned enterprises, and the creation of an atmosphere for a competitive economy that will encourage more socialist economy. These economic strategies are lofty but are referred to as white elephant projects among citizens because of their highly insignificant effect these countries citizen.

Above all, the evidence of (Kennett & Mizuuchi, 2010) shows that neo-liberal globalisation, fundamental internal arrangements, and social class alteration in these countries have developed to form the environmental degradation and a more insecure society in these countries. The individual risk of social housing exclusion, housing inequality, housing insecurity, and homelessness that exists in Asia today. The study also found that there has been more recognition of increased difficulty and uncertainty in everyday life for citizens, which is usually an issue of loss of jobs, increases in debt, relationship breakdowns, and other numerous challenges that result in homelessness and general misfortune in housing conditions among people.

Despite the effort of the individuals, NGOs, social organisational, and institutional structures (political and others) contributing to improving homelessness, and informal settlement in these countries, the challenges of homelessness, social exclusion, and informal settlement persist. It persist at a higher proportion with visible destitution and street sleepers. Nevertheless, the focus of (Kennett & Mizuuchi, 2010; Tam, 2012) and other related studies reviewed, point that homelessness, informal settlement, and social exclusion in any form exists in Asia. It is greatly

influenced by socio-economic dynamics, global economic influence, and internal organizational structures, including politics, policy, culture, and governance.

3.3.1 Urban Informality: China's Experience

About urban development challenges in China, (Shao & Shi, 2012) reveal the inadequacy of current urban planning, construction, and management services of physical, natural, and infrastructural resources as producing urban informality. Their research finds the following problem areas in China's urban development:

i. Natural resources

ii. Living environment

iii. Image projects (economically wasteful investment in showy projects, called "image projects")

iv. Public safety

v. Social stratification

vi. Public finance

vii. Public policies

These seven critical areas of concern are found as very important and deserve the attention of every researcher because of their critical influence on sustainable urban development, social harmony, and the stability of the country's economy. The shortage of natural resources as a bottleneck for urban development is the most important critical area relating to urban development challenges identified in China, followed by a lack of energy resources and other issues. According to (Shao & Shi, 2012), The evidence of natural resource inadequacy, imbalanced development, low energy utilisation, and growing consumption of energy inconsistent with supply, despite the fact that 178 Chinese cities were created based on mineral resources, which account for 27% of all cities in China. Still, communities in China are presently experiencing a serious imbalance in supply and demand of natural resources, and this has become a great concern for cities' resiliency and sustainability. These issues not only affect the national economic development but also influence national safety, social stability, and security (Hao, Sliuzas, & Geertman, 2011; Wu, Zhang, & Webster, 2013).

Consequently, to the contradiction between population growth, intense land use, and China's insufficient habitable land use, quality environment and adequate arable land use energy

challenge increases. Statistics presented by Shao and Shi show that in 2004, national energy consumption was 1.97 billion tons of standard coal, which marked a 15.27% increase compared with previous years. Also, the five-year plan for arable land was reduced by 92.40 million mu (approximately 6.16 million hectares), due to fast economic and social growth. The effect of this poor living condition in China is attributed to its urbanisation, large population, and industry concentration in cities, which have created a wide range of problem that affects people's quality of life. Unbalanced habitable environment and differing economic situations between regions cause a corresponding difference in the quality of the living environment (Jianfa, 2005; Shao & Shi, 2012). Pollution increases by the day, including poisonous pollutants, and this threatens the health of China's citizens, from urban residents to suburban farmers. Such challenges have arisen in China because of technological advancement and the concentration of industrial activities in city centres. There are three basic reasons why these challenges persist, which include: China's unique population, China's continued economic growth that faces resource and environmental pressure, and policy deviation. These challenges contribute significantly to the dramatic rate of land consumption.

The issue of public safety is identified as increasing urban challenges in China and as a threat to the security of the global community. The frequent occurrence of various safety crises continues to increase, in both planned and non-planned areas, and in both traditional and non-traditional areas. The issue of public safety in China is identified as connected with accelerated urbanisation and its associated risk. The high speed of urban development and the existing urban system which cannot accommodate the ongoing urban infrastructure construction and management workload are also part of safety issues and require institutional innovations and strategies for making public safety work. These seven challenges described by Shao and Shi are all identified as contributing to urban informality and require approaches based in sustainability (Alan & Wing-Shing, 2005; Kennett & Mizuuchi, 2010; Shao & Shi, 2012).

The identifiable strata in China reflect the high wealth inequality, and there is a high tendency for less changeover in favour of equality. Social stratification also means that one's social background, including an individual's family, parents' profession, parents' educational backgrounds, and even regional differences have a considerable influence on potential professions and education. Issues of inequality are coming to the forefront with increasingly wider gaps that are becoming difficult for society to accept. Rural workers are treated unfairly

and in a discriminatory manner regarding employment and right to habitation, among other denials of rights. The study of (Shao & Shi, 2012) identified a wide gap in social resource allocation and inequality in wealth distribution due to the identified social strata that exist within society.

The issue of insufficient financial capacity by the Chinese government to fund urban construction and management is another serious issue (Hao et al., 2011; Wu et al., 2013). The Chinese government is questioning how to source the funds to give adequate infrastructure that meets the need of the people and addresses the fast-growing urbanisation of the country; the urban government needs to provide more public services and infrastructure, and this requires more funds. Also, to provide better services and infrastructure public must provide necessary financial support, but current public finance management makes it unsuitable for urban governmental functions to be transformed into public services (Hao et al., 2011; Wu et al., 2013). Considering these challenges, many actions need to be taken into consideration, such as ensuring that urban government funding incomes increase and have stable revenue sources, as well as transferring proper taxation rights to urban legislative authorities. Local taxation should be established to allow municipal bonds and an emergency response system should be recognised for urban public finance. Taxation should be proportionate to resource allocation, even with better opportunity to the lower social strata to encourage equal financial empowerment, and equal access to funds, services, and infrastructure for urban public finance (Carolyn, 2005; Shao & Shi, 2012).

The issues identified are critical to urban development, informal settlement, infrastructure planning, and general development in China, and are all urban public policy issues. These urban challenges, particularly urban informality exists in almost every country in the world, as do and different forms, different experiences of inadequacy, inefficiency, and inadequate public policy to address the issues of urban governance and management. In China, this relates to the professional and regulatory content of urban development. Urban planning policy is an integral subset of urban policy, and it affects all aspects of development regarding services and infrastructure. The significance of this urban policy as identified in China includes the issues of less acceptance or recognition, social disorder, and conflicting interests of urban planning combined inadequate government administration. Urban planning practices are distorted and

are separated from the nature of public policy, meaning they are merely used as technical tools (Jianfa, 2005; Shao & Shi, 2012).

3.3.2 Urban Informality: Hong Kong's Experience

Urban informality in Hong Kong is not abnormal or out of place because informality has been identified as existing in all countries of the world in different forms and with different natures (Schneider, 2002; Tam, 2012; Wekesa, Steyn, & Otieno, 2011). The study of Tanasescu et al. (2010) describes urban informality as ubiquitous and emphasises the need for a comprehensive case study (developed and developing country) of informality, housing insecurity, and homelessness in developed and developing nations to expand knowledge and approaches to solving these challenges

> "The tendency to examine illegal housing in developing and developed nations separately with distinct approaches has impeded our capacity for comparative and more holistic understandings of the process that gives rise to the housing illegality (Tanasescu et al., 2010)".

According to the studies of (Tam, 2012; Tanasescu et al., 2010), informal settlement is often hidden homelessness, which is simply less conspicuous to the government and a nation's citizens. According to the studies of (Chiu, 2002; Kennett & Mizuuchi, 2010; Tanasescu et al., 2010) and (Rufina Wu & Canham, 2009), urban informality exists in Hong Kong in different forms. These researchers describe the informal settlement in Hong Kong as including street sleepers, informal rooftop settlements, cage-type housing, illegal housing, housing insecurity, homelessness, and social exclusion.

Rooftop informal settlement in Hong Kong is one of the many manifestations of an informal settlement in the country. Illegal rooftop structures are dwellings built on roofs of buildings without authorisation. These structures are built to be lived in, rented out, or sold. They are built with permanent or temporary materials such as concrete, bricks, or wood, among other materials. The motivation for building these kinds of structures is to maximise income by building in identified available spaces that are under-utilised or vacant.

The official Hong Kong census on informal dwellings showed that in 1,554 houses, 3,962 people resided in this dwelling type in 2006. Surprisingly, the statistical report of rent payable by informal residents were identified as higher than that of other tenants. The informal average

rental income was estimated at 18.5%, while it was 16.0% for the general tenant population. Illegal rooftop structures in Hong Kong create confusion and challenges similar to those in Calgary, Canada with regard to enforcement and administration of legal procedures. The legal framework according to Hong Kong building ordinances finds any structures built on a roof without approval from the authorities, or any additional or alterations made to existing structures without approval, as illegal structures, and squatter settlement, and requires that these must be demolished and a legal trial held for the lawbreaker. There exists some ambiguity in the administration (enforcement and monitoring) of this law, and these ambiguities are seen as direct or indirect permission of illegality on the part of Hong Kong's government (Tanasescu et al., 2010).

Charged with the difficult task of improving urban informality, the Hong Kong Lands Department issued a press release on 22 June 2016 titled "Lands Department Announces the Findings of its Investigation and Follow-Up Actions in Tung Ah Pui Village", which discussed one of the several urban informal areas referred to as squatter settlement in Hong Kong. The press release discusses the challenges associated with urban informality extensively, with subsections discussing topics such as "surveyed squatter structures", "strengthened squatter control and improvement measures", and "non-surveyed squatter structures and unlawful occupation of government land". However, the press release ignores several other urban informal areas of Hong Kong and does not include design principles to guide the required improvements. Excerpt of the report states that:

> "There are currently 12 surveyed squatters in Tung Ah Pui Village, all of which are located on government land. Per the squatter survey records in 1982, these squatter's structures were built with permanent materials such as concrete, tiles, and bricks ... Moreover, as these squatter structures were covered in the Squatter Control Survey (SCS) in 1982, they are 'tolerated' and 'allowed to exist' on government land" (Hong Kong Department of Lands, 2016).

The SAR government named the Tung Ah Pui Village, but it is just one of the several unidentified urban informal settlements in the region.

Tanasescu et al. (2010) also report the issues of illegal rooftop structures in Hong Kong and government tolerance, emphasising that the government allow the informal dwellers to pay for services, such as postal and water supply, because of which these illegal dwellers are somewhat tolerated. Another significant activity of the government that indicates direct or indirect

permission of illegality in Hong Kong, identified by (Tanasescu et al., 2010), are government charges such as property taxes and other municipal charges levied on these illegal structures. This implies that the land registry also directly or indirectly recognises these informal settlements and legalises the purchase and/or renting of these structures, even though the law categorises these structures as illicit or informal settlement and the Hong Kong Council of Social Science refers to these structures as illegal.

The research of Tanasescu et al. (2010) further indicates that the government in Hong Kong is not active enough or is simply indifferent to identifying and implementing laws relating to these illegal structures. Government inaction on the issues of informal settlements can be summarised as follows:

i.   If the illegal buildings are not complained about and are not constituting a nuisance (e.g. safety risk, public disturbance) to the public, they are directly or indirectly tolerated;

ii.   There are several factors related to limited resources in enforcing policy consistently, including the social effect of removing such structures and the relationship that exists between the supply and demand of rental housing in relation to the removal of such illegal building;

iii.   The enforcement of zoning, building compliance and codes is complicated in application;

iv.   This government tolerance is identified to be influenced by culture and non-compliance, which is extremely complicated for government policy or political influence to interfere in;

v.   The illegal structure involves an agreement between the operators and occupants in relation to government actions as either active or inactive with neighbourhood compromise;

vi.   The complex situation of officials accepting secondary shelter and recognising them as part of public rental housing is another issue of significance that further muddies public understanding regarding their illegal status.

The study of legal and law enforcement conditions of illegal rooftop dwellings in Hong Kong reveals shifted policy approaches, which according to (Tanasescu et al., 2010) are changing political and economic structures. The social context of public outcry and neo-liberal attitudes in Hong Kong create a complex system of administration and enforcement regarding illegal

rooftop structures. The study makes it clear that the illegal housing situation in Hong Kong is of great concern to the government and it also affects the privacy, social self-esteem, health, and safety of the citizens who occupy these dwellings.

3.4 Urban Informality: The Study of Africa

Chirisa, Kawadza, and Bandauko (2014) study the management of Africa's urban landscape with regards to the sustainability of current land management practices in African cities such as Nairobi, Abuja, Harare, Kigali, Johannesburg, and Addis Ababa. They find that these cities cannot achieve their desired sustainable development. The study notes that Africa's land management varies from contexts that can achieve or foster development and required critical assessment of issues before policy strategies are implemented. The study identifies important challenges in the land tenure system, land administration corruption, issues with political will, and the receptivity of foreign philosophies in urban land governance. These challenges, among several others, are identified as manifesting in several urban areas with urban informality and issues of infrastructure planning significant in the regions studied.

According to Opuenebo and Mabel (2006), the concept of urban informality in Africa is one of the concepts that has been applied in different research and urban studies. It has been used to characterise economic issues, types of building, and urban development. Informal settlement is a constant urban challenge in developing countries, and a significant portion of the population of African cities is housed in informal urban settlements (Abbott, 2002). Between 50 and 60% of the world's population lives in urban centres, and the challenges of urban informality in Africa, in particular, are enormous, as it was estimated that between 50% and 80% of poor and low-income earners live in an informal urban settlement in African cities (Aluko & Amidu, 2006). The world highest urban growth rate is found in Africa, with an estimated annual average growth of 4%, with 34% of the continent's total population living in urban areas. By 2030, Africa is expected to house more than half of its population in informal urban settlements (Abbott, 2002; Aluko & Amidu, 2006).

Nwaka (2005) in Opuenebo and Mabel (2006) state that "the informal sector encompasses a wide range of areas of informality – environmental, spatial, economic and social, covering business activities, employment, markets, settlements and neighbourhoods". Africa exhibits the largest share of these challenges, followed by Asia and Latin America. In a study of urban

planning and small-scale enterprises in Nairobi, Kenya, (Muraya, 2006) also emphasises that the informal sector has played an important role in the challenges and opportunities identified in Africa and developing countries in the world, and there is a recognition by governments and international agencies for the need to ameliorating the challenges associated with informality. (Lukeman, Bako, Omole, Nwokoro, & Akinbogun, 2014) state that slums (informal settlement) will be permanent fixtures in developing cities in Africa, Latin America, and Asia. The authors argue that slums are a condition of settlement that occurs because of inadequate control or management of non-regulated activities of residents in urban centres across the globe. The issue of urban informality is a global challenge, and Africa (among other developing regions of the world) is experiencing a severe aspect of this challenge. Considering the evidence from the literature reviewed in this study, the occurrence and significance of urban informal settlement in Africa cannot be overemphasised, as it occurs in different styles, shapes, and with varying severity across many countries in Africa.

The literature reviewed all point to different causes, sources, and features of urban informality in Africa. Above all, the most significant factors influencing these challenges are identified as urbanisation, rapid population growth, poverty, poor administration or systems of management, corruption, and the wide gap between the rich and the poor. The study of (Abbott, 2002) states that the conventional method-based approaches (urban renewal, sites, and services schemes) adopted are inappropriate or wrongly implemented, and the agencies' adopts old practices or principles which do not address the challenges of UISIP. Thus, the pervasive nature of urban informality in Africa reflects that there is no significant effective planning strategy or framework for integrating, upgrading, or improving UISIP (Lawanson & Fadare, 2015; Opuenebo & Mabel, 2006; Watson, 2009)

3.4.1 The Challenges and Characteristics of Urban Informality in Africa

The severity of the challenges and characteristics of urban informality in Africa are diverse, complex, and severe. This study may not be able to describe all these challenges in full, but attempts are made to present realistic perspectives in this study. The informal sector in Africa gives the most significant means of survival for many Africans, either through informal settlement, the informal economy (business and employment), or informal socio-cultural activities (Gerhard & Arie, 2012; Nwokoro et al., 2015). An informal settlement in Africa is

so important and significant that in content or context, the informal (settlement, economy and socio-cultural activities) and formal may not be easily differentiated from one another (Abbott, 2002). Considering the challenge of the urban informal settlement specifically, the substantial social aspect of informal settlement remains difficult to measure and is difficult to improve. The challenges and characteristics of urban informality are, however, identifiable, and are associated with traditional, socio-cultural, social exclusion, economic and infrastructure inadequate driven by top-down approach. Despite the different attempts made by different researchers and government agencies to address these challenges, the fact remains that there is no clear, effective way to make meaningful improvements (Gerhard & Arie, 2012).

Abbott (2002) states that after three decades of best practices regarding how to address the challenges of informality, these challenges are still far from having a clear practice despite different consensuses at different points. The prevalent approaches identified according to Abbott's studies are still based on sectoral interventions. In his research, Abbott never disputes these approaches, but he does state that although they have achieved a certain degree of success, the failures of these traditional planning and engineering approaches (i.e. method-based approaches) simply call for better modern approaches. The study does not state that the method-based approaches should be abandoned, instead it advocates for structured and interrelated actions that comprise a rational framework with internal cohesion that will produce a designed outcome. Abbott states that:

> "A settlement is not an island; it is an integral part of the city of which it constitutes a physical part. To isolate it is to cut off a part of the city, to the detriment of all who live there…"

The study advocates for a comprehensive, method-based, rational approach that can only be achieved through an international collaborative effort of study and intervention. This perspective is expected to be a more generic, holistic methodology that provides a framework for long-term design, planning, and improving informal settlements in a structured, cohesive, and prototyped manner. In the process of proffering solutions, the following indicators were identified by Abbott (2002) as requiring measurement to improve urban informality challenges:

i. Physical risk associated with the site;
ii. Personal risk;
iii. Livelihood;
iv. Ability to withstand shocks;

    v.   Ability to withstand negative trends;

   vi.   The recognition of intangible assets;

  vii.   The social value of tangible assets;

 viii.   The social value of communal assets;

   ix.   The impact on informal sector activities;

    x.   Spatial relationship (Abbott, 2002).

The study finds several comprehensive, rational, method-based approaches for improving the challenges of urban informality in Africa, ranging from decision-making structures and spatial relationships to extensive community participation derived approaches, to demographic, social, and economic principles. The discussion of infrastructure was identified as important for improving informal settlements through the multi-level decision-making process for urban development projects. A summary of the literature on the challenges and characteristics of urban informality in Africa describes the problem as a unique challenge that is deeply rooted and interwoven with different sectors of African countries. The problems and characteristics of urban informality are complex, and the amelioration of difficulties or improving issues around urban informality is a process that should not be approached from the developmental or urban renewal perspective alone but should involve a comprehensive plan. The challenge not only relate to poverty or economics, but also involve corruption, control, care for each other, social exclusion, inequity, and other factors of vulnerability. Thus, this study identifies comprehensive approach for social and economic integration to provide a framework for achieving spatial integration and the formulation of cohesive and proper institutional/organisational structures.

3.4.2 Urban Informality in South Africa

Urban informality in South Africa (SA), like every other developing country, is associated with rapid urbanisation, globalisation, economic challenges (significant income disparity), socio-cultural discrimination, and other issues. Watson (2009) said that a group of several factors foster urban informality in SA, but the issue of peri-urban areas is important in considering this phenomenon. The issue of inadequately planned environments, zoning, segregation, and concentrated development in some areas forces suburban and peri-urban areas to develop with lack of access to shelter, infrastructure, and consequently informal urban areas. Watson's study emphasises that poor populations predominantly occupy these areas, with weak local

governments and evidence of environmental challenges. This results in social exclusion and segregation, among other adverse outcomes.

In a study of the judicial system, policy making, problems, pressure, and contradictions that exist with regard to informal settlement upgrading, Ziblim (2013) identifies access to adequate housing as a serious challenge, despite the effort of SA's government towards housing provision. The study states that despite the attempts since 1994 to make affordable housing available to about 2.3 million poor households though project-linked subsidy schemes, the current backlog of housing demand in the country is still 2.1 million households, with approximately 1.2 million of this population living in an informal settlement. The condition of this population is described as precarious, with serious threats to health, safety, and security. In 2004 the government aimed to eradicate all informal settlement by 2014, and established an initiative called the "Upgrading of Informal Settlement Programme (UISP)". However, Ziblim (2013), in a study assessing the efforts of policy, legislative context, and the implementation challenges of upgrading informal settlement through the scheme established that the goal of the initiatives is still far from reach.

Brown-Luthango, Reyes, and Gubevu (2016) also describe physical infrastructure interventions as a strategy to improve economic, environmental, social, and health factors and address violence and insecurity experienced by informal settlement dwellers. Their study finds that while there has been an improvement in living conditions, there is still uncertainty about what constitutes the improvement as the environment is still deprived. However, the paper states that physical improvement and the provision of basic services and facilities are necessary factors for the improvement of living conditions, reducing vulnerabilities, and improving the safety of informal settlement inhabitants. The investigation of three different settlements (Freedom Park-Mitchell's Plain, Sheffield Road-Philippi, and Monwabisi Park, Khayelitsha) in SA reveals that physical development and infrastructure improvements must be supported by social and economic programmes to achieve the required settlement transformation in these areas. The study states that this is necessary to break the cycle of poverty, relieve high unemployment, improve poor education, and provide an opportunity to sustain the impact of the improvement in the region.

3.4.3 Urban Informality in the City of Lagos

Agbola and Agunbiade (2009) state that the agglomeration of migrants in Lagos has spurred a consistent increase in size and complexity of the city. This increased growth is associated with a profound effect on land use, landforms, and other urban land use in the city. Alade (2010) estimated that the current population density of Lagos' metropolitan area is 20,000 people per sq. km. Incompatible land uses, traffic congestion, pollution, and other issues with different effects are identified as challenges associated with the agglomeration of activities in the metropolis (Agbola & Olatubara, 2008; Oduwaye, 2013). The increase in urban population has led to the emergence of urban informality with the advent of more slums, illegal conversion of the built environment into other uses, obsolete settlements, and insecurity of lives and property in the metropolis. This study and several others have described the emergence of these issues as arising because of an uncontrolled influx of migrants with non-regulated economic activity in the metropolis (Adetokunbo & Emeka, 2015; Agbola & Agunbiade, 2009; Jiboye, 2011; Lawanson, 2011).

Evidently, these challenges are interrelated with other factors that have a consequential effect. The issue of population growth in relation to the effect of urban informality on the environment cannot be separated from infrastructure, and vice-versa. Soyinka, Siu, Lawanson, and Adeniji (2016) state that the challenges of infrastructure combined with socio-economic factors affect urban informality in Lagos with a substantial effect on residential areas. The study shows the agglomeration of urban informality without adequate management creates pressures on infrastructure such as roads, electricity, drainage, and other elements, which produces an adverse effect on the built environment. They argue that integrating smart infrastructure can improve these socio-economic and environmental challenges for sustainable development.

Socio-economic factors such as high cost of living, unemployment, poverty, and social exclusion are more significant in the study area and exacerbated by uncontrolled population growth and infrastructure breakdown, which forces residents into urban informal economic activities (UIEA) and has a profound effect on the built environment. These challenges affect every other area of urban living. In the built environment, UISIP issue is associated with the haphazard spread of inadequate structures and a degraded, polluted, littered environment. Furthermore (Douglas, 2016; Farinmade & Anyankora, 2012; Mba, 2008) noted that the threats

of urban informality to physical planning activities and the quality of the developed environment in residential areas of the metropolis are severe, and involve several environmental degradations.

Agunbiade (2013); Oduwaye (2013) discussed urban informality in relation to physical planning activities and the quality of the built environment (land use, structures, and infrastructure). They contend that the competition between these activities and several other land uses, combined with inadequate management by physical planning authorities results in the identified challenges of urban informality on the physical environment. The physical challenges of urban informality cannot be separated from the political or administrative issues of the metropolis, which are closely related to physical planning administration. Additionally, Soyinka (2013) found that the identified administrative and physical planning issues of urban informality on the quality of the built environment are associated with several severe problems in Lagos. The study states that the lack of clear development control actions, lack of a quality database, inadequate planning implementation tools, and inferior control strategies contribute significantly to the current challenges in the metropolis. The disjointed physical planning regulations with inadequate physical planning parastatals or structures were also identified as hindering effective administration strategies to ameliorate these challenges.

The problems of administration in Lagos with regard to the regulation of urban informality include outdated land-use decrees, land laws, and planning laws, such as Land Use Decree (1978) and NURP Decree 88 (1999), among others. The most significant and critical aspect of the challenge of regulating urban informal settlement activities is the silence of all regulations (including decrees and laws) on this issue of urban informality. The role of many and disjointed Lagos planning laws and other laws like traffic laws also contribute to the ambiguity, confusion, ineffectiveness, and weak operations of physical planning regulations of urban informalities in Lagos.

Urban informality in Lagos has been discussed from different perspectives with different urban planning approaches to discuss this issue in the metropolis. Farinmade and Anyankora (2012) and Lawanson (2011) describe it in relation to economic activities, while Aluko and Amidu (2006) and Olajide (2010) discuss urban informality from the housing and settlement perspectives, including land regularisation, tenure, land use policies, and general urban land management. Nwokoro et al. (2015), Opuenebo and Mabel (2006), UN-Habitat (2015b), Lawanson and Fadare (2015), and Lawanson (2007)

also contribute to this body of knowledge with perspectives that consider low-income settlements, poverty, environmental health, and urban disparity. Soyinka and Siu (2017) investigate the professional views of urban informality and infrastructure planning challenges. However, despite the studies mentioned here, there is a dearth of literature on informal urban settlement in Lagos metropolis, especially regarding the research question of the present study and the adoption of tactical urbanism to address the challenges of UISIP and sustainable development.

Aluko and Amidu (2006) and Olajide (2010) attribute the causes of urban informality and infrastructure challenges in Lagos to inefficient land use administration and planning systems. This inefficiency was found to have contributed to the high incidence of informal housing and settlement development in the metropolis. Consequently, informal urban housing and informal settlement create infrastructure planning challenges. Poor infrastructure provision and distribution also contribute to the challenges of urban informal settlement development. Thus, the issues of urban informality and infrastructure planning are interrelated, interdependent, and are associated with inefficient land use administration and planning systems in Lagos (Gandy, 2006; Otegbulu, 2011; Soyinka & Siu, 2017).

Land administration and planning policies are crucial tools for urban planning. The efficient functioning of any urban structure or pattern of development is a function of its land administration and planning policy. Land use administration and planning policy in Lagos and Nigeria originates from customary law. Customary law is a system that recognises individual interest, family interest, and community interest regarding land. It is a system of land law and customary administration where the chief or family heads hold the land as a trustee for the interest of the people. This customary system was used before the Land Use Act of 1978, which vested all land authority was to the governor of each state. This act was described as engendering several urban land use challenges, which include the dual processes of land ownership, land speculators and several other land disputes (Olajide). The presence of these challenges and continuous population growth has led to urban informality and infrastructure challenges in the metropolis.

The reality of urban informality and infrastructure challenges in the metropolis reflects that urban formal houses continue to be in short supply, because of the land tenure-ship and land acquisition bureaucracy. The cost and complex land matters in Lagos metropolis have made the land acquisition goes beyond the reach of the poor. This situation encourages informal development with both permanent and temporary structures, street trading with several features of slums and squatter settlement in the metropolis (Lawanson & Fadare, 2015; Oladije, 2010). Public utilities and services are insufficient and overstretched from the reach of the general people. More than half of Lagosian are tenants and homeless in both slum and non-slum areas of the metropolis (UN Habitat, 2013). There is

no difference between the slum and non-slum areas regarding house ownership within the urban centres of Lagos metropolis. Most urban areas are informal occupancy (legal status), that is, without adequate and constitutional recognised title of ownership. The challenges of urban informality and infrastructure are evidence in Lagos metropolis without much emphasis, and it thus needs urgent attention to address this issue of sustainable development in the metropolis.

3.5 Infrastructure

[2] Infrastructure is a broad word with different definitions and different classifications. Infrastructure according to Fox (1994) in (Ijaiya & Akanbi, 2009) includes roads, water supply system, mass transportation, solid waste system, electricity, telecommunications, sewage and sewerage system. Also, Jacobson and Tarr (1995) in (Ijaiya & Akanbi, 2009) says, infrastructures are the network of structures and frameworks that bind the modern cities and metropolitan areas together. These are the network of structures that connect the environment, economic, and social activities together in any settlement. The definition of Oshikoya et al. 1994 in (Ijaiya & Akanbi 2009) also identify them as facilities and services but classified them into two perspectives. The first classification is identified infrastructure as the softcore or social infrastructure, while the second classification is the hardcore or physical infrastructure. The soft-core infrastructures entail facilities and services such as healthcare, educational services, diverse types of government structures among others and are often referred to as the drivers of social and economic activities. The hard-core infrastructures are the physical structures or facilities such as telecommunications, power, transportation system (roads, railways, seaports, and airports), water supply and sewerage system.

The review of (Ijaiya & Akanbi, 2009), (UN-Habitat, 2015a), World Bank (2013), (Choguill, 1996a), and other literature presents infrastructure as the combination of functioning facilities and services that enables the adequate functioning of human habitat. Also, some of the literature categorise infrastructures in the same way, and few generalise the nature of the infrastructure. It is the totality of facilities, basic utilities, services, and structures that allow the

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effective functioning of human habitat; promote the social, economic, cultural, and political integration of the people.

Choguill (1996, p.391) states categorically that the availability of adequate infrastructure is a prerequisite for urban sustainability. The study added that infrastructure is another strategy to improve the challenge of environmental sustainability and in-turns contribute to the quality of living of the people. Considering the emphasises of (Choguill, 1996a) and other literature, there is a relationship between infrastructures and sustainable development. Consequently, there is a relationship between infrastructure adequacy, informal settlement, and sustainability. Infrastructure is complicated to define; it is described in diverse ways and different context. It is the umbrella term for facilities and services which are overhead expenses and propel sustainable, functional environment (Choguill, 1999). Aigbokan (1999) referred to it as the network of facilities that integrate the society for effective functioning, and it includes facilities, services, and utilities.

Infrastructure is a universal term that refers to a series of interconnected and a network of basic facilities, services, utilities, capital equipment's required for effective functioning of a country, community, society or an area. (Familoni, 2006) opined that infrastructures are basic services for the development of an area. (Choguill, 1996a, 1999; Ijaiya & Akanbi, 2009; UN-Habitat, 2015a, 2015b) among other literature refer to infrastructure as the functioning facilities, services, utilities, and equipment's that enables sustainable living condition in a giving geographical area. Their studies identify infrastructure as a broad term that includes network of structures that are privately or publicly owned and that induce functional interrelationship between socio-economic, cultural and political system of a society with the environment to achieve adequate standard of living (Gandy, 2006; Olaseni & Alade, 2012; Otegbulu, 2011).

The word infrastructure is universal, but the definition is diverse globally and is used differently in a different context but all with similar meaning. Public or social services refer to these facilities, services, or utilities as the common goods of the people. These include water supply, healthcare delivery, education, postal and telecommunication facilities, and electricity. Adequate infrastructural services are indispensable for the physical, social and economic development of a nation (Familoni, 2006). The adequacy of infrastructure helps to determine a country's success or failure in diversifying production, coping with population growth, reducing poverty, and improving environmental conditions (Gandy, 2006). In any discourse of

infrastructure, it is important to note that infrastructure can be broadly classified into holistic meaning or categories in the different context of uses such as physical infrastructure (water, roads, electricity, and telecommunication) and social infrastructure (education, health, recreation and housing). These categorisation does not necessarily mean differentiation or superiority but the diversity of use of the term infrastructure. The following few classifications of infrastructure was identified from the summary of literature reviewed by this study, and they are identified based on the context of use as follows:

Table 3. 1 Literature classification of infrastructure

Author/Source	Infrastructure Classification		
Ijaya (2009). An Empirical Analysis of the Long-run Effect of Infrastructure on Industrialization in Nigeria	Oshikoya et al. (1994)	Softcore/Social • Healthcare • Education • Governance • Accountable assets • Socio-economic structures	Hardcore/Physical •Telecommunication •Power •Transport (roads, railways, seaports, and airports) •Water supply •Sewage
	Jacobson and Tarr (1995)	Physical, social, and economic assets • Streets • Highways • Waste disposal system • Water &sewer line • Electricity • Gas supply • Distribution facilities • Telecommunication network	
	Fox (1994)	Group classification it as sets of the public supported services by public sectors. This is all facilities and services inclusiveness.	
	World Bank (1994)	It is classified as an umbrella term for social overhead capital	
		Public activities • Power • Telecommunications • Piped water supply • Sanitation & sewage • Solid waste collection • Pipe gas	Public works • Roads • Major dams and canal • Irrigation •Drainage	Transport • Urban and interurban railways • Urban transport • Ports and waterways • Airports
Choguil (1999). Community infrastructure for Low-Income Cities: The Potential for Progressive Improvement	Social infrastructure • Healthcare • Governance structures • Public or communal structures	Physical infrastructure • Water supply • Sanitation facilities • Drainage • Urban roads • Solid waste disposal facilities • Land management	

Olaseni and Alade (2012). Vision 20:2020 and the Challenges of Infrastructural Development in Nigeria	Social infrastructure (Socio-economic)	Physical infrastructure (Public Utilities)
	• Education • Health • Water and sanitation • Recreation • Public communal areas etc.	• Power • Telecommunications • Piped water supply • Sanitation and sewage • Solid waste collection and disposal • Piped gas (Public Works) • Roads • Major dams and canals • Irrigation and drainage (Transport) • Urban and interurban railways • Urban transport • Seaports and waterways • Airports • Oil and gas
Familoni K.A (2006) The Role of Economic and Social Infrastructure in Economic Development: A Global View	Economic Infrastructure	Social Infrastructure
	Classification based on public utilities that services that are: • Consumption bundles • Large-scale expenditure • Stimulus to economy • Input to private sector production	Classification based on public utilities that services that are: • Social marginal productivity • Even thou economic value is involved, but it is the human capital development • Design to provide knowledge, skills, cultural/societal value development

Source: Author (2016)

Consequently, to the direction of different classifications and to avoid overemphasising the classification by different literature, the summary of varying literature above highlight infrastructures as economic infrastructure, social or socio-economic infrastructure, and physical infrastructure. However, for this research, infrastructure is classified into social infrastructure and physical infrastructure, and the cases selected for further studies is based on physical infrastructures.

3.5.1 Social Infrastructure

Social infrastructure from different kinds of literature and for this thesis is described as the (public or private) facilities and services which promote social development and enhance the quality of living of the people. Education and health are the two dominant social infrastructures which can have a profound effect on settlement development and economic development of any nation. Education has been considered as a very important source of economic growth. Even though education may be a social investment, it is also a financial investment since it enhances the stock of human capital (Agbola, 1998a). Again, the role of education as social

infrastructure, a stimulant of growth and development can be enhanced only if it is qualitatively provided. Qualitative education is a significant determinant of the stock of human capital. It has proved to be the vehicle for national transformation in human history, and no nation ever rises above her investment in education (Otegbulu, 2011). Health is one of the significant determinants of labour productivity and efficiency. Public health deals with the environment in which economic activities and settlement growth take place. In fact, the convenient environment would be permissive of accelerated growth and development with the availability of social infrastructure.

3.5.2 Physical Infrastructure

Physical infrastructure which is also referred to as technical or hardcore infrastructure is that servicing facilities that function as conveyance or channelling of people, vehicles, fluid, energy, or information which takes the form of network or nodes for achieving the quality of human living. Aside from the classification of the facilities and services by the uses, physical infrastructures are identified irrespective of their use with significant permanent structures. This is defined according to Fox (1994) in (Ijaiya & Akanbi, 2009) as the services from public works that support private sector production and household consumption. Physical infrastructure can simply be described as the "social overhead capital" by development economists. Precisely, it is referred to as a network of transport, communication, and public services – all functioning as a system or as a set of interrelated and mutually beneficial services provided for the improvement and general well-being of the population (Otegbulu, 2011).

These are also referred to as the 'Hardcore' facilities, heavy structure facilities that are generally seen as the inducers of economic activities and this mostly includes telecommunications, power, transport (roads, railways, ports, and airports), water supply and sewerages among others. Physical infrastructure from all description is identified as the types of infrastructure that are better provided by the public or public-private provision and cannot be provided or maintained by an individual or private resident of a community.

The challenges of infrastructure are a global challenge, and they are considered to affect the urban environment in different ways. "The challenges of economic and social progress for a long time has remained at apogee in the hierarchy of needs of many nations in both the developed and developing countries of the world"(Olaseni & Alade, 2012). (Familoni, 2006)

reported the statement of The World Development Report on infrastructure published in 1994 that the "percentage increase in the stock of infrastructure is associated with the percentage increase in the Gross Domestic Product across all countries of the world". The World Development Report as cited, infer that as countries developed or increase in population, infrastructure must be designed to support such growth and such increase proportionately. Metropolitan cities of the world, global south, and the rest are faced with an ever-increasing crisis of adequate infrastructure provision such as water, housing and mass transit system (Gandy, 2006).

3.5.3 Infrastructure in Hong Kong

Hong Kong infrastructure regarding social, economic, physical, and environmental facilities and services is one of the best in the world. It is a network of efficient and functioning facilities and services that make the city a 24hours community without any challenge. Its transport is advanced with well-connected roads, MTR services, airport and its seaport is recognised for excellent performance. Its highways system link the above and underground rail network, bus and minibus routes, tram rides, taxi and ferry, makes it compacted without any difficulty in getting to a location (Mehk Meetings & Exhibitions, 2017).

Despite the excellent infrastructure development in Hong Kong their several urban challenges such as urban informality, a hidden slum in prosperous community of Hong Kong and a wide gap between the rich and the poor. The citizen's protest about the state of development, request better services, ask for economic empowerment to compete favourably with the foreign investors, reduce poverty and bridge the gap between the poor and the rich. In response to the agitation of the populace in October 2007, the Chief executive officer of the Hong Kong Special Administrative Region (HKSAR) announced ten (10) major infrastructure projects for Hong Kong's economic growth in the 2007-2008 policy address (Wong, 2011). Although the infrastructure is excellent, this statement confirms the relationship between infrastructure, economic, social and environmental development. Wong (2011) states policy objectives as thus: a) "promoting economic development through infrastructure projects", b) "promoting community development through revitalisation", c) promoting social harmony by helping people to help themselves". The policy accepts the need to keep up with the latest development

in the region with accelerated infrastructure development for the next five years through high priority to infrastructure development.

The infrastructure in Hong Kong is excellent, but it can be improved for the adequate living condition of its citizens, reduce the rate of a street sleeper, bridge the wide gap between the rich and the poor and several other urban challenges in the region. Confirming this situation Wong (2011) states the policy position:

> "In promoting economic development, our top priority is to consolidate Hong Kong's status as an international financial service and shipping. The economic benefits brought about by the accelerated infrastructure development are apparent..." (Wong 2011, pg. 2).

Above all, the difference between Hong Kong and other developed and developing country include its compact nature and it high-density development. In recent past, its government has been implementing a massive infrastructure development program. The transport and housing bureau published it railway development strategy 2014 which include seven new railway networks to be completed over the next fifteen (15) years (CBRE, 2015). Li, Ng, and Skitmore (2012); Mok, Shen, and Yang (2015); Ng, Wong, and Wong (2013) identify the need for the development of stakeholder's participation in the planning and design of the major public infrastructure to ensure its success. The study states that the conflict between the proper public participation in the projects is part of the challenge that generated several urban challenges in the region.

3.5.4 Infrastructure in Lagos Metropolis

Describing infrastructure in Lagos Metropolis according to the definition of (Aigbokan, 1999) categorised infrastructure into different classes by types, nature and uses. (Aigbokan, 1999) gives examples of physical infrastructure in Lagos Nigeria as public utilities such as power, telecommunications, piped water supply; sanitation and sewage; solid waste collection and disposal; piped gas as well as public works which include roads. Major Dam, canal works for irrigation and drainages; transport projects like urban and interurban railways; urban transport; seaports and waterways; airports and others. The research of Aigbokan further describes physical infrastructure in Lagos metropolis as the significant determinant of growth and measurement of countries performance. The economic, social, and physical development of a community follows a rational well-coordinated; harmonised path; and a growth of

infrastructure that follows such harmonised infrastructure with a big boost in the development of the area.

Infrastructure is also a term used in several disciplines, and it can only be described as the network of interconnected, physical, socio-economic and environmental facilities and services that provides effective functioning of a given geographical space (Soyinka et al., 2016). It is a term mostly used to describe basic facilities and services such as telecommunications, roads, drainage system, electricity and other utilities that make human environment habitable (Olaseni & Alade, 2012; Verheijen, 2016). The term infrastructure although defined and used differently, it is majorly classified into three broad categories: the physical infrastructure, social infrastructure, and economic infrastructure (Dukiya, 2014; Familoni, 2006; Ijaya & Akanbi, 2009; UN-Habitat, 2015 and Zhang, Wu, Skitmore, &Jiang 2015). Lagos is significant as the case study area of this research, considering the rapid population growth of the metropolis with the alarming rate of infrastructure challenge. These challenges are evident in the municipality with physical characteristics such as haphazard urban development without adequate infrastructure provision and management (Oduwaye, 2009). Infrastructures such as roads, electricity, health care services, and sewage system are grossly inadequate. The regular experience of Lagos' residents are inadequate shelter, non-availability of infrastructure and where they are available, they are over-utilised, misuse to induce several other urban challenges.

The summary of infrastructure in Lagos Metropolis according to the literature reviewed, reflect a degraded and inadequate infrastructure in the metropolis. The Lagos metropolis rapid urbanisation and population surge are also identified as part of the metropolis infrastructural challenges. Prominent among these challenges is the high poverty rate and non-availability of infrastructures in the metropolis. Nigeria. Lagos State Government (2005), estimates that 51% of men and 54% of women resident in Lagos live below the poverty line and which are an informal settlement of the Lagos metropolis and are identified with a dearth of infrastructure. This is characterised as the 3rd world countries which are posed with the challenges of infrastructure, urban poverty and which contributes to the detriment of the growth of the countries. These infrastructural challenges manifested with the growing number of largely unskilled, unemployed and homeless migrants from the rural areas of the country into Lagos.

This migrants find it convenient and affordable to live in this existing slum communities or create new slum area without basic facilities, services, and amenities (Lamina, 2015).

3.6 Sustainability

Sustainability is a professional term that is relevant to all professions but carries different approach to achieve the same purpose. Boyko et al. (2006) state that there are over 70 definitions of sustainability. Per the "World Commission on Environment and Development 1987", they define sustainability as present use without compromising the future generational use (Wiedmann, Salama, & Mirincheva, 2014). The definition includes a) social, b) environmental and c) economic uses by people without compromising future uses. The accepted definition of sustainability, as described by (Boyko et al., 2006; Glanville & Turnbull, 2007), states that the social, environmental and economic uses for sustainability are not necessarily qualitatively equal to and mutually interacting in dimensions. Rather, they occupy various positions in the hierarchy depending on the specific sustainability focus. This research adopts sustainable urban development within the described context above as the "sustained abilities" of urban livelihood (residential, recreation, economic and commercial activities) to achieve the present needs of the people without jeopardising their future needs (Boyko et al., 2006; Glanville & Turnbull, 2007; Soyinka et al., 2016).

Sustainability is a universal, multi-dynamic, and interdisciplinary idea that promotes the adequate use of a resource without jeopardising its ability for future use. It is a philosophy that considers the tripod of economic, social, and environmental factors to ensure that human activities do not deplete resources used. Glanville and Turnbull (2007) argue for sustainability to exist, there must be a feed-forward and feedback between nature and the stakeholders with mutual benefits. In this study, this concept is adopted to describe the relationships that are needed in the sustainability tripod of achieving improved urban informal areas and infrastructure in the study areas. Figure 3.1 describes the application of sustainability in this study and further divides this concept into socio-economic, eco-efficient, and socio-environmental factors, which are driving forces for ensuring sustainable development in the study area.
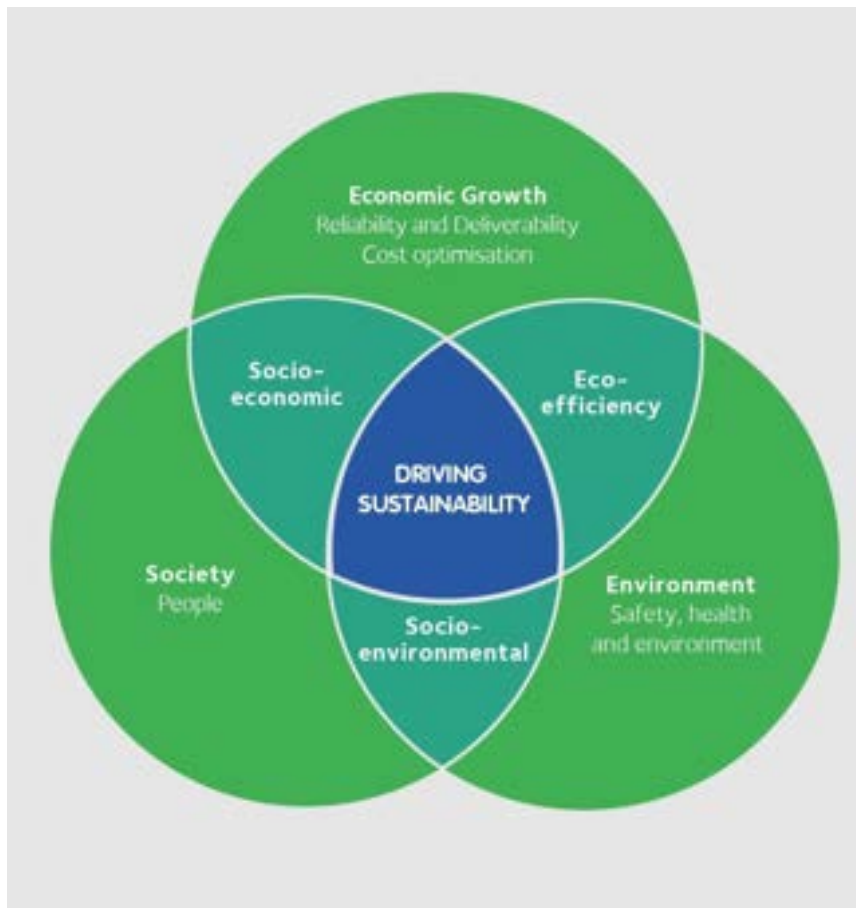
Figure 3.1 Sustainability concept
Source: Adapted from Ras Gas sustainability framework (2017)

The definition and characterisation of sustainability and sustainable development is quite complex and has many diverse perspectives. To adequately understand the dynamics of sustainability, the questions "What is sustainability?" "How can we make sustainable development a reality?" and "How can sustainability be measured?" were posted on a professional research forum ("ResearchGate"). These questions were posted in May 2017 by Jayanta Kumar Biswas from the University of Kayani and received over 4,207 reads, more than 200 follows, and over 325 answers. Significant responses for defining sustainability were extracted after 10 months of group discussion on this issue. The significant and relevant perspectives from professionals on sustainability are presented below in Box 1.

Box 1: Selected definitions of sustainability

Bill Thompson
Sustainability is best considered as a tradition that has a long history and is essentially organic rather than systemic, although in discussion, systemic models are inevitable even though inevitably paradoxical. There will be those on the left and right of tradition. The resources of tradition are what we collect and embody as resources in order to make the future. Traditions are the practices we make in order to sustain a tradition. Sustainability is one of trillions of traditions that humans seek to sustain, networking in order to produce working models through social action, premised on some holistic myth.

Rene Aga
*On 25 September 2015, the General Assembly of the United Nations adopted a **Resolution** titled "**Transforming our world: the 2030 Agenda for Sustainable Development**". In the preamble it says "the Agenda is a plan of action for people, planet and prosperity... All countries and all stakeholders, acting in collaborative partnership, will implement this plan... The 17 Sustainable Development Goals (SDG) and 169 targets which we are announcing today demonstrate the scale and ambition of this new universal Agenda... They are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental... For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and people like you"*
(http://www.un.org/sustainabledevelopment/sustainable-development-goals/).

Douglas Nuttall

...I would say that sustainability is the ability of a community to maintain a non-declining quality of life, while utilizing the resources they manage, in perpetuity....

Manish Puranik

I don't know where the above responses are coming from, but with due respect to all the opinions expressed, I would like to add a simple definition of sustainability as - ability and capacity of any being or existence to survive its natural potential with full immunity in a most organic way without any external supplements and deliver what it is expected to contribute to the ecosystem it is part of. As far as making it a reality and measuring it - all I can say is if Humans stop (at least control) their uncalled for and undesired intervention in the natural course of development (read: evolution) there would be no need of measuring it, I believe!

Ranko Bozovic

If we really want to be practical, to define status and [a] way forward, we need to complete resource mapping and plot it against maps of population requirements, now and future. Then the resource sourcing and consumption rate will have to be defined. All at the global level. That will give us information [about] what we have to do.

Amiye Francis

In addition to above submissions, sustainability, which deals with ensuring that services enjoyed by present generations do not fade away but [are also] enjoyed by unborn generations, is an ideal that is most needed in the exploitation of biotic aquatic resources (Fisheries Resources).

Kenneth M Towe

"Sustainability" is a buzzword and a concept that is in the "eye" of the sustainer...who make[s] decisions for others? Where are you on this diagram Mike?

Davor Virkes

Kenneth, I assure you, there is something in [the] sustainability concept. Not if you take it all apart, but it makes sense when assembled together. Far too many "sustainability" people use it as a buzzword that in their mind is a substitute for "environmental" which is so last century. But in reality, it is a viable concept that makes a company float amidst various attacks, including the environmentalists' one. Or many. First and foremost, your business must be economically sound, and you need to take care of your stakeholders, and you also need to take care of the various strata of the market. But when you assemble it all together, your business will fare much better than without it [sustainability]. It all boils down to a good practice of doing business nowadays. The sustainability concept [reminded] me of the fragility of the mass production and mass consumption market of the bottom-of-pyramid. In all fairness, it is the most important ecosystem with regard to many popular topics, including climate and ecology. Your views on population are one facet of it.

Anthony B. Nd.

Sustainability means being good stewards to the Earth, being proactive, [and] positively innovative without impairing the ability of nature's life-support mechanism to renew and replenish itself, [being] compassionate towards others, and morally capable of avoiding excesses...

3.6.1 Urban Informality and Sustainable Livelihoods

Urban informality is significant within the context of sustainability because it is associated with quality of life, as well as social, economic, and environmental factors, which are strategic for sustainability improvement. To discuss urban informality within this broad perspective and evaluate living condition in informal urban settlements is essential in this study. The review of studies about urban informality and sustainable livelihood according to Majale (2001) reflects an inadequate quality of life in most urban informal areas. The studies review such as (Abiodun, 1997; Agbola & Agunbiade, 2009; Gerhard & Arie, 2012; Jiboye, 2011; Lawanson, 2011; Lawanson & Fadare, 2015; Oshinowo, 2007; Soyinka, 2013; Ziblim, 2013) also emphasise the perspective of Majale. The quality of life as a measure of livelihoods in Africa according to the definition from Majale (2001) is as follows:

> "adequate privacy, adequate space, physical accessibility, adequate security, security of tenure, structural stability and durability. Adequate lighting, heating and ventilation, adequate basic infrastructures such as water supply, sanitation, and waste management facilities. Suitable environmental quality and health-related factors, adequate and accessible location with regards to work and basic facilities: all of which should be available at an affordable cost" (Majale 2001, pg1).

Considering this definition of urban informality (see Figure 3.2 on urban informality and sustainable livelihood), it is essential to investigate this issue in the interest of sustainable development.
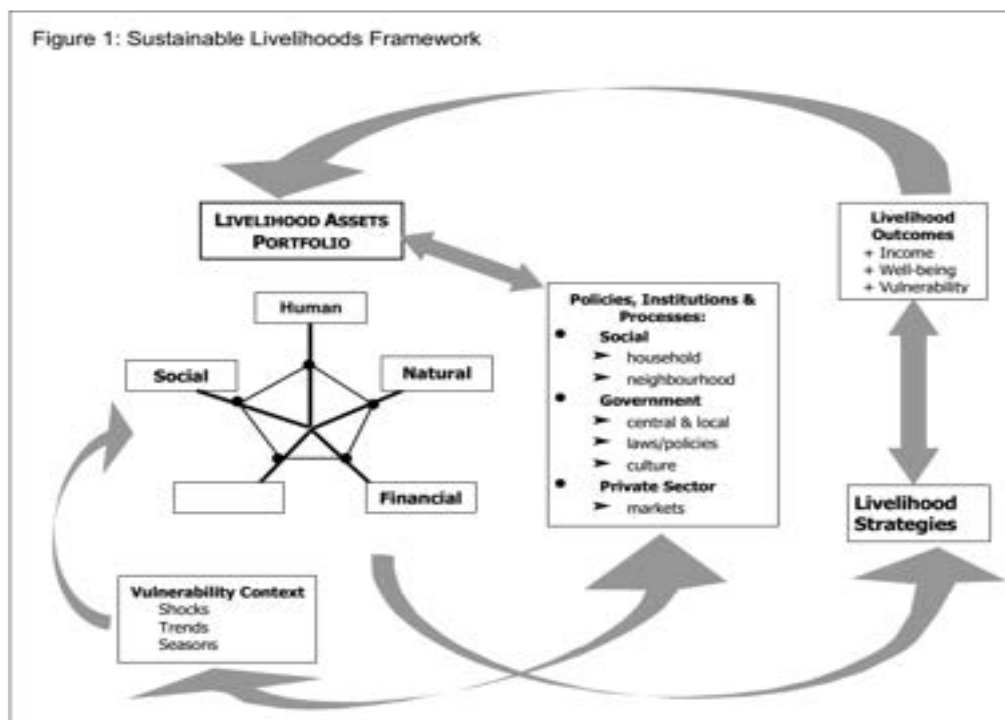
Figure 3.2 Urban informality and sustainable livelihood
Source: Adapted from (Majale, 2001)

Evaluating sustainable livelihoods within the context of Asia and Africa from the perspective of UISIP reveals that the living condition of these areas is not sustainable. Several studies identify different challenges, but that of Majale (2001) summarised these from a perspective directly related to this study and argued that:

> "A livelihood is comprised of the capabilities, assets and the activities required for a means of living. A **livelihood is sustainable** when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the long and short-term" (Majale 2001, pg3).

In evaluating Hong Kong and Lagos based on this definition, there is a need for urgent intervention to improve the quality of life in these regions. The challenges of urban informality and livelihood are associated with human factors, social factors, physical factors, financial or economic factors, and natural factors, which are inadequate. Human interaction is full of discrimination, social exclusion, injustice, inequality, and segregation, among other issues, that

fuel the cycle of poverty and the spread of urban informality. The growing concerns of globalisation (as socialisation increases) create a higher poverty gap between the rich and the poor, unequal access to land with evidence of housing insecurity, homelessness, and an increase in the population of vulnerable women and children. The urban informal areas characterise as haphazard building arrangements, flooded, and built with immaterial objects within an environment that can be categorised as slums and the degraded. The level of poverty in Lagos is critical, with an estimated 1.5 billion people living at or below one dollar per day. This poverty ratio is described as the feminisation of poverty, the urbanisation of poverty, and African factor poverty (Boonyabancha & Kerr, 2015; Majale, 2001; Olajide, 2015).

3.7 Summary of Literature Perspectives: Comprehensive Highlights

Urban informal settlement is a significant area of urban challenge and has attracted different research interest and perspectives from all over the world. UISIP, as they relate to sustainable development, is more significant challenge world with a dearth of studies despite its severity globally These areas of research are broad and interdisciplinary, and UISIP is an area of study that can be undertaken in all professions and disciplines. To establish evidence of research gaps in this area in terms of investigating what has been done, what is yet undone, and that which requires research (and what may not be significant), this study reviews research on this subject area. A summary of significant findings is presented in Table 3.2, below:

Table 3. 2 Selected research on urban informality and infrastructure planning

Authors/Tile	Country	Significant summary/findings
Urban informality		
Alter Chen, Martha (2005). Rethinking the informal economy: linkages with the formal economy and the formal regulatory environment	Global Perspective	This study suggests why and how more equitable linkages between informal and formal economy should be promoted through appropriate inclusive policy and regulated environment.
Roy, A. (2012). Urban informality: the production of space and practice of planning	Global South	Urban informality is perceived as a 'planet of slum' with 'advanced marginality' and as a city 'embodiment of entrepreneurial energies'. It is a way of life; the characteristics and condition of living is associated with several factors
Douglas, Gordon CC (2016). The formalities of informal improvement: technical and scholarly knowledge at work in do-it-yourself urban design	USA	The study argues the formalities of informal improvement through technical and scholarly knowledge of Do-It-Yourself (DIY) urban design.
Hernández, F., Kellett, P. W., & Allen, L. K. (2010). Rethinking the informal city: critical perspectives from Latin America.	Latin America	The book attempts to generalise the perspective of informal cities for spatial rethinking and development strategies. It, however, argues that the formal and the informal have become not only inseparable and interdependent but also indefinable. "Formal and informal are best thought of as part of a continuum: a few activities are wholly formal, a few wholly informal, but most home and household are some combination of both" (pg. 795).
Elsheshtawy, Y. (2013). Where the sidewalk ends: informal street corner encounters in Dubai.	Dubai	The overall perception of Hor Al Anz is that the area is a menace that needs to be contained. The role of supportive environment facilities and services act as a system composed setting which supports each other. There is a sense of anomie and alienation due to the absence of a strong community sustained social, economic, and environmental network. The area experiences a strong degree of isolation from the city-the district appears remote and inaccessible.
Jabareen, Y. (2014). "Do it yourself" as an informal mode of space production: conceptualizing informality.	Israel	It is a study of the ideal right to city, resolving injustice, insecurity, poverty, and inequality. Informality are socially, economically, and culturally constructed, and it has its own unique structural element.
Marjit, S., & Kar, S. (2009). The Urban Informal Sector and Poverty: Effects of Trade Reform and Capital Mobility in India	India	The study reflects that large part of the urban poor in India work and lives in the informal settlement. The improved conditions of the informal workers leave significant and sustained impact on the incidence of poverty in urban areas of the country.
Ali, M. H., & Sulaiman, M. S. (2006). Shaping the Change-The Causes and Consequences of the Informal Settlements in Zanzibar.	Zanziba Tanzania	The basic problems with this urban development pattern have been the inappropriate conception of space as somehow separable from other dimensions of society such as the economy, social, policy, and environment. Added to the weak political will to restructure and improve the area.
Hegazy, I. R. (2016). Informal settlement upgrading policies in Egypt: towards improvement in the upgrading process.	Egypt	The findings reflect that despite the continuous attempt to develop informal settlements and improve their conditions, Egypt is still facing intractable challenges that influence the sustainable development. It also identifies the significance of upgrading through infrastructure "It is essential to develop affordable and participatory measures for upgrading housing conditions with related infrastructure support in informal areas to achieve improvement" (pg. 272).
Brown-Luthango, M., Reyes, E., & Gubevu, M. (2016). Informal settlement upgrading and safety: experiences from Cape Town, South Africa.	South Africa	One of the significant findings and conclusions of the study states that "Physical improvements in the built environment are of absolute importance. However, without accompanying social and economic programmes, they will not bring the settlement transformation Abbott refers to (pg. 491)
Lawanson, & Fadare. (2015). Environment and health disparities in urban communities: Focus on Eti Osa, Nigeria.	Lagos, Nigeria	Levels of social, economic, and environmental vulnerability are related to the health outcome and condition of the people. The study identified social injustice and inequality.

Adeyinka, S. A., Omisore, E. O., Olawuni, P. O., & Abegunde, A. A. (2006). An evaluation of informal sector activities and urban land use management in South Western Nigeria.	Lagos, Nigeria	The findings describe the infiltration of informal sector activities into the planned residential areas. It also identifies the social, economic, and environmental capacity of the phenomenon with several associated land use implications like infiltration, illegal change of use, pollution, and high rental values among others.
Olajide, O. (2010). Confronting the Lagos Informal Land Use: Issues and Challenges:	Lagos, Nigeria	The land defines the social, economic, environmental, and political relations in a society. The findings further show that the challenge confronting informal land development in the area is multi-dimensional ranging from social, economic, cultural, environmental, and physical. The paper thus suggests confronting the challenge with sustainable urban land use management system.
Olajide, O. A. (2015). Understanding the complexity of factors which influence livelihoods of the urban poor in Lagos' informal settlements.	Lagos, Nigeria	This study argues that the vulnerability and deprivation of urban informal settlement goes beyond the issue of legal title and security of tenure. It also reveals that there is a disconnection between urban development policies, and the real aspirations and need of urban poor. Their effort work against the ingenuity of urban poor, thereby undermining building sustainable livelihood.
Farinmade, A., & Anyankora, M. I. (2012). The Challenges of Improving Informal Sector Activities Condition in Lagos Island, Nigeria.	Lagos, Nigeria	The study concludes that there is a relationship between employment in the informal sector and formal sector, unemployment, illiteracy, environmental degradation, and the rampant violation of planning regulations.
Kennett, P., & Mizuuchi, T. (2010). Homelessness, housing insecurity and social exclusion in China, Hong Kong, and Japan.	China, Hong Kong, and Japan	The study describes this issue from the perspectives of homelessness, housing insecurity and social exclusion. It concludes that the underlying factors and forces associated with this issue is complex, multi-dimensional and it reflects economic, social, physical environment and policy inequality/inadequacy.
Rufina Wu, & Canham, S. (2009). Portraits from Above-Hong Kong's Informal Rooftop Communities:	Hong Kong	The study present pictorial analysis of the types and characteristics of urban informal settlement in Hong Kong. It describes the condition of living of the people and the state of the facilities and services available in these areas. It also argues that the neoliberal system of government in the region with the socio-economic and housing challenges in the region contribute to the issue of urban informality in the area.
Tam, I. Y. S. (2012). Hidden Slum-Poor People in Rich Hong Kong.	Hong Kong	The incident has different causes, and it is associated with several factors. The Society for Community Organization (SoCo) also states that there still exist at least 100,000 people living in such environment in Hong Kong. Over the past five or ten years, the supply of public housing was a shortage. It used to be 50,000 per year, but now we only have 15,000 public housing supplies per year.
Chui, E. (2008). Rooftop Housing in Hong Kong: Hong Kong's informal rooftop communities.	Hong Kong	The study findings describe Hong Kong informal rooftop communities as shanty towns with little or no enforced regulations from small shacks to multi-storey structures, all spread out in organic mazes over the rooftops of apartment structures and skyscrapers in Hong Kong.
Tanasescu, A., Wing-tak, E. C., & Smart, A. (2010). Tops and bottoms: State tolerance of illegal housing in Hong Kong and Calgary.	Hong Kong and Calgary, Canada.	The study states clearly that illegal (informal) housing does not only exist in developed countries, but is tolerated, and it plays a critical role in economic growth, and it serves as a key source of accommodation for the lower income households. It also identifies the concurrent shift to neoliberal policies, economic prominent with wide gap between the rich and the poor as what contributes to the present housing and settlement challenge in the region. It identifies contextualising and investigating the challenge in developed and developing country to gain insight into the strategies to improve the phenomenon.
Alan, S. (2001). Unruly Places: Urban Governance and the Persistence of Illegality in Hong Kong's Urban Squatter Areas.	Hong Kong	It identified urban informality as unruly places, where governments have less control than usual, and it examines the government attempt to regulate these illegally occupied spaces. It concludes that three different phases of regulation are possible: repression, resettlement, and exclusion. While the study identifies that there is considerable continuity intolerance, the nature and outcome of this practices is relative to the regulatory regime.

Infrastructure planning

Goodman, A., & Hastak, M. (2015). Infrastructure Planning, Engineering, and Economics:	Global perspectives	It discusses diverse perspectives towards infrastructure planning; the concepts, model, and methodologies of infrastructure planning. It concludes that the sustainability (social, economic, physical, and environmental) factors is significant towards achieving sustainable infrastructure planning.
Uddin, W., Hudson, W., & Haas, R. (2013). Public infrastructure asset management.	Global perspective	The design of infrastructure life in relation to planning needs assessment and performance indicators is significant for infrastructure planning.
Verheijen, M. (2016). Infratecture: Infrastructure by Design.	Global Perspectives	With 15 research perspectives and over 30 international best practices this book present design perspectives for infrastructure and its significant findings states that infrastructure is more than functional necessity. An intelligent infrastructure design can result in social, economic, and physical value of the people for effective living.
Timmermans, J., & Beroggi, G. (2000). Conflict resolution in sustainable infrastructure management.	Netherlands	It opined that developing effective infrastructure plans is compromising between sustainability, safety, economic and environmental factors of the infrastructure planning, which different organisation must agree on course of action.
Dukiya, J. (2014). The state of urban road infrastructure and the implementation of the FRSC speed limiting devices in Nigeria.	Nigeria	Road infrastructure is an interdisciplinary activity that requires continuous research to achieve development, and that is backed up with funding. It also concludes that the globalisation of road standards and hybrid vehicles should be adopted with information technology devices among others.
Gandy, M. (2006). Planning, anti-planning and the infrastructure crisis facing metropolitan Lagos.	Lagos, Nigeria	The study concludes that a workable conception of the public realm must form an integral element approach of urban infrastructure policy-making.
Ijaiya, G. T., & Akanbi, S. B. (2009). An empirical analysis of long run effect of infrastructure on industrialization in Nigeria.	Nigeria	Maintenance, repairs, and operations of the facilities, especially electricity, communication and water supply are commercialised, and the involvement (inclusive design) of every citizen (individual, private organisation, and corporate bodies) is essential for sustainable infrastructure planning.
Olaseni, M., & Alade, W. (2012). Vision 20: 2020 and the challenges of infrastructural development in Nigeria.	Nigeria	The country's economy and infrastructure development is interrelated, and the social, economic, and physical infrastructure is critical for sustainable development. The quantity and quality of infrastructure needed to propel, economic, social, physical, and environmental development is absent.
Ng, S. T., Wong, J. M., & Wong, K. K. (2013). A public-private people partnerships (P4) process framework for infrastructure development in Hong Kong.	Hong Kong	It advocates re-strategizing the pragmatic approach underpinning public engagement to enhance social, economic, and physical infrastructure and services. Adopting P4 framework, it envisages that the framework will change the public aspiration and involvement in infrastructure planning and policy formulation.
Zhang, X., & Chen, S. (2013). A systematic framework for infrastructure development through public-private partnerships.	Hong Kong	The design of right public-private partnership framework is essential for infrastructure development. With four broad stage frameworks 1, design of a workable concession 2, competitive concession selection 3, financial regulation and 4, periodic recon cession and rebidding and help achieve sustainable infrastructure planning.
Sustainable Development		
Harris, J. M. (2000). Basic Principles of Sustainable Development	Global perspectives	The concept of sustainable development considered the suitability of present lifestyle to achieve the desired future generation. Because intergenerational equity must go alongside the intra-generational equity. A restructuring of world's income and consumption patterns as a necessary precondition for any viable, sustainable development strategy.
Newman, P., & Jennings, I. (2008). Cities as Sustainable Ecosystems: Principles and Practices.	Global perspectives	As cities grow in population, the tendency of social, economic, and environmental problem in the city grows. Sustainability can only be achieved if cities are approach as a system and components nested system in ecological balance with each other.
Salat, S., Labbé, F., & Nowacki, C. (2011). Cities and forms: on sustainable urbanism	Global perspectives	Morphology, forms, and urban fabrics appear as the lever of sustainable urbanism. The relationships between metrics, scale, typology, urban fabrics, density, texture, symmetric, and configuring human dimension and complexity are design elements to foster sustainable design.

Yigitcanlar, T. (2010). *Rethinking sustainable development: Urban management, engineering, and design*:	Global perspectives	Multi-dynamic perspective and approach of resolving sustainable development challenges is to rethink its opportunity and challenges within the context of management, engineering, and design.
Mori, K., Fujii, T., Yamashita, T., Mimura, Y., Uchiyama, Y., & Hayashi, K. (2015).	Global perspective	City sustainability index (CSI) is adopted as indicators to measure, assess, and applied to sustainability (social, economic, and environmental) concept. It is based on constraint and maximum indicators possible.
Larco, N. (2016). Sustainable urban design–a (draft) framework.	US	Achieving sustainable development through sustainable urban design matrix framework. It is the matrix of sustainable urban design element by topics, scales, and synergy to allow urban design activities.
Knaap, E., Ding, C., Niu, Y., & Mishra, S. (2016). Polycentrism as a sustainable development strategy: empirical analysis from the state of Maryland.	State of Maryland	Polycentrism as a sustainable development strategy describes social, economic and environment factor as unit that have finite place and can contain multiple centres. Regional plans and policies are encouraged to urban opportunity within selected centres particularly high transit centres. Polycentrism idea argues that it will foster growth, increase transit rider, reduce vehicle miles travelled, and mitigate automobile related environmental impact.
Meijer, M., Adriaens, F., van der Linden, O., & Schik, W. (2011). A next step for sustainable urban design in the Netherlands.	Netherlands	Sustainable spatial development approach adopts the urban design effectiveness towards improvement of the space around us. The pursuit of efficient measure and interventions produces less waste or consuming less energy.
Aluko, B. T., & Amidu, A.-R. (2006). Urban Low-Income Settlements, Land Deregulation, and Sustainable Development in Nigeria.	Lagos Nigeria	The issue of sustainable development in Nigeria is associated with social, economic, physical, and environmental factors. Squatter or illegal settlement, land de-regularization, security of tenure and socio-economic sustainable challenges. Therefore, land regularisation with security of tenure, economic empowerment, and citizen co-regularization is advisable for sustainable development.

Source: Author (2016)

3.8 Determinant of Urban Informality and Infrastructure Planning: Theoretical Framework

The literature evidence of studies conducted around the world reflects that specific factors can be identified to determine an area as an urban informal settlement and infrastructure challenge area. The condition of an area in relation to these factors are used as determinants of the area as either urban informal settlement and infrastructure challenge area. It is therefore often refers to as determinants or factors (Lee & Chan, 2008). These factors are often categorised into social, economic, environmental, institution and different types of infrastructure facilities and services.

Lee and Chan (2008), found thirty factors from a review of literature as a determinant for urban design consideration and reiterated that inadequacy and the absence (negative impacts) of these factors justify the need for urban design and renewal in the area. That is, the condition (positive or negative) of these factors in an area decide what the area is or can be refer to and is recommend for adequate urban development strategy. Adopting the case study of Hong Kong in relation to sustainable urban development or redevelopment (Lee and Chan 2008) field study categorise these identified factors into three categories and identify six factors which are rank differently in these three categories. These three categories namely: 1) factors for economic sustainability, 2) factors for environmental sustainability, 3) factors for social sustainability. These categories are further described in relation to the design factors and its indicators. Table 3 present the overall determinants of urban informality and infrastructure conditions as follows:

Table 3. 3 Determinant of sustainable urban design

Category	Factors/Determinant for urban Design Consideration	Factors/Determinant Indicators
Factors for economic sustainability	Quality welfare planning and provision	Access to public facilities
		Preserving and facilitating social networks
		Access to open space
		Provisions for meeting special needs of the impaired citizen
		Sense of community
		Provision of public facilities
		Provision of open space
	Conservation and preservation	Green design
		Green construction
		Provision s to control pollution
		Ease of maintenance and management of buildings, facilities, and spaces
	Land strategic utilisation	Provisions facilitating the establishment of different business
		Mixed-use development

		Adaptability of non-domestic development to the changing needs
		Efficient use of land and space
		Availability of local employment
		Proximity to commercial establishments
		Access to work
		Availability of housing for different income groups
	Community contribution	Community involvement
		Preservation of historical structures and features
		Rehabilitation of repairable properties
	Integrated design	Compatibility with neighbourhood
		Design of open spaces
		Layout of buildings and streets
		Conservation/improvement of local distinctiveness
		Building form
		Provision of security measures
	Transport arrangement	Convenience, efficiency, and safety of pedestrian and public transport users
		Convenience, efficiency, and safety of drivers.
Factors for environmental sustainability	Quality welfare planning and provision	Access to work
		Availability of local employment
		Proximity to business activities
		Establishment of different business activities
		Provision of accommodation for different income groups
		Mixed development
	Quality living condition	Sense of belonging to a community
		Preserving and facilitating social network
		Security against crimes
		Promotion of local distinctiveness
		Community involvement in public decision making
	Conservation and preservation	Green features (design related)
		Provisions to control pollution
		Green features (construction related)
		Adaptability of development to the changing needs
		Management of buildings, facilities, and spaces
	Integrated design	Building design regarding appearance, density, height, and mass
		Layout of building and streets
		Convenience, efficiency, and safety for pedestrian and public transport users
		Compact with neighbourhood
		Design of open space
		Efficient use of land and space
		Convenience, efficiency, and safety for drivers
	Provision of welfare facilities	Provision of open spaces
		Access to public facilities
		Provisions for basic needs of disabled, elderly, or children with proper access
		Access to open spaces
		Provision of public facilities
	Conservation of existing properties	Rehabilitation of repaired building structures
		Preservation of historic structures and features
Factors for social sustainability	Quality welfare planning and provision	Provision for meeting unique needs of the disabled, elderly, or children
		Preserving and facilitating social networks
		Sense of community

	Provision of public facilities
	Access to public facilities
	Convenience, efficiency, and safety of pedestrian and public transport users
	Availability of housing for different income groups
	Provision of security measures
	Community involvement
Conservation and preservation	Green construction
	Green design
	Provision to control pollution
	Ease of maintenance and management of buildings, facilities, and spaces
Image building	Conservation/improvement of local distinctiveness
	Layout of buildings and streets
	Compatibility with neighbourhood
	Rehabilitation of reparable properties
	Preservation of historic structures and features
	Building form
Daily living provision	Availability of local employment
	Access to work
	Proximity to commercial establishments
	Provisions facilitating the establishment of different business
	Convenience, efficiency, and safety of drivers
Development strategy	Adaptability of non-domestic development to the changing needs
	Efficient use of land and space
	Mixed-use development
Open space design and provisions	Access to open spaces
	Design of open spaces
	Provision of open spaces

Source: Adapted from (G. K. Lee & Chan, 2008)

The study of Olayiwola, Adeleye, and Oduwaye (2005) in Lagos metropolis on factors influencing residential land values in Lagos metropolis also identify similar factors such as price, transport improvement, quality of the neighbourhood, facilities and services, and government regulations as (Lee & Chan, 2008). In Ghana, the study of Owusu-Ansah (2012) also identified similar factors such as numbers of floors, rooms, bathrooms, age and condition of building among others as critical factors that affect residential property values and urban development of an area. To establish the theoretical framework that determine and/or factors used as yardstick for assessing urban areas as blight (informal settlement) or sound urban areas, a review of literature around the world is presented in Table 3.2 and Table 3.3 above. The significant summary of this factors is highlighted Table 3.4 below.

Table 3. 4 Determinant of urban informality and infrastructure

	Factors	Indicators	Council, B. C. (2010).	Hernández, F., Kellett, P. W., & Allen, L. K. (2010)	Tanasescu, A., Wing-tak, E. C., & Smart, A. (2010).	Kennett, P., & Mizuuchi, T. (2010).	Alan, S. (2001).	Roy, A. (2012).	Rufina Wu, & Canham, S. (2009).	Chui, E. (2008).	Owusu-Ansah, A. (2012)	Olayiwola, L., Adeleye, O., & Oduwaye, A. (2005).	Aluko, B. T., & Amidu, A.-R. (2006).	Lawanson, & Fadare. (2015).	Olajide, O. A. (2015).	Ijaiya, G. T., & Akanbi, S. B. (2009).
Urban Informality	Social Factors	Level of Education				✓	✓		✓	✓	✓	✓	✓	✓	✓	
		Size of Rooms				✓	✓		✓	✓	✓	✓	✓	✓	✓	
		Available Rooms				✓	✓					✓		✓	✓	✓
		Number of Toilet & Bath				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Economic Factors	Income		✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	
		Occupation		✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	
		Job Security		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
		Unemployment		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Environment Factors	Housing Insecurity & Affordability		✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	
		Age of Building		✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	
		Types of Building	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
		Building Use	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	
		Building Materials	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Building Facilities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Institutional Factors	Corruption				✓	✓	✓	✓				✓	✓	✓	✓
		Inadequate Policy	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓
		Dual Policy	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
		Policy Enforcement	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
		Residential Status		✓	✓			✓	✓	✓	✓		✓	✓	✓	✓
		Tenure-ship & Documentations	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓
Infrastructure	Health facilities	Availability of Health facilities	✓	✓	✓				✓		✓		✓	✓	✓	✓
		Accessibility to Health Facilities	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓
		Condition of Health Facilities	✓	✓	✓						✓	✓	✓	✓	✓	✓
		Distance to Health	✓		✓						✓	✓	✓	✓	✓	✓
	Sewage & sewerage	Availability of Sewage Sewerage	✓								✓		✓	✓	✓	✓
		Accessibility to Sewage Sewerage	✓			✓					✓		✓	✓	✓	✓
		Condition of Sewage and Sewerage	✓			✓				✓	✓		✓	✓	✓	✓
		Area Coverage	✓			✓					✓	✓	✓	✓	✓	✓
	Road	Availability of Road	✓		✓	✓				✓	✓	✓	✓	✓	✓	✓
		Road Accessibility	✓		✓	✓	✓		✓	✓		✓	✓	✓	✓	✓
		Road Condition	✓		✓	✓	✓		✓	✓		✓	✓	✓	✓	✓
		Road Connectivity	✓		✓	✓	✓		✓	✓		✓	✓	✓	✓	✓
	Electricity	Availability of Electricity	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
		Electricity Supply	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
		Condition of Electricity	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	

Source: Author (2017)
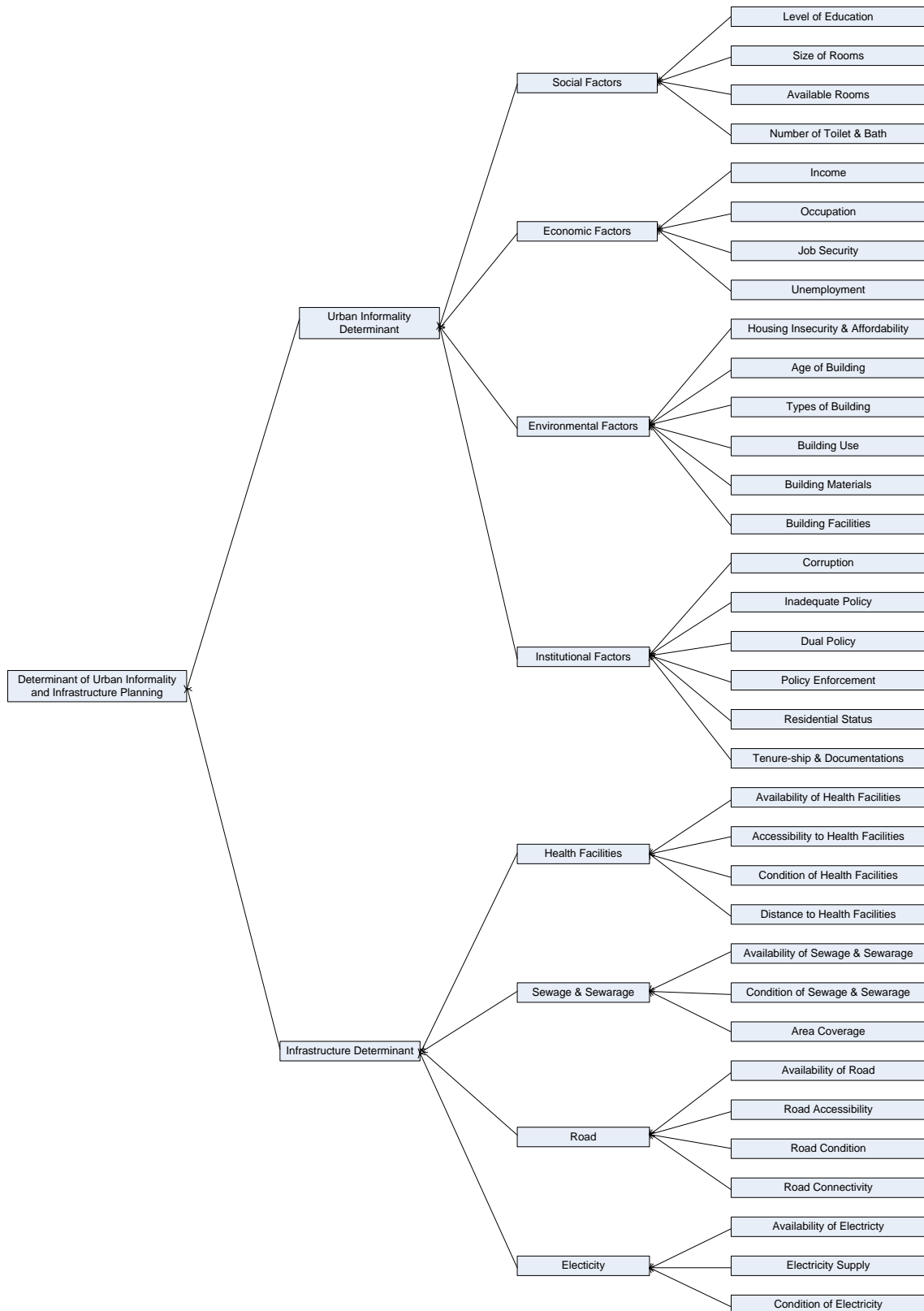
Figure 3. 3 Theoretical framework of determinant of urban informality and infrastructure planning
Source: Author 2017

Council (2010); Olayiwola et al. (2005); Owusu-Ansah (2012) identify and highlight these factors and indicators as critical determinant UISIP. However, the focus of literature discussion, investigation and assessment of urban informality and infrastructure are identified, extracted, and adopted for the theoretical framework. Selected samples of some of the literature adopted are presented in Table 3.2 and 3.4 above. Based on the extensive review of literature in this research and the selected article above, this thesis established that the above-identified factors and indicators are essential for urban informality and infrastructure determinant (Olayiwola et al., 2005; Owusu-Ansah, 2012; Wekesa et al., 2011). In line with this review, this study concludes that these factors are essential for sustainable urban development and a theoretical framework was developed based on this literature evidence and how they are applied in this study. It depicts the literature evidence of significant factors that determine urban informality and infrastructure planning and how they are considered for sustainable urban design strategies and sustainable urban development. Figure 3.3 illustrates this theoretical framework in this study.

3.9 Chapter Summary

The challenge and opportunity of UISIP are described as to associate with several factors among which sustainability is significant. It occurs in different forms and severity across different areas. This study review, defines, describes, and conceptualise urban informality, infrastructure planning and sustainability from the study context. It discussed the literature perspectives from the different region and latter within the context of the study area. The challenges are found in relation to several factors which are significant to the tripod of urban sustainability (social, economic, and environmental). The theoretical framework of the elements and/or determinant of these issues were also described. The chapter also finds that there is a significant relationship between UISIP design vis-à-vis sustainable development.

In Hong Kong, the issue of urban informality (illegal housing, squatter settlement, housing inequality, and homelessness) exist based on theoretical and practical evidence in the study area (Ananya, 2012; Rufina Wu & Canham, 2009; Soyinka & Siu, 2017b). While the challenge is identified to exist in different forms with different factors, it is identified as a system and social equity challenges. Chiu (2002), investigate this challenge with the significance of

government policies to respond to it through housing provision, distribution, and affordability in Hong Kong.

Unlike Hong Kong, the challenges of urban informality are severe in Lagos metropolis, and they appear in different forms, different areas, and with different significance. They are associated with infrastructure challenges and create major breakdowns in the metropolis (Soyinka & Siu, 2017b). The root of urban informality is comprised of several factors such as poverty, urbanisation, land regularisation, infrastructure provision and distribution, and administrative issues (Aluko & Amidu, 2006; Olajide, 2010). Olajide (2010) further attributes urban informality in Lagos to the current structure and pattern of land policy in the metropolis. Olajide argues that before 1978 land use administration in Nigeria had been guided by customary laws and did not show chaotic present-day land use challenges.

This chapter described the evidence from the literature evaluated in this study and discussed the opportunities and challenges of urban informal settlement situations in China, Hong Kong, and the city of Lagos. The concepts of sustainability and sustainable development were also highlighted from different perspectives provided by ResearchGate scholars. The classification of infrastructure and how it relates to this study was explored, and a comprehensive literature review to find the critical determinants, factors, and indicators of urban informality and infrastructure planning was also discussed. Theoretical framework about the association of urban informality and infrastructure planning and sustainability as a concept was developed to guide the focus of this study.

Chapter 4
Conceptual Framework

If the physical reality is understood and conceptualised as an analogy to our imagination, then we pursue a morphological design concept that turns into real phenomena like all concepts that can be expanded or condensed.

(Stapenhorst, 2016)

Synopsis

A conceptual framework is an essential analytical tool for designers to capture real situations and explain, predict, and understand their phenomena. This chapter discusses several concepts adopted for the different settings of this study. It explains the ideas behind the concepts of urban informality, culture of circuit, pro-poor, sustainability, and the concept of tactical urbanism as adopted in this study to aid the understanding of the subject of study and develop a strategy for improving sustainable development. The operational synthesis of the conceptual framework and a model for sustainable urban design is also discussed to achieve the aim of this thesis.

4.1 Introduction

There are numerous urban challenges in different areas globally, but the increasing rate of urban informality, infrastructure problems, and people living in inhumane environments is significant and alarming. The term "urban informality" was first coined in 1971 by the British anthropologist Keith Hart in a study of low-income residents in Ghana (Inam, 2015). The concept was identified as encompassing haphazard development, inadequate infrastructure provision, and management issues, among other factors. Urban informality is an inadequate infrastructure development pattern and the proliferation of informal settlements (Oduwaye, 2009). Several studies have identified the relationship between these two significant urban challenges UISIP as symbiotic and detrimental to sustainable development. They result in unwieldy expansion of urban centres with the agglomeration of different major planning problems, such as poor provision and management of urban areas and infrastructure breakdown. Urban informality also influences the quality of roads, drainage, and sewage systems, shows increased environmental degradation, and increases urban poverty, environmental pollution, the rapid spread of diseases and epidemics, urban crime, and other conflicts (Lawanson, 2011; Lawanson & Fadare, 2015; Norman & Susan, 2012).

This study has established the different literature perspectives regarding this issue and its associated phenomena with respect to achieving sustainable development. It defines and describes the issue within the context of global perspectives and the context of this study (Hong Kong and Lagos) to illuminate the literature perspectives. However, it is essential to describe how these issues are conceptualised and operationalised in this study to ensure adequate investigation of the case study areas regarding sustainable urban development. The following are the conceptual framework elements identified as relevant for achieving the aim of this study, which is adopted in the construct of this study:

  i.   The concept of urban informality
  ii.   The concept of circuit of culture
  iii. The concept of pro-poor
  iv.   The concept of sustainability
  v.   The concept of tactical urbanism

4.2 The Concept of Urban Informality

Urban informality is used in diverse ways and can relate to urban informal settlement, the informal sector, illegal settlement, and squatter settlements, to mention only a few contexts. However, the term is always related to inadequate or substandard housing conditions that are usually not taxed or monitored by the government (not-formalised). The terms used to define and describe urban informality, housing insecurity, and social exclusion might be different, but there exist certain criteria for conceptualising these and their related meaning. This study describes urban informality in the following ways.

UN-Habitat (2015d) describes urban informality as residential areas with one or more of the following characteristics: 1) no security of tenure regarding land use and/or dwelling structures (i.e. the occupants are squatters living in informal rented or purchased sheds/structures); 2) the neighbourhood is cut off from/lacks basic facilities, services, and city infrastructure; and 3) housing does not comply with the current planning and building regulations and is often situated within a geographically hazardous area. The UN-Habitat criteria for conceptualising urban informality includes the condition of the entire living environment (social, economic, and physical) of the individual or group of individuals in each geographical space.

The studies of Inam (2015); Lai (2015); Nwokoro et al. (2015) find several criteria for defining urban informality. These include 1) the physical characteristics or nature of the structure; 2) the quality of life and living condition of a given geographical area; and 3) the designated use of an area as either residential, commercial, or industrial.

The European Typology of Homelessness and Housing Exclusion (ETHOS) presents the following criteria for defining urban informality (as described by Kennett and Mizuuchi (2010)):

1) roofless-ness;
2) houseless-ness;
3) insecure housing.

The study of the ETHOS is similar to those of (Edgar, 2004, 2009; Edgar, Doherty, & Meert, 2004), but the term is used differently by the ETHOS. In (Edgar, 2004, 2009; Edgar et al., 2004) the criteria for urban informality in Europe include:

1) physical domain;

2) social domain;

3) legal domain;

4) economic domain;

5) policy and non-regularised domain.

Physical domain describes physical characteristics of inadequacy. This includes an assessment of the visible dwelling space of a person or family in relation to the quality of the building materials and the living environment. The social domain criteria describe the ability of a person or family to relate to and support relationships within a community, i.e. the ability of a person or family to build and keep a minimum social standard of living in a given geographical space. The legal domain criteria include the lawful possession or occupancy of a dwelling unit and the location of the dwelling unit, i.e. the exclusive right to residence. The policy and the non-regularised domain relates to the influence of government and policy on urban informality. Together, these criteria provide the framework for conceptualising urban informality, considering its acceptable use with a common theoretical meaning, and understanding the practical indications of the criteria associated with this challenge in different urban areas globally. Figure 4.1 illustrates the criteria for defining and conceptualising urban informality.

Factors
Inequality/Exclusion (IE)
Economic IE
Social IE
Environmental IE
Policy/Political

Definition Domain
Physical Status
Social Status
Economic Status
Legal Status
Policy/Institutional Status

Urban Informality

Terminologies/Jargon
Informal sector
Informal Economic Sector
Informal Settlement
Informality
Squatter Settlement etc.

Features
Living/Job Insecurity
Inadequate Infrastructure
Squatter Settlement
Housing Insecurity
Cage Housing
Rooftop Inadequate house
Homelessness/Rooflessness
Street Sleepers

Figure 4.1 The concept of urban informality
Source: Author's 2017

Figure 4.1 describes the concept of urban informality and classified the criteria into: causes/inducers, definition of domain, features/conditions, and professional use with a direct or indirect interrelated relationship that causes urban informality. The absence of adequate elements necessary in the human right to life (including social and economic conditions, the right to a certain quality of environment, and equal distribution of resources) creates conditions of job insecurity, homelessness, and several other urban challenges. This process continues as a cycle and keeps people perpetually caught in the challenges of urban informality. Figure 4.1 illustrates this concept and presents the factors of these challenges from a global perspective.

Informal settlement is the functioning of a geographical area below the required planned and organised standard. It is an area with illegal occupants, degraded environmental conditions, haphazard buildings, and inadequate or complete lack of infrastructure. These areas are significantly correlated with juvenile delinquencies, unemployment, and general slum characteristics. Public utilities are inadequate and insufficient for the use of general people. Informal settlement is associated with several factors and questions, which are necessary to

examine in the interest of ameliorating the problems informal settlement engenders. Figure 4.2 presents the identified factors, questions, and areas of concerns relating to informal settlement in Lagos from the study of Soyinka and Siu (2017b).

Figure 4.2 The concept of informal settlement
Source: Soyinka and Siu (2017b)

The concept of informal settlement and its application in this research is used to investigate and understand the vulnerable populations that reside in these areas and ultimately create better living environments. The philosophy here is that once the root cause of a challenge is determined, it is feasible to develop an adequate solution. To that end, the root cause of informal settlement and poor infrastructure in settlements are identified above, and according to this research, it includes numerous factors. In a quest to identify and understand how this issue originates, operates, and affects its environment, this research discusses the conceptualisation and operationalisation of urban informality within the context of the study below. It discusses this conceptualisation in relation to its criteria for defining urban informality, housing insecurity, and social exclusion, all of which are central to sustainability factors.

4.2.1 Conceptualising the Operationalisation of Urban Informality

Although the terms do not mean the same thing, urban informality, housing insecurity, and social exclusion but they are often used interchangeably based on their relationship and association with physical urban development. This research has conceptualised (see Figure 4.3) these problems based on descriptions and criteria set by earlier studies for assessment of sustainable development in this thesis. Apparently, one problem leads to another, and many times these problems originate from economic challenges that manifest as *housing insecurity,* which is also called housing inequality and has been identified as a parameter that represents the inadequate provision of quality residential houses. The main criteria for conceptualising and defining housing insecurity/inequality are economic factors. This could either be related to provision or availability of public housing by the Government and/or the socio-economic capability of individuals to afford such apartments where they are available. The most used measurement techniques for housing insecurity are availability (i.e. the difference between supplied housing and its demand) and affordability. Where housing is available, and the cost is high and/or is not affordable for the majority of the populace, there is housing insecurity resulting in most people becoming homeless. This is obviously excruciating to the high rate of urban poor and unemployed workforce.

In a bid for survival, the option of illegal development and migration to unregulated urban areas or suburbs is inevitable, leading to what is generally known as *urban informality,* which is the second stage of the conceptualisation of urban informality process as depicted in Figure 4.3. UN-Habitat (2015d) describes this *urban informality* as residential areas with one or more of the following characteristics: 1) insecurity of tenure regarding land use and/or dwelling structures where occupants are squatters living in informal rented or owned sheds/structures; 2) lack of basic facilities, services, and city infrastructure; and 3) non-compliance with urban planning building regulations, standards, and often situated within a geographically hazardous area. These criteria encompass the entire living environment, which includes the social, economic, and physical condition of the individual or entire population in a given geographical area. This definition has also been adopted by other studies such as (Inam, 2015; Lai, 2015; Nwokoro et al., 2015). In these studies, criteria for conceptualising urban informality have been further explicitly identified and are based on 1) physical characteristics or nature of the

structure; 2) the quality of life and living conditions of a given geographical area; and 3) the designated use of an area as either residential, commercial, or industrial contrary to the approved/zoned use.

Furthermore, the ETHOS describes urban informality as including roofless-ness, houseless-ness, and insecure housing (Kennett & Mizuuchi, 2010). This standpoint is similar to that of Edgar (2004, 2009); Edgar et al. (2004) even though the context of use is different. Their identified criteria were subdivided into *"physical, social, legal, economic, policy and non-regularised domains"*. The *physical domain* describes urban informality relative to its inadequate physical characteristics. This is the assessment of the visible dwelling space of a person or family in relation to the quality of the building materials and the living environment. The *social domain* criteria are the ability of a person or family to build and maintain relationships within a community. The social capacity of a person or family to reside and maintain a minimum quality social standard of living required in a geographical space. The *legal domain* criteria include the lawful possession or occupancy of a dwelling unit and the location of the dwelling unit. This is the exclusive right to residency. The *policy* and the *non-regularised domain* criteria relate to the influence of government and administration on dwelling (urban informality).

Finally, the aftermath of housing insecurity cum urban informality constitutes the third stage in the cycle, which is identified as the cluster of deprived people subjected to ***social exclusion*** by all or discrimination, stigmatisation, coercion, moral insubordination, or environmental degradation (Jianfa, 2005; Roy, 2012). Sadly, these groups of residence or urban informal area are often neglected by the political class and lack representation in governance and policymaking. From the perspective of environmental health disparities, Lawanson and Fadare (2015) state that:

> "Researchers have identified socioeconomic status (SES) as a fundamental cause of the observed inequalities in health. There is mounting evidence that the widening gap between the rich and the poor contributes to health disparities" (Lawanson & Fadare 2015 Pg.46).

Figure 4.3 further illustrates the literature conceptualisation of urban informality, housing insecurity and social exclusion for further investigation, analysis, and recommendation in this study.
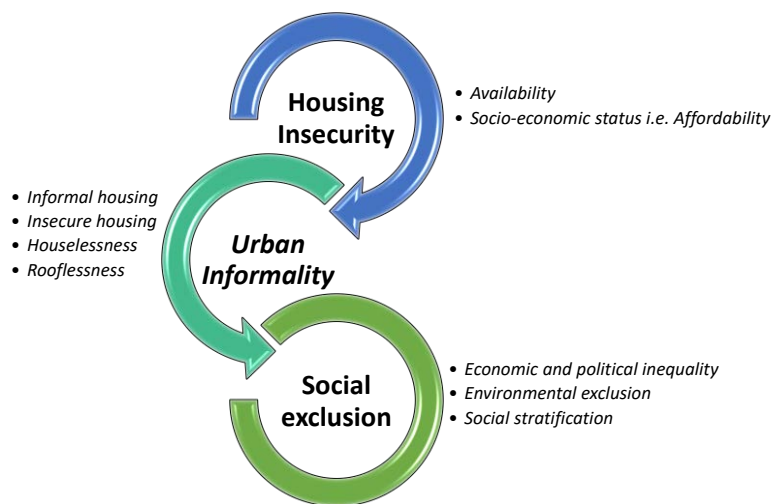
Figure 4.3 Conceptualising the concept of urban informality
Source: Author (2016)

4.3 The Concept of Circuit of Culture

The concept of circuit of culture was identified by (Du Gay et al. 1997) in (Sandy, 2016) and describes the integration of culture as a complete holistic process in design and environmental planning. The circuit of culture in urban informality and infrastructure highlights the various levels of design and the connection that exists between each level. This concept describes the things people are connected to, the things people contribute to, what, when, and how people affect the course of this circuit, and how it affects society in general. This is the consideration of culture strategy in design approach, which includes symbolic, structural, and specific ideology of the people to aid design expression. All things are interconnected, and as designers or researchers, it is impossible to work in ignorance of any of these segments. The circuit of culture highlights the need for UISIP integration in conceptualising, designing, and implementing problem solutions in a holistic manner, and avoids design that ultimately generates another problem. This philosophy promotes comprehensive, holistic, and universal design in all areas (public space design, and environmental design) and is based in the theory that no object or subject exists in isolation (i.e. the theory of emptiness). Because of this, design should be inclusive and developed in consideration of other related factors.

Introducing the philosophy of the circuit of culture with regard to UISIP describes the representation, identification, production, consumption, and regulation of sustainable urban design approach in relation to the interactions of people in society. Representation in the cycle

refs to how the culture of the area is represented and what it is known for, which must be adequately integrated into any design. Identity describes the identities of the people, their culture, and how problems are understood (conceptualised). Production relates to the design, policy, and plan preparation, and how they are prepared by designers considering the culture, among other factors. The initialisation, design, regularisation, and consumption of the design all refer to the implementation of the design and the implementation control of the design to aid its usage (Curtin & Gaither, 2005).
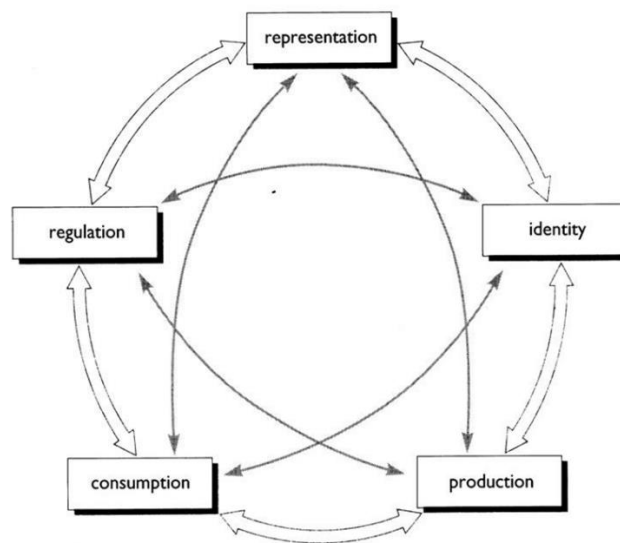
Figure 4.4 The Concept of the circuit of culture
Source: Adapted from (Curtin & Gaither 2005)

4.4 The Concept of Pro-Poor

The Concept of pro-poor is a general professional and academic idea that is deeply concerned with pro-poor growth. It is a vulnerable-oriented approach that has been used in various contexts to mean different things. However, its general meaning and application indicate that this approach focuses on vulnerable (poor) oriented development programs and activities. In the context of this concept, "poor" does not necessarily refer to an economically deprived group, but rather to any group that has been deprived or lacks certain basic needs or resources. The concept was developed in relation to the "Feminist Theory of Power", which enquires about the level of power attached to each of the different viewpoints design and planning. The feminist theory of power in relation to this concept promotes an adequate share of power, equity, and equality in services rendered and enjoyed by all citizens.

Son (2007) describes pro-poor growth as having its roots in the pre-distribution arguments of Chenery and Ahluwalia (1970) – "redistribution with growth". The study of Son identified the uses pro-poor in the 1990 World Bank Development Report and further argued that the concept has been redefined as "inclusive growth". In equating pro-poor growth with inclusive growth, based on the recent use of the term, the study defines inclusive growth as a growth that facilitates the participation of the less well-off in expanding market opportunities, with an emphasis on improving basic services in health, education, environment, and infrastructure. The study argued that inclusive growth is the same as pro-poor growth because both concepts are concerned with the benefits for the less well-off population, rather than the better-off population, in society. The study also identifies that there are no significant answers as to how much the poor must benefit or how much of poverty reduction is required for growth to be considered pro-poor.

Boonyabancha and Kerr (2015), in a study of how urban poor community leaders define and measure poverty, described pro-poor as diverse and incompatible with the US $1.25/person/day poverty line. The study argues that there are many dimensions to the definition and measurement of urban poverty:

> "I do not agree that poverty can be judged by how much money a person earns or spend[s] each day. Otherwise, why do so many people earn good money but continue to be poor? We must think [about] what causes poverty. It comes from many causes, not just one. We must look at all those various factors and consider what effect [they] may have on how the poor live. The way governments draw the poverty line by money is too narrow" (Boonyabancha and Kerr 2015 pg.640).

The study identifies work, income, and living conditions as the most important of six factors identified for defining the urban poor. It also identifies five groups of urban poor, as described in Figure 4.5, in answer to the question "Who are the urban poor?" This provides a framework for understanding and identifying the community organisations that need to take a pro-active approach and provide citywide development strategies.

Figure 4.5 Different levels of urban poor
Sources: Adapted from (Boonyabancha and Kerr 2015)

According to the literature review, the pro-poor concept in this study is understood as the provision of basic facilities, services, and utilities for the effective functioning of the environment, for the interest of the common resident which is also accessible by all citizens. This is referred to as the *concept of pro-poor infrastructure planning*. This concept is inclusive of all citizens but with priority given to the less well-off in a community.

4.4.1 The Concept of Pro-Poor Infrastructure Planning

Considering the background statement of the concept of pro-poor, infrastructure, the gravity of the challenges in developed and developing cities, this concept relates to the global goal of achieving sustainable urban development. The concept of pro-poor infrastructure planning therefore emphasises equity and equality in provision of facilities and services that are sustainable and accessible by the people. That is, the provision and the accessibility of basic facilities and services for the urban poor should be considered first before complex and sophisticated strategies. This includes equity and equality in distribution of facilities and services with priority to the urban poor without jeopardising the satisfaction of the general

population. Infrastructure development should be strategic within the context of the current needs of the urban poor, using possible and workable local approaches with the resources available to them.

The study of Majale (2001) also corroborates this idea and further adds that there is a need to recognise existing urban characteristics and the potential of small and medium-sized areas with respect to their inter alia informal sector activities, informal housing, and infrastructure, and create adequate guidelines for urban development plans. Similar to the study by Son (2007), Majale also emphasises inclusive policies and strategies for informal housing development, slum upgrading, and resettlement. However, the importance of simplicity and flexibility in the design approach is identified by Majale as key in making decisions and regulatory framework more pro-poor and removing the constraints on improvement of informal settlements and infrastructure in order to achieve sustainable development.

4.5 The Concept of Sustainability

The challenge of sustainability is global, and mostly urban in nature with significant increase in public space facility design challenge, urban informality, and infrastructure inadequacy. Despite the rapid increase in these challenges of sustainability and several other challenges, attempts by different researchers to discuss the menace but with little to no research that discusses this challenge of sustainability in tandem with urban informality. Most research has studied the issues of sustainability and urban informality and infrastructure separately. This study evaluates sustainability from the perspective of sustainable urban development, considering the trio of social, economic, and environmental factors. It adopts sustainable development as a concept through which to investigate urban informal areas and infrastructure in Hong Kong and Lagos and to recommend a design strategy.

Sustainability is a universal and urban design concept that seeks to improve urban challenges such as urban informality and infrastructure by ensuring sustainable use. Sustainability ensures that the urban environment and its resources (e.g. living conditions and infrastructure) are not depleted. The UN Sustainable Development Goals (SDGs) present a global agenda and guide for promoting sustainable development (Leal Filho et al., 2017; UN-Habitat, 2015d). Again, sustainable development for the purpose of describing this concept in this thesis is the ability

to use the Earth's resources without jeopardising their capacity for future use, i.e. the ability to use and reuse urban resources without depleting their capacity for similar quality of future use. Sustainable development promotes the effective and efficient use of resources from the perspective of society, economy, and environmental development in urban areas (Glanville & Turnbull, 2007). Thus, sustainable urban design principles include principles, strategies, policies, and programs that are established to guide human interaction within a geographical habitat to ensure effective use and reuse of its resources through a sustainable development approach (Carmona, 2009; Larco, 2016).

This study adopts sustainable development as the conceptual framework to achieve the aim and objectives of this study. It is integrated with the concept of urban informality to analyse sustainable urban development. This framework describes how these models and concepts can be applied in the study areas to develop sustainable urban design principles for sustained infrastructure development in urban informal areas. The model as adopted in this study for UISIP is illustrated in Figure 4.6 The figure illustrates the context of sustainability (environmental, societal, and economic) in the study areas and the significant factors of sustainability to be considered within these contexts, and the interactions that can occur.
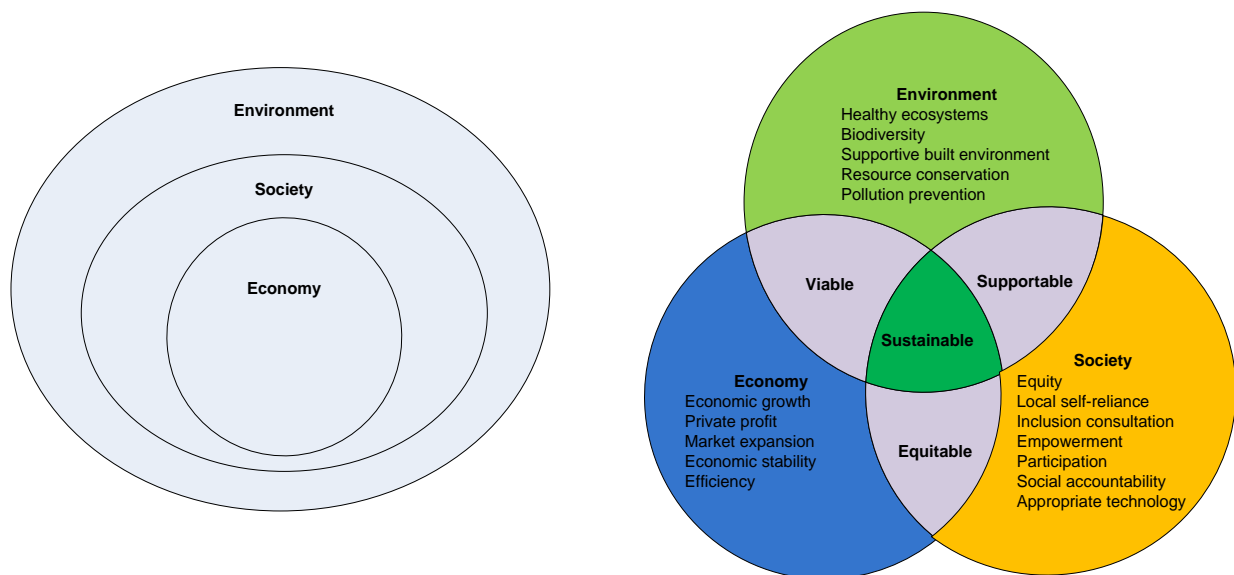
Figure 4.6 Sustainability model
Source: Adapted from (Goodman & Hastak, 2015; Yigitcanlar, 2010)

The concept of sustainability is adopted in this study because it applies to urban development strategy and is a philosophy that has case study, theoretical, and practical applications, which are essential to achieving the aim of this thesis.

4.6 The Concept of the Tactical Urbanism Approach

Talen (2015) account of tactical urbanism describes it as incremental change to improve urban environment that began in the 19th century as a popular political version of Jefferson's idea of self-government. It is also known as the pop-up approach, the guerrilla approach, or the Do-it-Yourself (DIY) urbanism approach. It is an approach that is rooted in the tradition of 19th century American civic engagement. Unlike urban reformers such as Ebenezer Howard and Daniel Burnham, small-scale urban improvers made no attempts to radically alter the structure of cities. Tactical urbanism is an approach that has recently produced significant achievement in urban planning based on its success in short-term action for long-term change in different urban areas.

Tactical urbanism is a relatively new paradigm in urban design that adopts "short-term actions for a long-term change" (Elrahman, 2016). Lydon and Garcia (2015a) also support this perspective and describe it as a strategy that is practical and citizen-oriented, with urban principles and exact approach to improve planning challenges. Tactical urbanism approaches urban building through the activation of short-term, low-cost, accessible, and practical interventions with measurable policies and programs for achieving a specific urban planning agenda. It is an emerging planning approach that adopts a hybrid of modernism and postmodernism and combines this with the integration of people and environmental initiatives to achieve sustainable urban development (Harper & Stein, 2006) This approach has been adopted in fragmented urban areas, UISIP-challenged areas. For example, Elrahman (2016) adopted tactical urbanism with citizen participation (a bottom-up approach) to examine socio-economic, culture, and environmental urban planning in Cairo's built environment. Lydon and Garcia (2015b) reiterate the position of Nabel Hamdi and emphasise the importance of being strategic with planning ideas in solving urban challenges and beginning where actions can have an optimised tactical effect. The study states that:

> "In order to do something big, to think globally and to act globally, one starts with something small and starts where it counts...It is about getting it right for now and at the same time being tactical and strategic about it" Nabel Hamdi in (Lydon, & Garcia, 2015b Pg.171).

Tactical urbanism is an approach that applies to every urban area that faces challenges, and in every urban planning activity from the blank wall, to a single house unit, to large-scale planning projects. It is an initiative that adopts deliberate and accessible means of achieving predetermined planning goals with embedded flexibility, citizen participation, and a planning process. Tactical urbanism is not a silver bullet or the only approach to solving problems, but it is an approach capable of responding to *economically*, *socially*, *physically,* and *environmentally* degraded urban conditions. Tactical urbanism is a planning paradigm that evolved from the planning ideas of technical rationalism in the period of urban modernism through urban postmodernism. The term "tactical" connotes technical, practical, and psychological strategic approaches adopted with respect to urbanism. Urbanism is the social, cultural, and economic way of life for city dwellers and characteristic of cities and towns. Although urbanism has been described in several ways, the Merriam Webster definition adopted in this study defines urbanism as: 1) the characteristic way of life of city dwellers; 2) (a) the study of the physical needs of urban societies, (b) city planning; and 3) urbanization.

4.6.1 The Concept of Tactical Urbanism Design

The challenges of UISIP are comprehensive and critical in developed and developing countries (Alter Chen, 2005; Cronin &Guthrie, 2011; Olajide, 2010; Rufina Wu & Canham, 2009). Urban planning has evolved to include different theories and application paradigms. However, tactical urbanism has been identified more recently to address urban planning challenges (Marshall, Duvall, & Main 2016). Tactical urbanism is described as urban planning and design strategies that adopt public participation, bottom-up initiatives, and low-cost, short-term techniques for long-term change on a small scale (Elrahman, 2016). Tactical urbanism is also referred to as the DIY development strategy (Gadanho et al., 2014; Marshall et al., 2016). It is referred to as a DIY development strategy because of its community-based, active citizenship, action-oriented, strategic, and technical initiatives that create the opportunity for the application of new concepts by local actors before making large-scale commitments (either environmental, social, economic and political) (Elrahiman, 2016; Marshall et al., 2016).

The concept of tactical urbanism framework presented in Figure 4.7, is based on the literature evidence of UISIP challenges in Hong Kong (Roy, 2012; Rufina Wu & Canham, 2009; Zhang, Wu, Skitmore, & Jiang, 2015), its significant in Lagos (Agbola & Agunbiade, 2009; Farinmade

& Ayankora, 2012; Olajide, 2010), and the need for a new approach to achieve sustainable development (Harper & Stein, 2006). This framework is adopted in this thesis for assessment of the study areas and strategy recommendations. Gadanho et al. (2014) identify tactical urbanism as a pragmatic approach that has the potential to ameliorating UISIP challenges in Hong Kong, Lagos metropolis and other global urban areas with uneven growth. This study adopts this approach as described by these literatures and several others to create the conceptual framework for sustainable urban design strategies. Figure 4.7 depicts the application of this approach based on the summary of the literature review and its application as the research framework in this study (Lydon & Garcia, 2015b).
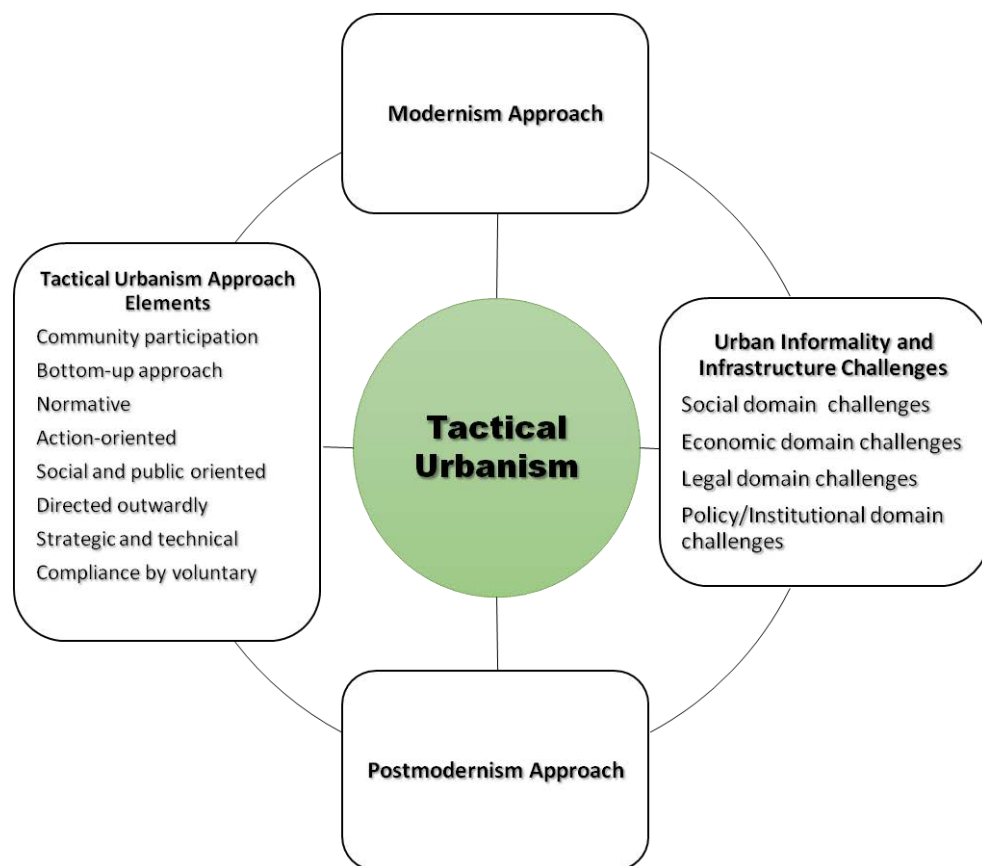
Figure 4.7 Framework for the tactical urbanism approach
Sources: Author 2017

The research framework shown in Figure 4.7 seeks to bridge the gap in knowledge of UISIP by developing sustainable strategies through the tactical urbanism approach to discuss UISIP challenges. Through its research framework, this study answers the research question and discusses the described knowledge gap in planning theory and planning project implementation methods.

4.7 Operational Synthesis of Conceptual Framework

The conceptual frameworks showed in this thesis are the philosophical ideas adopted to investigate and understand the issues of UISIP for sustainable urban design strategies. This study categorises the conceptual frameworks into three research areas, namely urban informality, infrastructure, and sustainable design strategy with identifiable workable concepts. Urban informality, as the first research area, adopts the concepts of urban informality and the culture of circuits. The second research area, infrastructure, adopts the concepts of tactical urbanism and pro-poor attitudes. The third arena, sustainable design strategy, adopts the concept of sustainability. The operational synthesis of these concept (concept of urban informality, circuit of culture, pro-poor, tactical urbanism, and concept of sustainability) to achieve the aim of this research involves the investigation of the thesis discourse based on these concepts to understand their operation, identified the research challenges which are theoretical and practical to propose sustainable design strategy. Figure 4.8 illustrates the operational synthesis of these concepts as the conceptual framework within the context and the study areas.
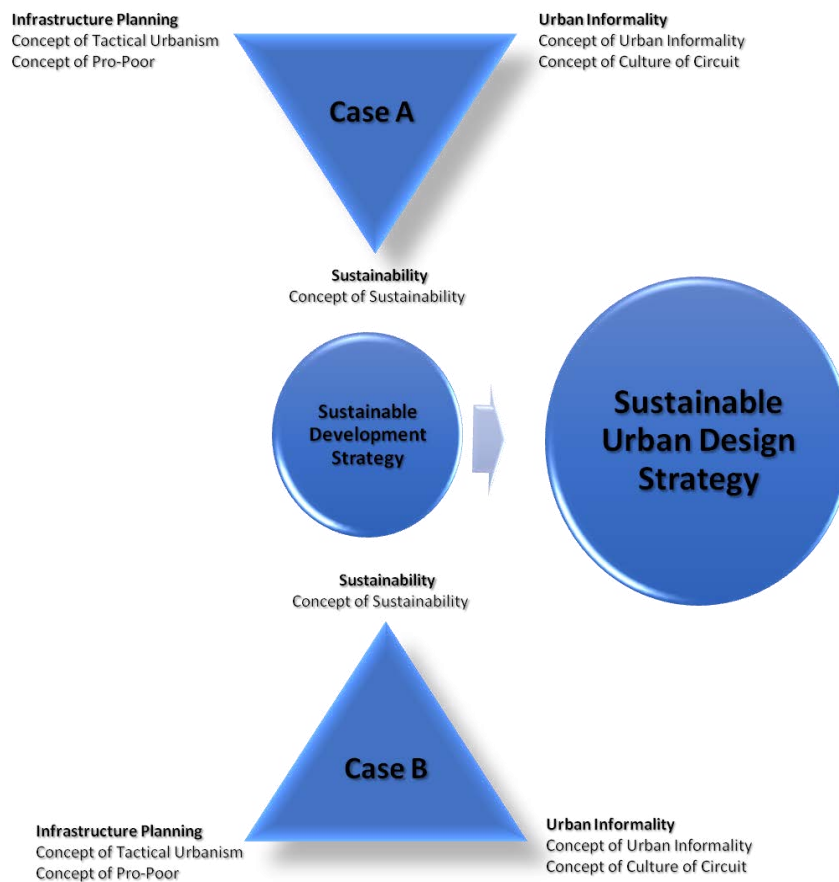
Figure 4.8 Operational synthesis of conceptual framework
Sources: Author 2017

The operational synthesis of this study's conceptual framework as illustrated above describes the process of achieving the aim of this study, the research gap, and investigate the contribution of this study to existing knowledge using the idea of triangulation. The figure adopts two triangles, each triangle for a case study, and each angle in the triangle depicts the operation of each concept in the study area or case study. Each case study is represented by a triangle, and each angle of the triangle describes a perspective of urban informality, infrastructure, and sustainable design strategy in the specific case study. The space between the two case study triangles represents the gap in knowledge identified in this study, and the circle represents the findings that produced the comprehensive sustainable design strategies to ameliorate urban informality challenges for sustainable urban development.

4.8 A Model for Sustainable Urban Design Strategy

Models are described and classified in several ways, but there is generally a basic distinction between physical and abstract models. In this study, the model represents the abstract/intellectual objects represented by symbols rather than physical objects (Lee 1973, 2016; Taylor, 1998). The foundational use of the term model by several studies, such as Faludi (2013); Lee (1973); Taylor (1998), describes its essence as the representation of reality (Lee, 2016):

> "It is usually a simplified and generalised statement of what seem to be the most important characteristics of a real-world situation; it is an abstract from reality which is used to gain conceptual clarity to reduce the variety and complexity of the real world to a level we can understand clearly. The value of a model is that it can be used to improve our understanding of the ways in which a system behaves in a circumstance where it is not possible (for technical, economic, political or moral reasons) to construct or experiment with a real-world situation" (Lee, 2016 Pg.7).

In line with the theoretical and practical literature, this study's perspective, ontology, epistemology, and methodology are considered to adopt the model used in this thesis. This research adopts a rational, integrated, sustainable design model to ensure a framework that can be generic and allow integration of several concepts for the development of sustainable design strategies. The model is adapted to guide the integrated design process of achieving sustainable UISIP design strategies towards the goal of sustainable urban development. It is an integration of three concepts, namely: the concept of rationality, event-based or context-based implementation, and the sustainability concept. Yigitcanlar (2010b) states that a rational planning, event-based implementation concept and sustainable development are fundamental urban planning and design approaches, which involve distinct, interrelated cycles. This emphasises that the implementation of these three concepts will create sustainable-oriented urban design and planning, and subsequently sustainable development. Figure 4.9 illustrates the model adopted in this study, discussing its concept in further detail.
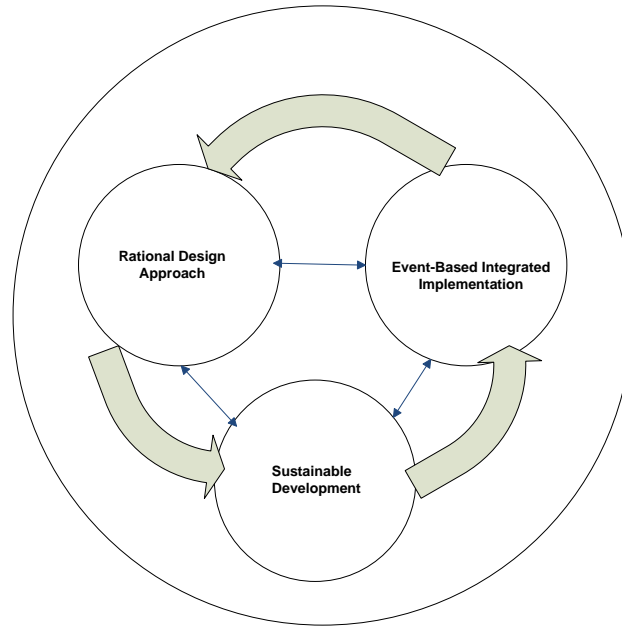
Figure 4.9 Rational integrated sustainable design framework
Sources: Developed based on (Yigitcanlar, 2010b)

The framework as described by Yigitcanlar (2010b) and adopted in this study emphasises that each component in the process include a list of criteria or variables that require different application techniques to implement the model. It should be noted that the consideration of the researchers', designers', and planners' different perspectives of each component under consideration, consensus building, and high quality of citizen participatory design in the process are necessary to achieve this model's philosophy. The rational design approach of the model is discussed further to elucidate how it is adapted to guide design decision processes and strategies for sustainable urban development.

Adopting the rational development model for design decisions and the iterative design strategy by Hamilton et al. (1969), as described by Lee (1973, 2016), the rational development model is a guide to assist designers in understanding, predicting, and developing the behavioural strategy of urban system. It is not meant to replace expert judgement, but it is a guide to develop balanced, logical, and systematic processes for urban design:

> "It represents an attempt to provide 'a systematic approach to helping a decision-maker choose a course of action by investigating his problem, searching out objectives and alternatives, and comparing them in the light of their consequences using appropriate framework – in so far as possible analytic – to

bring expert judgement and intuition to bear on the problem'" (Lee, 2016 Pg. 15).

Applying this principle for the design and development of urban design strategies in this study, the model is identified and described as a design strategy. Teriman, Yigitcanlar, and Mayere (2010) state that the global public authority oriented urban planning of the 1950s was based on the rational planning design. This approach has long been considered and used as a rational methodological decision-making strategy for urban development. Rational planning design is a set of processes for selecting, evaluating, and implementing the best strategy for urban design. It is the central concept for the evolution of modern urban design and planning (Lawrence, 2000; Teriman et al., 2010). It is further argued that rational planning design is a broad, acceptable, applicable planning and design process for master planning or comprehensive planning (Faludi, 2013; Taylor, 1998; Teriman et al., 2010). Figure 4.10 illustrates the model as adopted in this study as the structure for developing sustainable urban design strategy.
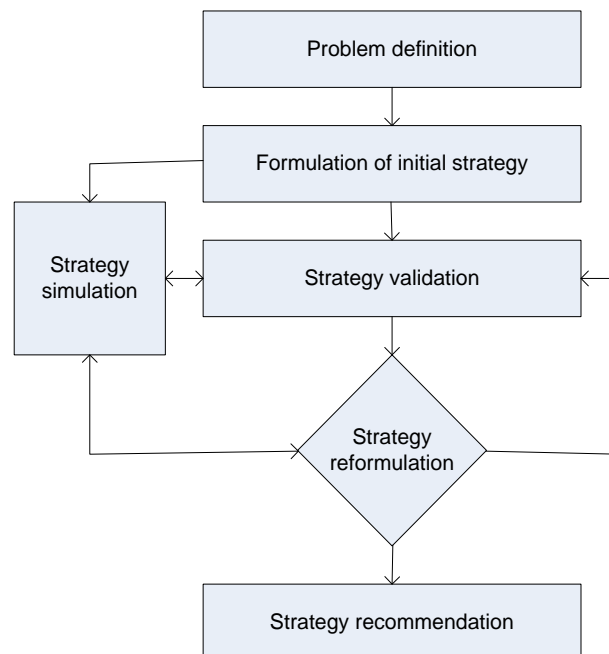
Figure 4.10 Overall rational principle model for urban design strategy
Source: Developed based on (C. Lee, 2016)

This rational principle for urban design follows a logical design sequence of six stages that are interrelated. The first stage adopted in this thesis begins with the problem definition, theoretical and practical evidence of urban challenges in the study areas, and the aims and objectives. This

involves the significant aspects of urban sustainability (social, economic, environmental, and institutional) challenges in the study area. This stage proceeds to the investigation of the problem definition based on the identified challenge, aims and objectives, resulting in stage two. This stage is actualised in this study with a pilot study that provides an outline of existing challenges. The second stage, which involves the formulation of design strategy, develops from the findings and recommendation of the first stage, leading to the third stage. The third stage involves the evaluation of the second stage strategy formulation and its validation by conducting the second, actual fieldwork with the complete rational, integrated, sustainable principles based on the strategy formulated. The fourth stage entails the formulation of the sustainable design strategy adopted at this phase. This stage can be described as presenting decisions for implementation but can be repeated based on the circumstances illustrated in Figure 4.10. This study proceeds to last stage after the reconnaissance study and pilot study, conducted which assist in the study and the recommendation and/or endorsement of urban design strategy adopted in this study. This based on the identification of a suitable urban design strategy to achieve sustainable urban development objectives with regards to the case findings.

4.9 Chapter Summary

The underlying ideas of urban informality as urban settlement, including its several challenges and few opportunities, is described in this chapter. These were described mostly in relation to sustainability factors (including social, economic, and environmental) and institutional factors, which creates a better understanding of the perspective of this study with regard to sustainable urban development. The definition and conceptualisation of urban informality and UISIP was also discussed. The circuit of culture concept argues that the culture of a people is significant to their way of life and that nothing exists in isolation from societal culture. The pro-poor perception emphasises placing poor people first in urban environmental planning design to promote equity, equality, and inclusive community. These two concepts are essential in this study because they emphasise the integration of societal identity (belief and culture) with general acceptability and accessibility for the community, with priority given to the poor in UISIP design. The concepts of sustainability and tactical urbanism as discussed in this chapter also relate to the practical tactics of improving difficult urban informality situations with regard to their most significant associated factors (social, economic, environmental, and institutional)

and possible application perspectives. The discussion in this chapter presents literature perspectives from the global context, the study scope, and the context of the study area.

The operational synthesis of the conceptual framework was explained to describe the operationalisation of each concept adopted in this study, the essence of each concept, and how they holistically contribute to achieving the aim of this study. The synthesis also helps create wider perspectives and complete overviews of the conceptual framework at a glance, helping the reader understand the necessity of conceptual framework in this study. With an understanding of the theoretical and conceptual framework, this chapter also discusses a model for sustainable urban design strategy. The model illustrates the pattern of decision making and the process adopted based on the findings of this study to develop urban design strategy for sustainable urban development. It also describes the novel strategy of this study (i.e. an integrated sustainable design framework) based on urban planning design, tested strategy, and the rational model adopted in this study.

Part 3
Research Methods

2	Chapter 3: Literature review Chapter 4: Conceptual framework
Research Framework	

1	Chapter 1: Research background Chapter 2: Study Area
Research Overview	

3	Chapter 5: Design research methods Chapter 6: Data presentation and discussion
Research Methods	

4	Chapter 7: Investigating UIIP: context of the study area Chapter 8: UIIP towards sustainable development
Research Case Study	

5	Chapter 9: Sustainable urban design strategies Chapter 10: Summary and conclusion
Research Conclusion	

Every discourse, even a poetic or oracular sentence, carries a system of rules for producing analogous things and thus an outline of the method.

Jacques Derrida

Chapter 5
Design Research Methods

The exploratory design is a two-phase mixed methods design. The overall purpose of this design is that qualitative data helps explain or build upon initial quantitative results.

(Clark & Creswell, 2008).

Synopsis

In this chapter, the design research methods adopted are discussed from the research method standpoint, reflexivity and positionality, justification for adopting the methods, the research design, and the operational synthesis of the research methods. The design research methods adopted include case study research design methodology, mixed methods of data collection with triangulation techniques. Data collection and mixed methods of data analysis were explained within the context of the study subject. The discussion in this chapter is based on the foundations laid in Chapters 1, 2, and 3, and its purpose is to create an adequate framework to investigate and make inductions and deductions regarding sustainable urban design strategies.

5.1 Introduction

Research, according to the Merriam Webster Dictionary, is the critical and studious inquiry into a subject with the aim of discovering, re-discovering, and interpreting new knowledge. The general description of the term "research" constructed from the prefix "re-" (again) and the word "search" (look for) can be understood as the process of "looking for again", i.e. looking more carefully, more intelligently, and more extensively (Marshall & Rossman, 2014). Frayling (1993) describes design research specifically as "research into art and design, research through art and design, and research for art and design". Considering the dynamics between design research methods and research design, design research methods can be simply described without any ambiguity as the logical thought process of determining the position of an argument (hypothesis), with a focus on accepting or establishing a theory that contributes to the existing body of knowledge in a particular way that can be reproduced.

Design research methods, according to Pertti (1995), are the totality of all methods in any research, which includes the strategies and processes research adopts to establish its findings. This includes the principles that guide the examination processes, direct the interpretation, and govern the system induction and deduction in the research. This also describes the term "methodology" and this term and the term "research methods" are used interchangeably in this thesis and case study investigation. This chapter discusses the thesis methodology, including the research standpoint, the justification for the choice of methodology, the research design, its application in this study, and hypothesis testing. It also provides information on the nature and sources of data collection, methods of data collection, and methods of analysis.

This thesis adopts case study methodology, mixed method data collection with triangulation techniques, multi-stage sampling techniques, and mixed method data analysis. The choice of cases in Hong Kong and Lagos adopts the literature, government verdict, conceptual framework, and practical evidence criteria through pilot studies, site investigation in the study areas. Triangulation techniques of data collection were adopted as the data collection strategy to ensure the validity and reliability of the study. Triangulation techniques involve the use of more than two data collection techniques to obtain data from both primary and secondary sources. The data analysis adopts a mixed method data strategy and exploratory design

(qualitative data analysis results building quantitative data analysis and results, which are then followed by the interpretation) in this study.5.2 Methods Standpoint

Research method standpoint is an important aspect of any design research process adopted. What we know depends on what ontology and epistemology we belong to, and this subsequently influences our research standpoint and determines the type of methodology that best suits the study. This thesis' standpoint and the perspective for selecting this method is built on the paradigm of rationalism, which in turn is based on the ontology and epistemology of the origin of what is known. This emphasis that what is known about the study (e.g. what the researcher knows about the study and the research methods, what the public knows, or what the audience knows), what is the researcher's involvement is, the researchers roles/practice in the study, where the researcher's interest is coming from and how best will it able to achieve the unknown (Sultana, 2007; Wirman, 2015).

This is the structure of describing reality, which may not necessarily be the truth from the current position reality which are also theoretical and practical. Adopting the epistemology of rationalism, which also considers empiricism (constructive and positivism) and transformativism (idealist, ethnography), this study describes the reality of urban informality and infrastructure in both a developed and a developing city. Guba and Lincoln (1994) in Healy and Perry (2000) synthesise scientific paradigms into four categories: positivism, realism, critical theory, and constructivism, which are critically considered before the selection of rationalism as the ontology, epistemology, and the research standpoint of the thesis method. Regarding the different identified literature on ontology, epistemology, and the rationalist paradigm, the view of rationalism is also adopted as the driver of this study. Rationalism serves as the ontology, epistemology, and the methodology standpoint of the thesis. The lecture notes of (Wirman 2015) summarised rationalism as:

> "In epistemology, rationalism is the view that 'regard reason as the chief source and test of knowledge' [1] or 'any view appealing to reason as a source of knowledge or justification'. [2] More formally, rationalism is defined as a methodology or a theory 'in which the criterion of the truth is not sensory but intellectual and deductive'. [3] Rationalists believe reality has an intrinsically logical structure. Because the rationalist argues that absolute truths exist and that the intellect can directly grasp this reality which may or may not be the truth" (Wirman, 2015).

This finding of (Wirman, 2015) summarises accurately and supports other factors that justify the use of rationalistic paradigm shifts as the ontology and epistemology standpoint of this thesis methodology. As described above, the research standpoint of selecting the thesis method, which is the use of a case study, is based on rationalism of describing the reality of the subject of study. This knowledge of what is known is identified as critical to this study and its methods, which further justifies the use of this standpoint and perspectives in achieving the goal of the thesis in the pursuit of urban sustainability within the global knowledge.

5.2.1 Reflexivity and Positionality

Reflexivity in research is the identification, recognition, and rethinking of the research process to ensure ethical research processes. It is the systematic approach of evaluating the context of knowledge construction in the study, especially the effect of the principal investigator's actions in every step of the research process. Research reflexivity occurs either for the researcher or the context of the research. Research positionality is the researcher's position in the process of the research and is the consideration of the researcher's influence in the research. Olajide (2015) describes reflexivity and positionality according to Chambers (2007) as the self-critical epistemology of awareness. He describes it as the mindset, value, training, and predisposition of the researcher, which is a factor that can influence the outcome of the research:

> "Reflexivity in research involves reflection on [the] self, process, representation, and critical examination of power relations and politics in the research process as well as the researcher's accountability in data collection and interpretation" (Olajide 2015 pg. 148).

Sultana (2007) argues that it is important to critically consider the issue of reflexivity, positionality, and power relations in research fieldwork to undertake ethical and adequate participatory research. Sultana posits that these reflections are more important in situations of multiple axes of differences, inequalities, and geopolitical regions and situations where the ethics and politics involved are cross-cultural. These criteria must be heeded and negotiated to achieve ethical research practices. Describing the position of Peake and Trotz (1999), Sultana (2007) states:

> "It can strengthen our commitment to conduct good research based on building relations of mutual respect and recognition. It does, however, entail abandoning

the search for objectivity in favour of critical provisional analysis based on plurality of (temporally and spatially) situated voices and silences" (Peake and Trotz 1999 pg.37) in (Sultana 2007 pg.376).

Sultana (2007) concludes that:

"It is critical to pay attention to positionality, reflexivity, the production of knowledge and the power relations that are inherent in research processes to undertake ethical research, especially in international field research contexts. Reflecting on my positionality vis-à-vis others has constructed my identity and helped me to fully engage in reflexivity that enables adequate engagement with the research process in a more meaningful way" (Sultana 2007 pg. 382).

Considering the significance of reflexivity and positionality in the studies of Ihuah (2015); Olajide (2015); Sultana (2007), and several others, it can be concluded that reflexivity and positionality support the commitment towards conducting a good research. The researcher should acknowledge his research positionality as a researcher and how it might influence the outcome of the study.

As a researcher, I acknowledge my empathy for the poor and those in informal settlement without infrastructure, having previously lived in an informal settlement in Lagos and having this experience myself, and I reflect on my positionality vis-à-vis the construct of UISIP and literature perspectives, as well as my training and identity as a planner. This experience has helped me to engage in fuller reflexivity that enabled the research process in a meaningful way. The first decision was to adopt a positionality of subjectivity, tempered both spatially and temporally. The second was to avoid including the settlement I lived in previously as part of the case study, in order to avoid too much familiarity with the setting. Since this research could not cover all areas that experience urban informality, avoiding this area had no effect on the research outcome. The third decision was the choice of methodology adopted, most especially the use of the triangulation method of data collection and analysis, which enables multiple methods of data collection and analysis. This helped in ensuring the validity and reliability of the research, checking the effect of the researcher's pro-poor bias in data collection and analysis. The summary of the research philosophy, perspective, and research stance in relation to existing literature, the context of the study, and the study area is presented in Table 5.1, below.

Table 5.1 Description of the research philosophy, perspectives, and research stance

Research Philosophy	Perspectives	Research Stance
Ontology	Objectivism (External relationship) Constructivism (Internal relationship)	Constructivism and interpretivism with rationalism on the investigation of a real-life situation within the context of the phenomenon.
Epistemology	Rationalism (appealing to reason but not subjected to reason alone) Positivism (observer is independent of that being researched) Interpretative (observer is dependent on that being researched, which implies a social phenomenon)	Rationalism, because the context spatial and the issue is practical. Positivism, because reason is required for induction or deduction. Interpretative, because it involves people, their knowledge and understanding of the phenomenon in the real world that requires interpretation and processing.
Axiology	Value-neutral (value free) Value biased (value-laden)	Value-laden, as the researcher's views are dependent on the participant beliefs and experience of the situation.
Pragmatism	Combination of rationalism, positivism, and interpretative approach to address social sustainability issues	Descriptive and inferential interpretative more than positivist because a practical solution is needed for a real-life challenge.
Reflexivity and Positionality	Subjectivity both spatially and temporally	This research thinks critically, acts pragmatically and rationally, and accepts subjective results objectively

Source: Adapted from (Ihuah, 2015; O. A. Olajide, 2015; Sultana, 2007)

5.2.2 Method Justification

The justification for selecting the methods adopted in this thesis is based on the nature of this thesis, its aim and objectives, the literature review context, the research question, and the research gap this study attempts to bridge. Also, the selected methods are based on the literature evidence of past research that proves these methods are the most appropriate for achieving more precise and accurate results. This is based on the relevant advantage of this selected methodology in relation to other methodologies.

Considering this, the following are the identified methodologies that can be adopted in this thesis, among which case study methodology with mixed method data collection (triangulation techniques of qualitative and quantitative data collection) and mixed method analysis (exploratory design of qualitative data analysis leading to quantitative data analysis and results, followed by interpretation) are adopted, among other methodologies. The identified applicable methodologies for this study include, but are not limited to, the following:

i.   Case Study Methodology;

ii. Experiment Research Methodology;

iii.   Content Analysis Methodology;

iv.   Action Research Methodology;

v.   Qualitative or Quantitative Methodology;

vi.   Mixed Methodology;

vii.   Ethnographic Research Methodology

Based on the reviews of (Donald & Arthur, 1974; Earl, 2008; Figueira, Greco, & Ehrgott, 2005; Geoffrey & Zedeck, 1989; Lee 1973; Marshall & Rossman, 2014; Triantaphyllou, 200, 2013) and other literature reviews of social, environmental, and design research methods, case study methodology was selected as the methodology for this study. This is considered more appropriate than any other methodology based on this thesis research design, the research methods, the research application, and the system of testing the hypothesis. The basis for selecting case study methodology above other methodologies is discussed below.

Unlike most methodologies that could be adopted in this study, case study methodology allows the use of different settings and cases in different areas simultaneously. Case study methodology is compared with experimental methodology to justify the selection of the methodology adopted. Case study methodology is the technique used for sampling a population segment with the intention of gaining information that will aid in accepting or rejecting a hypothesis in a single case or multiple cases. Experimental methodology is the procedure of testing, verifying, or establishing the validity and reliability of a hypothesis, not necessarily within the context of a single case or multiple case studies. Case study methodology was selected over experimental methodology even though both case study methodology and experimental methodology could have been adopted for this study based on the context. Experimental methodology is often adopted for procedure manipulation in the laboratory. The field experimental study is also on a case-by-case basis, but it is not mostly adopted for different case or cases simultaneously, which can be adopted in case study methodology. That is, experimental methodology is inadequate for experiments in more than one setting or multiple cases at the same time, which are necessary elements in this thesis. Also, considering the title of this thesis, the perspective of study, and especially the nature of the research (design, planning and social science in nature), the best methodology to adopt is case study methodology.

Also, in comparing case study methodology with other methodologies identified above, it can be seen that case study methodology can utilise almost all other types of methodologies as methods, which was the approached used in this study. This study adopts a case study research approach because it allows for a more practical discussion of the subject of study than any other methodology. It further allows for simultaneous case discussion more than any other methodology. Another important reason for adopting a case study approach is because it supports effective replication of the research process in different area(s) or case(s) of study, as the whole approach can be easily reproduced in other areas, cities, and countries. This aspect of case study methodology is significant for this study to achieve its expected contributions of knowledge that is applicable in other urban informal areas. This provides this thesis with the ability to highlight development strategies that can be reproduced in other developed and developing cities if the methodology is effectively applied within the context of that area. Furthermore, the application of case study methodology in this thesis allows the research case study to test the hypothesis in either a case-by-case manner or in multiple cases simultaneously. It also allows the integration of more than one method in the thesis methodology, which most other methodologies cannot support. Case study methodology allows the combined use of mixed method data collection using a triangulation approach, multi-stage sampling techniques, and mixed method data analysis using an exploratory design of qualitative data analysis, which results in building quantitative data analysis and interpreting the results for adequate use which is necessary for this thesis and most other methodology cannot adopt.

In addition to the justifications above, case study methodology was selected over experimental or any other methodology because it is the most frequently adopted methodology for this kind of research in previous studies. Geoffrey and Zedeck (1989) also state that it is evidence that design research, social science research, and behavioural science adopt certain types of methodology more frequently than others. Social science research, design, and behavioural scientists generally use four types of methodology: (1) case study; (2) content analysis; (3) experiments; and (4) non-experiments. However, case study methodology is often identified and used as an approach that is more appropriate in several social science research fields, environmental sciences, design, and applied research. This study identifies and highlights some relevant literature reviews to further justify the use of case study methodology above other

methodologies. Table 5.2 presents related literature findings of research using case study methodology.

Table 5. 2 Methods/approach in urban informality and infrastructure studies

Authors/Title	Methods/Approach	Sample size	Variable used
Urban informality			
Alter Chen, Martha (2005)	Content analysis with descriptive method approach	N/A	Social, economic, and environmental. (Economic & social affair)
Roy, A. (2012).	Qualitative descriptive	N/A	Qualitative descriptive review
Douglas, Gordon CC (2016)	Ethnographic methodology	17 cities of USA	Social, economic, and environmental variable consideration
Hernández, F., Kellett, P. W., & Allen, L. K. (2010).	Ethnographic methodology	N/A	N/A
Elsheshtawy, Yasser (2013)	Behavioural mapping and videography	N/A	Social and environmental behaviour research.
Jabareen, Y. (2014).	Case study methodology with a qualitative approach	N/A	Concept of urban self-determination. Normative right approach
Marjit, S., & Kar, S. (2009).	Case study (survey)		Socio-economic
Ali, M. H., & Sulaiman, M. S. (2006).	Ethnographic,	N/A	Social, economic, and environmental.
Hegazy, Ibrahim Rizk (2016)	Ethnography	N/A	Socio-economic
Brown-Luthango, M., Reyes, E., & Gubevu, M. (2016)	Case study methodology with mixed method approach	633	Social, economic, environmental, and infrastructure.
Lawanson, & Fadare. (2015).	Case study methodology with quantitative approach	500	Socio-economic, environmental and health
Adeyinka, S. A., Omisore, E. O., Olawuni, P. O., & Abegunde, A. A. (2006)	Case study with quantitative approach	200	Social, economic, and environmental.
Olajide, O. (2010).	Literature review	N/A	Social, economic, and environmental. (Economic & social affair)
Olajide, O. A. (2015).	Case study with mixed approach	N/A	Social, economic, and environmental. (Economic & social affair)
Farinmade, A Anyankora, M.I (2012)	Case study with quantitative approach	177	Socio-economic
Kennett, P., & Mizuuchi, T. (2010).	Case study with descriptive	N/A	Physical, social, economic, environmental, and policy.
Rufina Wu, & Canham, S. (2009).	Ethnographic photography and videography	N/A	Social, economic, and environmental.
Tam, I. Y. S. (2012).	Case study mixed method	N/A	Social, economic, and environmental.
Chui, E. (2008)	Content analysis	N/A	Physical and environmental variables.
Tanasescu, A., Wing-tak, E. C., & Smart, A. (2010).	Descriptive approach	N/A	Physical, social, economic, environmental, and policy.
Alan Smart (2001)	Documentary analysis	N/A	Soci-economic, environmental, governance and policy.
Infrastructure planning			
Goodman, A., & Hastak, M. (2015).	Case study, qualitative and quantitative	N/A	Planning, engineering, and economics
Uddin, W., Hudson, W., & Haas, R. (2013).	Case study, qualitative and quantitative	N/A	Planning and management
Verheijen, M. (2016).	Case study, qualitative and quantitative	N/A	Design
Timmermans, J., & Beroggi, G. (2000).	Mixed method	N/A	sustainability, safety, economic and environmental
Dukiya, J. (2014).	Quantitative method	N/A	Road infrastructure
Gandy, M. (2006).	Qualitative method	N/A	Planning
Ijaiya, G. T., & Akanbi, S. B. (2009).	Qualitative method	N/A	Empirical analysis
Olaseni, M., & Alade, W. (2012).	Literature review	N/A	Review

Ng, S. T., Wong, J. M., & Wong, K. K. (2013).	Case study with mixed methods.	N/A	N/A
Zhang, X., & Chen, S. (2013).	Case study with qualitative approach	N/A	N/A
Sustainable Development			
Harris, J. M. (2000)	Qualitative approach	N/A	N/A
Newman, P., & Jennings, I. (2008).	Case study with qualitative approach	N/A	N/A
Salat, S., & Walker, G. (2011).	Case study, qualitative and quantitative	N/A	Planning, design, physical and environmental development variables
Yigitcanlar, T. (2010).	Case study, qualitative and quantitative	N/A	Urban management, engineering, and design.
Mori, K., Fujii, T., Yamashita, T., Mimura, Y., Uchiyama, Y., & Hayashi, K. (2015).	Qualitative	N/A	Social, economic, and environmental
Larco, N. (2016).	Qualitative	N/A	Social, economic, and environmental
Knaap, E., Ding, C., Niu, Y., & Mishra, S. (2016)	Case study, qualitative and quantitative	23 economic centres	Economic and environment
Meijer, M., Adriaens, F., van der Linden, O., & Schik, W. (2011).	Qualitative	N/A	Social, economic, spatial and environment.
Aluko, B. T., & Amidu, A.-R. (2006).	Literature review	N/A	Social, economic, spatial and environment.

Source: Author (2016)

Apart from the evidence of the previous literature, this thesis also adopts case study approach because it allows for site-specific characteristics in relation to the nature of the research.

5.3 Research Design

According to Earl (2008), the essence of research design is to inquire into a subject and interpret the subject for decision making with the aid of graphical blueprints of the process. Therefore, the research design for this thesis is simply the holistic blueprint of the research methods with the details of the process adopted at a glance. This study research design adopts case study with mixed method data collection (triangulation techniques of qualitative and quantitative data) and mixed method analysis (Exploratory design of qualitative data analysis result building into quantitative data analysis and results followed by the interpretation) above other research methods because it allows real-world settings investigation. This research design is structure towards the use of qualitative and quantitative research approaches because of their suitability application to achieve the aim and objectives of this study.

The qualitative research according to Patton, 2002 in Lawanson 2011, is identified as a naturalistic approach that seeks to investigate research phenomenon in their context-specific, flexible methods of data collection and analysis suitable for any society, with thorough understanding of the context of the study from direct sources. It is an approach that allows the

opportunity for quantity and quality response through flexible techniques of question(s) and response. It also allows the researcher to familiarise to the subject of research in a way to extract intrinsic content of study. While the qualitative research is essential in this aspect, the quantitative on the other hand enables a quantitative measure to test hypothesis, enhance more scientific process and allows adequate study generalisation. Importantly, quantitative ensures a more real-world setting where the research has little or opportunity to manipulate the subject of research.

Also, to finally conceptualise and adopt this research design, a pilot study to investigate the subjects of study, suitability of the study area and methods was adopted. The findings reflect that the suitable research design and research methods required depends on the research aim and objectives, the nature of the study, types of data set required, and the variables/questions sets required. Thus, considering this premise, and the conditions above which are significant in the selected areas. The application of these two study areas is inevitable with this research design process for data collection, analysis, interpretation, and discussion. Figure 5.1 the research design adopted for the study is presented below.
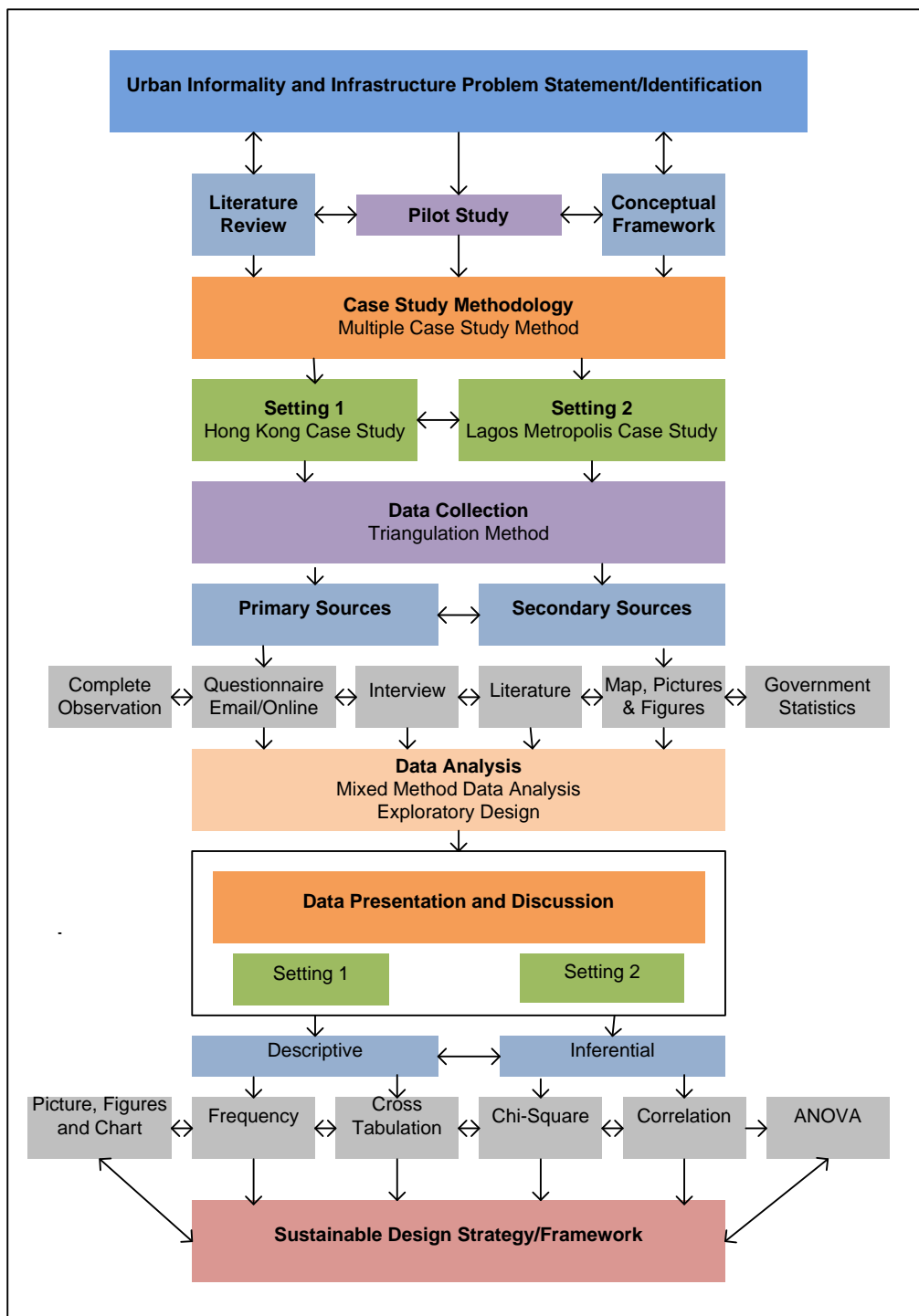
Figure 5. 1 Exploratory research design
Source: Author (2017)

5.4 Methods Application

This aspect of the study discusses the application of the adopted research methods within the context of the thesis. This study adopts case study (multiple case study) approaches because it

allows for multiple settings (locations) and more than one case to be studied simultaneously. The case study approach in this research is an exploratory field-based study in the two settings of Hong Kong and Lagos. The decision to adopt case study methodology is based on the nature of this study, its aim and objectives, the research gap, and the literature review. This research method is applied in this study area within the context of the study's conceptual framework. A detailed description of the application of this research method is discussed in the following sections.

5.4.1 Case Study Method

The case study areas are Hong Kong SAR and the city of Lagos. This study adopts two separate metropolitan cities in a developed and a developing country to understand and assess UISIP for sustainable urban development. Although differences exist between these two metropolitan cities, this thesis does not compare two cities to select the best or determine which has the most critical issues. This study seeks to understand the concepts, nature, and characteristics of urban informality and infrastructure in a developed and a developing metropolitan city in order to support development strategy. The study areas were adopted based on theoretical and practical evidence of issues of informality in these areas. These areas were adopted to confirm or negate the hypothesis that there is no significant relationship between UISIP and achieving sustainable development in Hong Kong and Lagos with the other hypotheses tested. This study investigates the socio-economic, environmental, and infrastructural characteristics in these areas to understand the issues of urban informality and develop adequate improvement strategies. The study areas in this research are discussed in detail in Chapter 1, Section 1.10. This section discusses these areas within the context of case study methodology, the justification of the choice of these areas, and the application of case study methods to these areas.

The choice of Hong Kong as a study area is justified considering the evidence of urban informality in this area. The significant relationship between Hong Kong's population in relation to its land use, its experience with high rates of housing challenges, the theoretical and practical evidence of squatter settlements in the SAR make the area an appropriate choice for this research (Alan, 2001; Rufina Wu & Canham, 2009; Tam, 2012; Tanasescu et al., 2010).

A statement by the Hong Kong Department of Lands (2016) regarding some areas in the region support the past and present evidence of urban informality issues in the SAR:

"There are currently 12 surveyed squatters in Tung Ah Pui Village, all of which are located on government land. Per the squatter survey records in 1982, these squatters' structures were built with permanent materials such as concrete, tiles, and bricks ... Moreover, as these squatter structures were covered in the Squatter Control Survey (SCS) in 1982, they are 'tolerated' and 'allowed to exist' on government land" (Hong Kong Department of Lands, 2016. Pg1).

The acknowledgement of Tung Ah Pui Village, among several other areas of Hong Kong, with the theoretical evidence and physical indications of this issue in the region, justifies the SAR as a suitable case study area in a developed country. Hong Kong occupies 1,104 sq. km of land area at 22°15'N latitude and 114°10'E longitude on the Tropic of Cancer. Of its landmass, 45% is developed and above 50% is covered with natural features (terrain, hydrology, etc.) and flora. Hong Kong is characterised by its compact urban landform and high-density buildings, with urban informal settlement seen in specific areas of the city. Hong Kong was adopted as a case study due to its past and present experience of issues with urban informality, its rapid urbanisation, and its current crisis in affordable housing and public housing provision (Cuthbert & McKinnell, 1997; Ng et al., 2012).

Similarly, the city of Lagos has socio-economic, physical, and environmental characteristics that clearly reflect issues with UISIP. Despite this, there is no significant government report regarding this challenge in the metropolis, or relevant decree (Nigerian Urban and Regional Planning Law Decree 88 of 1992 and the Lagos State Urban and Regional Planning and Development Law of 2005) adopted in the metropolis. However, the studies of Aluko and Amidu (2006); Lawanson and Fadare (2015); Olajide (2010), (2015); argue the significance of these issues in Lagos with significant practical evidence.

The coastal city of Lagos, the fifth largest city in the world, is situated within the latitude 6° 23'N and 6°41'N and longitude 2°42'E and 3°42'E on the south-western Nigerian coastal plain. It is located on the Bight of Benin, with a geographical area of 3,577 sq. km. The city of Lagos was adopted in this study because of the practical and theoretical evidence of urban informality challenges in the metropolis. According to Aluko and Amidu (2006), as well as other studies, more than half of Lagosians are tenants or homeless, in both slum and non-slum areas of the metropolis. More than 40% of the metropolis occupy core informal areas, and less than 20% occupy formal areas of the metropolis (Aluko & Amidu, 2006; Lawanson, 2011; Omole, 2001). There are no significant differences between the slum and non-slum areas of Lagos metropolis

regarding house ownership, quality of housing, and living conditions (Lawanson & Fadare, 2015).

Finally, in relation to the case study methodology, these study areas were adopted after pilot research studies conducted by Soyinka and Siu (2017a, 2017b); Soyinka et al. (2016), which also supported the evidence of these areas as suitable for this research. The findings of this research reflect the challenges of Hong Kong as well as Lagos, creates a growing concern of housing, informal settlement, public space, and infrastructure inadequacy. The study investigates the nature of informal settlement and the adequacy of infrastructure provision in Hong Kong and Lagos and identifies these issues with regard to different dynamics. Finally, as this study utilises a case study method, the specific research areas were also selected in relation to the appropriate methodology.

5.4.1.1 Research Area

To further describe the case study areas based on the theoretical, practical, and governmental evidence and pilot research by the studies of Soyinka and Siu (2017a, 2017b); Soyinka et al. (2016), this study establishes the research areas. The research areas are the specific areas for analysis and they are justifiable research areas for generalising the findings of this research. The research area was selected based on the literature review, the findings of the pilot study, adequate study area for generalisation evidence of the issues in the area, since this study cannot cover all of Hong Kong or Lagos. The research area also serves as the sample frame for this study and the frame for selecting the sample size (see detailed discussion for sample frame and sample size in section 5.4.2.5) in this study. The research areas were selected based on multi-stage sampling techniques that were also adopted for the survey sampling techniques and procedures. The first stage of the multi-stage sampling method is the stratification of the study areas into regions. For Hong Kong, this includes the New Territories, the Kowloon Peninsula, and Hong Kong Island, while for Lagos these divisions encompass the Lagos Island region and Lagos Mainland region. The second stage is adopting 20% of the 18 districts in Hong Kong and 16 LGAs in the city of Lagos, is based on the practical and theoretical evidence of the issues in these study areas. This study investigates seven areas in four districts of Hong Kong and seven areas in three LGAs of Lagos based on these premises. Table 5.3, below, presents the research areas as explained above in table form.

Table 5.3 Hong Kong SAR and Lagos case study areas

Hong Kong SAR			
New Territories	**Kowloon Peninsula**		**Hong Kong Island**
Tai Po District	**Kowloon City District**	**Sham Shui Po District**	**Wan Chai District**
• Tai Po Market	• Hung Hum	• Sham Shui Po	• Wan Chai North
	• Homan Tin	• Shek Kip Mei	• Wan Chai South
City of Lagos, Nigeria			
Lagos Island Region		**Lagos Mainland Region**	
Eti-Osa LGA	Obalende area	**Lagos Mainland LGA**	Iwaya
	Ilado/Eti-Osa Environs		Makoko
	Badore	**Ikeja LGA**	Ipodo/Seriki Area
			Alausa/Oregun/Olusosun

Source: Author (2017)

Why Hong Kong and Lagos metropolis: In addition to the discussion of section 1.7.2 on justification of the study areas, the theoretical, practical, and pilot evidence discussed in the design research methods above, the study area adopted is relevant for this study. This is also established by the study of "uneven growth" and its exhibition in MOMA, New York (Bridger, 2015) where Hong Kong and Lagos were identified significant on this issue. The review of the study describes the increasing inequality of urban development in six global metropolises namely; Hong Kong, Istanbul, Lagos, Mumbai, New York, and Rio de Janeiro respectively. It finds Hong Kong as the most significant of the six metropolis and Lagos as the third. Based on all these evidence, UISIP is significant in the study area and its evident in different aspect of the living condition with regards to housing, socio-economic capacity, environmental, and governance. The past and present condition of the area in relation to UISIP; the potential of improving the area for sustainable development through urban design strategies justifies these study areas for this research.

5.4.1.2 Research Population

In this study, the research population is the direct group of people that are considered for investigation. From this population, a sample is drawn for survey questioning and interviews with the aim of ensuring a survey result that is credible and supports generalisation. Lawanson (2011) describes the term "research population" as an identified group that is relevant to all cases or objects of interest in a study. The study also emphasises the need for a homogenous population with minimum levels of variability, as according to the study of Moriris (2007), this obviates the need for a large sample size. In this study, the identified relevant groups are:

1. **Informal Settlement Dwellers:** This study administered survey questionnaires and interviewed this group to establish the characteristics of, and assess and determine the relationship that exists between, informality and infrastructure. It is essential to analyse this group to determine the socio-economic and environmental profile of the households that make up urban informal settlements and to determine the influence and relationship between informal settlement and infrastructure on these household's conditions of living and immediate environment. This group includes native residents and settlers in the research areas with adequate knowledge of the area. See Chapter 1, Section 1.8, and Section 5.4.2 Data Collection and Section 5.4.2.6 Sampling Procedure for more details about this population group in this study.

2. **Professionals:** This group is essential for this study to assess the issues researched from the professional perspective. The professionals surveyed in this research were divided into two groups, namely private and public professionals. Private professionals are those with academic, research institute, and consulting practices, while the public professionals are those from public parastatals or agencies. Professionals that met the minimum required criteria of holding a master's degree in any environmental science or design-related discipline and had practised in public or private practices between 5-10 years and above were included. Table 5.4 presents the distribution of the professionals sampled in the study areas, while a detail discussion is provided under the data collection section that follows. See research instruments and sample frame and size for further details.

Table 5.4 Professional research population sample

S/N	Professionals Interview (PI)	Lagos Metropolis	Hong Kong	Total
1	Lecturers/Academics	5	5	10
2	Public Professionals/Civil Servants	10	1	11
3	Private Practitioners/Consultants	3	6	9
	Total	**18**	**12**	**30**

Source: Author 2016.

5.4.2 Data Collection

The data gathering process for this study adopted mixed methods of data collection with triangulation techniques and multi-stage sampling techniques to determine the sample size. The triangulation techniques of data collection are defined as the collection of research data using

more than two approaches. This was adopted to ensure the validity and reliability of the data collected, increase its accuracy, and subsequently ensure the precision of the results/findings and the recommendations of this study. The nature and sources of data collected in this study are discussed in conjunction with the tools and process of data collection used in this research.

5.4.2.1 Nature and Sources of Data

This study adopts different natures of data for investigating the different perspectives of this study. The nature of the data adopted is data related to socio-economic characteristics of residents, such as occupation, income, environmental variables, informality, and infrastructure in Hong Kong and Lagos. The sources of data used also include primary and secondary sources of data. The primary sources are data derived from multiple sources of first-hand data, i.e. data collected for this research that has not been used for any previous studies. The secondary sources are the data sourced from multiple materials and publications. The nature of the data used is discussed below in terms of the category of source of the data (primary or secondary) adopted in this study.

5.4.2.1.1 Primary Data

The data adopted through primary sources was obtained through personal observation, questionnaires, and interviewing. This data falls into the following categories:

1. Socio-Economic Condition: This is the social and economic background data of the respondent. This data includes gender, age, marital status, level of education, occupation, average monthly income for the household, household size, number of rooms for the household's exclusive use, and residential status, among other indicators. This data is essential for investigating the relationship between socio-economic and environmental dynamics of urban informal settlement in the study areas.

2. Environmental Condition: This includes data from the housing and physical environment such as predominant building use, types of building, construction materials, roofing materials, and types of building facilities. The status of residence, ownership, charges, and documents available are also included in this data. This data is

necessary to investigate the environmental condition of the residences in relation to urban informality and infrastructure in the area.

3. Infrastructure: This study considers infrastructure facilities such as roads, water, and public health facilities. The nature of this data includes infrastructure availability and infrastructure adequacy, assessed through questions such as "Which infrastructure is available to you in your community?" "Who provides the infrastructure?" "How adequate is the infrastructure?" and "What degree of accessibility and distance from basic facilities and services do you experience?" among other questions.

5.4.2.1.2 Secondary Data

Secondary data was obtained to support the primary data. This includes existing data from published and unpublished sources utilised in this study, i.e.:

1. Records from relevant agencies on urban informal settlement, infrastructures, and the study areas, including sources such as World Bank records, UN-Habitat, UNDP Surveys, Hong Kong SAR, and Lagos State Government records, etc.

2. Maps and figures of Hong Kong and the Lagos metropolis showing the study areas adapted from the agencies' websites using appropriate software to map the areas of interest. This is essential for spatial analysis of the study areas.

3. Previous literature on urban informalities and infrastructures obtained from journals, books, and technical reports.

4. Internet materials from Wikipedia, social groups, and professional groups (ResearchGate), which also serve as background sources of information in this study.

5. Records from the National Population Commission (NPC) census and Independent National Electoral Commission (INEC) records obtained at ward levels for projection and analysis in this study.

5.4.2.2 Research Variable Specification

Research variables are measurable attributes of a research subject and units of data suitable for analysis. These are the elements or factors of a research question that are liable to change, and the measurable aspect of the question used in making inductions, deductions, and predictions. In this study, variables are used in analysis and hypothesis testing. The variable specification variables are the set of questions asked with their measurable response. Variables are the attributes whose values changes from one unit of investigation to another. Variables can be classified into categorical, discrete, and continuous variables, and are measured with different scales. The scales of measurement include nominal, ordinal, interval, and ratio scales. The variables adopted in this study can be categorised into: 1) demographic variables, which include social, economic, and environmental variables; 2) urban informal settlement variables; and 3) infrastructure and access to infrastructure variables. These variables are essential in this study because they represent the operational attitudes and characteristics of urban informality and infrastructure on which this research induction/deductions are based. Although the nature and position of dependent and independent variables in an analysis varies based on the type of hypothesis tested. In general application, demographic variables such as age, sex, location, average monthly income, and similar markers constitute independent variables, while urban informal settlement and access to infrastructure variables are the dependent variables (i.e. these are the measured, observed, or monitored variables). Table 5.5 presents the variables classifications in this study:

Table 5. 5 Research variable specification

S/N	Variable Categorisation	Variable Code	Variable Definition	Measurement Scale	Data Type
1	Demographic variables (social, economic, cultural)	V1	Gender	Nominal	Categorical
		V4	Level of education	Ordinal	Categorical
		V6	Average monthly income	Interval	Discrete
		V7	Household size	Interval	Discrete
2	Urban informal settlement variables (housing and environment)	V9	Building use	Nominal	Categorical
		V12	Construction materials	Nominal	Categorical
		V14	Building facilities	Nominal	Categorical
		V16	Housing availability and adequacy	Ordinal	Categorical
3.	Infrastructure (health, sewage and sewerage, water, roads, and electricity)	V24	Which of the following facilities do you have	Nominal	Categorical
		V26	Who provides the following infrastructure?	Nominal	Categorical
		V31	How accessible are facilities to you?	Ordinal	Categorical
		V35	How adequate is your accessibility to facilities?	Ordinal	Categorical

Source: Author (2017)

The research questionnaire sample provided in the appendix provides further details regarding all the variables adopted for the testing of the hypothesis in this study.

5.4.2.3 Research Instrument

The research instruments in this study are the tools or devices used to obtain the research data. They are the medium by which the questions and the measurable variables adopted in this study are retrieved from the research population. The research adopts a triangulation method of data collection, and this ensures the research instruments are adopted in more than two strategies. The research instruments are discussed with regard to the primary and secondary sources of data collection using triangulation techniques below:

1. Primary sources of data collection using triangulation:

    a. **Field Observation:** This research instrument is used in this study to retrieve data through the complete observation of the research subjects for a period of three months without inferring or manipulating the subjects in any way. This is essential to understand the dynamics of the research subjects without any information from the stakeholders, and it also helps support the other approaches adopted in this study. Pictures and notes on the observations were taken for pre-information/knowledge purposes in the study.

    b. **Interviews:** In this study, structured interviews (with professionals) and unstructured interviews (with both professionals and residents) were conducted to provide more depth for this research. While the sample frame includes all environmental science professionals in the study areas, the sample size adopts the concept of saturation according to Baker, Edwards, and Doidge (2012); Mason (2010), which states that there is no standard minimum number of interviews that is sufficient, excessive, or too small. A minimum of 12 responses with similar response is considered sufficient based on past studies. A total of 30 interviews were conducted with professionals in the study areas including researchers, private practitioners, and public servants. A total of 18 interviews were conducted in Lagos metropolis and 12 in Hong Kong. This was essential to provide depth for the study and ensure the validity and reliability of the data collected in the study areas. See the

research population, sample frame, and sample size sections of this thesis for more details.

c. **Questionnaire**: A questionnaire survey was used in this study to obtain respondents' answers and reactions to a set of questions prepared in a specific order. Two types of questionnaires were prepared for the research population to extract perspectives on certain issues. These were designed and implemented carefully to reflect the genuine characteristics of the issue in the study area. The questionnaire was designed in a flexible form and adapted to the research design, the population, and purpose of the research in the different study areas as required. For example, in Hong Kong, the questionnaire was designed in English and Cantonese to aid flexibility and improve the accuracy of data collected. It was designed with both open-ended and closed questions. While the open-ended questions allowed the respondents to freely express their opinions and perspectives without bias and provided adequate information in relation to the question(s), the closed questions offered options for the respondents to select, prepared in both the nominal and Likert scale format. The closed questions were prepared to reduce time consumption while obtaining quality responses, guiding the respondent on likely responses, and providing easy data analysis for quality results (see appendix for questionnaire samples). The questionnaires were prepared in hardcopy for direct administration to respondents, Microsoft Word Developer format for sending through email, and Survey Monkey for dissemination through smart devices.

2. Secondary sources of data collection using triangulation:

a. **Literature review:** Using literature review as a research instrument in this study included the use of journal article reviews, books, and other published materials and provided the theoretical basis for this study. This was essential to understand what research has been done and what perspectives have been used, and to establish the purpose of this research within global literature perspectives.

b. **Maps or Images:** This includes the Lagos and Hong Kong maps extracted from different sources such as government agencies and the Geographical Information System (GIS) database and modified for this study. These maps were adapted to provide spatial information regarding the study areas and subjects.

c. **Population Figures and Statistics from the Government:** These are also an important research instrument adopted in this study and were used to make statistical inductions and deductions in the study areas. This also helped determine an adequate research sample frame, sample size, and sample population sufficient for generalisation.

5.4.2.4 Triangulation, Validity, and Reliability

Validity and reliability are adopted to ensure the research achieves its aim. Asika (1991) described validity as the degree to which the research instrument measures its intended subjects, and reliability as the stability, dependability, and predictability of a research instrument. Reliability is the degree to which the research instrument produces and reproduces stable and consistent results. Siu (2001) established three principles to address the challenge of validity and reliability of case studies. This include: 1) creating a case study database; 2) using multiple sources of evidence; and 3) maintaining a chain of evidence. The study further states that the first principle is not possible in Hong Kong:

> A case-study database (the first principle does not exist in Hong Kong, so the
> first principles was impossible to fulfil) (Siu p.167).

Adopting the second and third principles, Siu (2001) describes the position of nonreactive *Research in the Social Sciences* (1981) and Yin (1994) to support the use of triangulation to ensure validity and reliability as follows:

> "The individual sources of evidence [are] not recommended for conducting case
> studies. On the contrary, a major strength of a case study data collection is the
> opportunity to use many different sources of evidence…… The most important
> advantage represented by using multiple sources in case studies is the
> development of *converging lines of inquiry* of a process of triangulation…thus
> any finding or conclusion in a case study is likely to be more convincing and
> accurate if is based on several different sources of information, following a
> corroboratory mode" (Yin 1994, p.92) in (Siu, 2001 p.167).

Similarly, the study of Olajide (2015) also states that triangulation increases the reliability of findings because it allows for checks and balances based on the application of multiple sources. Thus, triangulation techniques in relation to principles 1 and 2 above were adopted in this study. The triangulation is the collection of data using two or more data collection approaches and maintaining a similar chain of evidence in the study to ensure the validity and reliability of the

instruments and the data collected. Considering this, this study adopts triangulation validity and reliability strategies to ensure precision, accuracy, legitimacy, and dependability of the research methods in the case studies.

There is a relationship between internal and external validity and the reliability of a study and the quality of its result. Internal validity and reliability are adopted in the research from the conceptualisation, to the problem identification, to the writing, testing of hypotheses, and the induction or deduction of results. External validity and reliability describe the relationship between the research and external factors such as the types of data collected, instruments, and methods of data collection in the research. The error parallaxes and/or potential error can be derived from the relationship between the research and its natural environment.

5.4.2.4.1 Triangulation, Validity, and Reliability Application

Considering the evidence above, this study adopts the triangulation approach and maintains a chain of evidence for internal and external validity and reliability in this study.

i. **Triangulation for internal validity and reliability:** This approach adopts the use of a) literature evidence, b) conceptual framework, and c) practical evidence for every step of internal decision-making, idea conceptualisation, processes, and inductions and deductions made in the study. The practical evidence adopted in this study is the observation conducted for a period of three month in the study areas. This approach was utilised throughout this study to maintain a chain of evidence.

ii. **Triangulation for external validity and reliability:** This approach adopts the use of more than two strategies to evaluate every relationship in study with its natural environment. This was applied for the nature and sources of data (primary and secondary sources), research instruments (primary and secondary), and the system of using of a research instrument for obtaining data. For example, the questionnaire uses a collection system of a) direct distribution (field distribution), b) email distribution using Microsoft Word Developer, and c) the use of Survey Monkey for smart device users.

5.4.2.5 Sample Frame and Sample Size

Sample frame and sample size are important to determine the target population. It is vital to ensure adequate spatial representation that captures the relevant groups for later generalisation of the study. The sample frame for this study is all of Hong Kong SAR and the city of Lagos. However, considering the available resources, including time, cost, and human capacity, this study adopts the position of Lawanson (2011) based on Van Bennekom (2006):

> "A population spread of 25% guarantees approximately 95% of 0.05 level of accuracy in survey results. In other words, the sample frame must cover at least 25% of the research area to guarantee 0.05 level of accuracy" (Lawanson 2011 p126).

Combining this position with practical evidence, evidence from the literature, this study triangulation approach, and the available resources for this research, this study adopts 20% of the research area population at the household population level. This strategy is employed throughout the study sample frame and sample size to maintain the chain of evidence required in this study. The study, therefore, stratified the areas' populations into regions such as the New Territories, the Kowloon Peninsula, and Hong Kong Island for the Hong Kong SAR and the Lagos Island region and Lagos Mainland region for the city of Lagos. By evaluating 20% of the 18 districts in Hong Kong and 16 LGAs in the Lagos metropolis, the sample frame of this study includes one area from the New Territories region, two areas from Kowloon, one area from the Hong Kong Island region, two LGAs from the Lagos Island region, and two LGAs from the Lagos Mainland region. Table 5.6 describes the sample frame of the study area.

Table 5.6 Case study

Lagos Case Study Areas and Population Figures 2006 Census Projected @ 3.2 for 2015			Hong Kong Case Study Areas and Population Figures		
Region	**Local Government Areas**	**Population Figures**	**Region**	**Districts**	**Population Figures**
Lagos Island region	**Lagos Island**	**1,141,667**	New Territories	Island District	**144,500**
	Eti-Osa	**1,305,865**		Kwai Tsing District	**501,900**
				Sai Kung District	**448,600**
Lagos Mainland region	Ojo	1,250,110		Sha Tin District	**648,200**
	Amuwo-Odofin	697,032		**Tai Po District**	**302,300**
	Alimosho	2,717,945		Tsuen Wan District	**301,600**
	Agege	1,371,654		Tuen Mun District	**489,000**
	Ifako-Ijaye	988,277		Yuen Long District	**595,100**
	Ikeja	**861,340**	Kowloon	**Kowloon City District**	**402,300**
	Oshodi-Isolo	1,506,399		Kwun Tong District	**639,900**
	Mushin	1,754,648		**Sham Shui Po District**	**388,300**
	Surulere	1,692,038		Wong Tai Sin District	**424,500**
	Ajeromi-Ifelodun	1,905,717		Yau Tsim Mong District	**313,600**
	Apapa	693,597	Hong Kong Island	Central and Western District	**248,600**
	Lagos Mainland	**853,779**		Eastern District	**579,400**
	Shomolu	1,361,110		Southern District	**270,500**
	Kosofe	1,240,936		**Wan Chai District**	**150,400**
Total		**21, 342,114**	**Total**		**7, 152,000**

Sources: Adapted from (Hong Kong, 2014; Nigeria Lagos State Government, 2013a, 2013b)

The sample size selection in these areas was determined using the same approach and is discussed in detail below.

1. **Qualitative Sample Size**: The qualitative sample size describes the interview size adopted in this study, including both the structured and unstructured interviews recorded. Structured interviews were conducted with professionals, while unstructured interviews were conducted with residents based on their receptivity to being interviewed. However, in this study the interview sample frame includes all the built environment professionals in the study areas, adopting the concept of saturation (Baker et al., 2012). The sampling techniques use snowball sampling (chain-referral sampling techniques) for professionals that meet the minimum requirement of a master's degree in any environmental science or design-related discipline and must have been practising in public or private practices between 5-10 years and above. Tables 5.7 and 5.8 below present the characteristics and the distribution of the professionals sampled and the samples taken in the study areas. The characteristics and the distribution of the interviewees are also presented.

Table 5.7 Sample size of the interviewees

S/N		Professional Interviews (PI)	Lagos Metropolis	Hong Kong	Total
1	1. A minimum of MSc in any environmental science/design study	Lectures/academics	5	5	10
2		Public professionals/Civil servants	10	1	11
	2. 5-10 years of practice in public/private				
3	3. A registered member of the professional bodies	Private practitioners/Consultants	3	6	9
		Total	**18**	**12**	**30**

Source: Author (2016).

Table 5.8: Distribution of the interviewees

Code	City of Lagos		Hong Kong	
	Professionals interviewed (PI) Profession	No. Sampled	Professionals interviewed (PI) Profession	No. Sampled
PI1	Quantity surveyor	2	Landscape Architect	2
PI2	Architects	4	Interior designer/Architect	2
PI3	Estate surveyors	4	Estate manager	3
PI4	Urban planners	8	Urban planners/designer	5
	Total	**18**		**12**

Sources: Author (2016)

Regarding qualitative sample size, Baker et al. (2012); Mason (2010) argue that there is no strict benchmark to measure or determine how many interview samples are enough in qualitative (interview or ethnographic) studies. However, a minimum of 12 with evidence of repeated responses (the concept of saturation) from the interviewees has been established over time as a minimum for acceptable interview samples, and this has been adopted in this study.

2. **Quantitative Sample Size:** Quantitative sample size describes the samples taken and the strategies adopted for the sample size choice in this study for the questionnaire survey. This also uses the practical, literature review evidence regarding urban informality in the research areas and the sample frame of 20% with the triangulation approach. This study investigates seven areas in four districts of Hong Kong and seven areas in three LGAs of Lagos based on these criteria. The household size population data was used, and was extracted from the government official report (Hong Kong, 2014; Nigeria Lagos State Government, 2013b). The sample size choice for the questionnaire was based on the research advisor 2006 formulae. Tables 5.8 and 5.9 address the sample frame and the sample size selected.

Table 5.8 Sample size table

Population Size	Confidence = 95%				Confidence = 99%			
	Margin of Error				Margin of Error			
	5.0%	3.6%	2.5%	1.0%	5.0%	3.6%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	128	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1176	3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

Source: Research advisor (2006)

Table 5.9 Case study areas with sample frame and sample size

Hong Kong SAR					
Region	**No. of Districts**	**Research Area/District**	**Sample Frame and Sample Size**		
			Selected Wards	**Household Size/ Sample Frame**	**Sample Size**
New Territories	18	Tai Po District	Tai Po Market Area	96,400	88
Kowloon Peninsula		Kowloon City District	Hung Hom Homan Tin	136,700	125
		Sham Shui Po District	Sham Shui Po Shek Kip Mei	138,600	126
Hong Kong Island		Wan Chai District	Wan Chai North Wan Chai South	56,100	51
Total				**427,800**	**390**
Lagos Metropolis, Nigeria					
Region	**No. of LGAs**	**Research Area/LGA**	**Sample Frame and Sample Size**		
			Selected Wards	**Household Size/ Sample Frame @ 5.0**	**Sample Size**
Lagos Island region	16	Eti-Osa LGA	Ilado/Eti-Osa Environs Badore	261,173	142
		Lagos Island LGA	Obalende Area	228,333	123
Lagos Mainland region		Lagos Mainland LGA	Iwaya Makoko	170,755	92
		Ikeja LGA	Ipodo/Seriki Aro/ Wemabod Estate Alausa/Oregun/Olusosun	172,268	112
Total				**832, 529**	**469**

Source: Author's Fieldwork 2016 and Adapted from (Hong Kong, 2014; Nigeria Lagos State Government, 2013a, 2013b)

A total of 390 questionnaire surveys were retrieved and analysed in Hong Kong SAR, while a total of 469 questionnaire surveys were retrieved and analysed in Lagos using different methods of data collection techniques. The sample frame includes the total population of the selected areas based on household population size. The sample size adopts the research advisor's sample size table at a 95% confidence level of continuous data.

5.4.2.6 Sampling Techniques and Procedure

Sampling techniques and procedures describe the strategy adopted to determine and select the direct respondents of the questionnaire surveys and the interviews conducted in this study. To obtain significant valuable information and facilitate easy data collation, interpretation, and analysis, specific sampling procedures and techniques are required (Earl, 2008; Frayling, 1993; Marshall & Rossman, 2014). Considering the peculiarity and dynamics of this study, the study area, and past literature about this type of investigation, this research adopts multi-stage sampling techniques and procedure. Multi-stage sampling techniques and procedure are the use of two or more stage techniques for the sampling of respondents. This technique is adopted for

both the qualitative and the quantitative method of data collection adopted in this study, as follows:

1. **Qualitative Sampling Techniques and Procedure**: The sampling technique adopted is multi-stage sampling technique, and the procedure includes more than two stages of sample selection method. The first stage includes the stratification of the study areas to determine the sample frame and sample size (see section 5.4.2.5 sample frame and sample size for more details) and the second stage includes criteria for selecting samples. The third stage and the last stage adopt the snowball sampling (chain-referral sampling) technique for finding professionals that meet the minimum required criteria of a master's degree in any environmental science or design-related study and have been practising in public or private practice for between 5-10 years.

2. **Quantitative Sampling Techniques and Procedure**: Similarly, the sampling techniques adopt multi-stage sampling techniques with more than two procedures. The first stage stratified Hong Kong SAR into three established geographical regions and the city of Lagos into two regions, and the second stage includes the selection of the research area in Hong Kong SAR and Lagos based on certain evidence (pilot studies, practical and literature/theoretical evidence) of urban informality in the area. The third stage includes the sample frame and sample size determination based on the household size of the selected ward. The next stage of the procedure involves the simple random selection approach with regard to residents/buildings, and the last stage includes the purposive selection of the respondents.

5.4.3 Data Analysis

The data analysis includes hypothesis testing, extracting information from the data collected, and making deductions or inductions in this study. In this study, the data analysis utilises mixed method data analysis, exploratory design (qualitative data analysis results that build into quantitative data analysis and results followed by interpretations for deductions and inductions). This method is adopted for both case study areas, and its application in this thesis is discussed accordingly below.

5.4.3.1 Mixed Method Data Analysis

The mixed method data analysis in this thesis is the application of both the quantitative and qualitative data analysis methods (inferential and descriptive statistics) for deduction and induction. The research method application is an exploratory case study (field-based study), and the mixed methods of data analysis are adopted in an exploratory design method. The exploratory design with the mixed method of data analysis in this study is the "qualitative data and the result, building into quantitative data and the result then followed by the interpretation" (Liu, 2015). The application of the mixed method of data analysis in the thesis is described in the following sections.

5.4.3.1.1 Qualitative Data Analysis

The qualitative aspect of the mixed method data analysis in this study includes the use of frequency tables, statistical charts, pictures, and statements to present the results of the data collected and analysed. It also includes the interpretation of the data collected (interviews) through theme analysis. Theme analysis as adopted is the descriptive methods of data based on subject and question themes, and also expresses the working concepts, thoughts, opinions, and beliefs of the respondent as retrieved from the interview. This study also adopts the presentation of the theme descriptive analysis to support the statements of quantitative measures.

5.4.3.1.2 Quantitative Data Analysis

The quantitative aspect of the mixed method data analysis adopts the use of inferential statistics and figures derived from Statistical Package for Social Sciences (SPSS) statistical tools. This involves the testing of hypotheses and the presentation of the findings using statistical tools such as cross-tabulation, chi-square, Analysis of Variance (ANOVA), and correlations. This is essential and used in this study to make deductions and inductions with precision and accuracy. Also, based on this study's research design (exploratory design, qualitative data analysis results, and quantitative data analysis), quantitative analysis is used with every qualitative research aspect to ensure precision and accuracy of analysis, which subsequently influences deduction or induction and the decisions made in this study.

The analysis of the qualitative and quantitative results is interpreted in relation to the research settings (Hong Kong and Lagos) simultaneously and/or separately as required in this thesis. The exploratory findings and recommendations of the data analysed is further integrated to developed strategies for sustainable urban design principles.

5.4.4 Hypothesis and Method of Testing

To provide scientific and statistical justification for the development of concepts and/or strategies that can be reproduced in both developed and developing countries of the world, a test of the hypothesis is necessary because it validates and presents a scientific basis for accepting or rejecting a research position or making a statement. This study tests one main hypothesis using three different sub-hypotheses (with three different measurable variables) as described below.

5.4.4.1 Hypothesis

H_o: There is no significant relationship between informal settlement and infrastructure planning design towards achieving sustainable urban development in Hong Kong and Lagos.

5.4.4.2 Hypothesis Analysis Techniques

This study's hypotheses are tested using inferential statistics such as chi-square, ANOVA, and correlation, which are derived from SPSS. This involves the testing of hypotheses and the presentation of the findings using statistical tools such as frequency distribution tables, cross-tabulation, chi-square, ANOVA, and correlations tables.

5.5   Operational Synthesis of Methods

This aspect of this study describes the application and operational synthesis of the design research methods in this research. It describes how research methods connect and integrate with significant aspects of the thesis to achieve the aim of the study. This thesis methodology and/or research design is based on theory (literature review, conceptual framework), hypothesis (assumption, proposition, research question research gap, etc.), observation (pilot study with practical evidence, investigation, etc.) and empirical generalisation of this kind of study

(general research perspectives, findings, and conclusion). The methods synthesis describes the operation of the methodology and how the methodology integrate it element as the centre point to establish an investigation in this study. The synthesis operates as a cyclical process from the theory of what is known about the study, the hypothesis, and the methodology to what is unknown, in order to establish conclusions based on observation and empirical generalisation. Figure 5.2 presents the method's operational synthesis.
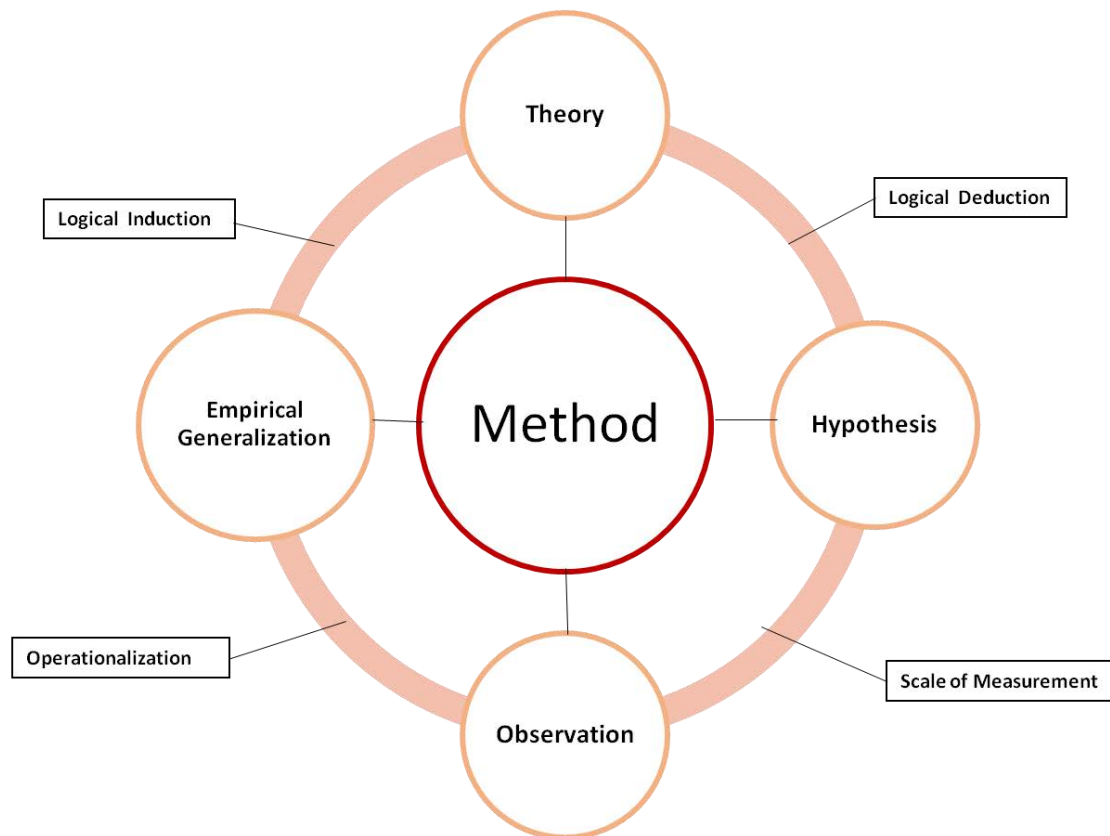
Figure 5.2 Method's operational synthesis
Source: Author 2017

Theory is the body of knowledge based on postulation, assumptions, and findings of an investigation of varying degrees that can be further subjects to investigation. It encompasses the statements accepted to be true based on existing knowledge, concepts, personal experience, and investigation. *Logical deduction* involves a study is made (deduced) from what we know about a given population or subject to further establish characteristics that may arise from the unknown samples of the population. *Hypothesis* is the statement subjected to investigation, speculations, or research question(s) about some variables or parameters of a given population.

It is a statement deduced from theory and practical evidence of a situation that is subject for further probing. *Scale of measurements* are the parameters, values, and criteria adopted for investigation. *Observation* is the investigation of the population based on adopted strategies. *Operationalisation* includes the strategies adopted based on the methods, and *empirical generalisation* includes the findings and conclusion of the study in relation to the acceptable knowledge (theory) on which the *logical induction* is made.

Method is significant, and it is placed at the centre because the adoption of every related element is a function of a specific method (methods of deducing hypotheses and observation) The method itself is based on these elements, which are all integrated to achieve a significant contribution to knowledge. While everything begins with *theory* (literature review, conceptual framework, and practical evidence) and ends with *theory*, the *hypothesis* is a *deduction* made from the *theory*, the *observation* relies on the *scale of measurement* and is *operationalised* by relevant methods to produce *empirical generalisation* of the study area for logical induction (conclusion, recommendations) of this research.

5.6 Chapter Summary

This chapter discussed the study methodology, justification for the research methods, research design, research methods application, hypothesis testing, and methods of operational synthesis. This study adopts case study methodology, a mixed method of data collection with triangulation techniques, and mixed methods of data analysis. The primary data adopted is the first-hand data collected through observations, survey questionnaires, and interviews from the study area. All other data obtained from previous studies constitute the secondary data. The triangulation techniques include the collection of data using two or more data collection techniques to ensure the validity and reliability of the data collected from primary and secondary sources. This encompasses site observation, pilot studies, interviews, and questionnaire surveys (implemented online via email using Microsoft Word Developer and Survey Monkey, and on-site survey administration) administered in the study area. See research design for details of the approaches adopted in both the primary and secondary triangulation method of data collection.

The questionnaires were structured with open and closed questions, with both numeric and Likert scale questions. Numeric questions are questions without any order or scale, while Likert scale questions are questions that require the respondent to respond in a range of 1 to 5, where 1 represents very inadequate, 2 represents inadequate, 3 represents neutral, 4 represents adequate, and 5 represents very adequate. The question covers the demographics (social, economic, and cultural) of UISIP with variables that include the level of education, income, household size, type of housing, and construction materials, among other elements. A total of 390 questionnaire surveys were retrieved and analysed in Hong Kong SAR, while a total of 469 questionnaire surveys were retrieved and analysed in Lagos using the different methods of data collection techniques. The sample frame includes the total population of the selected areas based on the sampling techniques. The sample size adopts the research advisor's sample size table at a 95% confidence level of continuous data. The sampling techniques employ multi-stage sampling procedures, simple random selection approach within the study area, and a purposive selection of the respondents. The first stage of the multi-stage sampling method is the stratification of the study areas into regions such as the New Territories, the Kowloon Peninsula, and Hong Kong Island for the Hong Kong SAR, while the city of Lagos was stratified into the Lagos Island region and Lagos Mainland region. Adopting 20% of the 18 districts in Hong Kong and 16 LGAs in the city of Lagos with practical and theoretical evidence of UISIP. This study investigates seven areas in four districts of Hong Kong and seven areas in three LGAs of Lagos.

The interview sample frame includes all the built environment professionals in the study areas, and the sample size is based on the concept of saturation (Baker et al., 2012). The sampling techniques adopt snowball sampling (chain-referral sampling) of professionals that meet the minimum multi-criteria requirements.

The mixed method data analysis includes qualitative and quantitative data analysis using descriptive statistics and inferential methods of data analysis. The data presentation and discussion use pictures, descriptive statistical tables, charts, and ANOVA tests retrieved from SPSS.

Chapter 6
Data Presentation and Discussion

_____

There are two goals when presenting data: convey your story and establish credibility.

Edward Tufte

Synopsis

In line with the previous chapters, the data collected are presented and discussed with a focus on sustainable urban development factors. The hypotheses stated were also tested to provide an opportunity for further discussion in this thesis. Also, the discussion of data and hypotheses provides an opportunity for detailed objective discussion to achieve the aims of this study.

6.1 Introduction

Based on evidence from the literature, urban informality and infrastructure planning design have been established as global and sustainability challenges and are interrelated with both one another and significantly with sustainability factors. To support or refute this position of the literature in the study area and create a basis for the discussion of urban design strategy in this study, the findings of the data collected are presented and discussed within this context.

The data presentation and discussion focus on the research gap, research question, research objectives, and the research hypothesis, which are related to one another and all function towards achieving the aim and objectives of this study. In line with this, the specific hypothesis tested to bridge the gap in knowledge and answer the research questions with a sustainability focus is:

H_o: There is no significant relationship between urban informal settlement and infrastructure planning design with regard to achieving sustainable urban development in Hong Kong and Lagos.

Thus, to test this hypothesis, four other sub-hypotheses with measurable variables of urban informal settlement, infrastructure, and sustainable indicators were adopted and tested. The characteristic distribution of these variables in the study areas is presented and discussed to achieve the aim and objectives of this study. The measurable variables include socioeconomic variables, such as level of education, occupation, income, household size, and exclusive rooms available for household use. The environmental variables include types of building, construction materials, and residential status, to mention just a few. Infrastructure variables include health facilities, sewage and sewerage, roads, and electricity. These variables are investigated and operationalised in the study areas to develop sustainable urban design strategy.

6.2 Urban Informality and Infrastructure Planning: Characteristics

The urban informality and infrastructure characteristics data presented in this section describes the demographic distribution within the study area in relation to sustainability elements/factors

(social, economic, environmental) and policy factors. It presents the data collection and analysis with a focus on establishing sustainable urban design strategy.

6.2.1 Socio-economic Characteristics

The findings relating to socio-economic characteristics in the study areas reflect that the growth of cities and urban centres cannot be separated from the culture of the people and the economic structure of the settlement. At the same time, the settlement infrastructure, infrastructure availability, and its adequacy cannot be separated from the people's culture, socio-economic development, and housing development pattern within a community.

In Hong Kong, the interview responses highlighted this association and how it affects or interrelates with urban informal settlement and infrastructure development. One significant response of an interviewee in this regard reflects that:

> "Hong Kong is an open economy with the free flow in and flow out of social and economic activities, it welcomes investment all over the world, which however limits the capability of our people to compete favourably with foreign investors…gradually creates gaps between the rich and the poor and subsequently creates informal settlement".

Another respondent believed that although socioeconomic status and infrastructure are related to the condition of living (informal settlement), they stated that:

> "[In] Hong Kong people are always seeking for an efficient and effective way of living… so convenient location is one of the criteria for living in a location, so sometimes they may sacrifice the quality living environment to get a location which could be close to work or transportation".

Another respondent answered that the challenge is a significant factor, it contributes to the issue of UISIP, and if it remains the menace will persist:

> "Yes, financial capacity is significant…i.e. it is dependent on the earning power of each person. Even for us professionals working in Hong Kong, we still cannot afford to buy houses in Hong Kong. Also, for some other professionals because

our income level is higher than the government housing criteria…we choose to go for the private [ly owned] houses and the housing is expensive because it is majorly private investors. So, whether the infrastructure is available or not if the market is not affordable the challenge will still exist".

Like the response above, another interviewee shared the same view, but added social ties and/or family factors to economic issues:

"…It is very small in Hong Kong, and it occurs mostly in the old apartment[s]. It is caused because of money, living with families and [because] getting government housing or a lower rent is not easy. So, it is because of financial problem, staying with families and there are not enough public houses".

Besides these and several other responses in the study areas, the findings of this study reflect that despite the prosperity of the SAR, there still exist informal settlement and infrastructure challenges. Also, although socio-economic factors contribute to this problem, it is not the only factor, as choice of location and occupation are also significant.

Figure 6.1 further illustrates the socio-economic characteristics of the study area.

Figure 6.1 The Socio-economic characteristics of the Kowloon region of the study area in Hong Kong
Source: Author's fieldwork 2016

In Lagos, the socio-economic findings are similar, but the conditions are critical and have implications on urban informality, infrastructure, and urban development. The root of urban informality is identified as poverty or inadequate material resources, which in turn are

associated with several factors in the metropolis. Relevant selected responses of the interviewees in the study areas are presented below:

> "Yes, socioeconomic status induces informal settlement as the per capita income of people is so low, there is inflation, poverty, and the gap between the poor and the rich is there…therefore, informal settlement is a melting point for different people, urban poor and migrants with different origins…"

> "The urban poor occupy the low-income communities, which are mostly informal and comprising of approximately 75% of the urban population".

> "…socio-economic values of people differ, but what the environment looks like is as a result of what the people earn…no matter your socio-economic taste we live [in] what we can afford, and we have a poor economy so what do you think…"

Contrary to most responses, one interviewee stated that informality and infrastructure challenges are urban issues all their own, saying:

> "I don't think socio-economy is a factor, but informality is a structural dynamic, then the poor find succour within the informal sectors or settlement. As lack of stable income is also a tension, people who are not income poor use the informal means in accessing many of their things, for instance in security the so-called 'vigilante' means of security to protect the residential areas is being used instead of police, as there are not enough police to protect the area…"

Regardless of this perspective and its relation to other responses received in the study area, it is evident that socio-economic issues associated with UISIP in the metropolis are significant to the urban management of the city. Figure 6.2 further illustrates this fact through images of socio-economic conditions of the area.

Figure 6. 2 The Socio-economic characteristics of the Eti-Osa and Lagos mainland in Lagos
Source: Author's fieldwork 2016

Furthermore, the analysis of questionnaire survey in the study areas on socio-economic characteristics of the respondents also supports the finding above. The results as presented in Table 6.1 regarding gender, age, level of education, occupation and household exclusive room use suggests high precision of response on UISIP, and it reflects the settlement as an active society with capacity for human and environmental development.

Table 6. 1 Socio-economic characteristic of the study areas

Socio-economic Characteristics		Hong Kong District					Lagos Metropolis L.G. A				
		Kowloon District	Sham Shui Po District	Tai Po District	Wan Chai District	Total	Eti-Osa	Ikeja	Lagos Island	Lagos Mainland	Total
		Fr	Fr	Fr	Fr	Fr	Fr	Fr	Fr	Fr	Fr
Gender	Male	92	111	61	36	**300**	67	57	50	47	**221**
	Female	33	15	27	15	**90**	75	55	73	45	**248**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Age	Below 15yrs	0	0	0	0	**0**	0	0	3	4	**7**
	16-30yrs	74	126	58	37	**295**	71	42	38	41	**192**
	31-45yrs	38	0	30	14	**82**	56	41	38	31	**166**
	46-60yrs	13	0	0	0	**13**	9	16	31	13	**69**
	60yrs Above	0	0	0	0	**0**	6	13	13	3	**35**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Level of Education	No Formal	0	0	0	0	**0**	12	5	10	0	**27**
	Primary	0	0	39	0	**39**	10	12	6	11	**39**
	Secondary	73	0	49	37	**159**	76	71	63	62	**272**
	Tertiary	52	126	0	14	**192**	44	24	44	19	**131**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Occupation	Public/Civil Servant	13	0	5	7	**25**	2	6	6	4	**18**
	Private Employed	42	30	18	44	**134**	27	27	22	17	**93**
	Business	45	45	40	0	**130**	74	60	67	42	**243**
	Street Trader	0	0	8	0	**8**	24	15	12	16	**67**
	Student	25	51	17	0	**93**	15	4	16	13	**48**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Household Size	1	0	0	0	0	**0**	0	0	0	0	**0**
	2-4	112	96	70	51	**329**	45	42	35	27	**149**
	5-7	13	30	18	0	**61**	97	70	88	65	**320**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Household Exclusive Room Use	1	31	18	21	7	**77**	56	47	74	37	**214**
	2-4	88	108	67	44	**307**	65	62	46	54	**227**
	5 &Above	0	0	0	0	**0**	21	3	3	1	**28**
	Missing	6	0	0	0	**6**	0	0	0	0	**0**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**

Source Author's fieldwork (2016)

Table 6. 2 Income characteristics of the study areas

Characteristics		Hong Kong				
		Kowloon District	Sham Shui Po District	Tai Po District	Wan Chai District	Total
		Fr	Fr	Fr	Fr	Fr
Average Monthly Income	Below HKD 15,000	24	15	30	22	**91**
	HKD 15,001-30,00HKD	55	81	27	29	**192**
	HKD 30,001-60,000HKD	46	15	21	0	**82**
	HKD 60,001-HKD 90,000	0	15	10	0	**25**
	HKD 90,001 and Above	0	0	0	0	**0**
Total		**125**	**126**	**88**	**51**	**390**
Characteristics		Lagos metropolis				
		Eti-Osa	Ikeja	Lagos Island	Lagos Mainland	Total
		Fr	Fr	Fr	Fr	Fr
Average Monthly Income	Below NGR 20,000	59	33	41	31	**164**
	NGR 20,001-50,000NGR	63	42	43	50	**198**
	NGR 50,001-80,000NGR	10	16	30	6	**62**
	NGR 80,001- NGR 110,000	7	16	6	2	**31**
	NGR 110,001 and Above	3	5	3	3	**14**
Total		**142**	**112**	**123**	**92**	**469**

Source: Author's fieldwork (2016)

While Table 6.2 illustrates the average monthly income of the respondents, Table 6.3 describes the wide-ranging distribution of the socio-economic characteristics using frequency, mean and standard deviation. This is essential to describe the central limits the normal distribution of the data set and to verify the results reports in further inferential statistics which induction and deduction are made in this study.

Table 6. 3 Socio-economic characteristics of the study areas

	Hong Kong											
	Kowloon District			Sham Shui Po District			Tai Po District			Wan Chai District		
Socio-economic Characteristics	Fr	Mean	SD	Fr	Mean	SD	Fr	Mean	SD	Fr	Mean	SD
Gender	125	1.2640	.44257	126	1.1190	.32514	88	1.3068	.46383	51	1.2941	.46018
Age	125	1.5120	.67937	126	1.0000	.00000	88	1.3409	.46382	51	1.2745	.45071
Level of education	125	3.4160	.49488	126	4.0000	.00000	88	3.5568	.49961	51	3.2745	.45071
Occupation	125	2.8560	1.24242	126	3.5714	1.24212	88	3.1591	1.13347	51	1.8627	.34754
Average monthly income	125	2.1760	.73027	126	2.3571	1.09153	88	2.1818	1.14013	51	1.5686	.50020
House hold size	125	2.1040	.30649	126	2.2381	.42762	88	2.2045	.40568	51	2.0000	.00000
Household room exclusive use	119	2.8560	.44077	126	1.8571	.35132	88	1.7614	.42869	51	1.8627	.34754
	Lagos metropolis											
	Eti-Osa LGA			Ikeja			Lagos Island			Lagos Mainland		
Socio-economic Characteristics	Fr	Mean	SD	Fr	Mean	SD	Fr	Mean	SD	Fr	Mean	SD
Gender	142	1.53	.501	112	1.49	.502	123	1.59	.493	92	1.49	.503
Age	142	2.65	.783	112	3.00	.995	123	3.11	1.039	92	2.67	.891
Level of education	142	3.07	.848	112	3.02	.710	123	3.15	.846	92	3.09	.567
Occupation	142	3.16	.904	112	2.86	.847	123	3.08	.997	92	3.18	1.037
Average monthly income	142	1.82	.920	112	2.27	1.162	123	2.08	.997	92	1.87	.880
House hold size	142	1.85	.697	112	1.77	.684	123	1.86	.717	92	1.89	.718
Household room exclusive use	142	2.10	1.087	112	2.03	.963	123	1.82	1.025	92	2.18	1.016

Source Author's fieldwork (2016)

The summary of socio-economic findings of this study in relation to the evidence presented above shows that the socio-economic characteristics of the study areas are associated with UISIP. The associated effect of this relationships was assessed across the study areas on different variables of socio-economic factors, and it reflects that there is a positive or negative relationship between the socio-economic variables, UISIP towards sustainable development in the area.

In Hong Kong, while there is socio-economic prosperity with a developed service industry/economy and several other opportunities, the tripled down effect to the informal settlement is positive and negative relationship. This also creates a wide a gap between the rich and the poor, incapacitating residents from competing favourably with foreign investors and subsequently creating a high cost of living (especially with regard to housing), which contributes to the informal settlement (flat subdivisions, rooftop informal settlements) characteristics in the region.

The situation in Lagos is different, and the activities of informal settlement are identified as support for the poor economic development and inflation economy of the metropolis. Informal settlement is a survival strategy for the metropolis; it supports the economy with sources of employment and inexpensive sources of shelter. It also poses a great threat of slum development and haphazard and disordered urban development, which is not sustainable because of its irregularities in operation.

Above all, the findings of the socio-economic characteristic distribution in the study areas suggest the need for improvement and development of urban planning design strategies that promote sustainable urban development.

6.2.2 Environmental Characteristics

The description of the environmental characteristics of the study areas based on the respondents' type of building, type of building facilities available, the predominant use of the building, and most especially the respondents' perspective of the environment reflects different environmental situations between the two cities. However, the findings nevertheless cast the study areas as challenged areas, associate, or interrelated with UISIP and requiring significant sustainable urban design development strategies.

In Hong Kong, the findings reflect that the physical aesthetics of the environment are not bad, in fact, most informal settlements are hidden within the city structures or on a rooftop. However, they require improvement as their condition is not satisfactory or sustainable. Selected responses of the interviewees include the following statements:

"I am not satisfied it is too expensive, too small, there [is] limited open space in the environment, and most of its residents only reside in it for survival…"

"Yes, we know that housing is a basic need for each person, and in Hong Kong because of the high price in housing, that leads to subdivided houses where people live in substandard conditions in quite a small apartment- people cannot afford adequate housing and cannot wait for government-subsidised houses…"

"…no [I] am not satisfied as the housing prices are too high so it is not affordable by the locals and the residents but the utilities are fine like the power supply, transport is doing very well, and the public housing is doing very well but the quantity is not enough to serve low-income and the private houses which very expensive…"

The findings on the environmental characteristics of the study areas also corroborate the findings of (Rufina Wu & Canham, 2009). While Figure 6.3 presents the findings of Rufina Wu & Canham (2009), Figure 6.4 presents pictures taken from the selected areas in this study to support the statements and interviewee responses above.

Figure 6. 3 Environmental characteristics of informal housing in Hong Kong.
Source: Adapted from (Rufina Wu & Canham, 2009)

Figure 6. 4 Environmental characteristics of informal housing/settlement in Hong Kong.
Source: Author's fieldwork 2016

The evidence of this study in the study areas reveals that the issue of urban informality is not only present in the old urban areas of the SAR but also constitute a rapidly growing challenge across Hong Kong.

In Lagos, the environmental characteristics of informal settlement are more severe with large clusters of deteriorated settlements across the metropolis in different areas. Today, the challenge is horrific in the metropolis, and formal housing ownership is below the national average of 30.0%, with informal housing above 55.0%. These areas have several urban challenges such as illegal occupancy, degraded environmental conditions, haphazard buildings, a lack of infrastructure, juvenile delinquencies, unemployment, and general slum characteristics. The response of the interviewees in these study areas include the following statements:

"…it's a defence mechanism and survival strategy of the poor, and by extension, many of the residents are embedded in the culture of the environmental nuisance of the informal sector because of its inhuman state in the metropolis…"

"…[the] informal settlement environment in Lagos is not supposed to be a severe urban challenge the way it is now…a lot has, however, gone wrong, and they [are] characterised [by] shark's structures and all inhuman conditions…no open space, [no] facilities like sports grounds, no countryside, no open views, no community facilities..."

"…the situation in the metropolis is critical, severe and characterised by several sprawls, squalor, squatter and slum appearance. The shelters are in terrible situations with temporary or permanent materials, neglected and disconnected from several amenities."

In addition to the responses of the interviewees in the metropolis, Figure 6.5 presents pictures of the environmental characteristics of these study areas regarding types of housing, types of building, predominant building use, and construction materials.

Figure 6. 5 Environmental characteristics of informal housing/settlement in Lagos
Source: Author's fieldwork 2016

The frequency of distribution of the environmental condition from the questionnaire survey in the study areas also presents evidence to support the need for urgent, critical, and strategic

improvement actions about the environmental characteristics of the study areas. Table 6.4 presents the frequency distribution of environmental characteristic indicators assessed across the different settlements in the study areas. The findings reflect that the environmental conditions of these settlements are inadequate across the board. Even though the severity and sustainability assessment of the challenge is different and is based on a combination of several factors. This is clear in the result with diverse types of buildings, buildings facilities construction material response, although the challenge exists, and the residents are not satisfied across the areas.

Table 6. 4 Environmental characteristics of the study areas

Characteristics		Hong Kong District					Lagos Metropolis L.G. A				
		Kowloon District	Sham Shui Po District	Tai Po District	Wan Chai District	Total	Eti-Osa	Ikeja	Lagos Island	Lagos Mainland	Total
		Fr	Fr	Fr	Fr	**Fr**	Fr	Fr	Fr	Fr	**Fr**
Types of Building	Traditional Compound	0	0	0	0	**0**	18	52	117	70	**257**
	Rooming House	0	0	0	0	**0**	44	33	0	3	**80**
	Studio/Single Room Apartment	25	18	13	7	**63**	31	3	6	3	**43**
	Duplex	0	0	4	0	**4**	8	3	0	15	**26**
	Flat between 1-10 floor	69	48	27	14	**158**	41	21	0	1	**63**
	Flat Above 10floors	31	60	44	30	**165**	0	0	0	0	**0**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Types of building facilities	Water closet	125	126	84	51	**386**	116	61	19	12	**208**
	Pit latrine	0	0	0	0	**0**	20	7	19	11	**57**
	Bucket latrine	0	0	0	0	**0**	6	43	85	69	**203**
	Other type of toilet	0	0	4	0	**4**	0	1	0	0	**1**
	Total	**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
	Indoor inclusive kitchen	63	48	33	29	**173**	68	71	3	11	**153**
	Outdoor kitchen	0	0	0	0	**0**	0	34	73	47	**154**
	Indoor exclusive kitchen	56	63	42	22	**183**	69	0	0	0	**69**
	Shared kitchen	6	15	13	0	**34**	0	0	3	2	**5**
	No kitchen	0	0	0	0	**0**	5	7	44	32	**88**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Predominant building use	Residential and commercial	85	93	58	15	**251**	67	39	24	23	**153**
	Strictly commercial	6	0	9	0	**15**	8	18	28	24	**78**
	Strictly residential	34	33	21	36	**124**	67	55	71	45	**238**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Building age	Below 10yrs	6	0	13	7	**26**	40	30	64	64	**198**
	11-20yrs	60	30	33	8	**131**	60	17	12	2	**91**
	21-30yrs	27	48	26	22	**123**	39	20	32	7	**98**
	31-40yrs	13	48	4	7	**72**	3	24	12	17	**56**
	Above 41yrs	19	0	12	7	**38**	0	21	3	2	**26**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Construction material	Plank & Bamboo	0	0	0	0	**0**	5	0	0	4	**9**
	Mud	0	0	0	0	**0**	0	14	32	21	**67**
	Mud & Cement	0	0	0	0	**0**	0	1	6	7	**14**
	Burnt Bricks	0	15	18	7	**40**	0	29	55	51	**135**
	Concrete Blocks	125	111	70	44	**350**	137	68	30	9	**244**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Roof material	Corrugated iron sheet	31	33	35	22	**121**	70	61	108	56	**295**
	Burnt bricks	0	0	0	0	**0**	0	0	0	0	**0**
	Plank and bamboo	0	0	0	0	**0**	0	0	0	0	**0**
	Reinforced concrete	88	93	49	29	**259**	5	17	6	24	**52**
	Aluminium	6	0	4	0	**10**	40	14	3	8	**65**
	Asbestos	0	0	0	0	**0**	27	20	6	4	**57**
	Thatch	0	0	0	0	**0**	0	0	0	0	**0**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Residential status	Owner	25	33	16	14	**88**	29	36	12	23	**100**
	Mortgage ownership	18	15	12	0	**45**	0	0	0	0	**0**
	Public housing	49	63	19	14	**145**	0	0	0	0	**0**
	Inherited	0	0	0	0	**0**	18	17	24	35	**94**
	Tenant	33	15	37	15	**100**	91	56	19	4	**170**
	Squatting	0	0	4	8	**12**	4	3	68	30	**105**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**

Author's fieldwork 2016

While Table 6.4 describes the distribution of environmental indicators within the study areas and identify the area's threat to sustainable urban development for improvement actions. Table 6.5 present the frequency, mean and the standard deviation for normal frequency distribution and further inferential statistical analysis to check the reliability of the data, findings and possibly make necessary deduction and inductions.

Table 6. 5 Environmental characteristics of the respondent in Hong Kong and Lagos metropolis

	Hong Kong											
	Kowloon District			Sham Shui Po District			Tai Po District			Wan Chai District		
Environmental Characteristics	**Fr**	**Mean**	**SD**	**Fr**	**Mean**	**SD**	**Fr**	**Mean**	**SD**	**Fr**	**Mean**	**SD**
Types of building	125	2.8480	1.01645	126	3.1905	1.00967	88	3.2614	1.17927	51	3.9020	1.45952
Types of building facilities	125	1.5440	5.8893	126	1.7381	.65944	88	1.7727	.69028	51	1.4314	.50020
Predominant building use	125	1.5920	.88987	126	1.5238	.88285	88	1.5795	.85395	51	2.4118	.92036
Building age	125	2.8320	1.16906	126	3.1429	.77681	88	2.6477	1.20382	51	2.9804	1.19147
Construction material	125	1.0000	.00000	126	1.1190	3.2514	88	1.2045	.40568	51	1.1373	.34754
Roof material	125	1.8000	.50800	126	1.7381	.44143	88	1.6477	.56811	51	1.5686	.50020
Residential status	125	2.7200	1.06710	126	2.4762	1.00967	88	3.0114	1.21763	51	3.0588	1.43404
	Lagos metropolis											
	Eti-Osa LGA			Ikeja			Lagos Island			Lagos Mainland		
Environmental Characteristics	**Fr**	**Mean**	**SD**	**Fr**	**Mean**	**SD**	**Fr**	**Mean**	**SD**	**Fr**	**Mean**	**SD**
Types of building	142	2.8	1.146	112	2.02	1.223	123	11.05	.216	92	1.78	1.511
Types of building facilities	142	1.56	.565	112	1.44	.641	123	2.38	.580	92	2.27	.697
Predominant building use	142	2.01	.996	112	2.27	1.074	123	2.49	.927	92	2.39	1.027
Building age	142	2.04	.803	112	2.99	1.630	123	2.03	1.254	92	1.84	1.361
Construction material	142	1.14	,740	112	1.65	1.002	123	2.33	1.112	92	2.57	1.082
Roof material	142	2.17	1.232	112	1.94	1.180	123	1.24	.728	92	1.57	.829
Residential status	142	2.49	.848	112	2.24	.961	123	3.19	1.089	92	2.45	1.189

Source Author's fieldwork (2016)

The summary of findings of environmental characteristics across the study areas reflects that the informal settlement occurs in different areas with different environmental features, nature, types, and characteristics. The severity of the environmental challenges of informal settlement differs, it does not necessarily have to be a slum, squalor and inhuman with several deteriorating characteristics before it can be referred to as informal settlement.

Hong Kong environmental characteristics according to the data presented shows that the informal settlement shares good environment within the beautiful aspect of the SAR and the nature of informal settlement is inbuilt (hidden) within, cage structures (see section 7.2.2.4) and except a closer look or investigation it may not be found. It is an environment with mostly permanent structure materials and few temporary materials in the cases of rooftops.

Lagos metropolis reflects a different environmental characteristic, and this is the most common and familiar appearance of informal settlement environmental characteristics across a global environment. It mirrors an environmental characteristic of slums with shark structures, degraded and deteriorated buildings (permanent and temporary materials). Its sprawl in nature with haphazard building arrangement and flooded environment among other challenges found.

6.2.3 Infrastructure

The beautiful city of Hong Kong has one of the best infrastructures in the world with an effectively functioning Mass Transit Railway (MTR), highly connected roads with bridges in good condition, excellent sea transport, and a good airport. Health, electricity, sewage, and sewerage are among the best in the world. However, there still exist hidden slums, informal settlements, poor communities, and homeless and street sleepers within the rich city of Hong Kong. Considering the nature of informal settlement in this region, infrastructure elements, such as health, sewage and sewerage, water, roads, and electricity in Hong Kong's informal settlements are adequate. The informal settlements of the region have access to infrastructure similar to every urban area of the city because the nature of the informality is mostly hidden within beautiful structures of the city or on rooftops (see Section 7.2.2.4 Nature of Informal Settlement). The neoliberal system of the SAR with tolerance for these settlements also justifies access to facilities, and these settlements are further taxed on their facility and service usage despite being identified as informal. These findings were expressed in the interview and questionnaire survey responses in the study area.

The interviewees' perspectives in Hong Kong include the following statements:

> "…yes, infrastructure in any context you want to talk about it is better here in Hong Kong because you get to anywhere in the city within plus or minus one-hour maximum…"

> "… do you mean infrastructure regarding roads, water, electricity and other[s]…, yes its adequate because we have options for any of the facilities and services…"

> "…I have not been to several places apart from China and Macau and from what I know around the world our infrastructure is adequate although can be improved but it's okay…"

The field evidence through photographic data presentation also corroborates these perspectives

Figure 6. 6 Infrastructure in Hong Kong.
Source: Author's fieldwork 2016

Lagos results of the interview on infrastructure reflect a breakdown of infrastructure that was identified by the respondent to contribute to the proliferation of informal settlement or spread of informal settlement in the metropolis.

"…to some extent infrastructure is an inducer but to a large extent it's not, as government is making an effort to make good roads with drainage for instance government made provision for waste disposal by government vehicle to the appropriate channels but when it rains the poor which are a higher number within the masses throws wastes into drainage which in turns blocks them, so poverty is a major challenge."

"…it's a terrible issue in these areas and I think you should see for yourself because I really can't describe it…"

"I think infrastructure is a major challenge too…government should try and develop our local materials for building infrastructures to reduce cost and be able to build houses and subsidise..."

The pictures of infrastructures in the study areas below reflect critical, deplorable conditions and suggest the need for urban design strategies for improvement in a sustainable perspective.

Figure 6. 7 Primary health facility, road, water, and road condition in urban informal area of Lagos metropolis.
Source: Author's fieldwork 2016

Figure 6. 8 Typical sources of water in the informal settlement of Lagos metropolis.
Source: Author's fieldwork 2016

Figure 6. 9 Typical sewage and sewerage in the informal settlement of Lagos metropolis.
Source: Author's fieldwork 2016

Added to the interview response and the picture analysis of the study areas, Table 6.6 presents the response on the occurrence of the sources of water, method of waste disposal and condition of sewage across the study areas.

The data collected in Hong Kong on sources of water and methods of waste disposal reflect government water connection and method of refuse collection as the main sources of water and refuse collection, followed by the different estate provisions and arrangement respectively. The condition of sewage and sewerage shows that they are covered and free, and no areas without sewerage and sewage.

The characteristic in Lagos metropolis reflects borehole as the main sources followed by public pay pipe borne water, surface well and water vendor. While the method of waste disposal is PSP/Municipal collection, private disposal and communal collection respectively. The condition of sewage and sewerage reflects that it is mostly open and free, followed by not available, covered but block and open but block.

Table 6. 6 Infrastructure characteristics in the study areas

Variables		Hong Kong District					Lagos Metropolis L.G. A				
		Kowloon District	Sham Shui Po District	Tai Po District	Wan Chai District	Total	Eti-Osa	Ikeja	Lagos Island	Lagos Mainland	Total
		Fr	Fr	Fr	Fr	**Fr**	Fr	Fr	Fr	Fr	**Fr**
Sources of Water	Government water connection	100	93	76	36	**305**	0	0	0	0	**0**
	Estate central provision	18	33	12	15	**78**	0	0	0	0	**0**
	Public pay pipe borne water	0	0	0	0	**0**	52	28	79	25	**184**
	Borehole	0	0	0	0	**0**	64	79	41	57	**241**
	Surface well	0	0	0	0	**0**	26	4	3	8	**41**
	Water vendor and tanker	0	0	0	0	**0**	0	1	0	2	**3**
	Missing	7	0	0	0	**7**	0	0	0	0	**0**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Method of waste Disposal	Government collection	82	111	61	28	**282**	0	0	0	0	**0**
	PSP/Municipal collection	0	0	0	0	**0**	133	95	111	87	**426**
	Private disposal	0	0	0	8	**8**	2	13	9	5	**29**
	Estate central collection point	43	15	18	8	**84**	0	0	0	0	**0**
	Communal collection	0	0	9	0	**9**	2	2	3	0	**7**
	Burning	0	0	0	0	**0**	0	2	0	0	**2**
	Burying	0	0	0	7	**7**	5	0	0	0	**5**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Condition of Sewage and sewerage	Covered and free	125	126	88	51	**390**	48	16	9	15	**88**
	Open and free	0	0	0	0	**0**	8	71	105	66	**250**
	Covered but block	0	0	0	0	**0**	14	13	3	2	**32**
	Open but block	0	0	0	0	**0**	16	0	6	9	**31**
	No drainage	0	0	0	0	**0**	56	12	0	0	**68**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**

Source: Author's fieldwork (2016)

Table 6.6 describes the distribution of infrastructure within the study areas to investigate the accessibility of the infrastructure in the study areas. Across the study areas (Hong Kong and Lagos metropolis), access to a health facility is mostly available at less than 1/2km, followed by 2-4km, 2-4km, above 4km and no drainage with close frequency respectively. Also, less

than 1/2km is the most occurrence in the accessibility distribution of sewage and sewerage, followed by not available, 1/2km to 1km, 2-4km and above 4km with few results missing. Access to water is highly available at less than 1/2km, 1/2km to 1km, and above 4km respectively. Electricity is found available in every one of the areas. Table 6.7 describes this distribution in detail below.

Table 6. 7 Table dispersions analysis of infrastructure

Variables		Hong Kong District					Lagos Metropolis L.G. A				
		Kowloon District	Sham Shui Po District	Tai Po District	Wan Chai District	Total	Eti-Osa	Ikeja	Lagos Island	Lagos Mainland	Total
		Fr	Fr	Fr	Fr	Fr	Fr	Fr	Fr	Fr	Fr
Health facilities	Not available	24	18	0	8	50	0	6	26	7	39
	Less than 1/2km	30	48	44	21	143	126	102	56	74	358
	1/2km to 1 km	32	15	13	0	60	12	2	14	10	38
	2-4km	13	15	19	22	69	4	2	24	0	30
	Above 4km	13	30	8	0	51	0	0	3	1	4
	Missing	13	0	4	0	17	0	0	0	0	0
Total		125	126	88	51	390	142	112	123	92	469
Sewage and Sewerage	Not available	18	51	4	7	80	12	4	0	3	19
	Less than 1/2km	56	45	57	22	180	111	91	114	83	399
	1/2km to 1 km	6	15	9	7	37	6	5	9	3	23
	2-4km	0	0	10	15	25	7	12	0	2	21
	Above 4km	32	15	4	0	51	6	0	0	1	7
	Missing	13	0	4	0	17	0	0	0	0	0
Total		125	126	88	51	390	142	112	123	92	469
Water	Not available	0	0	0	0	0	5	4	12	1	22
	Less than 1/2km	63	66	66	36	231	130	96	105	90	421
	1/2km to 1 km	24	30	18	7	79	2	5	6	0	13
	2-4km	6	0	0	8	14	5	7	0	1	13
	Above 4km	19	15	0	0	34	0	0	0	0	0
	Missing	13	15	4	0	32	0	0	0	0	0
Total		125	126	88	51	390	142	112	123	92	469
Electricity	Not available	0	0	0	0	0	19	35	60	35	149
	Available	125	126	88	51	390	123	77	63	57	320
Total		125	126	88	51	390	142	112	123	92	469

Source: Author's fieldwork (2016)

The adequacy and satisfaction of infrastructure according to Table 6.7 in the study areas reveals general adequacy and satisfaction in Hong Kong, while in Lagos metropolis the response is not satisfied and inadequate.

In Hong Kong, the response on health facilities reflects adequate as the highest, followed by indifferent, inadequate, very adequate, and very inadequate respectively. While this pattern of response reflects the results of an investigation of sewage and sewerage, adequate water supply, and accessibilities of these facilities in the SAR. The response of the overall adequacy and satisfaction of infrastructure in the region shows the respondent is satisfied with infrastructure adequacy.

Contrary to the experience of Hong Kong, the findings of infrastructure adequacy in Lagos metropolis shows inadequate satisfaction. The response on adequate health facilities reflects inadequate as the most response followed by adequate, very inadequate, indifferent, and very adequate. Similarly, the investigation of sewage and sewerage, water supply and the

accessibility to these facilities reflect this pattern of answer with inadequate as most occurrence response followed by adequate, indifferent, very inadequate, and very adequate. However, the overall response of the adequacy of infrastructure in the metropolis reflects inadequate as the most responsible of the respondents, very inadequate, adequate, indifferent, and very inadequate respectively. Table 8 present the detailed frequency distribution of this response in the study areas.

Table 6. 8 Infrastructure adequacy and satisfaction

Variables		Hong Kong District					Lagos Metropolis L.G. A				
		Kowloon District	Sham Shui Po District	Tai Po District	Wan Chai District	**Total**	Eti-Osa	Ikeja	Lagos Island	Lagos Mainland	**Total**
		Fr	Fr	Fr	Fr	**Fr**	Fr	Fr	Fr	Fr	**Fr**
How adequate is health facilities	Very inadequate	6	0	0	7	**13**	16	9	12	11	**48**
	Inadequate	24	33	8	0	**65**	69	50	57	51	**227**
	Indifferent	50	30	28	16	**124**	19	17	24	10	**70**
	Adequate	38	48	43	14	**143**	36	31	27	20	**114**
	Very adequate	0	15	9	14	**38**	2	5	3	0	**10**
	Missing	7	0	0	0	**7**	0	0	0	0	**0**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
How adequate is sewage and sewerage	Very inadequate	12	0	0	7	**19**	14	11	5	8	**38**
	Inadequate	0	0	9	0	**9**	65	55	72	70	**262**
	Indifferent	43	30	24	23	**120**	17	10	8	9	**44**
	Adequate	63	81	42	7	**193**	37	30	30	5	**102**
	Very adequate	0	15	13	14	**42**	9	6	8	0	23
	Missing	7	0	0	0	**7**	0	0	0	0	0
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
How adequate is water supply	Very inadequate	6	0	0	7	**13**	16	12	59	10	**97**
	Inadequate	6	0	4	0	**10**	69	67	55	79	**270**
	Indifferent	25	15	17	16	**73**	19	15	6	3	**43**
	Adequate	68	81	54	7	**210**	36	16	3	0	**55**
	Very adequate	13	30	13	21	**77**	2	2	0	0	**4**
	Missing	7	0	0	0	**7**	0	0	0	0	**0**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
How adequate is your accessibility	Very inadequate	12	0	0	7	**19**	14	15	35	20	**84**
	Inadequate	26	0	17	7	**50**	65	70	85	67	**287**
	Indifferent	30	30	22	15	**97**	17	8	3	5	**33**
	Adequate	50	66	36	15	**167**	37	19	0	0	**56**
	Very adequate	0	30	13	7	**50**	9	0	0	0	**9**
	Missing	7	0	0	0	**7**	0	0	0	0	**0**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**
Generally, how adequate, and satisfactory is infrastructure in your area	Very inadequate	18	15	4	7	**44**	18	22	57	10	**107**
	Inadequate	13	0	18	0	**31**	63	55	63	78	**259**
	Indifferent	55	48	31	16	**150**	20	12	0	2	**34**
	Adequate	32	48	22	7	**109**	35	22	3	2	**62**
	Very adequate	0	15	13	21	**49**	6	1	0	0	**7**
	Missing	7	0	0	0	**7**	0	0	0	0	**0**
Total		**125**	**126**	**88**	**51**	**390**	**142**	**112**	**123**	**92**	**469**

Source: Author's fieldwork (2016)

6.2.4 Policy/Institutional Perspectives

The discussion of policy data in this section is expected to be the discussion of primary data on the policy position, and this should include the presentation of information received from both the professionals (government or public servants and private professionals) and the residents on this issue. However, all efforts to get professionals discussed this position in both interview and questionnaire administration was not productive substantial for any analysis. Especially in Hong Kong, the responses are similar, and it was directing the research to their published documents or website:

"…...all policy, regulation and press release or information related to this issue is provided on our website for the public domain you should please visit our website…."

In line with this feedback, the deduction and induction made in this section on policy issues are based on available, relevant government published policy, decrees, and press releases.

6.2.4.1 Policy Findings in Hong Kong

Contrary to the situation in most developed and developing countries, Hong Kong is one of the few developed cities that responds to the existence of UISIP challenges by harnessing all efforts to improve the situation. The city administration has made several efforts and provisions regarding investigation, policies, decrees, and multiple press releases on this issue. Government offices where enquiries, complaints, and reports of ill behaviour can be submitted have been established.

However, the findings of this study in Hong Kong reveal that despite all the efforts put in place there is no specific planning design approach. Rather to adopt design research approach such as inclusive design, universal design, participatory design, and several other design models based on the context of the region its government press release after press release. The investigation approach used for investigation used in the government report has been more of a technical approach, authoritarian and top-down even though.

Another finding of this research on policy in the region is the action or inaction of one of the most significant related agencies on this issue. This study finds no evidence, documents, or contribution on the part of the Hong Kong Planning Department about UISIP challenges. There are no urban planning design policies, regulations, guides, or standards to adopt towards improving the situation or achieving sustainability.

Similarly, the neoliberal approach of the available policy and the established control office is also a challenge in the area. Settlements are tolerated and allow to exist without significant urban renewal strategies. They are presented as squatter settlements, but they are taxed on water bills, electricity, and other utility usage. This situation is evidenced in the unstructured interviews/discussions with the residents, and some feedback indicated that some structures or urban informal settlements are allowed while some are not. Actions are most often taken

against any reported squatter structures, while similar or worse situations that are not reported are allowed to persist. The findings of Alan (2001) and several others also argue a similar position taken by policy. Box 2 presents extracts from the urban informal and squatter settlement policy identified in Hong Kong with specific areas highlighted for induction and deduction made in this study.

Box 2: Selected policy extract in Hong Kong

Squatter Control Policy

on Surveyed Squatter Structures

Lands Department
August 2016

This pamphlet can be downloaded from the Lands Department website
http://www.landsd.gov.hk/en/squatter_control/cont4.htm

Introduction

This pamphlet sets out information on the established policies applicable to squatter control (SC) of surveyed squatter structures. The information contained in this booklet is for reference only and is not intended to create any legal rights or interests and does not confer upon any person the right of occupation of land (whether leased or unleased) nor shall it be construed as a representation that the persons in occupation of the land have any rights or interests whatsoever in the land which they occupy. The pamphlet serves only to explain the key features of the current arrangements in dealing with surveyed squatter structures. The information contained herein may be subject to revision without any prior notice.

Surveyed Squatter Structures

The surveyed squatter structures referred to in this pamphlet are those unauthorised structures erected on Government land and leased agricultural land before June 1982 and have been surveyed and recorded by Government before June 1982 (1982 Survey) (Surveyed Squatter Structure).

I.   Use, Materials and Size of Surveyed Squatter Structure

1.1   The 1982 Survey recorded the location, dimensions (i.e. length, width, height), building materials and use of the Surveyed Squatter Structure (SC Survey Record).

Box 3 Continuation of selected policy extract in Hong Kong

1.2 Government's position is that any Surveyed Squatter Structure on Government land is unauthorised occupation of Government land and any Surveyed Squatter Structure on leased agricultural land is an unauthorised structure on leased agricultural land, but they are tolerated to remain on a temporary basis, provided the location, dimensions, building materials and use are the same as the record in the 1982 Survey, until the Surveyed Squatter Structure has to be cleared for development, environmental improvement or safety reasons, or until the Surveyed Squatter Structure is phased out through natural wastage (e.g. when the structure is not occupied or ceases to exist). Such tolerance does not create any legal rights or interests or obligations and does not confer on any person the right of occupation of land.

1.3 Extension, new erection, addition, change of use or alteration with materials that do not conform with the SC Survey Record are not allowed. A Surveyed Squatter Structure with extension, new erection, addition, change of use or alteration with materials that do not conform with the record of the 1982 Survey will lose the status of a Surveyed Squatter Structure and the SC Survey Record will be cancelled. Having considered that the squatter control policy explicitly requires enforcement actions to be taken against unauthorized squatter structures and does not encourage unauthorized extension, Lands Department issued a press release on 22.6.2016 to announce the strengthened squatter control measures with immediate effect. Specifically, if there is evidence showing that a new extension has been completed after that day, actions will be taken such as cancelling the squatter survey number instantly and demolishing the whole unauthorized structure on government land immediately upon detection without giving any opportunity to rectify, or taking lease enforcement actions against cases involving newly extended structures on private land as appropriate.

1.4 Some of the Surveyed Squatter Structures may also be authorised by licences or other forms of approval issued by the Government (licensed structures). If they are found to be non-compliant with the records in the 1982 Survey, their SC Survey Record will be cancelled and they will then be subject to the conditions of the licences or other approval.

2

Box 4 Continuation of selected policy extract in Hong Kong

Lands Department announces the findings of its investigation and follo...   http://www.info.gov.hk/gia/general/201606/22/P201606221063.htm

Press Releases

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Lands Department announces the findings of its investigation and
follow- up actions in Tung Ah Pui Village
****

In response to the suspected irregularities concerning
squatter structures and illegal occupation of government land in
Tung Ah Pui Village, Tai Tam Bay, Shek O, the LandsDepartment
(LandsD) announced the findings of its investigation and follow-up
actions today (June 22).

Surveyed Squatter Structures

On the surveyed squatter structures, LandsD's findings are as
follows:

(i) There are currently 12 surveyed squatter structures in Tung Ah
Pui Village, all of which are located on government land.
According to the Squatter Survey Records in 1982, all ofthese
squatter structures were built mainly with permanent materials
(such as concrete, tiles, and bricks) for domestic use. In other
words, although the materials concerned are not those temporary
materials commonly used in the construction of the majority of
surveyed squatter structures (like planks and galvanised iron),
the use of permanent materials does not deviate from that of their
surveyed records. Moreover, as these squatter structures were
covered in the Squatter Control Survey (SCS) in 1982, they are
"tolerated" and "allowed to exist" on the government land
concerned provided that the requirements (including those in
respect of materials, dimensions and uses of the structures
conform to the SCS records) under the squatter control policy are
complied with; for this reason, the allegation that the Government
"has turned a blind eye to the illegal occupation of government
land by those structures for over 30 years" does not hold water.

(ii) Squatter control is carried out based on the SCS records in
1982. Recently, LandsD has gathered further information like
aerial photographs to find out whether all surveyed squatter
structures in Tung Ah Pui Village have been re-built or extended
after 1982. Based on such information, it is established all such
squatter structures have not been rebuilt. However, it is found
that the dimensions of three squatter structures are inconsistent
with the 1982 SCS records. Two involve unauthorised extensions
(including one glass house which was demolished earlier) and one
involves unauthorised structures on its roof. Warnings will soon
be issued, asking the occupants to rectify the irregularities
within 28 days, or else their SCS records will be cancelled and
their squatter structures demolished in whole.

(iii) There is no initial indication of irregularities concerning
the uses of the squatter structures. However, inspections inside
some of the squatter structures are yet to be conducted as their
occupants cannot be reached, so the uses of these structures
cannot be ascertained at the moment. To further confirm their
uses, the Squatter Control Office will follow up closely on the
matter.

As to whether the district Squatter Control Office has
delayed in taking action against the irregularities concerning the
surveyed squatter structures in Tung Ah Pui Village, LandsD
responds as follows:

(i) Due to the remoteness of Tung Ah Pui Village and the
neighbouring areas, inspections are conducted once around every
three months by the Squatter Control/Hong Kong and Lei Yue Mun
Office of LandsD (SCO). But these inspections are generally
conducted to see whether any building works are on-going, and
whether there are any newly constructed structures.

(ii) In August 2015, SCO received a media enquiry on the squatter
structures in Tung Ah Pui Village. During an inspection carried
out at that time, SCO found a pavilion which did not have a
squatter survey number. The unauthorised pavilion was demolished
by the occupant after warning by SCO. Later on, SCO inspected the
site again in October and found, by observation, four squatter
structures with suspected extensions. No further checking was
performed due to the situation explained in paragraph (iii) below.

(iii) According to SCO's records at that time, Tung Ah Pui
Village, Tai Tam Bay has been included in a non-development

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Box 5 Continuation of selected policy extract in Hong Kong

Lands Department announces the findings of its investigation and follo...   http://www.info.gov.hk/gia/general/201606/22/P201606221063.htm

their squatter survey numbers immediately."

Non-surveyed squatter structures and unlawful occupation of government land

In addition to the investigation into the surveyed structures in Tung Ah Pui Village, LandsD has found that there are illegal structures and occupation of government land in the village, such as a tree house, bird cages, canopies and other miscellaneous articles. Last week, control actions were taken under the Land (Miscellaneous Provisions) Ordinance (Cap. 28), such as posting of a notice requiring occupants to cease occupation of government land, and 15 "Government Land" boards have been erected thereon. At present, most of the illegal structures without squatter survey numbers have been demolished. The rest are mainly fences, fence walls and others. As regards non-compliance with the above-mentioned statutory notice requiring the occupants to rectify the unlawful occupation themselves before the deadline, LandsD is consolidating the facts collected and gathering further information (including establishing the parties involved) to follow up on prosecution. In order not to prejudice evidence collection and prosecution, the department is not in a position at this stage to disclose the details of the follow-up action.

Jetties, barbecue platform and low walls

As for the eight jetties, one barbecue platform and several low walls currently located along the coast at Tung Ah Pui Village, after consulting the relevant government departments, LandsD confirmed that these jetties, contrary to previous media reports, are not located within the coastal protection area on the relevant outline zoning plan or within the marine parks and marine reserve areas governed by the Marine Parks and Marine Reserves Regulation, but all of these jetties, barbecue platform and low walls are illegal structures. LandsD plans to remove these coastal illegal structures, and is now consulting the relevant government department to ensure that removal works will be carried out in a proper manner.

Other surveyed squatter structures in Shek O area

LandsD previously indicated that, in addition to the investigation into the case of Tung Ah Pui Village, inspections would also be conducted on the surveyed squatter structures in Shek O area. According to the records as at late 2015, there are about 1 670 surveyed squatter structures in the whole Shek O area. In the past three years (2013-2015), SCO issued nearly 90 verbal or written warnings, requiring occupants to rectify irregularities or cease their unauthorised occupation of government land; deregistered 32 surveyed structures; and completed clearance of 38 illegal structures. In addition to the action taken in Tung Ah Pui Village, SCO will initiate a new round of inspection of other parts (including Lan Nai Wan, Ngan Hang, To Tei Wan, Cape D'Aguilar, Shek O and Tai Long Wan) in Shek O area in the next stage. Control action will be taken if irregularities are found.

Ms Linn said, "LandsD understands that members of the public have expectations for the Government's enforcement work. Hopefully, the actions against the cases of Tung Ah Pui Village and the improvement measures announced today will clarify the facts, manifest fairness and impartiality, and raise the effectiveness of enforcement work over squatter structures."

Under the current squatter control policy, squatter structures which were covered in the SCS in 1982 are unauthorised and temporary in nature and are "tolerated" and "allowed to exist" until they are phased out through natural wastage or are required to be cleared for development, environmental improvement or safety reasons. No extension or alteration can be made to those surveyed structures of which the uses and building materials must comply with the SCS records. Surveyed squatter structures cannot be re-built, but exemption may be granted to those surveyed domestic squatter structures in the New Territories which meet the established procedures and conditions depending on the actual circumstances of each case. If re-building is found, as the original squatter structures no long exist, squatter survey numbers of these structures will be cancelled instantly and enforcement actions will be taken. In 1984/85, the Government conducted a squatter occupancy survey on the surveyed squatter structures that were for domestic use mainly for record purpose; and no one has been granted the right to occupy the land concerned. The existing squatter control policy does not impose

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6.2.4.2 Hong Kong Urban Renewal Authority

Urban renewal authority (URA) is the statutory agency responsible for the revitalisation of urban environment in Hong Kong and this include UISIP project to accelerate sustainable urban development. Accepting the existence of UISIP challenge and describing its significance in Hong Kong, the URA states that "some tens of thousands of households are now living in dilapidated buildings with poor living conditions"(URA, 2018).

Delegated with the responsibilities of improving the challenge of urban deterioration, UISIP in Hong Kong, the authority was set up in May 2001 under the Urban Renewal Authority Ordinance towards achieving sustainable urban development. The agency has been identified vital in fighting urban decay, improving the quality of old urban district and its role is significant to sustainability campaign in Hong Kong over the years. The authority adopts the 4R strategies (redevelopment, rehabilitation, preservation, and revitalisation) for improving the urban fabrics such as shelter, road networks for vehicles, pedestrian, and open space.

6.2.4.2.1 Urban Renewal Authority and UISIP Projects in Hong Kong

Adopting the 4R strategies, the URA has initiated and complete several urban renewal and UISIP projects with several others under constructions while the issues of community satisfaction and project effectiveness are subjective question to the resident. Table 6.9 presents the identified selected urban renewal and UISIP related projects in the study areas

Table 6. 9 Selected URA and UISIP projects in Hong Kong

S/N	Study Area Projects	Details
	Central and Western	
1.	Central Market	Revitalisation Projects
2.	Pak Tsz Lane Revitalisation Project	Revitalisation Projects
3.	Street Improvement Scheme: Tung Street in Central and Western District	Revitalisation Projects
4.	107 First Street	Rehabilitation Scheme
5.	79-81 Connaught Road West	Rehabilitation Scheme
6.	9 Tai Ping Shan Street and 6 Pound Lane	Rehabilitation Scheme
7.	G7 Centre at Wing Lee Street	Redevelopment Projects
8.	120 Wellington Street, 26A-C Graham Street	Redevelopment Projects
9.	11-12 Yu Lok Lane, 1-2 & 9-10 Yu Lok Lane	Redevelopment Projects
	Kowloon City District	
10.	49 Ma Tau Wai Road	Rehabilitation Scheme
11.	264-268 Chatham Road North and 183-187 Bukeley Street	Rehabilitation Scheme
12.	86-106J Lok Shan Road	Rehabilitation Scheme
13.	120-122 Tam Kung Road	Rehabilitation Scheme
14.	17 Tak Ku Ling Road and 5-7A Nga Tsin Wai Road	Rehabilitation Scheme

15.	12 Pau Chung Street	Rehabilitation Scheme
16.	Hung Fook Street/Kai Ming Street Development Project (KC-010)	Redevelopment
17.	Kai Ming Street Demand-Led Redevelopment Project (DL-9: KC)	Redevelopment
18.	Kowloon City Road/Sheung Heung Road Project	Redevelopment
Sham Shui Po District		
19.	315- 319 Tai Nan Street	Rehabilitation Scheme
20.	245-247 Apliu Street	Rehabilitation Scheme
21.	204-208 Hai Tan Street	Rehabilitation Scheme
22.	28-30 Pei Ho Street	Rehabilitation Scheme
23.	287 Lai Chi Kok Road & 50 Pei Ho Street	Rehabilitation Scheme
24.	477-483 Un Chau Street	Rehabilitation Scheme
25.	Castle Peak Road/Un Chau Street Development Project (SSP-016)	Redevelopment
26.	Hai Tan Street/Kweilin Street and Pei Ho Street Development	Redevelopment
27.	Wong Chuk Street Demand-Led Redevelopment Project (DL-7: SSP)	Redevelopment
Tai Kok Tsui/Mong Kok/Yau Ma Tei		
28.	Prince Edward Road Western/Yuen Ngai Street	Revitalisation Projects
29.	Shanghai Street/Argyle Street	Revitalisation Projects
30.	Street Improvement Scheme: Tai Kok Tsui District	Revitalisation Projects
31.	Oak Street/ Ivy Street Development Project (YTM-011)	Redevelopment
32.	Man On Street/Tai Kok Tsui Road Demand-led Development Project (DL-12: YTM)	Redevelopment
33.	Ash Street Demand-Led Redevelopment Project (DL-11: YTM)	Redevelopment
Wan Chai		
34.	Wan Chai Heritage Trail	Revitalisation Projects
35.	Mallory Street/Burrows Street	Revitalisation Projects
36.	361 Hennessy Road	Rehabilitation Scheme
37.	141-147 Johnston Road	Rehabilitation Scheme
38.	122-128 Queen's Road East	Rehabilitation Scheme
39..	144 Lockhart Road	Rehabilitation Scheme
40.	67-73 Queens Road East	Rehabilitation Scheme
41.	20 Spring Garden Lane	Rehabilitation Scheme
42.	18, Ship Street	Redevelopment
43.	60-66, Johnston Road	Redevelopment
44	186-190 Queen's Road East	Redevelopment

Source: Adapted from (URA, 2018)

The findings of this study about projects strategies, community participation and the capacity of these projects to achieve sustainable urban development reflect similar trends in most of the projects executed regarding strategies. The response within these areas on several projects shows a process of prejudice, failed expectations of the public and the authority reflect a quasi-government profit making statutory body on the project processes.

The case of the building heritage preservation and revitalisation at 600-626 Shanghai street Mong Kong is an example of such URA projects that reflect this deduction in the study area. This URA project affects 157 population, 36 property interest and 81 households reflect a delayed process (over 10 years) and is still in progress with mixed satisfaction from the community.

Despite the significant achievements of the authority over the years in taking care of old buildings, decay urban settlement and UISIP; the authority also identified that there is a need to formulate better strategies to improve the challenge other than the current 4R strategies adopted. The statement of the Chairman of Urban Renewal Authority (Victor So Hing-woh) states that:

> "In view of the challenges and opportunities at the present moment and in the foreseeable future, we have embarked on a number of major studies to look into the breadth and depth of the problem of urban decay, aiming to formulate urban renewal solutions that enable us to rise to the challenges and take urban regeneration to new dimensions and be sustainable"(URA, 2018)

Considering the statement of the chairperson of URA with the investigation of this study on UISIP and the URA projects executed in Hong Kong, there is a need for different strategies which sustainable urban design strategies has the potential to resolve. This deduction is correct on the Hong Kong URA and UISIP projects because the 4R strategies (redevelopment, rehabilitation, preservation, and revitalisation) adopted is a long-standing strategy (late 1980-1990s) with poor improvement on a complex, modernised and the ever-dynamic urban environment like Hong Kong. Also, the physical evidence of decayed urban settlement and the challenge of UISIP with the high cost of housing, poor urban shelter such as cage house and high number of street sleepers are significant evidence that supports the deduction of this study.

6.2.4.3 Policy Standpoint in Lagos metropolis

In Lagos metropolis, there is no significant policy, decree and government law that can be identified to address the issues of urban informal settlement either in details or a subset of any regulation. The closest identified is discussed under the development control and urban renewal guidelines in the Nigerian Urban and Regional Planning Law Decree No. 88 of 1992. Despite the severity of this menace in the metropolis with abundant literature, protest, and several other controversies on this issue in Lagos, Nigeria. Boxes 6 and 7 presents an extract of the decree for the context of this study and discussion.

Box 6 Policy extract in Lagos metropolis Nigeria
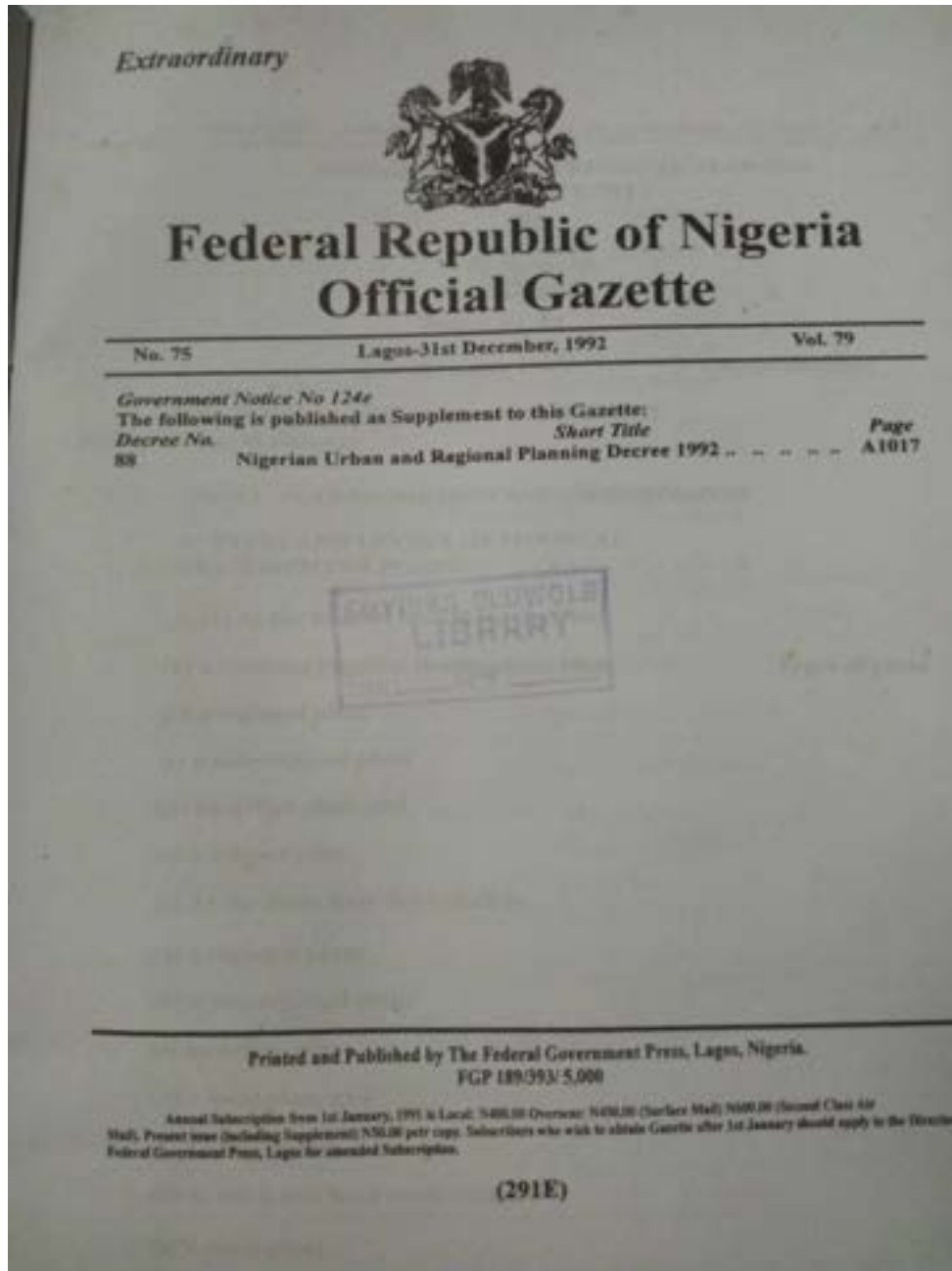
Box 7 Continuation of policy extract in Lagos metropolis Nigeria

(2) An enforcement notice may require a developer to alter, remove, or discontinue a development to ensure that the development becomes a lawful development or becomes compatible with the use for which an adjoining land has been put.

51. Enforcing an order

A Control Department or its authorised agent shall enforce an order of the Planning Tribunal or High Court against a developer or holder for the time being of a development permit who fails to comply with such an order.

52. Developer liable for expenses incurred by a Control Department

A developer or holder for the time being of a development permit shall be liable for all expenses reasonably incurred by a Control Department or any of its officers or agents, as the case may be, in enforcing the provisions of section 51 of this Act.

53. Issuance of stop-work order for unauthorised development, etc.

Where it appears to the Control Department that-

(a) an unauthorised development is being carried out; or

(b) where a development does not comply with a development permit issued by the Control Department, the Control Department shall issue a stop-work order pending the service of an enforcement notice on the owner, occupier or holder as specified in section 50 of this Act: Provided that where the development or use is a minor development or use, the Control Department shall have the power to order the developer to alter, remove or discontinue the development or use without reference of the matter to a court of Law.

54. Stop-work order to take effect on service

A stop-work order shall take immediate effect upon service on a developer or the occupier of the development for the time being.

55. Information to be contained in a stop-work order

A stop-work order shall comply with the provisions of section 53 of this Act and shall in addition inform the developer or occupier of--

(a) the development which is required to be stopped; and

(b) the work to be done on the site to conform with the development permit issued thereto.

56. Reasonable time to be given to a developer to comply with a stop-work order
The Control Department shall give a reasonable time not exceeding 21 days within which the developer shall be required to comply with the provisions of section 53 of this Act.

57. Effect of failure to serve enforcement notice within 21 days of service of a stop-work notice

A stop-work order shall cease to have effect if within 21 days of its issue the enforcement notice is not served on a developer.

58. Extension of time within which to comply with a stop-work order

Where an enforcement notice is served in respect of a development to which a stop-work order is served, a planning tribunal may on the application of the Control Department extend the period of time during which a stop-work order shall remain in force.

Table 6.10 presents other identified urban planning and decree, law and policies reviewed in the metropolis and Nigeria as a country to establish the findings of this research.

Table 6. 10 Identified policies in Lagos metropolis

S/N	Date	Policy	Highlights/ focus of regulation
1	1863	Town Improvement Ordinance	Health focus and monitoring sanitation
2	1873	The Colonia Survey Gazette	Environment gazette for health and cleanliness
3	1877	Inspection Nuisance Regulations	Garbage, street sweeping and clearing of nuisance
4	1877	Swamp Improvement Act	Environmental deforestation and afforestation with development implications
5	1899	Sanitary Health Board	Environmental health focus, prevention of malaria through environmental health broad.
6	1902	Town Planning Ordinance	First town planning perspective from health focus and it adopts reservations of the area (zoning)
7	1908	Public Health Ordinance	Improvement of health ordinance perspectives.
8	1917	Township Ordinance No.29	Classification of town as first class, second class and first serious planning approach using grid-iron pattern and zoning.
9	1928	Lagos Town Planning Ordinance Cap 95	An ordinance to compact the spread of Bubonic plague after the war and lead to the creation of Lagos Executive Development Board (LEDB).
10	1946	Nigerian Town and Country Planning Law- Ordinance No. 4	The first real town and country planning for the whole country with a focus developing planning authority (Federal, State, and Local authority), planning and plan preparation through the scheme and another strategy
11	1956	Public Health Laws	Health-related decree
12	1972	Lagos Executive Development Board (LEDB)	Environmental health decree, development of LEDB area office in Ikeja, Lagos and eventually lead to Lagos State Development and Property Corporation (LSDPC)
13	1982	Town and Country Planning Regulations	Focus on development strategy, the role of developer, building plan approval
14	1985	Town and Country Planning Edict	Improvement on 1982 regulations with an edict to empower and establish Local government planning authority
15	1986	Town and Country Planning Regulations	Building plan regulations, estate development and construction of the building
16	1986	Town and Country Planning Regulations	Planning ordinance regulating the conditions of development of government land by a private developer.
17	1992	Nigerian Urban and Regional Planning Law Decree (NURPD) No.88	Significant planning decree, with plan preparation, development control and the only close law on the revitalisation of urban areas with rehabilitation, renewal, and condition to high mark an area as improvement area.
18	1998	Lagos State Urban and Regional Planning Law, Edit No. 2	Improvement of NURPD No.88 with emphasis on plan preparation, conduct research and the types of plan or planning
19	2005	Lagos State Urban and Regional Planning and Development Law	Identify the responsibilities of State and Local authority on physical planning and urban renewal
20	2010	Lagos State Urban and Regional Planning and Development Law	The most recent law in the metropolis on development control, change of use, transport regulation without a guide on urban informal settlement

Source: Authors (2017)

The planning design policy in the country and the metropolis originated from health and environmental health perspectives. These policies are not proactive or prepared to address planning issues, and it is sad that the amendment of several British-adopted planning policies to address planning challenges were not even properly adopted. Subsequently, throughout this period and to date, the policy stance on and government administration of urban informal settlement has adopted the strategy of neglect and repressive actions (forced eviction and demolition), among other elements. In addition, the unstructured interview evidence obtained in this study on the policy standpoint towards urban informality corroborated this position and identified that the government position had been an action of inaction with greed responses of demolition of such areas for personal interest.

The response of a professional interviewed on this issue stated:

> "The slum upgrading, urban renewal and poverty alleviation you hear about is propaganda. It has been an attempt by the government to enrich themselves, acquire so-called illegal property [for] themselves without adequate compensation, relocation, and resettlement like Maroko and others. Government action so far on improving informal settlement or infrastructure provision there is a fraud…"

The origin of urban informality and infrastructure challenges in the city of Lagos and Nigeria is attributed to the land use planning administration that is derived from customary law. Customary law is a system that recognises the individual interest, and the interest of families and community with regard to land. It is a system of land law and customary administration of land where the chief or family head holds the land as a trustee for the interest of the people. This customary system was used before the Land Use Act of 1978, where all land authority was given to the governor of each state. This act has been identified as the origin of several urban land use challenges such as dual land ownership documentation, land speculators, and several other land dispute issues. The presence of these land management challenges with gradual population growth and economic, social, and environmental issues creates urban informality and infrastructure challenges in the metropolis.

The findings of this study reflect that the political system of the country is not helping. The inadequate policy provision, the inaction of the government towards urban informality, and infrastructure policies and programs create several other urban challenges. The process of housing provision is poor, full of inequalities, injustice, and appropriation and corruption, which creates urban informality in housing. The social exclusion experience of people results in deprivation of public utilities, insufficient and over-stretched housing facilities, and services based on political inadequacies. The policy approach on these issues by the government has been laissez-faire, with a top-down or technocratic authoritative approach in the few instances of government response to urban informal settlement and infrastructure issues.

6.2.4.4 Lagos State Urban Renewal Authority

Formerly known as Lagos State Urban Renewal Board (LASURB) and now Lagos State Urban Renewal Authority (LASURA) was set up by Edit No. 7 of 1991 Lagos State Government ordinance to implement policy on urban renewal, UISIP and the upgrading of blighted communities in Lagos metropolis.

Under the Ministry of Physical Planning and Urban Development (MPPUD), the Lagos State Urban and Regional Planning and Development Law 2010 empower the agency to implement policies and programmes of urban renewal. To direct and monitor resettlement schemes in urban redevelopment programmes, initiate and implement renewal programmes for facilities such as drains, health centres, markets, shopping malls, recreation facilities, and also sourcing of funds for renewal scheme. Operating as a parastatal of the MPPUD on UISIP policy and programme such as monitoring and initiation of slum upgrading and urban renewal. The identification and continuous updating and mapping of slum communities and making guidelines for curtailing the growth and spread of slum settlements; the agency depends mostly on urban and regional planning decree/law in the state without specific UISIP related decree.

6.2.4.4.1 Lagos State Urban Renewal Authority and UISIP Projects in Lagos

There is no specific identified urban renewal strategy for UISIP projects implementation in Lagos metropolis. LASURA under the MPPUD has initiated and complete few urban renewal projects with others under constructions while the issue of what is the strategy adopted, community satisfaction and project effectiveness are critical concern to the resident. There are

few projects identified in the study areas and Table 6.11 presents the identified selected urban renewal and UISIP related projects in the study areas.

Table 6. 11 Selected LASURA and UISIP projects in Lagos metropolis

S/N	Study Area Projects	Details
1.	Maroko illegal occupation	Redevelopment Projects
2.	Central Lagos	Redevelopment Projects
3.	Mushin	Redevelopment Projects
4.	Aboru village	Redevelopment Projects
5.	Bamisoro Island	Redevelopment Projects
6.	Ebute metta	Redevelopment Projects
7.	Agboju/Amuwo Odofin	Redevelopment Projects

Sources: Adapted from (Olajide 2015)

The challenges of adequate records and access to current LASURA urban renewal and UISIP project is a limitation, however, according to the findings of this study and as corroborated by (O. A. Olajide, 2015) on several projects of urban renewal in the metropolis; the interest of the community have always been jeopardised. The strategies of urban renewal is characterised by forced eviction, corruption, and a redevelopment approach of the area without adequate community participation and compensation. Social ties, lives and property are often lost in the process, poverty and more homeless situation are the upshot of such projects as the redevelopment area often belongs to the highest bidder after the execution and not the first owners who are even without compensation. There are no significant UISIP projects achievement recognised in the study area, and the current regeneration plan to transform central Lagos itself is regarded as political propaganda.

Based on the findings of this study about the operations of LASURA on UISIP projects in Lagos metropolis, there is a need for different strategies which sustainable urban design strategies has the potential to improve in the study area. This statement is valid of LASURA on urban renewal and UISIP projects in Lagos metropolis because of the strategies adopted which are less useful to address the current complex urban environment in Lagos metropolis. Also, the physical evidence of decayed urban settlement and the high increase rate of UISIP challenge with the high cost of housing, poor urban shelter support this statement and emphasise the need to develop sustainable urban design strategies.

6.3   Test of Hypothesis

To make scientific deductions and inductions for sustainable urban design strategies in this study, a test of the hypothesis using measurable variables was conducted. The relationships that exist between the factors the urban informal settlement, infrastructure, and sustainable development were tested. This study tests one major hypothesis using four different sub-hypotheses with relevant, measurable variables.

6.3.4   Test of Hypothesis: Socio-economic Characteristics

In addition to the normal distribution (frequency and statistics), interviews and pictures of socio-economic characteristics of the urban informal settlement, the first sub-hypothesis tested was within socio-economic characteristics. This hypothesis was tested to reflects the relationship that exists between different socio-economic variables towards informal settlement and sustainable urban development. The hypothesis tested states that:

H_o: There is no significant relationship between average monthly income and housing condition with regard to urban informal settlement.

The ANOVA regression tested on this hypothesis reflects that there is a significant relationship between the variables across the study areas. Table 6.10 presents the findings of this hypothesis in Hong Kong and Table 6.11 present the findings in Lagos.

In Hong Kong, the result of the table at alpha 0.05, r = 3.290, degree of freedom (df) = 383, and significant level 0.062 reflects that there is not enough evidence to accept H0, and thus we accept H1, i.e. that there is a significant relationship between the average monthly income and the room available for exclusive use of the resident.

Table 6. 12 ANOVA regression test between average monthly income and exclusive room use - Hong Kong

Model		SS	df	MS	F	alpha	Sig.	Remarks
1	Regression	3.290	1	3.290	3.491		.062[b]	NS
	Residual	360.020	382	.942		0.05		
	Total	363.310	383					

a. Dependent Variable: Average Monthly Income
b. Predictors: (Constant), Rooms for Exclusive Household Use
SS, Sum of Square; MS, Mean Scores; Sign, Significant Level; S, Significant; NS, Not Significant
Source: Author's fieldwork (2016)

The results for Lagos also support this perspective, and the outcome at alpha 0.05, r = 0.031, degree of freedom (df) = 468, and significant level 0.861 reflects that there is not enough

evidence to accept H0. Thus, we accept H1 that there is a significant relationship between the average monthly income and the room available for exclusive use by the respondent in the metropolis.

Table 6.13 ANOVA regression test between average monthly income and exclusive room use - Lagos

Model		SS	df	MS	F	alpha	Sig.	Remarks
1	Regression	.031	1	.031	.031		.861[b]	NS
	Residual	475.960	467	1.019		0.05		
	Total	475.991	468					

a. Dependent Variable: Average Monthly Income
b. Predictors: (Constant), Rooms for Exclusive Household Use
SS, Sum of Square; MS, Mean Scores; Sign., Significant Level; S, Significant; NS, Not Significant
Source: Author's fieldwork (2016)

The findings of this hypothesis in the study areas corroborate the results from previous data (interviews, pictures, normal distribution) presented above, i.e. that socio-economic factors are significant in urban informality settlement development, infrastructure, and subsequently sustainable development.

6.3.5   Test of Hypothesis: Environmental Characteristics

The hypothesis to scientifically prove the relationship between environmental factors and how they are associated with urban informal settlement states:

H₀: There is no significant relationship between construction materials and type of building with regard to urban informal settlement.

The outcome according to the ANOVA regression table in Hong Kong at alpha 0.05, r = 0.294, degree of freedom (df) = 389, and significant level 0.074 shows that there is not enough evidence to accept H0. Thus, we accept H1, i.e. that there is a significant relationship between construction materials and the types of building developed within the urban informal settlement of Hong Kong.

Table 6.14 ANOVA regression test between construction materials and types of building - Hong Kong

Model		SS	df	MS	F	alpha	Sig.	Remarks
1	Regression	.294	1	.294	3.203		.074[b]	NS
	Residual	35.603	388	.092		0.05		
	Total	35.897	389					

a. Dependent Variable: Construction Materials
b. Predictors: (Constant), Types of Building
SS, Sum of Square; MS, Mean Scores; Sign, Significant Level; S, Significant; NS, Not Significant
Source: Author's fieldwork (2016)

Contrary to the findings in Hong Kong, the results of the environmental factors and how they relate to urban informal settlement in Table 6.12 at alpha 0.05, r = 98.691, degree of freedom (df) = 468, and significant level 0.000 supports H0, i.e. there is no significant relationship between building construction materials and types of buildings constructed in the metropolis.

Table 6.15 ANOVA regression test between construction materials and types of building - Lagos

Model		SS	df	MS	F	alpha	Sig.	Remarks
1	Regression	98.691	1	98.691	92.518		.000[b]	S
	Residual	498.157	467	1.067		0.05		
	Total	596.849	468					

a. Dependent Variable: Building Construction Material
b. Predictors: (Constant), Types of Building

SS, Sum of Square; MS, Mean Scores; Sign, Significant Level; S, Significant; NS, Not Significant

Source: Author's fieldwork (2016)

Considering the findings of the tables presented above regarding the relationship between environmental factors and how they are associated with and influence urban informal settlement (and subsequently sustainable urban development), there is no evidence significant enough to either accept or reject H0 or H1, because the findings are significant in Lagos metropolis and not significant in Hong Kong. This implies that the relationship between environmental factors and how they relate to urban informal settlement, infrastructure, and sustainable development is location based. However, considering this result in combination with other data collected (interview, pictures, and frequency data distribution) in the study areas, this study argues that there is a relationship between environmental factors, urban informal settlement, and sustainable development, which can either be negative or positive and significant or not significant.

6.3.6   Test of Hypothesis: Infrastructure Characteristics

The challenges of sustainable urban development include infrastructure, and this study scientifically tests whether a significant relationship exists between different infrastructure variables and determines how these may be associated with and/or influence urban informal settlement, and subsequently sustainable urban development. The hypothesis tested states that:

H₀: There is no significant relationship between health infrastructure and road infrastructure with regard to urban informal settlement.

The outcome of testing this hypothesis in the case of Hong Kong is presented in Table 6.14 at alpha 0.05, r = 215.229, degree of freedom (df) = 372, and significant level 0.000. It shows that

there is not enough evidence to reject H0 and accept H1. Thus, we accept H0: there is no significant relationship between health infrastructure and road infrastructure in the SAR's urban informal settlement.

Table 6.16 ANOVA regression test between health infrastructure and road infrastructure - Hong Kong

Model		SS	df	MS	F	alpha	Sig.	Remarks
1	Regression	215.229	1	215.229	206.399		.000b	S
	Residual	386.872	371	1.043		0.05		
	Total	602.102	372					

a. Dependent Variable: Health Infrastructure
b. Predictors: (Constant), Road infrastructure
SS, Sum of Square; MS, Mean Scores; Sign, Significant Level; S, Significant; NS, Not Significant
Source: Author's fieldwork (2016)

The findings for Lagos present a different perspective. At alpha 0.05, r = 1.160, degree of freedom (df) = 468, and significant level 0.118, Table 6.15 shows that there is not enough evidence to accept H0 and reject H1. Thus, we accept H1, there is a significant relationship between health infrastructure and road infrastructure in urban informal settlements of the metropolis.

Table 6.17 ANOVA regression test between health infrastructure and road infrastructure - Lagos

Model		SS	df	MS	F	alpha	Sig.	Remarks
1	Regression	1.160	1	1.160	2.450		.118b	NS
	Residual	221.092	467	.473		0.05		
	Total	222.252	468					

a. Dependent Variable: Health Infrastructure
b. Predictors: (Constant), Road Infrastructure
SS, Sum of Square; MS, Mean Scores; Sign, Significant Level; S, Significant; NS, Not Significant
Source: Author's fieldwork (2016)

This finding further supports the evidence of the literature review, the interviews, and the picture data presentation in the study areas. This emphasises the statement made in this study that although infrastructure is significant with respect to urban informal settlement and sustainable development, the presence of adequate infrastructure does not equate to the absence of urban informal settlement. This is seen in the results of Table 6.14 and 6.15, where while the availability of efficient infrastructure has a significant relationship in the SAR, there is an urban informal settlement in the region. The situation of Lagos is directly opposite. This implies the negative and positive influence of infrastructure variables depend on several other factors.

6.3.4 Test of Hypothesis: Socio-economic and Environmental Characteristics

The test of the relationship between socio-economic and environmental variables tested states that:

H_0: There is no significant relationship between average monthly income and the housing environmental condition.

An ANOVA regression test of the relationship between the residents' socio-economic situation and housing condition shows that there is a significant relationship between socio-economic status and housing conditions in Hong Kong. This corroborates the residents' dissatisfaction responses in Table 6.8. Table 6.16 describes the results of the ANOVA test.

Table 6.18 ANOVA test between average monthly income and housing environmental condition - Hong Kong

	df	SS	MS	F	alpha	Sig.	Remarks
Regression	1	35.50928	35.50928	0.06565698		0.814334688	NS
Residual	3	1622.491	540.8302				
Multiple Regression		0.146345			0.05		
Total	4	1658					

SS, Sum of Square; MS, Mean Scores; Sign, Significant Level; S, Significant; NS, Not Significant
Source: Author's fieldwork (2016)

The results of Table 6.16 at alpha 0.05, r (4) = 0.14, and significant level 0.81 also support that there is not enough evidence to accept H0 and thus we accept H1, that there is a significant relationship between the average monthly income and the housing condition of the resident. Considering this result, this study argues that there is not enough evidence to prove that socio-economic status does not affect the critical housing condition and the development of UISIP in Hong Kong. This finding also corroborates the conclusion of Rufina Wu and Canham (2009) among research from other studies.

Similarly, the ANOVA test in Lagos as presented in Table 6.17 shows that there is a relationship between average monthly income and housing condition in the metropolis.

Table 6.19 test between average monthly income and housing environmental condition - Lagos

	df	SS	MS	F	alpha	Sign.	Remarks
Regression	1	105.2134	105.2134	0.203273357		0.682685136	NS
Residual	3	1552.787	517.5955				
Multiple Regression		0.251909			0.05		
Total	4	1658					

SS, Sum of Square; MS, Mean Scores; Sign, Significant Level; S, Significant; NS, Not Significant
Source: Author's fieldwork (2016)

The results of Table 6.17 at alpha 0.05, r (4) = 0.25, and significant level 0.68 reflect that there is not enough evidence to accept H0 and thus we accept H1, that there is a significant relationship between the average monthly income and housing condition of residents in Lagos. This result also reflects the opinion of (Lawanson & Fadare, 2015; Nwokoro et al., 2015; Oduwaye, 2009, 2013) on UISIP challenges and the manner in which socio-economic and environmental factors contribute to this issue in the city of Lagos.

6.4 Chapter Summary

The findings of this study based on the theoretical evidence and the data presented regarding UISIP reflect that the issue of urban informality is associated with several factors and there is a significant relationship between socio-economic, environmental, and administrative factors.

In Hong Kong, the study finds that despite drastic positive policy attempts urban informality challenges remain significant in the SAR. This study argues that the central source of these challenges in the region are systemic issues related to social and economic in-balanced, social structures, and human empowerment. The wide gap between the rich and poor, the unequal distribution of resources within regions, and the high cost of living with high rates of housing unaffordability. The challenges of social inequity and the purchasing power of adequate and affordable housing in a free market economy like Hong Kong is identified as contributing greatly to the issue of urban informality.

In addition to the socio-economic and environmental factors, the challenge of land use administration in Lagos was also a significant finding. While the customary structure seems to be perfect, the introduction of Land Use Act of 1978 created several controversies that accelerated current land use challenges and urban informality in the metropolis. The poor economy as influencing poverty is significantly associated with sustainable livelihood and

development. The study also argues that a reform of existing policy to achieve sustainable urban development is necessary

The residents' socioeconomic status is most likely to influence the residents' housing condition and subsequently the quality of their environment. The study areas require social and environmental strategies to improve the challenge of poor housing conditions, degraded public facilities, inadequate services, and haphazard building conditions, which are measurable variables of UISIP in the study areas.

Part 4
Research Case Study
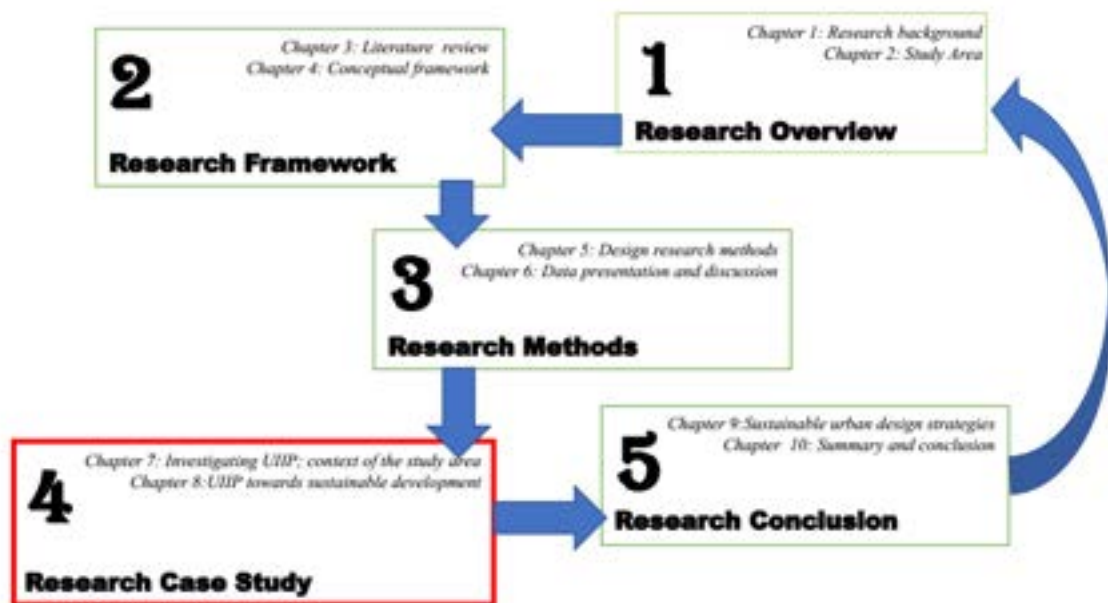
Case study strategies for architecture and urban design explain methods in evidence-based design, also called practice-based research, to show the value of research to design (Sarvimaki, 2017).

Chapter 7
Investigating Urban Informality and Infrastructure Planning

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The more important reasons for investigating is that the research itself provides an important long-run perspective on the issues that we face on a day-to-day basis.

Ben Bernanke

Synopsis

In line with the previous chapter on data presentation and the test of hypotheses for making deductions using sustainable (social, economic, environmental, and policy/institutional) development factors in this study, this chapter discusses objective 1 and 2 by investigating correlation between UISIP and assessing professional perspectives in relation to its effect on urban development in the study area.

7.1 Introduction[3]

Urban informality and infrastructure menace had been a long decade challenge with different research approach from different researchers globally. But recently, sustainable development principles, smart cities and city resilient approach are identified as a comprehensive approach to solving this environmental challenge. This paradigm-shift was also emphasised by the latest UN-Habitat issue paper III of 2015 and 2016 with urban housing, and basic services as one of the world challenges experienced by most countries of the world (UN-Habitat, 2015a).

Infrastructure means different things to different people at various times and in a different context. Above all, infrastructure has been identified significant for sustainable urban development from the physical, socio-economic, and environmental facilities and services put in place for the effective functioning of the society. This includes the sustainable facilities for adequate standard of living, working, and recreation of the people (UN-Habitat, 2015a). Also, the interrelationship between infrastructure and urban informality is ambiguous; it is described in diverse ways and different context. Informal settlement is simply identified as an area and/or settlement with functioning geographical space below the required standard. The definitions also include a settlement with evidence of illegal occupants, degraded environmental conditions, haphazard building arrangement or haphazard building use with or without infrastructure.

Considering, the broad perspective of these challenges (infrastructure and urban informality) and its potential crisis in most countries; this chapter investigates infrastructure adequacy in response to city resilience of Hong Kong and Lagos metropolis, with the view to understand the situation for sustainable urban design strategy. This section of the thesis discusses the objective one of the study by identifying and investigating the nature of informal settlement and infrastructure in Hong Kong and Lagos metropolis.

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[3] This section has been published in: Soyinka, O., & Siu, K. W. M. (2017). Investigating informal settlement and infrastructure adequacy for future resilient urban centre in Hong Kong, SAR. *Procedia Engineering*, *198*, 84-98, DOI: 10.1016/j.proeng.2017.07.075

7.2 Investigating Urban Informal Settlement and Infrastructure Planning in Hong Kong

The presentation of the research outcome covers the issues examined on infrastructure adequacy and informal settlement in Hong Kong from the literature study, the interviews and the survey conducted. The research findings are based on information extracted from the residents, researchers and professionals in Hong Kong in relation to the subject of study.

7.2.1 Informal Settlement in Hong Kong

The findings present 50% of the respondents as strongly agreed to the presence of informal settlement, 14.20% strongly agree, 10.70% are neutral about the presence of the challenge (it may, or it may not), 3.70% disagree about the presence of informal settlement as a global challenge and its existence in Hong Kong. While nobody strongly disagrees with 0.0%, 21.42% of the respondent skipped the question. The findings of this research from the data above, present informal settlement as a global challenge and a phenomenon existing in Hong Kong. This also agrees with the study of (Tanasescu et al., 2010; UN-Habitat, 2015d) and (Rufina Wu & Canham, 2009) on the existence of this challenge as a critical challenge that require attention in Hong Kong.
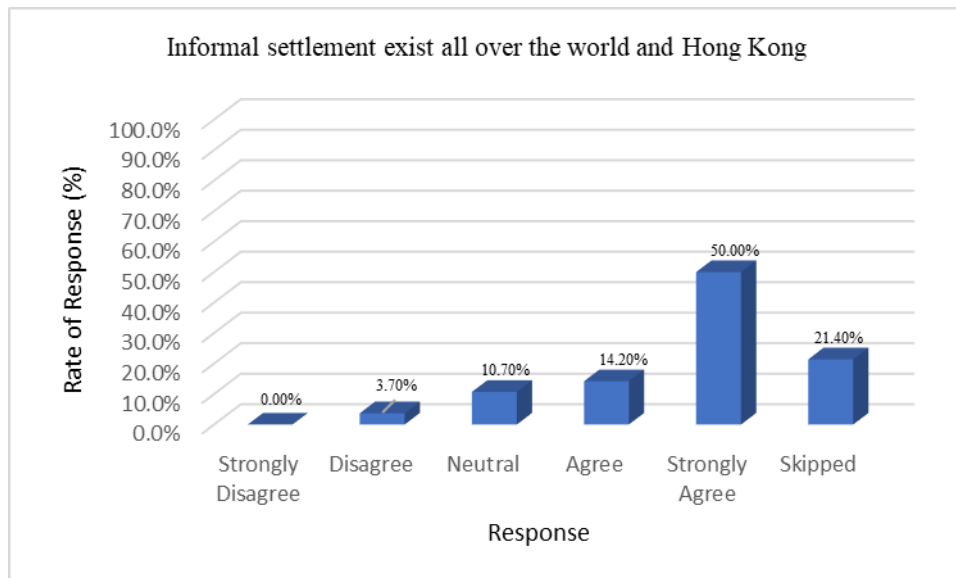
Figure 7. 1 Informal settlement in the world and Hong Kong
Source: Author's fieldwork (2016)

7.2.2 Socio-Economic Status and Informal Settlement

The study findings of the relationship between socio-economic status and informal settlement in the study area shows that 46.42% agreed that there is a relationship between the socio-economic status and living condition of the residents. This implies that socioeconomic status has the tendency to induce informal settlement and can at the same time ameliorate the challenges of informal settlement. 32.14% also strongly agree with this statement, 3.57% of the respondent are neutral, 0.0% disagree and strongly disagree with the assertion and 17.85% are indifferent to the phenomenon. These findings are further validated by the study of (Chiu, 2002; Kennett & Mizuuchi, 2010; Tanasescu et al., 2010; Valenca, 2015) which discuss the connection of income, the financial prosperity and crisis (financial policies) in relation to the challenges of housing and subsequently informal settlement development.
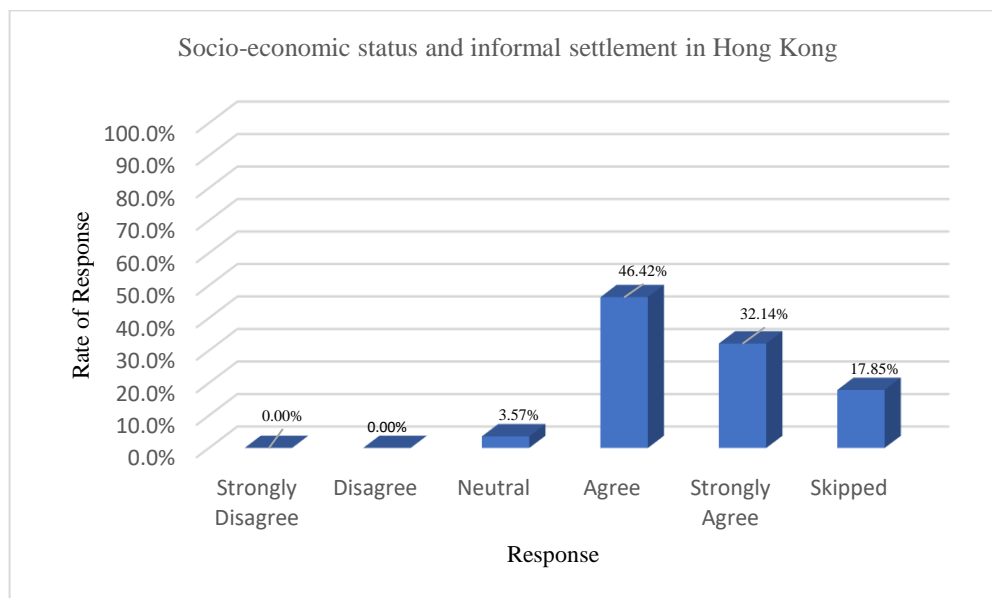
Figure 7. 2 Socio-economic status influence informal settlement development.
Source: Author's fieldwork (2016)

Also, the finding of this research was not only confirmed by the different literatures identified above. The Hong Kong population and household statistical analysis by the district in the year 2014 further confirm the relationship between the resident socio-economic status and development of the informal settlement. These statistics describe the relationship between income and informal settlements in the study areas with most of the low-income resident's areas and identified with highly compact density housing and informal structure characteristics. Areas like Sha Tin, Kwun Tong and Sham Shui Po among others are the high-density areas

with such characteristics, that record median monthly household income of 26,000, 19,000 and 18,000 respectively with the evidence of informal settlement according to the research findings and supported by the government statistics (Hong Kong, 2014, 2015). This justifies the assertion of this research as to why we have more informal accommodation in these areas, as the low-income influence the housing provision which later results in informal shelters as an alternative to housing.

7.2.3 Types of Informality in Hong Kong

This study found five types of informal settlement based on literature and physical evidence of informal settlement in Hong Kong urban centres. To examine this assertion on the type of informal settlement that still exists in Hong Kong and to what extent does the people see the severity. This research ranks the types of informal settlement in Hong Kong and the findings on informality types by illegal land/building ownership (that is illegality by title document) shows 47.37% disagree, strongly disagree 21.05%, 21.05% agree, 10.53% neutral and 0.00% strongly agree. Informal settlement by haphazard building development present disagree and agree at 31.5%, strongly disagree and neutral at 15. 79% and strongly agree at 5.26%. The unauthorised types of informal settlement response present disagree and neutral to be 26.32%, strongly disagree and agree at 21.05% and 21.0% respectively and strongly disagree at 5.26%. Informal settlement by unplanned zone uses recorded 52.63% disagree, 21.05% neutral, strongly disagree and agree at 10.53% and strongly agree at 5.26%. The inadequate facilities and services informal settlement inducers according to the response present disagree at 35.00%, neutral at 30.00%, agree at 20.00%, strongly agree at 10.00% and strongly disagree at 5.00%.

Table 7. 1 Raking the types of informality in Hong Kong

Ranking of informality types within Hong Kong	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
Illegal land/Building ownership (title documents	21.05%	47.37%	10.53%	21.05%	0.00%
Haphazard Building	15.79%	31.58%	15.79%	31.58%	5.26%
Unauthorized settlement	21.05%	26.32%	26.32%	21.0%	5.26%
Unplanned zoned uses	10.53%	52.63%	21.05%	10.53%	5.26%
Inadequate facilities and services settlements	5.00%	35.00%	30.00%	20.00%	10.00%

Source: Author's fieldwork (2016)

The study findings from the responses infer that there exists informal settlement in Hong Kong but at a very insignificant rate as a most response is closely related on both sides of agree and

disagree. Thus, weighted average is carried out to determine the most likely occurred type's informal settlement in Hong Kong and the findings present inadequate facilities and services induced informal settlement with 2.95, followed by haphazard building at 2.79, unauthorized settlement 2.63, while unplanned zoned uses and illegal land/building ownership illegality recorded 2.47 and 2.32 respectively.

7.2.4 Nature of Informal Settlement in Hong Kong

Informal settlement with all evidence from literature and survey above present the appearance of informal settlement types that are closely related. However, these responses present the nature (forms or characteristics) of occurrence of these types of informal settlement from different natures of informal settlement that exist in Hong Kong. The research findings present cage house informal settlement forms of informal settlement in Hong Kong with 30.00% agree, disagree at 25.00% and strongly disagree, strongly agree and neutral with 15.00% respectively. The shanty structure informal settlement appearance within the settlement records 31.58%, disagree 26.32%, neutral and strongly agrees to share 15.79% and strongly agree 10.53%. Inbuilt informal settlement (rooftops) present 31.58% neutral, 26.32% agree, 15.79% strongly disagree and disagree with 10.53% strongly agree. Informal settlement spread within the settlement or pockets of informal settlement everywhere is obvious at 31.58% agree and disagree, 15.97% strongly agree and disagree and 5.26% strongly agree. The identified clustered of informality as both night market and the other temporary cluster informal settlement record 42.11% neutral, 21.05%, strongly agree and disagree records 15.79% respectively and 5.26% strongly disagree.

Table 7. 2: The nature of informality in Hong Kong

Ranking the nature of informality within Hong Kong	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
Cage house informal settlement	15.00%	25.00%	15.00%	30.00%	15.00%
Shanty structures informal settlement (i.e. street structures and extended structure)	10.53%	26.32%	15.79%	31.58%	15.79%
Urban inbuilt building informal settlement. (Rooftop)	15.79%	15.79%	31.58%	26.32%	10.53%
Scattered space identified informal settlement (pocket informal structures)	15.79%	15.79%	31.58%	31.58%	5.26%
Clustered space identified informal settlement (night market and temporary settlement)	5.26%	15.79%	42.11%	21.05%	15.79%

Source: Author's fieldwork (2016)

The research findings describe the appearance of cage house informal settlement as the most visible nature of informal settlement in Hong Kong with 30.00% and 30.5 weighted average, and this is followed by clustered night market or temporary nature of informal settlement with 21.05% and 3.26 weighted average; informal street structures with 31.58% and 3.16 weighted average. The least occurrence according to the findings are an urban inbuilt informal settlement (rooftops) with 31.58%, 3.0 weighted average and scattered space informal settlement (pocket structures) with 31.58% agree and disagree with 2.95 weighted average.

7.2.5 Housing Adequacy and Informal Settlement in Hong Kong

Housing adequacy in Hong Kong had been a challenge that features in different forms and connected to different development factors in diverse ways. This research investigates the residential adequacy as an influencer of informal settlement or how related housing inadequacy contributes to informal settlement. The study finding reveals inadequate 60.87%, very inadequate 21.74%, neutral (maybe or maybe not) at 13.04%; very adequate 4.35% and adequate 0.00%.
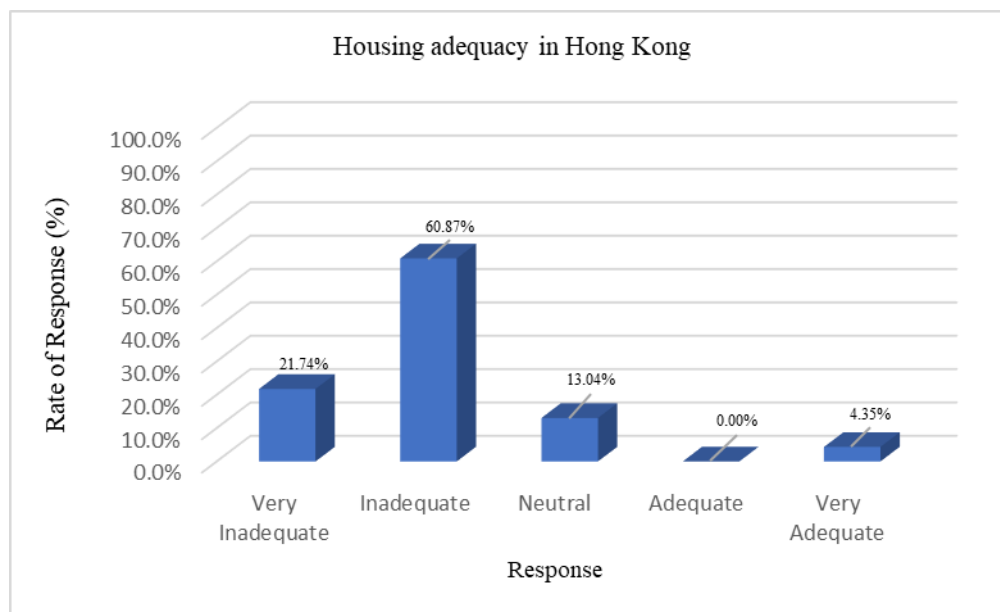
Figure 7. 3 Housing adequacy in Hong Kong
Source: Author's fieldwork (2016)

7.2.6 Access to Adequate Facilities and Services in Hong Kong

The research outcomes on access to facilities and services and it adequacy in different areas of Hong Kong shows that housing accessibilities is efficient at 68.65% and 47.83% from the resident and professional responses respectively. Neutral from few professionals and researchers at 34.78%, inefficient at 19.40% and 8.70% resident and professional respectively

Table 7. 3: Access to adequate facilities and services in Hong Kong

Resident Response	Residential access to facilities-critical services					
	Very Inefficient	Inefficient	Neutral	Efficient	Very Efficient	%
Total	**1.49%**	**19.40%**	**0.0%**	**68.65%**	**10,44%**	**100.0%**
Professionals, Researchers, and Academia responses.	Residential access to facilities-critical services					
	Very Inefficient	Inefficient	Neutral	Efficient	Very Efficient	
Total	**4.35%**	**8.70%**	**34.78%**	**47.83%**	**4.35%**	**100.0%**

Source: Authors' fieldwork (2016)
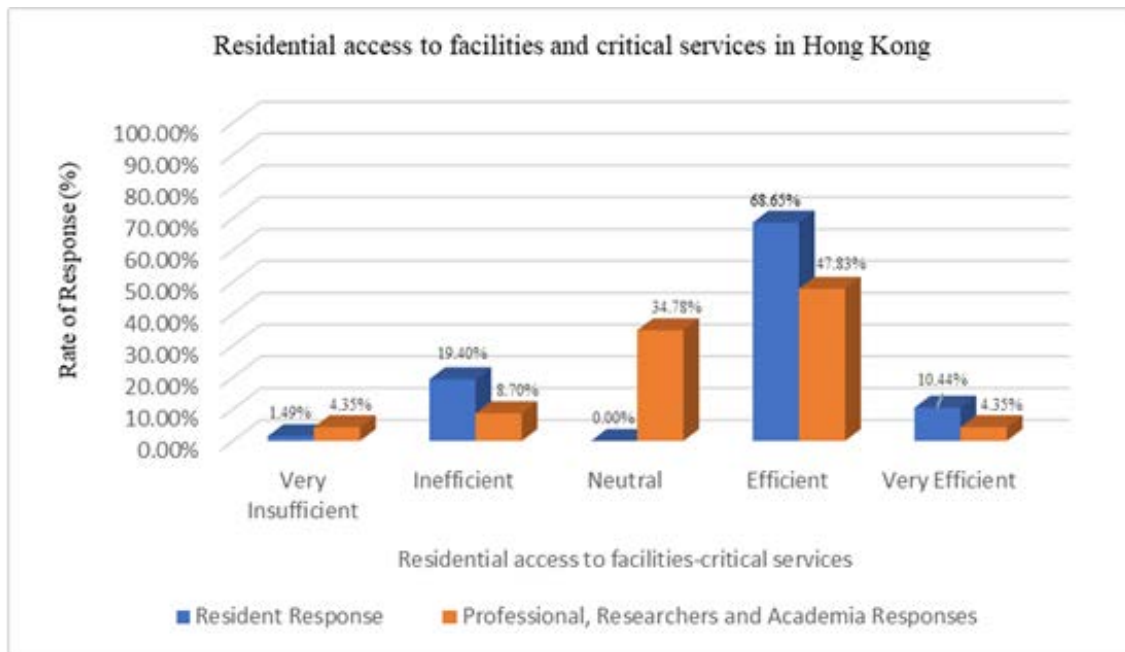
Figure 7. 4: Access to adequate facilities and services in Hong Kong.
Source: Author's fieldwork (2016)

7.2.7 Transport Adequacy and Informal Settlement

Transport facilities are often identified as a challenge at different capacity around the world depending on the level of infrastructure development. Hong Kong transport is one of the best in the world and has its share despite the high level of efficiency and connectivity experience within the country. Transport adequacy in Hong Kong from the research findings present adequacy 47.83%, very adequate and neutral 26.09%. However, from the findings of this

research, the unstructured interview, and the literature search. This research proved that although there is a relationship between transport and infrastructure and informal settlement development. The high level of transport and infrastructure development in Hong Kong has a great impact on the city development, the country is developed, but there still exist informal settlement within the developed and adequately connected transport and infrastructure developed areas of Hong Kong. Thus, infrastructure do not proliferate informal settlement in Hong Kong.
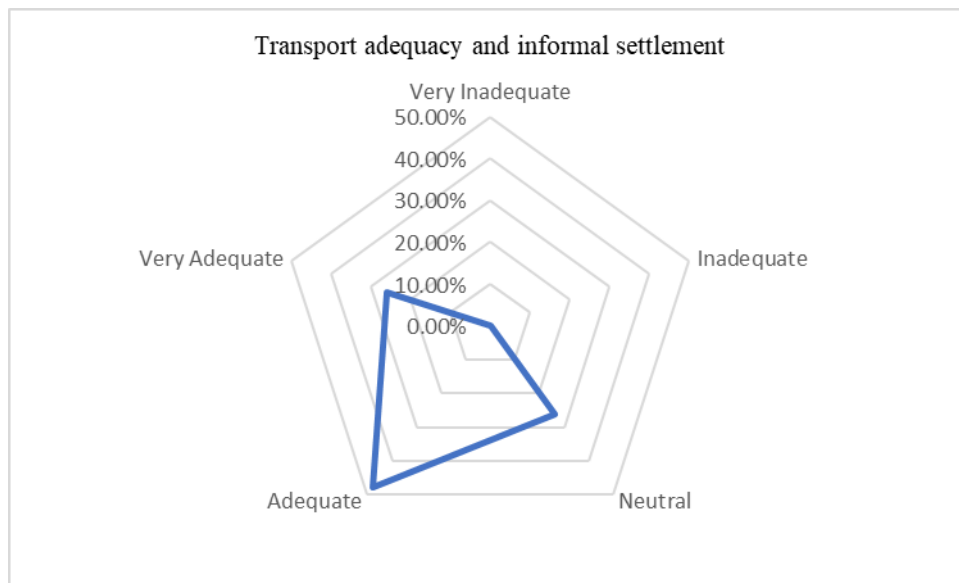
Figure 7. 5 Describing transport facilities adequacy in all settlement in Hong Kong
Source: Author's fieldwork (2016)

7.3 Investigating Urban Informal Settlement and Infrastructure Planning in Lagos metropolis[4]

The findings in Lagos reflects that the area is challenged with urban informality and infrastructure provision. The typical characteristics of the metropolis can be described with haphazard housing arrangement, shanty structures with temporary and permanent materials of different kinds, bad roads with several potholes and no drainages. Flooding is a regular occurrence in the metropolis; epileptic electricity has paralysed the SMEs and drives the big

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[4] This section has been accepted for publication in a book chapter as Soyinka, O., & Siu, K. W. M. (2018). Urban Informality and Infrastructure Planning in Lagos metropolis: Tactical Urbanism Approach. *In (Ed) Urban Crisis in Africa: Realities, Challenges, and Responses.* Institute for Peace and Strategic Studies (IPSS) University of Ibadan, Ibadan, Nigeria.

manufacturing industries out of the metropolis. Figure 2 below present some observed evidence gathered to support the secondary data collected and the interviews conducted in the study area.

Figure 7. 6 The challenges of urban informality and infrastructure in Lagos metropolis
Source: Author's fieldwork (2016)

7.3.1 Informal Settlement in Lagos metropolis

In Figure 7.7 the results of the survey conduct in Lagos metropolis on informal settlement shows that 54.00% strongly agreed that the challenge is a comprehensive challenge and it exists in the metropolis. 35.00% agreed, 5.00% neutral, 5.00 disagree, 1.00% skipped the question and 0.00% strongly disagree. These findings also corroborate the data presented and discussed in this thesis.
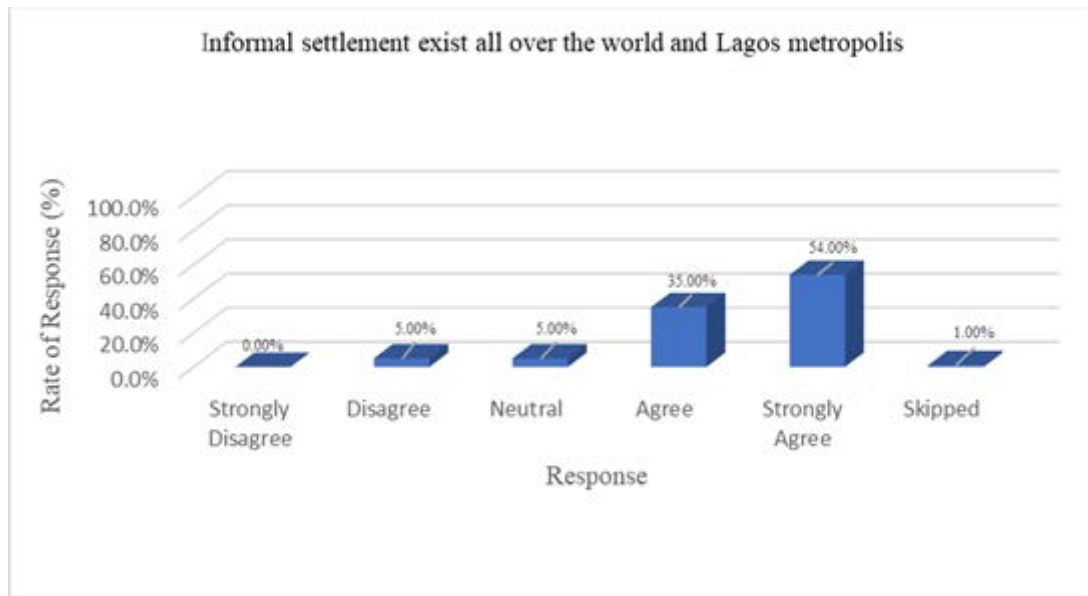
Figure 7. 7 Informal settlement in Lagos metropolis
Sources: Author's fieldwork (2016)

7.3.2 Socio-Economic Status, Cultural and Informal Settlement in Lagos metropolis

The cultural and social causes of urban informality and infrastructure challenges in Lagos metropolis exist in different forms and diverse ways. This study, however, finds out that the issue of cultural beliefs and social ties make people hold on to their property inheritance even when they cannot renew, renovate, or redevelop the property. This cultural and socio-cultural factor creates a gradual proliferation of urban informality and slums over a period within the urban areas.

The social factors in the metropolis also contribute a lot to this menace. The significant social factor that induces this challenge is the social exclusion of the people through the people's inability to cope with high cost of living and the high cost of habitat-able housing in the metropolis. The need to keep their social status of staying in the city of Lagos makes some of them to stay in such environment despite the hardship faced and the degraded nature of the environment. Again, the need to keep the family ties and gain respect within their family is another reason some stays in this challenging environment. Figure 7.8 illustrates the response of the resident on this issue.
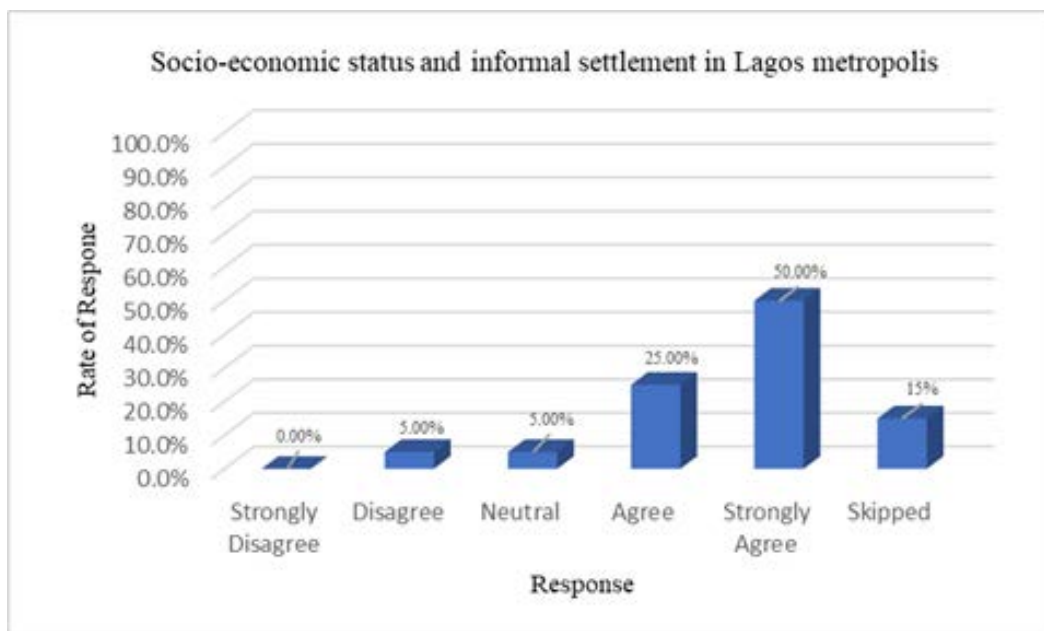
Figure 7. 8 Socio-economic status and informal settlement in Lagos metropolis
Source: Author's fieldwork (2016)

As depicted in Figure 7.8, cultural, and social issues, economic factors are also significant in causing urban informality and infrastructure challenges in the metropolis. It interrelates with social factors and several other factors to create urban informality and infrastructure challenges. The high rate of job insecurity, the high cost of living and high rate of unemployment contributes greatly to the challenge of urban informality and infrastructure in the state. Lagos metropolis is the economic and commercial city of the country with high rate of rural-urban migration, urbanisation that consequently leads to high cost of living, habitable structures and several social resources exclusion that creates the development of inadequate housing, urban informality, and infrastructure challenges. The wide gap between the rich and the poor, the desire to survive and earn a living also leads to informal economy in the metropolis. These economic opportunities with its challenges in the metropolis create several defragmented society of slums with dysfunctional infrastructures.

7.3.3 Types of Informal Settlement in Lagos metropolis

The review of literature and investigation carried out in this study reveals that informal settlement appears in diverse types, nature, and forms. Similarly, the response of the residents and professionals on the ranking of the types of informal settlement in Lagos metropolis corroborate this and reflect unplanned zoned uses at 52.63%, illegal buildings with no title 42.50%, inadequate facilities and services settlement 38.00%, haphazard building 30.00%, and unauthorised settlement 28.00%. Table 7.4 presents the results of the findings in the metropolis.

Table 7. 4 Raking the types of informality in Lagos metropolis

Ranking of informality types within Lagos metropolis	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
Illegal land/Building ownership (title documents	0.00%	10.05%	12.00%	35.00%	42.50%
Haphazard Building	10.00%	22.00%	5.00%	33.00%	30.00%
Unauthorized settlement	5.00%	8.00%	5.00%	54.00%	28.00%
Unplanned zoned uses	5.26%	10.53%	10.53%	21.05%	52.63%
Inadequate facilities and services settlements	0.00%	0.50%	36.50%	25.00%	38.00%

Source: Author's fieldwork (2016)

7.3.4 Nature of Informal Settlement in Lagos metropolis

Subsequently to the types of the informal settlement in the metropolis, the nature regarding the context, texture of the appearance in Lagos metropolis reflects clustered space identified informal settlement 42.00%, scattered space informal settlement 31.00% and shanty structures

informal settlement 26.50%. The distribution of this figure is presented in Table 7.5 below, and this describes the expected characteristics of an informal settlement in Lagos metropolis.

Table 7. 5 The nature of informality in Lagos metropolis

Ranking the nature of informality within Lagos metropolis	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
Cage house informal settlement	30.00%	50.00%	15.00%	5.00%	00.00%
Shanty structures informal settlement (i.e. street structures and extended structure)	10.50%	15.50%	16.00%	31.50%	26.50%
Urban inbuilt building informal settlement. (Rooftop)	49.00%	26.00%	10.00%	15.00%	0.00%
Scattered space identified informal settlement (pocket informal structures)	0.00%	5.00%	28.00%	36.00%	31.00%
Clustered space identified informal settlement (night market and temporary settlement)	0.00%	10.00%	20.50	27.50%	42.00%

Source: Author's fieldwork (2016)

7.3.5 Housing Adequacy and Informal Settlement in Lagos metropolis

Housing structures and shelters is identified significant in description of informal settlement. This research investigates this hypothesis in this study by investigating if the inadequacy of the housing structure in the metropolis contributed to the proliferation informal settlement in the area. The response reflects that 50.00% strongly agree to the housing challenge in the area contributes to the menace, 25.00% agree, 15.00% skipped the question, 5.00% neutral and 5.00% disagree. This result shows the significance of environmental factors (housing) in the challenge of informal settlement and suggests the improvement informal settlement for sustainable development through housing improvement. Figure 7.9 below present this fact in the metropolis.
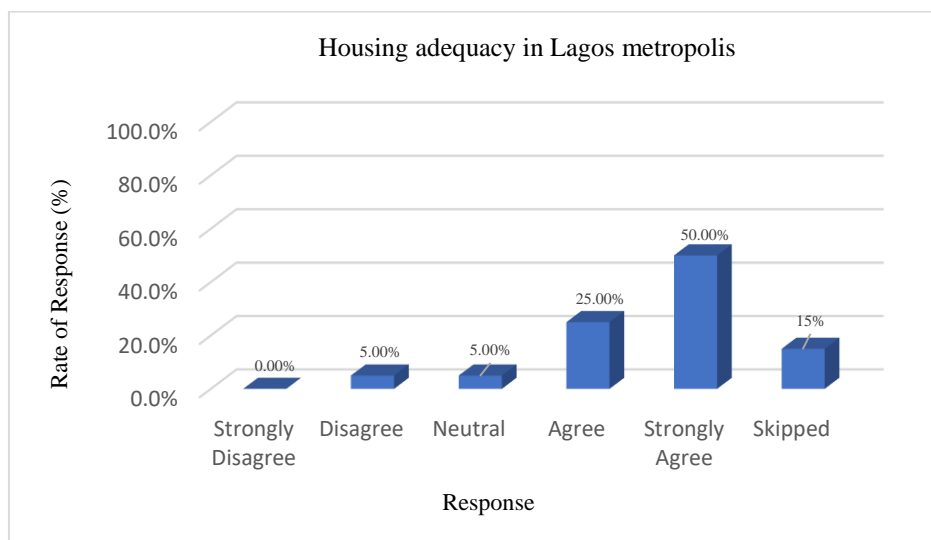
Figure 7. 9 Housing adequacy in Lagos metropolis
Sources: Author's fieldwork (2016)

7.3.6 Adequate Facilities and Services in Informal Settlement of Lagos metropolis

In Table 7.6 and Figure 7.10, the resident's, professionals, researchers, and academia's responses on the overall adequacy of facilities and services in Lagos and its association with informal settlement shows very inefficient 48.0%, inefficient 35.00%, efficient 12.00% and neutral 5.00% from the residents. While the professionals, researchers and academia reflect very inefficient 35.00%, inefficient 45.00%, neutral 20.00%. This finding reflects that infrastructure facilities and services take a significant role and it affects informal settlement and urban development in the study area.

Table 7. 6 Access to adequate facilities and services in Lagos metropolis

Resident Response	Residential access to facilities-critical services					
	Very Inefficient	Inefficient	Neutral	Efficient	Very Efficient	%
Total	**48.00%**	**35.00%**	**5.00%**	**12.00%**	**0.00%**	**100.0%**
Professionals, Researchers, and Academia responses.	Residential access to facilities-critical services					
	Very Inefficient	Inefficient	Neutral	Efficient	Very Efficient	
Total	**35.00%**	**45.00%**	**20.00%**	**0.00%**	**0.00%**	**100.0%**

Source: Author's fieldwork (2016)
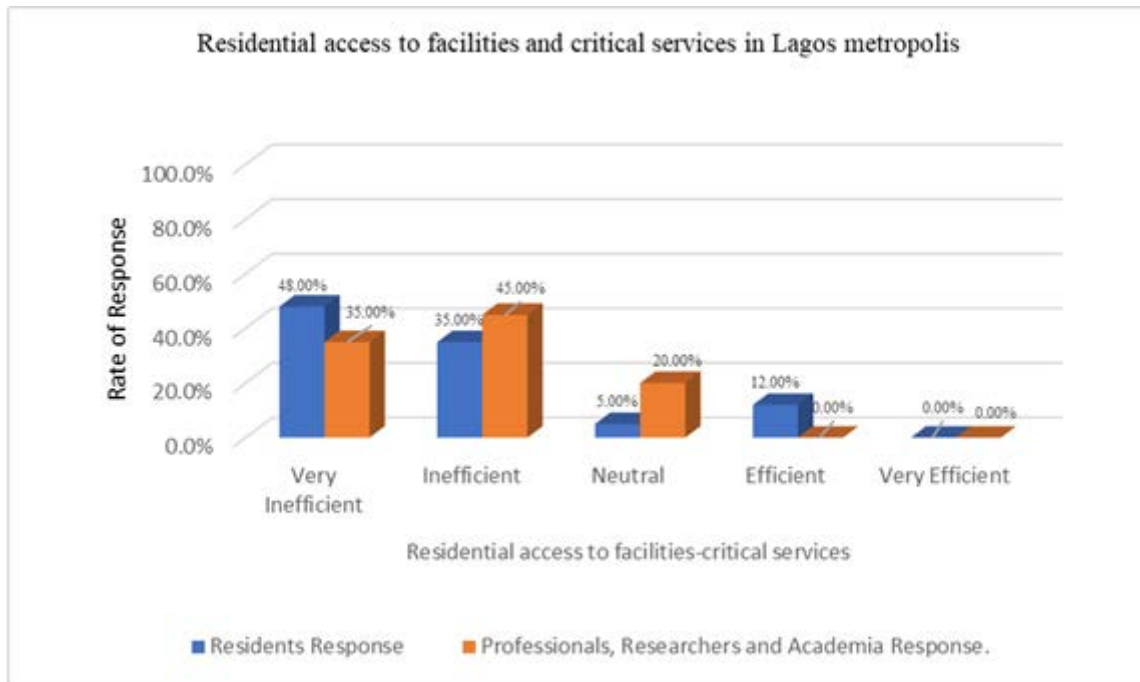
Figure 7. 10 Access to adequate facilities and services in Lagos metropolis
Source: Author's fieldwork (2016)

7.3.7 Transport Adequacy and Informal Settlement in Lagos metropolis

Transport adequacy and informal settlement in the metropolis is a significant challenge. It is obvious that bad roads without drainage, inadequate accessibilities among others which creates haphazard building arrangement and consequently slum development (see section 6.2.3). The response in Figure 7.11 further support these findings with 63.00% very inadequate response, 30.00% inadequate and 7.00% skipped the question.
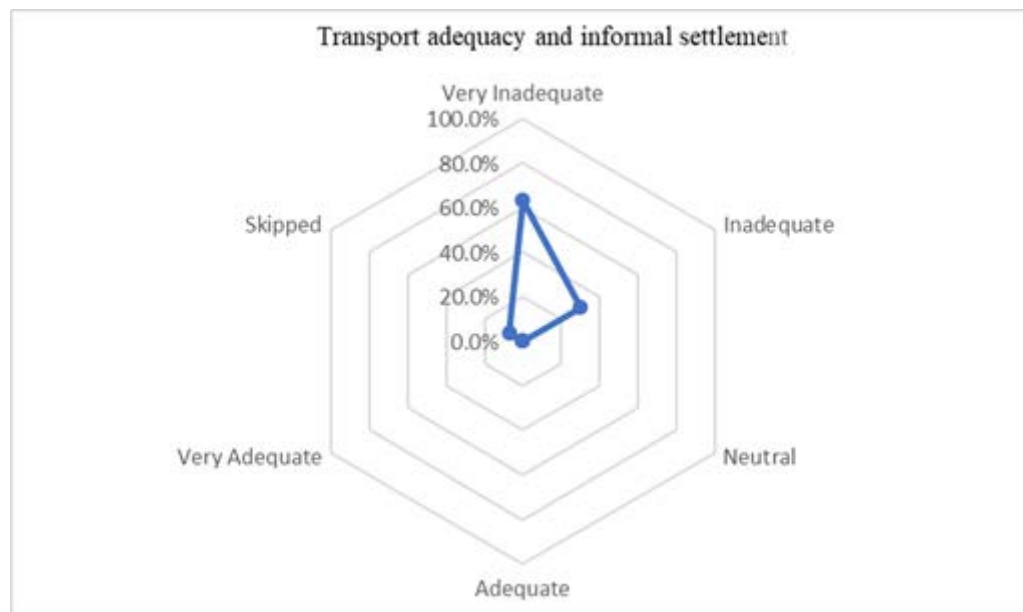
Figure 7. 11 Access to adequate facilities and services in Lagos metropolis
Source: Author's fieldwork (2016)

7.4 Urban Informal Settlement and Infrastructure Planning: Professional Perspectives

The issue of urban informality and infrastructure planning is a multifaceted discussion with different perspectives, however, considering the research objective two and the need to provide a sustainable approach to solve the challenges of UISIP from the study of Hong Kong and Lagos metropolis.

The perspective of the professionals interviewed in Hong Kong and Lagos metropolis reflects that there exists unequal growth, inadequate distribution of urban resources, poor condition of living, unruly development, non-regulated, non-taxed areas which are greatly described as an urban informal settlement. Although some professionals question the use of the word informal

settlement and the criteria for describing an area as formal or informal, for example, an interviewee states that

> "…yes, an urban challenged area exists in Hong Kong, and similarly in other countries, I want to believe but how do you judge an area formal or informal? I would rather refer to those areas as urban challenged areas…"

The results show that the professionals interviewed accept that UISIP challenges exist in the study and it is interrelated and interdependent with other sustainability factors. Table 7.7 describes the various context of the definition of the urban informal settlement by describing the factors of its causes. This also corroborated the findings of this research on the existence of the menace in Hong Kong and Lagos metropolis.

Although five professionals consisting of one quantity surveyor, two estate surveyors, and two planners opined that urban informality and infrastructure do not affect one another, while thirteen professionals with two quantity surveyors, two estate surveyors, three architects and six urban planners believed that they do affects each other in the metropolis.

In Hong Kong, one architect and one estate surveyors disagree with the term or definition but agree it exists and will refer to it as urban challenged areas. The findings in both Lagos and Hong agree that it is associated with several factors among which social, economic, environmental, and administrative is found significant. This finding, as presented in Table 7.7, further corroborates the different studies of UISIP challenges in the study areas and justifies the need for a different approach to discussing these challenges from the professional's perspectives.

Table 7. 7 Urban informality and infrastructure

	Lagos metropolis		Hong Kong		Theme Description (Significant response from interviewee)
Q1	**Do you think there is urban informality or occur in your area and what do you think is the causes?**				
PI	No	Yes	No	Yes	"…yes, it occurs, and I think it's because Hong Kong is an open economy that most of our people have no power to compete and which create a wide gap between the rich and the poor…."
PI1	0	2	-	-	
PI2	0	4	1	3	
PI3	0	4	1	2	"…yes, and so many factors such as tenure-ship, political, socio-economic are the causes…"
PI4	0	8	0	5	
Total	**0**	**18**	**2**	**10**	
Q2	**Do you think infrastructure availability affects urban informality in your area and vice-versa?**				
PI	No	Yes	No	Yes	"Maybe in another country, but in Hong Kong, we have good infrastructure it is just policy, economic and social issues I think still keep larger people in poor housing…"
PI1	0	2	-	-	
PI2	1	3	3	1	
PI3	2	2	3	0	"Yes, of course, in fact, I can say most of our challenge is infrastructure based, maybe if we get the infrastructure right other things will fall in place and which will reflect on housing and condition of living..."
PI4	2	6	4	1	
Total	**5**	**13**	**10**	**2**	
Q3	**Are you satisfied with housing and infrastructure in your area, and why your opinion?**				
PI	No	Yes	No	Yes	"…hmm, infrastructure yes I am satisfied because we have good infrastructure but for housing Hong Kong government still need to do a lot more…."
PI1	2	0	-	-	
PI2	4	0	2	2	
PI3	4	0	1	2	"…satisfied? how can I be satisfied with housing or infrastructure in this country, when there is no electricity, good road and affordable house……"
PI4	8	0	1	4	
Total	**18**	**0**	**4**	**8**	

PI= Professionals Interviewed, 1= Quantity surveyor, 2 = All architects, 3= Estate surveyors, 4= Urban planner/Designers, for more details see table 1 and 2 above.
Source: Author's fieldwork 2016

The summary of what most professionals refer to as urban informality and the reverse as the formality based on the interview reflects that there exists urban challenged area, which can be referred to as the broader type of urban challenge while urban informality is based on specific criteria as conceptualised in this study. In Hong Kong and Lagos metropolis, the findings also show that it is associated with several other sectors of the urban areas such as the infrastructure, the economy, the governance, and the quality of the environment where they are found.

7.5 Urban Informality and Infrastructure Planning: The Correlate

The debate on UISIP design is agreed to contribute significantly to urban development and have a relationship with sustainable development. However, the type of relationship that exists between UISIP and how they influence one another still needs investigation as there are different perspectives. This section of this thesis assesses the correlates of UISIP design in the study area. To investigate the type of relationship that exists between UISIP design Pearson

correlation matrix was adopted. The texts include the informal urban settlement (socio-economic and environmental), infrastructure variables and their results compared.

According to Lawanson (2011) the nature of co-relationship based on correlation coefficient can be interpreted using :

Table 7. 8 Nature of relationship based on the correlation coefficient

Correlation coefficient	*Nature of relationship*
0.00 – ±0.30	Negligible
±0.30 – ±0.50	Low
±0.50 – ±0.70	Moderate
±0.70 – ±0.90	High
±0.90 – ±1.00	Very high

Source: Adapted from (Lawanson 2011)

Table 7.10 present the findings of the correlation factor and quantifiers (frequency distribution, mean and standard deviation) for adequate presentation, validity, reliability, and/or further scientific test to be conducted. This also aids the interpretation of the correlation coefficient discussed in this section. Table 7.9 present the quantifier as follows:

Table 7. 9 Infrastructure characteristics of the study areas

| | Hong Kong | | | | | | | | | | | |
| | Kowloon District | | | Sham Shui Po District | | | Tai Po District | | | Wan Chai District | | |
Variables	Fr	Mean	SD	Fr	Mean	SD	Fr	Mean	SD	Fr	Mean	SD
Health facilities	125	2.6518	1.26427	126	2.9286	1.42648	88	2.8929	1.06441	51	2.7059	1.18818
Sewage and sewerage	125	2.7500	1.49775	126	2.8108	.98639	88	2.4405	.93591	51	2.5882	1.06163
Water	125	2.8304	1.13016	126	2.6757	1.01947	88	2.2143	.41279	51	2.4510	.75667
Road	125	2.6607	1.00048	126	2.8333	1.25698	88	2.3095	.71095	51	2.5686	.72815
Electricity	125	2.9286	1.12877	126	2.9524	1.21890	88	2.2024	.50966	51	2.4118	.72599
	Lagos metropolis											
	Eti-Osa LGA			Ikeja			Lagos Island			Lagos Mainland		
Variables	Fr	Mean	SD	Fr	Mean	SD	Fr	Mean	SD	Fr	Mean	SD
Health facilities	142	2.14	.423	112	2.00	.380	123	2.37	1.096	92	2.07	.530
Sewage and sewerage	142	2.18	.822	112	2.22	.681	123	2.07	.261	92	2.08	.497
Water	142	2.05	.435	112	2.13	.561	123	1.95	.381	92	2.01	.234
Road	142	1.89	.425	112	1.79	.832	123	1.51	1.089	92	1.87	1.352
Electricity	142	2.07	.541	112	2.03	1.009	123	2.34	1.360	92	2.88	1.554

Source Author's fieldwork (2016)

7.5.1 Correlate of Socio-economic, Environmental and Infrastructure in Hong Kong and Lagos metropolis

In Hong Kong, the result of Table 7.10 reflects that most of the variables have a positive relationship with few negative relationships. According to the nature of relationship based on the correlation coefficient criteria illustrated above, the outcome of the findings shows that there are significantly positive and negative (±) co-relationship between the variables tested.

This shows that despite the socio-economic, environmental and infrastructure development in the SAR, there exist significant positive and negative co-relationships within these variables

that influence the existence of this menace in the study area. However, there is no enough evidence to states that positive or negative effect of socio-economic variables induce a positive or negative co-relationship in urban informal settlement or infrastructure and vis-a-vis. But evidently there exist the menace in the region and there are significant co-relationships between the factors towards sustainable development.

The experience of Lagos metropolis also reflects that there is a positive and negative co-relationship in the area. Considering the evidence of the correlation table below which reiterate the findings of the data presented in data presentation (see chapter six) in this study. Thus, it can be inferred that there is a significant relationship between urban informal settlement (socio-economic and environmental) infrastructure and positive or negative infrastructure variables induce a positive or negative co-relationship in urban informal settlement of the area and vis-a-vis. Table 7.10 and 7.11 further presents the details of this result in Hong Kong and Lagos metropolis respectively:

Table 7. 10 Correlates of socio-economic, environmental and infrastructure in Hong Kong

		Level of Education	Occupation	Household Size	Type of Building	Construction Materials	Health	Sewage and Sewerage	Water	Road	Electricity
Level of Education	Pearson Correlation	1	.083	.048	.033	.040	.073	.014	-.128*	-.050	.105*
	Sig. (2-tailed)		.100	.344	.514	.434	.160	.790	.015	.333	.043
	Sum of Squares and Cross-products		19.821	3.305	7.272	2.282	16.520	2.860	-20.939	-9.190	19.718
	Covariance		.051	.008	.019	.006	.044	.008	-.059	-.025	.053
	N		390	390	390	390	373	358	358	373	373
Occupation	Pearson Correlation		1	.002	-.148**	-.061	-.257**	-.260**	-.287**	-.247**	-.276**
	Sig. (2-tailed)			.961	.003	.231	.000	.000	.000	.000	.000
	Sum of Squares and Cross-products			.436	-83.897	-9.026	-153.456	-140.385	-124.670	-119.019	-136.619
	Covariance			.001	-.216	-.023	-.413	-.393	-.349	-.320	-.367
	N			390	390	390	373	358	358	373	373
Household Size	Pearson Correlation			1	-.022	.413**	.244**	.100	.054	-.143**	-.068
	Sig. (2-tailed)				.668	.000	.000	.059	.305	.006	.192
	Sum of Squares and Cross-products				-3.574	17.744	42.775	14.034	6.145	-20.268	-9.847
	Covariance				-.009	.046	.115	.039	.017	-.054	-.026
	N				390	390	373	358	358	373	373
Type of Building	Pearson Correlation				1	.090	-.092	-.066	.042	-.006	-.108*
	Sig. (2-tailed)					.074	.076	.214	.430	.901	.037
	Sum of Squares and Cross-products					12.410	-51.488	-33.025	16.891	-2.914	-50.169
	Covariance					.032	-.138	-.093	.047	-.008	-.135
	N					390	373	358	358	373	373
Construction Materials	Pearson Correlation					1	.164**	.077	-.059	-.200**	-.089
	Sig. (2-tailed)						.001	.144	.264	.000	.087
	Sum of Squares and Cross-products						22.949	9.765	-6.017	-22.584	-10.287
	Covariance						.062	.027	-.017	-.061	-.028
	N						373	358	358	373	373
Health	Pearson Correlation						1	.597**	.436**	.598**	.524**
	Sig. (2-tailed)							.000	.000	.000	.000
	Sum of Squares and Cross-products							322.372	189.277	290.169	261.574
	Covariance							.903	.530	.780	.703
	N							358	358	373	373
Sewage and Sewerage	Pearson Correlation							1	.646**	.561**	.341**
	Sig. (2-tailed)								.000	.000	.000
	Sum of Squares and Cross-products								256.304	244.475	152.626
	Covariance								.718	.685	.428
	N								358	358	358
Water	Pearson Correlation								1	.677**	.478**
	Sig. (2-tailed)									.000	.000
	Sum of Squares and Cross-products									237.391	172.045
	Covariance									.665	.482
	N									358	358
Road	Pearson Correlation									1	.730**
	Sig. (2-tailed)										.000
	Sum of Squares and Cross-products										293.635
	Covariance										.789
	N										373
Electricity	Pearson Correlation										1
	Sig. (2-tailed)										
	Sum of Squares and Cross-products										
	Covariance										
	N										

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Author's fieldwork (2016)

Table 7. 11 Correlates of socio-economic, environmental and infrastructure in Lagos metropolis

		Education	Occupation	Household size	Types of building	Construction material	Health	Sewage and sewerage	Water supply	Road	Electricity
Highest level of education	Pearson Correlation	1	-.108*	-.043	.096*	-.085	.029	-.002	.069	-.015	.066
	Sig. (2-tailed)		.019	.349	.038	.066	.526	.967	.136	.752	.151
	Sum of Squares and Cross-products		-36.755	-10.923	44.296	-34.409	7.247	-.429	10.623	-5.006	27.981
	Covariance		-.079	-.023	.095	-.074	.015	-.001	.023	-.011	.060
	N		469	469	469	469	469	469	469	469	469
Occupation of head of household	Pearson Correlation		1	-.043	.026	.076	.026	-.127**	-.022	.109*	.044
	Sig. (2-tailed)			.348	.568	.101	.579	.006	.632	.018	.338
	Sum of Squares and Cross-products			-13.563	15.160	38.002	7.853	-34.857	-4.232	46.047	23.141
	Covariance			-.029	.032	.081	.017	-.074	-.009	.098	.049
	N			469	469	469	469	469	469	469	469
Household size	Pearson Correlation			1	.013	.043	.046	.058	.090	.039	.090
	Sig. (2-tailed)				.782	.353	.323	.214	.051	.398	.052
	Sum of Squares and Cross-products				5.441	15.966	10.354	11.714	12.719	12.249	34.748
	Covariance				.012	.034	.022	.025	.027	.026	.074
	N				469	469	469	469	469	469	469
Types of building	Pearson Correlation				1	-.407**	-.023	.180**	.122**	.174**	.015
	Sig. (2-tailed)					.000	.619	.000	.008	.000	.746
	Sum of Squares and Cross-products					-277.354	-9.578	67.286	31.580	100.213	10.640
	Covariance					-.593	-.020	.144	.067	.214	.023
	N					469	469	469	469	469	469
Building construction material	Pearson Correlation					1	-.015	-.083	-.042	-.062	.097*
	Sig. (2-tailed)						.742	.073	.366	.179	.037
	Sum of Squares and Cross-products						-5.554	-27.143	-9.499	-31.330	60.009
	Covariance						-.012	-.058	-.020	-.067	.128
	N						469	469	469	469	469
Health	Pearson Correlation						1	.109*	.046	-.072	-.073
	Sig. (2-tailed)							.018	.316	.118	.115
	Sum of Squares and Cross-products							21.857	6.426	-22.196	-27.588
	Covariance							.047	.014	-.047	-.059
	N							469	469	469	469
Sewage and sewerage	Pearson Correlation							1	.286**	.043	.005
	Sig. (2-tailed)								.000	.353	.921
	Sum of Squares and Cross-products								35.571	11.857	1.571
	Covariance								.076	.025	.003
	N								469	469	469
Water supply	Pearson Correlation								1	.099*	.110*
	Sig. (2-tailed)									.032	.017
	Sum of Squares and Cross-products									19.023	26.070
	Covariance									.041	.056
	N									469	469
Road	Pearson Correlation									1	.260**
	Sig. (2-tailed)										.000
	Sum of Squares and Cross-products										136.188
	Covariance										.291
	N										469
Electricity	Pearson Correlation										1
	Sig. (2-tailed)										
	Sum of Squares and Cross-products										
	Covariance										
	N										

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Sources: Author's fieldwork (2016)

7.6 Chapter Summary

Urban informality and infrastructure in the study areas were investigated and their significance in relation to sustainable development factors was discussed. The socio-economic and environmental characteristics were found to influence significant positive and negative relationships in the study areas. The findings reflect that improved or deteriorated socio-economic and environmental factors have consequential effects on UISIP and sustainable development. The relationship between socio-economic and environmental factors and UISIP indicates that the association may not necessarily result in direct inverse effects, but there is evidence that a positive relationship influences improved socio-economic and environmental factors. The significant response from professionals reflected that the challenges of urban informality exist in the study areas and identified this as an issue that is significantly associated with the question of definition, administrative perspectives, and consequential response.

The role of infrastructure and its interrelationship with this issue is also identified as significant, but the availability and non-availability of adequate infrastructure may not necessarily result in the absence of urban informal settlement or sustained development. For instance, the adequate infrastructure development of Hong Kong did not result in the absence of urban informal settlement or eradicate the several other urban challenges identified. In comparison, in Lagos the state of inadequate infrastructure was identified as a critical cause of urban informal settlement and sustainability challenges. One respondent stated categorically that "if these facilities and services are not provided, development will be very difficult. In fact, infrastructure contributes to economic development, functional environment, and societal development". The findings on the correlation between infrastructure and UISIP and sustainable development reflect that physical, economic, and social infrastructure is crucial for national development in both developed and the developing cities, but there is not enough evidence to state categorically that adequate infrastructure provision will eradicate urban informality.

Chapter 8
Urban Informality and Infrastructure Planning Towards Sustainable Development

Cities worldwide suffer from similar ills, which include deteriorating urban areas and their burgeoning suburbs, traffic congestion and declining environmental quality…it is a sustainability challenge and it can be resolved through [a] sustainability approach.

(Marchettini, Brebbia, Pulselli, & Bastianoni, 2014)

Synopsis

In relation to the previous chapters and in order to achieve the aim and objectives of this study, this chapter focuses on objective 3 by examining the relationship that exists between UISIP in achieving sustainable urban development with urban sustainability design indices in the study areas. It presents the qualitative and quantitative findings of this objective. It discusses its implication for the resident's livelihood by using the chi-square test of socio-economic, environmental, and infrastructure relationships in the study areas.

8.1 Introduction

Urban informality is an interdisciplinary concept, and it is often referred to as the informal sector, the informal economy, informal settlement, or squatter settlement, among other terms. It is the living condition (settlement, economy, and commercial and physical condition) of urban dwellers and their activities that are non-regularised, non-taxed, and are often characterised by different urban challenges.

Infrastructure is described in diverse ways and the term is applied in different forms by different professionals. However, infrastructure is ultimately the network of interconnected physical, socio-economic, and environmental facilities, utilities, and services provided for effective, working, living, and recreational use by citizens (Otegbulu, 2011; Soyinka et al., 2016). It is a significant aspect of urban livelihood that decides urban functionality, resiliency, and sustainability. Infrastructure is mostly built by public works that involve the federal, state, local, and municipal administrations with stages such as planning, budgeting, engineering, financing, and execution (Goodman & Hastak, 2015). Infrastructure planning is the ordering, organising, and integration of utilities and services to meet the present and future needs of residents.

Sustainability is an urban planning design concept that seeks to improve issues related to urban challenges, such as urban informality and infrastructure challenges, by ensuring sustained use. It is a phenomenon that ensures that the urban environment and its resources (both living conditions and infrastructure) are sustained. It is a global approach, with the UN SDGs representing the global agenda and guide for promoting sustainable development (Leal Filho et al., 2017; UN-Habitat, 2015d). Sustainable development is the ability to use the Earth's resources without jeopardising capacity for future use, i.e. the ability to use and reuse urban resources without depleting their capacity for similar quality of future use. This concept promotes the effective and efficient use of resources from the tripod perspective of society, economy, and environmental development in urban areas (Glanville & Turnbull, 2007). Sustainable urban design principles include the principles, strategies, policies, and programs established to guide human interaction within a geographical habitat to ensure effective use and reuse of the habitat's resources through a sustainable development approach (Carmona, 2009; Larco, 2016).

This urban challenge occurs globally in different forms, shapes, and degrees of severity. However, this study investigates these challenges with consideration of the societal, economic, and environmental challenges that are also significant for sustainability concepts and sustainable development. This study is therefore essential for developing sustainable design principles and utilises case studies from a developed and developing country to promote sustainable urban development. This chapter of this thesis explores the relationship between informal settlement and infrastructure planning in achieving sustainable urban development in Hong Kong and Lagos.

8.2 Urban Informality and Infrastructure Planning Vis-à-vis Sustainable Development

The findings on the relationships between urban informality and infrastructure planning as presented in Table 8.1 shows that there is a significant relationship between these two elements, and their intersection with sustainability or sustainable development. In Hong Kong, 10 professionals answered "yes" and 2 "no" to Q4, while in Lagos 13 answered "yes" and 5 answered "no".

Table 8.1 Urban informality and infrastructure vis-à-vis sustainable development

Q4. Do you think urban informality and infrastructure planning affect sustainable development?					
	Frequency				**Theme description (significant response from interview)**
	Hong Kong		**Lagos**		
PI	**Yes**	**No**	**Yes**	**No**	"Yes, however, in Hong Kong the challenges of sustainable development [are] more than urban informal settlement and infrastructure. Moreover, we do not have significant infrastructure challenges like I told you earlier…Infrastructure-wise we are okay, but we can do better…"
PI1	-	-	2	0	
PI2	3	1	3	1	
PI3	3	0	2	2	"…yes, most of our challenges are urban informal settlement and infrastructure based, they are interrelated in their effect, and they are sustainable development challenges"
PI4	4	1	6	2	
Total	**10**	**2**	**13**	**5**	

PI= Professionals Interviewed, 1= Quantity surveyor, 2 = All architects, 3= Estate surveyors, 4= Urban planner/Designers, for more details see Table 1 and 2 above.

Source: Author's fieldwork 2016

Tables 8.2 and 8.3 further investigate the relationship between urban informality, infrastructure, and sustainable development in the study areas. While Table 9 investigate the socio-economic variables, Table 10 investigates the environmental variables of the study areas to ascertain if the socio-economic and environmental conditions of the study areas affect the sustainable development of these areas. The socio-economic variables investigated include age, level of education, occupation, household size, and available household exclusive room. The

summary of socio-economic conditions of the residents as presented by Table 8.2 shows that socio-economic conditions are significant in urban development. The extent of household size is an important factor that determines the required exclusive room use and which is also a product of occupation, income, and level of education.

Table 8. 2 Socio-economic conditions of the respondent's in Hong Kong and Lagos metropolis

		Hong Kong District					Lagos Metropolis L.G. A				
		Kowloon District	Sham Shui Po District	Tai Po District	Wan Chai District	Total	Eti-Osa	Ikeja	Lagos Island	Lagos Mainland	Total
		%	%	%	%	**%**	%	%	%	%	**%**
Characteristics											
Gender	Male	72.9	88.2	69.4	70.0	**73.5**	49.1	50.9	41.0	51.7	**49.5**
	Female	27.1	11.8	30.6	30.0	26.5	50.9	49.1	58.9	48.3	50.5
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Age	Below 15yrs	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	2.6	4.6	**1.69**
	16-30yrs	58.8	100.0	65.9	73.3	**69.3**	50.9	37.5	30.8	32.2	**41.35**
	31-45yrs	30.6	0.0	34.1	26.7	**26.9**	38.6	36.6	30,8	32.2	**34.92**
	46-60yrs	10.6	0.0	0.0	0.0	**3.8**	7.0	14.3	25.6	21.8	**14.58**
	60yrs Above	0.0	0.0	0.0	0.0	**0.0**	3.5	11.6	10.2	9.2	**7.46**
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Level of Education	No Formal	0.0	0.0	0.0	0.0	**0.0**	7.0	4.5	7.7	0.0	**4.1**
	Primary	0.0	0.0	0.0	0.0	**0.0**	7.0	10.7	5.1	11.5	**9.5**
	Secondary	57.6	0.0	43.5	73.3	**46.2**	54.4	63.4	51.3	69.0	**61.7**
	Tertiary	42.4	100	56.5	26.7	**53.8**	31.6	21.4	35.9	19.5	**24.7**
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Occupation	Public/Civil Servant	10.6	0.0	5.9	13.3	**7.7**	1.8	5.4	5.1	4.6	**4.4**
	Private Employed	32.9	23.5	21.2	86.7	**34.2**	19.3	24.1	17.9	14.9	**19.7**
	Business	36.5	35.3	43.5	0.0	**34.2**	52.6	53.6	53.8	48.3	**51.9**
	Street Trader	0.0	0.0	9.4	0.0	**3.4**	15.8	13.4	10.3	18.4	**14.9**
	Student	20.0	41.2	20.0	0.0	**20.5**	10.5	3.6	12.8	13.8	**9.2**
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Household Size	1-3	89.4	76.5	81.2	100.0	**85.9**	31.6	37.5	28.2	28.7	**32.5**
	4-6	10.6	23.5	18.8	0.0	**14.1**	52.6	48.2	61.5	54.0	**52.5**
	7-9	0.0	0.0	0.0	0.0	**0.0**	14.0	14.3	5.1	14.9	**13.2**
	10 &Above	0.0	0.0	0.0	0.0	**0.0**	1.8	0.0	5.1	2.3	**1.7**
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Household Exclusive Room Use	1	25.9	14.7	24.7	13.3	**21.8**	38.6	41.9	61.5	42.5	**44.1**
	2	74.1	85.3	75.3	86.7	**76.5**	26.3	16.1	0.0	3.4	**12.2**
	3-4	4.9	0.0	0.0	0.0	**1.7**	19.3	39.3	35.9	52.9	**38.9**
	5 &Above	0.0	0.0	0.0	0.0	**0.0**	15.8	2.7	2.6	0.0	**4.7**
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Author's fieldwork 2016

The environmental factors examined in the selected case study areas include types of building, building age, construction materials, and residential status. Although the severity and significant of these environmental challenges in these areas are different. The common characteristics of these challenges across the different areas show that it is associated with economic factors, and it is a sustainability challenge. Also, type of building does not proliferate urban informality and infrastructure challenge. For example, in Lagos metropolis, the identified types of building in these urban informal areas with infrastructure challenges are more of tradition compound house, rooming houses, rooming apartment, few duplexes and more temporary or inferior materials. While in Hong Kong, it is more of flats, illegal rooftop structures and they are made of permanent materials such as concrete blocks.

Table 8. 3 Environmental conditions of respondent's in Hong Kong and Lagos metropolis

Characteristics		Hong Kong District					Lagos Metropolis L.G. A				
		Kowloon District	Sham Shui Po District	Tai Po District	Wan Chai District	Total	Eti-Osa	Ikeja	Lagos Island	Lagos Mainland	Total
		%	%	%	%	**%**	%	%	%	%	**%**
Types of Buildin g	Traditional Compound	0.0	0.0	0.0	0.0	**0.0**	12.3	46.4	94.9	75.9	**54.9**
	Rooming House	0.0	0.0	0.0	0.0	**0.0**	28.1	29.5	5.1	3.4	**18.3**
	Studio/Single Room Apartment	20.0	14.7	15.3	13.3	**16.7**	21.1	2.7	0.0	2.3	**5.8**
	Duplex	0.0	0.0	4.7	0.0	**1.7**	5.3	2.7	0.0	17.2	**7.1**
	Flat between 1-10 floor	55.3	38.2	30.6	26.7	**40.0**	33.3	18.8	0.0	1.1	**13.9**
	Flat Above 10floors	24.7	47.1	49.4	60.0	**41.5**	0.0	0.0	0.0	0.0	**0.0**
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Building Age	Below 10yrs	4.7	0.0	15.3	13.3	**8.9**	29.8	26.8	51.3	67.8	**42.7**
	11-20yrs	47.0	23.5	35.3	16.7	**35.5**	42.1	15.0	10.3	2.3	**15.9**
	21-30yrs	22.4	38.2	30.6	43.3	**30.3**	26.3	17.9	25.6	8.0	**17.6**
	31-40yrs	10.6	38.2	4.7	13.3	**12.8**	1.8	21.4	10.3	19.5	**15.6**
	Above 41yrs	15.3	0.0	14.1	13.3	**12.4**	0.0	18.8	2.6	2.3	**8.1**
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Constru ction Material s	Plank & Bamboo	0.0	0.0	0.0	0.0	**0.0**	3.5	0.0	0.0	4.6	**2.0**
	Mud	0.0	0.0	0.0	0.0	**0.0**	0.0	12.5	25.6	24.1	**15.3**
	Mud & Cement	0.0	0.0	0.0	0.0	**0.0**	0.0	2.8	5.1	8.0	**3.4**
	Burnt Bricks	0.0	11.8	20	13.3	**10.7**	0.0	25.9	43.6	52.9	**31.2**
	Concrete Blocks	100	88.2	80	86.7	**89.3**	96.5	60.7	25.6	10.3	**48.1**
Total		**100.0**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Resident ial Status	Owner	20.0	26.5	18.8	26.7	**21.4**	21.1	32.1	10.3	26.4	**25.4**
	Mortgage ownership	14.1	11.8	14.1	0.0	**11.9**	0.0	0.0	0.0	0.0	**0.0**
	Public housing	38.8	50.0	20.0	26.7	**32.1**	0.0	0.0	0.0	0.0	**0.0**
	Inherited	0.0	0.0	0.0	0.0	**0.0**	10.5	15.2	20.5	40.2	**22.4**
	Tenant	27.1	11.8	42.4	30	**30.8**	64.9	50	15.4	23.0	**34.6**
	Squatting	0.0	0.0	4.7	16.7	**3.8**	3.5	2.7	53.8	10.3	**17.6**
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Author's fieldwork (2016)

Considering the findings presented in Table 8.2 and 8.3 above, it can be inferred from the study area that the challenges of urban informality and infrastructure planning are social, economic, and environmental (physical), and they are interrelated. Also, these challenges affect one another vice-versa and subsequently create sustainable development challenges. Integrating the relationships that exist between this socio-economic condition of the residents based on this factor, the areas is not sustainable, and it provides an opportunity for urban planning design principles to ameliorate the challenge.

8.3 Urban Informality and Infrastructure Impact on Resident's Livelihood

 The challenges of UISIP per the findings presented in Table 9 and 10 shows that the challenges relate to one another from the socio-economic and environmental perspective. Thus, table 11 and 12 further investigates the significance of the relationship in relation to infrastructure and sustainable development. The study adopts 5% error margin at t = 1.96 in a continuous data. That is, the relationship of socio-economic, environmental and infrastructure factors is significant at P-value equals to +0.05. This shows that the factors have an association that is significant to influence either positive or negative effect on the resident and subsequently sustainability of the area.

Table 8. 4 Chi-Square test of socio-economic, environmental and infrastructure sustainability relationship in Hong Kong

Variables	Kowloon District			Sham Shui Po District			Tai Po District			Wan Chai District		
	X^2	df	P. Value	X^2	df	P. Value	X^2	df	P. Value	X^2	df	P. Value
Education*Health	41.926	4	0.000	. a	. a	. a	15.387	3	0.002	16.364	2	0.000
Education*Sewage	6.884	3	0.076	. a	. a	. a	9.664	4	0.047	30.000	3	0.000
Education*Water	11.327	3	0.010	. a	. a	. a	1.327	1	0.249	4.675	2	0.097
Education*Road	17.882	3	0.000	. a	. a	. a	7.399	2	0.025	8.342	2	0.015
Education*Electricity	5.274	3	0.153	. a	. a	. a	3.082	2	0.214	3.967	2	0.138
Occupation*Health	70.958	12	0.000	39.262	8	0.000	32.171	12	0.001	6.923	2	0.031
Occupation*Sewage	42.435	9	0.000	40.000	4	0.000	90.396	16	0.000	30.000	3	0.000
Occupation*Water	31.544	9	0.000	26.667	4	0.000	15.651	4	0.004	1.978	2	0.372
Occupation*Road	66.283	9	0.000	27.045	4	0.000	11.763	8	0.162	3.529	2	0.171
Occupation*Electricity	35.683	9	0.000	23.296	4	0.000	14.985	1	0.059	1.678	2	0.432
Income*Health	29.759	8	0.000	40.182	12	0.000	45.697	12	0.000	7.863	2	0.020
Income*Sewage	36.138	6	0.000	39.365	6	0.000	46.888	16	0.000	18.723	3	0.000
Income*Water	13.510	6	0.036	35.926	6	0.000	5.259	4	0.262	16.813	2	0.000
Income*Road	23.527	6	0.001	35.124	6	0.000	15.458	8	0.051	8.493	2	0.014
Income*Electricity	35.322	6	0.000	36.747	6	0.000	21.201	8	0.007	8.342	2	0.015
Household size*Health	33.428	4	0.000	18.609	4	0.001	17.513	3	0.001	. a	. a	. a
Household size*Sewage	3.059	3	0.383	6.923	2	0.031	21.813	4	0.000	. a	. a	. a
Household size*Water	7.149	3	0.067	12.692	2	0.002	5.296	1	0.021	. a	. a	. a
Household size*Road	14.044	3	0.003	5.706	2	0.058	5.296	2	0.071	. a	. a	. a
Household size*Electricity	8.703	3	0.034	5.594	2	0.061	3.468	2	0.177	. a	. a	. a
Room Use*Health	33.066	4	0.000	34.000	4	0.000	4.641	3	0.200	6.036	2	0.049
Room Use*Sewage	1.875	3	0.599	6.857	2	0.032	8.715	4	0.069	10.769	3	0.013
Room Use*Water	2.204	2	0.332	4.000	2	0,135	1.000	1	0.064	30.000	2	0.000
Room Use*Road	20.410	3	0.000	3.197	2	0.202	1.572	2	0.456	30.000	2	0.000
Room Use*Electricity	20.110	3	0.000	5.211	2	0.074	3.874	2	0.144	30.000	2	0.000
Building Use*Health	33.565	8	0.000	23.724	4	0.000	18.412	6	0.005	16.813	2	0.000
Building Use*Sewage	46.251	6	0.000	14.694	2	0.001	73.897	8	0.000	30.000	3	0.000
Building Use*Water	13.576	6	0.035	12.804	2	0.002	7.735	2	0.021	30.000	2	0.000
Building Use*Road	27.223	6	0.000	3.874	2	0.144	10.171	4	0.038	19.418	2	0.000
Building Use *Electricity	21.924	6	0.001	5.171	2	0.075	6.659	4	0.155	11.602	2	0.003
Building Type*Health	35.870	8	0.000	43.933	8	0.000	71.351	12	0.000	9.274	4	0.055
Building Type*Sewage	18.644	6	0.005	13.333	4	0.010	61.420	16	0.000	22.963	6	0.001
Building Type*Water	14.779	6	0.022	10.556	4	0.032	14.226	4	0.007	33.175	4	0.000
Building Type*Road	31.166	6	0.000	7.519	4	0.111	16.900	8	0.031	31.394	4	0.000
Building Type *Electricity	19.885	6	0.003	5.594	4	0.232	25.259	8	0.001	42.273	4	0.000
Building Materials*Health	. a	. a	. a	34.000	4	0.000	10.374	3	0.016	6.923	2	0.031
Building Material*Sewage	. a	. a	. a	6.923	2	0.031	25.133	4	0.000	30.000	3	0.000
Building Materials*Water	. a	. a	. a	12.692	2	0.002	4.113	1	0.043	1.978	2	0.372
Building Material*Road	. a	. a	. a	2.473	2	0.290	4.113	1	0.128	3.529	2	0.171
Materials *Electricity	. a	. a	. a	14.733	2	0.001	2.693	2	0.260	1.678	2	0.432

Source: Author's fieldwork (2016)

In Hong Kong, the socio-economic and environmental factors tested include the education level, occupation, income, household size, available room use and building use in relation to infrastructure factors such as health, sewage, water, roads, and electricity. As presented in Table 11, the relationships between these factors are significant to impact the resident and sustainability with the most significant level of 0.000 to 0.051. While few factors are reported to error (. a), however, the findings of this research are not enough to determine the severity of its impact on the residents in the study areas.

Table 8. 5 Chi-Square test of socio-economic, environmental and infrastructure sustainability relationship in Lagos metropolis

| Variables	Eti-Osa			Ikeja			Lagos Island			Lagos Mainland		
	X^2	df	P. Value	X^2	df	P. Value	X^2	df	P. Value	X^2	df	P. Value
Education*Health	3.737	6	0.712	12.145	9	0.205	37.576	12	0.000	4.358	6	0.628
Education*Sewage	26.750	12	0.008	8.603	9	0.475	20.834	3	0.000	17.189	8	0.028
Education*Water	8.171	9	0.517	12.049	9	0.211	11.779	6	0.067	4.352	4	0.360
Education*Road	20.613	6	0.002	15.479	9	0.079	40.549	9	0.000	8.764	4	0.067
Education*Electricity	35.712	12	0.000	26.328	12	0.010	13.734	6	0.033	6.186	8	0.626
Occupation*Health	16.314	8	0.038	40.225	12	0.000	53.038	16	0.000	25.351	12	0.013
Occupation*Sewage	61.902	16	0.000	17.934	12	0.118	8.116	4	0.087	11.876	16	0.752
Occupation*Water	11.363	12	0.498	11.537	12	0.484	32.219	8	0.000	7.326	8	0.502
Occupation*Road	19.782	8	0.011	43.232	12	0.000	56.902	12	0.000	20.148	8	0.010
Occupation*Electricity	56.648	16	0.000	26.129	16	0.052	17.044	8	0.030	41.466	16	0.000
Income*Health	14.346	8	0.073	33.210	12	0.001	22.160	16	0.138	22.033	12	0.037
Income*Sewage	17.602	16	0.348	40.426	12	0.000	11.071	4	0.026	100.148	16	0.000
Income*Water	10.461	12	0.576	19.118	12	0.086	14.668	8	0.006	16.460	8	0.036
Income*Road	29.337	8	0.000	20.262	12	0.062	44.651	12	0.000	14.826	8	0.063
Income*Electricity	12.779	16	0.689	54.637	16	0.000	22.485	8	0.004	20.858	16	0.184
Household size*Health	16.819	6	0.010	20.366	6	0.002	88.157	12	0.000	28.179	9	0.001
Household size*Sewage	14.515	12	0.269	7.198	6	0.303	19.393	3	0.000	9.014	12	0.702
Household size*Water	13.422	9	0.144	6.347	6	0.385	42.050	6	0.000	1.717	6	0.944
Household size*Road	21.092	6	0.002	6.298	6	0.391	12.327	9	0.196	6.896	6	0.331
Household size*Electricity	24.010	12	0.020	14.656	8	0.066	13.758	6	0.032	28.450	12	0.005
Room Use*Health	15.495	6	0.017	8.168	9	0.517	31.467	8	0.000	10.968	9	0.278
Room Use*Sewage	19.445	12	0.078	17.158	9	0.046	6.430	2	0.040	13.390	12	0.341
Room Use*Water	34.164	9	0.000	13.591	9	0.138	1.840	4	0.765	2.294	6	0.891
Room Use*Road	20.849	6	0.002	32.652	9	0.000	11.177	6	0.083	5.879	6	0.437
Room Use*Electricity	38.171	12	0.000	63.593	12	0.000	8.780	4	0.067	15.519	12	0.214
Building Use*Health	13.084	6	0.042	18.902	9	0.026	44.414	12	0.000	18.887	9	0.026
Building Use*Sewage	30.570	12	0.002	20.918	9	0.013	4.182	3	0.243	18.042	12	0.114
Building Use*Water	14.013	9	0.122	15.234	9	0.085	30.401	6	0.000	5.001	6	0.544
Building Use*Road	22.578	6	0.001	39.661	9	0.000	20.525	9	0.015	14.129	6	0.028
Building Use *Electricity	13.143	12	0.359	38.165	12	0.000	38.049	6	0.000	21.289	12	0.046
Building Type*Health	14.568	8	0.068	32.408	12	0.001	23.533	4	0.000	11.800	12	0.462
Building Type*Sewage	84.143	16	0.000	39.469	12	0.000	0.498	1	0.480	54.310	16	0.000
Building Type*Water	50.218	12	0.000	28.791	12	0.004	1.081	2	0.582	92.307	8	0.000
Building Type*Road	62.720	8	0.000	115.335	12	0.000	1.529	3	0.676	19.729	8	0.011
Building Type *Electricity	39.231	16	0.001	91.647	16	0.000	13.586	2	0.001	37.310	16	0.002
Building Materials*Health	0.658[a]	2	0.720	8.192	9	0.515	36.989	12	0.000	19.887	12	0.069
Building Material*Sewage	1.447	4	0.836	11.773	9	0.226	11.302	3	0.010	26.195	16	0.051
Building Materials*Water	0.478[a]	3	0.924	8.496	9	0.485	20.399	6	0.002	15.674	8	0.047
Building Material*Road	3.204	2	0.201	68.332	9	0.000	86.490	9	0.000	4.392	8	0.820
Materials *Electricity	0.567[a]	4	0.967	47.716	12	0.000	38.549	6	0.000	17.462	16	0.356

Source: Author's fieldwork (2016)

Similarly, in Lagos metropolis, these factors have significant relationships with infrastructure and are interrelated with sustainability. Especially, the scenario where the extent of individual household overcrowding exacerbates infrastructure overutilization, damage, and several other environmental challenges. While some factors are significant in some areas, they are not significant in some areas. The socio-economic and environmental factor (occupation) is significant with the infrastructure (electricity) in all the study areas with 0.000 in Eti-Osa, Ikeja 0.052, 0.030 in Lagos Island and 0.000 in Lagos Mainland.

8.4 Chapter Summary

Considering the gap identified in this study and the evidence of the previous chapters on the association between of UISIP and sustainable development factors. This chapter investigates the specific factors of UISIP across the study areas to establish the significant relationships that exist between the different factors of socio-economics, environment, and infrastructure with regard to sustainable development. This is essential to establish the significance of the relationships that exist between the factors and across the study areas to better understand strategies to improve issues associated with UISIP. Discussing selected significant interview responses and chi-square findings of UISIP and sustainable livelihood in the study areas, the findings support the interrelationship that exists between these factors.

Part 5
Research Conclusion
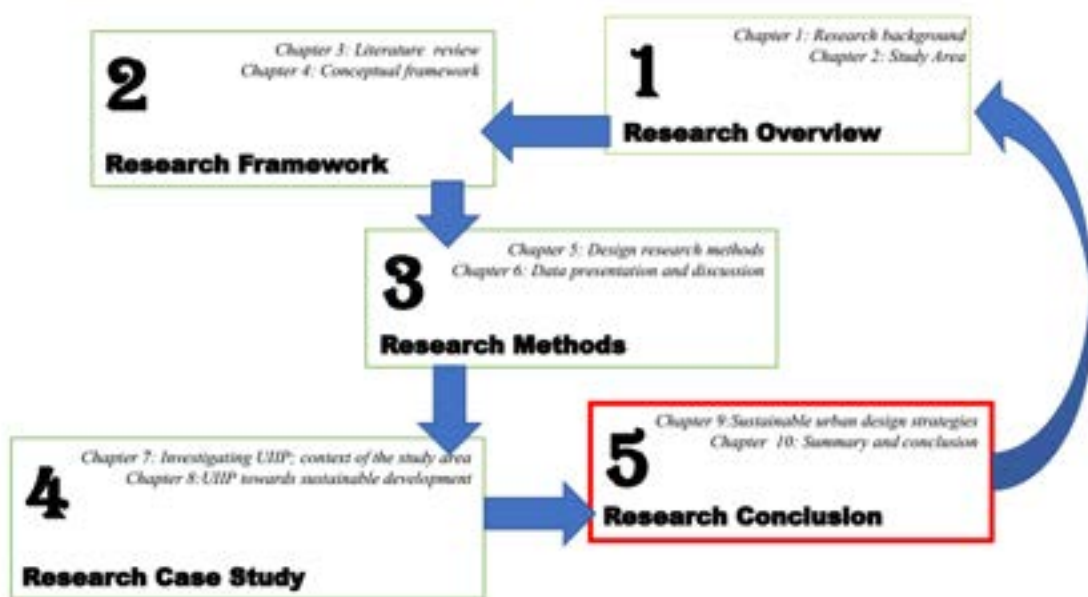
One of the most effective methods to create sustainable cities is to reclaim previously developed land by structuring and implementing social, economic, and environmentally feasible projects that support a municipality inclusive sustainable development.

(Marchettini et al., 2014)

Chapter 9
Urban Informality and Infrastructure Planning Design: Sustainable Urban Design Strategy

In an ideal world, the income level of a client would have an inverse relationship to the amount of effort put into the design of their housing. In the real world, this is seldom the case. Useful design is about using creativity to solve a problem, within the context and constraint of a project.

(Quale & Quale, 2012)

Synopsis

The aim of this research is to develop design strategies as guidelines for sustainable urban development in the study areas. Integrating the evidence from the literature and the results of the investigation conducted in this study, sustainable urban design strategies were found with comprehensive perspectives of the developed and the developing cities and should be used as a guide for specific urban design based on the context of the area. This chapter also identifies specific urban design strategies for the study areas based on the findings of this study.

9.1 Introduction

The previous chapters has extablished that UISIP has a significant threats to urban livelihoods, urban landscapes, and governance in different magnitudes all over the world. Developed countries such as Hong Kong are not exempted while it is more pronounced in the developing countries. There have been myriad attempts to integrate, alleviate, improve, and/or eradicate UISIP challenge with different approaches, yet they persist at a significant scale.

This study investigates UISIP in Hong Kong and Lagos metropolis to understand the concept, and the characteristics of this threats for urban design strategies. Adopting a case study methodology (exploratory design research approach) with mixed method data collection and analysis, this study conceptualized and investigates UISI for development strategies. It adopts triangulation techniques for the data collection and analysis. The findings reflect that several factors such as socio-economic, environmental, administrative, unequal distribution of urban resources among others contributes to the development of this threat. UISIP are prevalent in the study area although notable resources have been deployed to address the challenge in Hong Kong, neoliberal system of administration and the escalating cost of living (housing) hinder progress. The issues of equality, equity and race, and a wide gap between the rich and the poor are also critical findings in the study areas. In Lagos, the issue is more challenging with profound infrastructure breakdown, inadequacy in structure development and administrative challenges.

Therefore, considering the aim of this study with the method and the findings, sustainable urban planning design approaches are proposed to improve the condition of UISIP towards sustainable urban development. These strategies include 'integrated urban planning and sustainable design strategy', 'the tactical urbanism approach towards urban informality and infrastructure planning design' and 'inclusive sustainable socio-economic and environmental planning design' These strategies discussed 'inclusive social design' strategies and policies that promote social, economic, environmental equity as vehicles for social, economic, and physical development.

9.2 Integrated Urban Planning and Sustainable Design Strategy[5]

This study recommends UISIP principles integrated with sustainable development principles. That is, urban planning design principles should be applied with sustainable design principles to achieve sustainable development. This emphasises that all urban planning design activities carried out in urban informal areas should be adopted with the planning design principles and sustainable design principles. This strategy is proposed because the challenge is urban planning and design in nature, it is a sustainability challenge, and it occurs from social, economic, and environmental perspectives. Thus, the approach recommends that urban planning design and design principles and sustainable design principles be integrated together to achieve sustainable design principles.

This integrated urban planning and sustainable design strategy adopt the integration of the results of the personal observation, interview and questionnaire survey conducted on the socio-economic, physical environment and administrative characteristics of the study areas with the identified theories of urban planning and sustainable design principles to resolve the challenges in the study area. This strategy includes three principles namely; 1) the urban planning design principles, 2) sustainable design principles, and 3) integrated urban planning design and sustainable design principles. While the urban planning design principles described the urban planning and design approach adopted in this strategy to resolve the challenges of UISIP which are socio-economic and physical environment in the study areas, the sustainable design principles discussed the design sustainability approach of this strategy. Consequently, the integrated urban planning design and sustainable design principles describes how these two (1 and 2) principles can be integrated in the study areas and any other area identified with the challenges of UISIP based on the context or the challenges identified in the area. These principles are developed and proposed based on the focus of this study, the challenges identified in the study areas and most importantly the results of the data collected and analysed.

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[5] This section has been accepted for publication as Soyinka O.A and Siu. KW.M. Urban Informality and Infrastructure Planning in Hong Kong and Lagos Metropolis for Sustainable Urban Design. *Spaces and Flows: An International Journal of Urban and Extra Urban Studies.*

This integrated urban planning and sustainable design strategy is discussed as adopted in this study from these three identified principles in section 9.2.1, 9.2.2 and 9.2.3 respectively as follows.

9.2.1 Urban Planning and Design Principle

The findings of this study reflect that there is a significant relationship between socio-economic and physical environment challenges in the study areas. Table 8.4 and 8.5 chi-square test of socio-economic, environmental and infrastructure relationship in the study areas reflects that the relationships between these factors are significant to affect the resident and sustainability development of the area at most significant level of 0.000 to 0.051. This result is not entirely new, the findings of (Kenneth & Mizuuchi 2010; Ananya, 2012; Lawanson & Fadare 2015) also corroborates these results and this establish the need for planning design theories to address this challenge. This study therefore inferred that to foster sustainable urban development, basic socio-economic, physical environmental and infrastructural needs of the study areas must be designed to address the need of the people. Thus, based on Maslow's hierarchy of needs as adopted by (Lidwell, Holden, & Butler, 2003) this study proposed Maslow's hierarchy of needs integrated in urban planning design to improve the challenge of UISIP in the study areas. Figure 9.1 presents the illustration of this principles below.
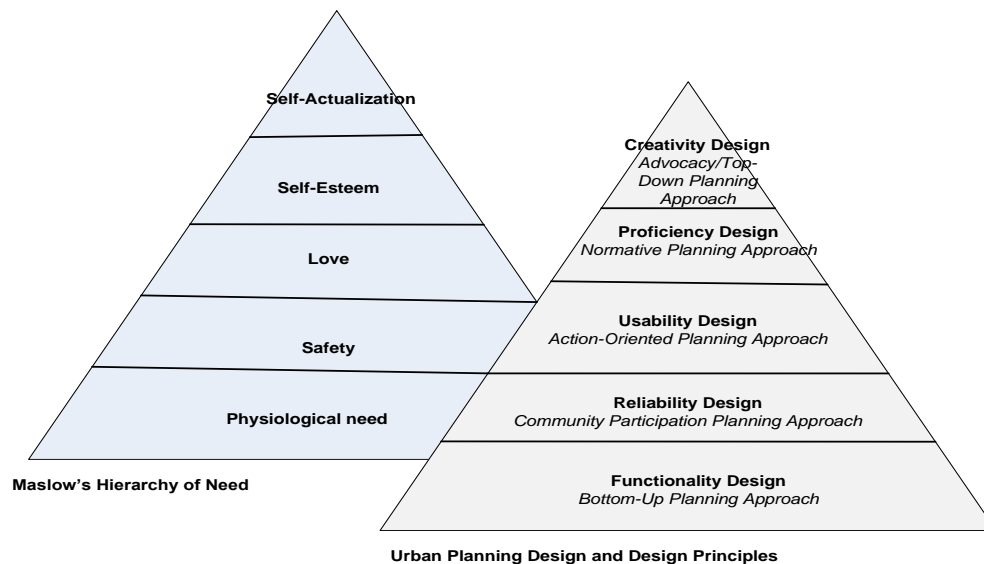
Figure 9.1 Urban planning and design principles
Source: Author (2017)

This principle is based on the hierarchy of needs design (Maslow's Hierarchy of Needs) in urban planning design. This hierarchy of needs in urban planning design states that urban planning design should address lower-level needs before higher-level needs. The basic needs of social, economic, and physical environmental needs should be prioritised at lower level need of the area with more emphasises on a particular type of design at each level of need. As illustrated in Figure 9.1 and corroborated by (Lidwell, Holden, & Butler, 2003) the principle proposed that although creativity design and other type of design is essential at the physiological need of the study areas, priority should be more on functional design with bottom-up participatory planning approach than other type of design at this level of need. This principle encourage that this perspective of design should be adopted at every other level of needs in the study area and can be adopted in any UISIP design or planning design.

9.2.2 Sustainable Design Principle

This study finds social, economic, and physical environmental factors (sustainability focus area) significant in UISIP challenge in the study are and thus required sustainability design approach. Therefore, as illustrated in Figure 9.2 and corroborated by (Goodman & Hastak, 2015; Yigitcanlar, 2010) this study proposed sustainable design principles to improve UISIP in the study areas.
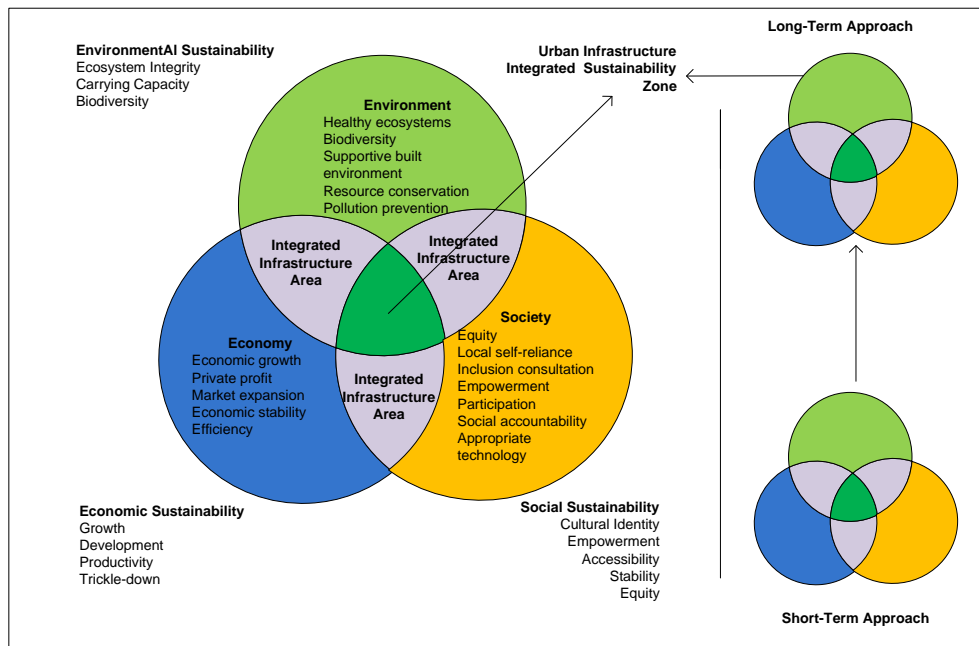
Figure 9.2 Sustainable design principle
Sources: Author (2017)

This recommendation is based on sustainable challenges found in the study areas in relation to the concept of sustainability and the study framework adopted in the study. This sustainable design principle emphasises the integration all the factors of sustainable development and their elements with infrastructure to achieve the sustainable urban development principle from the short-term application to long-term in the study areas. This principle proposed that to achieve sustainable urban development there must be a complementary integrated relationship between these factors and infrastructure of the area at a degree that it can be sustained. This principle implies that for every urban planning design to achieve sustainable urban development it must promote a design that meet the social, economic, and physical environmental need area with the required infrastructure.

9.2.3 Integrated Urban Planning, Design and Sustainable Design Principle

Based on the findings of this study and subsequently to the principles of urban planning design and sustainable design discussed in section 9.21 and 9.2.2 above, the integrated urban planning and sustainable design principle describe the application of integrated urban planning and sustainable design strategy. That is, it describes the operational synthesis of the urban planning design and sustainable design principles in the study area to achieve sustainable urban development. Figure 9.3 presents the principles below.
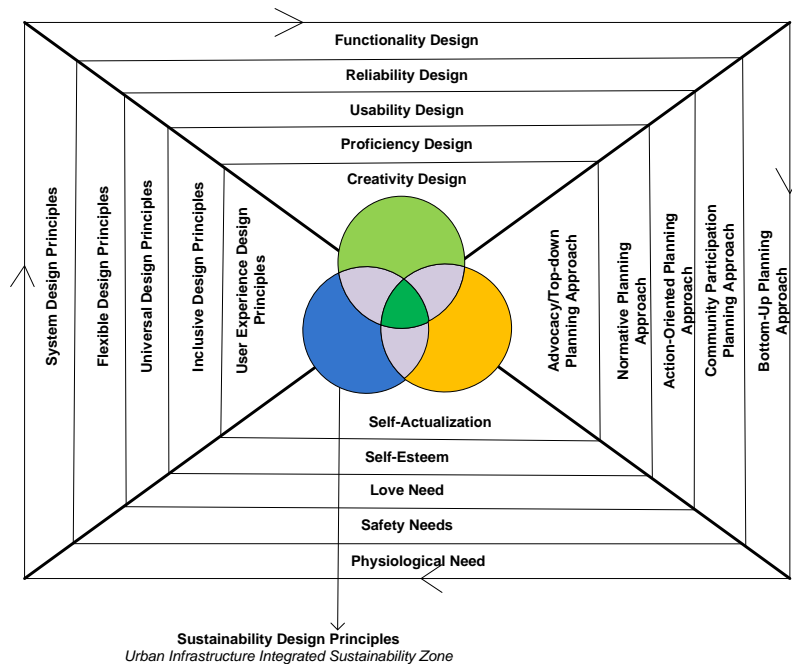
Figure 9.3 Integrated urban planning, design and sustainable design principles
Source: Author (2017)

The principle emphasises sustainability as the centre of urban design and planning approach (urban development integrated with infrastructure) to achieve sustainable urban development. Figure 9.3 illustrate this strategy with the integrated principles as adopted in this study. It describes the application of this strategy with different design and planning approaches possible from the combination of the principles integrated at diverse stages of the planning project in a cyclical process. For example, the application of this strategy in Lagos metropolis based on the findings of this study and as described in section 8.3, Table 8.5 and summarized in section 8.4; it is evidence that to achieve sustainable urban development in the studied areas, physiological needs is essential and a design to satisfy it is better achieved using system design principles with priority on functionality design (design of social, economic and physical environmental factors) from a bottom-up planning approach. While in Hong Kong the study inferred from the findings of this study that love need and self-esteem need is essential following the same pattern of proposed urban planning and design approaches in a cyclical process to achieving sustainable development.

This strategy is proposed to improve UISIP in Hong Kong and Lagos metropolis, and it can be applied in any other urban development challenged areas. Thus, the application of these sustainable design strategy is location specific, project precise, and different stages of a project may require different approaches depending on the investigation and findings of the study area. However, the sustainability concept is central to all and/or any of the urban planning approaches (urban development factors integrated with infrastructure and sustainability) adopted in any urban planning design project. That is, any approach adopted at any given time must be sustainable by integration of sustainability concept from the idea conceptualization to implementation.

9.3 Tactical Urbanism Approach Towards Sustainable Urban Design Strategy[6]

In line with the aim, objectives, and research framework of this study, these recommendations are proposed to address UISIP challenges in the study areas. The recommendations discuss the

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[6] This section has been accepted for publication in a book chapter as: Soyinka, O., & Siu, K. W. M. (2018). Urban Informality and Infrastructure Planning in Lagos metropolis: Tactical Urbanism Approach. *In (Ed) Urban Crisis in Africa: Realities, Challenges, and Responses.* Institute for Peace and Strategic Studies (IPSS) University of Ibadan, Ibadan, Nigeria.

elements of the tactical urbanism approach in relation to the identified challenges of urban informality and infrastructure planning which also reflect factors of sustainable development for adequate improvement. While the different responses received from the respondents and observation reveals that the UISIP challenge is evidence and interrelated with one another, the result of survey analysed reflect significant in most areas and not significant in some areas. For instance, the results of ANOVA regression test between average monthly income and exclusive room use in Hong Kong at significant level 0.062 and alpha 0.05 reflects not significant and 0.861 at 0.05 significant in Lagos metropolis respectively. The deduction from this investigation and analysis reflect the existence of the challenges of UISIP across the areas, it interrelates with the factors of social, economic, and environmental, and the respondents (community) feels neglected in the participation of the community development. Thus, this study recommends tactical urbanism approach to improve the challenges of UISIP. It recommends the strict application of tactical urbanism elements to address the factors of urban development (social, economic, and environmental) and sustainable development that are challenged in the study areas in relation to the research framework and findings.

This approach adopts the integration of the tactical urbanism features with community participation in a cyclical method as depicted in Figure 9.4. The community participation aspect of this approach emphasises a bottom-up approach of the elements of tactical urbanism approach at the short-term tactics to establish the operationalisation and a top-down approach with active community participation on a long-term tactics and a large-scale project implementation. Community participation in this approach does not absolve the primary role of the government, but it does emphasise the belief in society choice/fair system of cooperation above any other approach. The bottom-up techniques as a form of community participation should be normative for both the culture and the legal system of the study areas. Figure 9.4 further illustrates the application of this approach and shows the operationalisation of this tactics. The approach emphasises the involvement of the stakeholders (government, urban managers, environmentalists, etc.) in the integration of the tactical elements to ameliorate UISIP challenges.
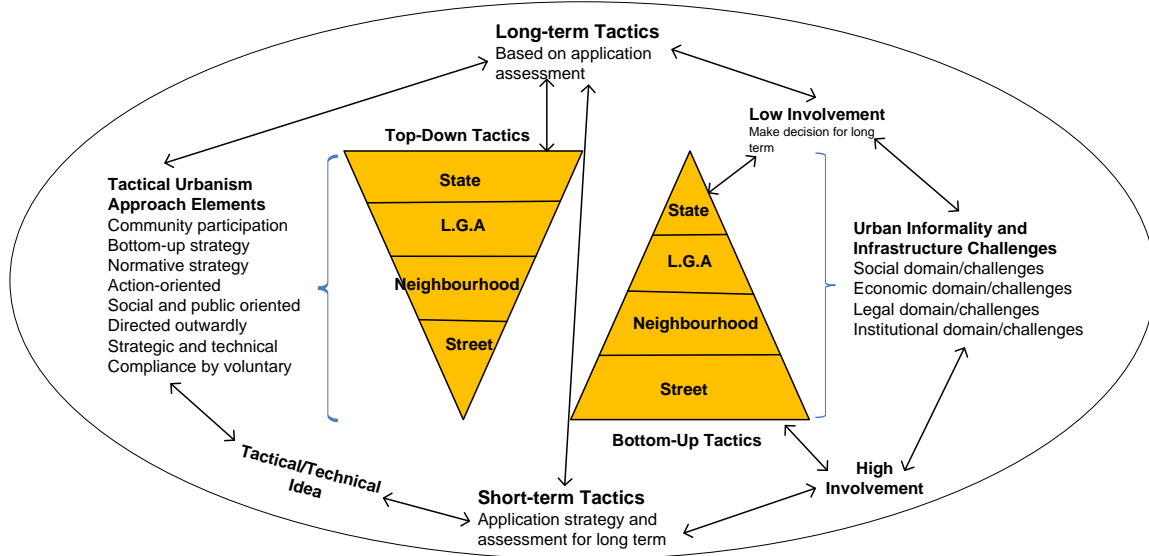
Figure 9.4 Tactical urbanism to improve urban challenges in Lagos
Source: Author (2017)

Adopting this approach should be site specific and based on the investigation of the factors of urban development and sustainability. Considering this approach to improve the challenges of UISIP in Lagos metropolis, the action-oriented, social, and public-oriented elements should be adopted with the following strategies, which are critical steps of tactical urbanism in the area based on the findings of this study:

1. A deliberately phased approach to instigating changes;

2. An offering of local ideas for local planning challenges;

3. Short-term commitment with a realistic expectation for a long-term change;

4. Low risks, with possibly high rewards;

5. The development of the social capital relationship between citizens and the building of organisational capacity, public/private institutions, non-profits/NGOs, and their constituents;

6. Discussion of each significant planning challenge using the identified elements;

7. Recommendation of solutions for large-scale tactical approach implementation;

8. Assessment of the results and starting the cycle again.

This approach considers the challenges of UISIP in Lagos (Lagos metropolis structure; streets, neighbourhood, local government areas and states) with this research framework and findings. The elements of tactical urbanism were discussed in relation to the major factors of urban

informality and infrastructure challenges to improve the issues identified in the study area. The approach shows the integration methods of participation of the stakeholders, what kind of participation and at the bottom-up strategy to a top-down approach. The bottom-up strategy addresses the inadequate citizen participation identified in the area and propose a better approach of a short-term method for a long-term solution and recommend it for a top-down strategy. The top-down strategy assesses the recommendations experimented at the bottom-up strategies which determines the roles of technicians, assesses administrative responsibilities and recommend tactics for a long-term strategy and a more lasting solution.

9.3.1 Tactical Urbanism and UISIP Integrated for Sustainable Urban Design Strategy

This recommendation discusses the third research question based on the findings of the study areas and it proposed a model/framework for infrastructure planning integration for urban informal areas with the tactical urbanism approach. The framework of UISIP is integrated with tactical urbanism for sustainable urban development that is tactical in application, cyclical, and adopts a planning process. It is designed to allow prototyping/modelling in the study area and any other urban informal area or planning challenge area. To prototype/model this approach in any other area with urban informality, the identified specific challenges of these areas (dependent factors) are integrated into the tactical framework with the planning process as illustrated in Figure 9.5. That is, based on the investigation conducted in the study area, the challenges of UISIP identified are categorised into the major domain (social, economic, legal and administrative) and they integrated into the framework following urban planning design process from the goal to implementation and performance monitoring in a cyclical process.

The case of Lagos adopts the identified areas of challenge in the metropolis (the socio-cultural domain, economic domain, legal domain, and political/institutional domain) according to the research findings and integrates it into the tactical framework with the planning process. The framework identified approach suitable for each of the process based on the domain and are writing below each stage of the process. That is the framework identifies what specific tactical urbanism element should be adopted, at what stage of the process, and in what domain of the urban challenge. Figure 9.5 further illustrates the tactical urbanism framework recommended for UISIP challenged areas of Lagos metropolis based on the study of the area findings below.
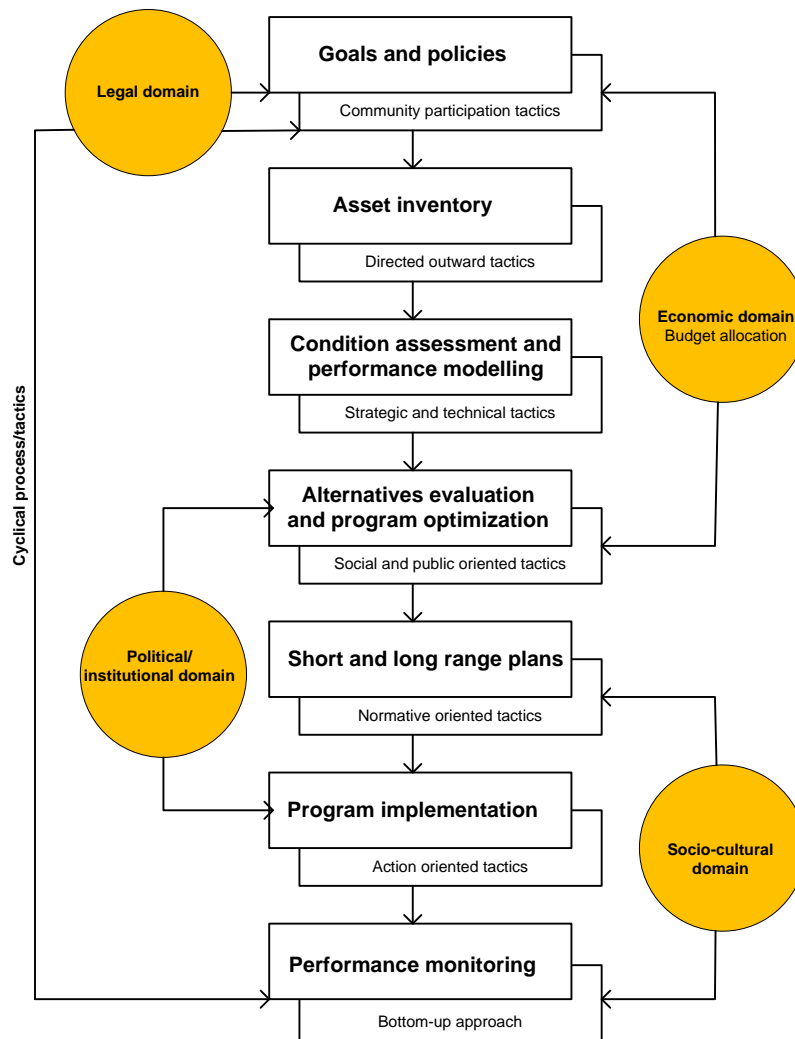
Figure 9.5 Tactical urbanism framework for sustainable planning design
Sources: Author (2017)

Although each of the tactical urbanism elements (bottom-up approach and others) and the domain (socio-cultural and others) can be adopted separately, and as a complete process in a cyclical process as described above, however, it will be tactical as proposed in this study in such instances and it might not achieve a comprehensive results. The "tactical" element of the approach is the inclusion of all these elements in a strategic system and technical method based on the specific challenge of the area. The approach is based on the location and the identified significant challenges of UISIP design in that area, because the domain and the approach can change (dependent) while the stages of the planning design process is a constant (independent) variables.

9.4 Inclusive Design Strategy: Sustainable Socio-economic and Environmental Design Principles[7]

While the previous recommendations of this study based on the findings identified in the study areas has addressed specific social, economic, and physical challenge of the area with the inclusion of the factors (social, economic and physical of sustainable development), this recommendation emphasises more on the policy with the inclusion of the sustainability factors. Several areas of improvement were identified in the study areas to improve the challenges of urban informality based on policy to guide behavioural change towards improvement. Based on this premise this study recommends sustainable design strategy, and these strategies are classified into the following areas for improvement:

1. Policy reforms;
2. Community-based participatory design;
3. Inclusive socio-economic and environmental planning design.

9.4.1 Policy Reforms

This aspect of the recommendation includes government programs and actions to improve issues of urban informality. Based on the findings in the study areas, the following government actions and programs are recommended:

a. The government should provide support that does not include long processes or office and agency visits before accessing government aid.

b. Policy should ensure government aid is given without prejudice.

c. Policy to ensure housing first for all should be introduced to avoid long waiting time for appropriate housing, which exposes the homeless to health issues, violence, human trafficking, prostitution, and even death.

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[7] This section has been accepted for presentation and publication as Soyinka. O.A, Spencer. B, Siu K.W.M, Hou. J, and Heland, L. (2018). Urban Informal Settlements and Infrastructure for Sustainable Urban Design: Investigating the Correlates and Mitigation Strategy. *9th International Conference on Applied Human Factors and Ergonomics,* Loews Sapphire Falls Resort, Universal Studios Orlando Resorts, Orlando Florida, USA 21-25st July 2018.

d. Policy reform towards tent-cities, tiny structures, and other temporary shelters should be reconsidered to achieve its purpose of transitional housing and not serving as a permanent home.

e. Policies to get homeless citizens employed (make earning) will also improve the situation more quickly by helping them integrate into society and manage the high costs of living in the community

9.4.2 Community-based Participatory Design

This involves the activities and actions for community integration towards addressing the issue of urban informality. Community-based participatory design should be structured based on each area's particular qualities. An overview of various elements of community-based participatory design approach are listed below:

a. Community outreach to develop awareness (of causes and dangers) and human empathy is very important to get all community members more involved.

b. Urban informal settlement and homeless citizens should be involved in creating real solutions.

c. A culture of community acceptance without prejudice regarding ethnicity, colour, and race should be promoted.

d. Equity and equality of abode are important in order to avoid some residents rejecting the location or development of homeless facilities in their neighbourhood.

e. The navigation team outreach should be community-based and integrated at the municipality and council level.

f. Social support systems to help citizens avoid system prejudice, accept their lifestyle decisions, mistakes, and personal choices and encourage reintegration into the community.

9.4.3 Integrated Socio-Economic and Environmental Design

This involves the integration of policy reform and community-based participatory design with a technical approach, sustainability perspectives, and all-citizen engagement.
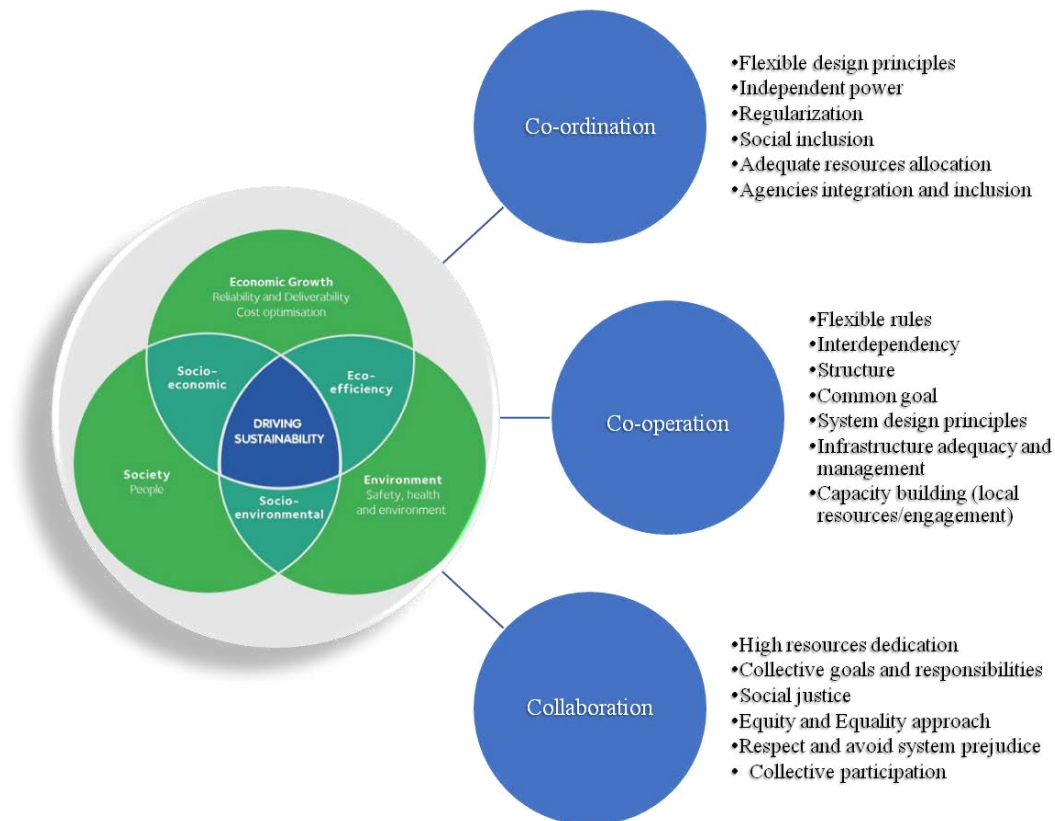

Figure 9. 6 Inclusive socio-economic and environmental planning design
Sources: Author (2017)

More interdisciplinary work to address these contexts is required for more holistic and sustainable results. Unified efforts that can support each other and prevent gaps in interconnected solutions should be encouraged.

Agency collaboration and coordination is important in addressing issues of urban informality. For instance, hospitals, police, and the fire department should work together to manage and correct addiction, mental illness, and systemic prejudice.

9.5 Chapter Summary

The evidence from the literature and the investigation of these study areas reflect the association of the issues of urban informality with sustainable development (social, economic, environmental, and administrative) factors. The strategy identified to improve the situation in this study with consideration of these factors includes: 1) an integrated urban planning and sustainable design strategy that highlights the integration of urban planning design principles with sustainable design principles; 2) a tactical urbanism approach for urban informal settlement and infrastructure planning design. This approach also describes the application of urban management principles, community integration, and sustainable development in a tactical urbanism approach; and 3) inclusive, sustainable socio-economic and environmental planning design. This strategy adopts the integration of policy reforms, community-based participatory design, and the application of inclusive socio-economic and environmental planning design guides.

Chapter 10
Summary, Recommendation, and Conclusion

The conclusion, when all has been heard is...to obey the law because this applies

to every person to enhance living and dying.

Anonymous

Synopsis

Previous chapters in this thesis have discussed the distinct positions and settings of UISIP for sustainable urban design. This chapter presents the summary and conclusion of this study to ensure the aim is achieved and clearly presented, and that adequate conclusions are drawn. It begins with the reintroduction of the objective, presents a recap of the key findings of the research, and ends with conclusions on strategies to improve UISIP through sustainable urban design. The research limitations and areas of further study are discussed after the research contribution to existing knowledge regarding theoretical and practical implications is presented.

10.1 Introduction

As stated earlier in this thesis, UISIP is a global challenge, a sustainability challenge, and a challenge associated with several other factors, among which sustainability factors are significant. It is a familiar subject of discussion for urban designers, planners, architects, and several other researchers including social scientists. The research organisation and researchers identify UISIP as a significant issue to address in urban development. This growing demand for sustainable urban development requires a dynamic approach to create the desired environment.

Although effort has been made in the development of significant approaches and recommendations, most previous studies address the issues of sustainability and urban informality in isolation and without sufficient comprehension. Most studies have not considered urban informality in connection with infrastructure, or UISIP in connection with sustainable urban development or within the context of a developed and/or developing city. This lacuna has significantly impeded the capacity for comprehending the issue, its dynamics, its challenges, and the ability to make an adequate recommendation for sustainable urban development. This gap is critical and essential to address if tangible results are to be achieved in this area of study. Hence, this research is necessary at this point in time to contribute to the quest of achieving sustainable urban development through urban design strategies.

This kind of research perspectives with broad and its complex approach can only be achieved with a strict, integrated, sustainable urban design planning approach, using inclusive design among other strategies as identified in this study. The conclusion (summary, recommendation, and conclusion) of this study which *investigated urban informality and infrastructure planning in selected settlements of Hong Kong and the city of Lagos and developed sustainable design strategies for sustainable development* has proved that that there are objectives, theory and practice approach that can lead to improve UISIP

10.2 Summary

The summary of findings of this thesis are categorised and discussed based on the objectives identified to achieve the aim of this study in section 10.2.1 and a general summary in section 10.2.2 below.

10.2.1 Research Objectives: Reintroduction

In this thesis, all the objectives stated were achieved by adopting case study design research methodology (exploratory design research) including a comprehensive literature review, research design, mixed method data collection with triangulation techniques, and mixed method data analysis. The triangulation techniques adopted included triangulation (qualitative and quantitative) data collection and triangulation mixed method analysis (exploratory design of qualitative data analysis feeding quantitative data analysis, with results followed by interpretation) with a comprehensive literature review.

As a summary, the objectives set to achieve the aim of this thesis are reintroduced and four are presented below:

i. To investigate UISIP conditions in selected study areas of Hong Kong and Lagos;

ii. To assess the professional perspective on UISIP in the study areas;

iii. To examine the relationship that exists between UISIP vis-à-vis the concept of sustainability in the study areas;

v. To establish sustainable design principles for UISIP in the study areas.

The key findings of these objectives as discussed in the thesis are briefly described below to explain how the research has achieved its stated objectives.

10.2.1.1 Obj. 1 - Investigating Urban Informal Settlement and Infrastructure Planning

The discourse of objective 1 in this thesis addresses research question 1 ("What are the characteristics of informal settlement and infrastructure in the study areas?") after establishing the significance of urban informal settlement and infrastructure planning as a global and sustainability challenge. It was essential to investigate the situation of the study areas to determine the characteristics and peculiarities of urban informality in that region. This is discussed in this thesis and the data presented in Chapter 6, with a specific discussion of the case study findings of this objective in Chapter 7. The investigation revealed that urban informality exists in the study areas, it is associated with several other factors, that the severity

of the issue depends on several factors, and that urban informality has different types and natures of appearance, which are associated with the development of the area.

In Hong Kong, the findings reflect that urban informality exists with the of respondent's result presented strongly agreeing that it exist. The evidence presented identified urban informality as associated with several factors, among which social, economic, and environmental factors are significant. The policy discussion on this issue also establishes this fact. Although urban informality is referred to as a squatter settlement in the SAR, this thesis and many other studies define it as urban informal settlement. The significant types of urban informality identified in the region are squatter settlement, illegal land/building and unauthorised settlement. The nature of appearance ranges from cage housing, structures with temporary materials (shanty structures), and urban inbuilt informal settlements on rooftops. This finding and its discussion in this study are corroborated by identified government policies and several studies such as (Kennett & Mizuuchi, 2010; Rufina Wu & Canham, 2009; Tanasescu et al., 2010).

Lagos's experience of this challenge is intense, and urban informality is identified as severe with characteristics that are inhuman and can be described as a slum, squatter settlements, and exhibiting squalor and environmental breakdown. Of respondents from Lagos, 54% strongly agree and 35% agree that UISIP exist, and urban informality is identified as associated with several factors such as urbanisation, poor land use administration, and poor social, economic, environmental and administrative menace in the area. The aspects of urban informality include unplanned zoned uses, illegal land/building ownership, and inadequate facilities and services in settlements (Adetokunbo & Emeka, 2015; Aluko & Amidu, 2006; O. Olajide, 2010).

10.2.1.2 Obj. 2 - Assessing Professional Perspectives of Urban Informal Settlement and Infrastructure Planning

Building off of objective 1, this objective answered research question 2 ("What are the influences of an informal settlement on infrastructure in the study areas?"). This objective addresses the professional viewpoint, definition, and correlates of UISIP in the study areas. This objective aimed to capture the perspectives of professionals to avoid bias or skewed deduction and induction in this thesis. This is essential considering the sensitivity of the subject of study and to adequately establish a statement of the research problem and answer the

research questions. The findings of this objective across the study areas reflect two significant opinions, the first, which identified urban informality as existing but questioned the context of its definition and preferred to refer to it as "urban challenge areas", and the second, which accepts the idea of urban informal settlement. The relationship between UISIP also varies between the case study cities.

The evidence from Hong Kong shows that 2 professionals hold the first opinion and referred to urban informality in Hong Kong as simply an urban challenge area (which exist in every city in the world), while 10 professionals accepted the existence of urban informal settlement and associated its causes with several factors. The relationship between urban informal settlement and infrastructure in the region reflects that there is a relationship between the two. However, the relationship does not signify that one aspect causes the other, i.e. the presence of adequate infrastructure does not equate to the absence of urban informal settlement (squatter) settlement in Hong Kong, and vice-versa, because urban informality is associated with several other factors.

In Lagos, the results were different. All the professionals interviewed accepted the existence of urban informality in the metropolis as urban informal settlement and identified tenure, political, and socio-economic issues as significantly influencing this phenomenon. Thirteen professionals answered positively and five negatively regarding the relationship between urban informal settlement and infrastructure, which reflects that there is a relationship between infrastructure and urban informal settlement. Infrastructure influences informal settlement and vice-versa, despite the fact that informal settlement is associated with several other factors such as social, economic, environmental, and administrative issues.

10.2.1.3 Obj. 3 - Urban Informal Settlement and Infrastructure Planning Vis-à-Vis Sustainability

In line with objectives 1 and 2, this objective addresses the research question "What is the situation of informal settlement and infrastructure in Hong Kong and Lagos considering sustainability perspectives?" This is necessary to focus the thesis on sustainability by assessing the situation within the context of sustainable development to highlight sustainable urban

design strategies for improving issues of urban informality and achieving the aims of this research.

In sum, the findings of this objective reflect that UISIP in the study areas are not sustainable based on responses from the residents and professionals obtained through interviews and questionnaire surveys. The objective statistics of the socio-economic and environmental conditions of the respondents and the chi-square test of socio-economic, environmental, and infrastructure sustainability in the study areas to further support the conclusion. Further information on the findings of this objective can be accessed in the published articles from this thesis (Soyinka & Siu, 2017a, 2017b; Soyinka et al., 2016).

10.2.1.4 Obj. 4 - Sustainable Design Principles for Improving Urban Informal Settlement and Infrastructure Planning

Finally, making deductions and inductions from objectives 1, 2, and 3, this objective addresses the research question "How can urban informal settlement and infrastructure be designed, planned, and integrated to achieve sustainable urban development in the study area?" Based on the findings in the study areas, this objective identified three comprehensive urban design strategies for planning, designing, and integrating urban informal settlements and infrastructure and sustainable urban development. These are listed below.

1. Integrated urban planning and sustainable design strategy

    a. Urban planning design and design principles

    b. Sustainable design principles

    c. Integrated urban planning design and sustainable design principles

2. Tactical urbanism approach for urban informality and infrastructure planning design

    a. Tactical urbanism and integrated sustainable urban design strategy for urban informality and infrastructure.

3. Inclusive sustainable socio-economic and environmental planning design

    a. Policy reforms

    b. Community-based participatory design

    c. Inclusive socio-economic and environmental planning design.

In addition to the comprehensive sustainable urban design strategies initiated in this objective, this objective also highlights specific recommendation or strategies for improvement of the study area.

10.2.2 General Summary

Based on the evidence of this study literature review, observation, interview, questionnaire survey and data analysed, this study states that Hong Kong has sustainable developmental objectives according to government statement while there is none in Lagos metropolis. Also, the efforts to achieve the objectives of the Hong Kong sustainable development is identified threatened by various factors which include economic, social, administrative (neoliberal system), and environmental factors.

The discussion of sustainable development objectives based on government statement was discussed in section 6.2.4 which was narrow down to UISIP in the thesis. The objectives of Hong Kong sustainable development according to government statement can be summarized to include the following areas:

1. It has three main pilot areas namely solid waste management, renewable energy, and urban living space (Urban development). While urban living space is the focus of discussion of this study. The objectives adopted for improving these three areas as identified from the government statements includes the following which was also areas discussed in the study.

   a. A change of mindset to achieve sustainable development goals

   b. All sector of the community working together to achieve sustainable development goals.

   c. The development of council for sustainable development in 2003 and their activities.

   d. Through the different government press release and policies.

In addition to the references cited in this study the government statement on the objectives of sustainability in Hong Kong can be retrieved from the link below https://www.gov.hk/en/residents/environment/sustainable/dev.htm among other sources used.

While in Lagos metropolis, there are no such categorical government statements or objectives towards sustainable development. All the policy, regulations accessed in this regard as stated

in the thesis do not address the issue of UISIP and sustainable development directly but indirectly within scope of urban renewal among others.

The major differences in the infrastructure components of Hong Kong and Lagos metropolis were discussed in detail in this thesis literature review and data analysis, section 3.5, 3.8, 6.2.3 and 6.3.3, which create the basis for the recommendations discussed in the study and specific recommendation provided in section 10.4.2 in Lagos metropolis.

1. Infrastructure development challenge is a significant factor and a major proliferation of informal settlement and poor urban development in Lagos metropolis while such cannot be stated categorically in Hong Kong.

2. According to the study response, the infrastructure provision in Hong Kong is adequate, but there is a room for improvement, however, in Lagos, it is not satisfactory and contributes significantly to urban challenges.

In Hong Kong, considering the nature of the urban informality the general infrastructure element such as the road, health and electricity are available and adequate but within the informal structures it is inadequate. Also, access to adequate facilities and services within the structures and settlement is dependent on your affordability power. While in Lagos, the general infrastructure provision is inadequate, and within the urban informal settlement, the condition is deplorable and with poor materials.

According to the findings of this study and as discussed in the thesis, the major constraint to infrastructure provision in the two cities is identified under the social, economic, and administrative factors which are significant areas of sustainability approach. In the two cities the social factors include the issues of equity, equality, race, and wide gap between the rich and the poor. Economic factors include the high cost of living, escalating cost of housing that encourage inadequate provision of facilities and services. The administrative factors include inadequate policies and policy implementations, lack of coordination between organisation, administrative bureaucracy. While the neoliberal system in Hong Kong contributes to the challenge, the issue of corruption also is significant in Lagos.

The infrastructure planning design strategy and sustainable urban design strategy proposed in this study were generated from the integration of all the data collected through the literature review, observations, interviews, and questionnaire survey which were analysed.

1. Through the literature review, observation and interview the infrastructure planning design and sustainable urban design objectives in the two cities were identified and this form the basis for further investigation through questionnaire survey.

2. Subsequently, the assessment of what the current situation in the study area is determined through the responses of all the stakeholders through interview and questionnaire survey that was conducted.

3. The questionnaire survey helps to narrow the investigation to a specific element of infrastructure and sustainable urban development such as physical environment (housing, household exclusive rooms etc) socio-economic (occupation, income, household size etc)

4. The questionnaire survey also helps to determine the level of significance of these factors and make a deduction on their severity to identify an adequate strategy to improve the situation.

5. Therefore, based on the feedback received on the inadequacy and the significant level of this inadequacy across the areas investigated the strategy adopted in the thesis was developed. These feedbacks were also crossed-checked for its validity and reliability with the findings from the literature review, observation, and the responses from the interview before the strategy was developed.

The strategy was developed on several analyses of rumpled sheets, sketches and process which can be summarised as follows:

    a. The approach for the strategy development involves highlighting and grouping of all the challenges identified from the investigation process under the physical, social, economic, and administrative factors.

    b. The identified elements of these factors were also identified with their level of significance.

    c. The identified conceptual and theoretical framework where place side by side with the different applicable urban planning and/or design principles.

    d. Thus, the consideration of a-c above side by side now creates the proposed strategies in this study.

6. Therefore, taking a critical look at the proposed strategies, they present the ideas of the findings, the conceptual and theoretical framework and applicable planning design strategies as follows:

1. Integrated urban planning and sustainable design strategy (Section 9.2)
   a. Urban planning design principles
   b. Sustainable design principles
2. The Tactical urbanism approach towards urban informality and infrastructure planning design (Section 9.3)
   a. Tactical urbanism and integrated sustainable urban design strategy for UISIP
3. Inclusive sustainable socio-economic and environmental planning design (Section 9.4)
   a. Policy reforms
   b. Community-based participatory design
   c. Inclusive environmental planning design

10.3 Research Contribution to Existing Knowledge

This study aimed to develop sustainable urban design principles for sustainable urban development through the investigation of UISIP in selected urban informal settlements of Hong Kong and Lagos. This research perspective was based on past literature and practical relevance of this issue in the study areas.

The accomplishment of the aim of this study has contributed to the body of knowledge as the first study to consider urban informal settlement and infrastructure planning design, the first study to consider the context of developed and developing cities, and most importantly, by using the perspective of sustainable development to establish sustainable design strategy for improving urban informality.

This study also contributes to existing knowledge regarding theory and practice for academic use and use by professional bodies, as well as the combination of the two through a critical literature review, establishment of new theories, and the investigation of residents' and professionals' perspectives to develop sustainable urban design strategies in this thesis.

10.3.1 Contribution to Theory

In this study, a significant contribution has been made to existing theory by bridging the literature gap with wealth of literature evidence added to knowledge in content and context of the study issues. This theoretical contribution identified the determinants of sustainable urban

design, investigated the determinants of urban informal settlement and infrastructure, and developed a theoretical framework for determining and factors for assessing, investigating, and discussing UISIP design. Also, the findings of this study regarding the peculiarities of this subject in the study areas in relation to the types, nature, and appearance of urban informality is a significant contribution solely established by this study and corroborated by several studies only in fragments. This theoretical contribution will be adopted by researchers for literature review, as the basis of further studies, for academic teaching, and even in professional practice as it guides the practical approach of implementing strategies for improving urban informality challenges.

10.3.2 Implications for Practice

The global demand for strategies for improving urban sustainability challenges with a focus on urban informal settlement and infrastructure is evidenced by several global organization and researchers, including UN-Habitat (declaration of sustainability as the global research perspective with informality and infrastructure as significant areas for upcoming decades), the Rockefeller Foundation, ARUP, and several other practical research organisations. The outcome of this study is significant for practical use of this organisations with regard to planning and urban design strategies. These include:

1. Integrated urban planning and sustainable design strategy

2. The tactical urbanism approach for urban informality and infrastructure planning design

3. Inclusive sustainable socio-economic and environmental planning design

    a. Policy reforms

    b. Community-based participatory design

    c. Inclusive socio-economic and environmental planning design

This study should, therefore, attract the attention of urban planners, designers, and environmentalists who are interested in action-based strategies for the initiation, execution, and implementation of projects. It will create a unique perspective regarding the practices towards urban informal settlement and infrastructure planning and awaken the consciousness of the practitioner to the subject of sustainability in this discourse. It also helps create a clear-cut

perspective for approaching urban informality to establish the causes and influence its associated factors, and how they appear in different developed and developing cities.

10.4 Recommendation

This study's recommendation is based on the study area findings and the research framework within the context of these study areas. It emphasises the different strategies that can also be adapted to improve the challenges of urban informality. This approach does not endorse any particular sequence of application of the identified strategies above. It discusses the alternative approaches that can be adopted in Hong Kong and Lagos based on the prevalence of urban informality and the findings identified in the study areas. This recommendation should be applied to sustainable urban planning design projects implementation and management with adequate considerations of the following:

1. Location-specific the application of the strategies should avoid over generalisation of the approach in that the application should be site specific.

2. The adoption of a planning design approach to address the challenge of UISIP design should consider the social-cultural domain, economic domain, legal domain, and the political or institutional domain of the people with the following inclusive design characteristics:

   a. Equity of person;

   b. Liberty;

   c. Tolerance;

   d. Rational, reflective choice; and

   e. The rule of law.

10.4.1 Specific Recommendation/Improvement Consideration: Hong Kong[8]

The focus of this research was to investigate informal settlement and infrastructure adequacy in Hong Kong for future sustainable urban centres. Considering the findings of this research

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[8] This section has been published as Soyinka. O.A and Siu K.W.M. (2017). Investigating Informal Settlement and Infrastructure Adequacy for Future Resilient Urban Center in Hong Kong. *Procedia Engineering*.

with respect to the literature review, site visit, observations, questionnaires, and unstructured interviews within the study area, this study recommends the following:

1. The public housing initiative and Newtown developments have been stopped for several years now; the government should return to aggressive construction of this public housing initiative to house the high population of low-income citizens and street sleepers.

2. The government should adopt inclusive design approaches as much as possible, even though this is very challenging in a neoliberal system of government as in Hong Kong. It should further consider the intense disagreement occurring in some development projects in the country.

   a. The government should educate the public very well about any state ideas and increase awareness and sensitivity from what now exists.

   b. The role and benefits of both the public and the government should be stated to achieve inclusive design and support the success of the initiated projects.

3. The existing policies on criteria for qualifying for some of the government's public housing provision should be reviewed with a citizen participation forum. The conditions are assumed to be ridiculous from the opinion of the people interviewed, and they are even assumed to be part of the origin of stigmatisation because people believe that for one to meet such criteria, you must be poorest of the poor. Conditions for public housing allocation should not be made or presented in a way that attracts stigmatisation.

4. Public education and enlightenment should be carried out to avoid stigmatisation of public housing residents.

5. Economic policy reforms should also be carried out to encourage equal economic development or at least reduce the gap between the rich and the poor as the country economically prospers.

6. The planning system in the country is currently excellent but should avoid a crisis planning approach; projects and planning (housing, infrastructure projects) should be deliberately planned.

7. The government tolerance level regarding urban informality should be reviewed. Inaction or silence on the part of the government should be avoided, and informal settlements should either be integrated into the housing system through improvement or they should be removed to reduce the spread of informal settlements. Also, select tolerance should be avoided, and collecting utility bills from some settlements should not be allowed.

8. According to the research findings and physical evidence in the country, infrastructure conditions are good but should be improved in selected informal settlement areas and be integrated in a way that can aid equal economic development in the country.

10.4.2 Specific Recommendation/Improvement Consideration: Lagos[9]

Based on the prevalent of infrastructure challenge in Lagos and its ability to proliferate UISIP a smart infrastructure improvement consideration is proposed in Lagos.

The assessment of environmental conditions, buildings, and infrastructural development in the study areas revealed that social, economic, and infrastructure development strategies are required for sustainable urban development in Lagos. These include the following:

1. The infrastructure can be developed by making a blueprint that find spot clearance areas for the redevelopment and integration of smart infrastructure concepts. The areas involved should be cordoned and connected through technology mapping and linkages for adequate functionality.

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[9] This section has been published as Soyinka O.A, Siu K.W.M, Lawanson O.T and Adeniji, O.A (2016). Assessing Smart Infrastructure for Sustainable Urban Development in the Lagos metropolis. *Journal of Urban Management.*

    a. Blueprints must be designed to find harmonious land uses within the same vicinity and develop cooperation with public facilities such as schools, grocery stores, and recreational facilities within these areas to promote sustainable residential areas.

2. Land use development that accommodates infrastructures and community amenities and their integration within the existing developed areas of Lagos should be encouraged.

    a. Infrastructures, public services, and building infrastructures should be integrated within existing vacant areas of the study areas through spot clearances. A practical example of such integrations with smart infrastructure concepts includes the Shoprite at Ikeja and the jetty transport in Badore area of Eti-Osa LGA, but this integration should be with adequate technology and smart infrastructure concepts. Figures 10.1 and 10.2 describe the identified areas of such applications in the study areas.

    b. The application of smart infrastructure in the study areas through spot clearance of obsolete structures through the modernisation, improvement, and maintenance of structures with smart infrastructure concepts by both the government and citizens would allow adequate smart infrastructure and public utilities with effective allocation and should be encouraged.

3. The utilisation of smart infrastructure strategy in the study area can be achieved through the creation of a coordinated, functional, socio-economic transport system that accommodates the mobility, safety, comfort, and convenience of all inhabitants, including the impaired citizens. An example of an existing infrastructure that can be upgraded into smart infrastructure transport is the Badagry-Lasu Lagos Metro line, which connects nodal areas of Lagos and the proposed Badagry-Lasu express road.

    a. These and similar infrastructures should be designed, provided, and integrated into built areas of the Lagos metropolis with smart infrastructure concepts such as technology, real-time information devices with lower energy consumption, and other concepts.

b. The development of big data, consumer engagement devices, certified thermostats, an efficient energy grid, and geographical real-time information devices should be developed with this infrastructure to achieve its smart infrastructure standard.

4. The implementation of smart infrastructure in the study area can be achieved through the improvement of non-motorised transport facilities, including the promotion of pedestrian and bicycling facilities by improving sidewalks, footpaths, and creating sidewalk bike sheds. These improvements could include but are not limited to, elements such as trees, sunshades, benches, and pedestrian-oriented lighting.

   a. The development of technology and non-motorised facilities should be designed, developed, and integrated appropriately in the study areas with smart concepts and coordinated technology with Pathfinder/tracker devices, such as streets and paths identified by Google maps and other services.

   b. The networks of interconnected street paths should be design and constructed to encourage the use of light capacity interconnected narrow roads as much as practicable. This is more important within the housing and business activity areas of Lagos that have pedestrian and bicycle paths.

5. Encourage neighbourhood and city designs that support a range of transportation choices, infrastructure developments, and adequate housing conditions. A practical example of designs that should be encouraged is the proposed Eko Atlantic City Development. Such developments should be effectively implemented with smart infrastructure concepts.

   a. This kind of development can be integrated into built-up areas using spot clearance strategies or can be fostered in identified developing areas.

   b. Mixed housing types with adequate infrastructural facilities that include affordable housing for employees near commercial and transport centres in more vertical development should be introduced and encouraged.

6. The development of smart power supply options is essential for the application of smart infrastructure in Lagos and should be encouraged. Focus should not be placed on

hydropower alone, but on other options as well, including fossil fuels, nuclear energy, and renewable energies such as biomass, geothermal, solar energy, and wind energy.

These recommendations are smart if they are connected in the study areas with smart technology and smart human capacity to adequately implement and operate sustainable infrastructure in the study areas. The areas where these recommendations are applicable are described graphically in Figures 10.1 and 10.2, below.

Figure 10.1 Action areas for smart infrastructure application in Lagos
Source: (Soyinka et al., 2016)
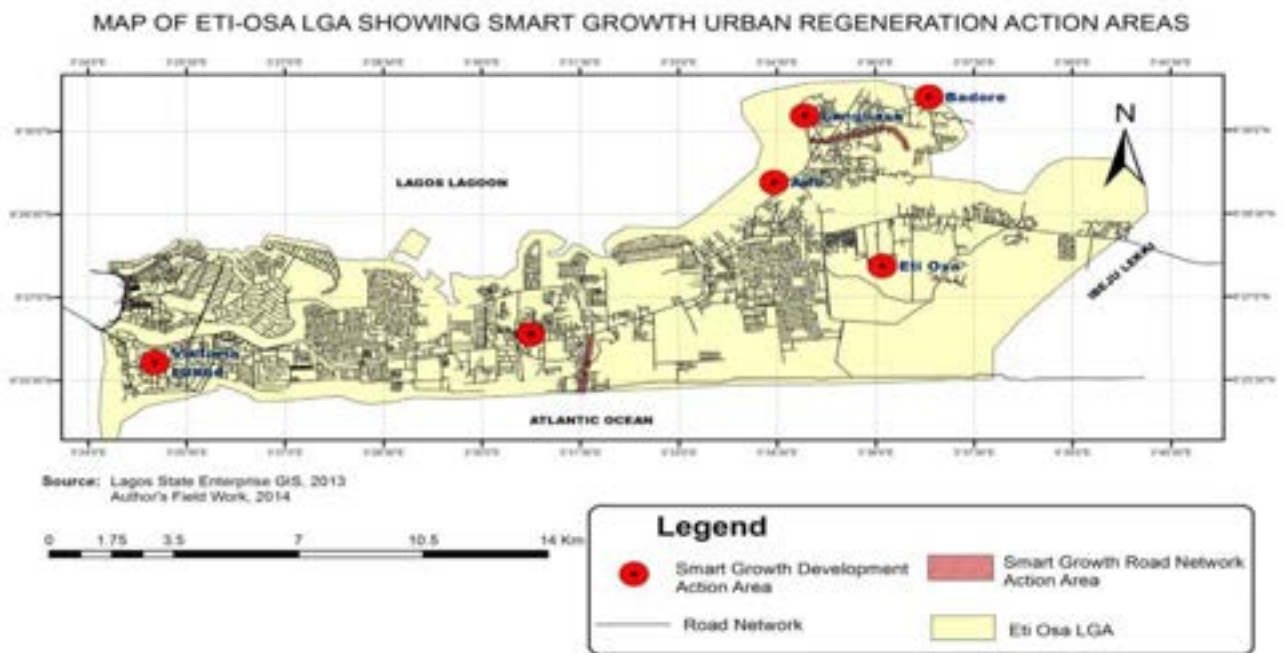
Fig. 7. Action areas for the application of a smart infrastructure strategy in Eti-Osa LGA.

Figure 10.2 Action areas for smart infrastructure application in Lagos
Source: (Soyinka et al., 2016)

10.5 Research Conclusion

In this thesis, all the objectives stated have been achieved through a case study (exploratory design research). The study concludes that informality exists in every country of the world and the nature of informality depends on the development of the country. The study reveals that the different types and natures of informal settlement that can be identified in Hong Kong are cage houses, shanty street structures, informal rooftop settlements, pocket informal settlements, and night markets. This emphasises how informal settlement exists in different forms and severity in different countries of the world. Also, the study reveals that informal settlement is related to infrastructure, although the improved development of infrastructure does not necessarily result in the absence of informality as the case of Hong Kong reflects (despite the developed infrastructure and economy in the SAR, there are hidden slums and squatter settlement). This research also points to the role of socio-economic capacity in relation to informal settlement development. The unequal elements of economic capacity and distribution of economic resources also contribute to informal settlement. This is evident in Hong Kong, as the presence of informal settlement is identified in some specific locations despite the majority of the country being developed.

The nature of informal settlement and the adequacy of infrastructure provision in Hong Kong to foster the required future urban growth that is resilient and sustainable is inadequate.

The reality is not resilient or sustainable enough for the future capacity of Hong Kong considering the factors discussed in this thesis, including the increasing population growth and economic development with a widening gap between the rich and the poor. The high cost of living, the current trend of unaffordable housing, and the non-availability of housing irrespective of infrastructure development will continue to engender informal settlement and subsequently reduce the capacity of the country to foster sustainable and resilient future urban centres.

In Lagos, urban informality also exists; it is associated with several factors and is quite severe. Urban informality is identified as being influenced by the inadequate infrastructure provision and poor economic development in the metropolis, i.e. the proliferation of urban informal settlement is based on inadequate infrastructure in the metropolis, and vice versa. This is evident in the challenges seen in existing infrastructure such as roads, electricity, health care services, and the sewage system, to name just a few infrastructural aspects that are completely devastated in the metropolis and further attract deteriorated shark structures and slum development. The inadequacy and non-availability of infrastructure is a regular experience for residents of Lagos. Where infrastructure is available, it is over-utilised and creates urban environmental pollution. Other factors, including social, economic, and environmental elements are also evident in the metropolis with critical impacts resulting from land administration and policy on the issue. Land administration and planning policy are valuable tools for urban planning and design. The efficient functioning of any urban structure or it is pattern of development is a function of its land administration and planning policy. This aspect as also identified as showing significant challenges in the metropolis.

Therefore, based on these findings, the strategies proposed are study area specific and can be adopted in other UISIP areas for sustainable development. The strategies include 1) integrated urban planning and sustainable design strategy, 2) the tactical urbanism approach towards urban informality and infrastructure planning design, and 3) inclusive sustainable socio-economic and environmental planning design.

10.6 Research Limitation

The research limitation of this study is based on the nature of the research regarding content (the subject of study) and context (location and study areas).

A first limitation is the general lack of consensus and ambiguity about the definition of keywords such as urban informality (urban informal settlement) and infrastructure (facilities and services) in this study. Hence, there was a dependency on literature in the adoption of a specific (UN-Habitat) definition for the study, but this was supported by other literature definitions in this research and applied with contextualization of the definition based on practical evidence. A second limitation was language barriers in data collection because the research cut across different languages and this was discussed with the preparation of the research instruments (both the interviews and question surveys) in English and Chinese, and because more educated respondents were adopted based on the research criteria. A third limitation was the hard access to the respondent who was willing to freely participate in the study, thus, the adoption of the triangulation method of data collection and data analysis was adopted. The data was therefore collected using two or more techniques (direct administration, Survey Monkey, and Microsoft Word Developer sent to qualified respondents through email) for the study observation, questionnaire survey, and the interview approach. Snowball (referral) techniques were also adopted for the interview data collection to manage the language barrier limitation. A fourth limitation was the sensitivity of the nature of the research, which might have affected the low rate of response from public professionals and/or inspired them to be cautious in their responses, holding back a response about policy and government issues. However, this study includes available official documents such as laws, decrees, gazettes, and press releases to support the literature and wealth of data collected to checkmate the limitations.

Above all, the research limitations were adequately addressed with the different approaches adopted in this study, such as triangulation, reliability and validity, and the practices of the study.

10.7 Areas for Further Study

The conclusion of this study does not mean that this area of research is exhausted. In fact, the findings of this research suggest that there are areas of further study to investigate to develop

strategies for improving urban challenges and achieving sustainable urban design. This is essential because of the significance of achieving sustainability in urban development and the severity of UISIP globally.

The findings of this study in relation to global research and this research area suggest further studies could be conducted in the following areas:

1. Smart and resilient urban design strategies towards sustainable urban development.

2. The significance of the internet of things in urban informality and infrastructure planning design for sustainable urban development.

3. Social design enterprise for improving UISIP design for sustainable urban development.

4. UISIP design land use, tenure, and policy reforms towards sustainable urban development.

5. Urban informal settlement sustainable livelihoods and resettlement design strategies.

Considering the significance of this field of study, the list of areas for future studies are not limited to those identified above. However, investigation in these areas will contribute to further bridging the significant gap in academic literature.

Appendices

Apendix1
Household questionnaire survey administered directly in study areas

Pilot Study Questionnaire

Urban Informality and Pro-Poor Infrastructure Planning: A Study of Hong Kong and Lagos Metropolis, Nigeria.

Dear Sir/Madam

My name is SOYINKA Oluwole Abayomi, a PhD candidate at the School of Design, The Hong Kong Polytechnic University, Hong Kong. I am conducting a research on Urban Informality and Pro-Poor Infrastructure Planning: A Comparative Study of Hong Kong, China, and Lagos metropolis Nigeria. This questionnaire survey is a subset of my PhD thesis and is aim is to investigate urban informal settlement and infrastructure adequacy in selected urban areas of Hong Kong and Lagos metropolis.

Answering this questionnaire is voluntary. However, your response will go a long way to improve the living condition of vulnerable residents of urban informal settlement and create a framework for sustainable urban environment for both the developed and developing cities.

I entreat you to kindly respond to the question to the best of your knowledge and it will not take 10minues of your valuable time. I assure you that your participation will remain anonymous and it will be strictly use for academic purposes.

Thank you for your support in saving our environment.

Researcher:
SOYINKA Oluwole Abayomi
PhD Student,
Chief Supervisor:
Prof. Kin Wai Michael-SIU.
Chair Professor, Public Design Lab,
School of Design, The Hong Kong Polytechnic University, Hong Kong.

Background Questions

1. Identify your occupation_____

2. How long have you been staying in this environment?

    a) 0-3years

    b) 4-7 years

    c) 8-10

    d) Above 10 years but not more than 15 years

    e) More than 15years

3. What is your Sex?

    a) Male

    b) Female

Urban informality Questions

Kindly read the instructions carefully and respond to it on a five (5) point Likert scale 1 to 5.
1=Strongly Disagree, 2=Disagree, 3=Neutral (Neither Agree or Disagree), 4=Agree
5=Strongly Agree

4. Urban informal settlement exists in all countries of the world including Hong Kong?

    1) Strongly Disagree

    2) Disagree

    3) Neutral

    4) Agree

    5) Strongly Agree

5. Do you think income and socio-economic status aid informal settlement development?

    1) Strongly Disagree

    2) Disagree

    3) Neutral

    4) Agree

    5) Strongly Agree

Kindly identify the types of informal settlement you think is present in your area from scale of
1 to 5 (5 as highest) and you can choose more than one

6. What types of informal settlement can you identify in Hong Kong?

    1) Illegal land/building ownership (title documents)

    2) Haphazard buildings

    3) Unauthorized settlement

    4) Unplanned zoned uses

    5) Inadequate facilities and services settlements

7. What nature of informal settlement do you think exist in Hong Kong

    1) Cage house informal settlement

    2) Shanty structure informal settlement

    3) Urban inbuilt building informal settlement

    4) Scattered space identified informal settlement

    5) Clustered space identified informal settlement

Infrastructure Availability and Adequacy Question

Kindly read the instructions carefully and response is on five (5) point Likert scale 1 to 5.
1=Very Inadequate, 2=Inadequate, 3=Neutral (Neither Adequate nor Inadequate), 4=Adequate
5=Very Adequate.

8. Housing and residential accommodation is available and adequate in every settlement in Hong Kong?

    1) Very Inadequate

    2) Inadequate

    3) Neutral

    4) Adequate

    5) Very Adequate

9. How adequate do you think every housing and residential apartment in Hong Kong have access to adequate facilities and services? (Water supply, sewerage system, schools, and healthcare facilities).

    1) Very Inadequate

    2) Inadequate

    3) Neutral

    4) Adequate

5) Very Adequate

10. How adequate do you think transport facilities (traffic and pedestrian) serve every settlement in Hong Kong?

1) Very Inadequate

2) Inadequate

3) Neutral

4) Adequate

5) Very Adequate

Consent Form 同意書

A Survey on Urban Informality and Infrastructure Planning: A Study of Hong Kong and Lagos Metropolis, Nigeria

城市非正規化現象與城市基礎設施規劃調查：香港與尼日利亞拉各斯大都會的比較研究

You are invited to participate in the above titled study conducted by Oluwole SOYINKA. A., a PhD candidate of the School of Design, The Hong Kong Polytechnic University. The study has been approved by the Human Subject Ethics Sub-committee (HSESC Ref No: HSEARS20160516001) of The Hong Kong Polytechnic University, Hong Kong.

你被邀請參與由香港理工大學設計學院的博士生 Oluwole SOYINKA. A 發起的此項調查。此次研究已獲香港理工大學人類實驗對象操守委員會（HSESC Ref No:HSEARS20160516001）准許。

The aim of this aspect of the study (Hong Kong Survey) is to conduct a survey on the relationships between urban informality and infrastructure planning in selected study areas of Hong Kong. The survey will involve completing a questionnaire, which will take a maximum of ten minutes (10mins) of your time.

此次問卷的調查目的是研究香港特定地區的城市非正規化現象與城市基礎設施規劃之間的關係。調查包括一份完整問卷，最多只會佔用你 10 分鐘。

The survey will not result into any undue discomfort by any subject required (question and/or personal queries) and you can leave any question(s) or the whole survey at any point without any sanctions whatsoever against you. All information related to you will remain confidential and will only be identified by codes only known to the researcher.

此次調查將不會造成任何不必要的由主題（問題或個人調查）產生的不適，你可以選擇不回答問題或整個問卷當妳覺得問題對你產生不適。所有與你相關的個人信息將被保密以及由調查員根據號碼辨認。

I understand the information above and I am clear with it. I also understand that the information obtained from this research may be used for future published research work and that my right to privacy (my personal details) will not be revealed. The data will be destroyed after the use of this Ph.D. study.

我明白及清楚以上信息。我同時亦明白由此次調查獲得的信息將被用於未來刊登的研究，我的私隱權（個人信息細節）將不會被透露。在此次博士學位階段研究結束後，數據將會被銷毀。

I acknowledge that I have the right to question any part of this study and that participation is voluntary. I also understand that refusal to participate will not attract any sanctions and I can withdraw at any time without penalty of any kind.

我承認我有對此項研究提出問題的權利以及問卷參與者是志願性質。我有權拒絕參與本次問卷調查或隨時取回本份問卷，並且不會受到任何懲罰或利益損失。

I 我 _____ hereby consent to participate in the captioned research 同意參與此項調查。

Date 日期: _____ .

If you have any further enquiry about this study, please contact Prof. Kin-Wai Michael-SIU on m.siu@ or Oluwole SOYINKA on oluwole.a.soyinka@ . If you have any complaints about the conduct of this research study, please do not hesitate to contact Miss Cherrie Mok, Secretary of the Human Subject Ethics Sub-Committee of The Hong Kong Polytechnic University in writing (c/o Research Office of the University) stating clearly the responsible person, the department as well as the HSESC Reference Number.

如果你對於此次研究有進一步的疑問，請通過 m.siu@ 聯繫紹健偉教授或通過 oluwole.a.soyinka@ 聯繫 Oluwole SOYINKA。如你對此次研究過程有任何建議，請以書面聯絡魯港理工大學人類實驗對象操守委員會秘書 Cherrie Mok 女仕並列明慾投訴的小組負責人、其所屬學系以及相關編號，她將會把你寶貴的建議轉交香港理工大學研究室，非常感謝。

Household Questionnaire Survey of Hong Kong Resident 香港市民家庭問卷調查

General Information 基本信息

Notes: **Household**: Household in this survey refers to a unity of family, that is, the father, mother and children. This survey targets the following resident in Hong Kong, however you can answer this survey if you have resided in any of the target district before now or have good knowledge of any of the area.

注意: 家庭：家庭在此次調查等同於家庭成員的聯合，包括父親，母親，子女。

此次調查主要針對以下地區的香港市民，我們亦歡迎曾經在以下地區居住或對以下地區有較深入了解的市民參與問卷調查。

New Territories 新界	Kowloon Peninsular 九龍半島		Hong Kong Island 香港島
Tai Po District 大埔區	Kowloon City District 九龍半島	Sham Shui Po District 深水埗區	Wan Chai District 灣仔區
1. Taipo Market Area 大埔墟	1. Hung Hom 紅磡 2. Homan Tin 何文田	1. Sham Shui Po 深水埗 2. Shek Kip Mei 石硤尾	1. Wan Chai North 灣仔北 2. Wan Chai South 灣仔南

State your District: _____
註明所居住的區: _____

Area in the District: _____
區內的位置: _____

Demographic Survey 人口調查

S/N	Question 問題	Response (Kindly tick the appropriate box) 回答（請在框內打勾）
	SOCIO-ECONOMIC FACTORS (Social Domain) 社會經濟因素 （社會層面）	
1.	What is your gender? 請問你的性別是？	1. Male 男 2. Female 女
2.	What is your age? 請問你的年齡範圍是？	1. 16-30 years 16-30 歲 2. 31-45 years 31-45 歲 3. 46-60 years 46-60 歲 4. 61 and above 61 歲以上
3.	What is your marital status? 請問妳的婚姻狀況是？	1. Single 單身 2. Married 已婚 3. Separated 分居 4. Divorced 離異 5. Widowed 喪偶

4.	What is your highest level of education? 請問你獲得過的最高學歷是？	1. No Formal Education 未接受過正式教育 2. Primary Education 小學 3. Secondary Education 中學 4. Tertiary Education 高等教育
5.	What is the occupation of the household head? 戶主的職業是？	1. Public/ Civil Servant 公職人員 2. Private Employed 自僱人士 3. Business 商人 4. Street Trading 街頭擺賣 5. Others (Specify 其他
6.	What is the estimated household average monthly income? 請問你的家庭成員總收入每月約為多少？	1. Below HKD 15,000 小於 HKD15，000 2. HKD 15,001- 30,000 HKD 3. HKD 30,001- 60,000 HKD 4. HKD 60,001 – 90,000 HKD 5. HKD 90,001 and above 90，001 以上
7.	What is the household size? 請問你的家庭成員數量為？	1. 1 2. 2-4 3. 5-7 4. Others (specify 其他
8.	What is the no. of rooms for household exclusive use? 家庭成員能夠獨自使用的房間數量為？	1. 1 2. 2-4 3. 5 and above. 5 間以上

Section A: Urban Informality A 部分：城市非正規性

S/N	Question 問題	Response (Kindly tick the appropriate box) 回答（請在框內打勾）
	HOUSING AND ENVIRONMENT (Physical Domain) 居住及環境（物理層面）	
9.	What is the predominant building use? 住宅的主要用途為？	1. Residential and Commercial 居住及商用 2. Strictly Commercial 只有商用 3. Strictly Residential 只有租用 4. Others (Specify 其他
10.	What type of building do you reside? 你居住的住宅類型是？	1. Studio Room (any floor) 一室單位（任何樓層） 2. Duplex 複式單位 3. Flats below 1- 10 floors 單位 1-10 樓 4. Flats between 11-20 floors 單位 11-20 樓 5. Flats between 21-30 floors 單位 21-30 樓 6. Others (Specify 其他

11.	What is the estimated age of the building? 你居住的住宅樓齡大概為？	1. Below 10 years 10 年以下 2. 11-20 years 11-20 年 3. 21-30 years 21-30 年 4. 31-40 years 31-40 年 5. 41 and above. 41 年以上
12.	What is the construction material use? 住宅所使用的建築材料為？	1. Concrete Blocks 混泥土 2. Burnt Bricks 燒磚 3. Plank and Bamboo 木板與竹 4. Others (specify 其他
13.	What is the roofing material? 屋頂所使用的材料為？	1. Corrugated Iron Sheet 瓦楞鐵皮 2. Reinforced Concrete Blocks (Decked) 鋼筋混凝土塊 3. Aluminium 鋁 4. Others (specify 其他
14.	What type of toilet facilities is available? 可使用的如廁設施為？	1. Water Closet 抽水馬桶 2. Others (specify 其他
15.	What type of kitchen and location of kitchen available? 可使用的廚房類型及廚房位置？	1. Indoor inclusive kitchen 2. Indoor exclusive kitchen 3. Shared kitchen 4. No kitchen 5. Others (specify 1.開放式廚房 2.封閉式廚房 3.共用廚房 4.沒有廚房 5.其他
16.	Do you think residential accommodation is available and adequate in your area 你覺得所居住的區內居所資源是否足夠？	1.Not available　　　　基本沒有 2.Very inadequate　　　非常短缺 3.Inadequate　　　　　短缺 4.Indifferent　　　　　一般 5.Adequate　　　　　　充足 6. Very adequate　　　　非常充足
CONDITION OF RESIDENCE (Legal Domain) 居住狀況（法律層面）		
17.	What is your residence status? 你的居住狀況為？	1. Building owner (private) 2. Mortgage ownership 3. Public housing 4. Tenant 5. Squatting 6. Others (specify 1.自置物業（無抵押）2.已按揭 3.公屋 4.租戶 5.棚屋 6.其他

18.	If you are owner, how did you get the building? 如果你是業主，你是如何獲得該住宅？	1. Purchase from Government 2. Purchase from Developer 3. Purchase land and build 4. Others (specify 1.向政府購買 2.向開發商購買 3.購買土地及興建 4．其他
19.	If owner what document do you have? 如果你是業主，你擁有什麼證明文件？	1. Kindly specify 請填寫
20.	What type of charge do you pay to government? 你需要向政府支付哪種類型的費用？	1. Tenement charge 2. Land use charge 3. Electricity bill 4. Refuse collection bill 5. Water bill 6. None 7. Others specify 1.居住費 2.土地使用費 3.電費 4.垃圾費 5.水費 6.不需要繳交 7.其他
21.	Have you had any eviction/court threat before? 你是否被驅出住所或收到法告？	1. No eviction 2. No to court threat 3. Yes, to eviction 4. Yes court threat 5. Others (specify 1.沒有試過被驅出住 2.沒有收到法庭警告 3. 是曾被驅逐 4. 是曾遭法庭警告 5.其他
22.	If yes above what is the cause? 如曾被驅出住所或收到法庭警告，原因是因為？	Kindly Specify 請填寫

Section B: Infrastructure B 部分：基礎設施

S/N	Question 問題	Response (Kindly tick the appropriate box)回答（請在框內打勾）

INFRASTRUCTURE AVAILABILITY (Quality and Availability) 基礎設施的可用性（質量及可用性）

| 23. | Which of the following infrastructure do you have in your community? 在你居住的社區有以下哪種基礎設施？ | Kindly tick all the appropriate box/boxes applicable to you 請選擇所有符合的選項並在框內打勾 |

Infrastructure 基礎設施	Not Available 沒有	less than1/2km 少於 1/2km	½ to 1km	2-4km	Above 4km 大於 4km
Health facilities 健康醫護設施					
Sewage& sewerage 排污設施					
Water 用水供應					
Road 道路					
Electricity 電力供應					

| 24. | Who provides the following infrastructure in your District/ Area? 所居住社區的基礎設施是由誰提供？ | Kindly tick all the appropriate box/boxes applicable to you 請選擇所有符合的選項並在框內打勾 |

Infrastructure 基礎設施	Government 政府	Community effort 社區協力提供	Public and community effort 公共及社區協力提供	Private source 私人提供	Not Available 沒有
Health facilities 健康醫護設施					
Sewage& sewerage 排污設施					
Water 用水供應					
Road 道路					
Electricity 電力供應					

| 25. | Which of the following health facilities do you often use? 你經常使用的健康醫護設施是？ | 1. Hospital
2. Patent medicine store
3. Self-medication
4. Traditional Herbs/spiritual house
5. Others (specify
1.醫院 2.處方藥物零售店 3.非處方藥物零售店 4.中藥 / 精神治療 5.其他 |

26.	Have you benefited from the National Health Insurance Scheme before? 你是否曾因政府醫療保障計劃受惠？	1. Yes 2. No 3. No such services for me 4. Others (specify 1.是 2.否 3.沒有醫療保障計劃 4.其他
27.	What is the sewage condition in your area? 你所居住的社區排水狀況如何？	1. Covered and free 2. Open and free 3. Covered but Block 4. Open but Block 5. No sewage 6. Others (specify 1.被覆蓋及暢通 2.開放及暢通 3.被覆蓋但阻塞 4.開放但阻塞 5.沒有排水系統 6.其他
28.	What is the method of sewage and sewerage collection in your area? 社區內的排水方式及污水回收的方法是？	1. Government collection point 2. Private disposal 3. Estate central collection point 4. Communal collection 5. Burning 6. Burying 7. Others (specify 1.政府收集站 2.個人處理 3.物業處理 4.共同收集 5.燃燒 6.填埋 7.其他
29.	What is the sources of water for your household use? 你的家居用水來源是？	1. Government water connection 2. Estate central provision 3. Communal 4. Others (specify 1.政府供應 2.物業供應 3.公社 4.其他
INFRASTRUCTURE ADEQUACY 基礎設施充足性(Adequacy and satisfaction)充足性及滿意程度		
30.	How adequate accessibility to infrastructure in your area? 在所居住的社區內基礎設施是否足夠？	1. Very inadequate 2. Inadequate 3. Indifferent 4. Adequate 5. Very adequate 1.非常不足夠 2.不足夠 3.一般 4.足夠 5.非常足夠

31.	How adequate is health facilities in your area to you? 在所居住的社區內，健康醫療設施是否足夠？	1. Very inadequate 2. Inadequate 3. Indifferent 4. Adequate 5. Very adequate 1.非常不足夠 2.不足夠 3.一般 4.足夠 5.非常足夠
32.	How adequate is sewage and sewerage facilities in your area to you? 在所居住的社區內，污水處理設施是否足夠？	1. Very inadequate 2. Inadequate 3. Indifferent 4. Adequate 5. Very adequate 1.非常不足夠 2.不足夠 3.一般 4.足夠 5.非常足夠
33.	How adequate is water supply in your area? 在所居住的社區內，用水供應是否足夠？	1. Very inadequate 2. Inadequate 3. Indifferent 4. Adequate 5. Very adequate 1.非常不足夠 2.不足夠 3.一般 4.足夠 5.非常足夠
34.	How adequate is your accessibility to infrastructure? 在所居住的社區內，你所能夠使用的公共設施是否足夠？	1. Very inadequate 2. Inadequate 3. Indifferent 4. Adequate 5. Very adequate 1.非常不足夠 2.不足夠 3.一般 4.足夠 5.非常足夠

Thank you 多謝你

Appendix 2
Household questionnaire administered using Microsoft word developer sent via email

You are invited to participate in the above titled study conducted by Oluwole SOYINKA. A., a PhD candidate of the School of Design, The Hong Kong Polytechnic University. The study has been approved by the Human Subject Ethics Sub-committee (HSESC Ref No: HSEARS20160516001) of The Hong Kong Polytechnic University, Hong Kong.

你被邀請參與由香港理工大學設計學院的博士生Oluwole　SOYINKA.　A　發起的此項調查。
此次研究已獲香港理工大學人類實驗對象操守委員會（HSESC　　　　Ref.　　　　No:
HSEARS20160516001）准許。

The aim of this aspect of the study (Hong Kong Survey) is to conduct a survey on the relationships between urban informality and infrastructure planning in selected study areas of Hong Kong. The survey will involve completing a questionnaire, which will take a maximum of ten minutes (10mins) of your time.

此次問卷的調查目的是研究香港特定地區的城市非正規化現象與城市基礎設施規劃之間的關係。調查包括一份完整問卷，最多只會佔用你10分鐘。

The survey will not result into any undue discomfort by any subject required (questions and/or personal queries), and you can leave any question(s) or the whole survey at any point without any sanctions whatsoever against you. All information related to you will remain confidential and will only be identified by codes only known to the researcher.

此次調查將不會造成任何不必要的由主題（問題或個人調查）產生的不適，你可以選擇不回答問題或整個問卷當妳覺得問題對你產生不適。所有與你相關的個人信息將被保密以及由調查員根據號碼辨認。

I understand the information above and I am clear with it. I also understand that the information obtained from this research may be used for future published research work and that my right to privacy (my personal details) will not be revealed. The data will be destroyed after the use of this Ph.D. study.

我明白及清楚以上信息。我同時亦明白由此次調查獲得的信息將被用於未來刊登的研究，我的私隱權（個人信息細節）將不會被透露。在此次博士學位階段研究結束後，數據將會被銷毀。

I acknowledge that I have the right to question any part of this study and that participation is voluntary. I also understand that refusal to participate will not attract any sanctions and I can withdraw at any time without penalty of any kind.

1

我承認我有對此項研究提出問題的權利以及問卷參與者是志願性質。我有權拒絕參與本次問卷調查或隨時取回本份問卷，並且不會受到任何懲罰或利益損失。

I   click here to enter Name點擊此處輸入名字. Hereby consent to participate in the captioned research.

Date Click here to enter a date點擊此處輸入日期.

If you have any further enquiry about this study, please contact Prof. Kin-Wai Michael-SIU on m.siu@   or Oluwole SOYINKA on oluwole.a.soyinka@   If you have any complaints about the conduct of this research study, please do not hesitate to contact Miss Cherrie Mok, Secretary of the Human Subject Ethics Sub-Committee of The Hong Kong Polytechnic University in writing (c/o Research Office of the University) stating clearly the responsible person, the department as well as the HSESC Reference Number.

如果你對於此次研究有進一步的疑問，請通過m.siu@   聯繫紹健偉教授或通過oluwole.a.soyinka@   聯繫 Oluwole SOYINKA。

如你對此次研究過程有任何建議，請以書面聯絡香港理工大學人類實驗對象操守委員會秘書Cherrie Mok女仕並列明您投訴的小組負責人、其所屬學系以及相關編號，她將會把你寶貴的建議轉交香港理工大學研究室，非常感謝。

Household Questionnaire Survey of Hong Kong Resident香港市民家庭問卷調查

General Information基本信息

Notes: **Household**: Household in this survey refers to a unity of family, that is, the father, mother and children. This survey targets the following resident in Hong Kong, however you can answer this survey if you have resided in any of the target district before now or have good knowledge of any of the area.

注意: 家庭：家庭在此次調查等同於家庭成員的聯合，包括父親，母親，子女。

此次調查主要針對以下地區的香港市民，我們亦歡迎曾經在以下地區居住或對以下地區

有較深入了解的市民參與問卷調查。

New Territories 新界	Kowloon Peninsular 九龍半島		Hong Kong Island 香港島
Tai Po District 大埔區	Kowloon City District 九龍半島	Sham Shui Po District 深水埗區	Wan Chai District 灣仔區
1. Taipo Market Area 大埔墟	1. Hung Hom 紅磡 2. Homan Tin 何文田	1. Sham Shui Po 深水埗 2. Shek Kip Mei 石硤尾	1. Wan Chai North 灣仔北 2. Wan Chai South 灣仔南

State your District 註明所居住的區: 選擇一個項目Choose an item.

Area in the District 區內的位置: 選擇一個項目Choose an item.

Resident Location 居住位置: 選擇一個項目Choose an item.

Demographic Survey人口調查

S/N	Question問題	Response (Kindly tick the appropriate box) 回答（請在框內打勾）
	SOCIO-ECONOMIC FACTORS (Social Domain) 社會經濟因素（社會層面）	
1.	What is your gender? 請問你的性別是？	選擇一個項目Choose an item.
2.	What is your age? 請問你的年齡範圍是？	選擇一個項目Choose an item.
3.	What is your marital status? 請問妳的婚姻狀況是？	選擇一個項目Choose an item.
4.	What is your highest level of education? 請問你獲得過的最高學歷是？	選擇一個項目Choose an item.
5.	What is the occupation of the household head? 戶主的職業是？	選擇一個項目Choose an item.
6.	What is the estimated household average monthly income? 請問你的家庭成員總收入每月約為多少？	選擇一個項目Choose an item.
7.	What is the household size? 請問你的家庭成員數量為？	選擇一個項目Choose an item.
8.	What is the no. of rooms for household exclusive use? 家庭成員能夠獨自使用的房間數量為？	選擇一個項目Choose an item.

Section A: Urban Informality A部分：城市非正規性

S/N	Question 問題	Response (Kindly tick the appropriate box) 回答（請在框內打勾）
HOUSING AND ENVIRONMENT (Physical Domain) 居住及環境（物理層面）		
9.	What is the predominant building use? 住宅的主要用途為？	選擇一個項目Choose an item.
10.	What type of building do you reside? 你居住的住宅類型是？	選擇一個項目Choose an item.
11.	What is the estimated age of the building? 你居住的住宅樓齡大概為？	選擇一個項目Choose an item.
12.	What is the construction material use? 住宅所使用的建築材料為？	選擇一個項目Choose an item.
13.	What is the roofing material? 屋頂所使用的材料為？	選擇一個項目Choose an item.
14.	What type of toilet facilities is available? 可使用的如廁設施為？	選擇一個項目Choose an item.
15.	What type of kitchen and location of kitchen available? 可使用的廚房類型及廚房位置？	選擇一個項目Choose an item.
16.	Do you think residential accommodation is available and adequate in your area 你覺得所居住的區內居所資源是否足夠？	選擇一個項目Choose an item.
CONDITION OF RESIDENCE (Legal Domain) 居住狀況（法律層面）		
17.	What is your residence status? 你的居住狀況為？	選擇一個項目Choose an item.
18.	If you are owner, how did you get the building? 如果你是業主，你是如何獲得該住宅？	選擇一個項目Choose an item.
19.	If owner what document do you have? 如果你是業主，你擁有什麼證明文件？	Click here to enter text 點擊此處輸入.
20.	What type of charge do you pay to government? 你需要向政府支付哪種類型的費用？	選擇一個項目Choose an item.
21.	Have you had any eviction/court threat before? 你是否被驅出住所或收到法告？	選擇一個項目Choose an item.
22.	If yes above what is the cause? 如曾被驅出住所或收到法庭警告，原因是因為？	Click here to enter text 點擊此處輸入.

Section B: Infrastructure 部分：基礎設施

S/N	Question 問題	Response (Kindly tick the appropriate box/boxes) 回答（請在框內打勾）					
		INFRASTRUCTURE AVAILABILITY (Quality and Availability) 基礎設施的可用性（質量及可用性）					
23.	Which of the following infrastructure do you have in your community? 在你居住的社區有以下哪種基礎設施	Kindly tick appropriate box/boxes applicable to you (one in each row) 請選擇所有符合的選項並在框內打勾					
		Infrastructure 基礎設施	Not Available 沒有	Less than ½ km 少於1/2km	½ to 1km	2-4km	Above 4km 大於4km
		Health Facilities 健康醫護設施	☐	☐	☐	☐	☐
		Sewage& sewerage 排污設施	☐	☐	☐	☐	☐
		Water 用水供應	☐	☐	☐	☐	☐
		Road 道路	☐	☐	☐	☐	☐
		Electricity 電力供應	☐	☐	☐	☐	☐
24.	Who provides the following infrastructure in your District/ Area?	Kindly tick appropriate box/boxes applicable to you (one in each row) 請選擇所有符合的選項並在框內打勾					
		Infrastructure 基礎設施	Government 政府	Community effort 社區協力提供	Public and community effort 公共及社區協力提供	Private source 私人提供	Not Available 沒有
		Health facilities 健康醫護設施	☐	☐	☐	☐	☐
		Sewage& sewerage 排污設施	☐	☐	☐	☐	☐
		Water 用水供應	☐	☐	☐	☐	☐
		Road 道路	☐	☐	☐	☐	☐
		Electricity電力供應	☐	☐	☐	☐	☐
25.	Which of the following health facilities do you often use? 你經常使用的健康醫護設施是？	選擇一個項目Choose an item.					
26.	Have you benefited from the National Health Insurance Scheme before? 你是否曾因政府醫療保障計劃受惠？	選擇一個項目Choose an item.					
27.	What is the sewage condition	選擇一個項目Choose an item.					

	in your area? 你所居住的社區 排水狀況如何？	
28.	What is the method of sewage and sewerage collection in your area? 社區內的排水方式及污水回收的方法是？	選擇一個項目 Choose an item.
29.	What is your source of water for household use? 你的家居用水來源是？	選擇一個項目 Choose an item.
INFRASTRUCTURE ADEQUACY 基礎設施充足性(Adequacy and satisfaction) 充足性及滿意程度		
30.	How adequate is accessibility to infrastructure in your area? 在所居住的社區內基礎設施是否足夠？	選擇一個項目 Choose an item.
31.	How adequate is health facilities in your area to you? 在所居住的社區內，健康醫療設施是否足夠？	選擇一個項目 Choose an item.
32.	How adequate is sewage and sewerage facilities in your area to you? 在所居住的社區內，污水處理設施是否足夠？	選擇一個項目 Choose an item.
33.	How adequate is water supply in your area? 在所居住的社區內，用水供應是否足夠？	選擇一個項目 Choose an item.
34.	How adequate is your accessibility to infrastructure? 在所居住的社區內，你所能夠使用的公共設施是否足夠？	選擇一個項目 Choose an item.

Thank you 多謝你

Appendix 3
Household interview question

Urban Informality and Infrastructure Planning: The Study of Hong Kong and Lagos Metropolis, Nigeria.

城市非正規化現象與城市基礎設施規劃調查：香港與尼日利亞拉各斯大都會的比較研究

Information 引言

You are invited to participate in the above-titled study conducted by Oluwole SOYINKA, a Ph.D. candidate at the School of Design, The Hong Kong Polytechnic University. This study has been approved by the Human Subject Ethics Sub-committee (HSESC Ref No: HSEARS20160516001) of the institution.

你被邀請參與由香港理工大學設計學院的博士生 Oluwole SOYINKA. A 發起的此項調查。此次研究已獲香港理工大學人類實驗對象操守委員會（HSESC Ref No: HSEARS20160516001）准許。

The focus of this study is to investigate urban informality and infrastructure in Hong Kong and Lagos metropolis Nigeria and develop a strategy to ameliorate this global challenge.

此項研究的目的是調查香港與尼日利亞拉各斯大都會的城市非正規化現象與城市基礎設施規劃，以及制定出改善這項全球性挑戰的策略。

The interview should not result into any undue discomfort by any subject required (question/s) and you can leave any question(s) or the whole interview at any point without any sanctions whatsoever against you. All information related to you will remain confidential and will only be identified by codes only known to the researcher.

此次調查將不會造成任何不必要的由主題（問題或個人調查）產生的不適，你可以選擇不回答問題或整個問卷當妳覺得問題對你產生不適。所有與你相關的個人信息將被保密以及由調查員根據號碼辨認。

Consent Form 同意書

I understand the information above and I am clear with it. I also understand that the information obtained from this research may be used for future published research work and that my right to privacy (my personal details) will not be revealed.

我明白及清楚以上信息。我同時亦明白由此次調查獲得的信息將被用於未來的研究，我的私隱權（個人信息細節）將不會被透露。

I acknowledge that I have the right to question any part of this study and that participation is voluntary. I also understand that refusal to participate will not attract any sanctions and I can withdraw at any time without penalty of any kind.

我承認我有對此項研究提出問題的權利以及問卷參與者是志願性質。我有權拒絕參與本次問卷調查或隨時取回本份問卷，並且不會受到任何懲罰或利益損失。

I 我: _____hereby consent to participate in the above captioned research. 特此同意參與以上提及的調查。

Enter Date 輸入日期：：_____

If you have any further inquiry about this study, please contact Prof. Kin-Wai Michael-SIU on m.siu@_____ or Oluwole SOYINKA on Oluwole.a.soyinka@_____ . If you have any complaints about the conduct of this research study, please do not hesitate to contact Miss Cherrie Mok, Secretary of the Human Subject Ethics Sub-Committee of The Hong Kong Polytechnic University in writing (c/o Research Office of the University) stating clearly the responsible person, the department as well as the HSESC Reference Number.

如果你對於此次研究有進一步的疑問，請通過 m.siu@　　　　聯繫紹健偉教授或通過 oluwole.a.soyinka@　　　　．聯繫 Oluwole SOYINKA。如對此次研究過程有任何建議，請以書面聯絡香港理工大學人類主體倫理小組委員會秘書 Cherrie Mok 女仕並列明慾投訴的小組負責人、其所屬學系以及相關編號，她將會把你寶貴的建議轉交香港理工大學研究室，非常感謝。

Notes: 1.　No question is compulsory; interviewee is free not to answer any question
2.　No right or wrong answer(s) to any question, the interviewee is free to answer all questions or any question to the best of their knowledge of Hong Kong.

注意：1. 所有問題均為自願性質；參與者可選擇是否回答任何問題。
　　　2. 任何問題都沒有對與錯，參與者可充分根據個人對香港的了解程度回答所有問題或個別問題。

Interview Question Types 面試問題類型

Question 1:　　Sir/Ma, do you think informal settlement and infrastructure challenge is a global challenge and does it exist in Hong Kong?

問題 1:　　先生／小姐，你覺得**城市非正規化現象與城市基礎設施規劃是全球性的挑戰嗎？它是否在香港存在？**

Question 2 or 3:　　Sir/Ma, if you think this challenge exists in Hong Kong how does it occur or what is the nature of existence in Hong Kong?

問題 2 或 3:　　先生／小姐，如果你覺得這個挑戰在香港存在，你覺得它是如何發生？或它在香港存在的性質是？

Question 2 or 3:　　Sir/Ma, if you think this challenge does not exist in Hong Kong what is the significant approach for that reason?

問題 2 或 3:　　先生／小姐，如果你覺得這個挑戰在香港不存在，你覺得罪顯著的原因是？

Question 4:　　Sir/Ma, do you think socio-economic status (financial capability) affect the condition of living and access to infrastructure in Hong Kong?

問題 4:　　先生／小姐，你是否覺得在香港社會經濟地位（經濟能力）會影響居住環境以及基礎設施的使用？

Question 5:　　Sir/Ma, are you satisfied with housing and infrastructure in Hong Kong?

問題 5:　　先生／小姐，你是否滿意香港的居住房屋以及基礎設施？

Question 6:　　Sir/Ma, if yes can you discuss why and If no can you explain it?

問題 6:　　先生／小姐，請妳描述滿意或不滿意的原因。

Thank you 多謝你

Appendix 4
Professional interview question

Urban Informality and Pro-Poor Infrastructure Planning: The Study of Hong Kong and Lagos Metropolis, Nigeria.

You are invited to participate in the above-titled study conducted by Oluwole SOYINKA, a PhD candidate of the School of Design, The Hong Kong Polytechnic University. The study has been approved by the Human Subject Ethics Sub-committee (HSESC Ref No: HSEARS20160516001) of the institution.

The aim of this aspect of the study is to conduct a survey on the relationships between urban informality and infrastructure planning in selected study areas of Lagos Metropolis. The survey will involve completing questionnaire, interview and focus group discussion which will take maximum half an hour (30mins) of your time.

The survey should not result into any undue discomfort by any subject required (photograph, recording and videotape) and you can leave any question(s) or the whole survey at any point without any sanctions whatsoever against you. All information related to you will remain confidential and will only be identified by codes only known to the researcher.

I agree that I understand the information above and I am clear with it. I also understand that the information obtained from this research may be used for future published research work and that my right to privacy (my personal details) will not be revealed.

I acknowledge that I have the right to question any part of this study and that participation is voluntary. I also understand that refusal to participate will not attract any sanctions and I can withdraw at any time without penalty of any kind.

I: _____hereby consent to participate in the above captioned research.

Enter Date: _____

If you have any further enquiry about this study, please contact Prof. Kin-Wai Michael-SIU on m.siu@_____ or Oluwole SOYINKA on Oluwole.a.soyinka@_____ . If you have any complaints about the conduct of this research study, please do not hesitate to contact Miss Cherrie Mok, Secretary of the Human Subject Ethics Sub-Committee of The Hong Kong Polytechnic University in writing (c/o Research Office of the University) stating clearly the responsible person, the department as well as the HSESC Reference Number.

Professionals Interview Questions

Question 1: Can you tell us about yourself, your industry; portfolio and year of experience?

Q2: In your own opinion, what do think urban informality is and do you think it exist in Lagos Metropolis *(Lagos metropolis replaced for Hong Kong in Hong Kong interview)*?

Q3: Considering your wealth of experience how do you think urban informality originated in Lagos Metropolis and how does it affect Lagos Metropolis?

Q4: Do you think socioeconomic status (poverty) induce urban informality and make people live in urban informality?

Q5: Please can you tell us about the state of Infrastructure in Lagos Metropolis (Physical Infrastructure)?

Q6: Sir/Ma, do you think sufficient or lack of infrastructure has anything to do with urban informality using Lagos Metropolis as your reference?

Q7: What do you think is the role of Government or how has the role of Government (Lagos Government) affect urban informality and infrastructure in Lagos Metropolis?

Q8: What do you think can be done as regarding urban informality?

Thank you, Sir/Ma.

Appendix 5
Interview response extract

Interview response extract from Hong Kong

……Long time ago it exits in Kowloon city (Kowloon walled city) though it transforms to other kind of problem. In different city it exists in different format. Long time ago Hong Kong was not development the building was not advanced as govt was not involve so people build their own building and then they are poor and then the economy was better but now getting wealth is difficult despite the education and working pay salary. But now some people from mainland China who could not afford to buy houses then buy flats and subdivide which may not be illegal in Hong Kong this days…. of about 80 square feet…. not because they are very poor but because the prices are too high compared to the salary being earned so building houses….

...yes, I am satisfied. From my own experience, if I compare with other country Hong Kong is doing quite good. Although I live in lofted part of new territory and the public transport is very convenient and reliable always on time although seldom might be late sometimes…. Although at the moment the accommodation is still affordable but a little bit expensive if you live further away from the city centre….it is affordable, effective, and efficient…

Yes, I think it is a global challenge, I think it happens in Hong Kong and it happens in some developed countries. I do not know there is a global standard for this. I think this condition may be happening because of the extreme economic condition of the people, the rich getting richer and the poorer getting poorer that makes the living condition and even the community status substandard going to the extreme and this is what informal settlement is….

Informal settlement is part of nature, so it is a global challenge. In terms of infrastructure challenges is based on the development and it is look different by different people which invariably is the way we live, rather than saying infrastructure has a challenge then it should be the way we shall continue to live in this earth, when people are moving 21 tons of materials per day on the average…

Interview Response extract from Lagos metropolis

….it does exist in Lagos metropolis's economic affects infrastructure i.e. the poverty level and now that there is inflation. Infrastructure is a major duty of the government, which is meant to urbanize villages if the facilities are improved to reduce the pressure on the cities…

Urban informality is an alternative system of doing things outside of the formal sector. Yes, it exists in Lagos state. About 70 percent of Lagosian live in informal settlement and about 80 percent of jobs created are created within the informal economy sectors and…

…Its origin is a carryover from the colonial time when the colonial master establishes a dualize cities that emerge into GRA and the native quarts that emerge into the current informal settlement and lots of constraint in accessing lands. Land use decree makes land transaction cumbersome which makes lots of people step outside of the regular government protocol of obtaining land which has inturn increase informality…

…the existence of infrastructure either in place or not in place has a great influence, if infrastructure is not available it creates room for informality as different people does the development based on their state since there is no infrastructure in place but even at that in countries where there is infrastructure there are still slums in some areas.

…I will say yes, architecture in terms of materials, furnishes, even the design has a lot to do with the society and urban informal settlement… be it urban or rural the way we develop on prototype is based on our background, culture, religion among others... Based on culture for instance as a Yoruba man if I must imbibe culture it will determine the kind of houses in the irrespective of other factors… but mostly it's a combination of several factors...

Urban informality could be formal setting which is the inbuilt norm but once you go against the norm of what should not be there…

Appendix 6
Descriptive and inferential statistics

Descriptive and inferential statistic from Hong Kong

Cross-tabulation of relevant variables

Occupation * Health Infrastructure Availability Crosstabulation							
Count							
		Health Infrastructure Availability					Total
		Not Available	less than1/2km	1/2 to1km	2 to 4km	Above 4km	
Occupation	Public/Civil Servant	0	12	6	0	7	25
	Private Employed	26	34	20	27	21	128
	Business	6	39	17	42	19	123
	Street Trading	0	4	4	0	0	8
	Student	18	54	13	0	4	89
Total		50	143	60	69	51	373

Occupation * Water Infrastructure Availability Crosstabulation						
Count						
		Water Infrastructure Availability				Total
		less than1/2km	1/2 to1km	2 to 4km	Above 4km	
Occupation	Public/Civil Servant	18	0	0	7	25
	Private Employed	50	43	14	21	128
	Business	82	26	0	0	108
	Street Trading	8	0	0	0	8
	Student	73	10	0	6	89
Total		231	79	14	34	358

Occupation * Road Infrastructure Availability Crosstabulation						
Count						
		Road Infrastructure Availability				Total
		less than1/2km	1/2 to1km	2 to 4km	Above 4km	
Occupation	Public/Civil Servant	18	0	7	0	25
	Private Employed	47	53	7	21	128
	Business	93	11	0	19	123
	Street Trading	8	0	0	0	8
	Student	79	4	0	6	89
Total		245	68	14	46	373

Room Exclusively use * Health Infrastructure Availability Crosstabulation							
Count							
		Health Infrastructure Availability					Total
		Not Available	less than1/2km	1/2 to1km	2 to 4km	Above 4km	
Room Exclusively use	1	18	26	5	11	11	71
	2-4	26	117	55	58	40	296
Total		44	143	60	69	51	367

Descriptive and inferential statistic from Lagos metropolis

Cross-tabulation of relevant variables

Occupation of head of household * presence and distance of road facility in the community crosstabulation						
Count						
		Presence and distance of road facility in the community				Total
		Not available	Walking distance (less than 1/2km)	1/2 to 1 km	2-4 km	
Occupation of head of household	Public / civil servant	15	1	2	0	18
	Privately employed	42	38	3	10	93
	Business	122	93	0	28	243
	Informal economy	29	33	0	5	67
	Other	18	18	0	12	48
Total		226	183	5	55	469

Occupation of head of household * presence and distance of electricity facility in the community crosstabulation							
Count							
		Presence and distance of electricity facility in the community					Total
		Not available	Walking distance (less than 1/2km)	1/2 to 1 km	2-4 km	More than 4km	
Occupation of head of household	Public / civil servant	9	2	1	4	2	18
	Privately employed	26	42	6	18	1	93
	Business	76	94	12	52	9	243
	Informal economy	14	31	6	16	0	67
	Other	11	19	5	13	0	48
Total		136	188	30	103	12	469

Average monthly income * presence and distance of health facility in the community crosstabulation							
Count							
		Presence and distance of health facility in the community					Total
		Not available	Walking distance (less than 1/2km)	1/2 to 1 km	2-4 km	More than 4km	
Average monthly income	#20,000 and below	14	120	24	6	0	164
	#20,001 - #50,000	14	161	9	10	4	198
	#50,001 - #80,000	7	42	4	9	0	62
	#80,001 - #110,000	4	23	0	4	0	31
	#110,001 and above	0	12	1	1	0	14
Total		39	358	38	30	4	469

Average monthly income * presence and distance of road facility in the community crosstabulation						
Count						
		Presence and distance of road facility in the community				Total
		Not available	Walking distance (Less than 1/2km)	1/2 to 1 km	2-4 km	
Average monthly income	#20,000 and below	66	78	3	17	164
	#20,001 - #50,000	100	78	0	20	198
	#50,001 - #80,000	44	14	0	4	62
	#80,001 - #110,000	14	8	1	8	31
	#110,001 and above	2	5	1	6	14
Total		226	183	5	55	469

Correlate of socio-economic and environmental variables Hong Kong and Lagos metropolis: Pearson Correlation

Descriptive Statistics of socio-economic and environmental correlate in Hong Kong

	Mean	Std. Deviation	N
Gender	1.2308	.42187	390
Age	1.2769	.51729	390
Level of Education	3.6179	.48651	390
Occupation	3.0256	1.25608	390
Household Size	2.1564	.36371	390
Room Exclusively use	1.7995	.40091	384
Building Use	1.6744	.92612	390
Type of Building Residence	3.1897	1.16058	390
Age of Building	2.9103	1.08253	390
Construction Materials	1.1026	.30378	390
Roofing Materials	1.7154	.50552	390
Residential Status	2.7513	1.15716	390

Descriptive Statistics of socio-economic and environmental correlate in Lagos metropolis

Descriptive Statistics			
	Mean	Std. Deviation	N
Gender	1.53	.500	469
Age in years	2.86	.947	469
Highest level of education	3.08	.766	469
Occupation of head of household	3.07	.949	469
House hold size	1.84	.703	469
Number of rooms for exclusive household use	2.03	1.033	469
Types of building	1.97	1.291	469
Age of building	2.22	1.336	469
Building construction material	1.85	1.129	469
Roofing material	1.75	1.093	469
What is your type of residence	2.61	1.072	469

		Gender	Age	Level of Education	Occupation	Household Size	Room Exclusively use	Building Use	Type of Building Residence	Age of Building	Construction Materials	Roofing Materials	Residential Status
	Pearson Correlation	1	-.034	.105*	-.293**	.284**	.092	.219**	.173**	-.045	.156**	.116*	.097
	Sig. (2-tailed)		.498	.038	.000	.000	.072	.000	.001	.380	.002	.022	.056
Gender	Sum of Squares and Cross-products	69.231	-2.923	8.385	-60.308	16.923	5.844	33.308	32.923	-7.923	7.769	9.615	18.385
	Covariance	.178	-.008	.022	-.155	.044	.015	.086	.085	-.020	.020	.025	.047
	N	390	390	390	390	390	384	390	390	390	390	390	390
	Pearson Correlation	-.034	1	-.222**	-.134**	-.026	-.185**	.119*	.024	-.043	-.034	.145**	.034
	Sig. (2-tailed)	.498		.000	.008	.611	.000	.019	.642	.400	.503	.004	.506
Age	Sum of Squares and Cross-products	-2.923	104.092	-21.738	-33.769	-1.892	-14.547	22.169	5.508	-9.308	-2.077	14.738	7.862
	Covariance	-.008	.268	-.056	-.087	-.005	-.038	.057	.014	-.024	-.005	.038	.020
	N	390	390	390	390	390	384	390	390	390	390	390	390
	Pearson Correlation	.105*	-.222**	1	.083	.048	.139**	.117*	.033	.213**	.040	.017	-.096
Level of Education	Sig. (2-tailed)	.038	.000		.100	.344	.006	.021	.514	.000	.434	.743	.058
	Sum of Squares and Cross-products	8.385	-21.738	92.074	19.821	3.305	10.326	20.479	7.272	43.628	2.282	1.592	-21.059
	Covariance	.022	-.056	.237	.051	.008	.027	.053	.019	.112	.006	.004	-.054
	N	390	390	390	390	390	384	390	390	390	390	390	390
	Pearson Correlation	-.293**	-.134**	.083	1	.002	-.076	-.194**	-.148**	.380**	-.061	-.033	-.088
	Sig. (2-tailed)	.000	.008	.100		.961	.135	.000	.003	.000	.231	.516	.084
Occupation	Sum of Squares and Cross-products	-60.308	-33.769	19.821	613.744	.436	-14.792	-87.744	-83.897	200.897	-9.026	-8.154	-49.513
	Covariance	-.155	-.087	.051	1.578	.001	-.039	-.226	-.216	.516	-.023	-.021	-.127
	N	390	390	390	390	390	384	390	390	390	390	390	390
	Pearson Correlation	.284**	-.026	.048	.002	1	.146**	-.085	-.022	-.114*	.413**	.187**	-.078
	Sig. (2-tailed)	.000	.611	.344	.961		.004	.094	.668	.024	.000	.000	.122
Household Size	Sum of Squares and Cross-products	16.923	-1.892	3.305	.436	51.459	8.232	-11.136	-3.574	-17.526	17.744	13.362	-12.828
	Covariance	.044	-.005	.008	.001	.132	.021	-.029	-.009	-.045	.046	.034	-.033
	N	390	390	390	390	390	384	390	390	390	390	390	390
	Pearson Correlation	.092	-.185**	.139**	-.076	.146**	1	-.114*	.539**	.253**	.171**	.253**	-.069
Room Exclusively use	Sig. (2-tailed)	.072	.000	.006	.135	.004		.026	.000	.000	.001	.000	.180
	Sum of Squares and Cross-products	5.844	-14.547	10.326	-14.792	8.232	61.560	-16.263	96.839	42.185	8.021	19.742	-12.247
	Covariance	.015	-.038	.027	-.039	.021	.161	-.042	.253	.110	.021	.052	-.032
	N	384	384	384	384	384	384	384	384	384	384	384	384
	Pearson Correlation	.219**	.119*	.117*	-.194**	-.085	-.114*	1	-.033	.194**	.119*	-.297**	.015
Building Use	Sig. (2-tailed)	.000	.019	.021	.000	.094	.026		.513	.000	.019	.000	.762
	Sum of Squares and Cross-products	33.308	22.169	20.479	-87.744	-11.136	-16.263	333.644	-13.903	75.603	13.026	-54.146	6.413
	Covariance	.086	.057	.053	-.226	-.029	-.042	.858	-.036	.194	.033	-.139	.016

	N	390	390	390	390	390	384	390	390	390	390	390	390
Type of Building Residence	Pearson Correlation	.173**	.024	.033	-.148**	-.022	.539**	-.033	1	.036	.090	.162**	.098
	Sig. (2-tailed)	.001	.642	.514	.003	.668	.000	.513		.477	.074	.001	.052
	Sum of Squares and Cross-products	32.923	5.508	7.272	-83.897	-3.574	96.839	-13.903	523.959	17.641	12.410	37.062	51.405
	Covariance	.085	.014	.019	-.216	-.009	.253	-.036	1.347	.045	.032	.095	.132
	N	390	390	390	390	390	384	390	390	390	390	390	390
Age of Building	Pearson Correlation	-.045	-.043	.213**	.380**	-.114*	.253**	.194**	.036	1	-.034	-.042	.013
	Sig. (2-tailed)	.380	.400	.000	.000	.024	.000	.000	.477		.497	.407	.799
	Sum of Squares and Cross-products	-7.923	-9.308	43.628	200.897	-17.526	42.185	75.603	17.641	455.859	-4.410	-8.962	6.295
	Covariance	-.020	-.024	.112	.516	-.045	.110	.194	.045	1.172	-.011	-.023	.016
	N	390	390	390	390	390	384	390	390	390	390	390	390
Construction Materials	Pearson Correlation	.156**	-.034	.040	-.061	.413**	.171**	.119*	.090	-.034	1	.124*	.146**
	Sig. (2-tailed)	.002	.503	.434	.231	.000	.001	.019	.074	.497		.015	.004
	Sum of Squares and Cross-products	7.769	-2.077	2.282	-9.026	17.744	8.021	13.026	12.410	-4.410	35.897	7.385	19.949
	Covariance	.020	-.005	.006	-.023	.046	.021	.033	.032	-.011	.092	.019	.051
	N	390	390	390	390	390	384	390	390	390	390	390	390
Roofing Materials	Pearson Correlation	.116*	.145**	.017	-.033	.187**	.253**	-.297**	.162**	-.042	.124*	1	.046
	Sig. (2-tailed)	.022	.004	.743	.516	.000	.000	.000	.001	.407	.015		.368
	Sum of Squares and Cross-products	9.615	14.738	1.592	-8.154	13.362	19.742	-54.146	37.062	-8.962	7.385	99.408	10.392
	Covariance	.025	.038	.004	-.021	.034	.052	-.139	.095	-.023	.019	.256	.027
	N	390	390	390	390	390	384	390	390	390	390	390	390
Residential Status	Pearson Correlation	.097	.034	-.096	-.088	-.078	-.069	.015	.098	.013	.146**	.046	1
	Sig. (2-tailed)	.056	.506	.058	.084	.122	.180	.762	.052	.799	.004	.368	
	Sum of Squares and Cross-products	18.385	7.862	-21.059	-49.513	-12.828	-12.247	6.413	51.405	6.295	19.949	10.392	520.874
	Covariance	.047	.020	-.054	-.127	-.033	-.032	.016	.132	.016	.051	.027	1.339
	N	390	390	390	390	390	384	390	390	390	390	390	390

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations of socio-economic and environmental variables in Lagos metropolis											
		Gender	Age in Years	Education	Occupation	House Hold Sze	Rooms for Exclusive use	Types of Building	Age of building	Building construction material	Roofing material	Type of residence
Gender	Pearson Correlation	1	.047	.016	.009	-.020	-.113*	-.111*	.037	.047	-.143**	.039
	Sig. (2-tailed)		.309	.726	.844	.660	.014	.016	.427	.307	.002	.397
	Sum of Squares and Cross-products	116.861	10.429	2.906	2.021	-3.341	-27.345	-33.539	11.478	12.486	-36.661	9.825
	Covariance	.250	.022	.006	.004	-.007	-.058	-.072	.025	.027	-.078	.021
	N	469	469	469	469	469	469	469	469	469	469	469
Age in Years	Pearson Correlation	.047	1	-.258**	.066	-.009	-.129**	-.179**	-.035	.134**	-.098*	-.081
	Sig. (2-tailed)	.309		.000	.152	.851	.005	.000	.443	.004	.033	.080
	Sum of Squares and Cross-products	10.429	419.429	-87.571	27.857	-2.714	-59.286	-102.286	-21.000	67.143	-47.571	-38.429
	Covariance	.022	.896	-.187	.060	-.006	-.127	-.219	-.045	.143	-.102	-.082
	N	469	469	469	469	469	469	469	469	469	469	469
Education	Pearson Correlation	.016	-.258**	1	-.108*	-.043	.116*	.096*	-.059	-.085	.116*	.122**
	Sig. (2-tailed)	.726	.000		.019	.349	.012	.038	.198	.066	.012	.008
	Sum of Squares and Cross-products	2.906	-87.571	274.921	-36.755	-10.923	43.028	44.296	-28.507	-34.409	45.399	46.989
	Covariance	.006	-.187	.587	-.079	-.023	.092	.095	-.061	-.074	.097	.100
	N	469	469	469	469	469	469	469	469	469	469	469
Occupation	Pearson Correlation	.009	.066	-.108*	1	-.043	-.065	.026	.083	.076	.003	-.001
	Sig. (2-tailed)	.844	.152	.019		.348	.159	.568	.072	.101	.950	.979
	Sum of Squares and Cross-products	2.021	27.857	-36.755	421.535	-13.563	-29.870	15.160	49.388	38.002	1.409	-.588
	Covariance	.004	.060	-.079	.901	-.029	-.064	.032	.106	.081	.003	-.001
	N	469	469	469	469	469	469	469	469	469	469	469
House hold Size	Pearson Correlation	-.020	-.009	-.043	-.043	1	.120**	.013	-.019	.043	.049	-.101*
	Sig. (2-tailed)	.660	.851	.349	.348		.009	.782	.686	.353	.294	.029
	Sum of Squares and Cross-products	-3.341	-2.714	-10.923	-13.563	231.006	40.919	5.441	-8.209	15.966	17.450	-35.584
	Covariance	-.007	-.006	-.023	-.029	.494	.087	.012	-.018	.034	.037	-.076
	N	469	469	469	469	469	469	469	469	469	469	469
Rooms for Exclusive Household Use	Pearson Correlation	-.113*	-.129**	.116*	-.065	.120**	1	.156**	-.052	-.008	.127**	-.155**
	Sig. (2-tailed)	.014	.005	.012	.159	.009		.001	.260	.867	.006	.001
	Sum of Squares and Cross-products	-27.345	-59.286	43.028	-29.870	40.919	499.693	97.409	-33.687	-4.235	66.968	-80.267
	Covariance	-.058	-.127	.092	-.064	.087	1.068	.208	-.072	-.009	.143	-.172
	N	469	469	469	469	469	469	469	469	469	469	469

Types of Building	Pearson Correlation	-.111*	-.179**	.096*	.026	.013	.156**	1	-.056	-.407**	.557**	-.189**
	Sig. (2-tailed)	.016	.000	.038	.568	.782	.001		.224	.000	.000	.000
	Sum of Squares and Cross-products	-33.539	-102.286	44.296	15.160	5.441	97.409	779.454	-45.418	-277.354	368.043	-122.311
	Covariance	-.072	-.219	.095	.032	.012	.208	1.666	-.097	-.593	.786	-.261
	N	469	469	469	469	469	469	469	469	469	469	469
Age of Building	Pearson Correlation	.037	-.035	-.059	.083	-.019	-.052	-.056	1	-.089	-.083	-.071
	Sig. (2-tailed)	.427	.443	.198	.072	.686	.260	.224		.055	.071	.125
	Sum of Squares and Cross-products	11.478	-21.000	-28.507	49.388	-8.209	-33.687	-45.418	835.493	-62.552	-57.030	-47.582
	Covariance	.025	-.045	-.061	.106	-.018	-.072	-.097	1.785	-.134	-.122	-.102
	N	469	469	469	469	469	469	469	469	469	469	469
Building Construction Material	Pearson Correlation	.047	.134**	-.085	.076	.043	-.008	-.407**	-.089	1	-.274**	.051
	Sig. (2-tailed)	.307	.004	.066	.101	.353	.867	.000	.055		.000	.272
	Sum of Squares and Cross-products	12.486	67.143	-34.409	38.002	15.966	-4.235	-277.354	-62.552	596.849	-158.066	28.783
	Covariance	.027	.143	-.074	.081	.034	-.009	-.593	-.134	1.275	-.338	.062
	N	469	469	469	469	469	469	469	469	469	469	469
Roofing Material	Pearson Correlation	-.143**	-.098*	.116*	.003	.049	.127**	.557**	-.083	-.274**	1	-.187**
	Sig. (2-tailed)	.002	.033	.012	.950	.294	.006	.000	.071	.000		.000
	Sum of Squares and Cross-products	-36.661	-47.571	45.399	1.409	17.450	66.968	368.043	-57.030	-158.066	559.309	-102.757
	Covariance	-.078	-.102	.097	.003	.037	.143	.786	-.122	-.338	1.195	-.220
	N	469	469	469	469	469	469	469	469	469	469	469
Type of Residence	Pearson Correlation	.039	-.081	.122**	-.001	-.101*	-.155**	-.189**	-.071	.051	-.187**	1
	Sig. (2-tailed)	.397	.080	.008	.979	.029	.001	.000	.125	.272	.000	
	Sum of Squares and Cross-products	9.825	-38.429	46.989	-.588	-35.584	-80.267	-122.311	-47.582	28.783	-102.757	538.026
	Covariance	.021	-.082	.100	-.001	-.076	-.172	-.261	-.102	.062	-.220	1.150
	N	469	469	469	469	469	469	469	469	469	469	469

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

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Appendix 7
Pictures extract

Picture extract in Hong Kong

Picture extract in Lagos metropolis

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