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SUSTAINABLE URBANISM AND ITS ASSESSMENT IN DEVELOPING COUNTRIES: THE NIGERIAN CASE

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ABSTRACT

It is estimated, today, that more than half of the world's population resides in towns and cities. This population explosion has affected the development of urban areas. Such uncontrolled growth often results in the destruction of arable lands, congestion, various forms of pollution, slums and shanty towns. This perspective brings a pressing reality to the necessity to build tomorrow's world on sustainability principles. To achieve sustainable urbanism the scale of urbanisation must be accepted and urban development processes guided and managed within a sustainable approach. Sustainable urbanism, which is defined as an application of sustainability and resilient principles to the design, planning and administration/operation of cities for a better way of life affects a range of developments. The linkage between urbanism and sustainable planning signifies a beneficial impact for communities and built environment realisation. Through the use of mixed methods analysis this research provides an opportunity to study how sustainable urbanism and its principles can be adopted and implemented in developing countries using Abuja, Nigeria as the case-study area.

This research also examines how sustainable urbanism can be achieved through the use of sustainability assessment methods, and develops an innovative and holistic assessment method to measure the sustainable urban neighbourhood in developing countries. The use of interviews and questionnaires helped in developing the assessment framework, supported by complementing methods, including case studies and ethnography. For this thesis a total of 30 interviews were conducted, alongside the administering of 50 questionnaires, while the case-study analysis was used to test and develop the framework.

This research contributes to the area of sustainability and sustainable urbanism by developing and implementing an innovative *sustainable composite cities environmental evaluation and design* tool neighbourhood design (SUCCEED ND) to enhance the present practice, propose a novel assessment tool and to deliver neighbourhood sustainable projects. Past studies on sustainability assessment have focused on either the city or building level; whereas the assessment of neighbourhood sustainability has received very little attention in general and in the context of developing countries in particular. The SUCCEED assessment method is designed to be holistic, effective and robust to respond to the needs of urban design, planning and management within developing countries - specifically, the Nigerian context in neighbourhood scale. The SUCCEED system is designed to assess sustainability performance within four sustainability dimensions - Environmental, Economic, Planning and Social/Cultural dimensions. This system comprises a total of 105 indicators which cover all necessary and important areas with regards to sustainable urban neighbourhoods. Overall this looks at enhancing sustainability in urban spaces and also enables a critical understanding of sustainability assessment and implementation within the context of developing countries by testing and validating the tool on a case study in Abuja, Nigeria in order to achieve sustainable urbanism. The main result achieved from this research is that sustainable urbanism and its theories can be achieved through the use of environmental assessment methods alongside other supporting techniques. This designed method comprises of selected sustainability indicators which are used for testing purposes and are not presented as a comprehensive list to assess the entire system.

DEDICATION

This doctoral thesis is dedicated to God almighty, my heavenly father who has made sure the project was completed in due course. Also to my parents and siblings for their relentless prayers, support and encouragement towards the completion of this study: And to my girlfriend, Miss Isabel Mirabilis for her support and encouragement.

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ABBREVIATIONS LIST

AGIS	Abuja Geographic Information System
BFL 12	Building for Life 12
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment
CASBEE	Comprehensive Assessment System for Built Environment Efficiency
CBO's	Community based Organisations
CFC's	Chloro Fluro Carbon
CITEC	Construction Industrial & Technical Equipment's Cooperation
CO2	Carbon (IV) Oxide
EBD	Enquiry Based Design
ECOMOG	Economic Community of West African States Monitoring Group
ECOWAS	Economic Community of West African States
EIA	Environmental Impact Assessment
FCT	Federal Capital Territory Abuja
FMBN	Federal Mortgage Bank of Nigeria
GBCA	Green Building Council of Australia
GBCON	Green Building Council of Nigeria
GDP	Gross Domestic Produce
GHG	Green House Gases
LEED	Leadership in Energy and Environmental Design
LEED-ND	Leadership in Energy and Environmental Design - Neighbourhood Design
MDGs	Millennium Development Goals
MWA	Mega Watt per Ampere
NEED	National Economic Empowerment and Development Strategy
NGO	Non-Governmental Organisation
NGT	Nominal Group Technique
NIA	Nigerian Institute of Architects
NIB	Nigerian Institute of Builders
NIE	Nigerian Institute of Environment

NITP	Nigerian Institute of Town Planners
NSA	Neighbourhood Sustainability Assessment
NUDP	National Urban Development Policy
OPEC	Organisation of Petroleum Exporting Countries
PB-PB-P	Public Public Partnership
PPP	Private Public Partnership
QOL	Quality of Life
QOS	Quality of space
SAM	Sustainability Assessment Methods
SAMP	Sustainability Assessment and Management Process
SD	Sustainability Development
SI's	Sustainability Indicators
SuBETool	Sustainable Urban Built Environmental Tool
SUCCEED	Sustainable Composite Cities Environmental Evaluation Design Tool
SUD	Sustainability Urban Development
SUDS	Sustainable Urban Drainage System
SUPD	Sustainable Urban Planning Development
UD	Urban Development
UK	United Kingdom
UN	United Nation
UNCHS	United Nation Human Settlements Programme
UNDP	United Nation Development Programme
UNDESAPD	United Nations, Department of Economic and Social Affairs, Population Division
UNDIESA	United Nations Department of International Economic and Social Affairs
UNDPI	United Nation Department of Public Information
UNFPA	United Nations Population Fund
UN-Habitat	United Nations Human Settlements Programme
USGBC	United States Green Building Council

GLOSSARY

Benchmark is a standard or point of reference.

Case-Study is an active approach to learning based on a real-life scenario, event or problem, including contextual information and artefacts, which provides students with an opportunity to apply learning; develop higher order skills and critical thinking and to diagnose and solve problems.

Enquiry Based Design is a process in planning that brings together key stakeholders to collaborate on a vision for a new project or urban regeneration schemes.

Environmental Impact Assessment is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.

Indicators is known to be an operational representation of an attribute (quality, characteristics property) of a given system, by a qualitative or quantitative variable (for example numbers, graphics, colours, symbols) (or function of variables) including its value, related to a reference value.

Neighbourhood is a smaller subset of a broader community which consist of a mix or residential/non-residential buildings and land-uses.

Neighbourhood Sustainability is defined as the process of developing a neighbourhood level urban form or built environment that meets the needs of its residents whilst avoiding unacceptable social and environmental impacts both locally and in a broader context.

Neighbourhood Sustainability Assessment tools evaluate and rate the performance of a given neighbourhood against a set of criteria and themes to assess the neighbourhood's position on the way towards or success in approaching sustainability goals.

Smart Tools are mechanism which composes of technological and social components used in achieving a desire outcome within an urban development model, within a vision that produces more intelligent cities, more sustainable and more inclusive, not just inputting technology but generating innovations.

SUCCEED sustainability urban composite cities environmental evaluation and design tool is a neighbourhood sustainability assessment tool that examines the degree or level of sustainability achieved within a specific neighbourhood with regards to a set of sustainability indicators systematically selected from environmental, socio-cultural, planning and economic dimension of sustainability.

Sustainability is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs

Sustainability assessment is a process by which the implications of an initiative on sustainability are evaluated.

Sustainability Assessment Matrix is a performance score allocated to each sustainability indicator to be used for the model.

Sustainable Communities refers to communities planned, built, or modified to promote sustainable living.

Sustainable Development is a multidimensional undertaking to achieve a higher quality of life for all people. Economic development, social development and environmental protection are interdependent and mutually reinforcing components of sustainable development.

Sustainability Dimensions are dimensions in achieving sustainable development which consist of at least economic, social and environmental pillars of sustainability.

Sustainability Indicators are designed to measure, test and provide recommendation to meet the needs and expectations of its present and future generations.

Sustainable Urbanism is defined as an application of sustainability and resilient principles to the design, planning and administration/operation of cities for a better way of life affects a range of developments.

Threshold within the context of sustainability assessment, represents the boundary between good and poor sustainability practices.

Quality of Life (QOL) is the general well-being of individuals and societies, outlining negative and positive features of life. It observes satisfaction, including everything from physical health, family, education, employment, wealth, religious beliefs, finance and environment.

Quality of Space (QOS) with an urban environment is made up by a series of systems that are constantly being transformed and improved, to adapt it to the needs of its in habitants

Urbanisation can be stated as a process by which rural areas become urbanised as a result of economic development and industrialisation.

Urbanism is a creative, collaborative process that involves shaping the forms of the city, enhancing the experience of it and improving its function as a habitat for human life.

CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION

This chapter sets out the context underpinning the research and the problem to be studied and investigated, as well as a synopsis of the need to develop strategies on how sustainable urbanism can be implemented in developing countries through the use of neighbourhood sustainability assessment systems. It also creates an overview of the context of the research, methodological approach employed, the contribution to knowledge, and the structure of the thesis. This chapter is divided into six sub-sections: the first presents the context and background of development; the second looks at the importance and rationale of the research; the third, fourth and fifth sub-sections address the aims and objectives, overview of methodology and contribution to knowledge, respectively; and the sixth and final sub-section looks at the organisation of the research.

1.2 THE CONTEXT OF THE RESEARCH

The genius loci of Nigeria have experienced one of the fastest rates of urbanisation in the world: it has been extraordinary in scale, pervasiveness and antecedents. The rate of growth in Nigerian cities in modern times has increased dramatically: the current urban population in Nigeria was last measured at 88,272,292 in 2011, according to the World Bank and has been growing approximately 5.8 per cent each subsequent year (Daramola, 2010; Oyesiku, 2011). At present the urban population is about 48.2 per cent and it is estimated that in the year 2025 about 60 per cent of Nigerians will live in urban centres with a projected growth of 400 million, thereby making Nigeria the third most populous country in the world country in the world (Alkali, 2005; Daramola, 2010). There are more than 840 urban centres and over 10 cities with estimated population of over a million people. The former capital Lagos state is one of the 36 states, larger than more than 32 African countries, and has a population projected to reach 23 million by 2015. Within the next ten years, four additional cities in Nigeria will qualify as megacities and the explosive rate of growth will influence and exacerbate problems of human settlements and environment as well as increase poverty rates (Alkali, 2005, pg. 2). The demand for infrastructure, basic services, housing, sanitation, waste management, social conflict, and governance are issues that necessitate investigation and policy adaptation. This has affected the development of metro areas, causing poor sanitation, poorly managed wastes and pollution. Although studies have identified various environmental problems in Nigeria,

little attention has been given to the implications of adopting sustainable development and its principles (Matagi, 2001; Walter et al., 2005; Daramola, 2010). There are also other urban problems associated with a lack of resources and inadequate technical capacity to address pertinent issues (Oyesiku, 2011). Lagos state has a massive population that is driving demand for employment, land for housing, infrastructure and social services. These coincide with the positive outcomes of job opportunities and expanded infrastructure but the negatives of these accelerated spatial urban developments have a greater impact than the positive aspects, due to the disorganised planning, informal growth of slums, and urban sprawl. Currently, the country is not prepared for this rapid pace of urbanisation and this will continue to cause potential hazards and urban degradation. For us to be able to understand this research problem further study is required to identify the current status of urban issues throughout the world, with a particular focus on the case of developing countries looking at neighbourhood scale designs.

1.3 BACKGROUND, IMPORTANCE AND RATIONALE OF THE RESEARCH

The world is urbanising rapidly with cities today experiencing greater concentrations of people than ever before. It is extensively accepted that development and urbanisation go hand in hand and the expansion of cities has resulted in both opportunities and challenges. This population explosion has affected the development in urban areas; within the past years, the percentage of the people living in urban spaces has edged towards the halfway mark, and between 2000 and 2015 it is stated that approximately one billion will be added in urban areas in contrast to 125 million who reside in rural areas (UNCHS, 2007; UNDESAPD, 2014). Concise information obtained from the World Bank Report in 2000 and the International Monetary Fund in 2006 has specified that 66 per cent of the world's population lived in or near the countryside in the early 1950s. Currently, it is estimated by the United Nations (UN) that the world's population is about 6.572 billion of which three billion live in urban areas, and by 2030 approximately 61 per cent of the world's population is predicted to reside in cities of which most growth will take place in developing countries (Oladunjoye, 2005, pg. 211; UN-Habitat, 2007; Daramola and Ibem, 2011).

The past one hundred years have seen a population explosion that is extraordinary in human history. In the early 1900s, only around 14 per cent of the world's population, or about 200 million people, lived in cities. In the 1950s our planet had 37 cities with a population of over

one million. However, in 2005 it was estimated that 414 cities around the world had passed the one million population mark and this is still rising to this day. For more than 70 per cent of inhabitants in Europe, quality of life depends on the urban environment while in developing countries urban spaces are where most people strive to settle down and live in. It is now predicted that global population for the remainder of this century will continue to rise at a dramatic rate and this in turn will put a heavy pressure on our cities to adapt and provide (Moran, 2013).

The uncontrolled growth often results in the destruction of arable land vital for food production, with the spread of vast shanty towns which for a significant proportion of the world's population provides their first and only experience of urban living. Over the past 200 years, the average population of the world's 100 biggest towns has risen. By today's standards a city of 200,000 occupants is a medium-sized town. Such has been the vigour of urban growth that in the space of 30 years man has built as much as he had in his entire preceding history. It has been estimated that over the next 40 years, further development will be needed equivalent to a thousand cities, each with three million inhabitants; and most of this in developing countries (Gauzin-Muller, 2002, pg. 34). This perspective brings a pressing reality to the necessity to build tomorrow's world on sustainable principles. Professionals and policy-makers in the industrialised countries must focus on ways of improving quality of life (QOL) in cities which are already seeing extensive unemployment, ethnic, religious and social intolerance, and violence (Gauzin-Muller, 2002; Moran, 2013).

Many people who do not reside in towns and cities are increasingly dependent on urban centres in relation to economic, social and political progress (UN-Habitat, 2002). In continents like America, Australia and Europe they policy-makers and governments have stabilsed the economy and population growth to a specific level while most countries in Asia, Latin America and Africa are on the verge of grappling with the challenge of achieving a decent and adequate livelihood for their citizens. Africa is known for high rates of population growth, congestion, pollution, inadequate shelter, diseases, slums, poverty and underdevelopment. This has resulted in the lack of improvement in national economies and welfare of the people. Instead the unmanageable, uncontrolled, haphazard, and unplanned urbanisation has caused serious socio-economic, cultural and environmental issues (UN 2004; UNCHS, 2007; UNFPA, 2007).

Informal settlement is a major problem facing developing nations as they transit into developed nations. The rate in the number of people living in the urban spaces continues to grow - this is

inevitable, and to be able to achieve global sustainable development we would have to depend on imitating urban development in a sustainable method. Urban growth that is properly managed and controlled could lead to economic enhancement, reduced poverty as well as improved QOL/QOS for every individual; but for planning strategies to be adopted we would have to consider the possibilities of associated problems and challenges to sustainable development agenda. The need for sustainability within the built environment has increased these concerns which have led to quite a number of global summits arranged at the levels of government and international agencies. Specific examples are the Brundtland UN report 1987, the Millennium Development Goals Summit, the 2002 World Summit in Johannesburg, South Africa and the 2005 La-Havana UN Sustainable Cities Programme (Oladinjoye, 2005, pg.212). The overall goal of each summit is to establish the need for effective governance as a measure in achieving sustainable development in cities and urban spaces (UN-Habitat, 2007; UNDPI, 2008). Without sustainable urbanisation, sustainable development cannot be achieved and, without implementing sustainable urbanism as a planning policy, other urban design policies might contradict achieving sustainability within the built environment. In order to achieve sustainable urbanism the scale of urbanisation must be accepted and urban development processes guided and managed in a sustainable way.

Sustainable Urbanism, which is defined as an application of sustainability and resilient principles to the design, planning and administration/operation of cities for a better way of life affects a range of developments (Sharifi, 2016 pg.2). Sustainable Urbanism, is also defined as "walk-able and transit-served urbanism served with high buildings and high-performance infrastructure" (Farr, 2007, pg. 40) affects a range of developments which includes how places should grow, means of transportation and how people could live in a more sustainable environment. Farr (2007) suggests that these developments can help future cities generate a realistic picture of proposed directions. This linkage between urbanism and sustainable planning infers a beneficial impact for communities and built environment realisation. The actualisation of sustainability urbanism and sustainable development alongside its principles, protocols, methods and techniques is achievable with the use of sustainability assessment tools. This research has identified the need to achieving sustainability within cities, more especially urban areas because of the rapid pace of urbanisation and development happening within these areas. Also the rationale of this research has created a niche due to the fact that urban areas in developing world are characterised with high rates of population growth, congestion, pollution, inadequate shelter, diseases, slums, poverty and underdevelopment. Initiating sustainability

principles into this urban neighbourhood would facilitate, solve, manage and enhance these spaces in order to achieve an improved quality of life and quality of space (QOL/QOS). With focus on neighbourhood scale developments, current research has shown that the available Neighbourhood Sustainability Assessment tools (NSA's) across the globe includes certiveA, Aqua, LEED, BREEAM, DGNB, Green Star, CASBEE, HQE, Green Globes, PromisE, SPIN, VERDE, HKBEAM, SGP, Green Mark, Nabers, ABRI, Minenergie, Lider A, Protocollo Itaca, TGBRS India, amongst others. The listed NSA's tools are located within continents like America, Europe, Asia and Australia and the only prominent assessment tool in Africa is Green Star SA which is used in sustainability assessment in South Africa. Hence as at the time of this research within current literature there are no urban or neighbourhood assessment tool in Nigeria and it has been identified that it's currently lacking within the African region.

This research provides an opportunity to study these directions in context and examine as well as recommend strategies for long-term implementation of sustainable urbanism and its principles through developing an holistic framework/tool in sustainability assessment within urban neighbourhood in Nigeria.

1.4 AIMS AND OBJECTIVES OF STUDY, AND RESEARCH QUESTIONS

1.4.1 Aim of the Research

The aim of this study is to develop an urban assessment framework by applying the principles of sustainable urbanism. This framework will be designed for developing countries and tested using Nigeria as a case study.

1.4.2 Research Objectives

The specific objectives of this research are:

1. To investigate and critically review the existing concepts/definitions and identify the need for sustainable urbanism in developing countries using Nigeria as a case study.
2. To analyse/review the role of sustainable urbanism within the urban neighbourhood fabric of cities in the United Kingdom and across the world.
3. To test and examine the fundamental objectives of sustainable urbanism and propose an neighbourhood sustainability assessment tool as well as sustainability indicators and benchmarks for measuring its successful implementation based on the outputs from objective 1 and 2.

4. Propose a framework that visualises a truly sustainable urban development as the future of Nigerian cities using Abuja as a study area based on the neighbourhood sustainability assessment tool developed in objective 3.
5. Summarise the research and identify the areas of future study.

1.4.3 Research Questions

1. How will sustainable urbanism respond to understanding the synergies between technologies, politics, planning, economics, society, culture and environment?
2. What are the most important indicators and assessment models of sustainable urbanism used in measuring the level of sustainability of urban neighbourhoods in developing countries and how can they be selected to develop an assessment tool?
3. What can be learned from the result of implementing neighbourhood sustainability assessment tools and their methodological applications in Abuja, Nigeria's urban spaces?

1.4.4 Research Hypothesis

1. H0: If sustainable urbanism and its theories are applied through the use of neighbourhood sustainability assessment tools then urban spaces in Nigeria will be more sustainable compared to the country's present situation.

1.5 OVERVIEW OF METHODOLOGY

The ontological position of this research is social constructivism that studies the theory of knowledge and view of reality as a means of social construction ground in the key knowledge. It concentrates on the subjective but critical social and textual phenomena, thus drawing on the epistemology of interpretivism. This research focuses on the inductive and deductive approaches when examining phenomenology as the theoretical perspective.

1.5.1 Methodology

A successful research project is a product of a combination of various processes or factors. One of the most significant factors is the use of the appropriate methodology to attain the research aim, research objectives and questions. In addition, the research findings can be validated by using various knowledge bases such as explanatory, exploratory, descriptive and predictive types of research (Naoum, 2007; Yin, 2008). Sustainability is a branch of study that is broad and diverse with various methodological paradigms. The methods used in this study have

transformed from the social, physical and natural sciences and consequently both quantitative and qualitative data collection techniques are employed for collection of the data (Knight and Ruddock, 2008). Various methods have been recognised in respect to this area but the ability to select the most appropriate method for the research is created by combining various aspects of the research design and examining the research problem in its totality.

Thus, before choosing a methodology, it is essential to decide how the data would be used. It is important to design data management systems in a correct format in order to ensure the system performance is monitored properly, that reliable data are collected and that the relevant indicators are used by decision makers, architects, planners, engineers, projects managers, environmentalist and facilities management (Clements-Croome et al., 2007). It is advisable to think ahead so that the data collected as part of sustainability assessment can be reported as key sustainability indicators. The challenge in this case is to find effective indicators; this requires a clear conceptual basis. Hence, the selection of indicators will be based on the available data, resources, spatial and time scales, in addition to the interests and needs of the particular group involved in the selection (Bell and Morse, 2003; Becker, 2004; Brandon and Lombardi, 2005). Overall the design of the assessment framework would be based on the identification of the sustainability indicators synthesised from the overall knowledge of the subject area, the indicators found in the sustainable urbanism case studies, and also the indicators embedded in both recognised and emerging neighbourhood sustainability assessment methods. This would help in creating a robust assessment framework purposely designed for developing countries – specifically Nigeria as the case of this research.

1.5.2 Research Strategy

The research nature of this project relies on both qualitative and quantitative research methods. The inductive and deductive approaches involve four strategies – these are case-study research, semi-structured interviews, questionnaires and ethnography. All these strategies have their merits and demerits; the key factor is how workable each one is within this particular research problem. The main limitations to be considered include time, resources, constraints and access to data. The proposed strategy has to be applicable to the research question in order to avoid neglecting important elements which could affect the investigation of the problem. The primary data-collection strategy employed by this study will be the use of interview and case-study

research which is deemed to be the most useful and applicable strategy in line with the projects aim and objectives.

Overall this study will initiate the use of mixed method approaches to conduct this research which is also seen as complementary approaches.

1.5.3 Research Process

The research is divided into five stages to deliver the project's aim:

1. Understanding the theory of sustainable urbanism which includes concepts, beliefs, definitions and how it can be implemented by critically reviewing literature. Also carry out case studies' analysis to build-up the researcher's understandings of sustainable urbanism theory and its indicators.
2. Compare different neighbourhood sustainability assessment methods, both recognised and emerging, from different parts of the world and propose an assessment method for developing countries.
3. In-depth interviews, questionnaires and ethnography to establish the need for sustainable urbanism, neighbourhood sustainability assessment, sustainability indicators, selection of criteria's and implementation schemes.
4. Data analysis of the interview outcomes, questionnaire and case study to help validate, streamline and implement the proposed assessment tool (SUCCEED).
5. The proposed SUCCEED assessment tool was introduced and implemented on a case-study project in Abuja Nigeria in order to identify the practicability in its implementation and analyses. This framework was used in achieving sustainable urbanism as well as writing up the conclusion of the research and stating the contribution to knowledge.

The following process briefly explains the description of the overall research process used to meet each objective:

Stage 1: Undertake literature review to establish the present state of knowledge and knowledge gap in regards to how sustainable development and sustainable urbanism have been achieved, and the current neighbourhood sustainability assessment/implementation methods and the need in developing a tool for the Nigerian urban areas. This stage involves a comprehensive compilation of data from a range of sources; this includes an in-depth review of the literature, academic and technical journals, project reports, conference proceedings, articles, government publications, books, theses, case studies

of projects and sustainability indicators used in case studies, professional guidelines, and websites.

Stage 2: Justify and compare four main assessment methods across the globe with focus on neighbourhood scale smart tools and create a concise understanding of how they operate; their advantages and disadvantages; strengths and weaknesses; and any gaps which could be a potential contribution to knowledge to help develop the proposed tool. The four main assessment methods to be studied are LEED ND V4, BREEAM for Communities, CASBEE for Urban Development and Green star for Communities which are strategically selected due to the context in which each one has been developed and used. Also, emerging tools are studied to help cover areas that were not identified during the first analysis; these tools are SuBETool and SUPD. The analysis of this set of NSA's tools is then used to develop an assessment tool (SUCCEED) using developing countries as the context area. The set of indicators selected is based on a sound methodological analysis of indicators that is the most prioritised and important in the context of developing countries. This result is confirmed and refined based on stages 3 and 4.

Stage 3: Empirical field research includes preliminary interviews, ethnography (participative observation) and questionnaires with senior representatives involved within the built environment sector. Interviews and questionnaires are used to define categories of sustainability indicators while the case study and ethnographic research was conducted to understand the neighbourhood environment in which sustainable urbanism has been implemented and is to be tested this would give the researcher a much grounded understanding. A semi-structured interview was used to understand how best sustainability can be achieved in Nigeria. Interviews were conducted with professionals from government agencies, the construction industry and academia. The interviews are qualitative in nature based on semi-structured interview questions. The researcher also carefully selected interviewees based on their wealth of experience, position in organisations, and recommendation. The use of semi-structured interviews helps build an understanding of the present practices and perspectives on how best sustainability can be implemented with an emphasis on assessment methods. Overall a total of 30 interviews were conducted with 10 academics, 10 practitioners/sustainability experts and 10 government personnel's. Also questionnaires/surveys were administered to a total of 50 individuals within the government agencies, industry academia and the local

community who have knowledge on the built environment. This method complements/supports each other and informs the research in areas that needs other forms of validation or interrelationship in order to develop a robust assessment tool. This affirmed and identified categories and sub-categories of sustainability that key professionals consider to be important when evaluating both new and existing development and also created a process in which perceptions can influence their thinking about community planning and design.

Stage 4: Drawing from the initial three stages, the researcher developed the neighbourhood sustainability assessment tool SUCCEED. The tool was streamlined or tailor-fitted to suit the Nigerian context. During the analysis of the data collected the most important indicators necessary for achieving sustainable urbanism were identified. Overall the tool was developed based on the current literature review, case studies analysis and existing NSA's models and then the collected data's used to streamline the assessment tool.

Stage 5: The proposed assessment tool was tested and implemented on a specific case study project in Abuja Nigeria in order to identify the practicability in its implementation, adaptation and to get possible feedback for improvement where possible. The various rating systems generated from this tool helped the researcher to make recommendations on how existing and proposed developments can be enhanced to create a more sustainable urban environment. Also the data collected and overall research conducted were analysed to produce recommendations, implementation strategies, contribution to knowledge, summary of the research and identify areas for future research.

1.6 CONTRIBUTION TO KNOWLEDGE

To the best of the researcher's knowledge, and based on the status of the research currently being undertaken in the developing world, this is the first academic research to be carried out on Nigeria relating to the need for developing neighbourhood sustainability assessment method using Abuja Neighbourhood development as the case-study area. This research contributes novel knowledge in the area of architecture, urban development and environmental studies. An assessment tool is produced to enable key professionals to assess and measure how sustainable an urban neighbourhood is, both in its existing status and under proposed development. The tool is a neighbourhood sustainable assessment method aimed at achieving sustainable

urbanism to improve and promote best practices for planners, architects, designers, politicians and environmentalists, thereby creating a more sustainable built environment in developing worlds. This body of knowledge that has been developed can be modelled and used by these key professionals and experts within the area of sustainability assessment. The methodological approach used is based on mixed methods of data collection, analysing the research through the lens of a social constructivism perspective which is also part of the contribution to knowledge.

This study primarily contributes to sustainable urbanism planning concepts and models by understanding the problems that those involved face in its successful implementation and adoption in developing countries and broadening the scope for innovation from assessment tools, techniques or models to develop a holistic assessment method for developing worlds. This will create a more successful implementation of sustainability within the built environment with focus on neighbourhood scale. The contribution to knowledge redefines the meaning of sustainable development and sustainable urbanism in the context of the developing world and also proposes recommendations and strategies for its successful implementation. Also further recommendations are developed as strategies to facilitate the widespread adoption of sustainable urbanism.

1.7 STRUCTURE OF THE THESIS

This thesis is structured into nine main chapters, categorised into five key stages. This first stage is the literature review (chapters 2 to 3), the second stage is the research design of the neighbourhood sustainability assessment method (chapters 5 to 6), the third stage is the data collection and its influence on the proposed assessment method (chapter 7), and the fourth and fifth stages are the synthesis of the research which includes discussion, analysis, development of SUCCEED and testing it on the case study, findings, contribution to knowledge, and conclusions (chapters 8 and 9). The first stage deals with the current research on urbanisation, sustainability, sustainable urbanism and its implementation and also the indicators found in the sustainable urbanism case studies. It covers the present state of research gap, knowledge, theory, beliefs and concepts as stated in the literature. The second stage creates an understanding on current sustainability indicators and neighbourhood sustainability assessment tools. Also the limitations of the existing tools and reasons for proposing a new tool based on existing models are stated helps tin establishing the research gap. The third stage deals with

how the research project was carried out. It also discusses the interviews, questionnaires and ethnography, the problems of the research and presents an overview of the data analysis and summary. Last, the fourth and fifth stages talk about the data analysis, findings, discussions and results; the researcher also validates the development of the SUCCEED assessment tool, implementation and testing it on the case study, discusses the research outcomes, thesis synthesis and major findings, sustainable urbanism definition in developing countries, revisits the research aim and objectives to confirm these are addressed, and concludes with final recommendations. Finally a new neighbourhood sustainability assessment tool was developed and applied to enhance the current practices of developing sustainable urban spaces in developing worlds. The overall content of each chapter has is summarised below in figure 1.1, which describes the research process, the relationship/inter-relationship between the chapters, the research objectives and how it informs research process. Also these objectives are inter-related and inform each other. This thesis has followed the standard recommended by scholars such as Saunders *et al*. (2009) and Bryman and Bell (2011); that a thesis should be structured in the following stages - introduction, literature review, methodology, analysis, discussions and conclusions. And lastly figure 1.2 explains the relationship between the aim and objectives with reference to questions that addresses this research such as what, why, how and where various actions are carried out in the research.

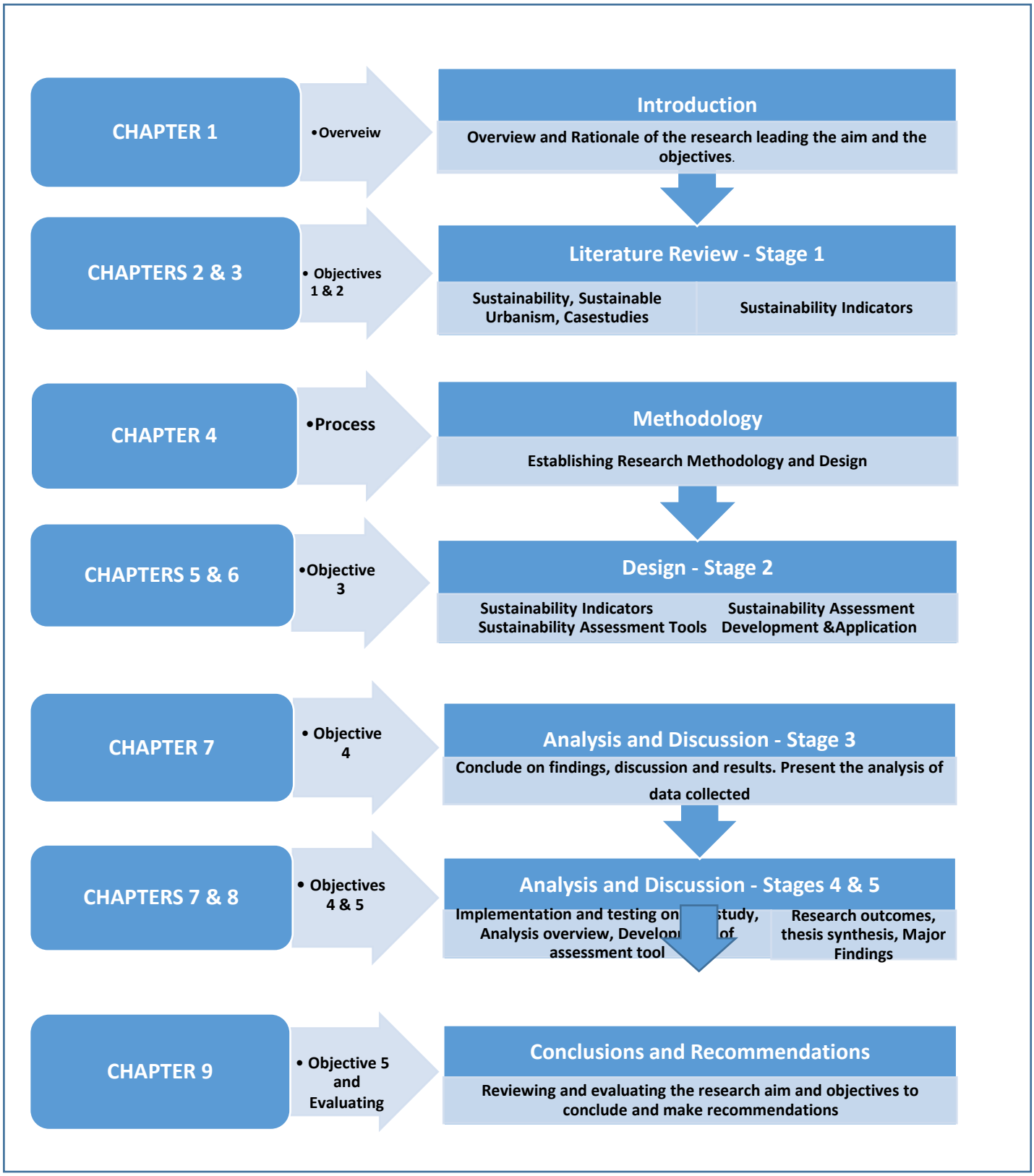


Figure 1.1: The Thesis Structure

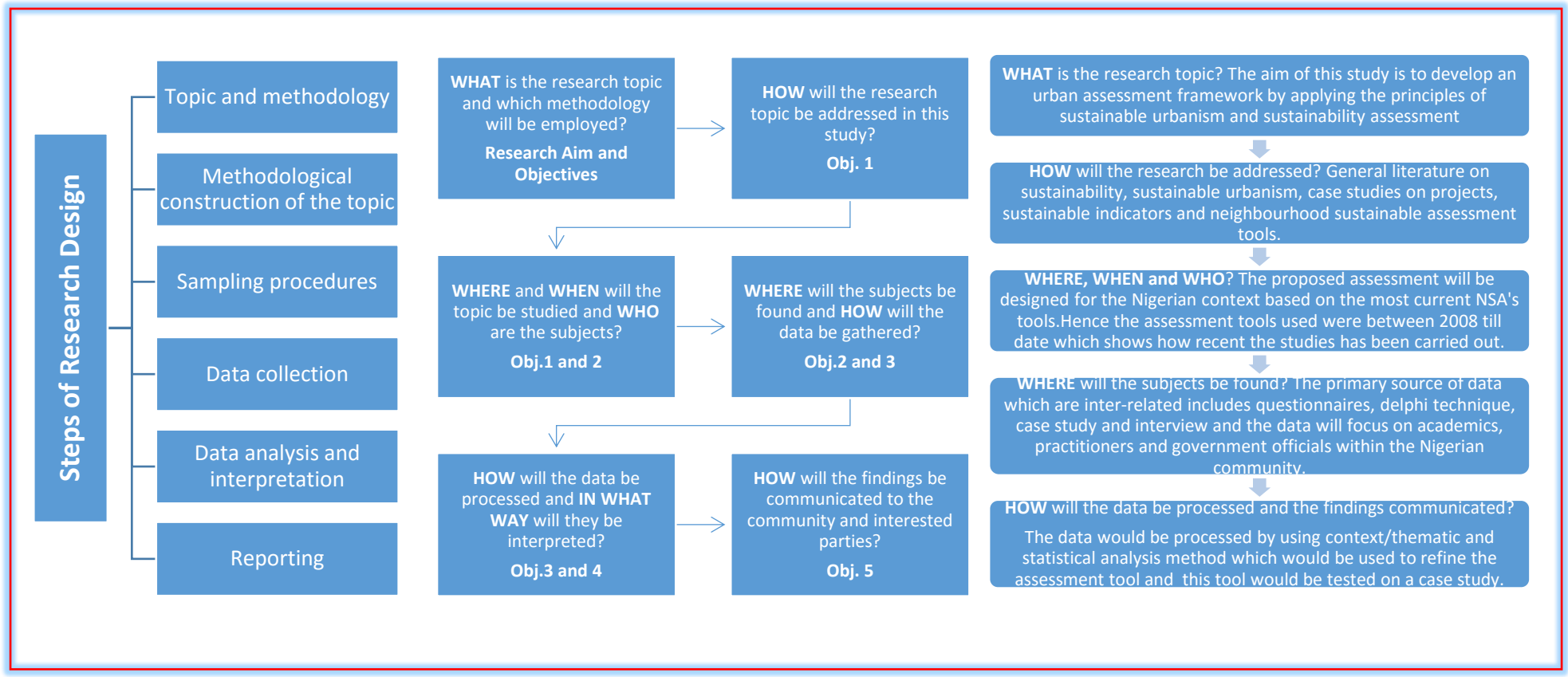


Figure 1.2: Steps of the research design and relationship between the research aim and objectives

CHAPTER TWO: URBANISATION, SUSTAINABILITY AND EMERGENCE OF URBANISM

2.1 INTRODUCTION

This chapter discusses the background of the research which is mainly on urbanisation and urbanism in the context of both the developed and developing worlds. First, the background of the problem being reviewed is discussed. Secondly the focus shifts to how this problem can be dealt with and better understood using sustainable development and sustainable urbanism principles and their concepts. These concepts and approaches are separate but they complement each other. The definitions of sustainability, sustainable development and sustainable urbanism are presented in this chapter since the importance and understanding of these terminologies is vital to the conceptualisation and the development of the neighbourhood sustainability assessment (NSA) criteria and its evaluation process. Finally, the emergence and evolution of various urbanism theories are discussed to create an understanding of the importance and development of sustainable urbanism theories, definitions, concepts and indicators.

2.2 DEFINITION OF URBANISATION FROM A GLOBAL PERSPECTIVE

Rapid urban explosion is agreed to be the most complex and important socio-economic and environmental phenomenon that has emerged between the twentieth and twenty-first centuries. Urbanisation is understood in most cases as a shift from a predominantly rural society to an urban society which represents major irreversible changes in production and consumption and how people interact with nature (Allen, 2002). In recent times, discourses on urbanisation have changed within interactional debates and it is only recently that urban environments and the entire urbanisation process has started to look into this movement through a sustainability lens. By definition, urbanisation can be stated as *a process by which rural areas become urbanised as a result of economic development and industrialisation*. In regards to demographic growth the term 'urbanisation' explains the redistribution of populations from rural to urban settlements over a period of time (UNDESAPD, 2014, pg. 15). It is also vital to affirm that what are seen as the key indicators of an urban environment differ from one country to another which creates a notion that cautions people against a strict comparison of urbanisation across various nationalities (Nsiah-Gyabaah, 2005; UN-Habitat, 2007). The major difference between urban and rural environments is that urban residents live in larger, denser, more developed and more heterogeneous cities as opposed to rural environments which are much smaller in growth, more sparsely separated and less differentiated rural places (Peng et al., 2010). Urbanisation is

the outcome of social, economic, environmental and political developments that leads to urban concentration and growth of bigger cities, changes in the use of land and transformation from rural to metropolitan pattern of organisation, governance and way of life (Nsiah-Gyabaah, 2005). Another definition of urbanisation from a different perspective refers to

> the use of land for urban purposes, focusing on people rather than on land or physical structures. It refers to the activities of the people (economic, social and cultural) and seeks to determine whether in any area these are urban in character or not (Hall et al., 1973, pg.118).

As the world's urban population reached its tipping point in 2007, these dramatic movements to cities is caused by push and pull factors such as attraction of opportunities for wealth generation, healthcare, jobs and infrastructure, amongst others (UN-Habitat, 2007). This has resulted in the phenomenon of "megacities" which is seen as urban areas with a population of 10 million or more. At the time of writing, there are 19 megacities in the world; this is expected to exceed 27 megacities by the end of 2020 (Chryssy, 2010, pg. 32). Over half of this growth will occur in Africa and Asia, countries where the world's economic geography and growth is now shifting. As at 1990 approximately 75 per cent of all South Americans were living in urban spaces due to the unprecedented industrialisation that took place in the 1970s and 1980s and that continent experienced the highest degree of urbanisation in the world. Europe ranked second with a little more than 73 per cent of the whole population living in urban areas. Africa had the highest urban growth rate within the period 1960- 1990, at about 4.9 per cent in comparison with the global annual rate of 2.8 per cent (UNCHS, 1992). This incredible growth in urban population that has occurred throughout the past decades is a result of changes in both demography and development. Hence it is inevitable that developing countries are going to increase in population overtime, substantially with continuing migration from rural to urban areas. Table 2.1 below showcases the statistical percentage of populations living in urban areas by world region between 1970 and 2010 (Watson, 1993; UNDESAPD, 2014).

Table 2.1: Percentage of Population Living in Urban Areas by World Region 1970-2010

	Percentage Urban				
Region	1970	1980	1990	2000	2010
World	37.2	41.2	45.2	51.1	56.5
First World	66.6	70.2	72.6	74.9	77.9
North America	73.8	73.9	75.2	77.3	80.2
Europe	66.7	70.3	73.4	76.7	80.1
Japan	71.2	76.2	77.0	77.7	78.4
Australia/New Zealand	84.4	85.3	85.2	86.2	88.1
USSR/CIS	56.7	63.1	65.8	67.5	71.2
Third World	25.5	27.3	37.1	45.1	51.8
Africa	22.9	28.0	33.9	40.7	47.4
East	10.3	15.2	21.8	29.0	36.0
Central	24.8	31.6	37.8	45.6	53.4
North	36.0	39.9	44.6	51.2	57.7
South	44.1	49.6	54.9	61.3	66.8
West	19.6	25.9	32.5	39.8	47.3
Latin America	57.3	65.4	71.5	76.4	79.9
Caribbean	45.7	53.2	59.5	64.8	69.2
Central	54.0	60.6	66.0	70.6	74.7
South	60.0	68.8	75.1	80.0	83.2
Asia	23.9	26.3	34.4	42.7	49.7
East	24.7	27.4	39.4	51.4	59.2
Southeast	20.2	24.0	29.9	36.9	44.4
South	19.5	23.2	27.3	32.8	39.9
West	43.2	51.5	62.7	70.3	74.9
Oceania*	70.8	71.5	70.6	71.3	73.3
Melanesia	15.1	17.9	19.8	23.7	29.8
Micronesia	25.7	36.9	47.2	55.6	62.0
Polynesia	32.4	33.5	37.4	44.2	52.1

* includes Australia and New Zealand

Source: United Nations Department of International Economic and Social Affairs (UNDIESA, 2008)

From these indices there would be high urban growth in Latin America, North America, Africa and Asia. Africa and Asia in contrast remain, to some level, rural, although their urbanisation has picked up recently with 40 per cent and 48 per cent of their populations living in urban areas, respectively. In the coming decades the level of urbanisation is projected to increase in all regions and major countries in Africa and Asia will be urbanising faster than the rest of the continents. These areas are anticipated to hit 56 and 64 per cent of the urban dwellers, respectively, by the middle of the twenty-first century (Chryssy, 2010; UNDESAPD, 2014). Africa and Asia overall are urbanising at a more rapid pace than other parts of the world at the current time. The rate of urbanisation is measured as average annual rate of change of the percentage of urban dwellers. From 2010, urbanisation is expected to reach its highest peak in Asia and Africa with urban dwellers increasing by 1.5 and 1.1 per cent every year respectively. Concurrently, countries or continents that had traditionally high rates of urbanisation are

urbanising at a slower pace; at less than 0.4 per cent per annum at the time of writing. Overall the rate of urbanisation tends to slowdown as the total population becomes more urbanised or has more urban dwellers (UN-Habitat, 2007; UNDESAPD, 2014).

According to recent statistics by UNDESAPD, the world's population has grown drastically since 1950 from 746 million to 3.9 billion in 2014. Asia is shown to have 53 per cent of the world's urban population followed by Europe at14 per cent, and Latin America and Caribbean at 13 per cent each. With the increase in growth of urban dwellers it is projected that 2.5 billion people will be added to the world's population by 2050 (UN-Habitat, 2007). Three main countries - India, China and Nigeria - are predicated to account for 37 per cent of the world population growth between 2014 and 2050. Based on this analysis India is anticipated to add 404 million, China 292 million and Nigeria 212 million to the worldwide population of urban dwellers. Table 2.2 below shows population growth and urbanisation rates (UN-Habitat, 2007; UNDEAPD, 2014).

Table 2.2: Estimates of population growth rates, urbanisation rates and urban population growth rates (all in % per annum) by region for decades between 1950 and 2050

Table 1. Estimates of population growth rates, urbanization rates and urban population growth rates (all in % per annum) by region for decades between 1950–2050

	1950–1960	1960–1970	1970–1980	1980–1990	1990–2000	2000–2010	2010–2020	2020–2030	2030–2040	2040–2050
Population growth rates										
World	1.8	2.0	1.9	1.8	1.4	1.2	1.1	0.9	0.7	0.6
Sub-Saharan Africa	2.1	2.5	2.8	2.8	2.7	2.7	2.6	2.4	2.2	2.0
Northern Africa	2.7	2.7	2.5	2.6	1.9	1.7	1.6	1.3	1.0	0.8
Asia	2.0	2.3	2.2	2.0	1.5	1.1	1.0	0.6	0.4	0.2
Europe	1.0	0.8	0.6	0.4	0.1	0.2	0.0	–0.1	–0.2	-0.2
Latin America and the Caribbean	2.8	2.7	2.4	2.0	1.7	1.3	1.0	0.8	0.5	0.3
Northern America	1.8	1.3	1.0	1.0	1.1	0.9	0.8	0.7	0.6	0.5
Oceania	2.2	2.2	1.6	1.6	1.5	1.6	1.4	1.2	1.0	0.9
Urbanization rates										
World	1.3	0.8	0.7	0.9	0.8	1.0	0.9	0.7	0.5	0.5
Sub-Saharan Africa	3.3	2.1	2.1	1.9	1.3	1.4	1.3	1.2	1.0	0.9
Northern Africa	2.0	1.6	1.1	1.0	0.6	0.4	0.5	0.5	0.6	0.6
Asia	1.9	1.2	1.4	1.7	1.5	1.8	1.4	1.0	0.7	0.6
Europe	1.0	1.0	0.7	0.4	0.1	0.2	0.3	0.3	0.3	0.3
Latin America and the Caribbean	1.8	1.5	1.2	0.9	0.7	0.4	0.3	0.2	0.2	0.2
Northern America	0.9	0.5	0.0	0.2	0.5	0.2	0.2	0.2	0.2	0.2
Oceania	0.7	0.6	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.2
Urban population growth rates										
World	3.2	2.8	2.6	2.7	2.3	2.3	2.0	1.5	1.2	1.0
Sub-Saharan Africa	5.5	4.6	4.9	4.8	4.0	4.1	4.0	3.6	3.2	2.9
Northern Africa	4.7	4.4	3.6	3.6	2.5	2.1	2.1	1.8	1.6	1.4
Asia	3.9	3.5	3.5	3.8	3.0	3.0	2.3	1.6	1.1	0.8
Europe	2.0	1.8	1.2	0.8	0.2	0.4	0.3	0.2	0.2	0.1
Latin America and the Caribbean	4.6	4.2	3.6	3.0	2.4	1.7	1.4	1.1	0.7	0.5
Northern America	2.7	1.8	1.0	1.2	1.6	1.2	1.0	0.9	0.8	0.6
Oceania	3.0	2.9	1.6	1.5	1.5	1.6	1.4	1.2	1.1	1.0

Source: United Nations Population Division, 2014. The figures are compound annual growth rates.

2.2.1 Challenges and Consequences of Urbanisation

It is a known fact that people move to cities from rural communities as a result of high rates of poverty and also they are pulled by the kind of big city lives in which they envisage themselves living. In some cases the growth of rural populations leads to shortage of arable land which then creates major problems because even though the land area may appear extensive, in most cases such areas are divided amongst several children and then their children in the future. This then results in migration as a result of extreme competition among the rural population and the only key skills that are brought to the cities are farming and other local skills (NUDP, 2012, pg. 5). Push factors of rural populations include circumstances that prevents the populace from earning decent livelihoods. This includes land deterioration, lack of adequate land, unequal land distribution, droughts, poor health systems, extreme poverty and religious conflict. Local economic declines are key push issues for moving to urban centres as well, while pull factors tend to inspire this rural population to move to urban centres for lifestyle reasons (Gugler, 1997). The biggest attraction is the industrial wages; people will move to cities as long as urban wages outweigh rural wages. Other factors are employment opportunities, attraction of better lifestyle, healthcare, education and basic infrastructures (Girardet 1996; Sajor, 2001, pg. 12)

Rapid urban growth and expansion results in urban sprawl, whereby new extensions are developed around the edges of urban centres mostly taking up farmland and encroaching on other neighbouring cities. This growth necessitates the need to provide utilities and road networks alongside services such as schools, recreational parks, healthcare, and retail parks (Sajor, 2001). Urban extension creates suburbs that are then dependent on automobile transport system to allow for easy commuting to work but has resulted in heavy traffic congestion, and air pollution through fossil fuel use. In most cases in the developing world, cities cannot manage or handle the influx of urban migration which results in the growth of shanty towns and suburban slum areas associated with various problems. The growth of these cities leads to megacities, which in turn creates manufacturing industries that provide locally made consumer products, job opportunities and extra tax revenue - but at the same time the presence of industry imposes heavy pressure on transportation system, water, air quality and the overall quality of life of its urban population (Gugler 1997; UNDEAP, 2014). In addition to this, urban spaces attract large volumes of highly skilled and unskilled labour based on the influx of people in search of better jobs; and also there is high concentration of capital stock which then makes it attractive for investment. Urban agglomerations and bigger cities create income and investment, and these impacts on the local economies, which also has a positive influence on

the surrounding rural environments. The expansion of cities leads to the improvement of urban planning laws, rules and guides. This can help to guide development towards achieving a proper sustainable built environment; in essence, the extension of cities in most cases helps to advance urban development projects and creates provision of public facilities (Kotter, 2004). However, in a situation where an extension develops outside the law, and without the use of proper urban planning guidelines, the result is informal housing, squats and slums where most migrants themselves settle. In many cases this can lead to lack of sufficient infrastructure, services and drainage systems and the side effect of this is that it has serious consequences. Lastly, urban areas are known to be habitats to socio-economic disparities where we recognise a wide range of social standards, gentrification, social fragmentation and social cultural conflicts based on the various strata within the area. A significant number of urban poor are located on the outskirts of the city centre (Hall, 2001; Kotter, 2004).

2.2.2 Urbanisation in Nigeria

Nigeria is known to be one of the most populated and rapidly urbanising countries in Africa with an estimated population of 170 million people as at 2011. Urbanisation in Nigeria was to be celebrated in the early 1960s during Nigeria's independence (Daramola, 2010). Further, in the late 1970s when the oil boom began in some parts of the country, it was accompanied by extensive development of infrastructure, jobs creation and economic expansion, among other aspects. This created a massive growth in population from the rural areas to the cities which brought a variety of problems such as extreme crime rates, unemployment, high poverty rate, slums, insecurity and environmental degradation among others (Agbola, 2004; National Planning Policy, 2012). The continuous rate of development was one of the major phenomena to occur between the nineteenth and twentieth centuries with concentration of economic and administrative activities in key cities like Port Harcourt, Lagos, Kaduna, Ibadan, Enugu, Jos, Kano and Abuja. These states had high degrees of specialisation and larger population size and were known for various goods, services and government offices (Idowu, 2013).

As Nigeria's rate of expansion continues, it has also influenced rapid urban population growth. Such growth, however, is not equaled by adequate development, planning and management of these cities which is a result of the lack of proper planning and management of these cities. The lack of proper planning of urban areas is based on the insufficient capacity, resources and lack of recent up-to-date data to implement proper planning. Other factors are lack of ineffective development control and institutional frameworks to enhance urban development. A good

example of a framework that is in place is the National Economic Empowerment and Development Strategy (NEEDS). They focus on sustained planning implementation strategy/schemes, lack of funding to the housing sector and, lastly, inefficient city planning (National Planning Policy, 2012).

Urban spaces in Nigeria can be defined in two ways based on the threshold population of 20,000 people as used by the National Population Bureau in computing the 1963 census but more recently the second definition which is derived from the provisions of the 1999 constitution of the Federal Republic of Nigeria is used more in Nigeria. "It states that all local government headquarters are urban and other areas so defined by states such states are as follow Rivers, Kano, Kaduna, Imo and Nasarawa amongst others" (NUDP, 2012). Based on this criterion Nigeria has a total of 843 cities as at 2004 with six of them having one million dwellers and above (National Planning Policy, 2012). According to current studies, two schools of thoughts have resulted in the consequences of urbanisation. The first suggests that urbanisation and urban growth is important to the economic development, modernisation, physical development, human resources development and other aspects (Kessides, 2005), while the second strand believes that the pace has resulted in much greater problems such as environmental degradation, slum development, high flood risk, high rate of crime, pollution, diseases, poverty, traffic holdup and squatter settlements (Aluko, 2010; Adetunji and Oyeleye, 2013). To resolve these problems it is mandated that urban planning should take place at various spatial levels which can help to minimise the impact of urbanisation. Another focus in urban growth is the increase in natural growth over the years; it has been argued this is an attribute of natural growth due to the decline in mortality rate. According to current research it indicates that natural growth can be responsible for about 60 per cent of growth within urban areas in some developing countries (Agbola, 2004). Natural increase is caused mostly by an improvement in medical care, improved sanitation, better food supplies and reduced death rates. Another argument is that natural growth is slightly lower in urban areas than in rural communities and the major reason for growth in urban population is basically rural-to-urban migration, urban expansion/extensions, and transformation of rural communities into urban settlements (Oluwatayo and Opoko, 2014).

In conclusion, factors responsible for Nigeria's rapid urban population growth rates include:

a. Natural population increases arising from high birth and fertility rates due to improvement in health facilities;

b. Rural-urban migration fuelled by economic factors that is responsible for the push and pull factors of people moving to urban areas in search of jobs and better living conditions in cities: Urban-to-urban migration as well;
c. Abandonment of agricultural activities due to the oil boom;
d. Creation of states and local governments and locations of universities, industries, religious camps/retreats, other public investments etc., as the cities selected for hosting these land-use activities become hot spots for population growth; and
e. Location and development of new towns, with Abuja as an example (National Planning Policy, 2012).

Table 2.3: Population of Nigeria (1921-2006)

Year	Total Population	Urban Population	Urban Population (%)	Cities of 20,000 or more	Cities of 100,000 or more	Cities of 500,000 or more	Cities of over 1,000,000
1921	18,720,000	890,000	4.5	10	-	-	-
1931	20,956,000	1,343,000	6.7	24	2	-	-
1952/54	30,402,000	3,701,000	10.2	54	7	-	-
1963	55,670,000	10,702,000	19.2	183	24	2	-
1972	78,927,000	19,832,000	25.1	302	38	3	-
1984	96,684,000	31,906,000	33.0	356	62	14	-
1991	101,900,000	37,703,000	37.0	589	68	23	-
1999	110,650,000	43,500,000	41.0	774	76	28	5
2006	140,431,790						

Sources: Adapted from Aniah, 2001 and NBS, 2009

2.2.3 Challenges facing Nigeria's Urban Environment

The fast pace of urban population growth has resulted in an outward expansion of the genius loci of cities in key regions of Nigeria. This has overstretched the fiscal, technical and management capacities of the country's government agencies from properly managing the usage of lands and created developmental challenges at both local and urban levels. The negative effects of the nation's uncontrolled, unmanaged rapid urbanisation of the environment has been steadily progressive and destructive, hence the need to look at various actions as to how these various levels of governance could achieve sustainable urbanisation (NUDP, 2012).

There is no doubt that this rapid urbanisation rate has resulted in various economic, cultural and environmental issues. The problems and challenges have created uncontrolled and unplanned cities resulting in millions of urban dwellers living in substandard dwellings mainly slums and shanty towns (Daramola and Ibem, 2010; Jiboye, 2010). In Nigeria the problems

faced are mostly loss of biodiversity, greenhouse warming, slums, environmental decay, overcrowding, housing congestion, crime and violence and other detrimental problems (Ogunleye, 2005; Jiboye, 2011). The absence of effective advocacy and inappropriate programmes for promoting planned urban growth and development has further compounded the present problems. The report presented by the United Nations Human Settlement Programme (UN-HABITAT) on the state of African cities published in 2008 indicated that cases of serious urban sprawl and emergence of urban corridors exist in many parts of the country including Lagos- Ibadan, Lagos- Otta, Lagos-Epe, Kano Megacity, Karu-Keffi axis and Onitsha-Ogbaru-Awka corridors of the country (NUDP, 2012).

Urbanisation has increased the poverty level in cities due to alarming population growth, high unemployment rates because of the high influx of skilled and unskilled workers, underdevelopment, and decrease in real wages (Idowu, 2013). The challenges of urbanisation are felt in all aspects of an urban environment. Some of these challenges are discussed below:

a. Housing and Urbanisation

In 2014, Nigeria reached its highest peak of housing deficiency of over 13.5 million. Current research has described the housing standards as very poor, due to factors like overcrowding, poor substandard building materials and inadequacy of infrastructural provision like roads, drainages and so on (Adediji, 2005). Over 75 per cent of this housing within urban areas is substandard and located in slums and this paves the way for crime, poor sanitary conditions, poverty, gentrification, and lack of basic facilities amongst others. Also housing in good neighbourhoods and city centres is expensive to rent while the cost of land to purchase in order for individuals to build on is also very expensive. As a result people sleep under bridges, live in slums and abandoned buildings and use poor materials in building construction. Another issue is the rampant collapse of housing across the country (NUDP, 2012).

b. Poverty and Urbanisation

The United Nations in 2005 stated that an average Nigerian lives on less than one dollar a day. The World Bank describes poverty based on the characteristics of hunger, inadequate shelter, poor healthcare without access to medical care, no education and amongst others (Idowu, 2013). It is also seen as not been able to fend for the next day, a state of hopelessness and lack of basic needs. The Millennium Development Goal (MDG) in 2000, aims to eradicate poverty to below minimum in order to upgrade living standards of people living in both urban/rural

settlements. Statistics provided by the World Bank states that rural poverty reduced from 19 per cent to 16 per cent while in urban area it increased from 9 per cent to 12 per cent. Between 1985 and 1992, extreme poverty rate increased from 10.1 million people to 13.9 million with a near threefold increase in the urban poverty from 1.5 million to 4.3 million people (World Bank, 1995; Idowu, 2013).

c. Crimes and Insecurity

Urban areas are known to have high levels of criminal activities which include robbery, kidnapping, rape, child trafficking, terrorism, drugs, fraud, prostitution, murder, and so on; this is due to the factors of urbanisation, hence there is higher crime rate in urban areas. In many urban areas in Nigeria today criminal activities threaten lives and properties, well-being and coherence, and peace and security of urban dwellers while reducing the QOL (Ahmed, 2010). The rate of crime in Nigerian cities can be associated with the exploded growth in these places with juvenile delinquent youth and adults, poverty, and unemployment. Crime rate is increasing by the day in cities due to rising youth unemployment, gradual decline of traditional social values, breakdown of family cohesiveness and community spirit (NUDP, 2012).

d. Food Insecurity and Urbanisation

The oil boom in the late 1970s has had negative impact on the growth of the agricultural sector. Oil money is much easier to generate due to the fact that crude oil is drilled out and sold in comparison to agriculture where it takes a longer time to till the soil, plant, grow, harvest and then sell. Most skills in rural areas are found amongst agricultural farmers who depend on this source of livelihood to provide for their family. Hence a high number of people involved in agricultural activities in rural areas abandon these activities and migrate to urban areas to look for jobs in the manufacturing, processing and informal sectors. There is a high decline in agricultural activities which has resulted in the importation of food - rice for example. Also prices of food become inflated which makes sources of livelihood expensive for many poor people (Idowu, 2013).

e. Unemployment and Urbanisation

The rate of unemployment is high in Nigeria as a result of population growth, creation of fewer jobs and a high influx of skilled and unskilled to urban areas. Rural to urban migration has a massive impact on unemployment level of key destination cities because of the uneven migration of people across the country (Aworemi et al., 2011). It was estimated that, between 1998 and 1999, unemployment increased from 5.5 per cent to 6.5per cent in urban areas while

on a national scale it increased from 3.9 per cent to 4.7 per cent in a similar period (USAID, 2008). Another factor for this was the migration of people from other neighbouring African counties seeking employment (NUDP, 2012).

f. Environment and Urbanisation

Impact on the environment is one of the major challenges posed by urbanisation in urban centres in Nigeria; this specifically relates to issues like ecological degradation, pollution, habitat loss, desertification, soil erosion, CO2 emissions, flooding, and other factors. These factors have other sets of sub-categories such as pollution (water, land, visual and noise), global warming, traffic congestion and slum development and so on (Idowu, 2013). Cities close to the coast where oil is extracted and refined are prone to oil spillage and air pollution - examples are Lagos, Bayelsa, and Rivers. Also many health-related illnesses are from environmental-related problems. How people behave, act and react is as a result of what the environment has sown into their minds; this is why urban residents in slums experience high rates of prostitution, drug use, crime and violence. Issues like in poor waste management causes diseases like typhoid, dysentery and malaria to spread fast. Most urban centres are known for large traffic congestion and the fumes from the exhaust pollute the atmosphere badly. Cities are major contributors of Green House Gases (GHG). As a result, cities are increasingly witnessing the adverse effects of climate change arising from GHG emissions which could be reduced by paying more attention to the design, production and operation of buildings in urban areas (NUDP, 2012).

Finally, although urbanisation is not inevitable, it is also beneficial to the economic development of cities in Nigeria which are major engines of growth and centres of political activities. The implications of Nigeria's rapid and unplanned urbanisation are profound not just for the people living in cities and towns but more broadly for the Nigerian economy and indeed for peaceful political, social and environmental development. Promoting the development of the cities is therefore central to achieving socio-political stability, economic growth and environmental sustainability of the country. In addition cities operate in the national human settlements system and there is the need to re-examine the linkages between the developments of rural areas and rural peoples and the growth of urban areas (NUDP, 2012; Idowu, 2013).

2.3 SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

2.3.1 The Definition and Concept of Sustainability

Towards the end of the second millennium the entire human race was overwhelmed by a series of unforeseen and unprecedented problems in human chronology such as global population, rate of resource use and environmental degradation. At the same time mankind has been able to produce more information and solutions to help foster greater interdependency and to accelerate change far faster than its ability to keep pace (Senge, 1990). This change has helped the development of new concepts which includes sustainability and sustainable development. It is almost three decades since the terminology 'sustainability' became a buzz word buzz word within the society interested in environment and development. The term emerged prior to the 1987 report of the United Nations-sponsored World Commission on Environment and Development (WCED) report, *Our common future*. Although various criticisms have been formed from this report and publications, several initiatives have emerged from local, national and global levels in response to addressing different aspects of economic, environmental and social challenges (Mebratu, 1998). Sustainability may be defined from different perspectives as a result of levels of concern for the subject. Although governments and private organisations have accepted the definition of sustainability and sustainable development, academics and non-government organisations (NGOs) have been more prone to its use and adaptation of its broad definition, hence various suggestions for its definition. The most common definition of sustainability globally known is the Brundtland Report which has a more managerial and incremental approach and is more accepted by government, business and services. It is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Robinson, 2004, pg. 369). Hence if the word sustainability is to be used as intended by Brundtland Commission it could be recommended that sustainability is more than a common term, slogan or expression but rather it must amount to an injunction to preserve and reproduce productivity capacity for the indefinite future (Farrington and Kuhlman, 2010). However, another approach to sustainability is taken by NGOs and academic/environmentalist – they state that it is the development seen as synonymous with growth and therefore sustainability development means ameliorating continued economic growth. From this standpoint, sustainability focuses on uses on the ability of humans to continue to live within environmental constraints (Robinson, 2004, pg.369). Sustainability may be also defined as managing the well-being of the environment, people, economy or society over a long period or even an indefinite period of time (Hamsson, 2010).

The sustainability concept has been interpreted in terms of three dimensions - social, economic and environmental sustainability. This embodied definition of sustainability derived from the United Nations in its agenda for development states that

> "development is a multidimensional undertaking to achieve a higher quality of life for all people. Economic development, social development and environmental protection are interdependent and mutually reinforcing components of sustainable development" (Farrington and Kuhlman, 2010, pg. 23).

2.3.2 Historic Evolution and Definition of Sustainable Development

The concepts of sustainable development surfaced during the post-Brundtland era which is basically considered when the foundations were laid for a vision of sustainable urban development and also as a methodology for its implementation (Curwell et al., 2006). The term which refocused the debate on the economic and social purposes of applying science to environmental problems was coined by Barbara Ward in the mid-1970s (Holmberg, 1992).

Sustainable development is one of the most current key concerns for researchers and policy makers to originate over the last few decades. 'Sustainable Development' has various meanings linked to this theory. 'Sustainable' implies perpetuity, renewal and constant rebirth - an inexhaustible system, while 'Development' implies growth, movement and production. Sustainable development is the ability of the urban areas to function at levels of desired QOL without limiting the options available to the present and future generations or resulting in adverse impacts within and outside their boundaries. The drive to attain global sustainability presents different challenges to different countries of the world, reflecting their different levels of socio-economic characteristics (Marmot, 2006). But each word modifies the other and for development to be sustainable, it needs to incorporate renewal that ensures the continuity of resources, population and cultures. For sustainability to incorporate development it must allow change and adaptation to new conditions. The combination of the two ideas envisions balancing economic and social factors against the environmental imperatives of resources conversation and renewal for the world of tomorrow (Porter, 2000). Sustainable development is a long-term project with, at its heart, an awareness of the human and economic cost of social breakdown in the cities. The cost of reversing the damage done by development in the industrialised world, and controlling its emergence in developing countries, is impossible to evaluate. Clearly it will be huge but the longer we wait the higher this cost will become (Gauzin-Muller, 2002, pg. 10).

The concept of sustainable development is likely to herald an important transformation in understanding relationships of humanity with nature and between people. In broad terms, the perception of sustainable development looks into how to combine growing concerns about a range of environmental issues with socio-economic issues. The concept of sustainable development is as a result of the growing enlightenment of the global links between environmental problems and socio-economic issues which includes poverty and inequality and concerns about a healthy future for humanity (Hopwood et al., 2005). Also sustainability is seen as capital, both man-made and natural, each of which must be preserved separately (WCED, 1987; Ayres, 2001). Apparently sustainability aims to target the natural resources which are economic resources. However, even in this sense, the concept of natural resource is not enough for interpreting what is usually described as sustainability (Hassan, 2010). Rather, this concept proposes three main factors - social, economic, and ecological - which have been transformed and developed over time. With these three main factors the formulation of sustainable development can be defined as

> "For development to be sustainable, it must take account of social and ecological factors, as well as economic ones; of the living and non-living resource base; and of the long-term as well as the short- term advantages and disadvantages of alternative actions" (Marmot, 2006, pg.120).

In the United Kingdom, the government has initiated the term sustainable development to the point at which strategies has been put in place looking into how challenges can be faced over the next 20 years. In other words sustainable development does not mean having less economic development; rather a healthy economy is the key solution to generate the adequate resources to meet people's needs. The UK government embraces sustainability by looking into human health, conserving natural resources, scientific analysis, precautionary action, ecological impacts and the polluter pays principle (Palmer et al., 1997). Sustainable development can be related to 'sustainable neighbourhood' which is defined as a form of traditional neighbourhood which comprises housing, workplaces, shopping and civic functions. It is a range of mixed uses which is placed in a context that is compact, complete and connected and more sustainable and satisfying.

Sustainable development has given birth to 'Sustainable Neighbourhood' and 'Sustainable Urban Development'. A Sustainable Neighbourhood comprises five basic conventions which are identifiable centre and edge to the neighbourhood, walk-able size, mixed-land uses,

network of walk-able streets and urban space for public and civic purposes. Sustainable Urban Development requires the achievement of urban development aspirations, subject to conditions concerning inter- and intra-generational equity, and that the stock of natural resources should not be depleted beyond its regenerative capacity. The set of principles for a sustainable built environment includes living off environmental interest rather than capital, not breaching critical environmental thresholds, developing a sense of equity and social justice, and forming inclusive procedures for decision making. Based on these sets of principles, it appears possible to define sustainable urban form through certain basic characteristics that it should possess (Brehny, 1992).

2.3.3 The Principles of Sustainable Urban Development and Sustainable Development

From this broad understanding of sustainable urban development and sustainable development it is clear that both theories differ from various perspectives by a number of important common factors which represent the principles of these theories.

The principles of Sustainable Urban Development (SUD) include the following:

- SUD is an inter-related principle which is determined by various factors rather than an absolute concept.
- SUD is a process which is a continuous action, operation, or series of changes. Therefore it is not a product or fixed destination.
- SUD relates to considerations of ecological integrity, equity, participation and futurity of the urban development process.
- This in turn relates to the planning, property development, design, construction and operational sectors of urban development process.
- Progress towards SUD must integrate environmental, economic and social issues underlying the urban development process and sustainability of cities.
- Integration of issues underlying the urban development process and sustainability of cities proceeds within a given institutional setting (Hassan, 2010).

The principles of Sustainable Development in relation to Urban Development are as follow:

- Sustainable development can be defined as a general term for making urban and economic growth more sustainable.
- Human beings are the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.
- The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.
- In order to achieve sustainable development, environmental protection shall constitute an integral parts of the development process.
- To achieve sustainable development and higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption.
- Regions and states should cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. The developed countries acknowledge the responsibilities that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment.
- Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority (Hassan, 2010).

2.3.4 Sustainability actualisation in Nigeria with reference to policies/practices

Over the last 20 to 30 years Nigerian's Government attitude towards sustainability has been improving based on factors like sustainability initiatives and few emphasis from the government, NGO's and the other bodies. Nigeria has never taken sustainability into context due to the pace and level of development not until early 2000 when policies began to change. There has also been efforts from various organisation and interest groups spear-heading campaigns for progressive changes in polices, laws, technologies and development strategies towards enhancing sustainable urban qualities, but the achievement has been rather very low and minimal without much effort to see this plans been put to place. Pressing areas that needs sustainable development initiatives includes human settlement, environment management, transport system, water supply, sanitation, waste management, social conflict and crime

amongst others. This areas has challenges for not only the government at various levels but also to stakeholders and other groups (Ayedun et al, 2011). One of the strategic plans made by the government was to increase the number of states within the country from 19 states to 36 states and which would include 774 local government councils in 1996. This was established as a strategic planning scheme to promote the development of human settlements and ensure the even spread of towns and cities across the country (Alkali, 2006). Despite this political re-structuring in the country the gap between the urban and rural areas with regards to QOL is a big concern in other to achieve sustainable development. These 36 states has been grouped under 6 geo-political zones which has effects on investment decisions, development of projects and inbalance of development are all major problems.

The government later revised the national urban development policy in 2001 which was a good intention toward attaining sustainable human/urban development in Nigeria. The urban development policy was to achieve a dynamic system, in which urban settlement will foster sustainable economic growth, promote efficient urban and regional development, increase the standards of living alongside QOL and wellbeing for all Nigerians. The two factors that were essential in the actualisation for sustainable urban development are:

1. Participating urban governance looking at an holistic approach which includes groups, agencies, youth, NGO's, consultations and end-users.

2. A more effective urban management information system based on the numbering of houses names or street and neighbourhood (Alkali, 2006).

A set of vital institutional framework has been created in July 2003 by the federal ministry of Housing and Urban Development to make sure that policies are been implemented effectively but there has not been major transformations with regards to sustainability in the Nigeria till date. This includes

- Pursuing programmes of urban renewal and slum upgrading in decaying urban cities.
- Preparation of cadastral maps for all urban centres as a basis for efficient urban planning and development.
- Development of comprehensive master plans to ensure coordinated development.
- Establishment of a national urban information data base for planning and raising citizen's awareness and access to information's.

- Implementation of community based urban development projects in thirteen locations
- Preparation of strategic regional development plans for the six geopolitical zones to reduce regional inbalance.
- Implementation of programs directed to rural-urban divide.
- Development of satellite towns to redirect growth to the hinterlands.
- Building capacities for improved urban development and management.

Although measures, policies and practices have been proposed in achieving sustainability the adaption and implementation is still a problem in Nigeria. The government resolution to tackle poverty eradication, improve the livelihood of the citizens and implement sustainable development or urban centres and the entire country which would therefore impact present and future generations. This would hence inform the generation of strategic polices which has been designed to stimulate and enhance sustainable growth of the country's urban areas.

The strategies being adapted to tackle the sustainable urban growth includes

- Provision of adequate and affordable housing for all.
- Ensuring environmental sustainability
- Good governance ad enhanced urban development
- Poverty reduction and economic empowerment strategies
- International cooperation for development (Ayedun et al, 2011)

2.4 EMERGENCE OF MOVEMENTS IN URBANISM AND CURRENT VIEWS IN URBANISM

The emergence of urbanism can be ascribed to Iidefons Cerda in his theory of urbanisation (1867). He clearly defines this as a science of human settlement at various scales in terms of size and time which deals with the theories within that era (Kelbaugh, 2007). Cerda was the first urbanist to envision a self-conscious, modern, scientific theory of the city looking into the relationship of the theories within the city. He suggested that innovation in advancement of technologies such as electricity and industrialisation will entail an enormous jump in scale and speed for the nineteenth-century modern European city (Shane, 2005). As a result of the

emergence in the development of urbanism other theories began to evolve. These theories are further studied within the current views in urbanism.

Douglas Kelbaugh writes about three urbanisms on the critical edge of hypothetical and proficient theories in western architecture and urbanism in cities across the world. In this article *"Towards an Integrated Paradigm: Further Thoughts on the Three Urbanism"* 2007 Kelbaugh talked about how to design the built environment in a transforming society in relation to social, cultural, economic, technological and ecological environments. However there are three current paradigms of urbanism; these are New Urbanism, Everyday Urbanism, and Post-Urbanism. Kelbaugh states that all three paradigms are direct and inevitable. Each has pros and cons, but not in equal proportion in most American cities at this point in their development (Kelbaugh, 2007, pg. 11). Other existing principles in urbanism include Classical, Modern, Post-Modernism, Smart Growth, Integral Urbanism, Green Urbanism, Sustainable Urbanism and Resilient Urbanism.

2.4.1 Classic Urbanism on Urban Theory

This theory began as a shift from the traditional form of planning transformation into the new urban forms. The theory depends on the links between the relationships of people with their shared physical space. As a result of the expansion of human population within urban areas, many kinds of social relations have changed. This process of transformation is called classical urban theory which helps to understand how these changes led to widespread anxiety and social concern beginning or late nineteenth century (Benedict, 1983; Wyly, 2012). Ferdinand Tonnies became one of the prominent theorists who emphasised on strong family ties, traditional authority of preindustrial and rural community which was destroyed by the transient, superficial and calculating actions of individuals in the public sphere within the outside world of society (Benedict, 1983).

2.4.2 Modernist Urbanism

The modern movement began to come into lime light between 1910 and 1930 in Europe and later across the world. It is an intellectual movement that spans across arts, design, architecture and urbanisms. Modernist urbanism is a movement that is seen as a continuation of modern city planning which commenced in the 19th century but is represented by city planning ideas of the time that advocated drastic transformation in the city form and city life. Modernist theory also known as functionalist theory supports the simplification of urban activities into four basic

characteristics and a strict separation of these activities in space by planning and design measures. This includes functional zoning of land uses, space configurations specially designed to accommodate these activities. The main theorist in the movement includes Louis Sert, Le Corbusier and Walter Gropius amongst others (Mario, 2000).

2.4.3 Post-Modern Urbanism

This movement was pioneered by Rern Koolhaus, who is known as a heterotopian, sensational and post-structuralist. One of his projects that inspired this movement is the generic city project which welcomes a disconnection between hypermodern buildings and shopping mall urbanism. Post-modernist urbanist is stylistically because it tries to develop an increasingly sophisticated consumer in the built environment with ever-wilder and more provocative architecture and urbanism. Its language is very abstract with few references to surrounding physical or historical context. Post urbanist work is characterised and expresses a more dynamic, destabilised and less predictable architecture and urbanism. Post modernism urbanism tries to accept and express the techno-flow of a global world, both reality and virtual reality. It is explorative rather than normative and also subjected to codes and convention. Also post urbanists don't engage the public like to carry out an enquiry based design because they feel it's obsolete and its civic institution too calcified to promote liberating possibilities. Some post-modernist urbanist includes Koolhaus, Eisenman, Hadid, Libeskind, Tschumi and Gehry (Kelbaugh, 2007).

2.4.4 New Urbanism

New Urbanism which is inspired by Farr's 2007 definition of Sustainable Urbanism is centralised on uniting everything closer together using higher-quality materials, resulting in more resourceful optimisation. New Urbanism achieves the most aesthetic harmony and the most articulate sense of a community (Kelbaugh, 2007). In the late 1980s the evolution of most theories in urbanism was as a result of the appearance of the new urbanism movement based on humanistic urbanism; this is considered as being of the newest approaches in urban design which emerged in the 1980s and 1990s. (Farr, 2008; Rahnama et al., 2012). In terms of historical antecedents, New Urbanism is reminiscent of the city's beautiful movements and embraces open spaces and housing typologies that recall the garden city tradition. The theory originated from the United States in the early 1980s, and has progressively informed many aspects of estate development, urban planning, land use, and environmental planning strategies. Throughout the 1990s, the theory became a major part of mainstream development practice

although it has been dismissed by some as *artificial* urbanism (Farr, 2008). The theory attempts to resolve the issues on environmental degradation of urban centres in the suburbs of metropolis and big cities. It helps to promote walk-able neighbourhoods via a range of housing and job types which include living and work units (Rahnama *et al.,* 2012, pg.196). New Urbanism has been criticised in that it tends to adopt nineteenth-century urban form to twenty-first-century city concepts and that it neglects economic diversity by generating costly urban spaces to live in that are highly privatised and controlled. It creates an appropriate environment in human scale which is responsible for transformation and urban development in relation to sustainable development practices (Custer, 2007; Kelbaugh, 2007).

2.4.5 Smart Growth

Smart growth first originated from the 1970s when the environmental movement was strengthened by the then president of the United States, Richard Nixon. During that period he signed a law that includes Clean Water Act, Clean Air Act, the Endangered Species Act, and the National Environmental Protection Act (NEPA). In 1973 Oregon's legislature passed a law which requires all the state's municipalities to designate Urban Growth Boundaries which would control the scope of land development and ensure the quality of development within these states. The Smart Growth theory was first used by the local Government Commission which put forward a new vision for what was called 'Smart Growth' (U.S.EPA, 2008A). Smart growth is a development that helps improve the economy, the environment and the society, providing a framework for communities to make decisions about how and where growth can take effect. Smart growth makes it possible for communities to grow in ways that maintain economic development and jobs; create strong neighbourhoods with a range of housing, commercial and transportation facilities; and attain a healthy community that offers families a clean environment to live in (ICMA, 2002). Smart growth is a planning theory that targets the advancement of an increasingly sustainable approach to the master-planning of novel places and regenerated places. The basic principle to effectively initiate Smart Growth projects is to work with a common stakeholder and community vision on development futures, reflecting how it should function and its values. The theory embraces the 10 principles of smart growth; these are listed below. The theory was created by planners and target to achieve greater jobs and housing balance; it also tends to exempt the sense of place in becoming a discourse but rather encourages community and stakeholder collaboration (Farr, 2008).

a. Settle in the Right Location

- Preserve Open Space, Farmland, Natural Beauty and Critical Environmental Areas
- Strengthen and Direct Development towards Existing Communities

b. Develop Compact Connected and Complete Places

- Take Advantage of Compact Building Design
- Create Walk-able Neighbourhoods
- Mix Land Uses
- Foster Distinctive, Attractive Communities with a Strong Sense of Place

c. Offer Citizens Robust Choices

- Create a Range of Housing Opportunities and Choices
- Provide a Variety of Transportation Choices

d. Conduct a Fair and Transparent Development Process

- Make Development Decisions Predictable, Fair and Cost Effective
- Encourage Community & Stakeholder Collaboration

The Ten Principles of Smart Growth (Farr, 2008, pg.30)

2.4.6 Integral Urbanism

Integral Urbanism can be defined as a theory that activates places by creating threshold places of intensity where a range of people and activities may converge. Integral Urbanism is the theory of urbanism that essentially offers a new model of urban life (Ellin, 2006). It creates places to congregate along with synergies and efficiencies; it offers settings while also liberating time and energy for collaboratively envisioning and implementing desired change. The theory was pioneered by Nan Ellin; she drew her inspiration from Jane Jacobs who wrote in *The Death and Life of Great American Cities* (1961) that urban vitality and public safety are complementary not contradictory features of a city (Stephen, 2010; Ellin, 2006, pg.5). Integral Urbanism not only focuses on master planning but tends to control everything. The revolution of this theory was inspired as a result of urban sprawl created during the modern and postmodern eras. This design revolution emerged as a response to the decline in the sense of community, as well as environmental degradation. From modernism to post-modernism it finds models simultaneously in ecology and new information technology. The goal of Integral Urbanism is to achieve flow, according to Mihaly Csikszentmihaly who defines Integral Urbanism as an intense experience characterised by immersion, awareness and sense of harmony, meaning and purpose (Ellin, 2005). Integral Urbanism demonstrates five qualities;

these are Hybridity, Connectivity, Porosity, Authenticity and Vulnerability. Nan Ellin's theory is suggested to stand as an antidote to the pervasive issues surrounding modern and post-modern urban planning and architecture: sprawl, anomie, a pervasive culture, irregular planning and disregard for environmental issues. It is seen as an approach that reverses the disintegration of our urban built environment and lives through proactive design solutions (Ellin, 2006).

2.4.7 Green Urbanism

Green Urbanism is a theory that is more considered to be similar to sustainable urbanism. This theory addresses urban design with nature alongside shaping better communities and lifestyles. Moreover, the principles of green urbanism are grounded in the triple zero frameworks which are zero waste, zero emission and zero fossil energy use (Farr, 2008; Jepson et al., 2010). The theory emerged and took root in the late 1800s when most cities in America started advancing in the use of pipe-borne drinking water, sewage facilities and sanitary systems, open spaces and public parks which were being implemented in New York City. After World War II, the government wanted to initiate affordable housing to citizens in order to boost city population and give an urban utopian way of life called suburbia. Most industrial cities in the States were at that time experiencing greener suburban pastures (Newman, 2010). In the early 1990s when *The Green Paper on Urban Development* was published, it was considered as a milestone document in promoting sustainability city projects as an answer to environmental issues (Lehmann, 2010). Urban space is said to be 'smart' when it is able to adapt to the new technologies of the present era and the sustainability of an urban space relates tends to last as well as response to solutions related to climate change, biodiversity and environmental management (Newman, 2010). Green Urbanism is a theory that comprises seven main principles which are emerging and are key pillars in initiating the concept. They are climate/context, renewable energy, zero waste, biodiversity, sustainable transport, sustainable materials, density, retrofitting, green building, mixed use programmes, urban governance, cultural heritage, and local food (Lehmann, 2010).

2.4.8 Everyday Urbanism

The theory came to be known by a broader audience in 1994 when a symposium was organised in the Los Angeles Museum of Contemporary Arts *Urban Revisions* exhibitions. Everyday urbanism is seen as an alternative urban design concept; a new way to reconnect urban research and design with ordinary human and social meaning. The concept was adapted by borrowing everyday life provided by Henri Lefebevre, Michel De Certeau and Mikhail Bakhtam (Chase et al., 1999; Crawford et al., 2008). The concept developed from urban residents and their daily experiences which provides an ethnographic mode of urban research which emphasises material reality. Everyday urbanism is an approach that looks at conceptualising urbanism within everyday space. It is the physical domain of everyday public activity that exists between the defined and identifiable realms of the home, the institution, and the workplace (Chase et al., 1999). It is the physical feature of everyday public activity, which is the connecting tissue that strengthens our daily lives together. Everyday urbanism accepts the diversity of life in contrast to other schools of thought in urban design - it focuses on a particular ethos and creates an approach to further this world view. Also everyday urbanism functions more as an attitude or a sensibility about the city or a particular context, and in addition, the use of this theory will adopt an approach that can be applied to various activities (Crawford et al., 2008).

2.4.9 Resilient Urbanism

Resilient Urbanism is known as the ability and flexibility in urban planning and urban design through which the built environment can adapt to new situations and conditions within the society and economy and also create the capacity in which it's ready for physical or functional alteration and adaption. Due to unforeseen climate events, climate change, volatile economies, societal changes, environmental issues the urbanism theory was created to deal with this issues in urban planning by identifying that flexibility is very important when circumstances are uncertain (Calabrese et al, 2015). This is the most recent trend is urban theory and one of the leading theorist is Lorenzi Chelleri who believes that in order to unpack urban resilience there is need to understand the operational meaning for making cities and human settlement inclusive, safe, resilient and sustainable. By using tradeoffs which are inherent to decision making in which it's been analysed and evaluated at varying spatial and terminal scales is an essential component of resilience building urban area (Chelleri et al, 2015; Hudson, 2016).

2.5 CONCLUSION

Current trends in urbanisation have shown that it is a concurrent phenomenon that can be controlled if the right measures are put in place. With the rapid pace of urban growth in developing countries like Nigeria it has come to attention that growth needs to be alongside development in order to help a population transcend from a developing to a developed society. On the other hand, with sustainability approached as a theory and a practical mode, it has been shown that sustainability can tackle issues that have resulted from urbanisation. This chapter has analysed relevant and related literature in regards to urbanisation, sustainability and sustainable development, looking at both global perspectives and the Nigerian region. It also showcases how various emerging theories of urbanism have evolved to the most current practice of urbanism - *sustainable urbanism* - which emanated as a result of the search for a theory that responds to the current issues in urbanism. The relationship between these theories has shown a transformation and re-adaptation of the main principles while some theories relate to each other and have similar fundamental practices. Although most of the theories are still in current day practice, they have contributed to the realisation of sustainable urbanism. Nigeria as the main area of study has indicated little knowledge in the area of sustainability although current findings have suggested that there has been great interest in the adaptation of sustainable practices in the design and management of the built environment. In the following chapter sustainable urbanism is studied in greater depth: how the theory has transformed to current day practice, the key principles that make up sustainable urbanism, and lastly the existing case studies are analysed in order to understand how the theory is perceived and what sustainability indicators makes up this theory or practice for the proper adaptation in developing countries.

CHAPTER THREE: SUSTAINABLE URBANISM

3.1 INTRODUCTION

This chapter presents a review of the literature regarding sustainable urbanism, reflecting the principles of the theory, how various scholars have viewed the theory and the position of the theory in both developed and developing countries. It also builds up a case on how sustainable urbanism is viewed in Nigeria and identifies the gaps in how quality design and practices inform this research, alongside the inefficiency in using sustainable urbanism as a planning theory of future places. Lastly, to better understand how sustainable urbanism has been implemented in existing cases, a general analysis is carried out of case studies across the globe to understand what criteria have been selected in the completion of these projects. This will result in a more informed understanding of key sustainability indicators necessary for use in the built environment.

3.2 SUSTAINABLE URBANISM

3.2.1 The Definition of Sustainable Urbanism

The world is more densely populated than ever before and is inhabited by more people who consume the available resources, creating an environment that is no longer truly sustainable (Adhja et al., 2010). Arguably the problem is not so much population expansion or consumption but rather unsustainable habits. Rapid urban expansion without effective environmental consciousness means that virtually every urban centre is at risk of both natural and human-induced hazards. Urban areas, particularly in developing cities, grow and deteriorate over time, creating cities that are not sustainable which may result in initiating the use of sustainability in environmental planning (Eisen, 1995; UN-Habitat, 2008). To define sustainable urbanism is to examine sustainability in relation to urban design. Urban design is derived from related matters such as planning and transportation policy, architectural design, development economics, landscape and engineering. Urban design is about creating a vision for an area and then deploying the skills and resources to realise that vision (Davies, 2007, pg.10). Also urban design draws together the many strands of place-making environmental responsibility, social equity and economic viability into the creation of places of beauty and distinct identity. Urbanism demands mixed-use development, creating a range of opportunities for people to interact easily within the urban space, live, work or travel, also creating activities within the building and its surrounding environment (Jacobs, 1961). Urbanism is a creative,

collaborative process that involves shaping the forms of the city, enhancing the experience of it and improving its function as a habitat for human life (Wall et al., 2009).

Sustainability on the other hand ensures that the present generation can enjoy a satisfactory QOL which aims to fulfil current needs without compromising the plans of the future generations. This principle is based on the whole life cycle of the building materials, use of raw materials, renewable energy sources, minimising the materials, energy use, raw materials production, and recycling of waste. It also considers the impact of such development on the society as well as its economic benefits and cost in actualising such projects (Dominque, 2002, pg.12; Slone, 2008). The theories focuses on three main tiers or strands of sustainability; these are social/cultural, economic and environmental (O'Riordan, 1998). Combining the two principles has resulted in 'Sustainable Urbanism', which can be defined according to Farr as

> a walk-able and transit-served urbanism integrated with high-performance buildings and high-performance infrastructure; where compactness (Density) and human access to nature (Biophilia) are core values and where aspects of sustainability, functionality and interconnectivity are more important than design (Farr, 2008, pg.65).

This definition focuses on the form-based bias of the current architectural theories and practices for understanding sustainability. Sustainable urbanism is also imagined as a grand unification of architecture, city development and environmental design for a better way of life (Polese, 2000; Dominique, 2002).

According to this statement, the unification of these three principles will entail the use of *architectural design* which relates to sustainable materials and sustainable building design. *City development* addresses how urban design can relate to the growth/advancement of cities and, lastly, *environmental design* involves the environment, global warming, green spaces and CO2 emissions. This definition is problematic as it situates the domain of sustainable urbanism in the context of contradictory and conflicting design bias of architecture, urban planning, landscape architecture and civil engineering. This also underscores a lack of clear definition and understanding of sustainability and sustainable urbanism (Newman, 2005).

The theory has its roots in America's search for global urban solutions by facing the problems of suburban development. It targets critical issues and challenges, not only those of urban planning, social, environmental and economic sustainable community but also health and climate on local and global scales; and proposes comprehensive solutions for these interdisciplinary tasks of both present and future meaning (Farr, 2008; Wu, 2010). Sustainable urbanism aims to return modern suburban designs to an earlier era which had smaller units of

mixed-land uses, internal pathways and a semi-grid street pattern which enhances integration with neighbourhoods and many activities are done on foot. It also draws attention to the enormous opportunity to redesign the built environment which supports a higher QOL and a healthy lifestyle (Farr, 2008). The likelihood of actualising this theory in developing countries like Nigeria will be as a result of studying how it has been applied in developed countries like the United Kingdom and other parts of the world.

Ian McHargs started the discussion on the role of man in relation to design with nature in 1969. In his book *Design with Nature,* he looks at urban design in its current true form from a critical point of view where he showed harsh reactions against the pollution, ugliness and lack of vegetation in his native environment Glasgow. Given how critical Ian McHarg was in regards to the design of cities, it is ironic that design with nature ignored the task of trying to improve cities by better integrating their design with natural systems (Adhya, et al., 2010, pg.2). Sustainable urbanism is said to have emanated from three reform theories that have transcended McHargs' antisocial environmentalism to focus on the benefits of fusing human and natural systems. Farr suggests that 'smart growth', 'new urbanism' and 'green building theories' provide the philosophical and practical foundations of sustainable urbanism (Farr, 2008;Adhya et al, 2010;). All three movements share a common goal in achieving economic, social and environmental reform. Sustainable urbanism was as a result of the unification of these three important theories transforming into a design philosophy to create a truly sustainable human environment (Newman, 2005; Adhya, et al., 2010). Each of these theories has suffered from certain insularity that has resulted in myopia when it comes to searching for long-term solutions. Therefore, sustainable urbanism attempts to bring these three important movements together and combine them into a design philosophy to allow and create truly sustainable human environments (Gauzin-Muller, 2002, pg.34).

Sustainable urbanism depends on both responsible politics and professional capabilities of policymakers, planners, architects and building and civil engineering industry. It makes best use of the built and natural environments, to the economic and social benefit of the community (Farr, 2008). It has positive consequences for the daily life, a cleaner, less noisy and less polluted city; traffic priority given to pedestrians and cyclists; more welcoming public spaces; enhanced community life, and a sense of civic pride (Gauzin-Muller, 2002; Farr, 2008). For a city to be sustainable it means that over the long term its harmful impact on the environment must be limited; also living and working conditions for its inhabitants must be pleasant.

Application of sustainable urban development policy requires both political strength and commitment on the part of central authorities (Adhja et al., 2010).

Sustainable urbanism combines the three main dimensions in sustainability by ensuring that urban spaces are environmentally aware, socially inclusive and economically productive (Adhja et al., 2010). Most key areas that this theory is adopted in include compact forms of residential expansion; mixed-use housing, jobs, social services and proximity to retail outlets; also integration of transportation as well as land use, and lastly sustainable drainage systems, reduction, re-use and recycling of waste materials (Farr, 2008). At the moment the recognition of some of the three main dimensions of sustainability has not been initiated in most urban development projects done in developing countries. Some emerging countries in Africa do not seem to adopt any area of these aspects of sustainability (Gauzin-Muller, 2002). Developed countries have implemented sustainable urbanism in projects using this theory as a platform in the design and planning of infrastructure; key examples are Dockside Green Victoria, British Columbia (Canada), Upton, Northampton (England) and Dongtan, Shanghai, (China) (Newman, 2005; Farr, 2008) (although their success is determined in the analyses at the end of this chapter). In developing worlds the perception in relation to sustainability is gradually emerging but its successful implementation is based on understanding the key principles. The major aim of sustainable urbanism is to develop a city that is ‘user friendly’ and resourceful in relations not only its form (design) and energy efficiency, but also its function in regards to a place for living (Eikin et al., 1991). Figure 3.1 below showcases how sustainable urbanism has transformed to its current phase based on the evolution of various urbanism movements.

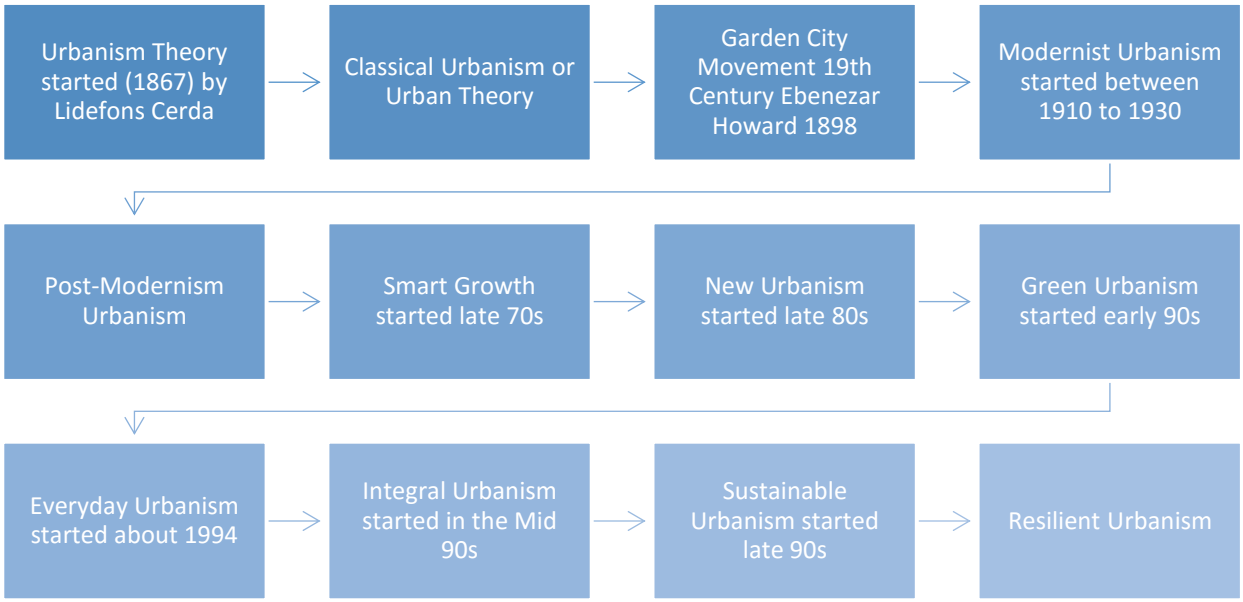


Figure 3.1: Time Line on Urbanism theories from 1800 to date (Sustainable Urbanism Era)

Source: Momoh, 2015

3.2.2 Emerging Threshold and Assessment Indicators for Sustainable Urbanism

It is estimated that, over the next 45 years, about 2.5 billion people across the world will be living in new developments. The principles of sustainable urbanism have been considered as the ideal theory in achieving this proposed scheme (Farr, 2007), although it would be difficult for most projects across the world to initiate this scheme based on a range of factors. However, recent research findings carried out by Farr, (2008) have indicated the wide adoption in the use of sustainable urbanism in today's practice mostly in new developments. The definition of sustainable urbanism is made up of a key set of words that explains the theory. These words are based on the meaning of sustainability and issues that underpin the definition of this theory and also emerging thresholds in sustainable urbanism. These thresholds comprise five areas; density, biophilia, corridors, high-performance buildings, and infrastructure and neighbourhood.

3.2.2.1 Increasing sustainability through density: The cost of constructing a project generally increases with density. High density is a main feature of sustainable urbanism and cannot be achieved at low density therefore implying that it should not be below seven to eight dwelling units for each acre. This is the standard measurement in developed countries like the

United Kingdom and America while, in developing countries, density is relative to the context and the policies guiding urban planning. The area should be dense enough to achieve a walk-able transit design and provide a place with a public traffic system. Sustainable urbanism requires mid- or higher density development in the planning phase of the design (Farr, 2007).

3.2.2.2 Sustainable corridors/transport system: These can be defined as building blocks in sustainable regions. The key functions of a sustainable corridor are related to density and land mixed uses. In order to achieve a well-based balanced density and reduce the use of transport facilities, corridors are the key support of sustainable urbanism because they link neighbourhoods with districts and other regional destinations (Farr, 2007).

3.2.2.3 Biophilia: This is defined as human access to nature which is based on how humans and other living systems can interact. The concept of biophilia in relation to sustainable urbanism aims to believe that human settlements need to be planned to make the natural system work with the built environment. Biophilia relates to locally grown food, waste management and storm water systems amongst others (Farr, 2007).

3.2.2.4 High-performance buildings and infrastructure: This threshold identifies how the building, planning and design can affect the overall performance of initiating sustainable urbanism. The performance of building talks about how building energy usage can be optimised by using building orientation and massing which can have a significant influence on the energy usage in the building. Also, other energy efficiency measures are initiated into the design using both active and passive solar architectural designs. High-performance infrastructure practices will improve the performance of the entire roadway system which includes design of street, sidewalks, landscapes and street furniture, and storm water infrastructure (Farr, 2007).

3.2.2.5 Sustainable neighbourhood: This is a pattern of our local or traditional neighbourhood design which comprises housing, work places, shopping and civic functions. The pattern used in designing mixed uses will involve a concept that is compact, complete, connected and sustainable. Sustainable neighbourhoods consist of five conventions – these are identifiable centre and edge to the neighbourhood, walk-able, mixed-land uses, network of walk-able streets and lastly urban space for public and civic purposes (Farr, 2007).

3.2.3 How have different Researchers viewed Sustainable Urbanism?

Douglas Farr states that the theory searches for global urban solutions originating from the United States, it targets the problems of sub-urban development, and it also looks into how to adapt sustainability principles in various planning states worldwide (Farr, 2008, pg.41). The movement also supports the role of global network and agenda which values factors and responds by using the tools of sustainable urban design (Newman, 2005). Sustainable urbanism addresses critical issues not only in urban design which includes social, economic and environmental sustainable community development (Farr, 2008). Farr (2008) suggests that these developments can help future cities generate a realistic picture. The implication of these principles is representative of a utopic state and a prerequisite for social change contributing to the urban development of society (Gauzin-Muller, 2002, pg.39). This linkage between urbanism and sustainable planning poses beneficial impact for communities and built environment realisation.

In the United Kingdom, the concept of sustainable urbanism is still in its early stages. According to the Prince's Foundation, sustainable urbanism can enhance development value and may potentially enhance land value (Smallwood, 2007). Certain areas have been identified as features of sustainable urbanism which includes mixed uses, mixed tenure, mixed housing type, good public transport connections, walk-able neighbourhoods, relatively high net densities, well integrated open space, and opportunities for a range of work and life style choices. It is put forward as the guiding policy for the development of North Northamptonshire, Stansted Corridor, Milton Keynes and the Thames Gateway (Smallwood, 2007). The Prince's Foundation seeks to build better communities in the United Kingdom both by example and by working with other partners who have similar goals to their objectives. Adhya Anirban and Plowright Philip who are promising researchers in America suggest that sustainable urbanism is also imagined as a grand unification of architecture, city planning, and environmental design for a better way of life. Various researchers have come up with theories in regards to sustainable urbanism all aiming at envisioning a truly sustainable environment (Adhja et al, 2010, pg.2).

3.2.4 Sustainable Urbanism on a Global Stage

A Global Report in 2009 on human settlements by the United Nations Centre for Human Settlements focuses on revisiting urban planning (Adhja et al., 2010). Renewed interest in urbanism within the last 10 to 15 years is driving the exploration of the nature and role of urban

planning; highlighting emerging global trends, complex urban patterns and evolving challenges of urbanisation (UN-Habitat, 2009). Urban growth in most parts of the world is characterised by a contradiction which shows that this growth is not uniform and as a result there is huge metropolitan growth, continuous displacement, deterioration and reduction in value of the inner core cities (Couch, 1990; Alexander, 1992). This has opened up opportunities and challenges to explore sustainable urbanism as a new discourse in city planning and urban design (McMichael, 2000; Wheeler et al., 2009).

Apparently urban growth over the last few decades has experienced advances in efficiency and individual wealth. Urban agglomeration and technical advancement are characteristics of progressively complex and interdependent growth (Cook, 2010). Recently, the financial innovation that stimulated most of the urban restructuring in the United States has ignited a global economic epidemic moving the economy into recession thereby affecting the global financial structure that sustained it. At the moment it is estimated that about a billion urban residents are currently living in slums, delinked from trunk infrastructure, without land tenure, unable to reach municipal capitals, and unnoticeable to urban policy makers (Wheeler et al., 2009; Cook, 2010). UN-Habitat has recently changed the themes based on the urgency to mitigate the overwhelming concerns of rapid urbanisation in the world.

In view of the implications of the increasing urban population in low- and middle-income countries, the 2002 Johannesburg World Summit on Sustainable Development (WSSD) called on all governments to address the overwhelming challenges in the provision of urban basic services particularly decent houses, water and sanitation for the teeming populations in slums where QOL is appalling. Most countries in Africa, Asia and South America have in the last few decades not been able to deliver on their promises of alleviating the precarious state of living environment of their citizens (UNHABITAT, 2003; Slone, 2008). Some very good examples are Cuba, India and Nigeria; these countries have embraced a socialist planning philosophy which implies that urban form could take a suitable direction to a global economic capitalism. Coyula-Cowley (2010) stated that this is an example where "the economy moved faster than the planners" (Cook, 2010, pg.20). His opinion opens an active space for review into relationship between planning theory and practice and the central unit of study of the city. Susan Fainstein (2008) explained that the planning theory with social evaluations of the "just city" states that the contemporary distinction between urban theory and planning theory as intellectually untenable and would result in "the isolation process from background and conclusion" (Newman, 2005; Adhja et al., 2010). Newman (2005) outlines the uses and scope

of planning theory drawing on the differences between explanatory, justificatory and normative uses of planning theory in relation to city planning and he suggests that a proper clear normative planning theory is needed to recognise the problems that may arise between local, regional and global interests that will in turn lead to isolation and inequalities in the cities (Newman, 2005).

3.2.5 Sustainable Urbanism in Developed and Developing Worlds

It is a known fact that cities have the potential in making sure infrastructure services and technology can affect environmental impact which could benefit increased awareness and economics of scale. It is only recently that cities have been able to develop robust effective planning systems and governance to set up pathways to sustainable development, and in developing countries, major cities still lack such systems (OCED, 2009). In response to the global environmental issues, however, a range of strategies have been employed to enable cities to build frameworks in order to protect their ecological security (such as waste, flood protection, water, energy) and to ensure continuity in economic and social development (Hudson and Marvin, 2009). In terms of policy and adaptation which are mostly driven by cities in governance, there has been more interest on the concept of 'sustainable urbanism' and how this can help cities towards achieving a more sustainable future. A good example in Europe 2004, was the joint urban policy known as the *Rotterdam Urban Acquis* was created to develop the concept of integrating sustainable urban development in the aim of creating a lasting improvement in economic, physical, social and environmental factors of a city. The main factor in achieving this is integration which means all policies, projects and proposals are considered in relation to one another (EIB, 2010; Dixon, 2011). According to Dixon (2011) within the next 40 years cities will face a combination of key socio-economic and environmental drives which includes climate change, population explosion, rise in energy prices, increasing densification, social inclusion, information technology, and global competitiveness (Dixon, 2011).

In the Middle East cities in Dubai, Abu Dhabi and Doha are currently working on incorporating sustainability principles in their master plans aiming to lead the sustainability agenda. Although some of the projects carried out have attracted major criticism in terms of environmental impact, others such as the Masdar city project have become good examples of sustainability (Stillwell and Lindebery, 2008). However, most of their projects are expensive and are mainly technologically driven.

Table 3.1: Four categories of cities with different attributes and prospects

	'Brown'	'Red'	'Green'	'Blue'
Example	London	Mumbai	Masdah	Dhaka
Development	Gradual	Ad-hoc	Deliberate	At risk
Assets	Cultural history, outdated buildings	Resilience, diversity, ability to manage scarcity	Clean slate for innovative, holistic solutions	Potential for innovative solutions
Buildings	New construction and retrofit	Affordable and low impact housing	Holistic design	Adaptation

Source: Adapted from WBCSD, 2010

Recent research into sustainable urbanism has that suggested cities and urban places will follow different trajectories in selecting indicators used in achieving sustainable urban futures. The World Business Council for Sustainable Development report (Vision, 2050) (WBCSD, 2010) recommends that urban cities across the world have different requirements and needs - see Table 3.1 above. Example cities like Masdar city in Abu Dhabi are constructed from the scratch while cities like London, Paris and Seoul have built up areas where most of its buildings are listed or protected. Cities like Dhaka and New Orleans have to target designing against flooding and population explosion (OECD, 2009; Dixon, 2011). Cities with higher environmental quality will maintain enhanced economic attractiveness. Africa is still facing significant problems and most issues are more a combination of various factors. It might take time to achieve sustainable urbanism but it is a gradual process. Development has resulted in the upgrade of developed countries. Most countries in Asia and Africa have higher social problems than developed countries (WBCSD, 2010). Achieving sustainability in urban development is

seen to be expensive because basic survival needs such as food, housing, clothing, education and healthcare are not available. In order to have a healthier house, renewable energy, technology, and environmentally friendly transportation system, it is recommended to first provide adequate affordable housing, energy, transportation and basic health facilities before other element can be incorporated and sustainable urbanism can ultimately be achieved (Couret, 2000, pg.2).

3.2.6 Sustainable Urbanism in Nigeria

Developing nations experience informal planning, housing dilapidation, and decay. This is as a result of many factors such as lack of proper urban planning systems, weak urban and housing management processes, land tenure system, urban violence, corruption and lack of awareness (Oyeshola et al., 2009). These problems are not been properly managed based on unequal distribution of income generated by social, environmental and economic systems. In order to achieve sustainable urbanism in developing worlds certain measures must be taken by architects, planners and government officials (Couret, 2000). In the Nigerian context it has been argued that, to achieve sustainable urbanism and sustainable development, there has to be a collaborative approach employed in achieving it, so that both future and present generations can benefit from this theory (Oyeshola et al., 2009). Hence it is important to know that the answer to the Nigerian urban chaos is not reliant only on new policy adaptation but it is determined by a composition of various factors like proper instrument implementation, incentives, education and public participation, amongst others. However, one of the biggest challenges which threaten the achievement of sustainable urbanism in Nigeria is poverty (Jiboye, 2011b, pg. 213). The definition of poverty is said to be a state of long-term deprivation of well-being, a situation considered inadequate for a decent life. Recent World Bank statistic has revealed that 60 per cent of Nigerians live below the poverty line while 30 per cent are middle-income earners and 10 per cent are high- -income earners, a ratio of 1:3:6 respectively (UNDPI, 2008). To tackle the rapid urbanisation and population explosion the poverty issue has to be properly managed. Because poverty jeopardises political stability, social cohesion and environmental balance of cities, until it is been managed, sustainable urbanism will be hard to attain (Olarewaju, 2003). Another way of achieving sustainable urbanism that most urban regeneration schemes or urban development initiatives should look into is the adaptation of an effective and operational framework for housing delivery in Nigeria, with the aim of improving

the standard of living of its habitats and creating cohesion between low-, middle- and high-income earners (Oyeshola et al., 2009).

Another problem faced in Nigeria is the inconsistency in the policies adapted by the government in regard to infrastructure provision. Sustainability in housing can be accomplished if the government embarks on policies based on the needs of the people and not selfish interest. Housing provision should facilitate improved standards of living of people which can create a knock-on effect on health, productivity and welfare of the people (Oladunjoye, 2005). Meeting targets should be the main focus of every government regardless of the initiative of the policy or governmental change (Jiboye, 2011a, pg.177). Policy adaptation, initiatives, schemes and programmes might be the tools needed in achieving sustainable urbanism but for them to have the desired outcome in Nigeria these strategies must be significant to problems and issues in relation to urbanisation, attitudinal orientation, lapses in the legal and institutional frameworks in urban environmental management, good governance, urban regeneration, extension, enhanced infrastructure development, and collaboration between stakeholders and community. These initiatives will go a long way in achieving sustainable urbanism (Oladunjoye, 2005; Jiboye, 2011, pg.181).

3.3 CASE STUDIES ON SUSTAINABLE URBANISM

Urban practices or cases can be adopted, deduced, synthesised and analysed to gain viable information on how to achieve sustainable urbanism and how well it has been implemented in most parts of the world. These practices include examples in the United Kingdom and abroad and are reviewed below to provide the best guide to ongoing quality design of new settlements and place-making. Also the study includes efficient practices in adapting sustainable urbanism as a principle in the planning of future places. These studies explain further why sustainable urbanism is not only about achieving sustainability in the built environment but also place-making which is creating a particular architectural style as well as well-designed functional homes and neighbourhoods that feel like home (CABE, 2005). In line with this definition of sustainability and place-making, five main cases are examined. These cases reflect the highest quality examples of sustainability and place-making within various locations across the world - mainly the UK, the Middle East, America and Australia.

Each project emphasises lessons learnt on environmental performance, social aspects, design, technology, key sustainability threshold and indicators, systems integration and leadership

(Farr, 2008). Although a few projects from decades ago have helped to shape sustainable urbanism movement - for example, the Garden City Project - the present cases help reveal good examples of sustainable neighbourhoods which are more than the combination of energy-saving technologies but rather a combination of the three components (tiers) of sustainability which includes Upton Northampton, Masdar City, BedZED in London, Newington in Sydney and Dongtan, Shanghai, amongst others. Sustainability aims to embrace context and these practices enhance the celebration of a place, taking account of the area's environmental, social and economic wealth and augmenting it through neighbourhood and corridor design (Newman, 2005). A set of criteria and indicators of key features in sustainable urbanism are cross-referenced and used to critique and analyse these case studies. Other functions that these cases undertake are appraised based on are the environment and public realms, transport and accessibility, housing, community and society justice, development and economy (CABE, 2005; Farr, 2008). The objectives of appraising and critiquing the case studies are to access the merits and demerits of each development against good sustainable urban practices. This allows us to identify the strengths in place-making that each example has to offer, and to learn valuable lessons.

The case studies considered are;

a. The Garden City Project Letchworth

b. Upton Northampton United Kingdom (Pilot Case study)

c. Newington Sydney Australia

d. Loreto Bay Baja California Sur Mexico

e. Masdar City Middle-East (Abu Dhabi)

The methodology used in analysing these cases is based on a review of the current literature, multiple sources and documentary analysis. Also the main reasons for selecting these cases are based on their location on each part of the continent and recommendation from literature.

3.3.1 Justification in the selection of case studies in understanding sustainable urbanism

Research must follow a systematic method in order to achieve results to be tested and validated. Case studies are used in design research in analysing a phenomenon and to generate an hypothesis with a methodological structure that supports the entire process of the results. Although they are used extensively it appears that there are no accepted systematic case study methods initiated in this design. When considering its nature, use and objectives the case-study method can be implied as a suitable method for conducting design research (Teegavarapu and Summers, 2015). Also case-studies is deemed to be one of the preferable approach when undertaking modest scale research project based on comparison of two or more context organisation, scenario or lots more (Rowley, 2002). The researcher selected five projects which are known to be designed based on the principles of sustainability. This includes Garden city, Masdar City, Upton Northampton, Sydney, Loreto Bay Baja California. They were selected based on a number of factors which includes degree of sustainability achieved, number or thresholds of sustainability indicators, access to materials/ proximity, global location/contextualisation, scale of the project (neighbourhood scale) and period of design/development. This gave a much robust understanding of how recent this case studies has been developed and how this cases have developed within the principles of sustainable urbanism looking from the garden city era up to the Masdar project which is the most recent project completed in 2016. This will also inform the degree of sustainability indicators to be selected based on the facts that indicators prioritisation has shifted from one era to another and the past projects always inform the future developments.

3.3.2 Case Study 1: Garden City Project

The Garden City Project was the most potent planning model in the western region during the nineteenth century. It was created by Ebenezer Howard in 1898 to solve urban and rural problems, and has acted as a pillar or source of many key planning ideas during the twentieth century. The idealistic principles used for the Garden City Project evolved out of reaction to conditions or trends concurrent with the period during which they were proposed as more or less a form of achieving utopian visions (Batchelor, 1969, pg.185). Most planning ideas were suggested by politicians, economists, geographer and architects whose concerns were based on a structure for involving people in the planning of their communities. Planning ideas do not happen as a one-sided phenomenon in the realm of social philosophy; rather they emerge as a result of a continuous accumulation of notions about the way of life people ought to live. Howard's primary goal was to produce a less crowded and more equal society by initiating

land reforms and cooperative effort (Unwin, 1912). In his book *A Peaceful Path to Real Reform*, Howard proposed the establishment of a garden city into the built environment. Apparently he had synthesised more than one hundred years of writing, thinking, postulating and experimenting by others on the creation of new communities. The core garden city principle includes strong communities, ordered development and environmental quality (Batchelor, 1969; Ward, 2013). These principles were to be achieved by;

- Unified collection of land to prevent individual land speculation and maximise community benefits
- Careful planning to provide generous living and working space while maintaining natural qualities
- Social mix and good community facilities
- Limits to growth of each garden city
- Local participation in decisions about development (Ward, 2013).

However, Howard's garden city concept originated from his predecessors whose ideas emerged out of the political turmoil of 1848. Howard proposed the development of a self-sufficient town of 32000 people to include the financial arrangements required to bring about its realisation. He also designed a structure by which local government could achieve a regional network of garden cities (Ward, 2013). As a result his utopian dream was proposed as an answer to the following problems:

- The encroachment of contemporary cities on adjacent rural areas
- The drift of agricultural population to large urban centres
- The subsequent decline of poor rural life
- The growth of slums in large cities and ensuing overcrowding
- The fluctuation of economic activity particularly in the agricultural sector of the economy
- The growth of land values without benefits to the community
- The exclusion of the benefits of city life from residents of rural areas
- The unsanitary conditions of life in contemporary metropolises (Batchelor, 1969).

Howard strongly believed that his concept would help create a remedy to most problems and this was used in the development of two successful projects - Letchworth in 1903, and Welwyn 1920, both in England. Letchworth was the world's first garden city and it was created as a response to or reaction against the chaos of the typical Victorian city. The style of design is basically twentieth century and it showcases arts and crafts in relation to form, materials and exquisite detailing (Ward, 1990). The garden city was the closest to Howard's ideal free-standing, self-contained communities. Many garden suburbs have applied Howard's techniques to existing cities and as a result ideas have spread to other countries, particularly in Europe and the USA through globalisation. Trading and colonialism are also key reasons why it spread to other parts of the world. It is a flexible, affordable and adaptable model which can be disassembled and juxtaposed with other concepts (Ward, 1990; Ward 2013). Different elements can be emphasised as a wider agenda to produce a better society. This element includes metropolitan decentralisation, regional economic growth and rural consolidation. A good example is Red Burn, New Jersey USA (1928); in this case the planners wanted the garden city concept to be affordable for all income earners, mostly those with modest income. The attractiveness of the living environments has resulted in a widely adopted principle which supports low-, middle- and high-income earners. Examples of modest income garden city are WW1 Kapyla (Helsinki, Finland) and Lolonel Light Gardens (Adelaide, Australia) (Ward 2013). The constituent elements of a garden city project includes reduction of population expansion and the introduction of a permanent agricultural belt around the city to act as a barrier in the growth of the city; control of the urban environment by the municipality or government; adopting unearned increment of land value to be able to generate benefit for the community; providing private commercial and industrial firms with lease properties and generating profit from the business operations; and development of regional clusters or constellations of smaller cities with good transport system and transit linkage (Batchelor,1969; Ward, 1990; 2013).

The garden city concept rekindled a strong interest in city planning around the turn of the century despite general skepticism by most people, shortage of capital and numerous initial problems, Letchworth became a successful project. The project became a reality and today is a thriving town. The effect of the garden city principle can be measured to have influenced tens of millions of people and various projects have been conceived both positively and negatively from the garden city project as well as planning principles like new urbanism (Ward, 2013). The American New Urbanism movement returns some aspects of the garden city as a more ordered, commercial and sustainable alternative to mass suburbia. The garden city has created

a widening middle class in a more individualised sprawl landscape, reducing spatial coherence or community life. It has met private needs in creating public problems for the environment and social development. Another criticism of this project is in relation to the wider environmental impact of the garden city which critics consider to be very minimal. Even though the garden city model has extended across the globe, it influenced a vast majority of people in the twenty first century, and largely those from most affluent countries, but still the movement remains an unattainable dream (Ward, 1990, pg.256).

Figure 3.2: Garden City Project Letchworth, United Kingdom

Source: Ward, 1990

3.3.3 Case Study 2: Upton, United Kingdom

This pilot case study will help to refine the overall data collection plans with respect to both the context of the data and the procedures to be followed. Also these cases will assist in the development of relevant questions and also provide some conceptual clarification for the research design as well. In general, convenience of access to the case and geographic proximity are the main reasons for choosing Upton as a pilot case. The fact that it is the first development which has been successful in the initiation of sustainable urbanism in the United Kingdom is

also one of the reasons to further investigate this case. The scope of the inquiry for the pilot case will create a much broader understanding of the project than the ultimate data collection plan. The inquiry covers both fundamental and methodological issues. Methodologically, the work on the pilot cases can provide information about relevant field questions and about the logistics of the field inquiry (Yin, 2008).

3.3.3.1 An overview and background of the Upton Northampton project

Population and employment growth have been the main reasons why the regional spatial strategy for the East Midlands has suggested Northampton as a potential region for economic growth, focusing on the government's sustainable communities plan, *Sustainable Communities; building for the Future*. Upton is known as a sustainable urban extension which is intended to promote good designs and development practices for developers and house designers (ADS, 2011). The Upton urban development project is a combination of new innovative green building technologies to a built form embedded in the traditional English countryside. It is stated that about eight phases of the project embrace traditional architecture more than other contemporary architectural designs; even the modern phases integrates traditional touches such as old-world masonry (Farr, 2008, pg.238). Upton is located within the Southwest borough and is a planned urban extension to the town. It is situated between the existing town edge and the highway. The initial plan aims to create 5000 new homes, 280000m^2 of industrial area, a country park open space and other complementary facilities. From inception the site was farmland but was later acquired by Northampton development cooperation following which it was transferred to the Commission for Newtown in 1985. Now it is under the management of the English Partnerships which is the government's national regeneration agency. In 1997 Upton was given planning permission to develop the following projects: 1020 homes, primary schools, local centre and retail spaces, medical centre, nursery, and community facilities (English Partnership, 2005; EST, 2006).

In 2001, the urban extension project partners including English Partnerships who were the landowners, Northampton Borough Council and the Prince's Foundation commenced on the project to promote best urban design practices in relation to sustainable development and sustainable urban growth where most contractors would become associated in the delivery of new homes under the guidance of a design code. The design code is an integrated vision for Upton that directs developers in constructing buildings that will meet both the environmental

and aesthetic goals of the project. The codes describe Upton as a warm, friendly and welcoming place to reside as well as a fertile ground for demonstration of new green technologies. The main goal for Upton is to develop a community that is flexible and can adapt as residents' needs change (Farr, 2008). A group of consultant agencies called EDAW now (AECOM) was in charge of supporting the realisations of the new community (English Partnerships, 2005). The use of enquiry-based design showcases how the partners were able to carry out a viable design process working together with a range of local stakeholders and professionals. During various meetings with the stakeholders, some options were tested to set up the most sustainable mixed form for the development. This procedure generated a draft master plan for the site (Farr, 2008, pg.239).

The design process resulted in the creation of a consultancy group to oversee the project's implementation and to encourage the involvement of all major partners. The group met consistently in order to establish a steady progression of the project and address any design problems that might arise. The process also involved studying various case studies of good practices of low-impact developments with the aim of looking into options and exploring the feasibility of this good case for Upton. This consultancy group also had to work with the local community and stakeholders which helped maintain the involvement of the entire community (Briggs, 2008). EBD has been developed and used in this project to establish a framework based on design guidelines agreed with the stakeholder. The guidelines were drawn up by the Prince's Foundation where a yardstick was used to measure and maintain high quality standards throughout its implementation. EBD was initiated within the design stage to collate various important pieces of information about the site and establish goals to harmonise this with the aims and objectives of the key stakeholders as well as setting a standard of UK house guides based on place-making and high environmental performance. The design of the master plan has resulted in an integrated and holistic approach in achieving sustainability which aims to balance environmental, economic and social issues (Farr, 2008).

3.3.3.2 Implementation of indicators to practice

The Upton code synthesised the principles established by the EBD scheme and was published in May 2003 as a planning guide for Upton area with high support from Northampton Borough Council (Noel, 2013, pg.4). The project was English Partnership's first coding project and was a learning curve for all parties and people involved in the planning and development. EDAW was later commissioned to formalise and design the master plan and to produce the Upton

design code. The master plan and design code together produced the Upton urban framework, which received planning consent in February 2003 (English Partnerships, 2005). That the design project commenced with EBD with the involvement of the Prince's Foundation was a clear intention that a novel approach in designing urban spaces was conceptualised. This new concept involved the need to adopt a new approach to all participants which includes consultants, contractors, local residents and other stakeholders, which subsequently resulted in the initiative of creating the Upton code. The design codes emphasis was based on the development meeting the objectives of a sustainable community in which residents live in neighbourhoods with walk-able permeable streets, good street views, quality public spaces/play areas, local facilities, and accessibility to public transport. In overall practice, the codes establish a design guide on how the urban elements and infrastructure are assembled and their relations to each other. This set of specific design briefs and constraint plans provides the developers with a clear set of rules. The codes emphasise the use of quality materials and efficiency in the improvement of energy and water usage across Upton, which later resulted in revisiting the design code and the creation of a second version. This revisited version looks into lessons learnt from the implementation of the first sites (Noel, 2013).

The design codes are important elements that make up the Upton development. The urban framework outlines the design process while the design codes help to provide a guide in ensuring that there is consistency throughout the phase of the development, thereby maintaining the aim of the urban perspective. The design codes follow the standards in regards to the development giving the relevant BREEAM/Eco-homes a high standard, achieving a rating equivalent to code 3 and code 4 under the publication for sustainable homes (English Partnerships, 2005; EST, 2006). The Upton Design Code created a set of outlined principles specifying an interconnected street pattern (street block structure of planning) and detailing a set of four character areas based on density and spatial character - urban boulevard, neighbourhood spine, neighbourhood general and neighbourhood edge. The Upton street structure targeted the connection into the wider street network by linking to developments neighbouring the Upton site (Adams et al., 2010). The Code creates the general three-dimensional form massing, setting out the heights of buildings close to the streets. All streets were assigned a place within a hierarchy of four street types, which are urban boulevard, main-street, lane, and mew. The Code requires the following

- Sustainable urban drainage system (SUDS): This system involves the combination of surface water discharge into the existing swale system, new swales and porous paving in the courtyard area and home zone in the housing areas.
- Energy and utilities: These require the use of green tariff electricity provision. It also involves the initiation of common service corridor for the system.
- Resource usage and energy conservation: The design incorporates the use of optimisation of passive solar gains, green roof, wool insulation, wind turbines and reduction of CO_2 emissions to be lower than 25kg/m^2 each year.
- Water conservation/rainwater management: There would be the use of high-efficiency fitting/facility (e.g. low-volume toilets and spray taps) to be incorporated and also the use of rain water harvesting technology.
- Building materials: Recycled or locally made sustainable building materials were used in the construction of the project.
- Waste minimisation: This involves the recycling of materials during construction and afterwards as well as using the lean construction process.

The project's highlights and benchmarks and key sustainable urban thresholds/indicators include the following:

a. Project's Highlights and Benchmarks

- 22 per cent of units are developed to be permanently affordable, with the aim to achieve social sustainability with no more than three units all together.
- Diverse dwelling types, high-density area, mixed use and tenure mix.
- All homes should meet BREEAM Eco homes excellent standards and enhance Local Ecology.
- Mini-wind turbines on some building sites.
- All developers must obtain green energy tariffs.
- Extensive sustainable urban drainage system.
- Every site should initiate or showcase different sustainable technologies.
- Twice-hourly bus service started with first residents (Farr, 2008).

b. Key sustainable urban thresholds/indicators

- Open space
- Storm water systems
- Impact of planning on building usage
- Large district energy systems
- Walk-able streets and networks and car sharing (Farr, 2008, pg.240).

The Upton master plan re-establishes the principles of place-making. Unlike adjacent cul-de-sacs, it uses a series of permeable street networks, blocks and open spaces. High-density living and minimum use of the car creates an attractive urban environment.

3.3.3.3 Learning outcomes from the practice to date

The urban scheme sets a new benchmark in the development of large-scale housing projects, giving investors and developers an opportunity to create and envision sustainable communities, and energy-efficient homes with a mix of modern and traditional architecture (EST, 2006). Northampton Borough Council being one of the main partners in the development made it much easier and possible for the local council and the planning committee to endorse and approve the detailed designs. Within a short timeframe they had the best-value performance indicators specified by ODPM (English Partnerships, 2005). This has created a knock-on effect where other local authorities are considering adopting the use of design coding for most projects. With EBD, other developers are free to focus on the best process in integrating design codes in the delivery of a project. The landowners and English Partnerships have ensured and created a role in maintaining a consistent practice in which sustainable housing can be attained. "English Partnerships have used these codes to develop a framework for the public sector, highlighting its potentials for sustainable housing" (EST, 2006, pg.7). The application of design codes helps to create discussions between developers and design team likewise developers and decisions makers. Overall context design codes have been a vital element in accomplishing the sustainability standards required on the urban extension (English Partnerships, 2005; Noel, 2013).

3.3.3.4 Identifying Reasons for its Recognition as best practice

The case study has created a best-practice status which has been recognised and supported by a vast body of literature from CABE, Energy Saving Trust, Doug Farr Sustainable Urbanism (Urban Design with Nature), Architecture and Design Scotland, Northampton University and so on. The major parameters for this success include;

- The use of community-led design tool called EBD for the urban extension.
- The use of "SUDS" on a large scale with urban swales to manage flooding and integrate biodiversity. The initiation of the Sustainable Urban Drainage Systems (SUD's) system to combat flooding has enhanced the urban street form, created play space, and increased biodiversity.
- Sustainable Neighbourhood with permeable settlements which makes it walk-able with clear differentiation between public and private spaces. Easy access to public transport.
- Incorporating a range of mixed uses including primary school, community hall, corner stores and offices. Also mixed architectural forms and styles, and retention of local identity.
- About 22 per cent of the buildings are used under the tenure system in other to achieve affordable housing.
- The building achieved a minimum of code 3 of the BREEAM excellence standards
- The integration of primary school, community halls and other facilities has created a strong sense of place with regional identity and enhanced community spirit, as seen in the open spaces, parks and community centres (English Partnership, 2005).

3.3.3.5 Barriers and Remaining Challenges

a. **Economic and Government Changes:** The project was affected by the start of the recession and by significant changes in government policy. The nominated developer for the final phase set out some negotiations including developing mixed uses. This resulted in it being difficult for the Homes and Community Agency to remarket the development in 2008, when not a single bidder emerged. When a new developer was secured the original application had expired and they had to put in for a fresh application which was approved in March 2012 (Noel, 2013). In general, the economic situation,

government policies and reforms can affect the success of a project been delivered efficiently (English Partnership, 2005).

b. **Adherence to the design code:** In the earlier phase of the development of EBD and the design code production phase, the Prince's Foundation had a stronger responsibility compared to the case during the latter phase of the project. They were both in the steering group and working group and had an architect in place coordinating the group. The code promotes a mixture of architectural expression but only time will tell if the developers keeps to the adherence of the traditional street character and a broader interpretation of the code (English Partnership, 2005; Noel, 2013).
c. **Social Integration:** The parking behind the courts at Upton have hard finishes and are too large which resulted in the adding of gates to the entrances thereby creating a sense of security for the home owners by reducing integration between dwellings within the neighbourhood (Noel, 2013).

3.3.3.6 Summary and implications of practices

The most noticeable practices used are legible streets and perimeter blocks, a design feature which is historically a tried and tested model in the UK. Upton is said to offer a rare example of new developments that successfully produce a befitting sense of place (Noel, 2013). Transferring and testing this model in other places is one of the researcher's objectives, and will be identified later on in this research project, but from an overview of these project some aspects can be adopted while some will be discarded as an understanding is constructed of this scheme. The use of design codes is voluntary although still in its trial stage. The use of this mechanism by local authorities can raise standards on all developments. Landowners such as English Partnerships are encouraging developers to incorporate these standards by optimising land values. Other projects showcasing the use of sustainable urbanism and design codes are now under construction and will provide further lessons for planners, developers and general public. As an overall view of this case study the design approach used in Upton generates a more sustainable development in the housing sector that incorporates creative technologies and sustainable interventions.

Figure 3.3: Upton Case study, Northampton

Source: Momoh, 2013

3.3.4 Case study 3: Masdar City, Abu Dhabi

Masdar city is a modern Eco-city located in Abu Dhabi and has been under construction since 2007. Masdar city is classed as the world's first sustainable urban development that combines renewable energy sources and efficient resource usage with traditional Arabian design with spectacular architectural elements. Masdar city was planned on a 1,483 acre site in Abu Dhabi and designed by renowned British company Fosters and Partners Architects for the Abu Dhabi Future Energy Company (Arthur, 2012, pg.3). The city is designed on a 23-foot-high concrete base to increase the potential of cooling winds and reduce the need for air conditioning. The major mode of transportation will be by gasoline-powered vehicles which will have a one-square-mile travel radius and also computerised controlled electric cars will be provided. With its estimated completion in 2016 the project will cost approximately 22 billion dollars to complete which will be sponsored by the government and private investors (Ouroussoff, 2010; Arthur, 2012).

The project has been criticised as socially exclusive and being more dependent on modern technologies for it to function properly. The most understanding features of Masdar city is its efficiency and optimisation in the use of natural lighting, insulation, low-energy lighting, and energy-efficient appliances. The master plan is proposed to accommodate 40,000 residents, 50,000 commuters and approximately 1,500 businesses. With the aim in optimising energy usage, the city is said to utilise a quarter of the energy supply needed to power a normal city with similar population. Water usage has been minimised by the use of high-efficiency fixtures and appliances. Also the city landscaping has enhanced biodiversity while the plants are selected based on their low water requirements; therefore these plants will be irrigated with recycled waste water (Arthur, 2012, pg.3). The city has the largest solar photovoltaic plant in the Middle East. The panels are mounted on the roofs of every building, creating electricity and also shading the walkway for pedestrians. Most waste will be recycled while the non-recycled waste will be incinerated as part of an electricity-generating process. Other sources of generating electricity include geothermal energy and hydrogen plants. The development is characterised with architectural features of Arabian architecture with narrow streets oriented at an angle, and wind towers are mounted to channel air currents onto the streets (Joss, 2009).

Masdar city serves as a showcase for unconventional planning methods and renewable technologies that other communities might find difficult to implement without Abu Dhabi's vast oil wealth.

a. Project Highlights/ Benchmarks

- Housing accommodation for 40,000 residents and 50,000 commuters
- 23-foot-high concrete base to increase the potential of cooling winds
- Approximately 1,500 businesses
- Renewable energy solar panels, geothermal energy and hydrogen plants
- Gasoline-powered vehicles and computerised controlled electric cars
- Water conservation technologies
- Other features include traditional Arabian design.

b. Key Sustainable Urbanism Thresholds

- The impact of planning on building energy usage
- Water and density debate
- Walk-able streets and network and open space
- Biodiversity corridors/Biophilia/High-performance infrastructures
- The integration of transportation, land use and technology
- Large district energy systems, car sharing (Joss, 2009; Arthur, 2012).

Figure 3.4: Masdar City, Abu Dhabi UAE

Source: Arthur, 2012

3.3.5 Case study 4: Newington Sydney Australia - an overview of the case-study project

Newington was built during the 2000 Olympic Games in Australia to be the greenest large-scale solar village to house the athletes. Home to the athletes of the summer games it was

developed by Mirvac and Land Lease Consortium and master-planned by the Cox Group. About half of the planned two thousand units were built prior to the games and most of the remaining units are now completed (Glen, 2007). The project was built under sustainable design principles and its high profile allowed Mirvac and Land Lease to increase momentum on sustainable technologies research to develop new green products for use at Newington. Built on a brownfield site the estate includes a residential area, retail area, business park and park lands. The retail area has the highest density developments while the suburb is planned as three-park-centered precincts, making all dwellings built within a five-minute walk from the park. Twenty one acres of the development site was incorporated into the millennium parklands making it the largest park in Sydney (Glen, 2007; Farr, 2008, pg.230).

The development has an extensive pedestrian and bicycle network linking the development to more open spaces. At the time of its construction, Newington's solar suburb concept was unique, and it was the largest solar village in the world (Farr, 2008, pg.230). The solar panel units are incorporated into every home – with about 780 homes creating 1000-watt power solar arrays and 339 homes with 500-watt power arrays. The benefit of this system of generating energy for all houses is that it will prevent 1,309 tons of CO_2 from entering the atmosphere. Other uses include solar-produced hot water and heating. All homes have been designed to have 50 per cent less energy consumption by using elements like wool insulation, slab construction, cross ventilation, and east-west orientation achieving maximum advantage of sunlight.

The usage of water has been efficient and reduced to 50 per cent by using efficient fixtures. Storm runoff water is used to channel water to quality ponds and also irrigate plantings, which comprise 90 per cent native species, making the site rich with biodiversity (Glen, 2007; Farr, 2008). There is substantial green space in the site which ensures that 40 per cent of runoff infiltrates the groundwater supply. The transit system has bus services running throughout the development connecting to heavy rail and ferry routes. Despite the availability of public transport system the neighbourhood is automobile-dependent and the developer provided two parking spaces for many dwellings. The development was not able to actualise affordable housing but they have a range of housing typologies ensuring a mix of incomes. During the construction phase the waste generated was used for landfill creating 90 per cent of hard waste and 60 per cent soft waste (Farr, 2008).

Newington's ultimate success lies in creating a vast solar village that maintains its mass appeal, while proving that green development can be a lucrative scheme. It is a good example for the Australian market for green building design and an important contribution to sustainability.

a. Project Highlights/Benchmarks

- Reduction of landfill waste by 90 per cent for hard waste and 60 per cent for soft waste
- Solar panels on all homes prevent production of 1309 tons of $C0^2$
- 90 per cent native planting landscape
- Dual water system separates potable and non-potable water
- Storm water used to create habitat in parklands
- Homes use 50 per cent less energy, portable water and transit system

b. Key Sustainable Urbanism Thresholds

- Open space, biodiversity corridors, storm water systems
- The integration of transportation, land use and technology
- The impact of planning on building energy usage (Farr, 2008, pg.230).

Figure 3.5: Newington, Sydney Australia

Source: Farr, 2008

3.3.6 Case-study 5: Loreto Bay Baja California Sur Mexico

Loreto Bay is a village with a resort community genre developed by the Mexican government and the Trust for Sustainable Development. The regenerated site has an 8000-acre parcel of land allocated as a new tourist destination by the Mexican tourism agency, FONATUR. The development includes 6000 homes, a hotel, a golf course and 5000 acres of protected land (Farr, 2008). The philosophy behind the project aims to enhance the ecological health of the area through development. The development comprises narrow pedestrian streets, and small neighbourhoods ensure that most residents are within a few minutes' walk of the neighbourhood centre. Public and private spaces are spread throughout the development including parks, playgrounds and fountains. Other uses within the development include a number of mixed-use spaces, comprising of shopping, recreation and gathering areas. The design stipulates that 50 per cent of residents will live almost exclusively within Loreto Bay, reducing the need for highway-oriented cars and increasing a sense of community among the residents (Farr, 2007; Newman, 2005). The design of the urban neighbourhood creates a highly

ambitious sustainability plan that aims to produce energy from renewable resources. The mass housing comprises of energy-efficient fixtures, appliances and reduced use of water fixtures. The planned beach club was built on LEED platinum standards. Also the homes was constructed out of adobe like blocks comprising of local materials and painted low-energy paint, reducing energy production cost, transport costs and providing excellent thermal insulated homes. Natural ventilation is done through the use of inner courtyards with vegetation and dome-vented kitchen cupolas. Solar hot water is provided in most homes and the fountains are powered by solar technologies. Also there has been a proposal to create electricity-use monitoring systems in homes to keep track of the energy consumption (Farr, 2008).

a. Project Highlights/ Benchmarks

- 20-megawatt wind farm will wean the area from diesel
- Five miles of restored estuaries
- 5,000 acres protected and restored as native habitat
- Recycling programme will send less than 10 per cent of residents' waste to landfill
- No gas-powered vehicles; instead, electric cars and golf carts, bicycles, car-share programme
- One per cent of all sales and resale's fund a non-profit to support social initiatives
- Electricity use monitoring systems
- Water conservation technologies (Farr, 2007; 2008).

b. Key Sustainable Urbanism Thresholds

- Open spaces, biodiversity corridors and storm water systems
- The integration of transportation, land use and technology
- The impact of planning on building energy usage, smart water and density efficiency
- Walk-able streets, networks and car-sharing (Farr, 2008).

Figure 3.6: Loreto Bay Baja California Sur Mexico

Source: Farr, 2008

3.4 SUMMARY AND ANALYSIS OF THE FIVE CASE STUDIES

To analyse the results of the five case studies the researcher used a methodological approach to select some sets of indicators and benchmarks from key common sustainable urbanism thresholds so as to compare and understand the priorities of this cases. These indicators have been identified from individual cases, and have been highlighted and represented by the ticked boxes from individual projects. The organisation of these thresholds into five categories is meant to focus attention on the core indicators that makes up sustainable urbanism as described by Douglas Farr. These categories include increasing sustainability through density, sustainable corridors, sustainable neighbourhoods, biophilia, and high-performance buildings and infrastructures (Farr, 2008). Under these core thresholds other sustainability indicators were identified. The table below (Table 3.2) highlights the certain aspects of sustainability indicators that have been implemented within the five cases studied above, and this will inform the research on the relevance of each indicator. These case studies have their similarities and differences in diversity and practices. The Garden City Project was able to achieve reduction

of population expansion and introduction of permanent agricultural belt around the city to act as a barrier in the growth of the city; control of the urban environment by the municipality or government; providing private commercial and industrial firms in lease properties; and generating profit from the business operations constellation of smaller cities with good transport system and transit linkage. The major problem with this scheme was that they used a model that creates an expanding middle class in a more individualised sprawl, thus reducing spatial coherence and community of life. Also the impact of the garden city on the environment is minimal.

Upton has incorporated the use of creative technologies, sustainability interventions and design principles in achieving sustainable urbanism. Another very important tool adopted at the earlier phase was the use of building codes and EBD in making sure sustainable practices were adopted in all projects. Although, overall, it was a success, the economic situation, government policies and reforms affected the success of the project being delivered efficiently: hence the adherence to the design code was a problem at the later phase of the project. Masdar City project has been estimated to cost approximately 22 billion dollars to build which is very expensive for an urban development and has been criticised as socially exclusive and that the project is more dependent on modern technologies and automated controls systems to function properly. The most outstanding features of Masdar City is its efficiency and optimisation in the use of natural lighting, insulation, low-energy technologies and energy-efficient appliances.

The Olympic Village in Newington Sydney was designed to be the greenest and largest-scale solar village as at 2000, which incorporated sustainability design principles and sustainable technologies in actualising the project benchmarks. Newington's ultimate success lies in creating a vast solar village that maintains its mass appeal, proving that green development can be a lucrative scheme; but the main issue was that the housing development was not targeted in achieving affordable housing. Loreto Bay Baja California is one of the most successful projects in its use of renewable technologies, renewable materials and sustainability design systems, and the design is built to comply with LEED housing standards. It is an exemplary project that is designed based on the architecture of the native dwellers and still redefines the scheme with sustainability. This project creates a better understanding of balancing sustainable design, cultural heritage and limited use of technology.

Table 3.2: Comparison of Emerging Threshold and Assessment Indicators with developments

SUSTAINABILITY INDICATORS	**Upton Northampton**	**The Garden City Project**	**Loreto Bay Baja California**	**Newington Sydney Australia**	**Masdar City Abu Dhabi**
SUSTAINABLE NEIGHBOURHOODS					
Walk-able nodes better opportunity for walking/cycling	✔	✔	✔	✔	✔
Access to green space and public amenities (school, stores, clinics, playgrounds)	✔	✔	✔	✔	✔
Job accessibility and job opportunities	✔	**X**	**X**	**X**	✔
Affordable housing (Price of house vs Minimum wages)	✔	✔	**X**	**X**	**X**
Density mix of uses	✔	✔	✔	✔	✔
Commercial uses at edge	✔	✔	**X**	**X**	✔
Genuine neighbourhood (compact, pedestrian friendly and mixed use)	✔	✔	✔	✔	✔
Diversity of land-use types and mixed uses	✔	✔	✔	✔	✔
Mixed housing types	✔	✔	✔	✔	✔
BIOPHILIA					
High degree of landscaping	**X**	✔	✔	✔	**X**
Highly absorbent native landscape systems	**X**	✔	**X**	**X**	**X**
Rainwater harvesting	✔	**X**	**X**	**X**	**X**
Bio-retention measures	✔	✔	**X**	**X**	**X**

SUSTAINABILITY INDICATORS	Upton Northampton	The Garden City Project	Loreto Bay Baja California	Newington Sydney Australia	Masdar City
BIOPHILIA					
Food production, urban agriculture	X	✔	X	X	X
Roof gardens, community farms, household garden	✔	X	X	X	X
Storm-water system (SUDS)	✔	X	X	X	X
Centralised detention basins, Green roofs, bio-swales	X	✔	X	X	X
SUSTAINABLE CORRIDORS					
Walk-able neighbourhoods	✔	✔	✔	✔	✔
Biodiversity and corridors served with landscape elements	✔	✔	✔	✔	✔
Housing in transit zones	✔	X	X	✔	✔
Green infrastructures corridors with community gardens, waste-water treatment	✔	X	X	X	✔
Local, express bus services and public transport use	✔	✔	✔	✔	✔
Design that supports urban living and transportation choice	✔	✔	X	✔	✔
Pedestrian and bicycle friendliness	✔	✔	✔	✔	✔
Car sharing	✔	X	X	X	X
INCREASING SUSTAINABILITY THROUGH DENSITY					
Diversity of land uses	✔	✔	✔	✔	✔
Density with walk-able street patterns	✔	X	X	✔	✔

SUSTAINABILITY INDICATORS	Upton Northampton	The Garden City Project	Loreto Bay Baja California	Newington Sydney Australia	Masdar City Abu Dhabi
INCREASING SUSTAINABILITY THROUGH DENSITY					
Narrow streets	✔	✔	✔	✔	✔
Effective zoning	✔	✔	✔	✔	✔
HIGH-PERFORMANCE BUILDINGS AND INFRASTRUCTURE					
Building energy usage	✔	**X**	✔	✔	✔
Location of building (orientation)	✔	✔	✔	✔	✔
Passive solar design /active solar design	✔	**X**	✔	✔	✔
Building code requirement	✔	**X**	**X**	**X**	✔
High-performance Infrastructure (dimmable streetlights, district power)	✔	**X**	✔	✔	✔
Natural heating, cooling, ventilation and daylights strategies	**X**	**X**	**X**	**X**	**X**
Waste recycling scheme	**X**	**X**	**X**	✔	✔
Innovative design strategy	✔	**X**	**X**	✔	✔
Renewable Technology/Energy Systems	✔	**X**	✔	✔	✔

Source: Momoh, 2014

3.5 Emerging concept of sustainability assessment, its protocol and the use of sustainability indicators

Sustainability assessment has emerged as a vital decision support process in the development of assessment tools/ methods in response to the growing need of the impacts of global change. The emergence is in response to a growing environmental crisis and to vast social inequalities in global development. The conceptualisation and contextualisation of the effectiveness of sustainability assessment method is synthesised by the processes or methods used in developing this tools and the most appropriate sustainability indicators adapted in it

development (Hiye et al, 2015). Sustainability assessment and sustainability indicators are known as powerful supporting tools that aid in achieving sustainable development by addressing three many sustainability decision making challenges which are interpretations, information-structuring and influences. The emergence of sustainability assessment began to become prominent in the 1990's which gave birth to many promising sustainability assessment tools or methods and sustainability indicators. The concept spans across various focus and areas such as food, agriculture, health care, building construction, urban regeneration, engineering, medical science and lots more. But for this research more emphasis would be placed on NSA's (Neighbourhood Sustainability Assessment tools). Sustainability assessment and its indicators are tools that help to make, suggest, support and implement decision making for sustainable development which can be used in different fields, business and disciplines and also in various socio-environmental contexts by many stakeholders.

Sustainability assessment more especially NSA's is still a relatively new field with researchers that are still developing effective assessment methods based on tools developed from early 90's till date. The first stage of its development emphasises on early practices which has been transformed to fit new societies and context. The process and development of sustainability assessment has been in regards to the aims which includes

- Contribution to a better understanding of the meaning of sustainability and its contextual interpretation/challenge
- Integrate sustainability issues into decision-making by identifying and assessing (past and/or future) sustainability impacts (information-structuring challenge)
- Faster sustainability objectives (Waas et al, 2014)

And this aims are informed by the following list of purposes

- Information generation for decision making
- Operationalisation and forum for participation, debate and deliberation (interpretation challenge)
- Social learning (interpretation and influence challenges)
- Structuring complexity (information-structuring challenge)

In order to develop sustainability assessment a set of procedures or protocols needs to follow as set by set guidelines. In 1996 an international group of professional developed the Bellagio principle which served as a guidelines as well as a practical assessment of progress in achieving

sustainability development. After a series of taking into account changes that take place when developing SA the process were reviewed and called "sustainability assessment and measurement principle" (Bellagio Stamp). The principles is group into four categories which are fostering sustainability objectives, adopting a holistic perspective, incorporating sustainability in the assessment process and supporting decisions. Please see table below to understand the process used in developing SA.

Table 3.3: Characteristics of an ideal-typical sustainability

1. Fostering sustainability objectives	• Intergenerational equity • Intragenerational equity • Geographical equity • Interspecies equity • Procedural equity
2. Adopting a holistic perspective	• Assess the system as a whole, including it parts and their interactions • Assess the system considering the different sustainability objectives together (integration) • Assess dynamics and interactions between trends and drivers of change • Adopt appropriate time horizon (short, medium, and long term) and (geographical) scope
3. Incorporating sustainability in the assessment process	• Consider the normative nature of sustainability • Broad participation of stakeholders, including experts, while providing active leadership to the process • Transparency regarding data (sources, methods), indicators, results, choices, assumptions, uncertainties, funding bodies and potential conflicts of interest • Avoid irreversible risks and favors a precautionary approach • Be responsive to change, including uncertainties and risks (dynamism)
4. Supporting decisions	• Assessment of sustainability impacts and alternatives for decision-making, including synergies and trade-offs • Establish formal and transparent synergy/trade-off rules • Assessment is based on a conceptual sustainability framework and its indicators • Ensure effective communications (clear language, fair and objective, visualization tools and graphics, make data appropriately available) • Adapted to and integrated into the institutional context • Iterative assessment process, starting at the onset of the decision-making process • Develop and maintain adequate capacity • Continuous learning and improvement

Source: Waas et al, 2014

It is therefore important to note that any sustainability assessment should be guided by the defining principles of sustainability development looking at an holistic/integrated perspective and lastly sustainability assessment should be conducted in support of decision making which indicates that assessing sustainability impacts and alternatives for decision making which should put in consideration rules for synergies and trade-offs (Waas, et al, 2014)

Uses of sustainability Indicators

Sustainability assessment comprises of sustainability indicators which forms an integral aspects of the assessment tool. These indicators are selected to facilitate key information's with regards to the workability of a specific system used for a specific purpose for example to support decision making and management of urban neighbourhood. An indicator is used to quantify and aggregate data which can be measured and monitored within an intergenerational time line to determine whether change is taking place. But in order to understand the process of this changes the indicators needs to help decision makers understand why this specific change is meant to take place (FAO, 2002). It is imperative that decision-makers understand to have the knowledge and trust in this indicator that helps to inform sustainable assessment which also informs policy adaptation (SEP, 2015). Within the last two decades there have been lots of sustainability initiatives by different stakeholders which includes governmental organisation from various levels, communities, businesses, higher education, NGO's and others used and applied in different contexts, area and sectors across the world for diverse purposes, based on different methodologies or a combination of this method (Waas, et al, 2014). Sustainability indicators is used in our daily life to know , understand and interpret the world as it is without actually realising what it truly mean to be clear with this definitions and terminologies because the vary for example an indicator can be a variable, a parameter, a measure, a value, metrics, a measuring instrument, an index, representation, proxy looking at systematic perspective an indicator can be defined as an operational representation of an attribute which includes (quality, characteristic, property) of a system. Bearing in mind that a system have three characteristics which are elements, interconnectivity and purpose (Meadow, 2008). From a technical perspective an indicator is known to be a variable or an aggregation of a number of variable which is related to a reference value that gives meaning to this values and variable (Lancker et al, 2000).

This following definition above leads to a more integrative definition of an indicator as an operational representation of an attribute (quality, characteristics property) of a given system,

by a qualitative or quantitative variable (for example numbers, graphics, colours, symbols) (or function of variables) including its value, related to a reference value (Waas et al, 2014 pg.5520). This definition and its schematic presentation are not useful theoretically but also practically.

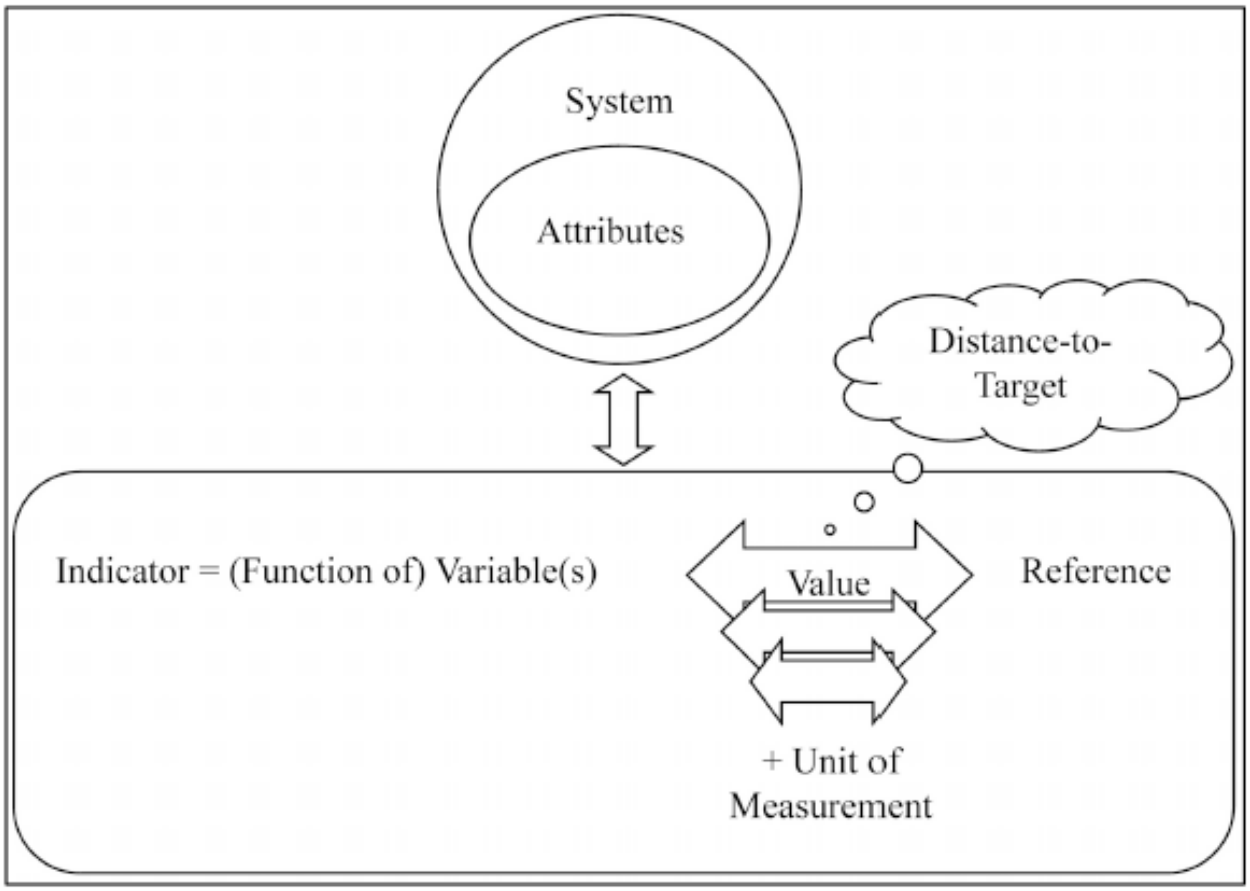


Figure 3.7: Schematic Presentation of an Indicators Integrative definition

Source: SEP, 2015

Sustainability Indicators have complementing purposes or uses for decision making strategy in other to achieve sustainable development and also sustainability assessment. This uses includes the following below:

- Structure complexity and communicate information
- Operationalisation of sustainable development
- Social Learning
- Demonstrate accountability and benchmarking

- Identification of knowledge and data gaps.

SI's is used to communicate information in a structured approach in order to inform decision-making for sustainable development. When this is achieved SI make sustainability for a particular system observable, demonstrable and measureable. When an holistic perspective is adapted the indicators selected should bridge the gaps within various environmental, social, and economic dimensions (Hak et al, 2012).

SI's is used to operationalise sustainable development: The selection of SI's used in designing assessment tools facilitated the discussion of sustainable development from been abstract forms and encourages implicit and explicit discussions on this concept with operational meaning (Rennings, 1997). SI's is used to facilitate learning among involved stakeholders and also enhance development and application which could be considered as a way of social learning. In other words SI's can induce changes in the mindset of decision makers and affect decision-making and behaviours. Hence the SI's development and application is a learning process (Meadows, 1998).

SI's can be used in demonstrating accountability to the society and its stakeholders through the means of communicating how sustainability systems perform. Therefore having the means of benchmarking the performance of a specific scheme (Hodge et al, 1999). SI's identifies knowledge and data gaps where improvement might be needed to create a more sustainable framework. In addition it is important to note that this various types of SI's uses exist and the stakeholders involved in decision making and the effectiveness of any sustainability assessment tool is influenced by the intended purposes of the sustainability indicators (Hodge et al, 1999; Waas et al, 2014).

3.6 CONCLUSION

From this comparison the researcher has realised that most of the indicators selected have been used across all five case studies and this shows how very important these indicators are in the realisation of sustainable urbanism. Although the individual selection varies from one project to another based on factors like the culture, context and level of development amongst others, it is understood that sustainability indicators are tailored and selected to suit a specific environment. This chapter has highlighted sustainable urbanism as a theory and movement, and as a practical urban design model. It also showcases how it has been successfully

implemented in the case studies analysed as well as some weaknesses which were encountered. Subsequently, this has shown that, for an urban neighbourhood to be truly sustainable, it has to showcase some elements of sustainability indicators that have been used in accomplishing the project. After analysing these case studies from across the globe it was noted that each one's success tends to be based on its region, application techniques, and sustainability assessment method employed. In regards to developing countries, for this theory to become a reality, further studies are needed to understand how its applications and adoption can become successful. To understand how these indicators work in developing countries it is imperative to analyse the principles behind sustainability selection, implementation and the methodology behind the design of the assessment framework. Also a brief introduction to emerging concepts of sustainability assessment, its protocol and the use of sustainability indicators established a broad understanding of the research and where it is heading towards. Hence a more intensive review of sustainability assessment and sustainability indicators would be looked into in chapter 5 and chapter 6 which would create the foundation in the selection of key indicators needed in designing the assessment tool.

The following chapter looks at how the research methodology underpins this research. This is achieved by adopting a philosophical approach, strategies and methods through data collection and analysis of the data. This links the theoretical underpinnings with the philosophy, methodology, approaches and strategies in the selection of sustainability indicators and the validation of the proposed assessment tool.

CHAPTER FOUR: RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

This chapter examines and creates an in-depth picture of how this research has been carried out in order to collate necessary information and data to answer the research questions. It also explains how the aim/objectives and research outcomes can be achieved by selecting the most effective methods which correspond with the research activity (Yin, 2003). The anticipated outcomes, analysis, conclusions, standards and legality of this research are achieved by the suitability of the data collection techniques (Fellows and Liu, 2009). This chapter includes the following sections: methodological framework, research philosophy, research approach, research strategy, research methods, techniques and procedures, research design, and conclusion.

4.2 METHODOLOGICAL FRAMEWORK

The manner in which a research investigation is conducted is dependent on many factors but the underlying methodology is the most important. Research methodology can hence be described as the general approach to a problem which is used as a principle in a research process - from the theoretical underpinning to the data collection and analysis (Remenyi et al., 2003). According to Collis and Hussey (2009), research methodology is seen as the overall procedures applied to the general research process to be conducted. It is centered on the issues or a problem to be investigated, and thus differs from one research problem to another. Some research projects might suggest that the investigation will be centered on using quantitative or qualitative frameworks to meet their requirements (Sarantakos, 2005). In other cases such as this research more information may be needed therefore a mixed methodology is applied. The methodological framework is guided by a research process that follows a step-by-step development alongside research tools and procedures to be adapted into the research (Sapsford, 2006, pg.175).

Research that has this kind of structured framework will need to state the paradigm that supports this theory and ideology (i.e. a project might adopt a Marxist, Phenomenologist, Post-Structuralism, Feminist or Symbolic interactionist approach). Therefore, explaining the theoretical and ideological stance of the research creates a better understanding of the project, which provides a clear and straightforward basis for creating the research design followed by a valid interpretation and analysis of the findings (Sarantakos, 2005). Denscombe (2007) suggests that positivism is a philosophical theory stating that positive knowledge is based on

natural phenomena and their properties and relations. And it has two strategy approaches - *experimental* and *non-experimental strategy*, while phenomenology (social constructivism) has three approaches - which are *case study*, *ethnographic study* and *grounded theory study*. It is also known that the element of a systematic research methodology includes the research philosophy, research method, research strategy, perspective and approach. Figure 4.1 below describes the *Research Onion* proposed by Saunders et al. (2007), which has been extensively applied in the field of research.

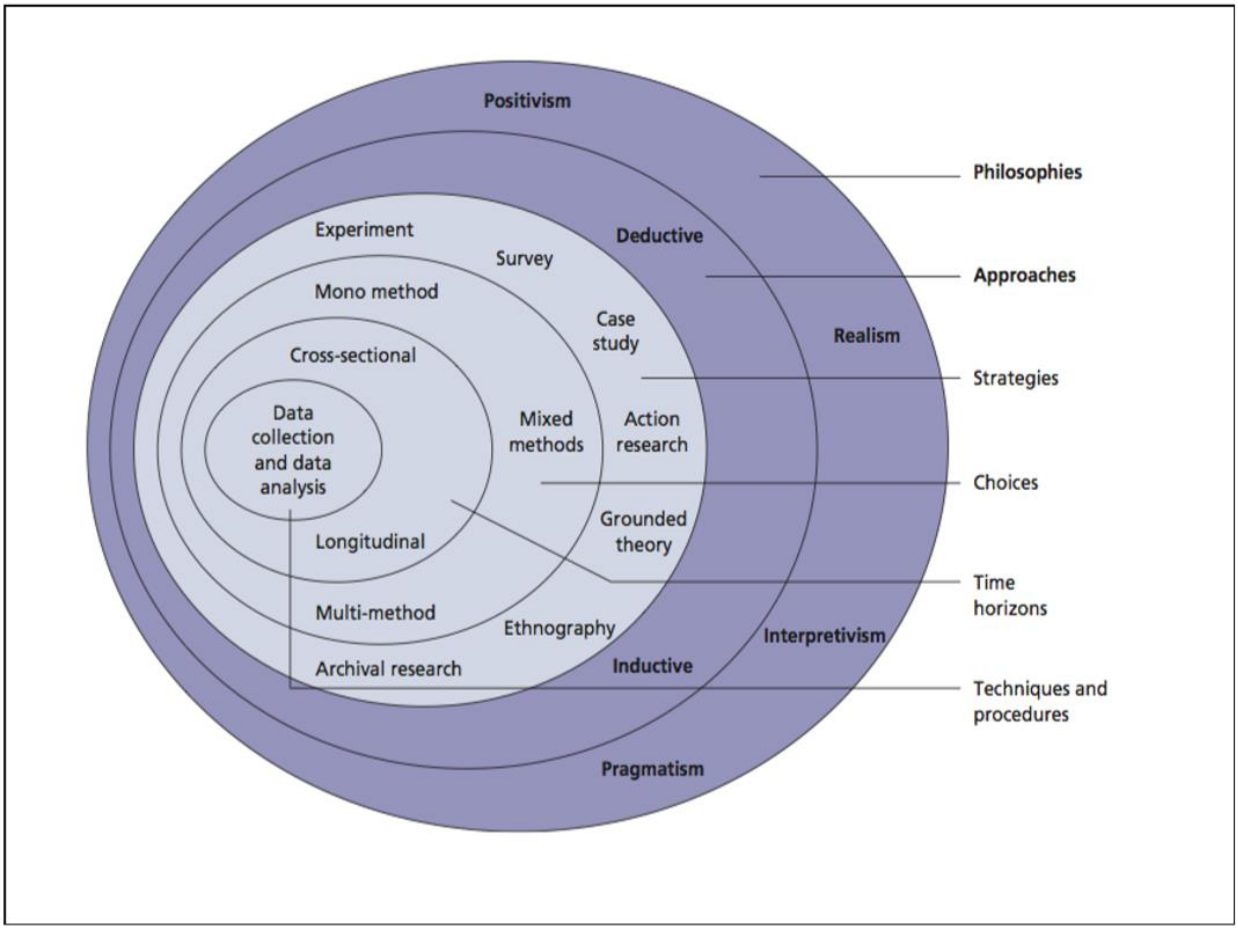


Figure 4.1: Research Onion

Source: Saunders et al., 2007, pg.138

This framework indicates a flow in the process where the research methods are informed by the research strategies and the research strategies are informed by the research approach and lastly the approaches are guided by the research philosophy. It is therefore known that the

research philosophy outlines the theoretical assumptions of the research (Keraminiyage, 2009). This principle further states that the selected research approach represents how the theory can be adopted and tested in order to answer the research questions. The research strategies are measured and aimed at tackling current research problems which includes case study, mixed methods, ethnography, grounded theory, action research, the feminist approach, and so on (Denscombe, 2007; Creswell et al., 2011; Dawson 2011). Lastly research methods are known to be the tools employed to collect, analyse and synthesise data within the selected research strategies in order to obtain a desired outcome (Sarantakos, 2005; Danjuma, 2013).

4.3 RESEARCH PHILOSOPHY

Diversity in research areas shows that there are different parameters that guide it's successfully completion. There is diversity in the *ontology* and *epistemology* that guides the methodology which in turns controls the research. Simply put, methodologies produce different research designs due to the fact that they follow a theoretical structure with different ontological and epistemological prescriptions. Ontology and epistemology influence methodology and this guides the choice of research designs and instruments (Sarantakos, 2005, pg.29). The way methodology affects the structure and organisation of social research is known to be the study of philosophy of science (Machamer, 2002).

Philosophy can be clearly defined as the investigation of the truth, the principles of knowledge and of being a component of a specific discipline (Crotty, 1998). The selection could be from any of the following areas - *natural, moral* or *metaphysical*. It focuses on general issues mostly linked with the branch of study and also demonstrates the principles, methods or procedures on how to conduct the research (Grix, 2001; Creswell, 2003). This further explains the process of analysing the principles of methods, theory and hypotheses used in a discipline. This will help to create an understanding of the scholar's research questions, techniques and methods to be adopted and lastly the anticipated findings are likely to be determined in these theories (Van De Ven and Johnson, 2006). It also explains the principle methods of inquiry, generic processes, compromise positions and the stance adopted for the research. Gray (2009) explains that there are relationships that exist and connect philosophy to the research approach, strategy and methods which in turn shape the scholar's view of the problem identified. The philosophical assumptions which are pragmatisms, ontology, epistemology and methodology determine the approaches, strategy and methods adopted in a research.

4.3.1 Ontology: Nature of Reality

Ontology informs methodologies as to the nature of reality, *what social research is supposed to study*. It demonstrates the theory or science of the actuality of life (Sarantakos, 2005, pg.23). Ontology is an assumption that is based on what is known to make up reality (Grix, 2001). It aims to address questions in regards to what objects exist or that can be postulated to exist, and how objects can be classified or subdivided in accordance to relationship and variations. Ontology is a methodological account of existence; in order words, ontological theories are guided towards they believes that it comprises of subjective rationality (Grix, 2001; Hay, 2002, pg.3). Alone, ontological assumptions answer questions in regards to what kind of reality exists. What is the nature of the social and political reality to be investigated? (Guba and Lincoln, 2005). They are two main aspects of ontology which are *objectivism* and *subjectivism* as explained below.

Objectivism: is about the existence of social objects that are free of social actors. It also states that reality and truth exists objectively and can be discovered and adequately measured. Reality is everywhere and has an identity of its own and can exist apart from our awareness (Crotty, 1998; Sarantakos, 2005).

Subjectivism: is known to be a social experience that is established through study of resulting activities of social group concerned with their presence. It is explained as "understanding the connotations that individuals assign to social events" (Saunders et al., 2009).

Ontological philosophy is seen as the conception of reality and, in the bigger picture, it is concerned with the question of existence and understanding realities in life.

4.3.2 Epistemology

Epistemology informs methodologies about the nature of knowledge or about what counts as a fact and where knowledge is to be sought (Sarantakos, 2005, pg.26). It is the study of knowledge which deals with nature and criteria of knowledge, along with its scope, outcomes and general perceptions. It creates a philosophical grounding for selecting what set of knowledge is to be used and how it is guaranteed that it is legitimate, concise and of quality (Crotty, 2003). Epistemology is focused on questions such as *what* and *how* we know what we assume exists. In the context of this research what and how can be related with the determinant factors on the success or failure of the proposed assessment tool (SUCCEED) for developing countries. This is known by clearly selecting the object which also incorporates the factors that determine the success or failure of the tool as a measure to address the problem. Epistemology

therefore represents the ability to describe and justify the philosophy of *how we know what we know* (Crotty, 2003). There are three types of epistemology assumption - *positivism*, *interpretivism* and *realism* according to Saunders et al. (2012). Positivism and interpretivism are addressed for the purposes of this study.

Positivism: is often taken to be identical to qualitative methodology because it contains the ontological and epistemological prescriptions that show how this methodology should conduct research (Sarantakos, 2005). The argument of positivism is that its principles are based on the fundamental scientific method that all theories should be tested against observations of the real world instead of focusing mainly on reasoning, intuition or revelation (Crotty, 2003). It can be further explained that all theories postulated need to be tested alongside observation of the real world (social reality) and the field work (observation, measurement and obtaining opinions and views) to provide the data required for testing the theories (Danjuma, 2013).

Interpretivism: The processes of construction and reconstruction are influenced by personal inputs. Life in the social world makes objectivity and rationality be known as relative concepts. This is a reflective assessment of the reconstructed impressions of the real world and combines action processes in a general context (Sarantakos, 2005). Interpretivism is the framework within which qualitative research is conducted - it "looks for culturally derived and historically situated interpretation of the social life world" (Crotty, 1998, pg.67). Within this domain "interpretive" means to emphasise the production of meaning and to learn the views of actors; in other words, *local meaning* (Pfeifer, 2000). Interpretivism is concerned about the dissimilarities among humans as social actors, so the main ideas for the researcher to understand the difference between humans in our roles as social actors must be understood. This creates an understanding that research should be conducted in humans not objects (Saunders et al., 2009). If we link interpretivism to constructivism, this proves that truth and meaning do not exist in some external world but rather are transferred by the subject's interaction with the real world (Creswell, 2005). The epistemological stance for this research focuses more on the interpretivist beliefs than the positivist stance concluding from numerous considerations of authors in the disciplines of urban development and sustainability. Table 4.1 below looks at the reason for adopting interpretivism for this research.

Table 4.1: Reasons for leaning more towards a position of interpretivism

Multiple subject realities: There is no single version of truth. What constitutes the real world or knowledge about the world is a construction of the mind, either individually or collectively. Different groups or cultures perceive the world differently. It is best explained in the multi-disciplinary perspective of the study (Gummesson, 2003).
Multiple interpretations: Due to the multidisciplinary nature of the research, explanation is not expected to be fixed. Hence, more than one explanation and discussion will emerge because there is more evidence to support (Gummesson, 2003).
Dynamic, socially constructed meaning: Whatever reality is for an individual or group, it can only be accessed and transmitted to others through yet more social constructions such as language and shared meanings and understanding (Gummesson, 2003). It is about the identity of the specific discipline under scrutiny.
Reflection: Basic assumptions, beliefs, values and actions will inevitably shape the research process and affect the situation; this would be manifested in a research study because it is not neutral.
Qualitative and quantitative data analysis: There is often a strong preference for generating and analysing both qualitative and quantitative datasets. However, the use of quantitative and qualitative data collections such as surveys and interviews can be analysed in different ways and interpreted to meet the objectives (Gummesson, 2003; Denscombe, 2007).
Study of respondents in their natural social setting: The understanding of the respondents in the field is very important because the laboratory is the field. Here the field is not artificial; rather, it is the real world.

4.3.3 Methodology: Systematic Manner to Solve Problem(s)

Methodology is known to occupy the central position in the research process. This is a research strategy that translates ontological and epistemological principles into guidelines that explains how research is to be done (Cook and Fonow, 1990). Methodology can also be defined as the plan of action, an approach or process behind the preference and application of certain techniques so as to collect the desired outcomes of which the research would likely integrate the use of techniques with prioritisation (Crotty, 2003, pg.45). Research works conducted apply one of the three methods in relation to the literature which are qualitative, quantitative and mixed methods.

Quantitative Research: This technique of enquiry adopted in many disciplines is mostly known in social sciences, in which the research process significantly moves around facts, experiments and figures rather than unfolding the connotations (Thomas, 2003). It is about asking people for their notion or opinion in a formatted way in order to produce hard facts and statistics to guide the researcher.

Qualitative Research: This is a research technique in which the contents and interviews are further studied in order to collate important samples so that an event can be illustrated promptly (Anerbach and Silverstein, 2003). It is more about finding out not what people think or feel alone, but *why* they think it - their values and opinions - in order to know their viewpoints, motivations and feelings.

Mixed Methods Research: This is normally used by applying both qualitative and quantitative research techniques to a study (Gill and Johnson, 2002). The main reason for utilising this research method is to tackle a given research topic from various perspectives using appropriate research techniques or more than one investigative perspective.

Overall, ontological, epistemological and methodological research studies are geared towards a paradigm which guides and supports everyday research. Table 4.2 below suggests that ontological, epistemological and methodological principles are of the same nature and are organised into paradigms which, together with methodologies, constitute the domain within which research is conducted (Patton, 1990).

Table 4.2: Theoretical foundations of social research/paradigms: Theoretical construction of research

	Addresses	**Positivism**	**Symbolic Interactionism, Phenomenology and Feminism.**
Ontology	The nature of reality ASKS: What is the nature of reality? Is it objective (out there), constructed, subjective? OR BETTER: What does research focus on?	Realism/Objectivism	Constructivism
Epistemology	The nature of knowledge ASKS: How do we know what we know? What is the way in which reality is known to us? OR BETTER: What kind of knowledge is research looking for?	Empiricism	Interpretivism
Methodology	The nature of research design and methods ASKS: How do we gain knowledge about the world? OR BETTER: How is research constructed and conducted?	Quantitative	Qualitative
Research	The execution of research designs	Fixed Design	Fixed/Flexible Design

Source: Sarantakos, 2005, pg. 30

4.4 RESEARCH APPROACH

The research approach is the methodology which has been implemented to carry out the research. It involves choosing the most appropriate research question and methods alongside the conceptual framework which is to be adopted. The selection of the most appropriate approach by the researcher is determined by the questions asked (Danjuma, 2013). Three kinds of research approaches are analysed below: the *inductive* approach, the *deductive* approach and the *quantitative* and/or *qualitative* approach. Depending on the type of research, some use one approach while others combine them to conduct the research (Neville, 2005; Denscombe, 2007). However research conducted at this (doctorate) level helps to develop two key functions: (a) it helps the researcher gather data or information in order to gain knowledge with regards to the subject matter and (b) it enables the researcher to develop the first outcomes by working on the methods employed (Grix 2001; Gummerson, 2003).

4.4.1 Deductive Approach

The deductive approach is a research that involves the deduction, testing and employment of a hypothesis using designed techniques for the purposes of adopting a theory that is opened to rigorous testing and prediction of occurrence (Collis and Hussey, 2003; Saunders, 2009). Deductive approach is more focused on adopting propositions from current theory and testing them to know the workability within the real world. It is composed of the generation of a theory that is subjected to a defined test by using research strategies mainly designed for the purpose of testing. Robson (2002) suggested that this approach involves five stages:

- Deducing a hypothesis from the theory
- Expressing the hypothesis in operational terms
- Testing this operational hypothesis
- Examining the specific outcome of the inquiry
- Modifying the theory in the light of the findings

4.4.2 Inductive Approach

The inductive approach is a research strategy based on observation of empirical data and mostly using the end results to derive a theory (Saunders et al., 2009). The methods are guaranteed to provide data which are qualitative and quantitative in nature. Dubois and Gadde (2002) believe that the approach relies mostly on grounded theory in which a theory is methodically generated from a set of data. The inductive approach is known to be a theory-developing process which

begins with the observations of individual instances and then establishes generalisations about the phenomenon under investigation (Easterby-Smith et al., 2008). There are three main reasons for adopting the inductive approach:

- It allows the researcher to make more affirmed decisions in regards to the research design, which is as important as data collection and analysis
- It creates an environment in which the researcher thinks of various research strategies and decisions that will enhance the research outcomes
- It assists the researcher in adopting the research design to consider for constraints (Easterby-smith et al., 2008).

Table 4.3 below shows the difference between the inductive and deductive approaches. By showcasing the differences the researcher can work towards understanding how they can be embedded into this research as they are both qualitative and quantitative in nature.

Table 4.3: The difference between the inductive and deductive approaches

Deductive Approach	**Inductive Approach**
Scientific principles	Gaining an understanding of the meanings that humans attach to events
Moving from theory to data	A close understanding of the research context
The need to explain causal relationship between variables	The collection of qualitative data
The collection of quantitative data	A more flexible structure to permit changes in research emphasis as the research progresses
The application of controls to ensure validity of data	A realisation that the researcher is part of the research process
The operationalisation of concepts to ensure clarity of definition	Less concerned with the need to generalise
A highly structured approach	
Researcher independence from what is being researched	
The necessity to select samples of sufficient size in order to generalise conclusions	

Source: Saunders et al., 2009

4.4.3 Qualitative and Quantitative Approaches

The qualitative research approach is known to follow research such as case studies, grounded theory and ethnographic methods alongside others (Yin, 2007; Dawson, 2009). It creates an opportunity where the researcher can be in contact with the field of study to develop knowledge

and conceptualise rich theory describing the phenomenon to be studied. These contacts may be dependent on interviews, observations, documental analysis and others. In some situations in order to affirm and develop sensitivity in observation and interpretation, a literature review is employed to further understand the research (Strauss and Carbon, 1994; Dawson 2009; Danjuma 2013).

The quantitative research approach generates statistics, or is based on numbers or quantity through the use of large-scale surveys, questionnaires, experiments and others (Dawson, 2009). Quantitative research is predominantly focused on quantity and it is also known as the "traditional", "empiricist" and "positivist" research paradigm. It is an enquiry of social problems based on testing a theory made up of variables and measured with numbers and analysed using statistical methods in order to determine if the predicted outcome of the theory is true (Creswell, 2003, pg.10; Danjuma, 2013). The whole process of quantitative research uses the deductive form of reasoning in which theories and hypotheses are mentioned in the beginning of the study, and it remains a steady guide throughout the study (Grix, 2001). Therefore it would be appropriate if the quantitative research approach is well understood and developed to create an understanding of a domain and judged with meaningful variables (Saunders et al., 2009).

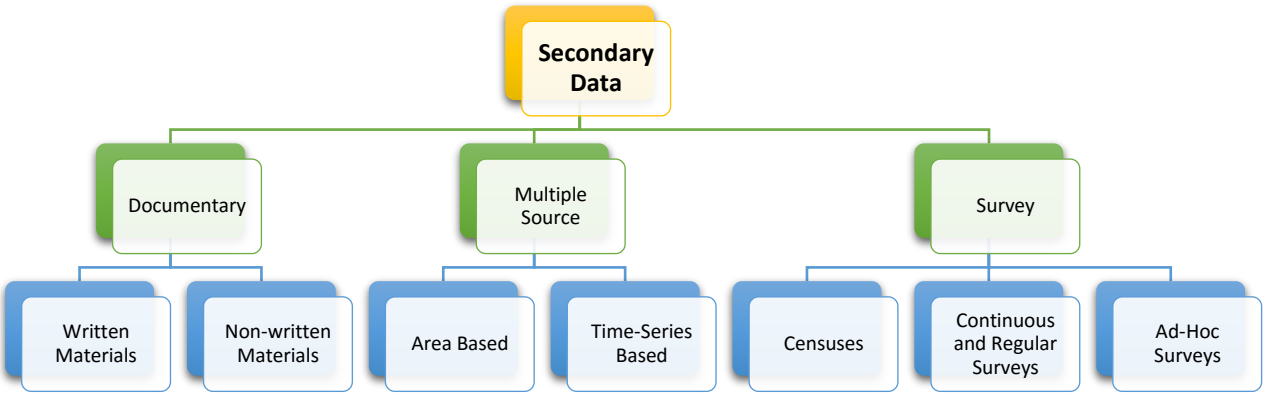
4.5 RESEARCH STRATEGY

Saunders et al. (2009) described research strategy as "the overall plan of how the research will work on responding to the research question". Another definition considers it to be a strategy or a broad orientation on how research is meant to be conducted (Remenyi et al., 2003; Bryman, 2008). The most appropriate research strategy has to be chosen with regards to research question, research aims and objectives, as well as the current literature available in the subject area, timescale of the research project, and lastly the philosophical framework or underpinning (Saunders, 2009). It has been acknowledged that different research strategies exist and there are gaps between them. It would be advised to select a strategy that better conforms to the particular research study (Yin, 2003; Saunders et al., 2009). Some of the most popular research strategies employed in the social science and, specifically, the built environment fields are grounded theory, experiments, surveys, case study, action research, archival research, ethnography, cross-sectional studies, longitudinal study and participative enquiry (Easterby-smith et al., 2008; Saunders et al., 2009).

A research question can be answered with the use of any of the research strategies listed. The research question of this thesis is *What can be learned from the result of implementing sustainable environmental assessment tools and its methodological application in Abuja?* This question is composed of a case study which investigates the successful implementation of sustainable assessment tools. Collis and Hussey further explained that a case study is a strategy employed in exploring a single phenomenon within a natural setting using a variety of methods to obtain in-depth knowledge. The case studies analysed earlier in this thesis were used to develop an assessment framework which is then further developed and tested on a project in Abuja. The reason is to assess how applicable this framework is in developing worlds. Other multiple sources obtained in order to back up this assessment framework are the use of different methods including questionnaires and interviews that are analysed in chapter 7.

4.5.1 Data Collection Techniques and Analysis

There are two main ways in which research data can be collected and analysed. The first source is secondary data which are easily accessible and fastest to access; these include reports, books, journals, articles, government proceedings, websites, blogs and newspapers. This is further explained in Figure 4.2 below. This method of data collection forms the foundation in selecting the methods to be used in collecting the primary data. This pattern is known to help the researcher collect original information from the main sources which includes facts and figures derived from questionnaires, surveys, observations and interviews (see Figure 4.3). The main reason for selecting these methods is based on the aim and objectives of this research and their accessibility/availability needed in achieving them (Naoum, 2007).



Examples:	*Examples:*	*Examples:*	*Examples:*	*Examples:*	*Examples:*	*Examples:*
Organisations Databases, such as personnel or Production. Organisation Communications, Such as emails, letters, memos. Organisations websites. Reports and minutes of Committees.	Media accounts, including TV and radio Voice recording Video recording	Financial Times country reports. Government publications. Books. Journals	Industry statistics and Reports Government Publications. European Union Publications Books Journals	Governments censuses Census of Population, Census of Employment	Government family spending Labour Market Trends Organisation BMRB International's Target Group Index Employee Attitude surveys	Government surveys Organisations Surveys Academic surveys

Figure 4.2: Various techniques to gather the secondary data

Source: Saunders et al., 2012, p.259.

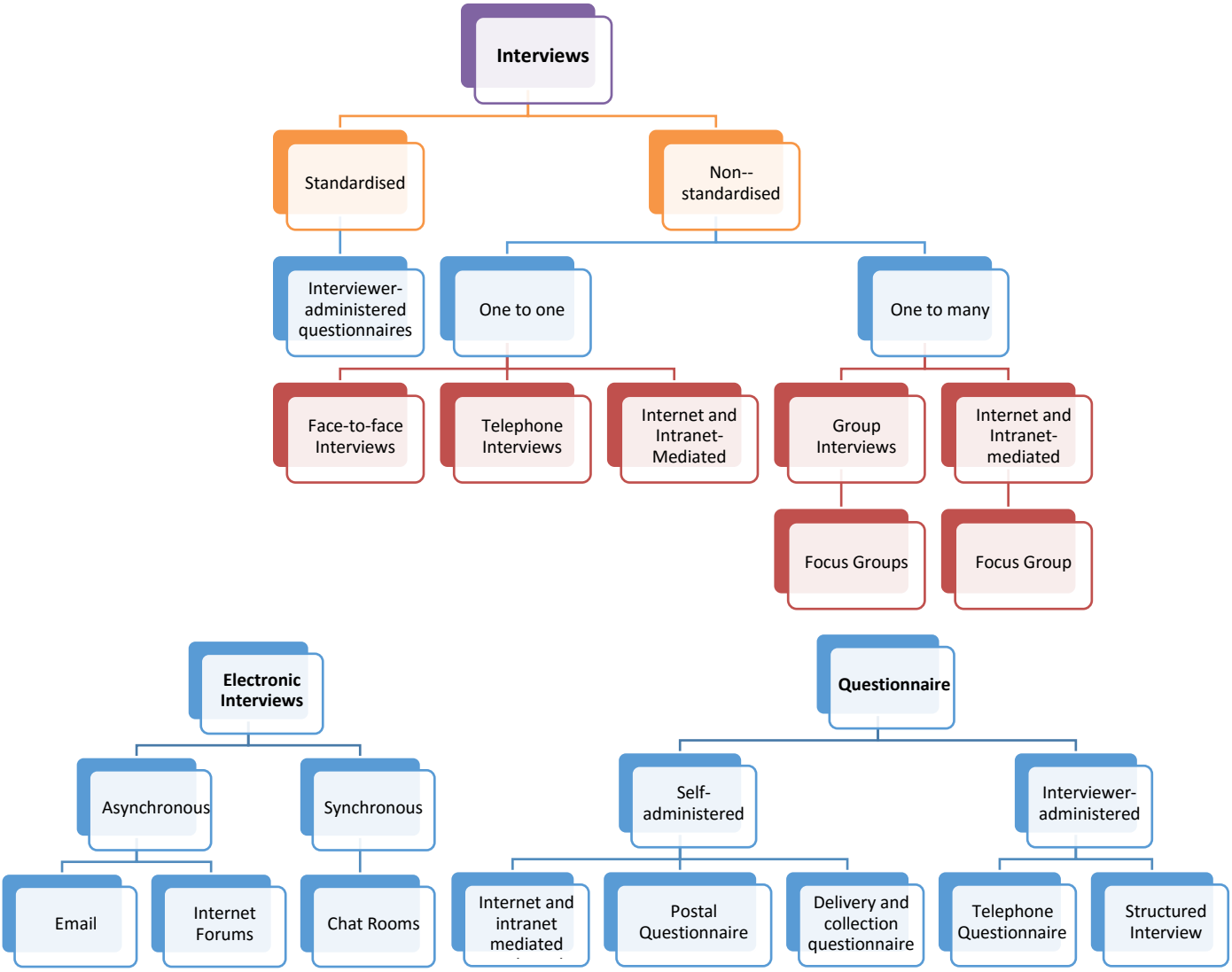


Figure 4.3: Various techniques to gather the primary data

Source: Saunders et al., 2012, pg.321.

4.5.1.1 Interview

Interviewing, also known as verbal questioning, is the most common method of data collection. Interviews and questionnaires, when both used, makeup the survey method which is one of the most popular techniques of social research. Interviews are used as a method of data collection in most research designs no matter what the underpinning methodology is that has been used. The use of interviews helps researchers to bring together more data; more specifically complex data with a detailed picture of the research area which assists the questionnaire design (Hall and Pam, 2006; Saunders et al., 2009). The interview method can be distinguished into three main categories which are *structured*, *semi-structured* and *unstructured* interviews (Saunders et al., 2009). Quantitative researchers mainly adopt structured or semi-structured interviews

while qualitative researchers tend to use unstandardised forms which includes intensive and focused interviewing (Sarantakos, 2005).

Structured Interviews: This set of interviews uses structured questionnaires which are verbally presented to respondents with the answers recorded in the questionnaire by the interviewer. When conducting a structured interview, strict adherence to the order and wording of the questions and the instructions is needed. The researcher is expected to behave like a robot acting in a neutral manner and keeping in the same pitch and tone across the interviews, giving a consistent expression to the respondents (Sarantakos, 2005). It also uses a set of predetermined questions which is concise, clear and straightforward, and which requires a precise set of answers in the form of a set of options displayed on paper to read (Thomas, 2003).

Unstructured Interviews: Normally contains a number of open-ended questions whose wording and position can be rotated at will. In this case the interviewer acts freely within this context on the basis on how the researcher is progressing on points that seem relevant. The structure is flexible and few restrictions are imposed; these take the form of guides rather than rules, and this approach is mostly used in qualitative and feminist research (Sarantakos, 2005). In this type of interview the questions are organised in a predetermined list but the direction of the interview is selected by both interviewer and interviewee (Saunders et al., 2009).

Semi-Structured Interviews: This is suggested to fall between both structured and unstructured interviews which have elements of both with some closer to structured interviews while others are closer to semi-structured interviews. The degree to which interviews are structured or otherwise largely depends on the research topic, purpose, resources, methodological standards, preferences and also the kind of information required which is determined by the research objectives (Sarantakos, 2005). In this interview format, the researcher normally has a list of questions with headings, themes and subheadings which are covered during the interviews (Saunders et al., 2009). This method was used for this research based on its flexibility.

This research therefore involves interviewees who have knowledge and experience within the subject area - comprising academics, practitioners and government officials. The questions asked address the key areas needed in achieving the research, supported by several sub-questions and various issues in relation to the subject area. The research looks at redefining sustainability, indicators of sustainability, sustainability assessment and, lastly,

implementation. Therefore, the semi-structured interview method is considered the most appropriate to achieve the aims and objectives of this study.

4.5.1.2 Questionnaire

Questionnaires are known to be the most commonly used method of data collection in the social sciences. The use of a survey has been anticipated to be the most commonly used method because at some point most of us have participated in a census survey, by completing a questionnaire at home or at work or filled out a questionnaire after completing a job application or applying for a bank loan (Sarantakos, 2005). Questionnaires are administered to the respondents by email or postal mail, or handed out personally by the researcher for completion at home, work, school, hospital or other locations. These are also called self-administered or self-completed questionnaires. The questionnaire method is a general term which includes all techniques of data collection by which an individual is requested to respond to the same set of questions listed in a predetermined order (Oppenheim, 2000). This technique is a powerful tool for data collection although researchers have to ensure that, to obtain the important data, they need to answer their research questions and attain the study objectives. There are three sets of questionnaires, explained below.

Standardised questionnaire: This is a structured questionnaire which is highly rigid with a high degree of standardisation which allows flexibility in answering the questions.

Unstandardised Questionnaire: Mainly composed of a structure of this questionnaire which is less rigid and the degree of standardisation is fairly low. They are normally few questions, and those included are well-defined, but open.

Semi-structured Questionnaire: This questionnaire can logically be placed between the two types (standardised and unstandardised) to attain a moderate degree of structuration and standardisation. The structure may include the combination of pre-structured and pre-standardised questions and of unstructured and unstandardised components (Sarantakos, 2005, pg.40).

In this research, the questionnaire was designed to focus on the respondent's knowledge in regards to sustainability, sustainability assessment and sustainability indicators. It is divided into two sections; the first has the most important sustainability indicators required for the Nigerian context from 'not important' to 'necessary in the near future', while the second section

looks at the respondents' level of understanding of the field of sustainability indicators and assessment.

4.6 RESEARCH DESIGN

Broadly defined, research design means all the issues involved in planning and executing a research project from identifying the problem through to reporting and publishing the results (Punch, 2004). Research design could also be seen to relate two views which is the general idea of design as situating the researcher in the empirical world and also connecting research questions to data (Denzin and Lincoln, 1994). Research design tends to accommodate both quantitative and qualitative approaches and places the researcher in the empirical world thereby connecting the research questions to data (Punch, 2004). According to Bryman and Bell (2011, pg.45.) "a research design provides a framework for collection and the analysis of data". The purpose of designing and performing research can be grouped into two categories: (a) The aim and objectives of the project, and (b) The type of contribution the research intends to make: but to be more specific, a research design is the basic plan for a research area which identifies four basic ideas; these are 1) strategy, 2) the conceptual framework, 3) the question of who or what is to be studied, and 4) the tools and methods to be used in collecting and computing the empirical materials. Hence research design must focus on the four main adopting these ideas, the data to be collected and the strategy to be followed. Within what framework? From whom? How? All these questions tend to overlap (Punch, 2004). Research design overall explains how the researcher hopes to carry out a task – namely, how the question is been asked and addressed, according to Figure 4.4.

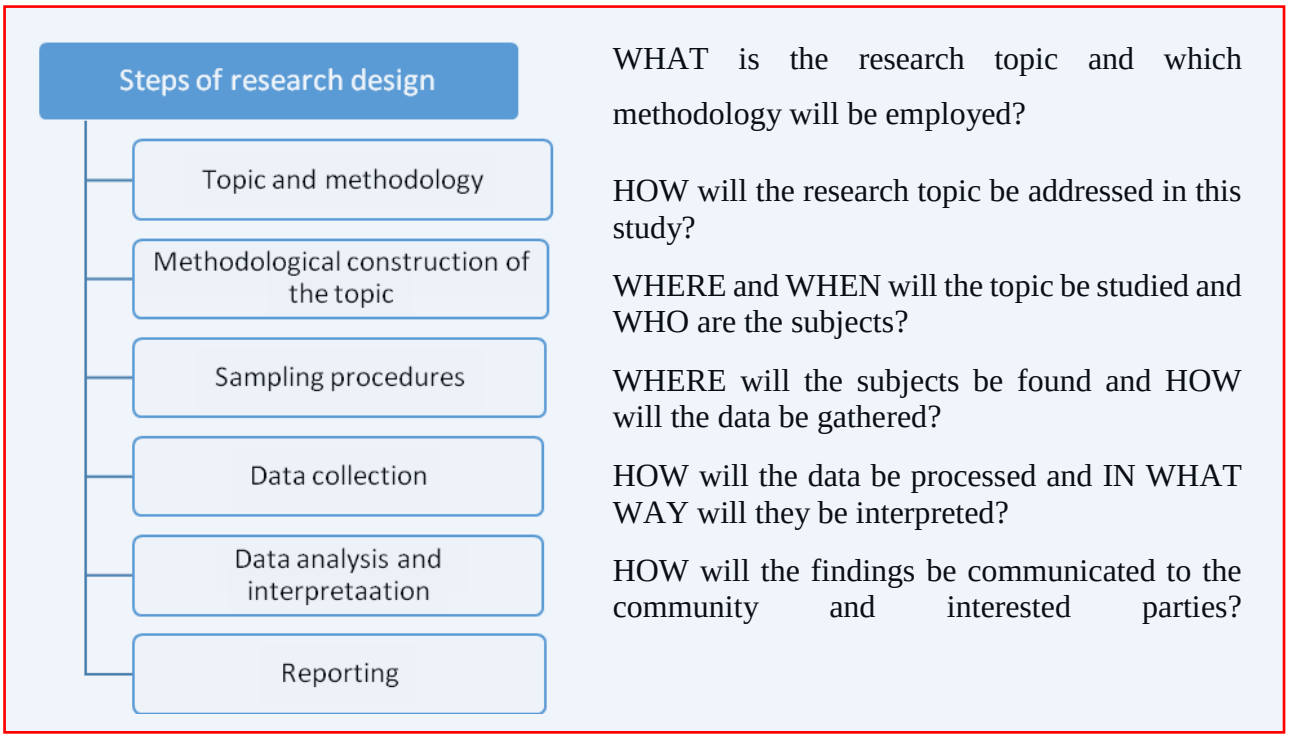


Figure 4.4: Steps of the research design

Source: Sarantakos, 2005

There are many forms a research design can take; some focus on the process of data collection only and others extend their boundaries to cover analysis (Ragin, 1994, pg. 191). Most writers and researchers tend to visualise the research in a broader context, covering all aspects of research which includes the selection of the topic to the publication of the data (Flick, 2000b). The design for this specific research looks into three key stages which identify how this research is accomplished. The *first stage* explores and evaluates the need for achieving sustainable urbanism and to provide a framework which would address the implementation and assessment of sustainability within Abuja, Nigeria. In Chapters 2, 3, 5 and 6 an extensive body of literature in regards to sustainability, sustainable urbanism, sustainability indicators and assessment was analysed and considered to help identify the research problems and propose a model for measuring sustainability. The *second stage* looks at the most appropriate methodology, data collection and analysis for this research project. It identifies the most useful research methods needed to respond to the research objectives and techniques used for data analysis and how the results were used in developing the proposed assessment method (Creswell and Plano Clark, 2011; Robson, 2011). The *third stage* considers the final design of the framework, validation (guidance document), contribution to knowledge and recommendation. It also showcases how the analytical result meets the stated research

objectives of the study. Figure 4.5 indicates the relationship between research objectives, questions/hypothesis, methodology, and data collection methods which leads to the development of the proposed assessment model.

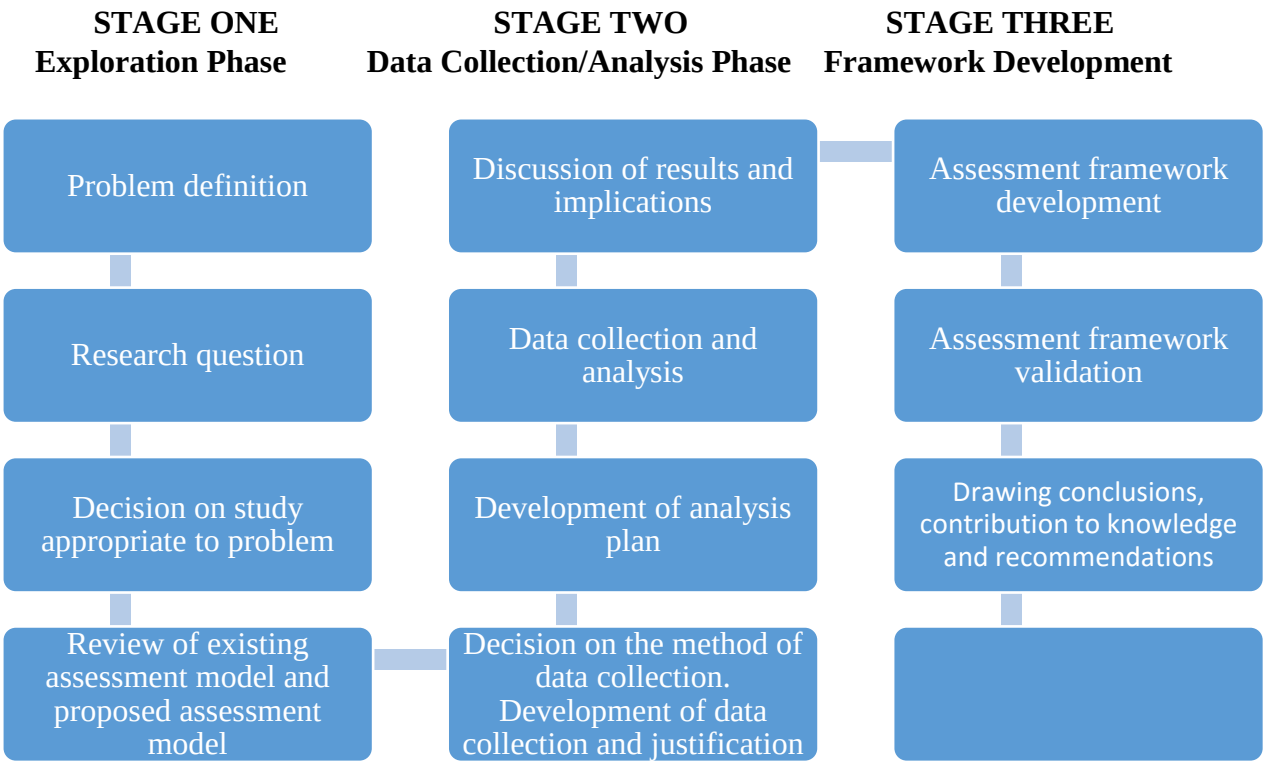


Figure 4.5: Research Design

Source: Momoh, 2014

This research design shows a clear relationship between the objectives, questions, literature, methodology and methods adopted to meet the aim of the research. Due to the nature of the data required for the study, and considering the exploratory phase and the framework phase of this research, the mixed method design is clearly most appropriate for and relevant to the study as shown in Table 4.4.

Table 4.4: Relationship between objectives, research questions, methodology and data collection methods, and linkage to chapters

Objectives	**Research Questions and Hypotheses**	**Methodology and Data collection Methods**					
		1	**2**	**3**	**4**	**5**	**6**
To investigate and critically review the existing concepts/definition and identify the need for sustainable urbanism in developing countries using Abuja, Nigeria as a case study.	How will sustainable urbanism respond to understanding the synergies between technologies, politics, planning, economics, society, culture and environment?	*	*	*			**1 & 2 & 3**
To analyse/review the role of sustainable urbanism within the urban neighbourhood fabric of cities in the United Kingdom and across the world.	What are the most important indicators and assessment models of sustainable urbanism used in measuring the level of sustainability of urban neighbourhoods in developing countries and how can they be selected to develop an assessment tool?	*	*	*			**3 & 4**
To test and examine the fundamental objectives of sustainable urbanism and propose a neighbourhood sustainability assessment tool (SUCCEED) as well as sustainability indicators and benchmarks for measuring its successful implementation based on the outputs from objective 1 and 2.	What are the most important indicators and assessment models of sustainable urbanism used in measuring the level of sustainability of urban neighbourhoods in developing countries and how can they be selected to develop an assessment tool?	*	*	*	*	*	**5 & 6**
Propose a framework that visualises a truly sustainable urban development as the future of Nigerian cities using Abuja as a study area based on the neighbourhood sustainability assessment tool developed in objective 3.	What can be learned from the result of implementing a sustainable environmental assessment tool and its methodological applications in Abuja, Nigeria's urban spaces?	*	*	*	*	*	**7 & 8**
Summarise the research and identify the areas of future research.	What can be learned from the result of implementing sustainable environmental assessment tools and its methodological applications in Abuja Nigeria's urban spaces?	*	*	*	*		**9**
	Hypothesis: If sustainable urbanism and its theories are applied through the use of environmental assessment tools then urban spaces in Nigeria will be more sustainable compared to its present situation.	*	*	*	*	*	

Source: Momoh, 2015

***Key: 1. Literature review. 2. Secondary data. 3. Case study. 4. Face-to-face interviews. 5. Questionnaire. 6. Chapters**

Based on the methods used, the project generated data which were obtained during the empirical analysis, and the resulting sustainability assessment framework was developed and validated. The framework developed can relate to both inclusive and exclusive models from literature. Each of the variables considered the best existing assessment models and then proposed a model and lastly identified the method of how this sustainability can be

implemented. The hypothesis for this research states that: “If sustainable urbanism and its theories are applied through the use of environmental assessment tools then urban spaces in Nigeria will be more sustainable compared to its present situation”. The rationale behind this hypothesis is that it tests and builds on theories, linking the research hypothesis with research questions and the objectives. The ontological perspective on the continuum leans towards social constructivism which studies the theory of knowledge and view of reality as a means of social construction with knowledge of sustainability, and it is linked directly to the research questions’ conductive reasoning. The epistemological perspective on the continuum leans towards phenomenology, emphasising the study of lived human phenomena within everyday social contexts in which the phenomena occur from the perspective of those who experience them, as experienced from the subjective or first-person point of view. Basically, phenomenology studies the structure of various types of experience ranging from perception, thought, memory, imagination, emotion, desire and volition to bodily awareness, embodied action, and social activities, including linguistic activity. From the researcher’s observations, this project has been influenced by most of these experiences perceived as phenomenological enquiries. The remaining part of this research from the ontology and epistemology stances are objectivist and positivist respectively, and these underpins the aspects of the hypothesis which affirms the basis for the development of the framework. This philosophical standing is grounded in the fact that the framework is known to be the magic bullet that makes the research work and which is presumed to be the best approach in tackling this problem of urban planning, sustainability implementation, and assessment. The sustainability assessment framework is aimed at implementing sustainable urban environment in Abuja, Nigeria.

4.6.1 Conceptual Framework

A common premise of this study is the supposition that urban neighbourhoods can be economically, socially, environmentally and planning sustainable. A conceptual framework is a bit of a recipe or a blueprint used in carrying out the research project. It generates an overview of how the researcher plans to conduct the research based on a diagrammatic representation with a series of flowchart justifying the choice made when conducting the research. It can be a written or visual presentation that explains either graphically or in narrative form the main subject to be studied (Miles and Huberman, 1994, pg 18). A conceptual framework is derived from processes that are employed by the researcher to link or achieve the research goal or

purpose (Shields and Rangarjan, 2013). In this research such processes includes the underpinning literature, research aim/objectives, research question, methodological framework and results of the data analysed. One of the key factors that debunk the adaptation of sustainable concepts in urban neighbourhood assessment is the lack of concise framework. In order to attain a workable conceptual framework, the framework needs to address research questions and to be developed alongside the research process. The framework is based on processes used in addressing the research questions developed from the literature and the methodological framework established in this chapter. The literature affirmed the need of a neighbourhood sustainability assessment tool in the Nigerian region. The research question guides the literature which discusses relevant areas such as the need for sustainability and sustainability development implementation in developed and developing countries, sustainability assessment/methods and sustainability indicators. This literature established the knowledge gap which was used in designing the research methodology leaning towards a theoretical framework. The data collection methods applied includes questionnaires, survey, interviews and case-study.

This questionnaire where derived to help in the selection of the indicators used in measuring sustainability within the Nigerian context based on the current literatures looking at the most recent NSA's tools. Also three fundamental questions will be used to guide the selection of appropriate sustainability indicators which includes who drives the indicators, what are the benefits of measuring sustainability indicators and how sustainability indicators should be measured. Also the modification of this questionnaire sample where based on a methodological approach in developing a robust framework looking at an holistic approach in developing an assessment tool influenced by the research gap. The research design and research process guides the selection of the questionnaire/survey and interview questions which is derived from the literature. The final tool created would be based on the result extrapolated from the mixed methods data analysis. Also the interview process was conducted in order to inform the assessment tool and also create a set of recommendations to be used in the applicability and adaptation of this tool. Participants took part in both interviews and questionnaires which helped in establishing a more unified result and also to cross-reference the interview responses to establish similarities and difference in the data collected. This method creates a robust set of recommendation on how this developed neighbourhood assessment tool can be implemented and the way forward. All methods are interrelated and informs/complements each see figure 4.6 below. The core steps of which the conceptual framework was developed includes research

aim/objectives, research question, literature reviews, research methodology, research method and analysis informs each other and supports the entire research process. And the end project or the interpretation of the results feed into the final development of the assessment framework. The justification and workability of the conceptual framework is based on how the entire framework has enhanced the outcome of these research findings and the contextual nature of the development and implementation of the assessment method which would lead to a novel contribution to knowledge.

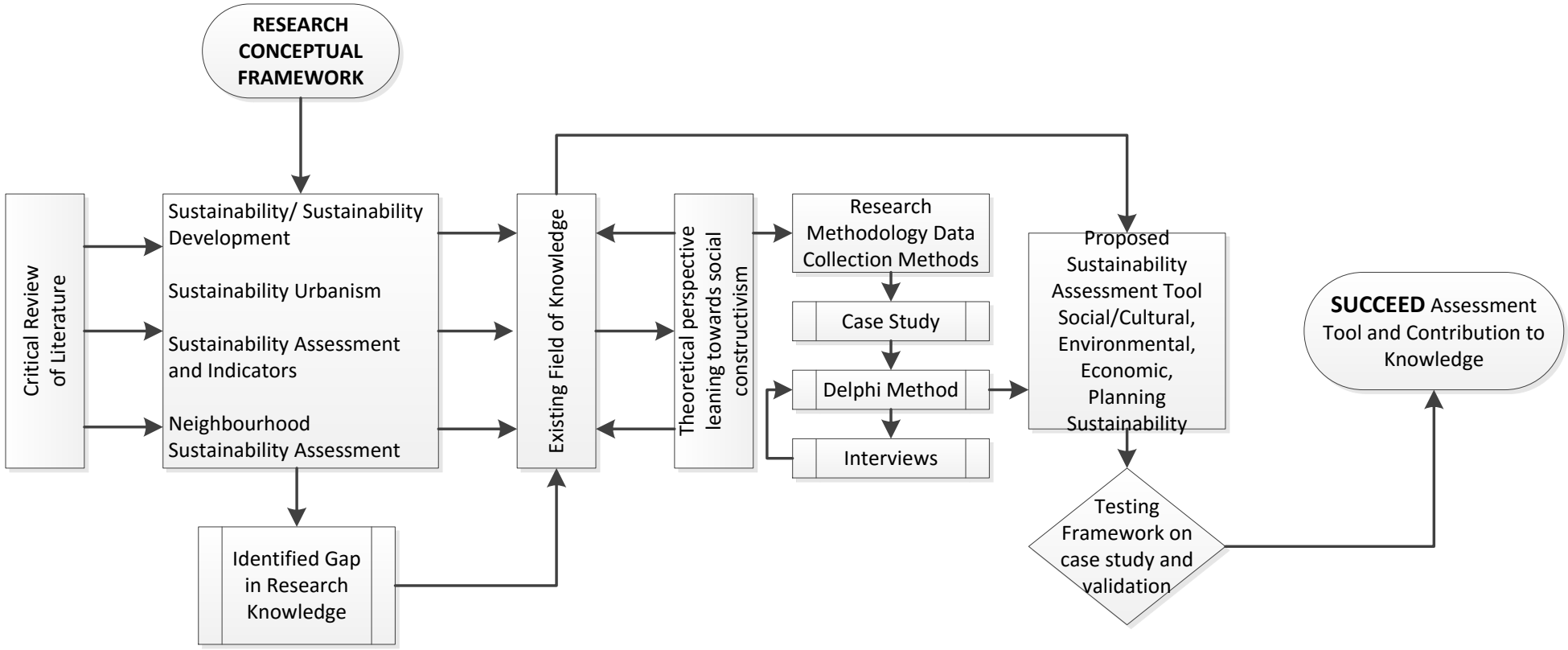


Figure 4.6: Conceptual Framework

Source: Momoh, 2016

4.7 RESEARCH METHODS

Research methods comprise the set of techniques which is employed to collect and analyse, data, and involves the use of specified instruments which includes questionnaires, interviews, observations and documentary data amongst others (Bryman and Bell, 2011). Research methods considers sampling methods, data collection methods, data analysis method and lastly ethical approval which deals with right of privacy, validation, informed consent, internal and reliability.

4.7.1 Sampling Technique

Information on and profiles of all the participants to be involved from Nigeria and the UK were obtained during the first phase of the data collection. The population size involved various experts within the built environment residing in Nigeria, and some abroad, to capture robust knowledge in regards to this subject area. Sampling strategies are divided into two major groups - *probability* and *non-probability* sampling. Probability sampling is more aligned with quantitative research while non-probability sampling is aligned with qualitative research (Walliman, 2011, pg.85). Non-probability sampling was therefore used to select respondents for the qualitative data collection stage, while the probabilistic sampling was used to generate the quantitative data for this study. This method was used because the researcher had very little or no control in regards to selecting the individuals for data collection (Collis and Hussey, 2003; Denscombe, 2007; Yin, 2009). The final research sample comprised 30 participants made up of professionals and practitioners (10), academics (10), and government officials (10).The practitioners were all registered architects, planners, projects managers and engineers who had vast amounts of knowledge, work experience and project delivery experience. The academics include scholars who have undertaken a level of research with their qualification ranging from a degree to a PhD. Lastly the government officials are experts in governance and have long career histories.

The selected participants were informed that the face to face/semi-structured interview approach would be used, which resulted in the use of snowball sampling, to arrive at a small-sized sample. Snowball sampling is a functional technique which is used for creating a reasonable sized sample as initiated in this study and it conforms to non-probability sampling (Denscombe, 2007; Yin, 2009). The sampling technique was also used in the selection of documents that are available and needed for the conducting of the study.

4.7.2 Data Collection Methods

Research methods are known as the various tools or procedures through which data are obtained and deduced. A good example is the use of questionnaires, interviews (semi-structured) and documents. In this study, the analysis of the data from the questionnaires was achieved using Microsoft Excel while face to face/semi-structured interviews were analysed by interpreting the data. As discussed above, qualitative interviews (semi-structured) and questionnaires were chosen as the most functional approach in developing this research. Also data from the documents studied were synthesised, analysed and introduced into the discussion in order to meet the stated objectives of the research (Collis and Hussey, 2003, pg.55; Dawson, 2011). The mixed method approach can be referred to as multi-methodology, which adopts both qualitative and quantitative research methods (Creswell and Plano, 2009). Collecting both quantitative and qualitative data provides a more comprehensive, robust and in-depth understanding of the research problem (Dawson, 2011). The method by which data were collected in this research was a combination of strategies used in both qualitative and quantitative approaches; this is very important because of the multi-disciplinary and multi-dimensional nature of the research. The first section of the research is composed of an extensive review of the relevant literature. The key research objectives include the following two strands:

a. To identify, investigate and critically review the evidence and need for sustainable urbanism in developing countries using Nigeria as a case study.
b. To analyse and review the role of sustainable urbanism within the urban fabric of cities in the United Kingdom and across the world.

The next section explains the instruments selected for the purpose of data collection mainly to obtain both qualitative and quantitative data which is analysed and synthesised to help meet the remaining objectives of the research.

4.7.2.1 Interview (Semi-structured)

As discussed in the previous section, three types of interviews can be used for the collection of data but this project will use semi-structured interviews. The participants were asked questions about an area of study aligned with a predefined interview protocol. The interview processes are flexible to allow new questions to be introduced during the interview process in relation to the respondent's answers (Marshall and Rossmen, 2006; Saunders 2009). For the purpose of this research the semi-structured interview was adopted as a data collecting tool. Thirty interviews were conducted with practitioners (professionals), academics (facilitators) and

government officials (policy makers). The interview process is more conversational in nature, and follows a set of questions with discussion around the topic.

The semi-structured interview is one of the most relevant data collection tools in qualitative research; it also helps the researcher to compare data from varied sources which is needed in answering the research questions. The interview questions are divided into four sections, with a total of 13 questions. The first section is the definition of sustainable development and sustainable urbanism which opens up discussion with regards to the definition of the terms in developing countries. The second section looks at adopting sustainability, and he ways in which sustainability can be developed and integrated. The third section looks at urban governance and how practices, economics and policies plays a powerful role in the adoption of sustainability, and the fourth section explains sustainability assessment and implementation which looks at the overall strategy in terms of its successful implementation, how the developed assessment tool can move forward. The 13 questions were used to capture qualitative data from experts involved in the process towards the accomplishment of the research, and the implementation of the final developed framework. Qualitative data collection methods is vital in providing useful data in knowing the procedures through which implementation of plans can be achieved (Dawson, 2011).

4.7.2.2 Review of Documents

The review of important documents such as the National Planning Policy 2012 and the Nigerian Urban and Regional Planning Law decree No. 88, 1992, alongside other important documents, provides a platform upon which the research can proceed. The secondary data used for this research includes documents such as government publications, newspaper official statistics, magazines, journals, articles, government proceedings, project reports, reports from planning authorities and ministries, parastatals and web pages. All these generate both qualitative and quantitative data which are then analysed as a base for answering most of the supplementary/secondary research questions. Documents are known to source out additional supplementary information which complements or informs data obtained from face-to-face interviews and questionnaires alongside other data collection methods (Denscombe, 2007; Yin, 2009). Documentation can be in various forms such as written sources (which is the majority), visual sources (pictures, table and artefacts), and sounds (music). The main advantage of this method is the feasibility and access to large documentary sources which makes the research more rich without cost implications, delay in data collection, unnecessary procedures like

scheduling meetings, easy scrutiny based on importance of data, and without ethical problems. The validity of documentary information is very important for backing up the study; therefore the choice of documents was carefully scrutinised in relation to credibility, sensitivity, authenticity and representativeness (Denscombe, 2007; Dawson, 2011).

4.7.2.3 Delphi Technique (Questionnaire and its development)

The Delphi Technique can be described as a team decision technique which is based on the judgements of skilled experts with profound knowledge on the subject area (Okoli and Pawlowski, 2004, pg.15). They are three established types of Delphi technique - these are the *policy Delphi*, *real-time Delphi* and *decision Delphi* (Hassan et al., 2000). For this research it was mandatory to make use of the Delphi technique in order to identify the views in regards to key sustainability indicators needed in achieving sustainability within developing countries. The technique was developed by Dalkey and Hehner (1963) at the Rand cooperation in the 1950s, and is widely used in achieving convergence of opinions in regards to real-world knowledge solicited or guided by experts within a subject area. The foundation of this technique focuses on the rationale, "two heads are better than one or ... n number of heads are better than one" (Hsu, 2007, pg 47). To consider the Delphi technique it must consist of a team of decision makers including both professional and experts. The main aim is to come to a consensus so that agreement can be reached (Hanafin, 2004; Hassan et al., 2000; Hsu, 2007). For this project the approach of "ranking–type" Delphi survey, designed by Schmidt (1997) is used in the organisation of the questionnaires, data collection and investigation of the information. It is determined by the distribution of the Delphi survey into three rounds - brainstorming, narrowing down and ranking round (Hanafin, 2004; Okoli and Pawlowshki, 2004). In this project the use of the Delphi technique is been adopted together with experts' opinions regarding the proposed framework which is one of the objectives of this project. The main reason for this technique is that the research is principally concerned with the issues of promoting sustainable urbanism within developing countries and its context. This is important because the design of the assessment tool needs accurate knowledge from highly experienced people who identify various indicators within environmental, social/cultural, economics and planning dimensions of sustainability.

Features of Delphi Techniques

To consider a procedure with the use of Delphi technique four main features needs to be considered and they include anonymity, iteration, controlled feedback and statistical aggregation of group response (Rowe et al., 1999; Zolingen, 2003). The first key feature, known as *anonymity*, is achieved using questionnaires where the individual group gets an opportunity to express their views and pass comments confidentially without any social stresses or influences (Rowe et al., 1999; Geist, 2010). The second feature known as *iteration* conveys how data from the survey are commented upon and remarks are passed regarding the concerns. Also the iteration of the questionnaire opens up an avenue where experts can make alterations according to their views (Rowe et al., 1991; Geist, 2010). This feedback is then synthesised by the researcher and returned to the experts for final or second-round assessment.

The third feature, *controlled feedback,* gives the panel members anonymous views of the feedback provided by other participants (Rowe et al., 1990). The last feature, known as *statistical aggregation* of group response or *statistical compilation* of the questionnaire, comprises quantitative feedback which varies according to Median, Means, Anova and Standard Deviation which is obtained from numerical (quantitative) deduction (Geist, 2010).

Justification for the selection of the Delphi Technique

Justifying the main reason for suggesting the use of the Delphi technique in this research is key in achieving the main aim and objectives of this project. The key aim is to develop a framework that is suitable for assessing and measuring sustainability for developing countries based on sustainability principles, existing successfully implemented frameworks, and considering the opinion of key experts and other participants with robust ideas of the most appropriate technique compared to others, such as the Nominal Group Technique (NGT), Focus Groups, and Statistical Groups. The following explains each of these techniques and the reasons behind selecting the Delphi technique.

- **Nominal Group Technique:** This is based on small group discussions to attain a consensus; it is also known as brainstorming. The NGT gathers information by moderating participants' discussions after which participants are asked to rank ideas obtained from individual discussions (Hallowell and Gambatese, 2009). It is quite similar to Delphi; the main difference lies in the fact that the feedback is collected inductively, which results in limited discussion, thereby reducing the amount of ideas

generated and proving less stimulating to the grouping process than the Delphi method allows. In most cases the end result might be biased.

- **Focus Groups:** This technique is built on collecting experts together in one location or for a group conference call to have group discussions and interactive brainstorming (Powell, 2003). This method faces issues like biased results because the panel is not anonymous and, in most cases, one person, or more people can become dominant and overshadow others. Also bringing people together into one location is not easy because of individual commitments and timing.
- **Statistical Groups:** This technique uses a similar approach to Delphi but disregards the feedback stage (Hallowell and Gambatese, 2009). Hence the results obtained from stage one are collated and analysed to obtain the final answer. In this way the cross-correlation between experts' opinions is undertaken away from their influence (Rowe and wright, 1999). In some scenarios this technique is more used to deduce the fact that expert are less likely to agree together in regards to incorrect output. This table below gives a brief comparison to confirm why the Delphi study is preferred to traditional surveys with regards to its strengths and weaknesses.

The Delphi technique was selected as the most appropriate technique for this research based on a number of reasons. The first reason is that the aim of this research is to determine how best to implement sustainable urbanism in developing countries. Hence it is vital that accurate information is obtained from experienced experts, all stakeholders, and the local community members (who are the end users) with regards to environmental, social and economic factors of that region. The second reason is that it is normally difficult to assemble a group of experts in one place. Also, even though not all experts have knowledge of all issues, the panel size is adequate to generate accurate results (Paliweda, 1983). The third reason is that the Delphi method creates a flexible approach, where a researcher can conduct a follow-up interview in order to make the research data much richer.

Table 4.5: Comparison of Delphi method with traditional survey

Evaluation Criteria	Traditional Survey	Delphi Study
Representativeness of sample	The researches use statistical sampling techniques to randomly choose a sample, which represents the population of interest.	The queries addressed by a Delphi study are of a highly doubtful and speculative nature. For this reason, a general population might not adequately and correctly answer the questions.
Sample size for statistical power and significant findings	The researchers are required to select a sufficient sample size to get a generalised result for a large population. This will help in determining statistically important effects in the population. To determine the suitable sample size, power analysis is performed.	To achieve an accord among experts, group dynamics is used to determine the Delphi group size. This size is not derived from statistical power. Therefore, 10 - 18 experts are recommended by the literature for a single Delphi panel.
Reliability and response revision	Reliability of procedures is a significant criterion to assess a survey. Generally, researchers ensure this by pretesting and retesting to guarantee test-retest reliability.	In the Delphi method, although pretesting is a vital reliability reassurance measure, still test-retest reliability is irrelevant. This is because the researchers anticipate respondents to modify their answers.
Construct validity	Vigilant survey design and pretesting ensures construct validity.	Delphi technique can perform extra construct validation by requesting the professionals to authenticate the researcher's version and classification of the variables. This validation practice is possible as unlike many surveys, Delphi is not anonymous to the researcher.
Anonymity	The participants are not only anonymous to each other at all times, but are also mostly anonymous to the surveyor.	Participating experts are anonymous to each other but always known to the researcher. This allows researchers to communicate with them for additional explanations.
Non-response issues	To be sure that the sample remains representative of the population, researchers need to explore the chances of non-response bias.	Generally in Delphi surveys, there are very little chances of non-response as most researchers have attained declaration of participation in person.
Richness of data	The framing of the questions and the opportunity of follow-up, such as interviews are the factors on which the richness of data relies. In cases where researchers fail to find the respondents, follow-up is often limited.	Traditional surveys undergo richness issues while Delphi studies essentially supply richer data due to their numerous iterations and their response review due to feedback. Also, the experts taking part in Delphi are positive towards follow-up interviews.

Source: Okoli and Pawlowski, 2004 pg. 123

Finally, it has been identified that this technique creates more robust and richer data, which is vital for this research. Based on the above, the researcher is confident/believes that the Delphi techniques will bring more success to the research outcome, compared with other techniques.

Selection of the Delphi Panel

Most research conducted on the efficiency of the Delphi technique has identified the importance of selecting experts in relation to their skills, qualifications and contribution to the survey (Giest, 2010). Hence, the key qualities that the experts should have are expertise and experience and knowledge of how best these can contribute positively to the survey. The use of the Delphi technique is not based on a statistical sample but rather on a group of individuals with profound knowledge of research questions (Okolo and Pawlowski, 2004). Figure 4.6 below describes a range of conducted multiple steps in recruiting quality (expert) respondents.

Figure 4.7: Procedure for selecting experts in the Delphi Technique (Okoli and Pawlowski, 2004).

Step 1: Prepare a Knowledge Resource Nomination Worksheet (KRNW)

The knowledge resource nomination worksheet is utilised in creating a classification of experts before ranking them. This is done in order to identify any imperative category of experts (Okoli and Pawlowski, 2004). This research has created a set of classifications between experts according to disciplines, organisations and those identified in literature; thereby, the researcher can easily identify world-class experts on sustainability urban development. These selected individuals have a grounded knowledge in sustainability, urban planning and development, as do some of the community dwellers.

Step 2: Populating KRNW with names

In this stage different criteria (for example; qualifications, age, gender) are used to identify and place participants by using different headings, disciplines and organisations. It is imperative to have various multiple criteria viewpoint to consider as many participants as possible.

Step 3: Nominal additional experts

In this step, experts are selected and briefly explained what the Delphi study is and its purpose, and why they have been selected for participation in this study. At this stage, the identified participants were asked to recommend or suggest more experts in order to increase the population size. This step is mostly concerned with expanding the KRNW to include as many expert respondents as possible. With their experience and relationships with colleagues (past and present), they were able to identify more people with knowledge on sustainable urban development.

Step 4: Ranking experts (including stakeholders and community members)

For this stage the qualifications attained by these experts were evaluated to rank their level of importance. This form of ranking was to create priority levels for every individual on the research. The years of experience, field of study and qualification were added to the checklist to strengthen the case for the selection of experts for the Delphi study.

Step 5: Invite participants to take part in the survey

At this stage various methods were used to process the invitations to the participants. An example showcases how some participants were invited through appointments by stating what the project is about and how best they can tackle this research. Five steps were used in making sure that competent participants were selected for this study. One of the main issues with this

research in regards to selecting participants was that most participants were male because of the nature of the research study and position of females within the built environment disciplines.

4.7.2.4 Questionnaire and its development

The development of the questionnaire comprised nine steps - preparation, constructing the first draft, self-critique, external scrutiny, revision, pre-test/pilot-study, revision, second pre-test and, lastly, formulation of the final draft and administration.

Step 1: Preparation

The researcher first decided how the Delphi technique would influence the design and preparation of the overall questionnaire using a set of guided principles.

Step 2: Constructing the first draft and scaling method

The researcher formed a number of questions including questions of substance related to aspects of the research topic. The scale of measurement is defined as a technique in which an individual assigns numeric values to the attributes of products (Oppenheim, 2000). The measurement scale is divided into four levels: nominal, ordinal, interval and ratio. The purpose of ordinal scales as a measurement of the questionnaire is to provide results to some research questions and to address the hypothesis. The ordinal scale identifies a set of categories organised in sequence of ranking of a degree of satisfaction. The questionnaires were structured and ranked from "not important" to "necessary in the future". Six ordinal scales were adopted ranked from one to six (1–6), from which the respondents were asked to select the most appropriate sustainability indicators needed in achieving sustainable urbanism. Oppenheim (2000) advises limiting the number of scales as much as possible, in order to prevent confusion among the option lists. The use of a six- point scale was adopted to encourage the respondents to select from a range of options, while reducing the tendency to bias (Oppenheim, 2000; Brace, 2004, pg.84).

Step 3: Self-critique

The questions were tested for relevance, symmetry, clarity and simplicity among others factors; they were also tested based on the compliance with the basic rules of questionnaire construction.

Step 4: External scrutiny

The researcher prepared the first draft which was given to experts for suggestions, scrutiny and feedback. It was noticed that some questions might be changed or eliminated or some indicators removed from the list while new indicators would be suggested. By using the Delphi technique panel members were informed of the anonymous views of other participants providing their feedback. The overall summary of the group response was generated by using controlled feedback which consists of views and verdicts of all group's members, not just the dominant ones.

Step 5: Re-examination and revision

The critique obtained from the supervisors and experts panels (Delphi panels) was then considered in order to implement or make changes. The revision was important in enabling the researcher to produce a robust questionnaire which tackled the research questions. The revision was substantial; once completed, the questionnaire was given to both the research supervisor and experts, and was considered satisfactory.

Step 6: Pre-test/Pilot study

The pilot study was undertaken to assess the suitability of the questionnaire as a whole, or some aspects of it. A small sample was selected for this purpose and the results were then analysed and interpreted. The pilot study was conducted to collect feedback regarding the adequacy of the questionnaire and to confirm the minimum duration needed to answer the questions, and lastly to collect opinions from respondents with regards to the information that can be obtained from the questions. Between 8 and 16 August 2014, 10 questionnaires were administered, from which eight were collected, indicating an 80per cent success rate. The feedback received showed that five minutes was the average time for answering the questionnaire. Some defaults in the questionnaires included no page numbering, irregular font size, lack of a proper description of the data enquiry process, and lack of sufficient space for respondents to make relevant remarks.

Step7: Revision

The pilot test study resulted in minor changes. All amendments were re-evaluated and addressed to make the questionnaire more efficient.

Step 8: Question design and layout

The questionnaire was designed for respondents to complete the questions appropriately, which would assist with efficient analysis of the data. For this research it was advised to have closed questions with alternative options to select from (Dawson, 2011). The main advantage is that not many skills are needed in making up decision. It is easier for the respondents and makes grouping much simpler (Oppenhiem, 2000). The respondents were asked to place "x" or a tick "√" in their selected scale position in response to their belief behaviour, knowledge in subject area, and pre-determined choices (Saunders et al., 2000). The questionnaire was designed to acquire data from key professionals, experts, community users, local citizens and the entire design team in response to their experience in sustainability. The layout of the questionnaire consists of three main sections; the first showcases general information from the respondent which includes name, current job role, years of experience and a brief, clear set of instructions about how to answer the questions. The second section showcases a list of relevant sustainable indicators to the Nigerian built environment that have to be ticked based on the most significant indicators. The ordinal scales are 1) not important at all, 2) of some importance, 3) important, 4) very important, 5) extremely important, and 6) necessary in the near future. Section three concludes the survey question and showcases five 'yes' and 'no' optional questions.

Step 9: Formulation of the final draft/administration of the main study questionnaire

The final step looks at how the investigator concentrates on editorial work: checking for spelling mistakes, legibility, instructions, layout, space for responses, pre-coding, scaling issues and the general presentation of the questionnaire. The questionnaire was designed to be clear, straightforward, and easily distributed. The span given for the respondents to fill in the questionnaire and return it was four weeks. Each printed copy of the questionnaire was accompanied with a cover letter containing the objectives of the study, benefits of the study, research definitions, and statement of ethical consideration. The questionnaires were sent to 65 respondents and, within four weeks of sending them out, 50 had returned and were considered to be very important for the study. The response rate can be calculated according to Bryman (2004) where,

Response rate = No of questionnaires x 100%

Total Sample

The above calculated response rate shows how important this result is in relation to the research outcomes. This response rate was seen to be very efficient after considering the needs and nature of the research.

Data collection is a vital aspect of any research. Any data collected can influence the results of the study and could discredit the findings. This is the main reason why it is important to carefully consider the type of research methods and also the method(s) of data collection needed. The methods used in the collection of this data determine and increase the degree of quality of both qualitative and quantitative analyses.

4.7.3 Data Analysis

The main reason for carrying out data analysis is to create an understanding of what the research is all about. Data analysis establishes a step-by-step explanation of the method and parameters adopted to analyse the data from documental review, semi-structured interviews, observations, and questionnaires. In analysing data the researcher made sure all information was organised into two formats - Microsoft Word (qualitative data) and Microsoft Excel (quantitative data). The researcher ensured that interview notes, observation notes and the documents analysed were transcribed utilising Microsoft Word. This was for two reasons: qualitative study is more defined towards knowing how things or behaviours come to being, so placing all the data in one format creates stress-free analysis. Secondly it helps to make the data storage and access to data easy because when transcribed one problem is that it generates large volumes of data (Bryman and Bell, 2011).

4.7.3.1 Developing the Analysis for Qualitative Analysis

In this study four sequential steps were utilised to develop the analysis of qualitative data:

- Focus on data which can be easily analysed
- Work on one process at a time
- Streamline or narrow the study to one part at a time of the process
- Compare the different sub-samples of the dataset.

During the course of this study, the rich aspect of data can be seen as high quality and can develop ideas that relate to provisional analysis which can be compared through corresponding

research groups or similar studies. The selection of rich and robust data opens the way for relativity and initial deductions. The next step is the interpretation of data on a "not to be taken for granted basis" (Silverman, 2007, pg.23). Also deciphering text is very important in qualitative data analysis. This is because words do not always mean the same thing and, at the same time, different words can be inter-switched to represent various ideas. One major criticism of qualitative research is the use of choice words to explain a particular conclusion.

4.7.3.2 Coding and the categorisation of information

A key part of the process when analysing qualitative data is to categorise information – this is also known as 'coding' or 'indexing' of data. In qualitative analysis it is vital for major categorizing of variables with labels, codes, figures and values. To generate more understandable meaning from the document review, observations, face-to-face interviews and questionnaires, the following had to be understood: Identify the patterns and theme (concept, framework, ideas, terms/terminology), and organise the data in coherent categories that summarise the meaning to a simple text (Gibbs and Taylor, 2005). Coding is known as a procedure of which data are combined for themes, ideas and categories.

4.7.3.3 Analysis of the Interviews (Semi-Structured)

The research adopted a semi-structured interview, or face-to-face format. The data obtained were subjected to thematic and content analysis (Denscombe, 2007). To understand how to analyse and synthesise data, it should be drafted in a format that can be easily analysed. The semi-structured interviews, documents, range of written results from the interviews, and case-study findings were composed of views and opinions of the participants which are concerned with words that are coded and analysed by the use of qualitative content data analysis. This analysis contains the interpretation of the meanings and results according to the way the respondents perceive and understand the social constructs. For this, the recording of the response was done using an audio tape recorder which was an ambiguous and time-consuming process, but very rich in text and information. The transcription was achieved in the same process as the question asked when conducting the interviews. Thus, it was very important to select important aspects of the interview. Recording the whole interview from start to finish (including the reading of ethical approval rights) was the best method to make sure all vital information from the interviewees were recorded (Silverman, 2007; Bryman, 2008). The analysis was manually conducted by the researcher; the process included coding through highlighting sections, extracting themes, and identifying relationships. The transcription

process used a high degree of analysis which is underestimated but very important due to the fact that responses give more insight.

4.7.3.4 The Analysis of the Document Review and Case Study

The research utilised both document reviews and case studies as major sources of data for this project which is very important due to the fact that it is an exploratory research. The use of these kinds of material as sources can be identified under two categories:

- Primary sources
- Secondary source are materials generated from previous researchers including journal papers, PhD thesis, articles, government proceedings and so on.

In the two cases the limitation shows a set of analytical choices for the research while the sources once selected is subjected to further analysis (Denscombe, 2007; Yin, 2009). The transfer of various experiences such as observations, memoirs and speech into text is a valuable procedure when taking qualitative research. The documents were summarised and placed within the text in a communicative approach - that is to say, in *words* and *sequences of words*. The use of these is a necessity for forms of qualitative analyses (Yin, 2009; Dawson, 2011).

A summary of different documents was compiled according to the objectives of the project. The reviews were coded into themes and sub-themes to create a group for reviews obtained from the documentation. The proceedings, memos and transcripts were synthesised together with the data collected from other sources. The new findings were adopted into the assessment framework, following which an assessment tool was proposed that would determine the successful implementation of sustainability within the built environment of developing countries. The qualitative data from the document reviews, case studies and observation were analysed with the use of content analysis which includes various sources that produce text and narrative data which include brief responses from questions, surveys, transcripts from interviews or focus groups, diary notations, newspaper and published reports (Yin, 2009).

4.7.3.5 Analysis of Questionnaires

The questionnaires generated 105 criteria with 21 sub-indicators and four sustainability dimensions. The data were inputted into Microsoft Excel spread sheet 2013 (analysis tool pack) which was used to analyse the data to ensure consistency in the entry of the ranked data. This application package was used because the information that needed to be analysed involved a simple data analysis task. For this project, mean and standard deviation were used as statistical

tests to analyse the data from the questionnaires to generate response to some of the project's questions and hypothesis. The research used the Delphi survey proposed by Schmidt (1997) for the organisation of the questionnaires, data collection and investigation of the information.

4.7.3.6 Developing the SUCCEED rating tool

The development of SUCCEED was based on the findings from both the qualitative and quantitative data. These analyses have centred on the development of a holistic but innovative sustainability assessment tool. The first stage deals with the study of sustainability indicators on a broad scope, case studies of projects that highlighted sustainability indicators, and the key sustainability indicators needed in accomplishing sustainability implementation in developing countries. The second stage of the development of SUCCEED included the review of various documents and literature that analyse the development of three main assessment tools - BREEAM, LEED, CASBEE, Green Star and Green Economy Framework - supported by emerging assessment tools – SUPD and SuBETool. Thus in developing SUCCEED the researcher was interested in understanding components and presentation of existing assessment tools.

The third stage is related to the data collection phase which looks at the credibility, dependability and conformability of using both qualitative and qualitative data to streamline and validate the SUCCEED tool. In other words the successful refinement of SUCCEED was based on how the data influence the importance or sustainability needs within the Nigerian context. The final stage which is described in Chapters 7 and 8 looks at the analysis, streamlining the assessment tool, creating a matrix of techniques/weight value and then testing the tool on a case study to examine its workability. The last phase creates a perfect unification of the four steps and creates a sense of quality, reliability and validity of the research. SUCCEED was developed with the criteria listed below:

- **Holistic Approach:** It is important that SUCCEED should be a system that integrates four dimensions of sustainability - *social/cultural*, *economic*, *environmental*, and *planning sustainability*. Also the tool acts as a monitoring and evaluation assessment criterion for determining the level of sustainability that a development has achieved.
- **Presentation:** The built environment assessment tool uses the rating system to determine the grade that has been implemented. Hence, the researcher made sure that the rating system adopted was simple and also falls into those requirements.

- **Easy to Use:** SUCCEED must be flexible to use and easily understood by the intended users.
- **Applicability:** SUCCEED must be applicable to the specific area which is neighbourhood designing, as realistic as possible, and enhance the learning of sustainability implementation within the industry. Again the SUCCEED system should always offer flexibility to respond and adapt to future demands.
- **Sustainability:** SUCCEED should be able to thrive as an assessment tool in developing countries for both intra-generational and inter-generational populations; hence it should have the flexibility to be updated alongside development patterns.

SUCCEED was designed using various methods, approaches and collection of tools as described earlier (see Figure 4.7). SUCCEED was developed to;

1. Address many shortcomings identified during the problem statement of this research
2. Overcome how sustainability is been previewed rather than embrace it for its simplicity
3. Encourage flexibility and adoption in various developing and developed countries across the world, and for use as a foundation for other related functions
4. Overcome limitations of evaluation and assessment of sustainability.

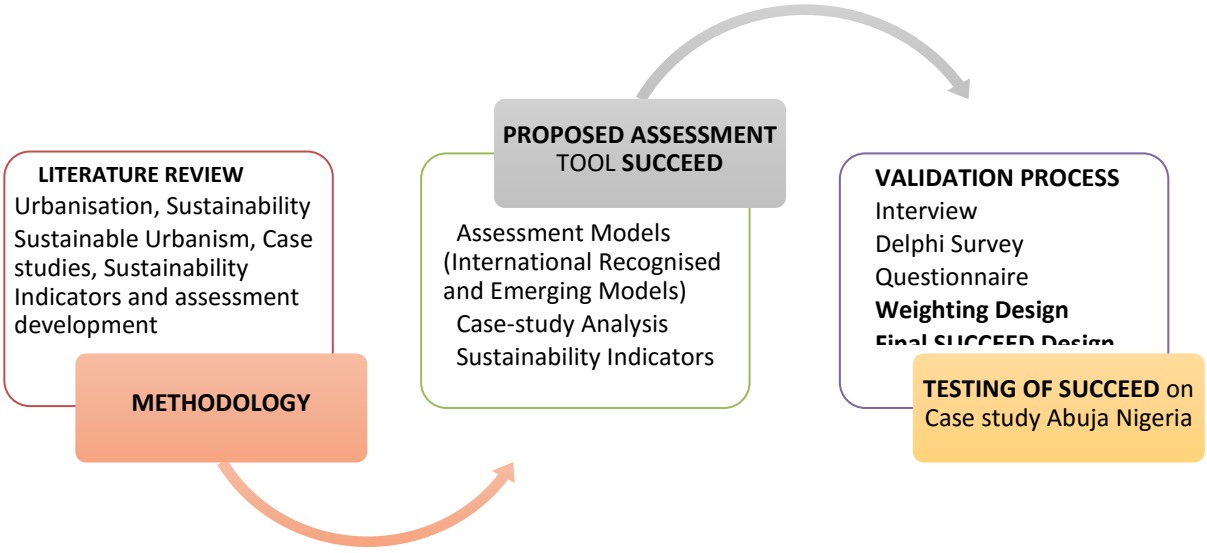


Figure 4.8: SUCCEED Development process

Source: Momoh, 2015

4.7.3.7 Introduction/Implementation and testing process

The main aim of this process is to understand the practical application of the framework developed for this project. The implementation process is a very important part of any

assessment tool; the process increases and enhances the originality of these frameworks and make them more useful, valuable and applicable (Kennedy et al., 2006). The test process to be done has a list of various techniques to be used for understanding how it works. After implementing and testing this tool on a case study the result was modified for improvement and clarity during this process. The aim of the testing process is to assess the practicality of the proposed tool with regards to sustainable urbanism. One main neighbourhood to be studied within Abuja is an urban scheme developed by CITEC which is located at the heart of the city. The features and outcomes of this result are discussed and analysed in detail in Chapter 8.

4.7.3.8 Quality of the Research

Qualitative and quantitative research methods are known to be very robust methods for attaining high validation and reliability of the research. The terms *validation* and *reliability* are both closely linked to quantitative research (Bryman and Bell, 2011). Yin (2009) and Bryman and Bell (2011) presented five tests for qualitative research; these are credibility, validation, transferability, dependability, and conformability. To increase the quality of the deduced data, Table 4.6 below showcases how the following actions were taken before and after the research design, data collection and data analysis.

Table: 4.6 Actions taken by the research to strengthen the quality of the research

Quantitative and Qualitative Tests	Description	Action
Credibility	How believable are the findings?	● The research process was properly explained in this chapter ● All documents collected were copied and stored safely by the researcher, and photographs were taken to support the evidence. ● The data collection tactics and the SUCCEED tool were piloted.
Validation	Has the proposed framework been validated by the data collected?	● The data collected was then used to streamline the assessment tool in Chapter 8. ● Both interviews and questions collected were used in influencing the results.
Transferability	Do the findings apply to other contexts?	● The initial aim of the thesis was the application of the tool to developing countries; this was considered throughout the research ● SUCCEED was designed to suit various urban neighbourhood within the main context.
Dependability	Are the findings likely to apply at other times?	● An interview protocol and questionnaire survey was developed. The use of the interview protocol, aside from the questions, also contains the procedures and the general rules for conducting the interview (see appendices B and C for sample). Also the questionnaire followed its own general rules for conducting data collection. ● Maintained the consistency before and during the research process. ● Information gathered was then stored in an interview database and the data analysis was conducted critically. ● The interviews were recorded and carefully transcribed verbatim. The questionnaire was analysed using Microsoft Excel. ● Research methodology was clearly presented, and clarifies sustainable urbanism as a field of study; theories, ontological and epistemological positions of the study were stated.
Conformability	Has the researcher allowed his/her values to intrude to a high degree?	● Various data collected were from selected and recommended individuals and some were randomly selected ● The researcher took a neutral position in the data collection.

Source: Momoh, 2015

Summary of data sources and method of analysis

The content analysis of the data was used to showcase the opinions which established the sets of attributes within different methods of data collection, which includes case studies, questionnaire, interviews and document analysis. This was then followed by the analysis of the methods and the results were used to facilitate the development of the assessment framework and guidance documents for implementing sustainable urbanism. Thematic and content analyses were applied to the data which were generated from interviews, case study and

documents reviewed to collect information that meets the need of the objectives - see Table 4.7 below.

Table 4.7: Summary of data sources and methods of analysis employed for the study

	Data Source and Methods	**Analysis**	**Area of analysis**
1	Questionnaire	Mean and Standard Deviation (Delphi Technique)	65 questionnaire sent; 50 returned
2	Document Review	Content	Documents reviewed
3	Semi-structured Interviews	Content and Thematic	According to the responses in the interview guide
4	Observation	Content and Thematic	According to the observations captured to meet the objectives

Source: Momoh, 2015

4.8 CONCLUSION

This chapter has identified and described the appropriate methods used in validating the research and the design of the proposed assessment framework. It also showcases how this tool was developed using a sound methodological approach which was further validated and conformed to suit the Nigerian context, and also achieving sustainable urbanism as the overall goal. The approach adopted was both qualitative and quantitative, based on deductive and inductive reasoning by adopting a mixed methodology as a research strategy. Also the research employed a questionnaire survey, ethnography, face-to-face interviews, case study and archival or document review as research methods. The Delphi technique was incorporated within the questionnaire design to help in selecting the right sets of indicators needed in proposing the assessment framework. The analysis of the interview questions was done through the use of thematic and content analysis involving 30 participants. The questionnaire was analysed using Microsoft Excel spread sheet 2013 (analysis tool pack) and the statistical test was conducted through mean and standard deviation involving 50 participants.

The following chapter analyses the various types of sustainability indicators present and their application in both developed and developing countries. It also includes the thresholds and indicators present in the studied cases and other indicators necessary for achieving sustainable urbanism. The researcher also focused on identifying which sustainability indicators are vital in designing the assessment framework and classified these indicators under social, economic and environmental sustainability groupings.

CHAPTER FIVE: SUSTAINABILITY INDICATORS

5.1 INTRODUCTION

This chapter is a continuation of the research methodology and the case studies which have been analysed, and offers further insight into the definition of sustainability indicators (SIs), applications, and the indicators needed in achieving sustainable urbanism. It was clarified in Chapter 3 that most urban spaces which have based their principles on sustainability have been able to realise the scheme through the initiation of some specific key indicators to make the project a success. The use of sustainability indicators is one of the prominent and most widely accepted measures in actualising sustainable urbanism, and this chapter introduces the sustainability assessment tools which are developed from the selection of various indicators based on each one's level of importance, priority and necessity in the development of the assessment framework. It is also important to clarify from the beginning of this chapter that the selection of the most important indicators to be used in the design of the proposed assessment tool would be used for testing purposes and are not presented as a comprehensive list to assess or describe the entire system.

5.2 SUSTAINABILITY INDICATORS

Indicators are used to perform many functions and can be seen as a set of multi-tasking pointers in achieving or measuring desired outcomes. Indicators are used in our everyday activities; they are part of everyone's life (Lee, 2012). The use of indicators is to monitor complicated and complex systems that need to be measured, studied or controlled. An indicator can be clearly defined as a summary measure that provides a set of data or information about a state of a system or whether it needs changes in order to improve the system that is been measured (Fiksel et al., 2012, pg.6). The use of indicators is known to simply communicate complex information and data about its performance to an audience who desires to understand more about the building, urban environment or make final decisions based on that information (Alwaer, 2006; Alwaer, 2015; Alqahtany, 2013, pg.179). Sustainability indicators adopt various key points that make up the composition of this system and its relation to sustainability within the built environment. This topic is classified under various headings as explained below.

5.2.1 Definition of Sustainability Indicators

As a result of the action plan adopted in 1992 at the UN Conference on Environment and Development in Rio de Janeiro, there was an initiative to create indicators of sustainable

development that develops a strong basis for decision making and policy adaptation at all levels. Another good example was the Agenda 21 which looks at the harmonisation of efforts to formulate such indicators. The call to attention was to inform all countries, international agencies, governmental and non-governmental organisations to work on creating possible indicators (United Nations, 1996). Indicators are known to accomplish many diverse functions; some of their is that they lead to better decisions as well as simplifying problems, and clarifying and creating aggregated information known to policy makers (Alwaer, 2006, pg.88). Indicators are used in adding to the physical, economic and social science knowledge on decision making and also to measure, test and calibrate the pace or progress in achieving sustainability targets and goals. They can also assist in early indications to prevent economic, social and environmental problems and are very important measures in communicating ideas, visions, values, focus and thoughts (Fiksel et al., 2012, pg.5)

The main reasons for initiating sustainability indicators fall into two categories. First, it is a tool to be used for management, development, implementation, and monitoring strategies/progress in implementing a sustainable urban development. Second it is a measuring tool kit or a report card to measure and analyse the progress being made in achieving a target and to ensure that all built environment experts, stakeholders and government achieve the end product of sustainable urban development (Fiksel et al., 2012). The role of sustainability indicators is to provide a framework for implementing sustainable urbanism and urban development. An important aspect of this framework is the composition of sustainability objectives, goals, indicators and measures, which is seen as a basis for evaluating and reporting of the sustainability targets and progress (Cole, 1999, pg.233). One of the key reasons why sustainability indicators are important is that they are used to understand how communities' projects perform alongside sustainable development criteria in the core dimensions, which are social, economic, environmental and cultural issues (Xing et al., 2006). Sustainability indicators can assist decision makers to be more informed with regards to how future development and past developments can be assessed. Also their use creates opportunities on how to improve the know-how, applicability, practice and implementation strategies of sustainability by providing a basis for analysis or decision making (Balsas, 2004, pg.4). Measuring sustainability is mainly approached by selecting important indicators of sustainability, and another method is that the overall progress towards achieving sustainable urban development can be achieved by combining individual indicators in relation to their interaction (Warhurst, 2002). In addition, most documents have suggested that measuring

sustainability is more effective by selecting indicators necessary in achieving the desired outcome. The combination of sustainability indicators can be used in measuring the sustainability of urban communities by establishing a framework with various dimensions of sustainability. To achieve this framework there is a need to consider all stakeholders involved because the indicators chosen must relate to a variety of different actors and disciplines (D'acci and Lambordi, 2010, pg.21).

5.2.2 Classification of Sustainability Indicators

Sustainability indicators can be defined as measurable characteristics of environmental, social and economic dimensions which are important for making sure changes in these characteristics are necessary to the continuation of human, environmental and social well-being. Sustainability indicators can therefore be briefly defined as relevant policy variables used as a means to measure variables over space and time (Fiksel *et al*., 2012, pg.6; Lee, 2012). Sustainability indicators can be categorised under quantitative and qualitative measures but their main difference are both ecological and economic (Lee, 2012).

Classification of sustainability indicators is very important particularly when developing an assessment tool or framework to measure sustainability (Fikel *et al*., 2012). These indicators are selected and classified into a clear set of defined categories and sub-categories which is normally referred to as taxonomy. This statement suggests that the classification and categorisation of indicators is fundamental when developing a framework as it creates a foundation for and basic understanding of the relationship of the indicators and the assessment framework. There are three main taxonomies in the classification of sustainability indicators which are as follows:

- Classification based on the three dimensions of sustainability

This is the most widely used taxonomy that classifies sustainability by identifying indicators used in creating the framework and various assessment tools. It is mostly known to be the traditional method used in defining sustainability and creating a structure for the analysis of sustainability indicators which are further studied for this research. The dimensions are environmental, social and economic. (Fikel *et* al., 2012, pg.8). Some very recent studies have incorporated planning the dimension based on the development of sustainability within urban design. A very good example is the assessment tool known as SUPD (Sustainable Urban Planning Development Tool) developed by Alqahtany Ali Muflah in 2014.

- Classification based on System-Based Indicators, priority and relevant indicators

This classification method is based on the needs and priorities of the organisations, professional bodies, cities and regions in regards to the indicators that best suit their context. This method of classification is mostly organised according to the needs and relevance (Fikel et al., 2012, pg.9); an example is the BREEAM Neighbourhood design developed by the Building Research Establishment.

- Classification of indicators based on national programmes

Another way of classifying indicators is by aligning the needs of indicators based on the existing national programmes and schemes. Some of the schemes include Vision 2020, Sustainable and Healthy Communities (SHC), World Bank Initiatives and UNDP (Fikel et al., 2012, pg.9). It is therefore advised to work on developing a framework based on two or more of these classifications of indicators to make it more successful in its implementation.

5.2.3 Three "Pillars" or Dimensions of Sustainability

The approach of sustainability using the three dimensions is known to be the most common classification of sustainability and it embraces a holistic approach to sustainability encompassing of social/cultural, environmental and economic dimensions of human development. This model helps us to understand the concepts of sustainability better, hence creating an opportunity to gather, share and analyse information which in return helps to coordinate work, and enlighten and train key professionals, policy makers and the entire public (Allen, 2009, pg.2). It is agreed that sustainable development is a concept that is based on the integration of the three dimensions - economic, environmental and social dimensions (refer to Chapter 2.3 for more detail). Figure 5.1 below showcases interlocking circles of the Environmental (conservation), Economic (growth) and Social (equity) dimensions. The relationship between the three linked dimensions is as follows:

- The three pillars of sustainability are more than environmental protection due to the fact that most theorists have focused on this dimension only. It is noted that the environment cannot exist as a sphere secluded from needs, human activities, growth and ambition; it is where humans live and development takes place, so the three dimensions are inseparable.
- There is no clear or single definition of social dimension because it is composed of many aspects like health, education, ethics, beliefs, diversity, safety, cultural aspects, inter-generational equity, inter-generational equity and poverty.

- Most models presented have indicated that there is interconnection of the three dimensions of sustainability.
- Recent studies have shown that this dimensions cannot be isolated most especially social dimensions but this studies suggest that is about human well-being and environmental quality and also the links between them (Rubenstein et al., 2001)

Figure 5.1: Sustainability Dimension

Source: Momoh, 2015

5.2.3.1 Environmental Dimension

Environmental sustainability is seen to be vital based on the fact that our natural resources are taken for granted and the fact remains that some are non-renewable or take longer to be replenished. This dimension refers to the influence of urban production and consumption on the integrity and development of the city. This dimension considers the links between the state and dynamics of environmental resources and services and the demands exerted over them (Allen, 2009, pg.3). Morelli defines environmental sustainability as *"meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provides them"* or also as a condition of balance, resilience and interconnectivity that lets human society attain its wants without exceeding the capacity of its ecological system to continue regenerating the services needed in meeting both needs or actions

diminishing biological diversity (Morelli, 2011, pg.46). Indicators or categories of environmental dimensions include ecology, pollution, water, energy, resources (materials), climate change, waste and recycling, mobility, and biodiversity (Alwaer, 2006). Environmental sustainability varies from context to context and it is more pressing in developed societies that have been able to attain a certain level of social and economic sustainability compared to developing societies that are just beginning to learn about this aspect of sustainability.

5.2.3.2 Economic Sustainability

This aspect of sustainability emphasises the capacity and ability to put both local and regional resources into productive achievement for the long-term gains of the context or community without damaging or causing adverse reduction in the natural resources which are a source of dependence (Alleni, 2009, pg.3). It is a known fact that people in the western world or developed society are heavy consumers, which is why they have attained this level of development while people in developing countries are beginning to explode in population, at the same time working to improve their living standards. The economic sustainability dimension aims to ensure fair distribution and efficient division of resources which then creates economic growth and maintains a healthy balance and unity with the ecosystem. Indicators of economic dimensions include employment, economics, growth, productivity, initiatives, costs and usability. Apparently, in developing countries, this dimension is very important in attaining a higher level or standard of living for its people. It is important for developing countries to embrace the pace of development but use the sustainability agenda as a pillar for development and, where possible, developed countries can assist.

5.2.3.3 Social Sustainability

This aspect of sustainability looks at the fairness, cultural inclusiveness of an intervention, equal opportunity, and rights over natural, physical and economic capital that assist and improve the living standards of people within the local communities with more emphasis on poor, under-privileged and marginalised groups. Some aspects of social sustainability are more in relation to socio-cultural aspects which represents cultural heritage and cultural diversity (Alleni, 2009). McKenzie (2004) suggests that social sustainability targets how communities can achieve an improved positive condition. This dimension is backed up with principles like

equity between generations, community ownership, equity in accessing services, political participation of citizens, and so on.

Social sustainability also looks at the social disruptions that endanger the well-being of people and the environment. Social sustainability indicators include social justice, education, poverty elimination, peace, health, security, equity and empowerment. These are pressing issues which are currently growing in the developing world, while developed societies have attained a higher level of social sustainability. This research suggests that, in developing countries, this dimension would go a long way in creating solutions to issues like terrorism, high death rates, inequality, religious and cultural discrimination among others; hence it would be advised to place this as a high priority. Figure 5.2 below showcases the three sustainability dimensions which have branched into main categories or indicators and then are further classified into sub-indicators.

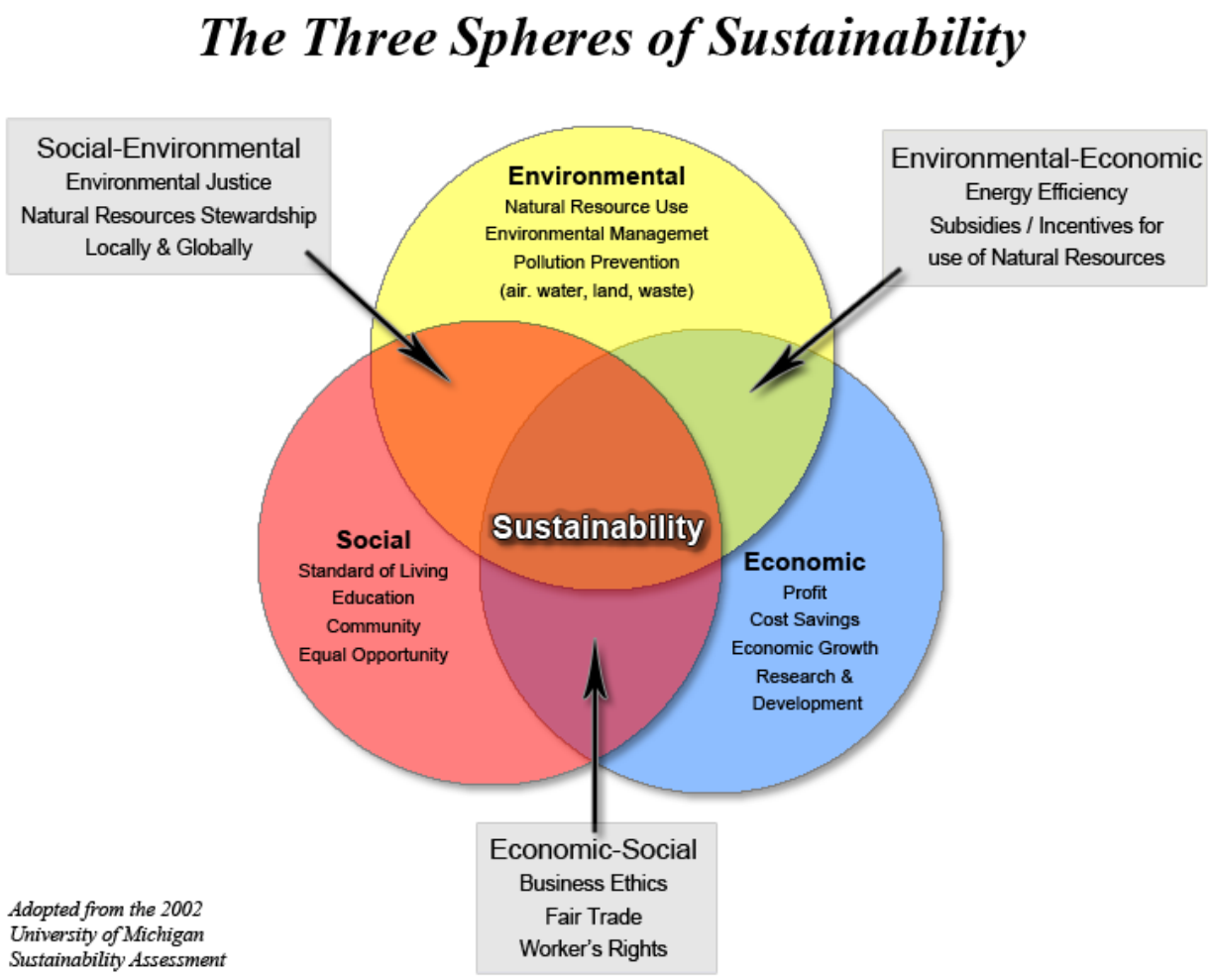


Figure 5.2: Typical Sustainability dimension, Indicators and Sub-Indicators

Source: University of Michigan Sustainability Assessment, 2002

5.2.4 Characteristics of Effective Sustainability Indicators

The main characteristic of an effective indicator is to communicate complex data or information about the performance of a design to people interested in knowing more of how the indicators interact with the design. In achieving sustainability within the urban environment, sustainability indicators are key in understanding how buildings and urban spaces perform against the criteria and dimensions of sustainable urban development (Cole, 1998, 1999). The collection of methods used in analysing and choosing the most effective sustainability indicators has been noted as one of the main issues for organisations, professional bodies, stakeholders, urban planners and architects. Some indicators are complicated to understand or are not necessary; hence, it is very important when selecting them to prioritise the needs of indicators. The number of indicators to be used has no limit although a larger number of indicators used can affect comprehension and relative importance (Becker, 2004). Other issues include how different auditors allocate individual scores for selected indicators to effective assessment tools. Selecting effective indicators requires a clear conceptual basis and recognition of available data, resources, time scale, spatial and the needs/interests of the groups or individual involved in the selection of indicators (Becker, 2004; Alwaer et al., 2008).

5.3 SELECTING SUSTAINABILITY INDICATORS

Selecting the right or most important sustainability indicator is important in the development of assessment tools or frameworks. The selection of effective indicators has become one of the main challenges for different organisations, stakeholders, architects and engineers (in particular, when such selections come to include the wide range in scale of sustainable development criteria, such as transportation, air quality, pollution, energy consumption and economic activity) (Alwaer, 2006, pg.171). The process of selecting the right set of indicators has to be detailed and specific because the procedure is rigorous and should be done based on methodological structure. In general, the choice of indicators is eminent and a critical determinant factor of a behaviour and the flexibility of a system. This process is what determines the workability of a desired measurement system to be used in the built environment.

5.3.1 Defining Time Scale in Sustainability Indicators

Time scale in sustainability development is known to be uncertain and variable based on the indicator concerned. Some indicators are analysed over a long timeframe, showcasing valuable information: examples are climate change and patterns of energy consumption or rate of

environmental degradation. Snapshots are known to be limited to offering the readings of the level of sustainability of a project at a certain time (Alwaer, 2013, pg.105). When analysing timescale of sustainability indicators, it is very important to analyse two key important questions which are a) over what space (area or context) is sustainability to be achieved, and b) over what length of time will it be achieved? In regards to scale, it is rather obvious that sustainability indicators are developed based on the size of the village, town or city, region or area, country or the entire world; but this is very difficult because these scales are interlinked and the smaller the area the harder it becomes to know where to draw the line (Bell and Morse, 2008).

On the other hand, different indicators may ideally be measured in various timeframes; as an example, energy usage in buildings is best studied over five to 10 years (longitudinal study). According to Dalman who undertook research on sustainability, space and time, "regular observations of the number of individuals of certain species present valuable information about tendencies of overall development" (Dalman, 2002, pg 11). His study has created an awareness about the timescale of sustainability and offers the opportunity to study the grade or level of sustainability for any project at a specific time which takes into account two main determining factors -

- Continuous period which explains the area of sustainability over a concurrent period of time
- Fixed period helps to explain the measurement done within a specific period of time within a fixed period (Bell and Morse, 2008).

The timescale in which sustainability can be initiated and accomplished is a further dimension. Research conducted has suggested that timescale is inter-generational in nature and might take generations to achieve (this could be 10, 100 or 1000 years) (Bell and Morse, 2008). Another very good example is agricultural sustainability which studies indicators such as the pest build-up and level of land degradation. In relation to this simple example it was suggested that the pest control would be best studied under a timeframe of five to 20 years, while land degradation will have a much longer timescale, between 20 and 100 years, and solutions like shifting cultivation would have to be adopted while pesticides will be used for pest control. In this case it would be very tough to achieve sustainability particularly when various determinants influence these indicators (Bell and Morse, 2008; Alwaer, 2013).

5.3.2 Sustainability Indicators (SIs) and Public Participation

There is an overall understanding that public participation in deciding the best indicators necessary for an urban environment is a good practice adopted in achieving a truly sustainable urban future. It is a known fact that the public are mostly the end users of any pilot schemes or projects so it is advisable that public participation through EBD is considered key in the delivery of sustainability. The use of indicators in assessment can promote societal changes towards sustainability implementation but these changes cannot be adopted without social engagement, empowerment and participation (Enserink et al., 2009). Public participation in sustainability indicators assessment can be clearly defined as the involvement or participation of individuals or groups in which the SI's are positively or negatively affected by a proposed action (André et al., 2006). Examples are projects, programmes, initiatives and policies which are subject to enquiry or decision-making process of the participants (André et al., 2006; Enserink et al., 2009). This definition can be backed up by the Rio Declaration for the environment in 1992 that suggests that an environmental decision taken at the relevant level, whether compulsory or legally mandatory, is a main factor that cannot be adopted without social engagement and participation (André et al., 2006). Sustainability indicators can be used to introduce the concept of public participation and meaningful QOL which would then reflect on community values, goals and aspirations (Alwaer, 2006).

Also, in a democratic government, it might be difficult introducing sustainability measures if the public are not informed of the benefits and long-term changes. It is also clear that sustainability can be attained efficiently when individuals live in a sustainable way; that is to say that necessary attitudinal, behavioural, economic and social changes will take place only when stakeholders and the public realise the need for sustainability (Bernadette and Richard, 2008). There are various initiatives that seek to achieve public participation such as Local Agenda 21 which was published in 2001 by the Irish local authorities. Guidelines such as these have helped policy makers to develop sets of indicators for sustainable development and also encourage public participation (DOEHLG, 2001). Most cases of adopting sustainability from a top-bottom approach in policy implementation have been seen to impose unwanted proposals on the public, which makes implementation very hard (Bernadette and Richard, 2008). Experiences from various projects have shown that the bottom-top approach can be problematic in terms of achieving a sense of shared purpose and ownership: which is in most cases difficult. There are some exceptions to this based on compatibility and diversity of group interests (Mega, 2000). Public participation in making decisions helps to improve the final

result and also helps to put into practice policies that are being made (Bruch, 2004). It also anchors the decisions based on the concepts of sustainable development and embedded principles like democracy, participation justice and social inclusion.

Successful implementation of public participation deals with addressing the process and outcomes clearly from the beginning of the schemes. It should be done only if there is commitment to listen and adopt the public's opinion, and how their input can make a difference (DETR, 2000). Therefore, it is pertinent to avoid consultation if the outcome of the scheme has already been decided and the public's opinion is taken for granted (Bruch, 2004; Bernadette and Richard, 2008).

There are various methods used in carrying out public participation ranging from surveys that adopt the public opinion to direct open-end discussions with the public which gives them an active role and a means in contributing to the overall planning process (Collentine et al., 2002). But the level at which the public interacts will be determined by the extent to which the public is to be involved. The methods used in public participation depend on the overall aim of the process. Vantanen and Marttunem (2005) classified public participation into the following:

- For informing and educating the public
- That seeks public input
- That promotes information interaction
- Aims at reaching a commonly agreed solution to a problem.

Overall public participation is very important in every stage when evaluating and implementing decisions in regard to sustainability to help inform the stakeholders, select policies, and improve overall performance. Public participation should be addressed first and foremost since it is vital throughout the evaluation process (see Figure 5.3 below).

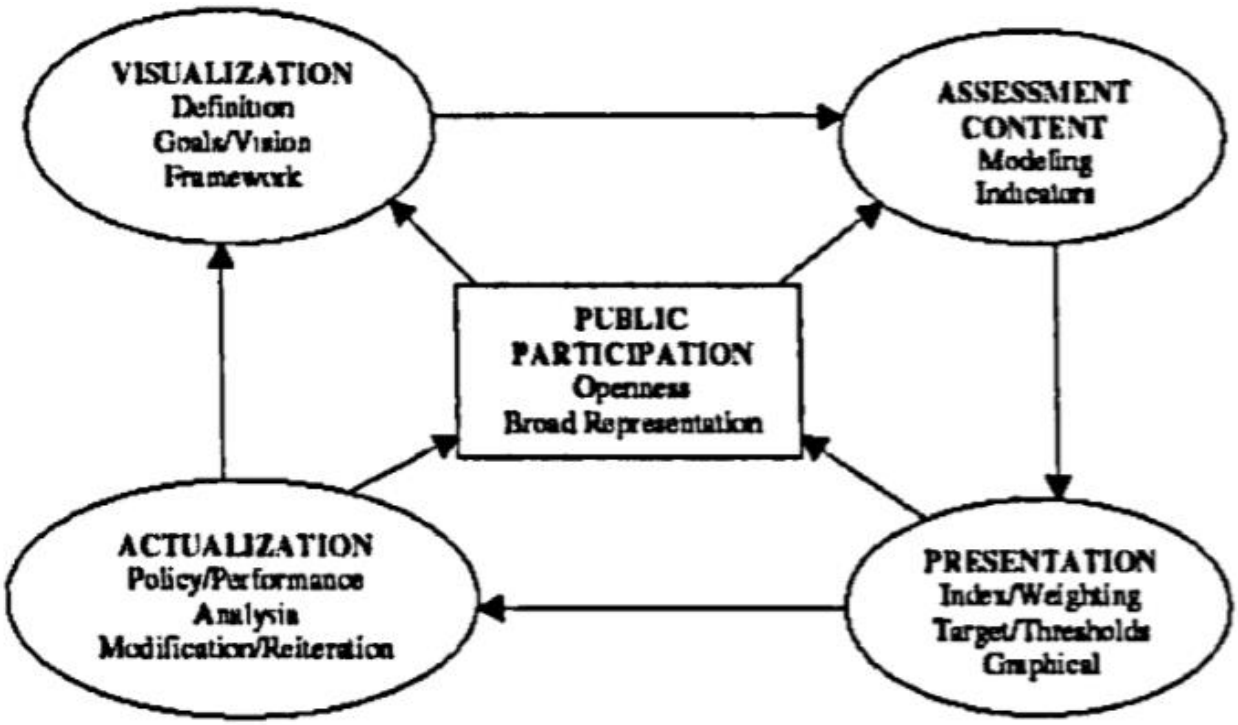


Figure 5.3: Conceptual model of Public Participation

Source: Becker, 2004

5.3.3 Selecting Sustainability Indicators

Indicators are mostly derived from values or what we as individuals consider important and also what is seen to be important (either by experts or individuals preference) and needs to be measured no matter what the context is, which might be government policy adaptation or decision making in business or sustainable development policy implementation. Indicators are very important in evaluating management and implementation of the process and making sure the outcomes of the process are targeted towards the overall goal (NRC, 2011). The selection of a range of indicators effectively determines the lens or channel through which the researcher views the importance of the system. Hence it is very important in influencing human decision and judgements. As analysed earlier, there are a wide range of sustainability indicators and sub-indicators used by various agencies and organisations across the globe (Alwaer, 2006, pg.169). The choice of indicators is contingent on the perspective of diverse stakeholder groups' parties and the context involved; and therefore the preferences might differ. Also the choice of indicators may vary by the diverse spatial scale within which it is operating, which includes national level, local level and also programme base level. There are three contexts in which indicators can be selected; these are indicators for national reporting, indicators for

focused investigation, and integrated indicator index (Fiksel et al., 2012). This is briefly explained below.

- Indicators for National Reporting

This method is actualised by selecting a small number of sustainability indicators based on the objectives of the national programme. This process is backed with strict guidelines drafted for choosing indicators which requires a statement of rationale and supporting data and methodological approaches. Also the choice of the needed indicator can be derived based on existing recommendation on policies such as green building codes and others (NRC. 2011; Fiksel et al., 2012, pg.18).

- Indicators for Focused Investigation

The method focuses on using a set of place-based and programme-based pilot projects to develop sustainability expertise, encourage cultural change, and show value for stakeholders. This kind of project-based selection will involve the selection process to have a comprehensive set of indicators which showcases the stakeholder's values and aspirations. The indicators selected will have a portfolio of indicators using typical categories of sustainability relevant to various stakeholders (NRC. 2011; Fiksel et al., 2012, pg.20).

- Integrated Indicators Index

This method uses a single platform or index developed by a combination of integrated indicators. A very good example is the Human Development Index created by the UN in 1990. This single index creates a more convenient means of communicating and tracking but the overall aim is that it reduces transparency by putting all indicators into a single index. This method makes it difficult for a user or stakeholder involved to interpret the increase in index value but it is advisable to present the information, having the index in such a way that interested parties will understand (NRC. 2011; Fiksel et al., 2012, pg.22).

5.3.4 Implementing the Use of Sustainability Indicators

There are two major approaches in the selecting of indicators in sustainability - the *top-bottom* approach and the *bottom-top* approach. The main difference in these methods is that the top-bottom approach indicates that policy makers create the goals and follow up these goals with indicators (Lee, 2012). Also the framework derived is mainly constructed by experts and highly qualified consultants. The bottom-top approach, on the other hand, is more community- or public- based and tries to create an environment where both stakeholders and the end-users

(public) are involved in the selection of the appropriate indicators (Newman and Jennings, 2008; Lee, 2012). Combining the two approaches can create a more complex and hybrid approach but it depends on the environment that it is proposed for. The two approaches can create more accurate scientific data and indicators are easily understood by both stakeholders and decision makers. All problems in creating a solution should be included among the core indicators which is easily understood and has linkages between multiple sustainability goals (Lee, 2012).

Sustainability indicators act as an important set of criteria in the sustainability assessment and management process (SAM). Ideally, the indicator used should be consistent with both local and regional assessment criteria, hence providing a link between the broader national indicators and local or regional assessments. SAM uses the following five steps as guidelines for the implementation of sustainability indicators in most applied research that results in policy implementation (Fiksel et al., 2012):

- Step 1 - Problem definition, scoping and planning

Problem definition creates a set of activities in the SAM process because it determines the level and boundaries of the system to be analysed and also identifies the important stakeholders interested.

- Step 2 - Identification and selection of relevant indicators

This step identifies a group of sustainability indicators chosen to analyse the goals and aim of the project, the interests of different stakeholder group, and whether the public has been integrated.

- Step 3 - Specification of appropriate spatial scale and units of measure

The selection and implementation of indicators should always consider the scope of the project or scheme and scale of measurement examples are single water body or water shed or regional/national scale. Other measuring values are also physical in terms of size or monetary units to be utilized, e.g. water usage and demand.

- Step 4 – Data collection and quality assurance procedure

In this stage the indicators and measurement approaches have been selected. The next step is data collection from both primary and secondary sources. A typical baseline set of data will be created for future comparison reasons. Also intensified effort must be made when collecting data to assure quality, accuracy, and reliability. Sources of uncertainty should be identified and provision should be made for data archiving, maintenance and retrieval.

- Step 5 – Communicating and reporting

Sustainability indicators are important tools used for problem analysis, reporting progress and analysing outcomes as well as assessment of performance. By using the SAM process, sustainability indicators can be used to back up any decision making and stakeholder communication (Fiksel et al., 2012). Figure 5.4 below showcases the sustainability assessment and management process diagram.

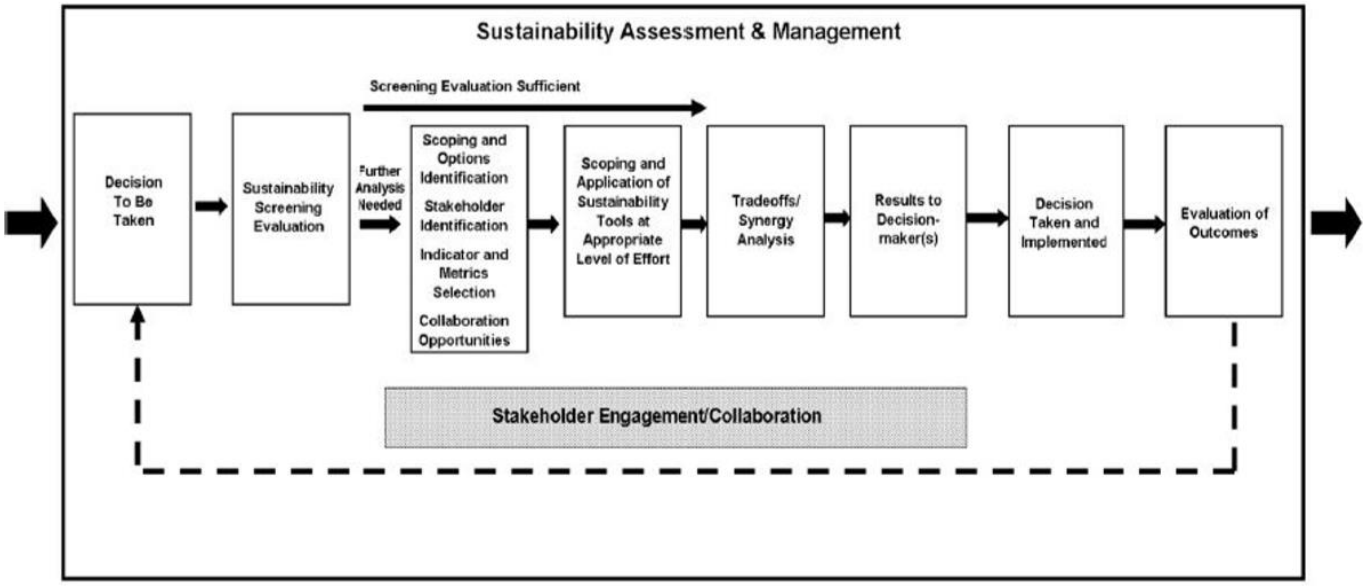


Figure 5.4: The Sustainability Assessment and Management Process

Source: Fiksel et al., 2012

5.3.5 Sustainability Indicators (Sis) to Measure the Level of Sustainability

Sustainability indicators can be measured both as quantitative and qualitative but the major difference between all three aspects of sustainability lies in their focus and linkages across various sectors (Lee, 2012). The use of indicators for measuring the efficiency of tasks, projects and systems has been widely accepted as a global standard, particularly in sustainability. With regards to what is to be measured, indicators can be used in developing various frameworks. The overall need for measuring sustainability is that indicators are used in improving the economic, socio-cultural and environmental dimensions for the benefits of present and future generations (Newman and Jennings, 2008). Measuring sustainability by the use of indicators can be considered to provide and encourage broad and holistic views of the indicators which will influence the development. Therefore, adding more indicators to a framework is better because it can help improve an already comprehensive set of indicators, and also increase the

need for data collected under similar conditions (Alwaer, 2006). To adopt the use of SIs in sustainability assessment a list of indicators needs to be considered and applied, as follows:

- The need for a clear definition
- The focus on holism in sustainability
- The relevance of time and space scales (Alwaer, 2006).

There are two classifications of SIs based on methods:

- Individual SIs
- Combined SIs or complex S's (SDI group for Indicators, 2001; Alwaer 2006).

5.3.6 Sustainability Indicators selection process with regards to fundamental questions

The selection criteria of these sustainability indicators are based on these three fundamental questions which are as follow:

a. Who drives sustainability indicators?
b. What are the benefits of measuring sustainability indicators?
c. How should sustainability indicators be measured?

This key questions are fundamental as they explain to the complexity and challenges associated with the selection process for sustainability indicators.

a. Who drives sustainability Indicators

Sustainability indicators provide an overview of the entire progress towards a sustainable urban environment. In order to understand the selection of these indicators it is important to know the problems in which this SI's are meant to be selected to resolve. SI's are designed to measure, test and provide recommendation to meet the needs and expectations of its present and future generations (Conte and Monno, 2012). To achieve sustainability within urban neighbourhood's scale, the three pillars of sustainability which are social, economic and environmental factors needs to be considered before recommending the indicators that falls into these three tiers.

There are also three fundamental principles which are the starting points for measuring sustainability. These starting points are:

• Sustainability is a qualitative property of a system
• Subjectivity on the part of the stakeholders in understanding. The sustainability of any given system is unavoidable

- Subjectivity derived measures of sustainability are nonetheless useful aids to planning (Bell and Moorse, 2008).

These three elements when combined create an approach that is both participatory and systematic. Systematic sustainability analysis is an approach that takes stakeholder participation as a non-negotiable starting point and suggests a set of principles that underpins the use of the most efficient SI's. The main drivers of sustainability are the key identified stakeholders that have knowledge of how this system works. Broadly drivers encourage the development and uptake of indicators schemes and drivers can also be categorised according to the relevant stakeholders group and the manifestation of their interest. This list summarised micro and macro level drivers which includes workers, companies, shareholders, local community, regional community, national regulators, international regulators, special interest groups, NGO, consumers, sectoral community, suppliers and so on. (Matens and Braganca, 2011; Bell and Moorse, 2008)

SI's selection cannot be one sided or based on a single view as it is narrow, limited and isolated view of the sustainability project context. According to Bell and Moorse there are five steps which are important in developing an SSA which helps in selecting the key SI's through using views of multiple stakeholders

1. Identify the stakeholders with multiply views and the system in view.
2. Identify the main SI's. SI's are subjective and dependent upon the stakeholder group and the dominant viewpoint of that group.
3. Identify the band of equilibrium the reference condition.
4. Develop the AMOEBA diagram as a means of representing the SI's. The description given is distinguished from other work only that it is based on an holistic and systematic approach to the factors that defines the sustainability of a project, upon an explicit recognition of the subjectivity of the analysis and the ownership of stakeholders within the context of the analysis using the tool for reflection.
5. Extend AMOEBA over time by regular updating and by use of scenario-making of possible futures. (Bell and Moorse, 2008)

An all-inclusive participation has become something of a holy grail in the development of SA. It is often portrayed as the solution to all the ills without any acknowledgement of the difficulties that it poses in current practice. The list of groups which are seen as stakeholders in a process project includes donors, project managers, implementers and beneficiaries.

b. What are the benefits of measuring sustainability Indicators?

The use of indicators has created an opportunity in developing a robust approach in measuring and assessing the indicators achieved when implementing sustainability. The rapid development of the green revolution has transformed the way in which SI's are been implemented as a result of the benefits seen in the implementation. Although most assessment tools do not have an holistic, integrated, multi dimensionality of sustainability (Conte and Monno, 2012). The design of this assessment methodologies favours environmental perspective of sustainability instead of having indicators from the three main dimension of sustainability. Therefore these key benefits may vary from one context to another. These benefits are currently signed by the scholars as advantages seen as a result of the implementation of SI's. Infact the benefits of SI's and assessment tools has been documented through the years in the list below (Yudelson, 2008; Durmus-Pedini and Ashuri, 2010; Matens and Braganca, 2011; Reed et al, 2011)

- Setting organisations and projects triple bottom line
- Performance, reduction of impact and meeting sustainability objectives
- Decision making process throughout the project life cycle
- Economics throughout the projects life cycle
- Increment of energy efficiency processes
- Productivity and health
- Organisation of information for certification process and performance evaluation
- Collection, reporting/interpretation of date for stakeholders and stockholders
- Performance benchmarking
- Risk and opportunity management
- Cultural/social change
- Positive publicity
- Morale/ engagement of employees and stakeholders
- Local communities and directly impacted stakeholders (Poveda and Young, 2015)

The benefit and use of sustainability indicators help decision makers to be better informed about the impact of future developments based on understanding of past experiences. Additionally, the use of sustainability provides bases of analysis, mediation or decision-making (Blasas, 2004, pg.4).

c. How should sustainability Indicators be measured?

The Complexity of SI's has been known to encapsulate both complex and diverse processes in a relatively few simple measures. And the easiest approach in understanding this complex

system is by breaking it down into manageable bits or components and study how they work in isolation before bringing it back together which is known as reductionist approach. Although reductionism has been widely criticised it has been realised that it very effective in understanding complexity of SI's (Copra, 2004). The use of SI's are number based which makes the measurement to be easily quantifiable. Based on this paradigm this implies that SI's were developed to be quantified or measured. SI's are therefore development on the theory of reductionist approach that can be measured. Atkinson et al (2009, pg.1) suggest: "if we are to solve the problems of sustainability, we need 'numbers-not adjectives' and must base what we do on evidence no public relation".

Sustainability itself is a human vision that by definition is guarded with human values and SI's are not necessarily developed through a long process of hypothesis setting and testing intended to arrive at a deeper understanding of sustainability. In order word it is imperative that an element of refinement can be built in but one shouldn't develop a host of SI's and test them to check if it describes sustainability but instead the beginning is to describe sustainability with all its human subjectivity followed by identifying SI's to gauge attainment of that description (Bell and Morse, 2008 pg. 43). Sustainability is measured appropriately through using quantitative index methods.

5.4 CONCLUSION

The selection of the most important indicators to be used in the design of the proposed assessment tool would be used for testing purposes and are not presented as a comprehensive list to assess or describe the entire system so it is imperative to know how this indicators work. Indicators are key in ensuring that government and communities are held accountable for goals, actions and solutions to sustainability agendas (Newman and Jennings, 2008). Also, indicators can be used to provide data in guiding policy-making and implementation as well as to assess the impacts and challenges of these policies in regards to the urban environment can be represented through the use of indicators (Lee, 2008). Hence this overall chapter has recognised the use of sustainability indicators and its importance in the development of assessment and measurement methods for achieving sustainable communities. Sustainability indicators are more efficient if there is public participation because the public or end users determine how functional and workable these policies and assessment criteria are. Based on this literature, it would be advisable to incorporate the use of both the top-bottom and bottom-top approaches

when it comes to the implementation of sustainability indicators. The selection of indicators will be influenced by the local context (developing countries) in order to localise the indicators to suit the Nigerian urban environment. It was also identified that sustainability is characterised by three main dimensions – these are *economic, social* and *environmental* sustainability. These three pillars of sustainability are determining factors in selection of the main categories and sub-categories of sustainability indicators to be used when developing an assessment framework to respond to a specific culture, need, people, climate, environment, development, and other uses.

The following chapter gives an in-depth analysis of sustainability assessment design and applications which would justify the reason for proposing an assessment tool for developing countries. It also gives an overview of the differences between emerging and recognised assessment methods alongside their strengths, weaknesses and characteristics. This chapter will also guide the researcher towards the selection of the most important sustainability indicators which are common within these assessment methods. Lastly a tool is proposed that will suit developing countries, with a specific focus on the Nigerian context.

CHAPTER SIX: SUSTAINABILITY ASSESSMENT DEVELOPMENT, APPLICATIONS, KEY SUSTAINABILITY INDICATORS AND LIMITATIONS

6.1 INTRODUCTION

The previous chapter has established the fact that sustainability implementation and assessment can be actualised through the use of sustainability indicators. This chapter looks into the role of current Neighbourhood sustainability assessment methods (NSA's) selecting FOUR key tools that are prominent across that have been used worldwide in order to affirm our knowledge on examples of neighbourhood sustainability assessment; these tools are BREEAM for Communities 2012, LEED-ND V4, Green Star for Communities and CASBEE for Urban Development. Also TWO emerging tools are studied so as to cover all gaps which might be lacking in the first set of tools – these are SuBETool, and SUPD. These assessment tools are studied in great depth and the limitations as well as gaps are identified: among this helps the researcher in constructing and proposing an assessment tool for developing countries. Such comparison is essential in order to evaluate the strengths and weaknesses of these methods and to allow for less subjective sustainability measurements together with realising the required criteria for future models in developing societies. Current research has suggested that sustainability assessment tools are lacking in regions like Asia, the Middle East and mostly Africa. Hence the end result of this chapter is to develop an assessment tool for the Nigerian urban neighbourhood. This proposed assessment tool is further validated when carrying out the research methodology and empirical field data analysis. Overall, this chapter looks at sustainability assessment, sustainability assessment methods and models and the development of an assessment tool for developing countries.

6.2 SUSTAINABILITY ASSESSMENT AND MEASUREMENT METHODS

Assessment can be clearly defined as how well or how badly a policy, framework, or project (urban design or building design) fares, performs or reacts against a set of indicators within a span of time (Cole, 1999, pg.231). Sustainability assessment is known to bridge the gap between buildings and cities, as well as to support the evaluation of the degree of sustainability within urban developments. Sustainability assessment is a combination of procedures, methods and tools by which a policy, programme or project may be assessed as to its potential, economic, social and geographical impacts as well as the distribution of those impacts within a population, a geographical area, a market, or across a generation (Curwell et al., 2005, pg.21; Haapio, 2012). In the course of this chapter a brief analysis is carried out showcasing a list of

methods created to analyse various levels of assessment from building- to city-scale development. Sustainability assessment is used as a tool that can assist decision- and policy makers to know the best possible actions to be taken - or not to be taken - in an approach to make the society, environment or policy more sustainable (Devuyst, 2001). The simplest definition of sustainability assessment is that it is a process that suggests and helps in decision making in achieving sustainability over the long run. The main reason for sustainability assessment is to ensure that visions, plans, activities and agendas make an optimum relevant contribution or addition to the overall aim of sustainable development (Verheem, 2002). In regards to measurement of urban spaces and urban neighbourhoods, sustainability assessment methods have recently seen as a means in evaluating the performance of the urban environment across various ranges of sustainability criteria. This is to say: how an urban space is rated is based on the level of key performance indicators used as well as the extent to which it has been initiated (Fiksel et al., 2012). Hence the workability of the sustainability assessment method is based on how well indicators of sustainable urban development have been integrated. This can be reflected from the interaction between members of the design team and various sectors of the building industry. These are some of the key issues used to identify key limitations in the adoption of sustainable assessment methods (Alwaer, 2006; Alwaer, 2015).

They are two distinct set of methods in the built environment which are *green assessment* and *sustainable assessment.* Green assessment is derived from the concept of being 'green' which incorporates features like applying solar energy, daylighting, natural ventilation, waste recycling, and so on. Although very costly, it is currently in high demand, worldwide/in developed countries. Green assessment methods seem to focus primarily on energy performance, with less focus on other socio-cultural issues (Cole, 1999; Alwaer, 2006), while sustainable assessment which covers a much broader holistic perspective derived from sustainable development (SD) looks at environment resources, equity and how best development can meet the present and future needs. These assessment criteria focus on indicators from environmental, economic and social sustainability (Brandon and Lombardi, 2005). However certain principles should ascertain that all criteria are considered in sustainability assessment in order to achieve optimal outcomes; these include:

- Holistic: They should encompass all key factors required to shape sustainable development (environment, social and economic aspects).
- Harmonious: They should make an effort to balance the criteria upon which sustainable development should be judged.

- Habit forming: They should be a natural tool to all concerned and encourage good habits.
- Helpful: They should assist in the process of evaluation and not confuse matters by further complexity or conflict.
- Hassle- free: They should be easy to use by a wide range of people and not require extra training unless they are to be used by experts.
- Hopeful: They should point towards a possible solution in sustainable development and not leave the users in a situation where there are no answers (Brandon and Lombardi, 2005, pg.122).

6.2.1 Maturation of Assessment Methods and their Importance

There has been significant transformation in sustainability assessment methods since the 1990s; the movement has matured rapidly and has experienced a tremendous growth in the number of assessment methods developed across the globe. Since the Brundtland Report in 1987, sustainability has grown to become a global terminology and its widespread popularity has led to adoption and implementation (Cole, 1999, pg.234). This has also influenced the development of tools which have been successful and their application has created strong needs to reinforce their role in creating a more sustainable urban future. The first sustainability assessment tool, BREEAM, was developed by the Building Research Establishment (BRE) and has been in use in the UK, since 1990. This first building assessment tool has influenced other assessment tools like LEED, Green Star, and CASBEE, among others (Happio and Vittanieni, 2008; Happio, 2012). From its maturation to date there has been a list of factors that has fueled the widespread use of assessment methods in building design and urban planning; these follow.

- There has been an increase in enlightenment and debate which has resulted in increasing benefits such as communication and interaction between the design team, stakeholders and diverse sectors in the building industry.
- Also it helps in defining a set of standards of what a sustainable urban environment is made up of, taking as priority the importance of building performance and energy efficiency and considering cost and social equity.
- They provide an overall summary of the level of sustainability attained in each development in order to communicate to stakeholders.
- They foster and promote research and development in materials efficiency and selection. Suppliers also produce new environment-friendly product, services and

construction techniques, which reduces the costs of technologies and running a building.

- They promote sustainability practices and provide pathways to public and cooperative policy design approval, adaptation and implementation (Gibson, 2005, pg.148).

6.2.2 Key aspects of Sustainability Assessment

To guarantee the quality of urban spaces, an assessment rating tool is needed. A sustainability assessment tool is used to examine the performance of a building or an urban space which is then used to compare the overall assessment against other urban spaces (Fowler and Ranch, 2006). Therefore, understanding the steps through which sustainability assessment is achieved is very important. This process consists of not just the theoretical approach but also involves the practicality of this scheme within a specific context (area, region) and specific aspects (building, urban design, community planning). In order to design and achieve an effective approach for long-term measurement it is vital to understand the key features applied in all currently used sustainability assessment methods (Cole, 1999).

- The assessment model or matrix is the most important component for any model. Therefore it is necessary to allocate a performance score to each sustainability indicator to be used for the model. This structure forms an essential framework of the assessment method.
- Developing an assessment method requires measuring sustainability which has to include qualitative and quantitative data input. However, in a situation where the measures of performance are more comprehensive and more defined, there is a need for a more qualitative approach in the measurement (Cole, 1999). For example, to determine the happiness of a community, the researcher might use a survey as a means of data collection which provides statistics of the views of the population studied. Quantitative data are seen to be represented in a quantitative approach; therefore the input model will be used to serve the assessment model and the kind of sustainable criteria analysed during the assessment.
- The outcome of an assessment should be analysed and presented with recommendations using the weighting system following which the results can be interpreted.
- The results of each assessment should have explanative or deductive reasons for the overall scores achieved. This will have to be processed by referring back to the input module which contains the information. This is likely to be more of an open loop

analysis which will help in achieving a better result of the assessment. The output format should be analysed which will create an application aiming at creating an effective measure in the overall performance. The proposed model should consider the criteria below - also see Figure 6.1:

1. Provide a comprehensive view of a sustainable built environment performance system.
2. Enable selective study of various performance areas.
3. Enable comparison for different useful case studies (Cole, 1999, pg.232).

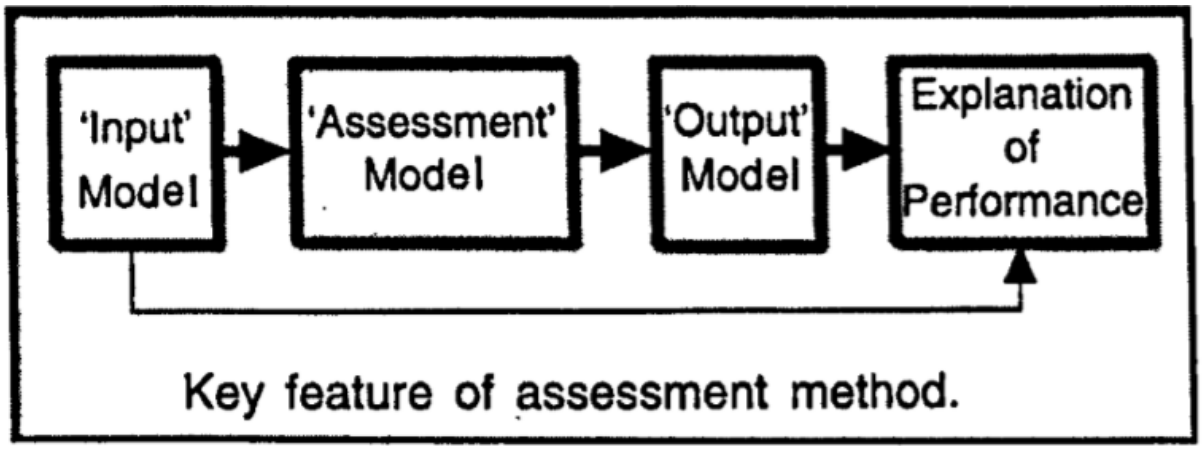


Figure 6.1: Key feature of sustainable method

Source: Cole, 1999

6.2.3 Methodologies for Assessing Sustainability: Monitoring or Assessing Sustainability

When achieving sustainability in various sectors such as agriculture, urban development, city planning or tourism, it is necessary to select where to start from, where it is they want to go - that is if they have detoured from their planned path, what they want to achieve and whether the plan is short term (intra-generational) or long term (inter-generational) (Alwaer, 2006; Alwaer, 2015). Sustainability assessment, measurement and monitoring in this context can be defined as a technical scientific procedure for determining a result based on values, the impact of a policy or an action on the system aiming to achieve sustainability development (Brandon et al., 1997). Sustainability goals and assessing the state of sustainability can be categorised under two groups, which are

- Sustainability Monitoring Methods
- Sustainability Assessment Methods

The methodologies for assessing sustainability can be said to be *monitoring* and *assessment*. 'Monitoring' as a terminology is been recognised as a policy orientation scheme which looks into a state or a change in a state within a system (Brandon et al., 1997). In relation to sustainability in the urban environment it is been realised that monitoring has been used in limited scope, mainly for examples like post-occupancy evaluation. This seems to be one of the main uses of monitoring - to carry out an exercise on how a building is been evaluated. Also most monitoring methods developed will have to consider categories such as social, economic, and environmental factors (Brandon et al., 1997: Alwaer, 2006).

'Assessment' is a concept that is carried out by evaluating the performance of any system (for example; buildings, agriculture, policy, tourism) against a set of anticipating criteria and indicators which is enabled through the most efficient data collection and data analysis methods (Brandon et al., 2005). Assessment in sustainability requires the design of a model or matrix system. These systems are designed based on a set of parameters like kinds of indicators, problem focus or aim of the model, timescale involved in data collection, spatial scale needed for the problem and, lastly, a framework needed to analyse the identified problem. The designed framework is then used by decision makers, urban planners, engineers and architects to make decisions (Alwaer, 2006).

6.2.4 Sustainability Assessment Methods, Models and Smart Codes in Urban Development (Neighbourhood Sustainability Assessment NSA)

The building industry and its activities have a significant environmental impact on society. Current research has shown that it has the highest energy consumption and greenhouse effect across the globe (Zuo et al., 2014). Also, current findings from the US Department of Energy (USIEA) predict that carbon emissions of buildings in 2035 will increase by approximately 42.4 billion metric tonnes, which is 42.7 per cent higher than its previously recorded level in 2007 (USIEA, 2010). Globally the building industry accounts for about 40 per cent of energy usage. Hence it is pertinent to understand the social, economic, environmental impact of buildings, which include energy consumption, CO^2 emission, social equity, building materials usage, and so on. Current issues in the today's global environment are looking at creating sustainable 'smart' cities. The emergence of global issues with emphasis on urbanisation and climate change has called attention to the use of developing smart codes for building future

urban spaces (Ali et al., 2013). The most important reason for introducing smart codes includes the pressing need in adopting sustainability within the built environment which includes social, cultural, environmental and economic sustainability. In relation to environmental sustainability emphasis has been placed on reducing energy consumption during the construction and post-occupancy stages of the building dwellings, thereby reducing the effects it has on the built environment both local and global (Ya et al., 2009). All these pressing issues led to the creation of smart building codes to assess, measure, and create an environment that is truly sustainable.

The UK and the USA have been at the forefront of realising smart codes for building sustainable neighbourhoods. As discussed above, the most useful or well-known assessment tools include Leadership in Energy and Environmental Design (LEED), Building Establishment Environmental Assessment Method (BREEAM), CASBEE and Green Star. Emerging assessment tools being developed include SUBETool and SUPD.

6.3 A BRIEF OVERVIEW OF MODELS, DEVELOPMENT AND ASSESSMENT METHODS FOR SUSTAINABLE COMMUNITIES

The emergence of neighbourhood sustainability assessment tools (NSA's) is as a result of a need to achieve sustainable urbanism across the globe. The measures are seen as significant because it is an important process that is used to tackle a wide range of issues such as environmental degradation, implementation of sustainability, resource depletion, and socio-economic issues (Uwasu and Yabar, 2011). As mentioned above, the most utilised assessment tool across the globe is the Leadership in Energy and Environmental Design (LEED), designed and developed by the US Green Building Council. It was then followed by HQE which was development by the non-governmental organisation HQE based in Paris and used as a French system for rating (Reed et al., 2011). BREEAM is the UK's foremost environmental assessment tool for building assessment which has been in use since 1990, and which has been employed to measure sustainable practice in environmental design, management and planning (Happio and Vittanieni, 2008a). CASBEE which stands for Comprehensive Assessment System for Built Environment Efficiency was developed in 2006 and it's the foremost assessment tool used in Japan. Lastly, Green Star was designed by the Green Building Council of Australia (GBCA) and it has been established as a national guide in Australia, New Zealand and South Africa. It is their foremost evaluating environmental design and building assessment tool (Ya et al., 2009). Figure 6.2 below showcases the timeline of the development of these assessment

tool, and confirms that the chronology of rating systems in different countries is mainly based on the initial rating system of BREEAM which was developed in the UK in 1990 (Reed et al., 2011).

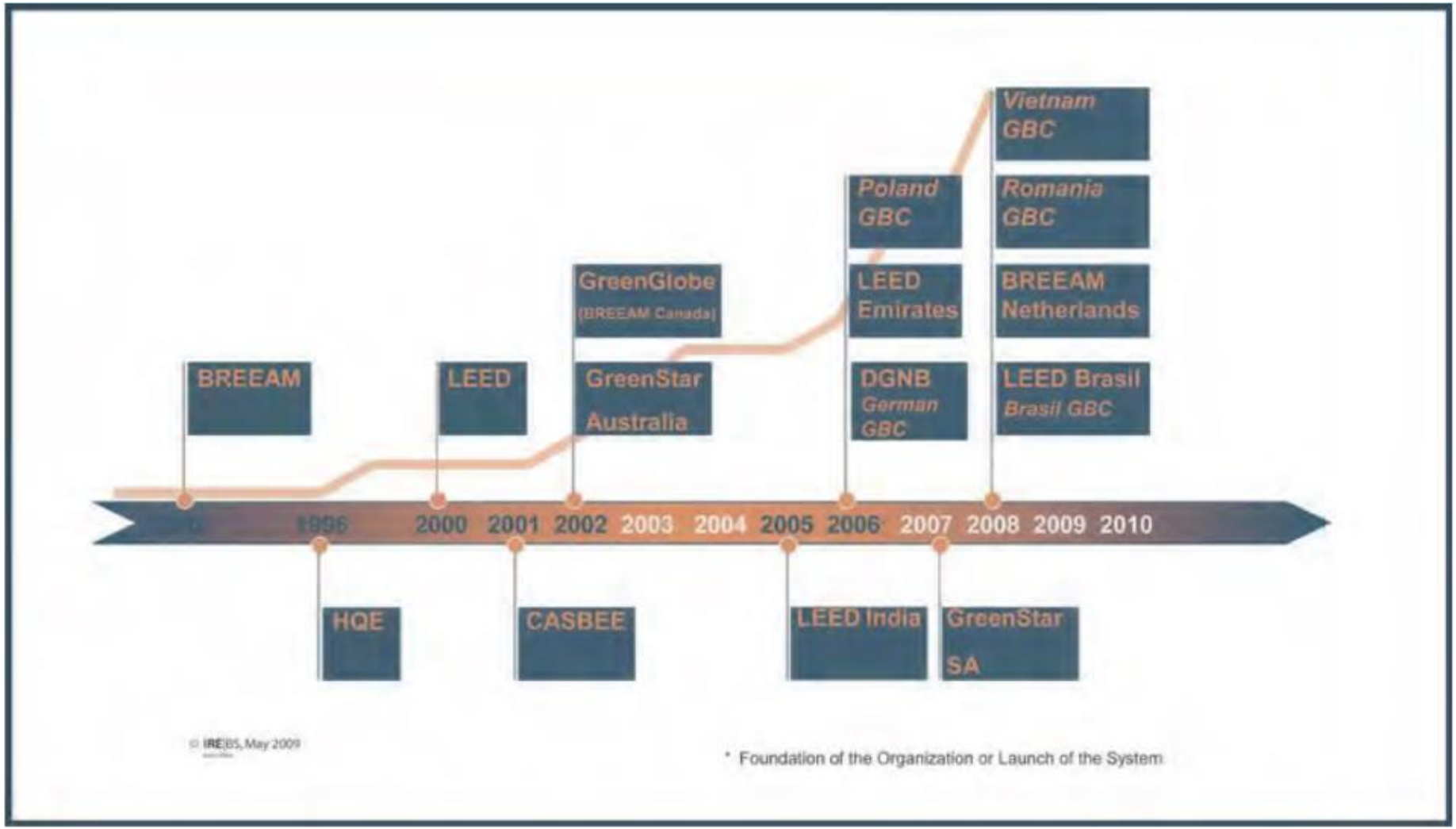


Figure 6.2: Timeline of the Development of Rating Tools

Source: Reed et al., 2011

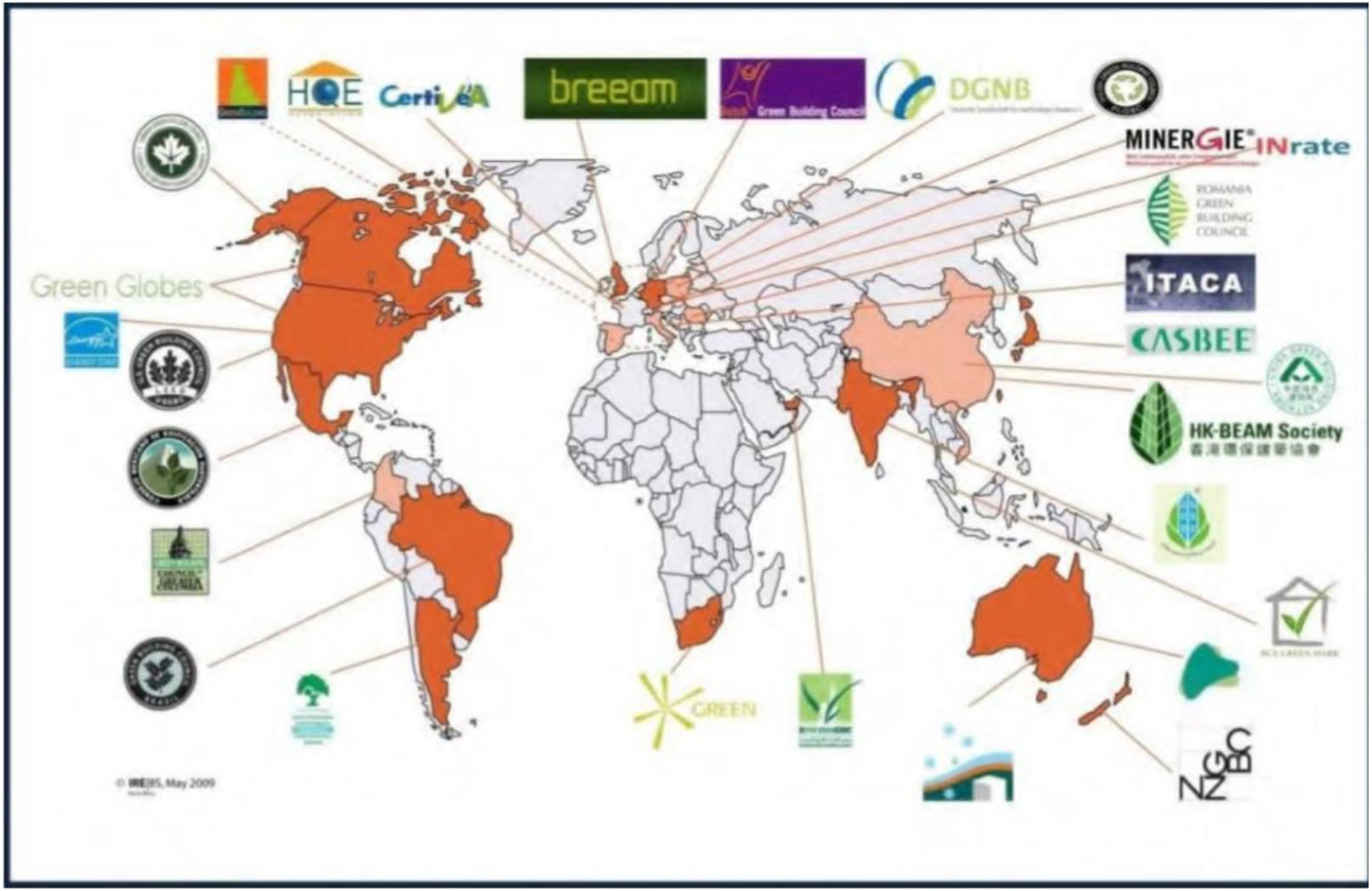


Figure 6.3: Complex System of International Rating Tools

Source: Reed et al., 2011

The design of each assessment tool is based on a rating system which involves a wide range of sustainability indicators that are associated with and applicable to individual regions within a wide range of urban neighbourhoods, building typologies, both new and existing. Areas covered while designing the tools include environmental, social and economic issues which are the three main tiers of sustainability. Sub-criteria are building materials, energy usage, water, pollution, indoor environmental quality and building site, among others. In some scenarios just basic indicators needed within that context have been considered while others consider most of the indicators based on the level of development attained as well as the prioritisation of this SI's.

6.3.1 Existing Assessment Methods

Three assessment models have been chosen to assess the design of sustainable communities due to their good reputation and global recognition of their utility in the field. The sections below briefly highlight their key indicators, concepts, aim and features which makes them very important in most communities.

6.3.1.1 LEED for Neighbourhood Development V4

LEED-ND is the most recognised tool used in most environmental assessment projects. It is been used in more than 120 countries worldwide to measure and assess sustainability within building designs and urban planning projects. It has also approved approximately 24,682 projects assessed across the globe as at 2012 (Sleeuw, 2011). The first piloted version was created in 2007 but launched in 2010 and at the moment the most recent version is 2014 which has 12 prerequisites, 5 themes and 44 criteria's. LEED-ND was developed by the US Green Building Council in collaboration with the Congress for New Urbanism (CNU) and the Natural Resources Defence Council (USGBC, 2011; Rev. 2014). It was founded in 1999/2000 and since then it has been the foremost neighbourhood assessment model in America mainly for urban development scale (Yudelson, 2004). Many of its criteria, particularly site location and neighborhood pattern, reflects the New Urbanist principles and are inspired by traditional neighborhood design (Yoon and Park, 2015). LEED-ND is based on a set of prerequisite indicators. Each set of indicators refers to one of the following aspects – smart site location, linkage neighbourhood pattern and design, green infrastructure/building, innovation and regional priority. Also the LEED credit includes recycled content and solid waste management of infrastructure. There is also a "heat island reduction" credit which specifies the use of non-roofing and roofing materials with a solar reflection index to reduce heat islands. This criteria

creates an opportunity to evaluate the locality of materials in an urban development. LEED-ND has a "Certified Green Building" prerequisite and credit. It also needs the building project to be accredited under the LEED rating systems or by a green building rating system that would need to be reviewed by an independent, impartial, third party certifying body (USGBC, 2016). Also all materials associated credit in the NSA's tools are placed under materials and resources. LEED-ND v4 major changes were highlighted in materials credit when it was updated in 2014 (USGBC, 2016; Yoon and Park, 2015).

Overall, LEED was designed and intended to develop high-performance neighbourhoods and sustainable buildings that have the following purposes; creating a common standard, integrated design practices, creating a strong face in the building industry, instigating competition, creating consumer awareness of green buildings and transforming the building market (USGBC-LEED, 2014; Yudelson, 2004;Ya et al., 2009).

Table 6.1: List of the material-related criteria in LEED-ND V4 (Leadership in Energy and Environmental Design for Neighborhood Development) (P: Prerequisite, C: Credit)

Division	Categories	No. of Items	No. of Points	Related to Material		Minor Items Related to Material
				No. of Items	No. of Points	
Assessment Criteria	Smart Location and Linkage	14 (P5, C9)	28	0	0	
	Neighborhood Pattern and Design	18 (P3, C15)	41	0	0	
	Green Infrastructure and Buildings	21 (P4, C17)	31	7 (P1, C6)	0	(P) Certified green buildings
					5	Certified green buildings
					1	Building reuse
					2	Historic resource preservation and adaptive reuse
					1	Heat island reduction
					1	Recycled and reused infrastructure
					1	Solid waste management
	Innovation	2 (C2)	6	0	0	
	Regional Priority	1 (C1)	4	0	0	
Total	5	56 (P12, C44)	110	7 (P1, C6)	11 (10.0%)	

Source: Yoon and Park,

6.3.1.2 BREEAM for Communities 2012

BREEAM is the first foremost environmental assessment tool for buildings and infrastructures, designed by the Building Research Establishment Limited in the United Kingdom and developed in 1990 (Grace, 2000). The model concentrates on deriving a tool that mitigates the impact of development projects on the built environment. It was launched in 2008 with the most recent version BREEAM Communities 2012 looking into 12 prerequisites, 5 themes and 40 criteria of which one set has an extended set of assessment indicators criteria (Appu, 2012). It is well adopted in the UK and other European countries and used in assessing over 200,000 projects approved from inception to about 2011 (Haapio and Viitaniemi, 2008a; Sleeuw, 2011). Therefore it is well grounded in the UK and a few other countries, although the designers are currently trying to gain international recognition. BREEAM Communities is a way to improve measure and certify the social, environmental and economic sustainability of large scale development plans by integrating sustainable design into master planning process. BREEAM establishes a focus which enables all the stakeholders involved in the decision making to determine key issues with regards to how sustainable development requirements could be achieved within urban spaces. The categories of credits or indicators for BREEAM Communities 2012 falls according to the level of building impact on the environment; these areas of impact are Governance, Social and Economic wellbeing, Resources and Energy, Land use and Ecology, Transport and Movement (Appu, 2012). The assessment criteria are grouped into five categories as listed above, which are then considered in the following steps establishing the principles, determining the layout and designing the details. The BREEAM Communities includes low-impact materials, sustainable buildings and resource efficiency to drive healthy, safe and habitable communities and environments. Its unique item is the specification of durable shelter seating materials in public transport facilities (Yoon and Park, 2015).

The scoring is calculated based on the total credit scheme, similar to LEED which falls under categories and weighting factors. The general performance of the building overall ratings are categorised as unclassified, pass, good, very good, excellent and outstanding (Ya *et al.*, 2009). The BREEAM rating benchmark levels enable a client or other stakeholder to compare an individual developments performance with other BREEAM rated developments.

Table 6.2: Categories and key issues of BREEAM Communities 2012

CATEGORIES	DESCRIPTION	CRITERIAS
Governance	Addresses community involvement in decisions affecting the design, construction, operation and long-term stewardship of the development.	Consultation Plan (EBD) Consultation and engagement+ Design review Community management of facilities
Social and economic wellbeing	Addresses societal and economic factors affecting health and wellbeing	Economic Impact Demographic needs and priorities Flood Risk Assessment Noise Pollution Adequate Housing Provision Delivery of services, facilities and amenities Public Realm Microclimate Utilities Adapting to climate change Green Infrastructure Local Parking Flood Risk Management Local vernacular Inclusive Design Light Pollution and Labour Skills
Resources and energy	Addresses the sustainable use of natural resources and the reduction of carbon emissions.	Energy Strategy Existing Building and Infrastructure Water strategy Sustainable Buildings Low Impact Materials Resource efficiency Transport carbon emissions
Land use and ecology	Addresses the sustainable use of natural resources and the reduction of carbon emissions	Ecology strategy Land Use Water Pollution Enhancement of ecological value Landscape and Rainwater harvesting
Transport and movement	Addresses the design and provision of transport and movement infrastructure to encourage the use of sustainable modes of transport	Transport assessment Safe and appealing streets Cycling network Access to public transport Cycling facilities Public transport facilities

Source: BREEAM Communities Technical Manual, 2012

Table 6.3: List of the material-related criteria in BREEAM (Building Research Establishment Environmental Assessment Methodology) communities.

Division	Categories	No. of Items	Weight (%)	Related to Material		Minor Items Related to Material
				No. of Items	Weight (%)	
Assessment Criteria	Governance	4	9.3	0	0	
	Social and Economic Wellbeing	17	42.7	0	0	
	Resources and Energy	7	21.6	4	4.1	Sustainable Buildings
					2.7	Low-impact Materials
					2.7	Resource Efficiency
					2.7	Existing Buildings and Infrastructure
	Land Use and Ecology	6	12.6	0	0	
	Transport and Movement	6	13.8	1	2.1	Public Transport Facilities
Total	5	40	100	5	14.3	

Source: Yoon and Park, 2015

6.3.1.3 Green Star for Communities (2012)

Green Star is a community's assessment tool used to measure sustainability in Australia. The rating tool is used to assess the planning, design and construction of community and precinct level developments against the five themes/framework principles and 37 additional criteria's. It is used for assessment of both, individual buildings to entire communities. The sustainability assessment tool was designed by the Green Building Council of Australia in 2003 but the Green Star communities was launched in 2012 and remains the only assessment rating system for buildings and community designs (GBCA, 2012). It has also been adopted in New Zealand and South Africa because of the similar climatic zone and weather condition which they both share (GBCA, 2008). The main reasons for developing Green Star were to establish a common language and standards in measuring sustainability with urban neighbourhoods and communities, raise awareness of green building benefits, reduce the environmental impact of development, and create a reputation in environmental assessment leadership (ABGR, 2015, pg.3). Green Star is very similar to LEED and BREEAM, but uses the credit rating system based on the points allocated to each credit to determine the overall scoring and level of certification (Ya *et al*., 2012; GBCA, 2012). The scoring of the project is achieved based on each category rating the percentage of points obtained against the points for that category. The credits are arranged according to the following categories – Governance, Design, Liveability, Economic Prosperity, Environment and Innovation. This range of categories shares various

credits which identifies an initiative that improves the potential of environmental performance (GBCA, 2012). The certification is awarded according to the numbers of stars calculated: 1 Star (Minimum Practice), 2 Stars (Average Practice), 3 Stars (Good Practice), 4 Stars (Best Practice), 5 Stars (Australian Excellence) and 6 Stars (World Leadership) (GBCA, 2012; Reed et al., 2011; Ya et al., 2009).

Table 6.4: The Green Star rating system looks at the following aspects of the building and process involved

Category	Criteria's
Governance	Accredited Professional, Corporate Responsibility, Sustainability Awareness, Engagement, Operational Governance, Adaptation and Resilience, Environmental Management
Design	Site Selection, Site and Context Analysis, Site Planning and Layout
Liveability	Access to Amenities, Community Development, Healthy and Active Living, Access to fresh food, Safe Places, Culture, Heritage and Identity, Accessibility and Adaptability
Economic Prosperity	Employment and Economic Resilience, Education and Skills Development, Return on investment, Community Investment, Affordability, Incentive Programs, Digital Economy, Peak Electricity Demand
Environment	Site Sensitivity, Ecological Enhancement, Heat Island Effect, Light Pollution, Greenhouse Gas Emissions, Green Buildings, Potable Water Consumption, Storm water, Materials, Waste Management, Transport
Innovation	

Source: ABGR, 2015

6.3.1.4 CASBEE for Urban Development

CASBEE for urban development is a joint research and development project of the Japanese government, industry and academia which was certified by Institute for Built Environment and Energy Conservation (IBEC) was launched in 2006 and the most recent version was developed in 2007. This sustainability assessment has 6 themes with 31 criteria's and 82 sub-criteria's. CASBEE stands for Comprehensive Assessment System for Building Environmental Efficiency and is developed for assessment of a group of buildings (EUKN, 2014). CASBEE for Urban Development framework divides the key issues, which are related to sustainable

urban development, into six main categories each one with a number of assessment points (CASBEE, 2007). The basic concept behind this tool is that it considers the human efforts and effects of groups of buildings, other than these single buildings which improve the environmental performance of the urban area as a whole. The major themes in which the categories are classed include Natural environment, area service functions, contribution to community, microclimate impact, social infrastructure and environmental management (Alqahtany, 2014; Yoon and Park, 2015).

This framework aims to enhance sustainability in regional urban plans and to link it to the operation of related laws, ordinances and systems, such as the comprehensive design of various district and extended site plans in addition to taking into account the important elements of city and regional planning fields (Murakami et al., 2011). CASBEE-UD covers all the criteria of the circle of sustainable materials, except for life-cycle cost and locality, which are not fully integrated in any analysed sustainability assessment tools, even though it is considered to be an important concept in sustainable material standards (Yoon and Park, 2015). See table 6.5 below indicating the main categories with the criteria's within this assessment tools.

Table 6.5: Table of the main categories and criteria included in Environmental Quality in Urban Development (CASBEE, 2007)

QUD 1 Natural Environment (microclimates and ecosystems)	1.1. Consideration and conservation of microclimates in pedestrian space in summer	1.1.1 Mitigation of heat island effect with the passage of air 1.1.2 Mitigation of heat island effect with shading 1.1.3 Mitigation of heat island effect with green space and open water etc. 1.1.4 consideration for the positioning of heat exhaust
	1.2 Consideration and conservation of terrain	1.2.1 Building layout and shape design that consider existing topographic character 1.2.2 Conservation of topsoil 1.2.3 Consideration of soil contamination
	1.3 Consideration and conservation of water environment	1.3.1 Conservation of water bodies 1.3.2 Conservation of aquifers 1.3.3 Consideration of water quality
	1.4 Conservation and creation of habitat	1.4.1 Grasping the potential of the natural environment 1.4.2 Conservation or regeneration of natural resources 1.4.3 Creating ecosystem networks 1.4.4 Providing a suitable habitat for flora and fauna
	1.5 Other consideration for the environment inside the designated area	1.5.1 Ensuring good air quality, acoustic and vibration environments 1.5.2 Improving the wind environment 1.5.3 Securing sunlight
QUD 2 Service functions For the designated area	2.1 Performance of supply and treatment systems (mains water, sewerage and energy)	2.1.1 Reliability of supply and treatment systems 2.1.2 Flexibility to meet changing demand and technical innovation in supply and treatment systems
	2.2 Performance of information systems	2.2.1 Reliability of information systems 2.2.2 Flexibility to meet changing demand and technical innovation in information systems 2.2.3 Usability
	2.3 Performance of transportation systems	2.3.1 Sufficient capacity of transportation systems 2.3.2 Securing safety in pedestrian areas etc.
	2.4 Disaster and crime prevention performance	2.4.1 Understanding the risk from natural hazards 2.4.2 Securing open space as wide area shelter 2.4.3 Providing proper evacuation routes 2.4.4 Crime prevention performance (surveillance and territoriality)
	2.5 Convenience of daily life	2.5.1 Distance to daily-use stores and facilities 2.5.2 Distance to medical and welfare facilities 2.5.3 Distance to educational and cultural facilities
	2.6 Consideration for universal design	
QUD 3 Contribution to the local community (history, culture, scenery and revitalization)	3.1 Use of local resources	3.1.1 Use of local industries, personnel and skills 3.1.2 Conservation and use of historical, cultural and natural assets
	3.2 Contribution to the formation of social infrastructure	
	3.3 Consideration for nurturing a good community	3.3.1 Formation of local centers and fostering of vitality and communication 3.3.2 Creation of various opportunities for public involvement
	3.4. Consideration for urban context and scenery	3.4.1 Formation of urban context and scenery 3.4.2 Harmony with surroundings
The main categories and criteria included in Load Reduction in Urban Development		
LRUD 1 Environmental impact on microclimates,	1.1 Reduction of thermal impact on the environment outside the designated area in summer	1.1.1 Planning of building group layout and forms to avoid blocking wind. 1.1.2 Consideration for paving materials 1.1.3 Consideration for building cladding materials 1.1.4 Consideration for reduction of waste heat

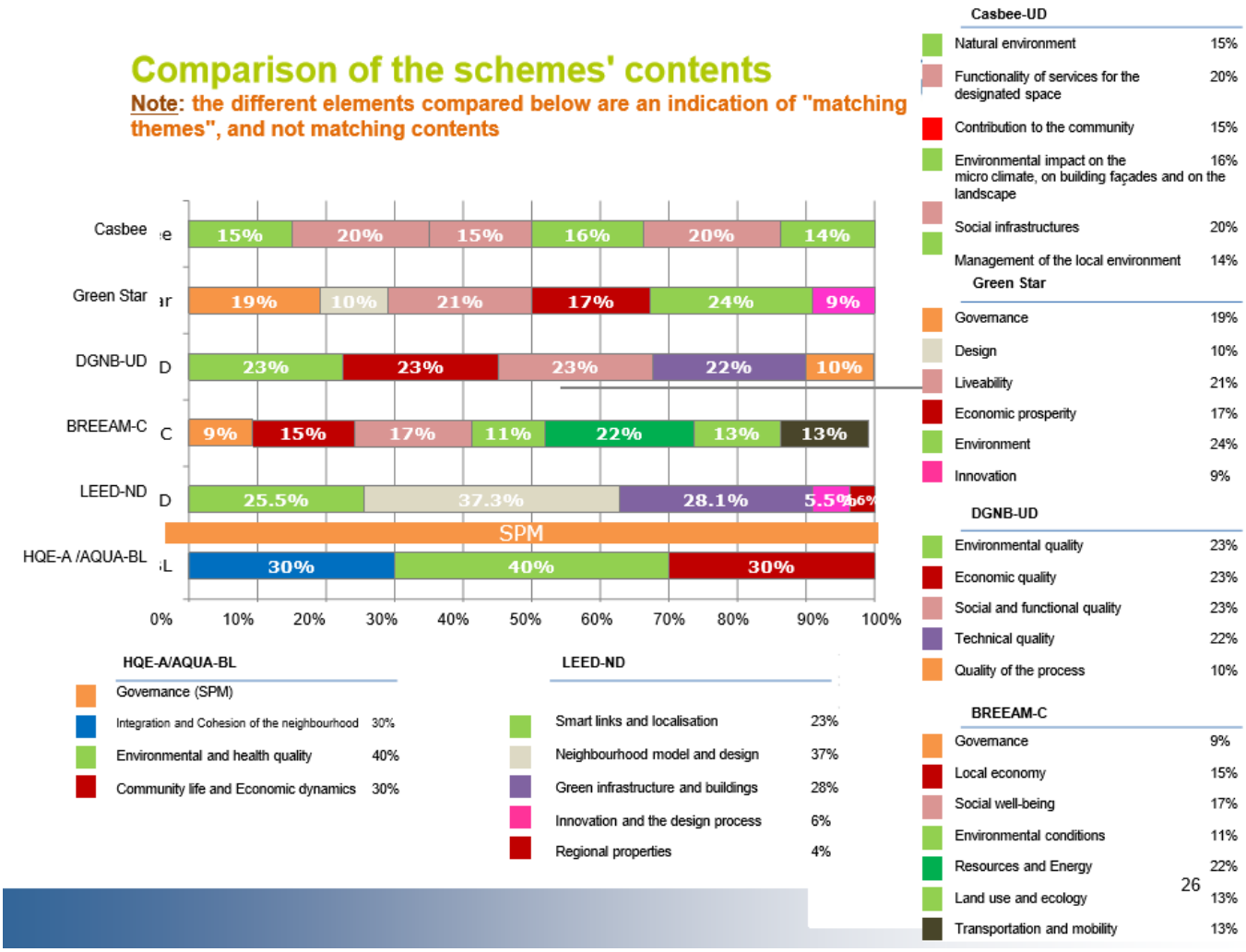
façade and landscape	1.2 Mitigation of impact on geological features outside the designated area	1.2.1 Prevention of soil contamination 1.2.2 Reduction of ground subsidence
	1.3 Prevention of air pollution affecting outside the designated area	1.3.1 Source control measures 1.3.2 Measures concerning means of transport 1.3.3 Atmospheric purification measures
	1.4 Prevention of noise, vibration and odor affecting outside the designated area	1.4.1 Reduction of the impact of noise 1.4.2 Reduction of the impact of vibration 1.4.3 Reduction of the impact of odor
	1.5 Mitigation of wind hazard and sunlight obstruction affecting outside the designated area	1.5.1 Mitigation of wind hazard 1.5.2 Mitigation of sunlight obstruction
	1.6 Mitigation of light pollution affecting outside the designated area	1.6.1 Mitigation of light pollution from lighting and advertising displays etc. 1.6.2 Mitigation of sunlight reflection from building facade and landscape materials
LRUD 2 Social infrastructure	2.1 Reduction of mains water supply (load)	2.1.1 Encouragement for the use of stored rainwater 2.1.2 Water recirculation and use through a miscellaneous water system
	2.2 Reduction of rainwater discharge load	2.2.1 Mitigation of surface water runoff using permeable paving and percolation trenches 2.2.2 Mitigation of rainwater outflow using retaining pond and flood control basins
	2.3 Reduction of the treatment load from sewage and graywater	2.3.1 Load reduction using high-level treatment of sewage and graywater 2.3.2 Load leveling using water discharge balancing tanks etc.
	2.4 Reduction of waste treatment load	2.4.1 Reduction of collection load using centralised storage facilities 2.4.2 Installation of facilities to reduce the volume and weight of waste and employ composting 2.4.3 Classification, treatment and disposal of waste
	2.5 Consideration for traffic load	2.5.1 Reduction of the total traffic volume through modal shift 2.5.2 Efficient traffic assignment on local road network
	2.6 Effective energy use for the entire designated area	2.6.1 Area network of unused and renewable energy 2.6.2 Load leveling of electrical power and heat through area network 2.6.3 Area network of high-efficient energy system
LRUD 2 Management of the local environment warming	3.1 Consideration of global	3.1.1 Construction and materials, etc. 3.1.2 Energy 3.1.3 Transportation
	3.2Environmentally responsible construction management	3.2.1 Acquisition of ISO14001 certification 3.2.2 Reduction of by-products of construction 3.2.3 Energy saving activity during construction 3.2.4 Reduction of construction-related impact affecting outside the designated area 3.2.5 Selection of materials with consideration for the global environment 3.2.6 Selection of materials with consideration for impact on health
	3.3 Regional transportation planning	3.3.1 Coordinating with the administrative master plans for transportation system 3.3.2 Measures for transportation demand management
	3.4 Monitoring and management system	3.4.1 Monitoring and management system to reduce energy usage inside the designated area 3.4.2 Monitoring and management system to conserve the surrounding environment of the designated area

Source: CASBEE, 2007

6.3.1.5 Categories and Criteria of BREEAM, Green Star, CASBEE and LEED

Frameworks are composed of main categories (main indicators) and criteria (sub-indicators). Table 6.6 and 6.7 below presents the main categories and criteria's of four frameworks. It can be seen that BREEAM 2012 has 12 pre-requisite, 5 main categories with 40 criteria's, Green star 2012 has 5 main categories with 37 criteria's, LEED-ND v4 has 5 main categories with 44 criteria's and CASBEE for UD has 6 categories with 31 criteria and 82 sub-criteria's. From this analysis it is understood that BREEAM communities places more emphasis on Resources and Energy which is 22 percent of its entire criteria's and less emphasis on Governance which has 9 percent of its entire criteria's. With this it can be concluded that environmental sustainability has a greater focus in this framework. Green Star on the other hand is a more innovative system of rating with the most emphasis on Environment having 24 percent of its entire criteria's and the Innovation category having 9 percent which is the least of the categories. Also CASBEE has two most significant categories which includes Functionality of spaces and Social Infrastructure having 20 percent each for the entire criteria which shows that planning and social sustainability has strong focus in the assessment tools and Management showcases 14 percent of the entire criteria's. And, lastly, the LEED-ND framework has one most important category which is Neighborhood model and design having a total of 37 percent of its entire criteria and regional properties has 4 percent of its criteria which is the least category as shown in tables below. The major and minor categories used in the design of this NSA's shows a change in importance of these criteria's based on individual context (Alqahtany, 2014). In overall the difference in SIs is based on preference and local context.

Table 6.6: Comparison of the schemes content with focus on Categories and Criteria's



Source: EUKN, 2014

Table 6.7: Comparison of the schemes contents

	LEED	**BREEAM**	**Green Star**	**CASBEE**
Most Recent Version	2013	2012	2012	2007
No. of Themes	5	5(+1)	6	6
No. of criteria or sub-criteria's	44	40	37	82
No. of Prerequisites	12	12	none	none
Weighting	none	none	none	yes
1	Smart links and localisation	Governance	Governance	Natural environment
2	Neighborhood model and design	Economic development	Design	Functionality of services for the designated space
3	Green infrastructure	Resources and Energy	Liveability	Contribution to the community
4	Innovation and the design process	Land use and ecology	Economic prosperity	Environmental impact on the microclimate, on building facades and the landscape
5	Regional properties	Transportation and mobility	Environment	Social Infrastructures
6		Innovation (optional)	Innovation	Management of the local environment.

Source: EUKN, 2014

6.3.2 Emerging Assessment Tools

Recently researchers are at the forefront of developing assessment tools that can be used to design more neighbourhood sustainable communities. Currently, sustainability theory has not been explored to its fullest potential and it is assumed that, to attain a more sustainable society, various updates on these tools have to be done on a yearly or seasonal basis. The result in developing emerging assessment tools will help in solving the world's global response to issues pertaining to sustainability development. The following tools have been developed as a result of adopting various sustainability approaches and improving on existing tools used within the industries. These tools include SuBETool and SUPD.

6.3.2.1 SuBETool Model

SuBETool was designed for master-planning an entire urban environment which requires the knowledge of not just knowing certain criteria for designing a sustainable urban environment

but also narrowing down important sets of indicators and rating criteria for that specific region (Alwaer, 2013; Alwaer, 2015). For architects, planners, and urbanists it means edging beyond fields and familiar ways of practice, and aims at a more multidisciplinary approach to consulting engagement within the project team and all stakeholders at the initial phase of planning. With this approach it becomes easy to discover different factors that come up and make up a truly sustainable environment (Moran, 2012). SuBETool was designed in 2009 by a consulting company called Hilson Moran alongside Dr. Husam Alwaer (Director of Sustainability Assessment Research Group at the University of Dundee) and Professor Derek Clement-Croome (Director of the Intelligent Buildings Research Group at the University of Reading). The tool is used to assess and evaluate the overall performance of the master plan. This exemplar tool is seen to be the future guide for achieving sustainable master planning. SuBETool creates a framework which looks at the three pillars of sustainability which are social/cultural, economic and environmental (Moran, 2012; Alwaer, 2013). The focus of the tool is not just to assess building but rather infrastructure and the whole master plan itself which affects the long-term sustainability impact. SuBETool also focuses on engagement as the key principle rather than just as a product that is self-standing. It is a tool that helps stakeholders to analyse and select from over 16 core-categories and 80 indicators from a range of environmental, social, cultural and economic impacts please see figure 6.4 below. The indicators determine the rating and weighting systems of the scheme according to the project's priorities. The purpose of the tool was to achieve the following sets of criteria:

- Establish a common language
- Set a standard local measurement
- Be tailored to tackle local problems
- Promote integrated design and recognise environmental leadership
- Encourage stakeholder involvement and identify building life-cycle impact
- Raise awareness of sustainable urban planning benefits (Moran, 2012).

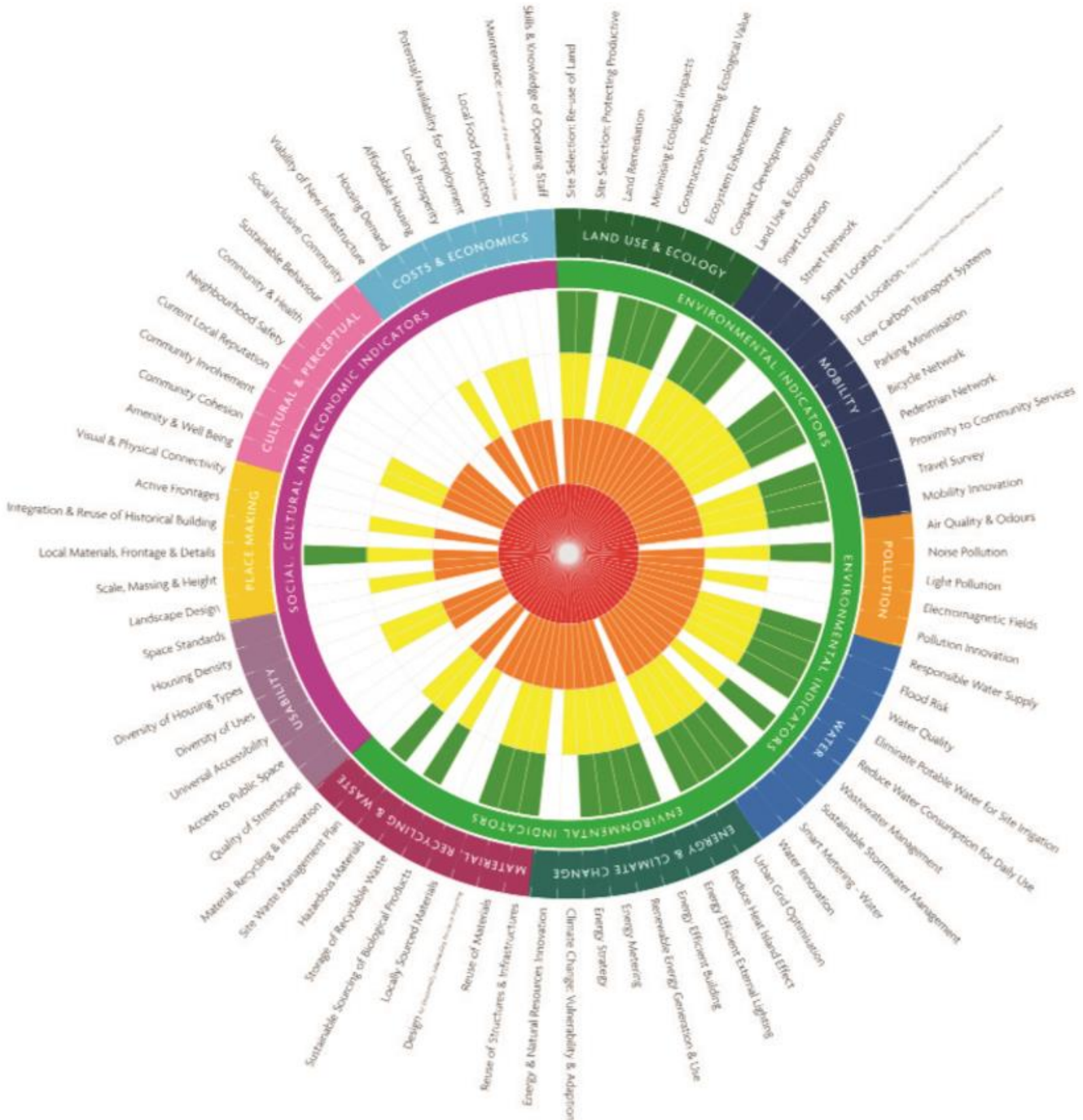


Figure 6.4: SuBETool Model

Source: Husam, 2012

6.3.2.2 SUPD Model

The Sustainable Urban Planning Development (SUPD) framework was proposed by Ali Alqahtany who developed this tool in search of creating a new assessment scheme for a more effective sustainable urban planning development framework within the Gulf region. This model comprises of integration between environmental, social, economic and planning dimensions, which is further categorised into various indicators (Alqahtany, 2014). Also, information and communication technology was recognised as one of the implicit dimensions that is embedded within all the four key dimensions. The environmental dimension concentrates on issues in relation to the environment. The dimension looks into the impact of global warming and how to reduce emissions in the environment. Sub-categories include pollution, health, resources, energy, ecology and climate. The *social dimension* looks into the needs of people in order to achieve a socially sustainable urban development. Major categories and highlights include education, equity, community and security. This dimension looks at how the society and the community are provided with essential services with emphasis on social equity. The *economic dimension* looks into the various aspects regarding the economy which include sustainable economy, economic growth, and employment, productivity and employee development. Lastly, the *planning dimension* creates a strong foundation for good planning. This dimension highlights various categories ranging from land use, infrastructure, transport, and governance, to management. This dimension also emphasises the management aspect in relation to the control and monitoring of planning development (Alqahtany et al., 2013; Alqahtany, 2014).

The framework also looked into the use of information and communication technology which has been embedded and connected within the four dimensions. It creates an opportunity to analyse essential issues that affect daily human life in relation to skills, outcomes, ability of citizens to access technologies, services and resources (Economic Intelligence Unit, 2010; Alqahtany et al., 2013). Overall, this framework is an update of existing models integrating the use of information technology which is embedded in our present-day society see figure 6.5 below for further detail on how this framework are been integrated.

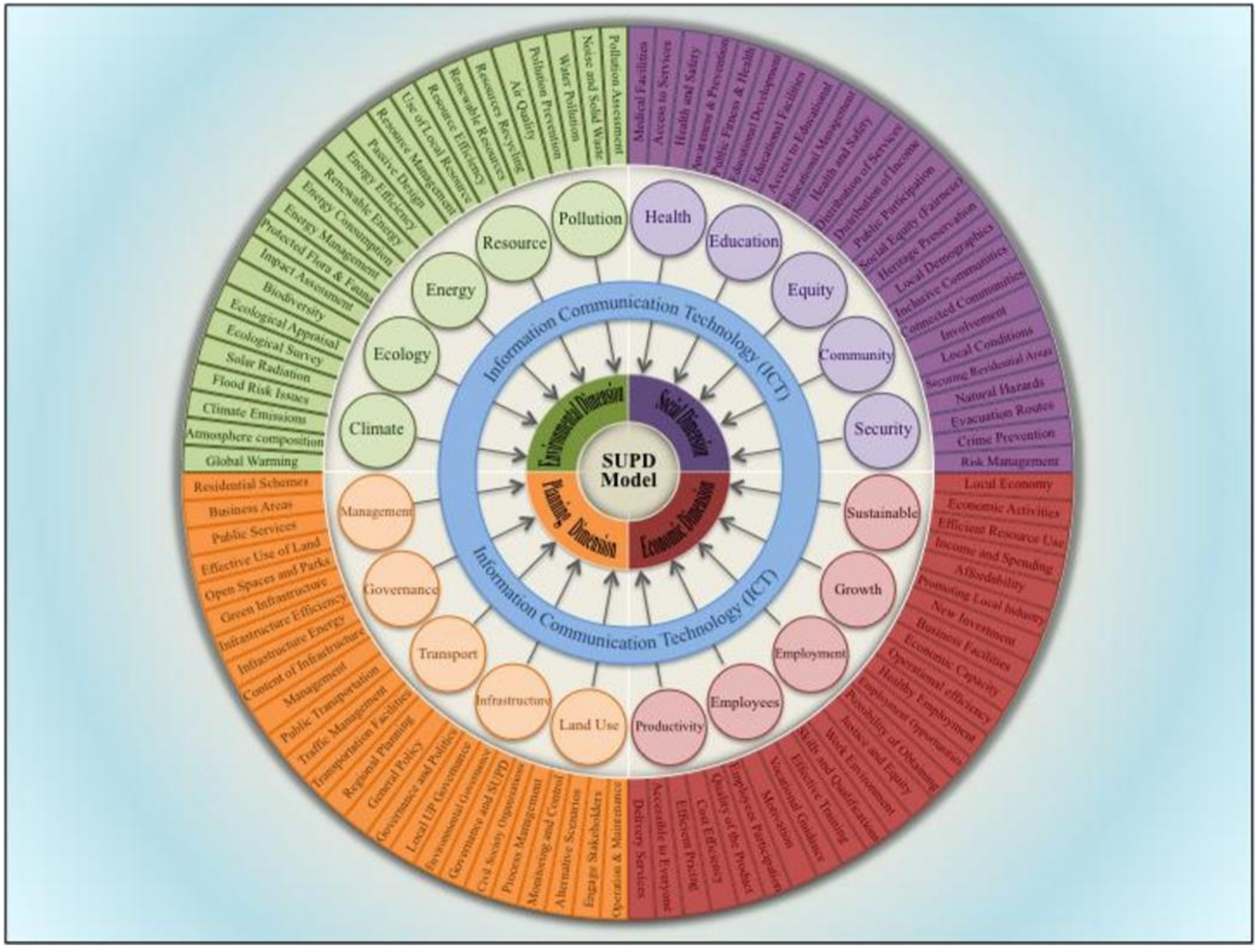


Figure 6.5: Proposal for the Sustainable Urban Planning Framework

Source: Alqahtany, 2014

6.3.2.3 Nigeria's Sustainability Indicators and Framework

The 1999 constitution of Nigeria reinforms the policy and legal bases of sustainable development in Nigeria. The pillars of sustainable development are embedded in many parts of the constitution. The constitution promises to all Nigerians citizens' justice encompassing the social, economic, political, equality of states, opportunity and the dignity of the individual. The government of Nigeria has identified the need to follow sustainable development initiatives. And with this interest various polices of the government has been initiated such as NEEDS 1 and 11 (National Economic Empowerment and Development Strategy), National Vision 20:2020 and the Transformation Agenda which are all geared towards ensuring sustainable development in Nigeria.

These policies and framework are geared towards pressing issues which includes poverty eradication and wealth creation, improving the livelihood of our people making the investment climate better for local and foreign investors, protect the environment, conservation of natural resources, ensuring safety and security of life and properties amongst other (FGN, 2012). The Nigeria's path toward achieving sustainable development has been initiated into the green economy policy which highlights the current policies, programmes and activities taken in order to achieve this goal. This comprises of all activities with regards to environmental protection and sustainable development over the last 12 years since the world summit on sustainable development held in Johannesburg in 2002. The green economy policy is based on this framework from NEEDS, national vision 20:2020, MDG, Transformation Agenda, Local Agenda 21, UNDP framework, EIA Act amongst others.

This framework has highlighted the key categories under social, economic, and environmental sustainability as main areas which are economic dimension: agricultural and food security, power generation, investment initiatives, trade, industries; social dimension includes: population, poverty and equality, education, health, water/sanitation, human settlement, security, gender, culture and tourism, and lastly environmental dimension includes: Biodiversity, coastal and marine environment, deforestation, drought and desertification, flood and erosion, land-use, environmental pollution, waste and climate change.

6.3.3 Comparative Assessment of Sustainability Performance Tools and the Role of Different Rating System

It is a known fact that LEED and Green Star were influenced by the BREEAM assessment. For this reason, rating tools in general tend to have a similar approach when it comes to how to assess buildings and urban development projects against indicators, categories and the credits been awarded. Also the weighted points used to determine the results are based on the credits obtained during the assessment exercise which would determine the rating classification (Ya et al., 2011). Assessment tools are designed to rate various schemes or types of building uses such as offices, educational facilities, factories, healthcare centre's, neighbourhood schemes, and so on. The development of these tools is set under building regulations and organisations (like the local green building council) and other standardisation agencies which set high-performance criteria in most areas of assessment for reasons such as pragmatism, credibility, and to achieve higher sustainability standards (Sleeuw, 2011). Table 6.8 below shows a comparison of environmental tools between BREEAM, LEED, Green Star and CASBEE. The criteria for comparing these tools include launch dates, rating schemes, data/information collection, assessment, third party validation, certification and labelling, frequency of update, governance, required qualification of assessors, assessors' CPD requirements, compound annual growth rate, assessment fee, certificate fee, cost of appeals, credit interpretation requests costs, number of units certified, numbers of domestic and non-domestic buildings certified to date and, lastly, availability of assessment information (BRE, 2008; Reed et al., 2011). Although they have a common environmental aim, there are significant differences in their details - such as in their methodologies, scope and emphasis of assessment, metrics and certification processes. Sleeuw (2011) stated that a common standard would facilitate benchmarking of building across different countries but the fact remains that different contexts have various levels and priorities of indicators. Adopting a uniform sustainability standard for the entire international neighbourhood sustainability assessment would be very hard to achieve even though the end goal is attaining sustainable built environment (Reed et al., 2011; Sleeuw, 2011).

Table 6.8: Comparison of BREEAM, LEED, Green Star and CASBEE

	BREEAM	**LEED**	**Green Star**	**CASBEE**
Launch Date	1990	1998	2003	2004
Ratings	PASS/GOOD/VERY GOOD/EXCELLENT/ OUTSTANDING	Certified/Silver/Gold/Platinum	One Star/Two Star/Three Star/Four Star/Five Star/Six Star	C/B-/B+/A/S
Weightings	Applied to each issue category (consensus based on scientific/open consultation)	All credits equally weighted, although the number of credits related to each issue is the weighting factor	Applied to each issue category (industry-survey based)	Highly complex weighting system applied at every level
Information Gathering	Design/management team or assessor	Design/management team or Accredited Professional	Design team Design	Design team Design/management team
Third Party Valuation	BRE	N/A	GBCA (Green Building Council of Australia) nominated assessors	Third Party Agencies e.g. JSBC (Japan Sustainable Building Consortium)
Certification Labelling	BRE	USGBC (United States Green Buildings Council)	GBCA	JSBC
Update Process	Annual	As required	Annual	As required
Governance	UK Accreditation Service (UKAS)	USGBC	GBCA	JSBC
Required qualification	Competent persons scheme	Passed exam	Training scheme and exam	N/A
Assessor/AP CPD requirements	Carry out at least one assessment per year	No CPD requirements	Status renewed every three years	N/A
Compound Annual Growth Rate	93% (1998-2007)	86% (2002-2007)	Not available	Not available
Assessment Collation Fee*	£2000-£10000 ($3971-19857)	Up to £37,770 ($75000)	£2015-4030 ($4002-8004)	Unknown
Certification Fee	£740-£1500 ($1469-2979)	£1133-£11331 ($2250-22500)	£2550-£7185 ($5063-14268)	Unknown
Cost of credit appeals	Free	£252 ($500)	£403 ($800)	Unknown
Credit interpretation requests cost/allowance	Free/unlimited number	£111 ($220) unlimited number	Free/Maximum of two	Unknown
Number of units certified**	110808	1823	50	23
n/a	109450	540	N/A	N/A
Non-Domestic	1358	1283	50	23
Availability of assessment information	Estimators' tools are available free of charge. Guidance is currently only available to people who attend the training courses	The tools are available free of charge and technical guidance is available for £100 ($200)	The tools are available free of charge and the technical manual is available for £224 ($444)	The assessment tool and guidance is available free of charge in Japanese and English.

Sources: Reed et al., 2011; Momoh, 2015

Most countries and organisation in places where environmental assessment tools have been developed were based on their needs and purposes, context and environment, focusing on sustainability which has resulted in a number of similarities and differences as well as various strengths and weaknesses of the tools (Ya et al., 2009; Kyrkou et al., 2011). Due to this there have been limitations because some categories and criteria have been emphasised while some remain dormant or not a priority. Recent criticism of these assessment tools has shown that BREEAM communities place emphasis on resources/energy and social wellbeing and with little emphasis on governance and businesses within the community. LEED-ND emphasises on the main categories which is neighbourhood model/building design alongside green infrastructure and buildings with little focus on regional properties, Green Star focuses more on the natural environmental quality, place-shaping and green infrastructure and CASBEE places more emphasis on functionality of services for designated spaces and social infrastructure (EUKN, 2014; Alqahtany, 2013). Also these four models have showcased how the development of various categories has come together to form the framework but one of the key issues is that they have all concentrated more on the environmental issues which includes climate change, environmental quality, ecosystems and green infrastructure. This is actually one of the strengths uniformly applied between these four frameworks because they all agree on how important environmental sustainability is (Haapio and Viitaniemi, 2008a; Alqahtany, 2013).

Another pressing weakness that has been noticed is the misconception about initiating management into a sustainable urban development framework. Management as a category is very important because, after proposing a framework, it needs to be managed efficiently. Adopting management is key in every framework in order to create a more sustainable lifecycle for the assessment method. There have been quite a few highlights on management but little or less focus is given to this field as well as integrating it efficiently within these frameworks (Tam et al., 2004; EUKN, 2014). Another problem is that emphasis was not placed on the financial issue in carrying out such mega-projects. Most of these projects are very expensive to embark on but little emphasis has been placed on the affordability of these schemes. BREEAM, LEED and Green Star have not included the financial aspects in their frameworks which in all understanding, contradicts the main essence of sustainable urban development (Grace, 2008). For any project to be truly successful, the financial aspects which will ensure that the schemes are workable, feasible and viable need to be stated. BREEAM is mostly used in the UK which is because it is developed to suit the British urban design and building

regulations/standards and is cheaper to apply. LEED is becoming more recognised mostly because it is particularly used as a fit-out only assessment and is preferred by multinationals as it is more globally recognised.

These rating tools are comparable to each other to a certain degree. It is well acknowledged that an NSA's or a green building rating tool, however well-developed, needs to be tailored when applying it in a country other than the original context for which the tool was developed. Hence these different characteristics, methods and categories offers no explanation of how to implement these frameworks outside these countries (Alqahtany, 2013; Zuo et al., 2014). In view of the above smart codes, understanding the concept and composition of this design could inform how other codes can be developed within the neighbourhood context. Meanwhile it is clear that a general, prominent and credible building environmental assessment will play a vital role in understanding and assessing building energy performance, particularly in developing worlds where this issue is still in its early phase. It would be very important for countries that do not have their own prominent evaluation scheme to derive their tool from working examples across the globe. In conclusion it is necessary to create an understanding of this scheme in terms of its assessment criteria, indicators, scope and performance criteria, critiquing this tool as well as creating a tool suitable for developing countries (Lee et al., 2008; Patxi et al., 2008). These NSA's tools dictate different methods of designing city and neighbourhood development, as well as the selection of the categories, criteria and indicators. Furthermore, these frameworks were developed in various countries, under different circumstances, and for different reasons and purposes, but all of these models aim to achieve sustainable urban development (Cao and Li, 2011). In line with this above analysis it is clear that a robust, credible and well-structured assessment tool will be needed in developing countries.

6.3.4 Limitations in Existing Tools and Reasons for Proposing New Tool

Most countries across the world either have an established rating tool or are working towards having one. Assessment tools are validated or influenced by national building code or building regulation standards which vary from one country to the other, different local contexts and climate conditions among others, and it is assumed that all countries have developed their rating system from the same baseline standards. In some cases, building codes and standards vary from one country to another based on some sets of reasons such as technological developments, economies of scale, level of poverty, housing provision, rate of knowledge transfer, knowledge-based economy, and so on. A simple example is the United States, which has lower

building standards compared to the United Kingdom building regulations (BRE, 2008). These standards are therefore used to set the parameters for ratings exercises. Based on case studies conducted by the BRE on individual dwellings, the LEED rating tool has shown to have a lower standard compared to the BREEAM tool rating system. A LEED platinum certified building which is the highest is equal to a very good certified building using BREEAM based on the results extrapolated; hence the LEED system is of lower standard than the BREEAM rating system (BRE, 2008; Reed et al., 2011). This is similar to the Australian Green Star which has also been deduced to have lower standards compared to BREEAM and LEED. This result has suggested that setting a global standard using one set of rating systems may lead to lower rating for urban spaces in some countries. It is then suggested that sustainability implementation should be in relation to the situation of each region, which is one of the main reasons that tools are developed to suit each country's needs and resources (Reed et al., 2011).

Countries have developed assessment tools to increase knowledge on the level of sustainability within the nation. It is debated that every country has individual characteristics which includes climatic conditions, building design and typography. Such features require that an individual rating system should be developed for each country. Developing countries in the Middle East, Africa and Asia have started to show an interest in developing their assessment tools and contributing to the sustainability agenda. Nigeria established the Green Building Council of Nigeria (GBCON) in 2009 and they are at the moment developing a Nigerian-based rating tool for both building- and neighbourhood-scale sustainability assessment. Research has shown that there is an increasing focus on developing a business case for sustainability implementation. Most developing countries are distinguished by their individual local economies and policy adoption (Sayce et al., 2004). The use of individual rating tools will help measure and improve on the social, environmental and economic dimensions of sustainability (BRE, 2004). Lastly the awareness level of sustainability differs from country to country based on the awareness of environmental issues, standards and rating tools to be developed. It is therefore mandatory for a level of sustainability to be adopted; this will have to be based on the level of awareness of indicators within the countries (Reed et al., 2011). It is important to start from the basic level to attain the highest level of sustainability implementation. It would be very hard to import rating tools from abroad to be used in developing countries. Figure 6.6 below shows that Nigeria has expressed interest in the development of a sustainability assessment tool.

Figure 6.6: Countries with Various Rating Tool and Interest Levels

Source: Reed et al., 2012

6.4 ASSESSMENT TOOL FOR DEVELOPING COUNTRIES

The level of sustainability achieved in developed countries is far higher than in developing countries. It is a glaring fact that developed societies like the United Kingdom have achieved certain aspects of sustainability more especially social sustainability with established indicators such as health, safety and equality. It is therefore agreed that in the UK, social sustainability is of lower priority in comparison to economic and environmental sustainability. In developing countries, the case is different because most aspects of sustainability have not been achieved but research conducted has suggested that economic and social sustainability are more pressing dimensions of sustainability (Gibberd, 2003). This has shown that there is a vast difference in priorities of sustainability between developed and developing countries which has to be considered when developing an assessment tool. The assessment tool for developing countries should reflect the overall goal of the project, aims and objectives, and indicators to be embedded. This goal should focus on achieving developments that adhere to the sustainability

agenda, while the objectives should be clear and focused through a structured approach. Lastly, sustainability indicators are used to measure the levels and progress at which sustainability has been attained. This structured approach must aim to achieve a maximum output in the adaptation of the assessment framework. Therefore the following is done in the process.

- A framework is derived based on up-to-date important information.
- All project stakeholders and community participants will understand what sustainability aims are to be achieved through the framework and come to a conclusion on objectives to support the aim of the project.
- The assessment framework tends to makes sustainable urban development relevant to both urban spaces and buildings by creating layers or fragments of easily implementable steps which are adopted in the entire assessment process (Gibberd, 2003)

6.4.1 The use of Sustainability Indicators in the Context of Nigerian Urban Spaces

Developed societies have been able to provide basic human needs for their citizens and in some cases where the population is less than the gross domestic product (GDP), standard of living parameters have been exceeded. In such cases emphasis would be placed on maintaining these standards, and as well reducing depletion of natural resources and damage to the environment (Loh, 2000; Gibberd, 2002). In developing societies, however, the average standard of living is much lower compared to the case in developed societies and, in some cases, human needs cannot be met; hence it is argued that development should aim at addressing basic needs while circumventing negative environmental impacts (Gibberd, 2002). In Nigeria there have been various range of policies, initiatives and schemes established to help support this approach by governmental and non-governmental agencies/organisations. Most of the schemes, like Vision 2010, have failed to work based on inappropriate implementation strategies. For the Nigerian urban spaces the use of sustainability indicators can be achieved when a proposed framework has been developed, tested and proven to work. Also the implementation could either focus on the top-bottom approach or the bottom-top approach. The three dimensions of sustainability can be designed to have core indicators and then sub-indicators. The selection of sustainability indicators for the Nigerian urban environment would be based on pressing issues raised earlier - mostly standard of living, socio-economic impact of the indicators, and minimising negative environmental impact. Assessing and implementing sustainability in Nigerian urban spaces would require an effective and easily adoptable approach. This approach can be the initiation

of an assessment tool or framework aligned with the stated objectives. This assessment and a set of processes will ensure that the scheme is used to guide and suggest actions in the buildings and construction sector (Gibberd, 2002). This conscious approach must be established in other to make sustainable development an explicit goal.

6.4.2 Key Sustainable Indicators for achieving a Sustainable Urban Neighbourhood in Developing Countries (Nigerian Case)

In achieving sustainable urban development it is necessary to identify the context of developing countries in which the tool is to be designed. It is important to understand the needs and priorities of the Nigerian context, in order to develop an assessment framework that will respond to the region and that can be effectively implemented. The key aspects in the context of developing worlds are listed below

- Infrastructure: In developing countries like Nigeria it is a known fact that infrastructure development is lacking, well below what it is supposed to have attained within today's context. Infrastructure provision is to be provided to achieve basic human needs and it is also required for key sustainable urban development objectives to be met.
- Capacity-building: The level of capacity-building and educational training is very low in developing countries of which Nigeria is currently striving to improve its educational standards. To achieve sustainable urbanism/development, it is vital to implement the inculcation of educational structures alongside capacity-building into the society. Training programmes and primary, secondary and tertiary education can be further improved on to make sure the most appropriate level of development is attained.
- Participation: Public participation and EBD are important in today's context but in the developing world, due to the mass populations, it becomes very hard to contribute to achieve it. For development to reflect the needs and priorities of the end users it should be influenced and supported by them and it is mandatory that the public is effectively involved during the entire process.
- Social Exclusion: Social exclusion is a big issue in developing worlds because there are disadvantaged and minority groups like the old, poor, disabled, uneducated, or people from a specific tribe or skin colour whose needs are not a priority, and are unlikely to be met. It is pertinent to know their needs and attend to them properly.

- Social priorities: Some sub-indicators like health, education, community cohesion, local lifestyle, equity, security, and cultural identity are not addressed in most developing worlds.
- Economic Priorities: One of the key issues why developing countries do not achieve sustainability is that economic priorities (such as unemployment, job creation, growth, initiatives, housing provision, integrating informal sector, effective finance systems, infrastructure, and ranges of opportunities for new investment) are not addressed.
- Development Limitations and Initiatives: Developing countries like Nigeria have limitations and issues that must be addressed for sustainability to be achieved. There can be, for example, shortage of electricity supply and lack of financial resources to support the initiative. Necessary factors have to be put in place for sustainability to be achieved.
- Indigenous Systems: Developing societies in most cases have highly adaptable local indigenous systems that are known to be sustainable - these could be technological, organisational, cultural and knowledge systems. These systems can be used to provide effective models for sustainable urban development that can be adopted or re-adapted (Gibberd, 2003).

These interventions and indicators above can be used to support sustainable urbanism and sustainable urban development in developing societies which should address social and economic aspects as priorities. It is therefore suggested that environmental issues which are not as pressing in comparison to the others should not be neglected, as this would not enable the entire state of holistic approach in sustainability to be attained. Instead it is suggested that the environmental dimensions objectives are acknowledged and addressed in interventions designed to address urgent social and economic priorities. Overall, environmental sustainability may have lesser priority compared to social and economic dimensions, accordingly (Gibberd, 2002, 2003).

6.4.3 Development of SUCCEED

The development of SUCCEED is characterised by understanding the growing international and global nature of the relationship between the environment and economy which is uncertain. This has resulted in an incalculable degree of risk associated with environmental policy and actions when member states take on resource conservation. Based on the understanding of the development of assessment tools, both internationally recognised and emerging accepted tools,

this has helped in developing a tool that is based on the context of the Nigerian region. SUCCEED looks at elements such as the current economic situation of the nation, social condition of the everyday person living in the country and, lastly, how all this affects the environmental standards and conditions of both the people and the country.

6.4.3.1 Sustainable Composite Cities Environmental Evaluation and Design Tool (SUCCEED Nigeria Neighbourhood Design)

This proposed framework is designed based on two major fundamentals. Firstly, the current knowledge is retrieved from an analysis of various academic research papers and reports in relation to the concepts of sustainable urban planning, sustainable urbanism, and indicators from sustainable urbanism case studies; and secondly knowledge is acquired from the analysis of various existing frameworks and assessment tools based on their merits and demerits as well as their strengths and weaknesses using a sound methodological approach. Lastly the tool is subject to validation.

In line with the analysis of the existing assessment tools, a detailed proposal for an assessment framework for developing country like Nigeria will increase the achievement of sustainable urban futures. The proposed tool titled SUCCEED which stands for *Sustainable Composite Cities Environmental Evaluation and Design Tool* focuses on emerging markets where sustainability is starting to become a priority. It also develops a new framework which encourages successful implementation of sustainability. The tool will offer a comprehensive assessment that evaluates the sustainable design and performance of any major master plan (mainly neighbourhood design scale). The SUCCEED tool will help to provide a framework which incorporates the three main dimensions of sustainability - which are *socio-cultural, environmental and economic*, and a fourth dimension lastly – *planning* - that has recently been incorporated and adapted into sustainability.

From the analysis of the four main models, LEED, BREEAM, Green Star and CASBEE. The results and findings obtained through the literature review have emphasised the need for an effective framework for sustainable urban futures based on their strengths, weaknesses, obstacles and challenges. Emphases would be placed on affordability (finance) and management. In developing worlds the major issue faced is mostly who will finance the project? How will it sustain itself? Would it be affordable for every common individual? (That is where social equity comes into play.) Are there measures put in place where people can pay

for this development over a long period of time? Can this development provide permanent job opportunities? Can the poor masses afford such development? Can the model be used in other developing worlds, and lastly can the development be self-sustaining or can the resource generated from this development be used to manage it? The management issue talks about how the environment can be used properly, managed, and sustained from the design stage to the post-occupancy stage. This will include issues like sustainable materials, proper planning system, resource-generated incomes, revenue generation to manage these facilities, and so on. These pressing issues are the most pertinent indicators to be explored further through data collection and analysis.

The term *Composite cities* is embedded in this research and could be defined as cities that have a combination of various elements of a built environment. Composite cities incorporate every aspect of the built environment not just individual buildings, but the spaces in-between them which includes infrastructure, people, and the overall wider master-planning which has a major impact on the long-term sustainability of the built environment. The term 'composite' reflects the complexity of our cities which transform through new urban emergences adding to the existing urban environment and continuously redefining our urban experience (EURAU, 2014). This proposed design tool is to be used to assess and measure sustainability within the composite spaces of a neighbourhood design (both existing and proposed) in developing counties.

6.4.3.2 Selected Sustainable Indicators for the Nigerian Context

Most existing assessment tools have been designed based on the context in which sustainability is to be assessed and measured. Therefore it is important to note that assessment tools have been developed in relation to a particular country and region to be focused on. The impact of measuring sustainability of environmental effects and socio-economic implications can be felt from a local level to the global level (Curwell et al., 2005, pg.35). There are diverse variations which may include environmental, cultural and social variations between local and regional levels which influence the measurement of sustainability varying from one region to another even when the same criteria are applied. The reason for sustainability assessment is to create an environment where decision makers can evaluate the impacts on the nature of global to local changes of society systems from short- and long-term perspectives.

Studies have shown that there are two approaches in measuring sustainability. The first approach is through the selection of individual fields which are measured by the use of

sustainability indicators while the second deals with the overall progress which aims to achieve sustainability through a combination of individual fields with regards to interaction (Warhurst, 2002). Sustainability indicators help those involved in planning to be more informed about the impact of future developments based on assessments taking from previous developments. Also it helps to improve the knowledge, practice and understanding on how these indicators could influence sustainability practices by providing a basis for analysis (Balsas, 2004). The compilations of the right set of indicators for a context is a thorough process with a structured framework or consensus on what urban sustainability should be (Deakin et al, 2002; Lambardi and Cooper, 2009). The use of indicators presents an evaluation of performances of projects, communities, neighbourhoods, buildings, infrastructures and countries as they relate to the three dimensions of sustainability (economic, environmental and socio-cultural (Xing et al., 2009). The most pressing issue in measuring the sustainability of communities is to create a single framework of indicators corroborating the three dimensions. Moreover, since this is a collaborative process of multi-stakeholders, the chosen indicators must communicate with the variety of different actors, players and disciplines involved (D'Acci and Lambardi, 2010, pg.21). A flexible assessment tool is hence required to allow users to consider spatial boundaries while retaining an understanding of what is being changed - and why (Todd and Geissler, 1999, pg.249).

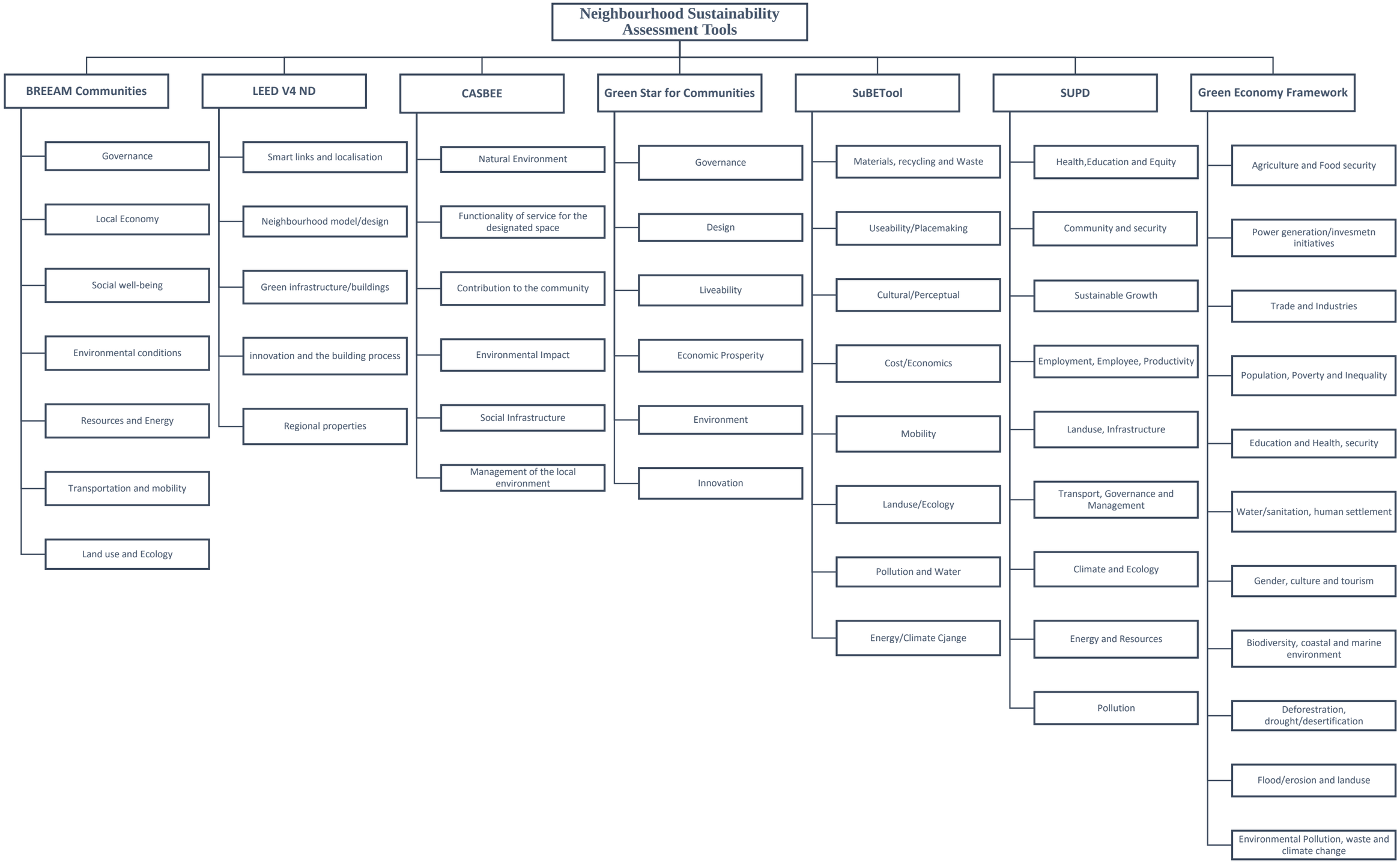
Six main sustainability assessment tools were used in the design of SUCCEED (a combination of LEED, BREEAM, Green Star, CASBEE, SUPD, SuBETool and Green Economy Framework). Four are internationally recognised while the remaining two are emerging methods see table 6.9 below.

Table 6.9: Main Core Categories in BREEAM, LEED, Green Star, SuBETool, SUPD and CASBEE

BREEAM	LEED	Green Star	SuBETool	SUPD	CASBEE	Green Economy Indicators
Governance	Smart Location & Linkage	Governance	Costs & Economics	Resource	Natural Environment	Agricultural and food security
Economic Development	Neighbourhood Pattern & Design	Design	Land use	Pollution	Functionality of services for the designated space	Power generation,
Resources and Energy	Innovation & Design Process	Liveability	Ecology	Health & Education	Contribution to the community	Investment initiatives, trade, industries
Land use and Ecology	Regional Priority Credit	Economic Prosperity	Mobility	Equity & Community	Environmental impact on the microclimate on building facades and on the landscape	Population, poverty and equality
Transportation and Mobility	Green Infrastructure & Building	Environment	Pollution	Security	Social Infrastructures	Education, health,
Innovation		Innovation	Water	Growth	Management of the local environment	Water/sanitation
Resources			Energy & Climate Change	Employment/ Employees & Productivity		Human settlement, security
Business			Materials	Land use & Infrastructure		Gender, culture and tourism
			Recycling & Waste	Transport & Governance		Biodiversity, coastal and marine environment
			Usability	Management		Deforestation, drought and desertification
			Place-making	Climate & Ecology		Flood and erosion, land-use
			Cultural & Perceptual	Energy & Resource		Environmental pollution, waste and climate change
				Pollution		.

Source: EUKN, 2014; Momoh, 2015

Figure 6.7: Mapping out all the Key Sustainability Indicators used in the Neighbourhood Sustainability Assessment Tools



In line with the above assessment tools which have been analysed and synthesised, SUCCEED (Sustainable Composite Cities Environmental Evaluation and Design Tool) is to be designed based on four dimensions of sustainability - *environmental, social-cultural, planning* and *economic*. Due to the context in which the project is designed, and to address the purpose of the study, the researcher selected the core indicators that respond to the region's needs by identifying and merging some of these indicators shown in Table 6.9 above into a unified set of categories shown in Table 6.10 below. This selection is subdivided into sub-criteria indicators which are further screened through the Delphi method and questionnaire analysis and then validated in Chapter 7. The four dimensions are constantly influenced by three main dynamics which are **Operation, Performance** and **Management.**

Table 6.10: Main Core Categories developed for SUCCEED

Sustainability Dimensions	**Core Categories**	
Environmental Sustainability	Operation, Performance and Management	Pollution, Materials, Resources and Waste, Water, Ecology, Energy, Climate
Social/Cultural Sustainability		Community/Culture, Education/Empowerment, Health, Equity, Security
Economic Sustainability		Economics/Value, Growth, Employments, Productivity and Initiatives
Planning Sustainability		Place-making, Management, Transportation, Governance, Land use

The researcher also adopted the same approach used in selecting the core categories to select the sub-categories' indicators. The collation of the key criteria or sub-categories was adopted from LEED-ND, BREEAM, Green Star, SUPD, SuBETool, SUPD and CASBEE. These criteria were selected and merged together to form a total of 105 sub-categories' indicators. Also these indicators were influenced by the analysis of sustainable urbanism case-studies (see Chapter 3 for reference). This selection was also grouped under the main dimensions so that the main dimension can relate to the core categories and the core categories can then relate to the sub-categories. Figure 4.6 in chapter 4 and Table 6.11 below showcases the relationship between design process and the sub-indicators, core categories and main dimensions of sustainability, respectively. And lastly figure 6.8 describes the entire process involved in the development of SUCCEED Neighbourhood design tool.

Table 6.11: Sub-categories' Indicators selected for Environmental, Social/Cultural, Economic, and Planning Sustainability developed for SUCCEED

ENVIRONMENTAL SUSTAINABILITY	**SUB –CATEGORIES' INDICATORS**
Pollution	Water Pollution and Noise Pollution Prevention, Air Quality Enhancement, Pollution Innovation
Materials, Resources and Waste	Local Renewable Materials, Recycling and Innovation, Site Waste Management Schemes, Storage of Recycled Waste, Reuse of Materials, Structure and Infrastructure, Longevity, Use of biodegradable materials
Water	Flood Risk, Water Quality, Erosion control, Responsible Water Supply Initiatives, Waste-water Management, Smart metering-water, Reduction in Water consumption daily
Ecology	Biodiversity, Biophilia, Ecological Appraisal, Ecology Innovation, Eco-system Enhancement, Minimising Ecological Impact, Topography Alteration/ Protecting Ecological Value, Diversity and Preservation, Use of natural topography
Energy	Energy Efficient Building, Passive/Active Designs, Renewable Energy Generation and Use, Urban Grid Optimisation, Consumption Management
Climate	Climate Emissions, Global Warming, Flood Risk Mitigation, Solar Radiation, Climate Change (Vulnerability and Adaption, Resiliency)
SOCIAL/CULTURAL SUSTAINABILITY	**SUB–CATEGORIES' INDICATORS**
Community/Culture	Sustainable Behaviours, Involvement Demographics, Social Inclusive Communities, Connected Communities, Local Context, Community Cohesion, Local social vitality (Local housing authority, supranational assistance organisation (United Nations)), Local lifestyle (embracing it, integrating it - for example, grounding place, local gardens, playgrounds, saga spots)
Education/Empowerment	Schools, Facilities, Health and Safety Courses, Workshops, Awareness Schemes
Health	Clinics, Medical Facilities, Access to services, Gymnasium Halls
Equity	Equity/Fairness, Enquiry-based design, Public Participation, Services
Security	Amenity/Well-being, Neighbourhood Safety, Crime Prevention, Police Stations, Risk Management, Securing the Areas
ECONOMIC SUSTAINABILITY	**SUB–CATEGORIES' INDICATORS**
Economics/Value	Affordable Housing, Housing Demand, Informal Sector, Local Economy, Income/Spending, Access to financing, credit, loans, and mortgages to build individual limits
Growth	Efficient Resources Use, Economic Activities, New Investment, Promoting Local Industry, Business Facilities
Employment	Employment Opportunities, Economic Capacity, Justice and Equity, Economic Capacity, Creation of local jobs (Some live and work units, local shops, clinics, core centres, social centres, offices, super stores, factory and other facilities, gymnasiums)
Productivity	Accessible to Everyone, Cost Efficiency, Efficient Pricing, Quality
Initiatives	Viability of New Infrastructures, Long-term Finance Schemes, Local Context, Politics
PLANNING SUSTAINABILITY	**SUB–CATEGORIES' INDICATORS**
Place-making	Scale, massing/ height, local materials, details, frontage, access to public spaces, diversity of building typologies, quality of streetscapes, landscape design, Space for future developments
Management	Facilities Management, Building/Site Maintenance, Monitoring Stakeholders Control, Operation, Site and services approach to housing provision (Where government provides services such as roads, utilities and basic building framework)
Transportation	Public Transport, Traffic Management, Sustainable Mass Transit, Cycling Network, Pedestrian Network, Car Sharing Schemes, Smart Location, Street Network, Proximity to community services, Walk-able, human-scale, transit-oriented
Governance	Environment, Local Context, Politics, Civil Society, Local Planning Approval
Land-use	Increasing sustainability through Density, Sustainable Corridors, Green Spaces, Residential Schemes, Public Services, Effective use of Land, Business Area, housing density, Compact Development, Homogeneity of houses (Courtyards, duplex, triplexes and galleries)

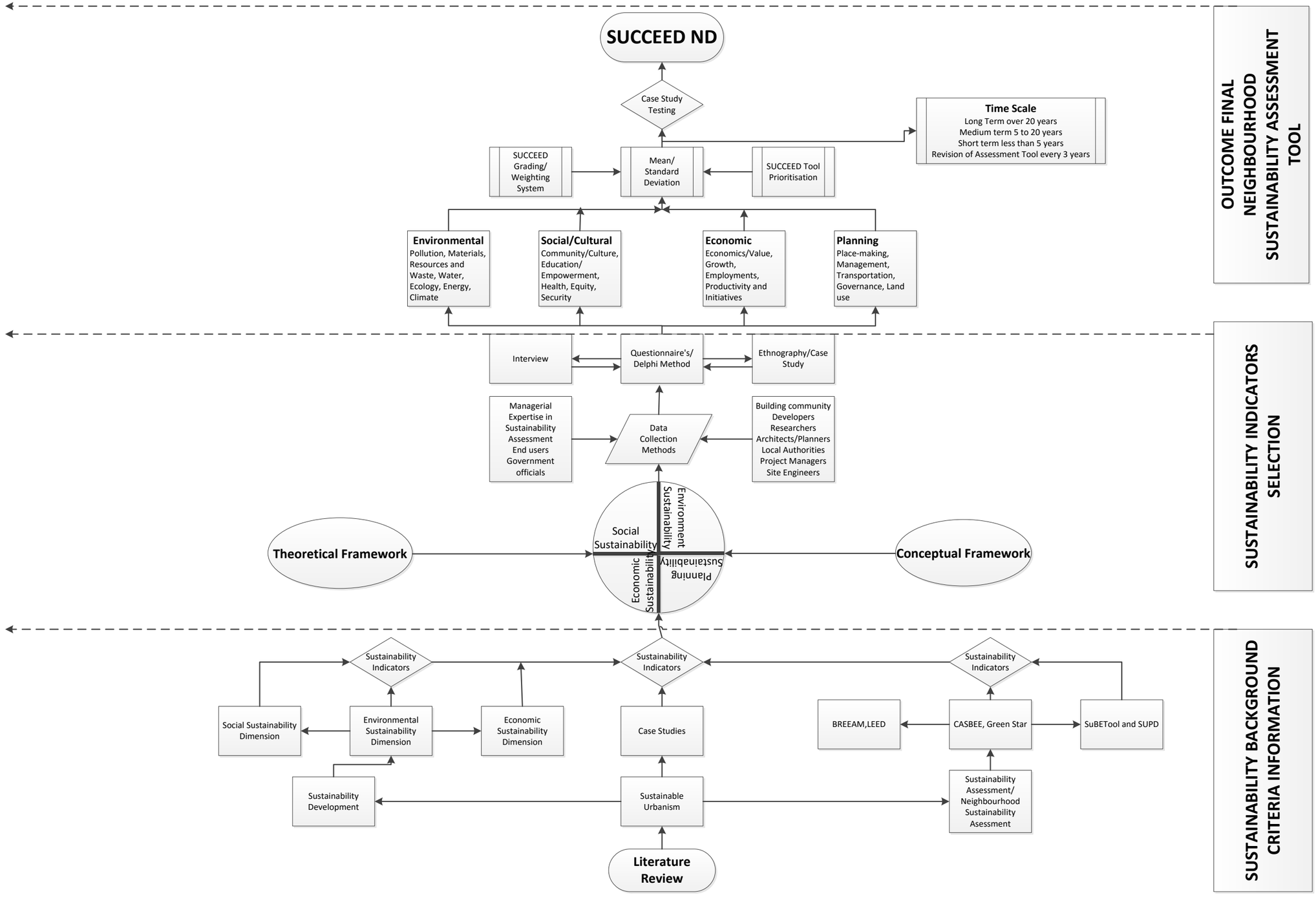


Figure 6.8: SUCCEED ND Tool: Development Process

6.5 CONCLUSION

This chapter has revealed the need for selecting indicators as a means of implementing sustainability. It also looks at the importance of prioritising sustainability indicators with regards to the context thereby developing a tool that respond to the region's needs, aims and aspirations. Also, well-recognised existing assessment tools (LEED, BREEAM and Green Star, CASBEE) and emerging tools (SuBETool and SUPD) were studied in order to understand how a proposed model could be designed for developing countries. The researcher discovered that these assessment models have similarities and differences and also merits and demerits, and used this knowledge in developing the proposed assessment models. The tool designed (SUCCEED) was developed based on the important aspects of sustainability required within the Nigerian context, by focusing on the overall knowledge extracted from sustainable urbanism and sustainability indicators, the studied assessment models, and the sustainability indicators used in the case studies within Chapter 3. To propose a new tool it was important to identify the gap between the existing tools and the reason why it was important to develop a new assessment model. This chapter has shown that one of the main results that was obtained from this part of the thesis is that there is a real need for creating a comprehensive and effective framework for sustainable urban development implementation strategies that is based on scientific knowledge and a methodological approach based on the unavailability of a current assessment method within most developing countries - and specifically Nigeria.

The following chapters explain the data presentation, analysis and discussion, the development of SUCCEED, and testing the assessment tool on a case study, followed by recommendations and conclusion. This chapter presents the analysis and discussion of the study and data collection which leads to the development and validation of SUCCEED, and finally refines the assessment tool to suit the proposed context of study. This has also showcased how experts, stakeholders and the community members help in designing the framework and also contribute to the current knowledge of sustainability assessment development and the overall recommendation for its applications to the built environment.

CHAPTER SEVEN: ANALYSIS OF FINDINGS AND REFINEMENT OF SUCCEED TOOL

7.1 INTRODUCTION

In this section the analysis of the research process is presented using both qualitative and quantitative methods. Four sections of the interviews are analysed; 1) the definitions of sustainable development and sustainable urbanism, 2) how can we adopt sustainability and sustainability indicators? 3) urban governance and sustainability, 4) lastly sustainability assessment and implementation of assessment tools. The very essence of this research project is to design a novel neighbourhood sustainability assessment tool that can assess or measure the level of sustainability in urban spaces. Again, SUCCEED, which is a new and innovative technique, is tested to study its effectiveness within Nigeria Abuja Urban Neighbourhoods. Altogether 30 interviews were carried out and the analysis of these interviews begins from recording the interview session, transcription and detailed analysis, which are explained in this chapter. The analysed data are classified into themes while the interviewee's quotations are recorded in italics. The themes are also described alongside the literature to identify similarities and difference. The analysis of the questionnaires is carried out based on the results from the interviewees' responses. Both interview and questionnaires are inter-related and the support/inform each other in order to satisfy the justification of selecting this sustainability indicators. Also the calculation of the mean and standard deviation helps to creating the weightings and prioritisation of each category of sustainability and its sustainability indicators which resulted into a more refined set of indicators suitable for the Nigerian context.

7.2 OVERVIEW OF INTERVIEWEES' DEMOGRAPHIC INFORMATION

The interviewees fall within three groups - academics (10), practitioners (10), and government officials (10). The groups were chosen to create an overall holistic approach in regards to the knowledge gap between them as it could be argued that the academics are known to be the facilitators, the practitioners are the implementers, and the government officials are the policy makers, coded as "A", "P", and "G", for academics, practitioners and government officials, respectively.

7.2.1 Respondents' Academic Qualifications

The researcher identifies that most of the academics have a degree, a Master's and/or a PhD. Specifically one has a Bachelor's degree, three respondents have attained a Master's degree and six hold doctorates (making a total of 10). This explains that the academics are well

positioned to know about current trends on sustainability in the developing countries. Among the practitioners' group, two respondents had undergraduate degrees, five had Master's degrees and three held doctorates. This shows that the management of construction projects has drifted from the general perception of vocational to degree-holding managers, although one may argue that it is not the underpinning perspective of the industry; there are managers with doctorates as well. Lastly among the government officials, five held undergraduate degrees, three held Master's degrees and two had achieved doctorates. With these statistics one can agree that literature, both past and current, tends to indicate that academics in construction tend to attain higher degree qualifications. Table 7.1 below indicates the structure and format of the interviews with "**Pn**" where P represents the participant and n number of the position of each participant.

Table 7.1 Lists of academics, practitioners and government officials with codes

List of Academics (A)	**List of Practitioners** (P)	**List of Government Officials** (G)
Academic 1 (P1)	Practitioner 1 (P5)	Gov. Official 1 (P8)
Academic 2 (P2)	Practitioner 2 (P3)	Gov. Official 2 (P16)
Academic 3 (P4)	Practitioner 3 (P7)	Gov. Official 3 (P19)
Academic 4 (P6)	Practitioner 4 (P9)	Gov. Official 4 (P17)
Academic 5 (P10)	Practitioner 5 (P11)	Gov. Official 5 (P20)
Academic 6 (P14)	Practitioner 6 (P12)	Gov. Official 6 (P21)
Academic 7 (P15)	Practitioner 7 (P13)	Gov. Official 7 (P22)
Academic 8 (24)	Practitioner 8 (P23)	Gov. Official 8 (P18)
Academic 9 (P25)	Practitioner 9 (P27)	Gov. Official 9 (P29)
Academic 10 (P26)	Practitioner 10 (P28)	Gov. Official 10 (P30)

7.2.2 Respondents' Professional Qualifications

Specifically, five out of 10 respondents (academics) are professionally qualified with some certain affiliation to a membership of a chartered institute. Also eight out of 10 respondents (practitioners) interviewed were professionally qualified**.** Lastly three out of 10 respondents (government officials) were professionally qualified. These statistics indicate that practitioners' endeavours to become professionally qualified in comparison to academics; and that the academics are professionally qualified in comparison to government officials. The bar chart in Figure 7.1 below illustrates this. Therefore academics endeavor to achieve the highest

qualifications (Master's and Doctoral degrees) while practitioners endeavour to achieve professional qualifications.

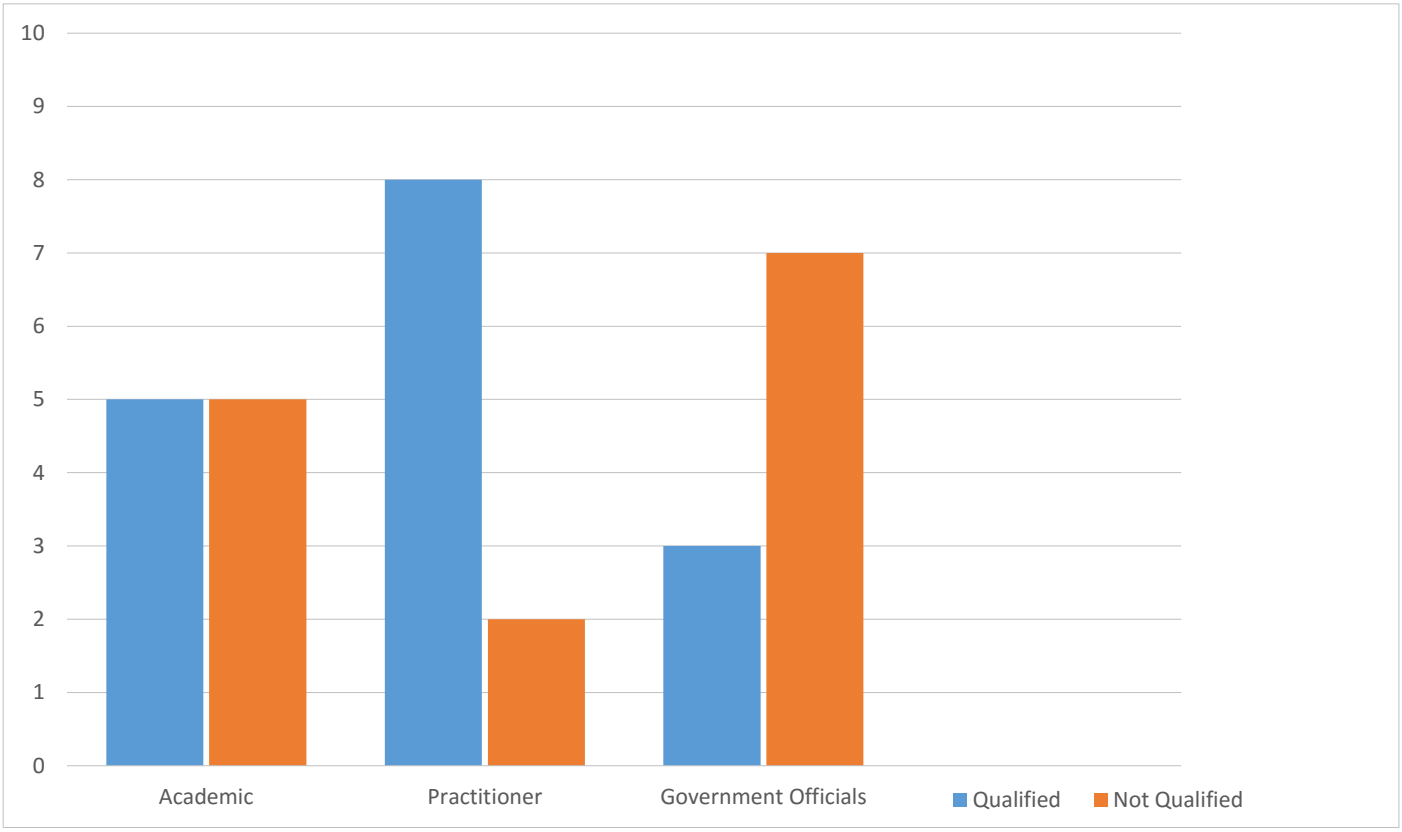


Figure 7.1: Professional Qualification of the participants

7.3 WHAT IS SUSTAINABILITY AND SUSTAINABLE URBANISM?

Here, we seek an understanding of sustainability and sustainable urbanism/urban development in the context of developing world. We examine whether the definitions and perceptions of in the west or developed societies are similar to how it is defined and perceived in developing countries. This takes into account culture, climatic conditions, development level and behaviours. The reasons why this definition needs to be studied in the context of developing countries includes the fact they have more natural resources which have not been explored, or exploited and also developing countries are at the verge of transitioning to developed societies. The conceptualisation of sustainable urbanism will create an understanding of urban development in the context of developing worlds within a holistic approach. (See interview questions format in Appendix B.)

7.3.1 Q1 - What is your understanding of Sustainability and Sustainable Urbanism in the context of developing worlds?

There was an agreed definition of sustainability by 11 participants (2, 3, 6, 8, 9, 13, 16, 23, 24, 28 and 30) that sustainability is a buzz word across different sectors and it is suggested that it is

> the consideration in the use of resources for the present generation without hampering its future extinction therefore using resources efficiently in other to meet the needs of our future generation as well.

Four participants (1, 6, 8 and 24) suggested that, looking at the Venn diagram, the emphasis in developing countries is not as equal as some people perceive it to be. Most issues affecting people in developing countries is forgotten in the developed world and vice versa. From this understanding of sustainability in developing worlds, economic and social aspects are the more pressing because most people do not really know about the impact on the environment. Nigerians, however, tend to manage or conserve their resources, the very act of which represents a form of sustainability, although people are not necessarily aware that they are practicing this. The researcher agrees that some aspects of management in the context of developing worlds can be classed as sustainability. For example, water usage in Nigeria is very minimal in comparison to developed countries not because they have more access to clean water but in Africa there are sustainable means of alternative sources of water, e.g. well, boreholes, streams, rivers, and rain water collection systems (due to lack of adequate water supply most homes have alternative means of collecting water).

Also, some two participants (10 and 12) stated that *''developing countries contribute marginal proportion to factors that trigger global environment degradation and changes in weather pattern"* (Respondent 10). That is why it is important that sustainability is taken serious from inception. According to participant 15, the term 'sustainable urbanism' can be clearly defined as follows:

> Sustainable Urbanism is seen as the development of cities or takes into consideration the design of cities and communities using resources within the community having in mind that those resources are not being used within detrimental impact to the future generation.

Another participant (4) suggested that *''sustainable urbanism models are imported from Europe and America and translated into other geographies without giving it much thought hence mistakes are made"*. This case explains how people try to implement techniques and

models from abroad that might not work due to diversity in context and socio/cultural issues. The researcher suggests that this has resulted in problems like cost of design, construction and maintenance, which is why it is imperative to develop models that respond to the context and needs of specific regions.

One participant (11) suggested that sustainable urbanism is tied to resources exploitation particularly considering the role that urban space plays within the globe. Therefore, if urban spaces are properly managed, then these spaces could become a good resource for environmental conservation as well as tackling the issues of environmental problems. Sustainable urbanism is more around how land use and transportation is organised around factors which are tied to how much energy is consumed, how much waste is generated and how that affects the global environment. Another participant (25) stated that, *"it looks into how land use ought to be organised in a way that it fosters sustainability using concepts such as smart growth and new urbanism".* Another conversation that sprung up between participants 13 and 27 suggests that sustainability urbanism is composed of economic, social and environmental aspects. With the current situation, economic drive in any rural-urban migration is a very powerful factor in urbanisation which leads to economic imbalance. The pressure on urban centres due to rapid urbanisation affects the pace of development which in turn does not accommodate sustainability; and the difference in developed societies, e.g. in Europe, is that when people migrate they bring skills to the urban areas while in Nigeria most people from the rural spaces are farmers without skills, which creates an imbalance of skills. One participant (30) said that it is "*the marriage of sustainability or sustainable development and urbanisation".* It is the provision of social amenities, infrastructures and basic facilities within a sustainable urban environment.

The researcher suggests that to define 'Sustainable Urbanism' the difference between urbanisation and urbanism has to be identified. *Urbanisation* looks at the expanse of land with regards to the population migration, managing present facilities or providing more to make the urban area livable for habitation, while *urbanism* looks at the character of the place and image of the city. The combination of sustainability alongside urbanism is the end result of sustainable urbanism. A total of 23 participants agreed with sustainability as the consideration in the use of resources for the present generation without hampering its impact on future generations, while the remainder had various suggestions. The researcher concurs that sustainable urbanism is the development of urban spaces within the confined principles of sustainability considering the three main dimensions.

7.3.2 Q2 - Do we have an opportunity to shape a brighter future for the built environment using sustainable measures? If yes, which one have you used?

All of the participants answered 'yes' to this based on the present level of development and their experience in sustainability implementation. Looking at statements from scholars like Daramola (2010), Jiboye, (2011) and Olaunjoye (2005) they all have asserted that sustainability development and its principles is the way forward for Nigerian urban spaces. Participant 1 clearly stated that

> …we do but how near is the question because it can be tomorrow or it can be 100 years from now or it can take a while. There is a brighter future because you can see that developing countries are in the infancy of exploiting their natural resources.

Some participants suggest that it is in its infancy stage at the moment and the framework can be developed looking at both short-term and long-term perspectives. This can be incorporated with key performance indicators (KPIs) to actually measure the performance within 5, 10, or 20 years and this could be at a country-, regional- or state-level approach. Some participants (7 and 13) shared similar views which suggests that *''we have the potential and we need a multi stakeholders framework bringing key players together to look at this sustainability measures''* (Respondent 7). In Nigeria awareness is the main problem and, to understand how sustainability can affect the entire population, people need to be aware of its advantages and disadvantages; hence experts need to come in and enlighten people on what the future holds (Participants 8, 25 and 29).

One participant (16) suggests that *''we are currently battling with urban planning problems and we need to have a review of the masterplan for sustainable purposes''.* Others suggest that it is possible because the principles behind sustainability is to use resources for a long time in a manner that is efficient, reusable, effective, cost manageable and no finite end. Participant 30 suggests *"that we need an attitudinal change which will lead to a change in our aspirations and with that change we have great opportunities to change our world".* One participant (23) suggests that we (Nigeria) lack basic infrastructure, housing and job opportunities while in other countries sustainability has resulted in energy-efficient homes, job creation, and innovation, among others. Green economic growth is a huge potential only if the areas like the urban planning sector, research/technological development and planning laws are revisited to achieve sustainability.

The researcher suggests that the potential is huge if sustainability is embraced and implemented. The future is bright and developing worlds are supposed to create newer ways in increasing investment opportunities, employment opportunities, income-earning opportunities, infrastructure, and urban development. The researcher suggests that current problems caused by developed worlds should be seen as an opportunity to correct the mistakes that have been made and an opportunity for developing countries not to take the unsustainable path that some developed countries have chosen. Almost three quarters of the interviewees stated that they had participated in projects that have implemented sustainability and that have an element of sustainability. This shows that a high number of participants have knowledge in regards to sustainability.

7.4 HOW CAN WE ADOPT SUSTAINABILITY AND ITS INDICATORS?

This section is a continuation of section one of the interview questions; it looks at sustainability definition and the researcher realised that the pressing question was how soon, realistically, it could be adopted. In developing countries the norm is that when new solutions to problems emerge, the entire stakeholders tend to look at various perspectives before elements of sustainability are adopted. The fact that most sustainability assessment tools are designed or geared towards a country's needs, context (environment/culture) and timeline (inter-generational/intra-generational) paves the way for successful adoption by starting with the basic form of sustainability and then increasing the benchmark as time passes. Various participants gave their perceptions on how sustainability could be adopted either by self-initiative or from top-down approach and lastly bottom-up approach. At the end of this section the adoption of sustainability is based on a multidisciplinary approach of various techniques. This influenced the researcher's overall conclusions, contribution to knowledge, and general recommendations for practitioners.

7.4.1 Q3 - How can we develop a sustainable urban planning system which integrates buildings and urban spaces designed with sustainability criteria? (Government Level)

It is agreed there are numerous political and economic issues at present in Nigeria but that does not hinder the adaptation of sustainable urbanism (Danjuma, 2013). The researcher suggests that the wheel should not be reinvented and there is nothing that cannot be done that has not been accomplished elsewhere, so technically it is not going to be difficult to develop a

sustainability assessment tool. Participant 4 suggested that *''the difficulty is that political power is very strong in Nigeria and they have the higher will in influencing decision change''*. Participant 1 suggests the need *''to review the statutes, laws and statutory requirements. Nigeria is a good environment because a lot of projects are driven by the government''*. Further responses from other participants (3, 8 and 9) suggest that the government, academics, sustainability built environment experts and stakeholders have to sit down together to develop very robust planning laws, building regulations/control, environmental protection acts geared towards sustainability. The researcher suggests that the problem lies in enforcement schemes and the lack of institutions and institutional building capacity to implement necessary policies. Also any regulations to be generated should be tailored to Nigeria's needs, culture, context and response to climatic conditions (Daramola, 2010).

One participant (11) suggests that *"cities are engines of gold and development and an opportunity for income-generating activities and better livelihoods,"* and this can be achieved by having leaders with urban planning visions. This can be a top-down approach through policy implementation. Other participants (15 and 28) suggest that one of the key issues to be addressed is how to look into key legislations because in every decision made the public sector plays a vital role. Hence, what is needed to be done includes developing policies and programmes that will help to re-orientate the way people think to be more sustainable. Policies should align with key strategies which are to be adopted and implemented. Also policies that are well designed become beneficial if the government puts these strategies into action. Participants 7 suggest that "*the government has to initiate some policy-driven measures like incentives and finances"*. Also participant 18 suggests "*the need to restructure our (Nigeria's) regional planning laws to create provision for development, at local, state and federal levels"*. Each level has its own development plans and all have to be integrated to work efficiently. Also with the plans made available they will be an addressed development moving from the local to state and then federal levels.

Overall, adopting sustainability would have to be based on the will to improve information systems. These responses have indicated various approaches in which buildings and urban spaces can be designed with sustainability criteria. The researcher agrees that implementation would be successful through a multidisciplinary approach or using various methods. Therefore the successful implementation of rules and planning regulations within urban spaces can be beneficial if properly integrated and managed.

7.4.2 Q4 - How can stakeholders (built environment experts) develop a system where they could collaborate in decision making to achieve sustainable development as well as ensure that they adopt a sustainable planning system? (Local Level)

This question led to various suggestions and recommendations by the participants. Participant 1 suggests the need to *''understand sustainability from a multi-disciplinary perspective. BIM adaptation with collaborative design can help in the design aspect''.* Another method suggested by some participants (3, 7 and 10) recommends having to use collaborative planning where planning strategies would be used in the design of cities. Built environment professionals are also to ensure that different actors have a stake in whatever initiative is created so that at the end they can take effective ownership of this initiative. Also one participant (5) suggests using

> EBD from the foundation which is basically a collaborative planning method used across the world both in developed and developing countries. The idea is to build consensus using shared ownership of a vision/objective.

Some participants (8, 20 and 23) suggested that "*sustainability can be achieved through bodies and associations like NIA, NIB, NITP, and NIE coming together to develop a framework"* (Respondent 23). The researcher agrees that these government bodies and professional bodies can collaborate together under the umbrella of the Association for Professional Bodies in Nigeria and discuss issues; through that platform new building codes and assessment frameworks can be developed. Also workshops, conferences and meetings are held to ensure standards are not compromised by discussing pressing issues or other themes which include sustainability implementation.

Other participants (12, 13 and 18) shared similar views and suggest that the Green Building Council of Nigeria (GBCON) can be a point of contact in implementing sustainability at all levels. They can create a framework and work on proper implementation of local green building laws. This agency can also create awareness through lectures, workshops, activities and seminars discussing sustainability education within the built environment. Also demonstration projects, research projects, pilot schemes and university projects can be used. Public participation is another bottom-up approach by contributing and seeking people's opinions, needs and aspirations which are incorporated into the design.

The researcher acknowledges that sustainability implementation cannot be driven by one institution alone; rather, it is an initiative that can be adopted by professional bodies, NGOs, governmental organisations and other institutions. Ministries and professional bodies can

support each other by presenting memos at the Federal Executive Council and, once it has been adopted as a policy, it can be implemented into the system as an example among others. There are various approaches to adopt sustainability and, for this action to be beneficial, it must pass through professional bodies as well as those at the state and federal levels, then it can become a very beneficial approach in adopting sustainability.

7.4.3 Q5 – In Nigeria are stakeholders aware of the range of sustainable assessment methods? If they are not aware, what seems to be the problems?

The awareness on sustainability assessment methods and how the indicators are measured is an area that has recently just started to emerge into the limelight both in developed and developing countries. This question has been clearly answered by a few while some do not know the current situation with regards to this topic. One participant (10) suggests that *''they are not aware, maybe a few''*. The built environment professionals are well positioned to drive the awareness of global environmental sustainability. The reasons for this include that it is a waste of time and it would add to overall cost. According to some participants (6 and 7), they suggest that in general some of the experts who are learned and well-travelled who are exposed to recent development within the built environment are aware but the extent in which it's applied into their design is the question

Individual level of knowledge affects each level of awareness hence when there is low level of exposure to these indicators and sustainability tool it will then affect the entire process. Also participant 9 clearly states that *''they are aware of sustainability in broad terms but in regards to sustainable techniques they have limited knowledge''*. While some participants 12 suggest that in Nigeria there are no assessment criteria, in the legislation. *''You can't force people to do what is not legislated. The truth is that nobody is aware''*. Others suggested that some are aware but not as much as they should but it is a gradual process. Some participants (20 and 25) suggest that definitely a certain amount of professionals are aware because when initiatives are been created the key question becomes how sustainable is the model? and participant 29 states that "*actually people are aware but putting it into practice is a challenge.''*

The researcher concludes that the main reason why they are not aware is that the level of exposure in the country with regards to sustainability indicators is minimal. The researcher affirms that people do not see global warming as a major problem in developing worlds where food and adequate shelter is still a priority. Hence it is the case of poor enlightenment and lack

of involvement of people with government initiatives because when people are informed about the benefits of sustainability from a long-term perspective and introduced to the basic level of sustainability implementation, it can be easily adopted and introduced into the country before advancing to higher levels of sustainability. The government can be a start point with regards to effective sustainability implementation strategies. The participants are into two groups - 25 per cent believed that people are aware while 75 per cent did not agree with the level of awareness, stating that most Nigerians are not aware.

7.5 URBAN GOVERNANCE AND SUSTAINABILITY

This section of sustainability looks at the relation of urban issues with sustainability. In Nigeria there are pressing issues that debunk or resist the idea of adopting sustainability. These include current existing policies/norms in construction practices, high rate of poverty which affects the idea that suggesting sustainability can be expensive and that it is a western initiative, high illiteracy levels, high land prices, inadequate services from the government, the cost of production and maintenance and sustainability not been among the top areas of focus when proposing new or retrofitting existing developments. In this analysis there have been some arguments that have shown that sustainability could be carried along by the government or by individuals stating that this could be a two-way string instead of relying on one scheme. Both approaches can complement each other in order to achieve the final goal of this research.

7.5.1 Q6 - How can existing policies, practices and issues like high rate of poverty inadvertently debunk the adaptation of sustainability agenda? How realistically do we need sustainable urban planning and how soon can it be achieved?

The main purpose of this question is to investigate participants' understanding on what their opinions are on these pressing issues. Most participants stated that these current issues that affect most developing countries should not upset the adaptation of sustainability. The first participant (1) states, *''clearly we need it, we are part of the human race, we are sharing the world with other people, and we have to take responsibility for our actions".* Another participant (4) suggests that *''sustainability can be a means to sort out people's problems''.* Some participants (5 and 6) shared similar views and suggest that poverty affects sustainability but can be used as an opportunity for job creation or skills improvement. The researcher agrees

that people are more concerned with economic sustainability because of the level of poverty and the level of awareness is not high in regards to environment sustainability.

One participant (7) suggests that *''for any sustainability framework to work, basic needs has to be sorted out, e.g. food, agriculture, health and education''.* This would start the entire process of development. Some participants (8, 10 and 12) suggest that "*it depends on the level you want to take sustainability to; for example, a basic level can be achieved even with the level of poverty''* (Respondent 10). It was agreed that in order to achieve sustainable urbanism there is the need to reduce the rate of poverty growth. Poverty can affect the adoption of sustainability but sustainability has numerous positive outcomes and one of them is poverty alleviation. Urban communities provide growth for people to work in factories, offices, shopping malls and to enjoy other job opportunities. Also there is a reduction in travelling distance, reuse of the materials, use of affordable building materials, education, work and live units which reduces transport and CO^2 pollution (Farr, 2008).

One participant (15) suggests that *''sustainability is linked to accepting new concepts and technology, peoples mind set and people's resistance to change and also culture''.* The researcher further explains that poverty, bad governance, lack of awareness, poor mortgage systems and high rate of corruption are key issues that can affect the adoption of sustainability. According to some participants (20 and 23), sustainability is cheaper than what people think it is and it's an attitudinal thing by accepting a more sustainable way of life. Further discussion agrees that if overall investment cost becomes expensive the government should give incentives, e.g. lower tax and green loans: *''The more sustainability is used the lower prices will drop for this concept and it will now become easier to invest'' (Respondent 23).*

The researcher suggests that, in general, sustainability implementation in developing countries should not be a problem. The overall interview suggests that sustainability is important no matter what level of development or poverty is present. It may take a longer time to achieve certain targets as compared to the UK because of the level of development; e.g. developing rural areas, empowering people, and educating the populace. The existing policies and practices can be rewritten, better tailored towards sustainability implementation. Lastly, although the use of technological solutions to achieve sustainability could be expensive, it can be achieved by adopting the basic level of sustainable urbanism which can be the starting point.

7.5.2 Q7 - Current arguments by builders and economists suggest that we cannot afford initiating sustainability: reasons include high land prices, and inadequate services from the government, as well as the costs of production and maintenance. What is your opinion on this?

This question looks at the cost aspect of sustainability, highlighting the fact that most perceive it as a money-making initiative or as been expensive. Participant 1 agreed with this question, stating that *''everything comes with a price - if that high quality is sustainable you have to pay more for that''.* Participant 2 says, *''It is not cheap to generate renewable energy sources'',* while participant 5 states that *''yes it can be expensive, it can add to the cost of construction. The savings are mostly long-term savings''*. Participant 9 asserts, *''It's partly yes and partly no''.* Some other participants suggest that not all aspects of sustainability are expensive, *stating that ''I don't think you need technology to be sustainable at all''* which the researcher agrees with as well. Participant 6 suggests that the *''mindset developers have is that sustainability is quite expensive, not in Africa alone but developers worldwide*".

Some participants (11 and 17) suggest that ''*high land prices is not a barrier but rather is a potential if you have a functioning mortgage system but inadequate services is a barrier''* (Respondent 11). Participants 15 disagree with this argument, suggesting instead that "*sustainability is not expensive if you compare the benefits with the costs, and that the benefits outweigh the costs''*. Another participant 17 suggests that, ''*I quite disagree with the issue that land values and sustainability are two different issues because sustainability is an attitudinal thing''.* For example the government builds high-rise structures for people to live in at reduced rents. But if it becomes a Public Private Partnership (PPP) project, individual developers create these high-density spaces and charge exorbitant prices as rent or mortgage. Hence people cannot afford the costs because developers are making profit from their investments.

Sustainability can be a luxury or an expense depending on the level of sustainability to be achieved. The mindset most developers have is that sustainability is quite expensive but the researcher agrees that some practices being conducted are sustainable without knowing; for example, low tech can be high tech. In general it depends on the sustainable planning techniques, policies, the people, and levels of knowledge and enlightenment. Couret (2000) argues that with the level of development achieved by developed countries mostly in Europe or America they tend to be known to have fewer social issues compared to developing countries. They have better standards of living and generally people have jobs and regular income to support their families. Hence basic human needs such as food, shelter, clothing,

education and healthcare system are already resolved. But, in developing nations, people would not worry over conditions like environmental factors, renewable energies or nature in comparison to health, transport or housing. In order words developed and developing countries have different priorities (Couret, 2000).

7.5.3 Q8- Is the sustainability agenda amongst the top foci when proposing new developments in Nigeria although other foci includes location, capital, investors, economic feasibility and growth, amongst others? If so, how can it create a knock-on effect on these agendas or reasons for developments?

When developments are proposed, a range of ideas and reasons are focused on the project. This question looks at if there are any elements of sustainability already in current-day practice. This will create a linkage if most construction projects have been practicing sustainability without knowing. Most participants suggest that sustainability is not seen as a priority in any development. Participant 1 stated, *''No, it's not a priority but yes, it can create a knock-on effect but there has to be a business case for it in Nigeria's case''*. Participant 4 said, *''No, not at all. I think sustainability is nice to have among the foci''.* Some participants (3 and 10) stated *''I can't say yes or no but looking at MDG goals they are not sustainability agenda. But taking indicators like poverty eradication is part of the sustainable agenda'' (Respondent 10).* The researcher affirms that even if sustainability is not been mentioned other factors mentioned when proposing a development can be an aspect. Participants 7 suggest that "*yes it's been presented just at the early stage and for publicity and in most cases becomes a theoretical exercise".*

Some participants (11, 13 and 26) state that all over the globe the word sustainability is the least considered not just in Africa "*It is the least factor to be considered by the government"* (Respondent 13). But an aspect carried out in broad scheme is called Environmental Impact Assessment. The researcher suggests that sustainability is a subset of EIA and that other frameworks are Nigeria's Local Agenda 21 and Nigeria's National Sustainable Development policy which people do not know about. Policies need to be localised from the grass roots to become fully functional. Other participants (20 and 21) state *"that economic factors affect investment and all those other factors stated in this questions are elements of sustainability indicators as well*". They are interwoven no matter how environmentally- friendly they are;

whether they are socially acceptable or unacceptable; and whether or not they are economically not affordable.

The researcher concludes that there is a link between sustainability, economic feasibility, location, capital, investors, economic feasibility and growth amongst others. Most initiatives are knock-on effects on sustainability but people do not realise that this proposal has been introduced to support green growth or a sustainability initiative. Sustainability can be seen as a core issue in the minds of stakeholders even though it has not been emphasised. Sustainable planning policies should be made an agenda which could be a legislation that can help with the planning system of the country. Overall, for sustainability to function properly, all key dimensions have to work effectively.

7.5.4 Q9 - Are we practicing the use of enquiry-based design which involves the design of our environment consulting and involving stakeholders and the local communities? Can this be actualised?

This question seeks to understand what they participants believe to be the current situation with regards to involving local communities to participate in delivering a successful project. For a development to function properly, the end user of the host community must participate in the successful consultation of the project from inception to post-occupancy. Enquiry-based design is seen as an important tool used in modern-day planning and design. It is defined as a design approach where all stakeholders are actively involved in the process and procedures of design (Farr, 2007). In participatory design the public are also recognised alongside the stakeholders, bringing them together into the process as well. Participant 8 suggests that, *''yes, it's been implemented mostly on a large-scale project that affects local communities - that's why EIA is a public assessment''.* Participant 7 believes that *''community participation matters but it is not every project that community members have a say in."*

Most interviewees do not believe that this concept has been adopted in Nigeria. Some participants (4, 9, and 10) do not believe that EBD is conducted at all in Nigeria. In general, though, most participants believe it can be actualised and the approach is to involve the host communities, which is not an ad-hoc process. Other participants (11, 16 and 21) suggest that it is possible to implement EBD but, at the moment, only World Bank-assisted projects and EU funded-projects emphasise participative planning which helps to improve local empowerment

and social development. There is also the Urban Planning Decree 1992 which states that when undergoing such projects the host committees should be involved. Participant 16 states that

> "there are not much convincing schemes going on; we hope in the future this process will come in. There is evidence that a lot of the housing schemes by government or public are being abandoned because they are not suitable for its users".

For example, in Abuja, the end users might suggest that it does not work because they feel it might not be affordable to them. In other locations, too many demands from the community might end up with a useless plan. The researcher further states that in every community-based participation or enquiry-based design planners need to involve the host community in order to integrate the project properly. In cases where end users are not carried along from the planning stage it becomes a big problem for the government and its benefactors. Most participants have shown signs that few practices across the country which have the propensity to become the norm within the construction industry. There are few cases because people are driving its adaptation alongside EIA. The researcher concludes that, with time and if properly adopted, EBD will be a big design process and sustainability implementation is going to be adopted alongside it.

7.5.5 Q10 - What can the government do to empower local communities to be more active in delivering sustainable places?

This question intends to determine how the government can make sure that local communities are actively involved in projects that aim to achieve sustainability. Most people came up with various ideas; for instance, participant 1 clearly asserts that *''policies, rules, regulations, creating standards, incentives, tax credits, sustainability assessment and measurement'',* while participant 3 states that *''it can be done through engaging them in the construction process, known as collaborative planning. It deals with what they want. What do you think? How can we do it?"* Participant 4 suggests clearly that *this can be achieved ''by new groups, new enterprises and engaging youths. Provide training as well as giving them the drive to keep the ball rolling for the future''.* Some participants (5, 6 and 8) believed in education and have a similar mindset that education is the key to sustainable development; participant 6 also said that it is not just about the knowledge of sustainability but it needs to be built into the economic solution - for example, when recycling plastic bottles, water bills fall. Hence, direct benefits through economic benefits can instigate this norm. Participants 15 suggest "*better awareness and better education through the use of pilot projects or schemes".* Also the government can

partner with the community sector that is able to embrace new ways or standards of thinking; such as partnering with committee-based organisations and providing them with an environment that is conducive to striving, and incentives to support their projects. Other participants (21 and 24) suggest the need to have experts to empower the local community's experts; e.g. BRE.

In general, through educating, empowering, training schemes, giving the local community a voice to learn about the impact of sustainability, involvement and support, the local communities can go about the delivering sustainable communities but the government needs an effective physical system to incentivise or disincentivise consumption. The government can bring in policies that take into consideration the feelings and expectations of the people, the related rules and regulations, creating jobs, creating standards, incentives and tax credits, and assess how sustainability can be measured looking at the benefits before and after from range of different scenarios where the proposed tool or tools can be initiated. Also facilitating public engagement with local communities can be commanded and controlled by using economic incentives, such as creating jobs when mega-projects are going on, and the use of material with minimum impact to the environment. Overall the researcher recommends the 3Es - *education, enlightenment* and *engagement* - to empower local communities.

7.6 HOW CAN WE ASSESS AND IMPLEMENT SUSTAINABILITY SUCCESSFULLY

This final interview section gives an overall detailed understanding on how to assess, examine and implement sustainability within the Nigerian context. Sustainability assessment is a tool used to measure the level of which an environment has achieved a certain degree of sustainability and it is normally graded in standard from poor to excellent. Assessment methods within the built environment have become a very popular research area in recent times and most developed countries have designed their tools which have been localised to suit their specific culture and context (Haapio, 2008c). In addition, as environmental issues become more pressing, a comprehensive urban assessment method is required to assess the performance of urban spaces across a broader range of sustainability dimensions.

7.6.1 Q11 - How can we establish an agency that regulates, operates, encourages and supervises the development of spaces in sustainable communities based on a set of standards?

Most participants believed there are existing agencies; however, what we need is for them to be trained and equipped with the right knowledge on how to handle the supervision of these urban spaces. Participant 1 states clearly that, *''the UK has BRE and other agencies that supervise sustainable construction. We actually need to incorporate this establishment into one of this parastatals'',* while participant 2 said that *"we have an organisation called FEPA and their role is to monitor the environmental impact assessment of projects".* EIA standards can have sustainability planning initiatives embedded in their policies in order to kick-start this implementation. Participant 4 suggests that it could be established but it would not work if it is not properly implemented and if there are no control measures or laws in place.

Also participant 5 suggests that *"we need to have someone to lead the current agencies to overlook issues like planning application, approval and enforcement".* An example in Gabon is that there are agencies that manage or supervise the development of projects a couple of days a week to ensure each one meets sustainability standards. Participant 9 explains that they are existing agencies and people; the agencies should collaborate with NGOs like GIZ, the United Nations and the AFDB, and also work with bodies like BREEAM and BRE to seek advice, collaborate or send people from Nigeria to study or bring professionals to the country for training to enlighten people. Some participants (14 and 28) suggest that the government has to work with private partnership. They should partner with people in all the local governments and report back to the state, and then the state reports back to the federal level. Others (15, 16 and 23) suggested that *"we need a body to look at sustainability development in regards to physical development, physical planning, infrastructure provision and so on" (Respondent 16).* Their job would be to evaluate and assess different projects to see the sustainability indicators that have been implemented.

The researcher analysed that most interviewees supported the idea on having an agency that oversees the area of sustainability implementation, and should be responsible in accepting, approving and enforcement of sustainability. So the agencies will have the overall responsibility of setting out the objectives of the development and looking at the plans required and making changes based on what has happened. At the moment Nigeria has established its own Green building council that will overlook the running of sustainability within the built environment. It is an agency that has the collaboration of various experts within the built

environment so this could be a starter in actualising sustainability implementation. The infrastructure exists but it is the implementation that needs to be strengthened to enforce the rules and laws in order to instill a sustainable agenda into the development of cities.

7.6.2 Q12 - How can smart tools for well-designed communities be adopted in Nigeria and what do you think can be the problems of these tools?

This question looks at how to implement the use of smart tools into the Nigerian system. Participant 1 suggests that *''if an existing building can be adapted, retrofitted to fit into that proposed smart system - once it's done every new development will go this way".* New developments can be modified to fit into these smart codes. Some participants (3, 8 and 10) suggest showcasing an example of good practice for people on what was done and how to achieve more sustainable urban places. But the challenge is that the community may have a lack of knowledge about assessment tools. The researcher suggests the need for sustainability enlightenment, although this might take some time for it to pass through to the mainstream.

According to participant 5 *''there should be an enforcement scheme because developers will not participate if it's not enforced'',* while another 6 suggests that *''I think you can teach it in professional bodies, universities and secondary schools, hence creating skills''*. Participant 8 suggested that, to ensure that sustainability is carried out, there is the need to have a development control manual that suggests what must be done and how the designs are been checked on the basis of the manual. The researcher suggests that policy formulation is key because when policy is placed within implementable phases, e.g. phases one to five, it can be easy for people to implement sustainability using yardsticks for assessment.

Participants 11 suggest that if indicators are imported into the Nigerian context they would require some modifications. Also the conventional planning system needs to integrate sustainable urbanism planning principles. Another two participants (15 and 16) suggest that sustainability is measured based on predetermined criteria so it needs to be legislated into the national building regulations and then have guidance documents developed to assist experts to meet these criteria. Participants 13 suggest that *''standards have to be achievable and measureable".* To have a common idea on how to develop a sustainable built environment all the professionals will come together to select the key parameters and indicators.

Overall the researcher believes that examples with best practices of sustainability will inform people about the benefits and will help drive it into the system. A good example is the Heritage Place Ikoyi, Lagos which is the first LEED-certified building in Nigeria. This will help bring state-of-the-art sustainable development into Nigeria, and with such developments, investors and practitioners will be willing to adopt such designs in the long run.

7.6.3 Q13 - If there was to be a proposed sustainability assessment tool developed for Nigeria, would the government and stakeholders adopt it? What would be the procedure?

This final question seeks to know if the tools would be accepted by the government and all stakeholder groups so as to know if there is a chance of designing a tool that can be implemented or adopted into the system. Some participants (1 and 9) are keen that the government will adopt it, stating that *''it depends on the type of leadership whether local, state or federal, the quality of leadership - educated or not - and what your tool achieves''* (Respondent 9). Also participant 2 states that, *''I am not sure if the government will ever adopt it but the tool must be feasible and robust for its adoption and implementation"*. Other participants (7 and 30) suggest that "*it's possible, if the proposal is good, that the government will adopt it because it's going to change the way procurement, procedure and strategies are been implemented''* (Respondent 7). Also participant 9 explained that the process will be to have an initiative for the government, come up with the presentation and showcase examples of projects and further explain their benefits.

Participant 29 suggests that it depends on your persuasive power and how you sell the assessment tool to the government. All other approaches to be adopted by the government will include written papers, conferences, seminars, and governmental proceeding explaining the tool and outlining the effects. Participants 18 explain that with the current situation, and the levels of awareness and education, it cannot be adopted. The answer is not a criticism of the tool but rather a query over how it is going to work and how to make it work. The main problem is implementation: "*there is no political will to implement sustainability into the urban and regional planning law if it's well implemented it will go a long way".* Some participants suggested that it is not compulsory to use the government to adopt it; for example, participant 13 suggests that "*if you have an assessment tool you need to engage all the professional bodies to be part of its development and adaptation"*. Some participants (14, 15 and 16) also held similar views stating that "*people will gladly accept it because many of the things we have are*

obsolete'' (Respondent 16). It can adopted if the benefits are well explained and easily understood.

Some other participants (20, 21 and 22) suggest that to implement these tools and techniques there is the need to ensure it has various indicators embedded within it. When these tools are tested and work with positive outcomes using a set of approaches then this can be introduced to the main authority. "*You can achieve it by combining various approaches together''* (Respondent 22). Also participant 23

> "to ask the stakeholders what is on ground because if something is proposed and given to them it's possible that this is not amongst their plans. You need to hear from GBCON if they have plans, what have been done, are they interested in something been proposed to them".

The researcher suggests that the best approach is to use a multiple system-based approach by working with necessary key professional bodies, particularly GBCON, and also creating a proposal to the government with demonstrated projects highlighting the key benefits and positive outcomes. Another approach is through sustainability education enlightenment and community participation. The third approach suggested is through written papers, conferences, seminars, governmental proceedings explaining the tools, and outlining the effects.

7.6.4 Overall summary of Interview Questions

The summary of these interviews has showcased a vast amount of data and information that was agreed within a consensus and target specific questions with regards to how sustainability could be implemented in developing countries. Also some questions are related to individual sustainability dimensions which would serve as a basis in supporting or complementing the questionnaire section. This would also influence the proposed assessment tool and also propose sets of recommendations, guidelines and opportunities for further research with regards to any area that were not covered as a result of the research focus. Each question has been summarised with an overall conclusion which reflects the opinion of the participants.

7.7 OVERVIEW OF QUESTIONNAIRE (RESPONSE TO THE MOST APPROPRIATE SUSTAINABLE INDICATORS)

Sustainable communities have been defined as the spatial manifestation of sustainable development principles. Roberts states that "they are places where people want to live, work, prosper and enjoy a good quality of life now and in the future" (2009, pg. 128). To create an

environment that is sustainable, an assessment process is required to embrace sustainability within communities. The main reasons for sustainability assessment are to provide decision makers with an evaluation of the impacts of both proposed and existing developments; also its impact on nature, and global to local changes of social systems looking at both short- and long-term perspectives (Pope et al., 2004). The most effective approach is made by assessing selected individual fields by way of sustainability indicators. The use of sustainability indicators helps decision makers to be more informed about the impact of future developments based on their understanding and past experiences. The list of indicators selected below is specifically chosen (refer to Chapter 6) for their adaptation in developing.

This survey is used to identify which main indicators and sub-categories of sustainability key professionals and non-professionals consider important when evaluating a new or existing development and also create a process in which perceptions can influence thinking of community planning and design. This will clarify any areas of uncertainty and allow those responsible for decision making to offer additional information as well as to validate the proposed assessment scheme creating a more pragmatic tool which will be influenced by the data collected from professionals, stakeholders, end users and, lastly, the general community. The sustainability indicators are rated according to six categories: which are 1 - Not important at all; 2 - Of some importance; 3 - Important; 4 - Very important; 5 - Extremely important; and 6 - Necessary in the near future. This process is be conducted with over 50 participants from various fields and people within the local communities as well which helps in establishing a robust assessment tool to be refined at the end of this exercise. The results are cross-referenced with the interview responses to establish similarities and differences in the data collected. Therefore the indicators with the highest amount of **not important** or **of some importance** are given less priority compared to the **very important** and **extremely important** responses. This helped in establishing both priority rating and weighting of the assessment tool. A sample of the questionnaire is presented in the appendix C (pg.277) section.

7.7.1 Delphi-based Validation Result

The participants were asked to select the level of priority of each dimension in relation to the Nigerian context. A total of 65 people were contacted for this research; of these, 50 agreed to participate in this project. Two rounds of the Delphi technique were completed and the entire process of conducting the questionnaire was carried out from July 2014 through to October 2014. The two rounds used in the Delphi-based validation helped in streamlining the

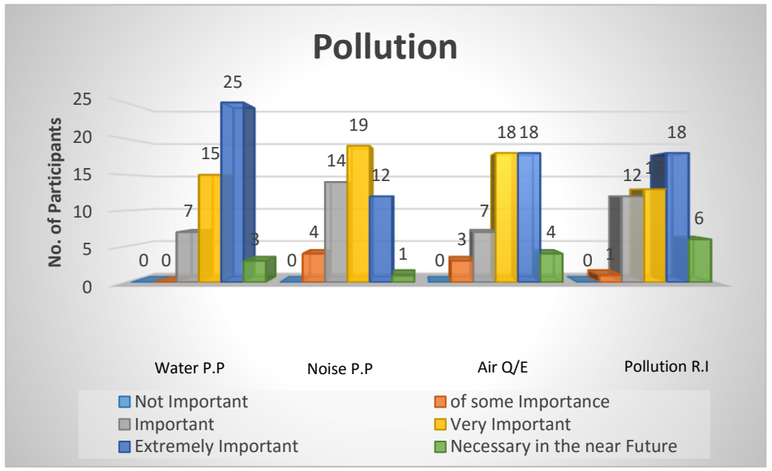
assessment method and to create a list of indicators which were seen to be vital for the Nigerian context. Data analysis was carried out using Microsoft Excel 2013 software because the data could be easily evaluated. The graphs generated from the questionnaires showcase the analysis of the overall perception of 50 participants who took part in this exercise, and the results are then cross-referenced with some of the responses from the interviews conducted with various experts. Also the table within each sustainability category shows that the mean value and standard deviation for each dimension would also influence the results and are used to develop the grading criteria. No participant was compelled to complete the questionnaire which will alter the goal and end result of this exercise. Rather this questionnaire was conducted on an equal level playing ground and each response was based on self-will, individual perception and experience on the requirements in making urban spaces truly sustainable.

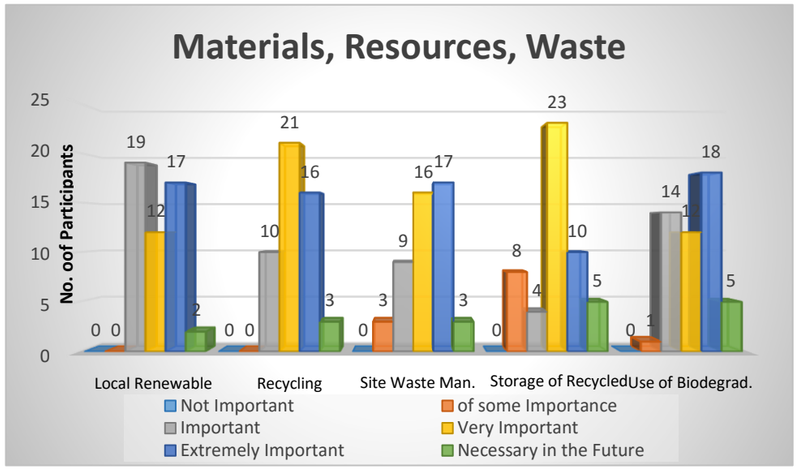
7.7.2 Environmental Sustainability

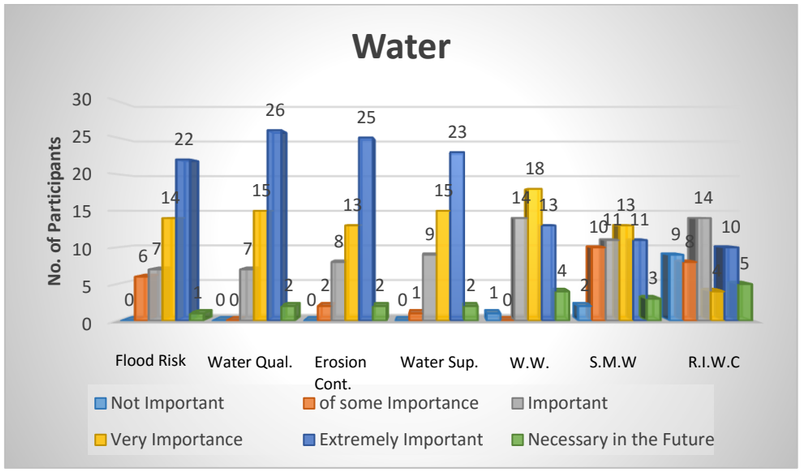
Environmental sustainability is defined as the ability to maintain the factors, practices or qualities that are valued within the physical environment which contributes to the quality of the environment on a long-term basis (Allen, 2009, pg.2). Six main indicators were selected from a sound methodological approach; these are pollution, water, energy, materials (resources/waste), ecology and climate (see Chapter 6). From the graph produced it was understood that the highest amount of importance was from water and energy see figure 7.2 below (and appendix D for the analysis). Material came third followed by pollution, climate and lastly ecology. The interviews conducted suggests that although most neighbourhoods have alternative sources of water supply, due to the high demand of water usage in relation to per-household dwellings, the amount of water dispensed was not sufficient. Water usage is on the high side hence adequate water provision should be made for each dwelling in relation to the amount of people living within that urban space; likewise electricity supply, due to the fact that the overall electricity required to power the nation is not sufficient to provide adequate energy for every neighbourhoods within the country. This has led to power shortage, power rationing and energy consumption management. The results of the questionnaires support the fact that more emphasis should be placed on these main indicators which are water and energy. In relation to materials used, some construction projects conducted in Nigeria with emphasis on Abuja showcase a certain percentage of material reuse but the researcher recommends that emphasis should be placed on this area to make it a priority when conducting an assessment. Climate change, pollution and ecology are areas that have not been taken into serious account

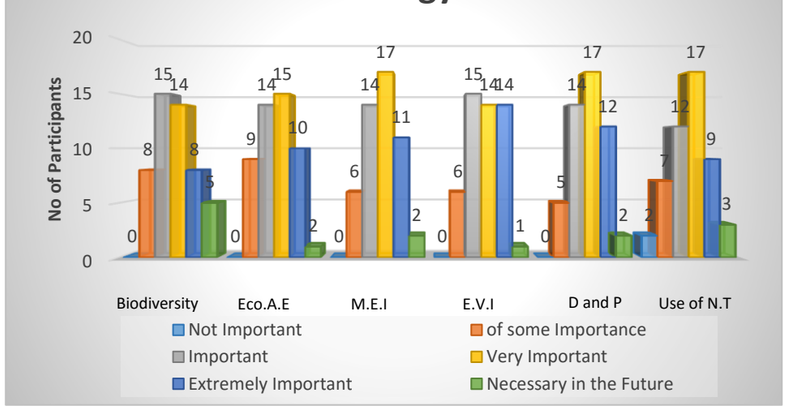
in Nigeria, although slight traces of action in these areas have been seen in some projects. This is because, according to the responses from the interviews, most participants suggest that looking at the position of developing countries they contribute marginal proportion to all factors that trigger global environment degradation that manifest into climate change, desertification, pollution, flood and changes to global weather pattern. Participants 1 and 8 suggest that *"we contribute little or none disproportionately to global environmental degradation".* This statement is a bit contradictive because the way most developing countries are going they are heading towards the same direction in which developed countries have found themselves. For example, China's rate of industrial development over the past 20 years has been remarkable and has made their economy grow exponentially but little emphasis has been placed on tailoring this growth towards a sustainable approach (Zuo et al., 2014). However, these results have shown that even though it is not seen as a priority this should be included in this analysis, and also recommendations should be made to help create an awareness which would place environmental sustainability as a priority. Ecology in this analysis has shown a decline and, in relation to importance and irrelevance, although it is one of the key areas that sustainable urbanism preaches, the graph below has shown only slight distortion in relation to its importance.

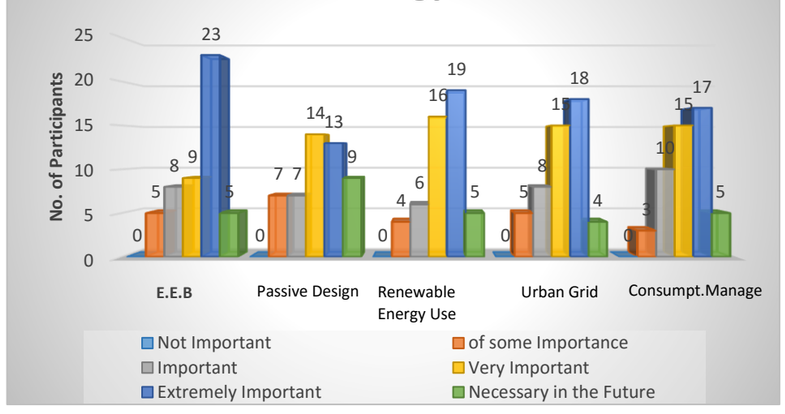
Other sub-indicators with less priority include energy management and reduction in water usage which is based on this exercise; the energy production within the country is not enough to power individual dwellings and the same applies to the water supply. Thus, emphasis should be placed on management alongside the generation of additional renewable energy and alternative water supplies to complement both energy and water supplies respectively.











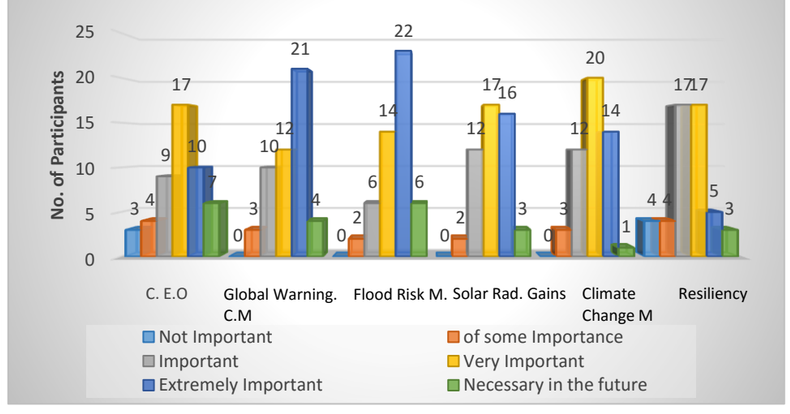


Figure 7.2: Graphs of the most appropriate Environmental Sustainability Categories and Sub-Categories

Table 7.2: Mean/Standard deviations for categories and criteria on the Environmental dimension

Sustainability Dimension	Core Categories	Sub-categories	Mean	Standard Deviation
Environmental Sustainability	Pollution	Water Pollution	4.48	0.76785
		Noise Pollution Prevention	3.84	0.94573
		Air Quality Enhancement	4.26	0.99619
		Pollution Innovation	4.32	1.02839
	Materials Resources, Waste	Local Renewable Materials	4.28	0.93722
		Recycling and Innovation	4.24	0.83809
		Site Waste Management Schemes	4.0	1.28062
		Storage of Recycled Waste	4.0	1.14891
		Use of biodegradable materials	4.24	1.03072
	Water	Flood Risk	4.1	1.06301
		Water Quality	4.46	0.7800
		Erosion control	4.34	0.92973
		Responsible Water Supply Initiatives	4.32	0.88181
		Waste-water Management	4.08	1.01666
		Smart metering-water	3.60	1.29615
		Reduction in Water consumption daily	3.26	1.61009
	Ecology	Biodiversity	3.74	0.98994
		Ecological Appraisal/Enhancement	3.64	1.10923
		Minimising Ecological Impact	3.78	1.044796
		Ecological Value Improvement	3.78	1.044796
		Diversity and Preservation	3.84	1.02684
		Use of natural topography	3.32	1.21012
	Energy	Energy-Efficient Building	4.3	1.15326
		Passive/Active Designs	4.2	1.28062
		Renewable Energy Generation/Use,	4.3	1.06301
		Urban Grid Optimisation	4.16	1.10199
		Consumption Management	4.22	1.06377
	Climate	Climate Emissions Optimisation	3.96	1.34848
		Global Warming Control Measures	4.26	1.05470
		Flood Risk Mitigation	4.48	0.98468
		Solar Radiation	4.12	1.05148
		Climate Change	3.96	0.91564
		Resiliency	3.48	1.20399

The mean was obtained by multiplying the value (value given to each priority of indicators which are not important 1, of some importance 2, important 3, very important 4, extremely important 5, necessary in the near future 6) given to and frequency together and the summed-up value is divided by the total number of participants. The formula is giving in equation 1 below (Taylor, 2006).

$$\bar{x} = \frac{\sum fx}{\sum f}$$ Equation 1

For example when calculating the mean for water pollution prevention using the formula above the summation of the value and frequency is giving as 124 which is then divided by the total number of participants which is 50

$$\frac{1 \times 0 + 2 \times 0 + 3 \times 7 + 4 \times 15 + 5 \times 25 + 6 \times 3}{50} = 4.48$$

The standard deviation shows how much variation exists from the average. A low standard deviation indicates that the data points tend to be very close to the mean and a high standard deviation indicates that the data points are spread out over a large range of values. The formula is giving in equation 2 below (Taylor, 2006):

$$s = \sqrt{\frac{\sum x^2 f}{\sum f} - \left(\frac{\sum xf}{\sum f}\right)^2}$$ Equation 2

For example when calculating for the standard deviation of water pollution prevention using the graph and formula above the solution is provided in the table below

Table 7.3: Standard deviation Calculation for Water Pollution Prevention

x	F	x^2	xf	x^2f
1	0	1	0	0
2	0	4	0	0
3	7	9	21	63
4	15	16	60	240
5	25	25	125	625
6	3	36	18	108
	$\sum f = 50$	$\sum x^2 = 91$	$\sum xf = 224$	$\sum x^2 f = 1036$

$$\sqrt{\frac{1036}{50} - \left(\frac{224}{50}\right)^2} = 0.76785$$

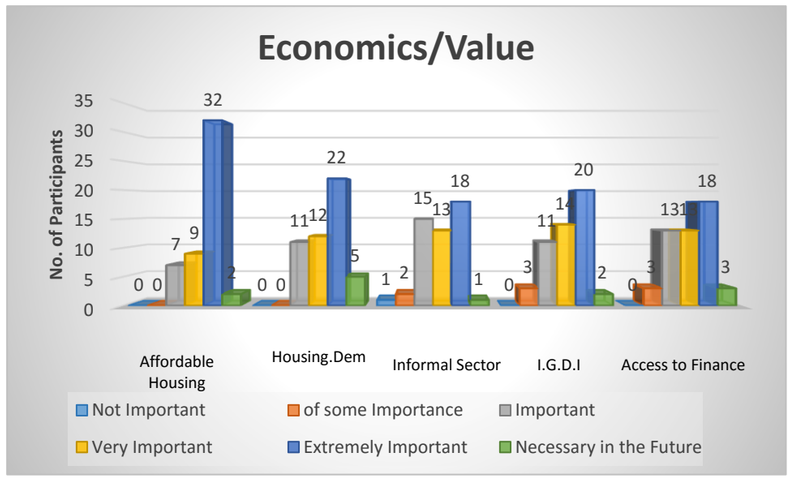
The mean values for the categories of environmental dimension are in the range of 3.32 and 4.48 while the standard deviations for the categories are in the range of 0.769 and 1.61 which means that there is a satisfactory consensus. The decrease in the standard deviation means that the experts show a movement toward convergence and consensus (Vidal et al., 2011). Table 7.2 above presents the mean values and standard deviations for all categories under the environmental dimension as well as their criteria.

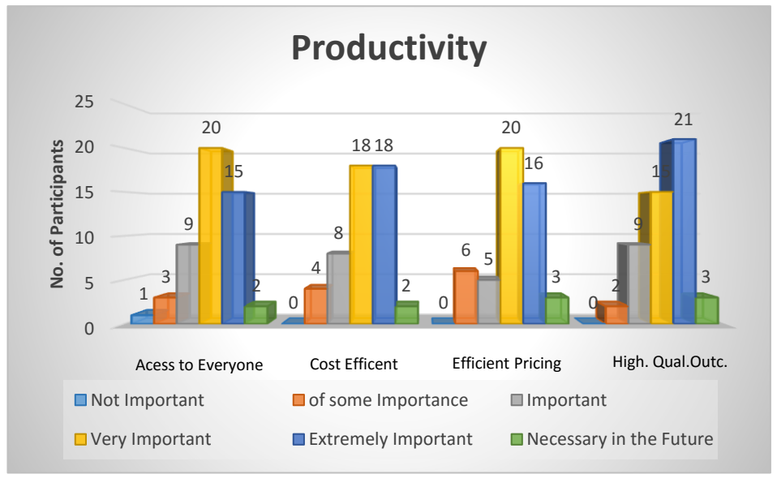
7.7.3 Economic Sustainability

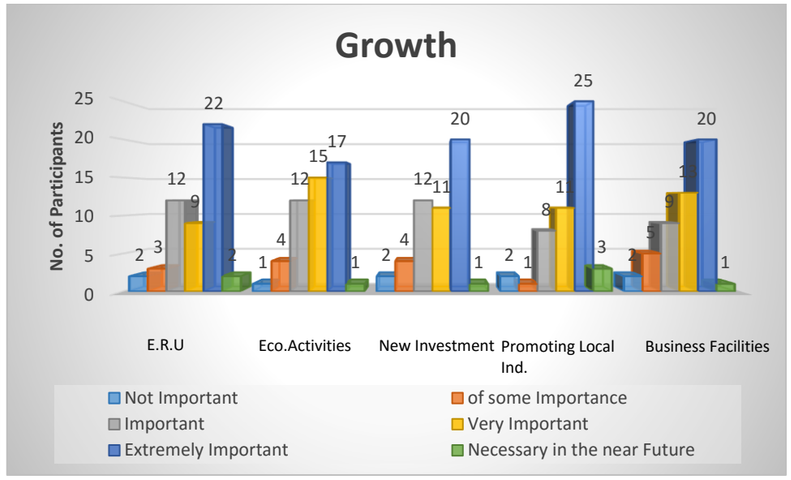
Economic sustainability can be generally defined as the ability of an economy to support or sustain a defined level of economic production, indefinitely (McKenzie, 2004). In relation to the built environment it is a combination of various issues which includes how the development can enhance factors like employment opportunities, growth, urban expansion, affordability of housing schemes, low-cost production of housing, affordable building materials and techniques, among others. In most developing countries in Africa, sustainability is seen as a vital sector due to the fact that the economic drive of a country is what promotes development and increases in the overall GDP of a country. The construction industry is seen as one of the largest generators of revenue to a country's GDP based on the fact that it creates employment, expands buildings and infrastructure construction, and also creates a pull factor where potential investors could relocate to start up a company or take advantage of investment opportunities. Economic sustainability contains five main indicators which are economic/values, employment, growth, productivity and initiatives, and has been proven to be very important in any urban space.

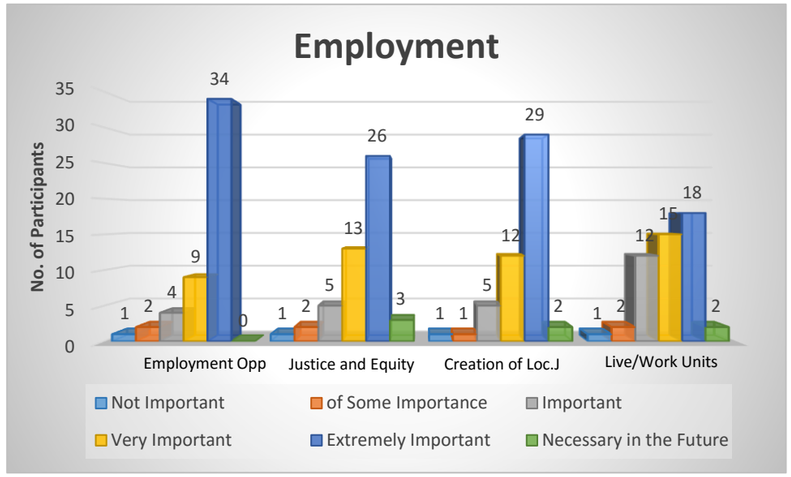
From the graphs extrapolated in figure below all indicators has shown to be very important with the highest indicator on employment, then economic/value followed by growth, then productivity and lastly initiatives. Cross-referencing this graph with the semi-structured interview in section 7.4, the data analysed have shown that economic sustainability should be given priority compared to other aspects of sustainability. Reasons cited are that it should be the driving power of future developments and encourage the adaption of sustainability: in essence, if economic sustainability has been adopted then other aspects of sustainability will follow. Analysing the interview responses, most participants also suggest that, within the three dimensions of sustainability, the economic dimension should have the highest amount of priority and also comparing this to the graph we see that the highest number of responses comes from main indicators like employment, economics/value, and lastly growth. The interview

responses suggest that economic factors affect investment and all other elements of sustainability indicators as well. To create a more sustainable environment in Nigeria, aspects like employment opportunities, affordable housing, access to finance and loans, promoting local industries, new investments initiatives and high quality outcomes are areas of focus that achieved the highest number of "extremely important" responses from the participants. The researcher concludes that this feedback suggests a call that all urban spaces should respond to these sub-indicators. From this analysis it would be agreed that emphasis should be placed on economic sustainability because any project that aims to achieve this dimension will create a window where other aspects of sustainability like social/cultural, planning and environmental can integrate properly, work together and function appropriately.









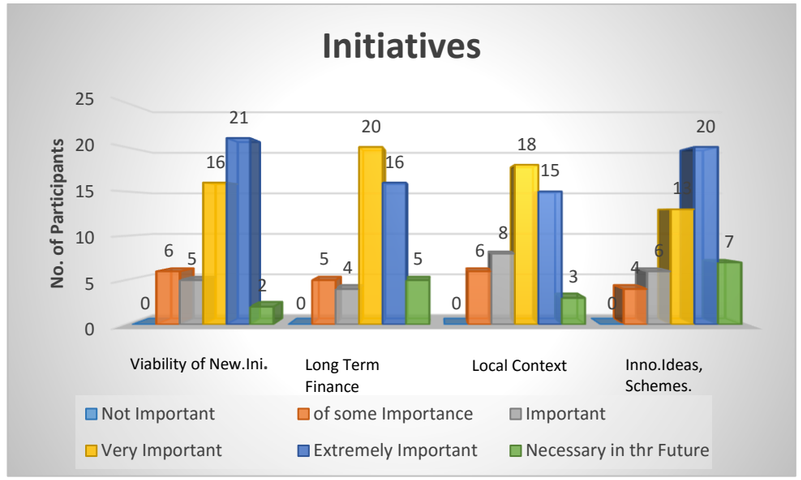


Figure 7.3: Graphs of the most appropriate economic sustainability core categories and sub-categories

Table 7.4 Mean/Standard deviations for categories and criteria on the Economic dimension

Sustainability Dimension	Core Categories	Sub-categories	Mean	Standard Deviation
Economic Sustainability	Economics/ Value	Affordable Housing	4.58	0.7769
		Housing Demand	4.42	0.94
		Informal Sector	3.96	1.0385
		Income-Generated Development.	4.14	1.0002
		Access to financing	4.1	1.04403
	Growth	Efficient Resources Use	4.1	1.19933
		Economic Activities	3.92	1.1536
		New Investment	3.92	1.18051
		Promoting Local Industry	4.3	1.11803
		Business Facilities	3.94	1.19013
	Employments	Employment Opportunities	4.46	0.94255
		Justice and Equity	4.4	1.01980
		Creation of local jobs	4.46	0.94255
		Live/work units, local shops, core centres, factory, social centres and offices	4.06	1.04709
	Productivity	Accessible to Everyone	4.02	1.02937
		Cost Efficiency	4.12	0.9928
		Efficient Pricing	4.1	1.06301
		High Quality Outcomes	4.28	0.96
	Initiatives	Viability of New Infrastructures	4.16	1.06508
		Long-term Finance Schemes	4.24	1.068831
		Local Context	4.26	1.086093
		Politics	4.4	1.11355

$$\bar{x} = \frac{\sum fx}{\sum f}$$ Equation 1

A typical example when calculating the mean for affordable housing using the formula above the summation of the value and frequency is giving as 286 which is then divided by the total amount of participants which is 50

$$\frac{1 \times 0 + 2 \times 0 + 3 \times 7 + 4 \times 9 + 5 \times 32 + 6 \times 2}{50} = 4.48$$

Also when calculating for standard deviation the formula is giving below

$$s = \sqrt{\frac{\sum x^2 f}{\sum f} - \left(\frac{\sum xf}{\sum f}\right)^2}$$ Equation 2

For example when calculating for the standard deviation for affordable housing using the graph and formula above the solution is provided in the table below

Table 7.5: Standard deviation Calculation for Affordable Housing

x	f	x^2	xf	x^2f
1	0	1	0	0
2	0	4	0	0
3	7	9	21	63
4	9	16	36	144
5	32	25	160	800
6	6	36	36	216
	$\sum f = 50$	$\sum x^2 = 91$	$\sum xf = 253$	$\sum x^2f = 1223$

$$\sqrt{\frac{1223}{50} - \left(\frac{253}{50}\right)^2} = 0.7769$$

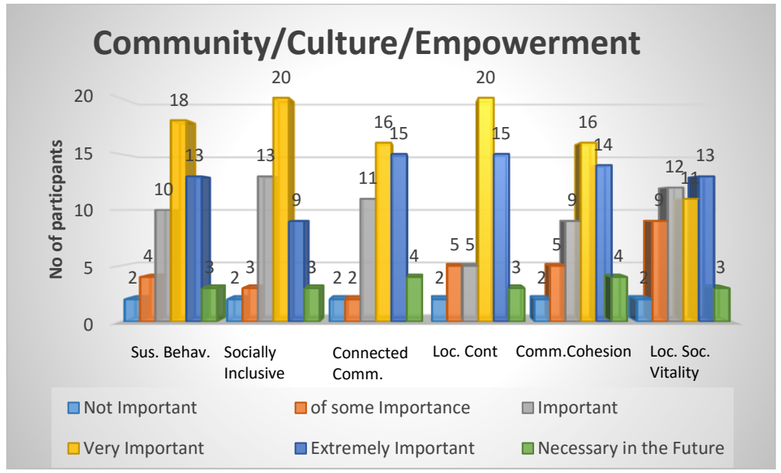
The mean values for the categories of social dimension are in the range of 3.92 and 4.58 while the standard deviations for the categories are in the range of 0.7769 and 1.1993 which means that there is a satisfying consensus and the slim gap indicates that the economic dimension has higher priority. The decrease in the standard deviation means that the experts show a movement toward convergence and consensus (Vidal et al., 2011). Table 7.4 above presents the mean values and standard deviations for all categories under the economic dimension as well as their criteria. A low standard deviation indicates that the data points tend to be very close to the mean and a high standard deviation indicates that the data points spread out over a large range of values.

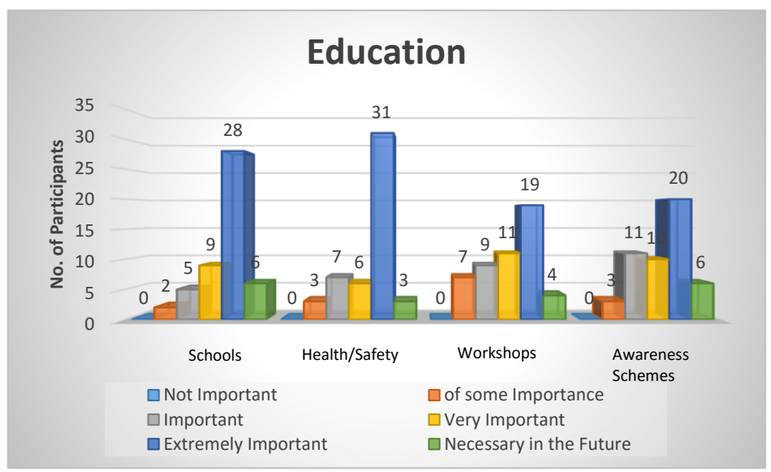
7.7.4 Social/Cultural Sustainability

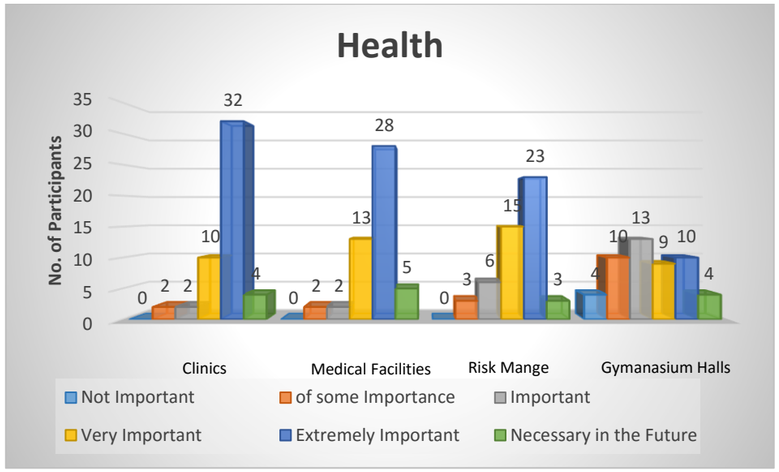
Most scholars have described social sustainability as the engagement among local communities, employees, clients, and all stakeholders involved in the construction project in order to ensure that it meets the needs of current and future generations (Herd-Smith and Fewings, 2008). This definition looks at various diverse aspects or perspectives of the stakeholders of a project. Another definition is that social sustainability involves the general community by appraising the impact of construction projects in relation to where users live, work, play, and engage in cultural activities (Burdge 2004). The social/cultural dimension has

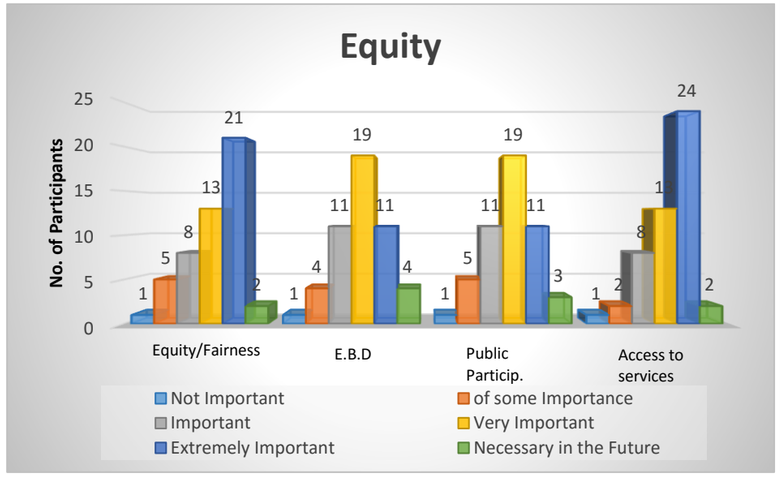
five aspects or main indicators to be considered in this analysis; these are community (culture/empowerment), education, health, equity, and security. According to the graph in figure below (also refer to Appendix D for analysis) the current system in Nigeria has shown that some areas are very poor in regards to education, health and security. Education is seen as the most pressing aspect because knowledge is power and to build a knowledge-based economy most of these aspects of sustainability indicators can be adopted more easily without any issue from both urban and rural communities. Health is seen as the second most important indicator to be considered when planning. The built environment includes the physical structures in which people work, live, play and socialise. Another important aspect is the connections between these spaces, including the built infrastructure and a range of natural features used in creating a healthier environment. Other major indicators include housing, neighbourhood conditions and transport routes, all of which shape the social, economic and environmental conditions on which good health is dependent (Dearry, 2004).

Security has shown a significant number of responses; due to the current issues in Nigeria, the safety of citizens is very important. Every individual needs to feel that they are secure from issues like terrorism, theft and vandalism hence safety systems, initiatives and features should be placed in urban spaces in order to enhance the overall safety of its occupants. Community (culture/empowerment) which is the second-to- last aspect looks at how diverse cultures can live in harmony with each other and lastly equity strives to incorporate various strata of people working together, living in unity and in one accord, thereby providing basic services, facilities and infrastructures for all to use and also creating opportunities for all, no matter what level of income they have. In relation to these sub-indicators, participants interviewed in section 7.4 have emphasised that for any sustainability measures to be implemented efficiently there is a need to have an attitudinal change. Without an attitudinal change as Nigerians this cannot be accomplished. The graph generated in the figure below (and the analysis in Appendix D) has shown that there is a high response rate of ‘very important’ with regards to aspects like sustainable behaviour and socially inclusive designs; and both sets of data complement each other. Also EBD is said by most interviewees to be imperative in the successful adaptation of participant-led design where all stakeholders and the whole community are consulted during the entire development phase of a project. The response to these criteria in the questionnaire analysis shows the importance of this aspect in every project. Other areas with high responses include crime prevention, health/safety, clinics and medical facilities, neighbourhood watch and amenity provision.









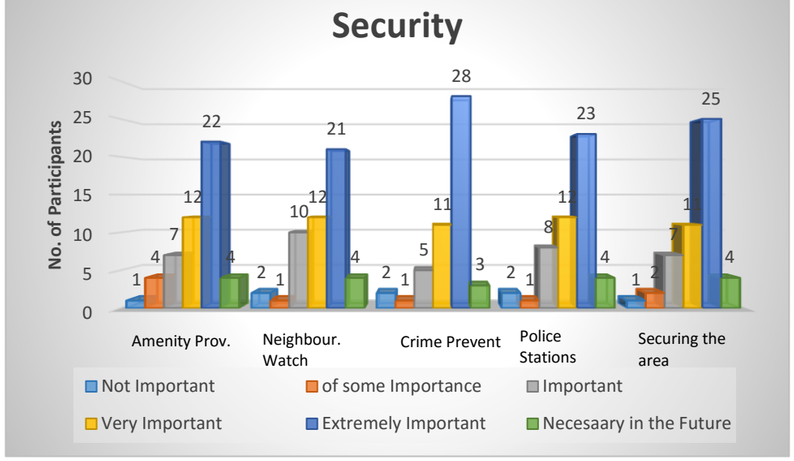


Fig 7.4: Graphs of the most appropriate Social/Cultural Sustainability core categories and sub-categories

Table 7.6 Mean/Standard deviations for categories and criteria on the Social/Cultural dimension

Sustainability Dimension	Core Categories	Sub-categories	Mean	Standard Deviation
Social/Cultural Sustainability	Community/Culture	Sustainable Behaviours	3.9	1.11355
		Social Inclusive Communities	3.8	1.17047
		Connected Communities	4.04	1.165504
		Local Context	4.0	1.18321
		Community Cohesion	3.94	1.2395
		Local social vitality	3.66	1.050904
	Education/Empowerment	Schools	4.62	0.956869
		Health and Safety Courses	4.48	1.00479
		Workshops	4.08	1.197330
		Awareness Schemes	4.3	1.118034
	Health	Clinics	4.68	0.83522
		Medical Facilities	4.64	0.86626
		Risk Management	4.34	0.971802
		Gymnasium Halls	3.46	1.41718
	Equity	Equity/Fairness	4.08	1.146124
		Enquiry-based design	3.94	1.120892
		Public Participation	3.86	1.113732
		Access to Services	4.26	1.03557
	Security	Amenity Provision/Well-being	4.24	1.15862
		Neighbourhood Watch Safety	4.22	1.15395
		Crime Prevention Scheme	4.42	1.078702
		Police Station	4.3	1.13578
		Securing the Areas	4.38	1.07499

$$\bar{x} = \frac{\sum fx}{\sum f}$$ Equation 1

A typical example when calculating the mean for sustainable behaviours using the formula above the summation of the value and frequency is giving as 195 which is then divided by the total amount of participants which is 50

$$\frac{1 \times 2 + 2 \times 4 + 3 \times 10 + 4 \times 18 + 5 \times 13 + 6 \times 3}{50} = 3.9$$

Also when calculating for standard deviation the formula is giving below

$$s = \sqrt{\frac{\sum x^2 f}{\sum f} - \left(\frac{\sum xf}{\sum f}\right)^2}$$ Equation 2

For example when calculating for the standard deviation for sustainable behaviour using the graph and formula above the solution is provided in the table below

Table 7.7: Standard deviation Calculation for Sustainable Behaviour

x	f	x^2	xf	x^2f
1	2	1	2	2
2	4	4	8	16
3	10	9	30	90
4	18	16	72	288
5	13	25	65	325
6	3	36	18	108
	$\sum f = 50$	$\sum x^2 = 91$	$\sum xf = 195$	$\sum x^2f = 829$

$$\sqrt{\frac{829}{50} - \left(\frac{195}{50}\right)^2} = 1.11355$$

The mean values for the categories of social dimension are in the range of 3.46 and 4.68 while the standard deviations for the categories are in the range of 0.83522 and 1.41718, which means that there is a satisfactory consensus and the gap indicates that the social/cultural dimension has the next priority after economic sustainability. The sub-category spans between gymnasium halls which has the lowest factor and clinics which has the highest factor. The decrease in standard deviation means that the experts show a movement towards convergence and consensus. Table 7.4 above presents the mean values and standard deviations for all categories under the social/cultural dimension. A low standard deviation indicates that the data points tend to be close to the mean and a high standard deviation indicates that the data points are spread out over a large range of values.

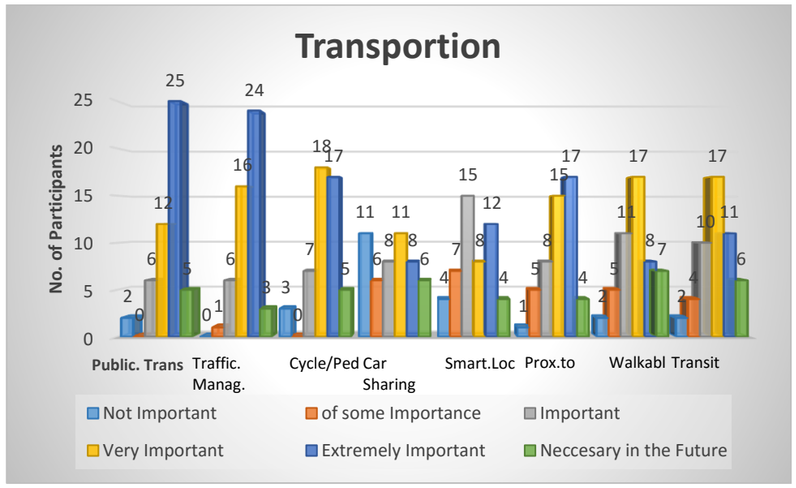
7.7.5 Planning Sustainability

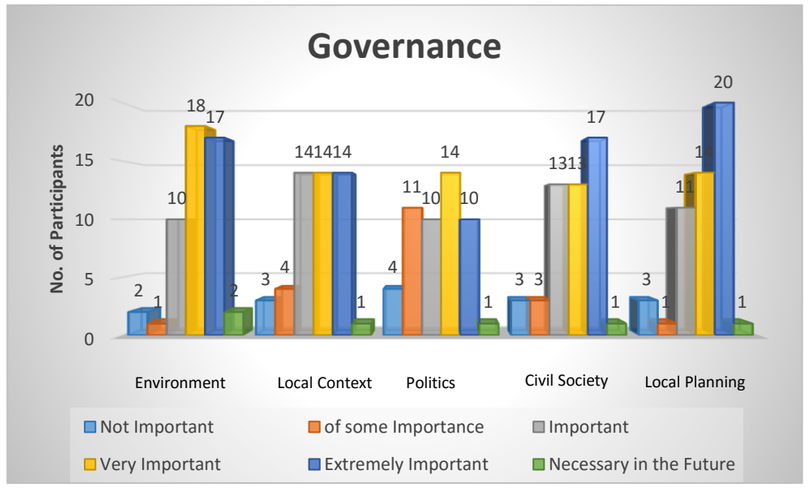
Planning sustainability is a new dimension that has started gaining recognition as a new tier of sustainability in the last decade. Planning sustainability looks at balancing the needs of communities, government and private companies against a range of social, economic and environmental objectives. For planning to be effective it requires an understanding of the

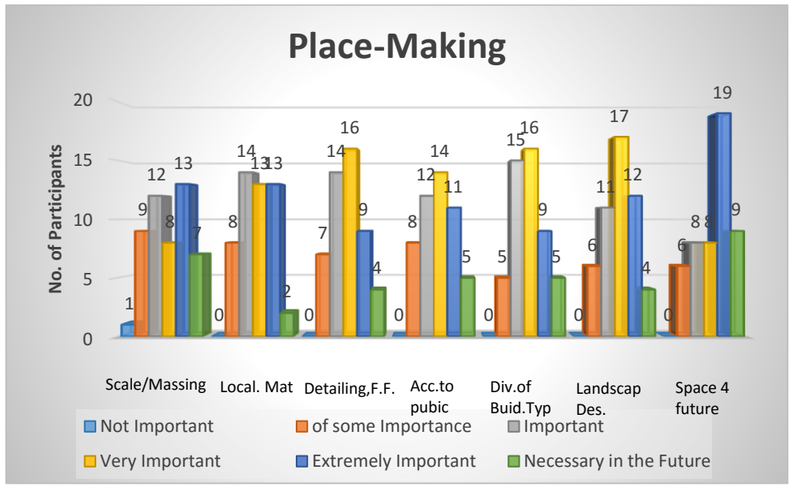
relationships between communities, buildings, cities and climate. In this study the main indicators comprise place-making, management, transportation, governance and land use. According to the graph below (see appendix D for analysis) land use has attracted large interest with all its sub-indicators having the highest amount of importance. Land use is one of the most important indicators when considering future generations because when building it is imperative that the designer achieves sustainability through density, for example considering a range of mixed-use developments rather than focusing on the specific typology of building design, thereby utilising a vast area of land. Another interesting area of focus is the transportation system. The current state of the transportation system suggests that there are no alternative efficient means of transportation from one place to another. There is the need for a sustainable alternative means of conveying people from one place to another as well as providing facilities within the urban areas that would reduce the traveling distance to various destinations. Also the planning of effective use of land will help to reduce congestion and improve journey times. All this has been discussed under transportation and the sub-indicators selected have been tailored to fit the Nigerian context.

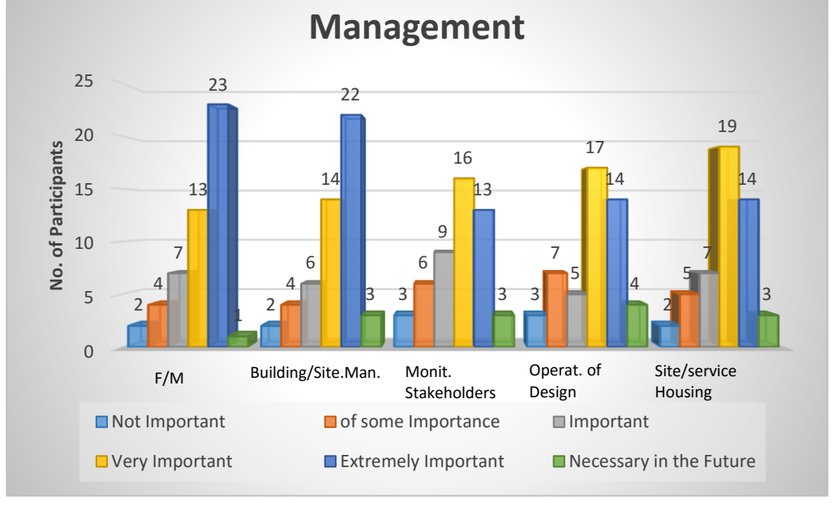
The third most important indicator is the management which is key in every development. For a development to thrive for decades it needs proper management to be carried out to help increase the life span of the buildings and the built-up spaces. The most common approach adopted is the use of facility management, site maintenance and post-occupancy evaluation. Urban spaces have to be driven by efficient management which is known to be a by-product of sustainability; hence, for it to last a long time, it has to be properly managed. Place-making is seen as a multi-faceted approach to planning, design and management of public spaces which place emphasis on the local community's assets, aspirations, and identities with the aim to promote people's health, happiness and well-being. It is a process and also a philosophical approach that is still gaining ground in developing worlds due to the fact that most countries believe in the adaption of the western style, while ignoring their locality, cultural heritage and originality. The data collected have shown a high level of importance in the adaptation of the various sub-indicators necessary in achieving place-making in the Nigerian context. Hence this main indicator is seen as a vital area in the achievement of sustainable places in the Nigerian context by incorporating cultural identity in the design of urban spaces. The sub-indicators that are seen as not relevant based on the questionnaires include homogeneity of houses. Because of the housing style in Nigeria, most dwellings have their own unique characteristics and function based on the client's desire. Also the car-sharing scheme although as a sub-indicator,

it is not considered further in this thesis it would will be well-thought-out in the near future after revisiting the analysis on the context and security. Most people feel safer when they use personal or public transport rather than car-sharing schemes.









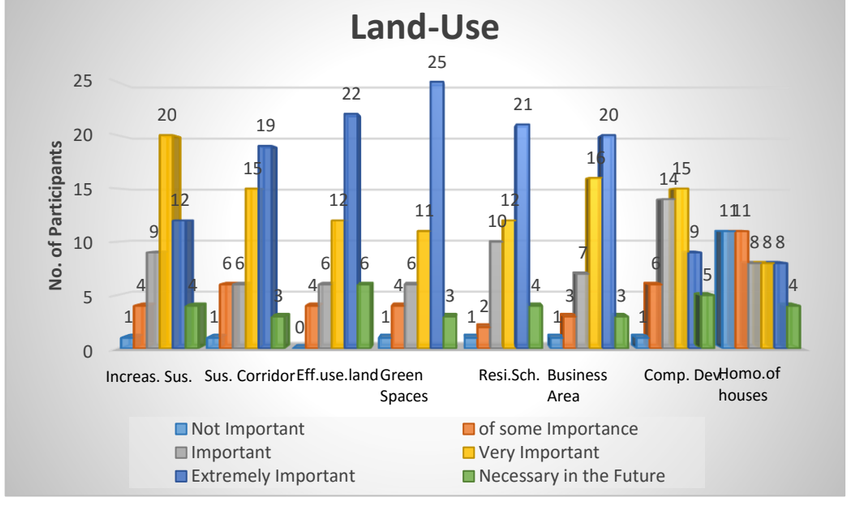


Fig 7.5: Graphs of the most appropriate Planning Sustainability core categories and sub-categories

Table 7.8: Mean/Standard deviations for categories and criteria on the Planning Dimension

Sustainability Dimension	Core Categories	Sub-categories	Mean	Standard Deviation
Planning Sustainability	Place-making	Scale, Massing and Height	3.88	1.39484
		Local Materials Use	3.74	1.1280
		Detailing, frontage, form, orientation	3.78	1.13649
		Access to public spaces	3.86	1.2167
		Diversity of building typologies	3.88	1.12499
		Landscape design	3.94	1.12089
		Space for future developments	4.34	1.2745
	Management	Facilities Management	3.88	1.1634
		Building/Site Maintenance	4.24	1.04995
		Monitoring Stakeholders Control	3.78	1.28515
		Operation of Design/Post-occupancy	3.88	1.33626
		Site and services approach to housing	3.94	1.19013
	Transportation	Public Transport	4.46	1.080926
		Traffic Management Scheme	4.44	0.85229
		Cycling/Pedestrian/Street Network	4.22	1.17115
		Car-sharing Schemes	3.34	1.680595
		Smart Location	3.58	1.401285
		Proximity to community services	4.08	1.18051
		Walk-able/Human-scale	3.9	1.3
		Transit-oriented design of communities	3.98	1.25682
	Governance	Environment	4.3	1.06602
		Local Context	3.7	1.18743
		Politics	3.76	1.29244
		Civil Society	3.82	1.19482
		Local Planning Approval	4.0	1.14891
	Land use	Increasing sustainability by Density	4.0	1.11355
		Green Spaces	4.28	1.133078
		Residential Schemes	4.28	1.1052
		Business Area and Public Services	4.2	1.077032
		Effective use of Land	4.4	1.095445
		Compact Development	3.8	1.21655
		Homogeneity of houses	3.06	1.61753

$$\bar{x} = \frac{\sum fx}{\sum f}$$ Equation 1

A typical example when calculating the mean for scale, massing and height using the formula above the summation of the value and frequency is giving as 194 which is then divided by the total amount of participants which is 50

$$\frac{1 \times 1 + 2 \times 9 + 3 \times 12 + 4 \times 8 + 5 \times 13 + 6 \times 7}{50} = 3.88$$

Also when calculating for standard deviation the formula is giving below

$$s = \sqrt{\frac{\sum x^2 f}{\sum f} - \left(\frac{\sum xf}{\sum f}\right)^2}$$ Equation 2

For example when calculating for the standard deviation for scale, massing and height using the graph and formula above the solution is provided in the table below

Table 7.9: Standard deviation Calculation for scale, massing and height.

x	f	x^2	xf	x^2f
1	1	1	1	1
2	9	4	18	36
3	12	9	36	108
4	8	16	32	128
5	13	25	65	325
6	7	36	42	252
	$\sum f = 50$	$\sum x^2 = 91$	$\sum xf = 194$	$\sum x^2f = 830$

$$\sqrt{\frac{830}{50} - \left(\frac{195}{50}\right)^2} = 1.39484$$

The mean values for these categories of the planning dimension are in the range of 3.06 and 4.46 while the standard deviations for the categories are in the range of 0.85229 and 1.680595 which means that there is a satisfactory consensus. The sub-categories span between homogeneity of houses which has the lowest factor and public transport which has the highest factor. The decrease in the standard deviation means that the experts show a movement toward convergence and consensus. Table 7.5 above presents the mean values and standard deviations for all categories under planning dimension.

7.8 INFLUENCES OF DATA ON SUCCEED TOOL AND GRADING/RATING AND WEIGHTING METHODS

The assessment platform is graded based on indicators that are not achieved which will score **0**, indicators that are partially achieved score **0.5** and lastly indicators achieved are scored **1**. The total score will then be summarised to find out the level of sustainability in which this project has achieved. Overall the score of **1** is awarded where there is sufficient evidence that the sub-indicator selected met this criterion in this case, while the score of **0.5** is awarded to specific areas where the sub-indicators perform well against the criterion but lacks some elements/characteristics or in this case is not wholly adopted. This option is to be used where the sub-indicators has attained a certain percentage of presence in the scheme at least 50 per cent. In the case of uncertainty about the sub-indicator not being able to meet the criterion of this scheme, it should be awarded a score of **0**. The score of **0** is presented where it is unclear whether the proposed sub-indicator used meets the criterion or if it clearly did not meet the criterion. The total score of how sustainable any urban neighbourhood development has achieved would be calculated by summing up the indicators that has been fully achieved and partially achieved indicators. This result would then be checked against the weighting criteria to see the level of sustainability that has been graded. See the assessment template below to understand how the rating of each indicator is calculated.

Table 7.10: SUCCEED Tool Grading System/ Assessment Template 1

SUSTAINABILITY DIMENSIONS	CORE CATEGORIES	SUBCATEGORIES	GRADING WEIGHT		
			N.A (0)	P.A (0.5)	F.A (1)
ENVIRONMENTAL SUSTAINABILITY	Pollution	Water Pollution Prevention			
		Noise Pollution Prevention			
		Air Quality Enhancement			
		Pollution Reduction Innovation			
	Materials Resources, Waste Management	Local Renewable Materials			
		Recycling/Innovation/reuse of materials			
		Site Waste Management Schemes			
		Storage of Recycled Waste			
		Use of biodegradable materials			
	Water	Water Quality Improvement			
		Erosion control			
		Water Supply Initiatives(During Shortage)			
		Waste-water Management			
		Smart metering-water (Managing cost)			
	Ecology	Biodiversity (Biophilia design with nature)			
		Ecological Appraisal/ Enhancement			
		Minimising Ecological Impact			
		Diversity and Preservation			
		Use of natural topography (No Alteration)			
	Energy	Energy Efficient Building			
		Passive /Active Design			
		Renewable Energy Use/Generation			
		Urban Grid Optimization (Energy Manag.)			
		Consumption Management			
	Climate	Climate Emissions Optimisation			
		Global Warming control measures			
		Flood Risk Mitigation (Management)			
		Solar Radiation gains (Solar Energy)			
		Resiliency (Return to original form)			
ECONOMIC SUSTAINABILITY	Economics/ Value	Affordable Housing			
		Housing Demand			
		Informal Sector (Local Economy)			
		Income generated development initiatives			
		Access to financing (Loans, mortgage)			
	Growth	Efficient Resources Use			
		Economic Activities			
		New Investments			
		Promoting Local Industries			
		Business Facilities			
ECONOMIC SUSTAINABILITY	Employments	Employment Opportunities			
		Justice and Equity			
		Creation of local jobs			
		Live and work units, offices, stores, factory Local shops, clinics, centres			
	Productivity	Accessible to Everyone			
		Cost Efficiency			
		Efficient Pricing			
		High Quality Outcomes			
	Initiatives	Viability of New Infrastructures			
		Long Term Finance Schemes			
		Local Context			
		Innovations, Ideas, Schemes			

SUSTAINABILITY DIMENSIONS	CORE CATEGORIES	SUBCATEGORIES	N. A (0)	P. A (0.5)	F.A (1)
SOCIAL/ CULTURAL SUSTAINABILITY	**Community/ Culture/ Empowerment**	Sustainable Behaviors			
		Socially Inclusive Communities			
		Connected Communities (United People)			
		Local Context, Public Engagement			
		Community Cohesion			
		Local social vitality/Life Style			
	Education	Schools			
		Health and Safety Courses			
		Workshops			
		Awareness Schemes			
	Health	Clinics			
		Medical Facilities			
		Risk Management			
		Gymnasium Halls			
	Equity	Equity/Fairness			
		Enquiry based design (Participative design)			
		Public Participation			
		Access to services			
	Security	Amenity Provision/Wellbeing			
		Neighbourhood Watch/ Safety			
		Crime Prevention Schemes			
		Police Stations			
		Securing the Area (Security Guards)			
PLANNING SUSTAINABILITY	**Place-making**	Scale, massing/ height (Efficient Design)			
		Local Materials Use			
		Access to public spaces			
		Diversity of building typologies, Layout			
		Landscape design, Quality of Streetscape			
		Space for future developments			
	Management	Facilities Management			
		Building/Site Maintenance			
		Monitoring Stakeholders control			
		Operations of Design/Post Occupancy			
		Site and services approach to housing			
	Transportation	Public Transport/Sustainable Mass Transit			
		Traffic Management Schemes			
		Cycling/Pedestrian/Street Networks			
		Smart Location (Proximity to City Centre)			
		Proximity to community services			
		Walk-able/Human-scale			
		Transit oriented design of communities			
	Governance	Environment			
		Local Context			
		Politics			
		Civil Society			
		Local Planning Approval			
	Land-use	Increasing sustainability through Density			
		Sustainable Corridors (Roads, Streets)			
		Effective use of Land			
		Green Spaces			
		Residential Schemes			
		Business Area and Public Services			
		Compact Development			
TOTAL SCORE					

Key: 1. NA= Not Achieved (0). 2. PA = Partially Achieved (0.5) 3. FA = Fully Achieved (1).

The SUCCEED tool was designed for assessing the level of sustainability which a proposed or existing urban scheme has achieved. The tool is targeted at measuring how urban neighbourhoods can be improved or upgraded based on a set of weighting system. This set of grading weighting system examines the performance or anticipated performance of an urban neighbourhood and translates that examination into an overall assessment that gives way for comparing and contrasting one urban neighbourhood against another. Also this fixed weighting system developed will provide an economic solution as well as a long-lasting planning solution to issues within urban spaces. There are a total of 105 sub-indicators and the assessment system is scored based on the amount of indicators that have been embedded into a design. The assessment system has different scores and different levels in order to create a minimum acceptable possible standard for an urban neighbourhood to incorporate sustainability. The grading system begins with Level 0 Below Standard or Fair (0-20 sub-indicators)(0 – 19%), Level 1 Insufficient or Needs Improvement (21-35 sub-indicators)(20-39%), Level 2 Satisfactory (21-35 sub-indicators)(40-59%), Level 3 Good (36-50 sub-indicators)(60-69%), Level 4 Excellent (61-85 sub-indicators)(70-89%) and lastly Level 5 Advanced or Exceeds Standards (86-105 sub-indicators)(90-100%) see table 7.10 below as reference to this explanation. The grading system, level, indicators and percentiles were designed in relation to the BREEAM ND, LEED v4, CASBEE for Urban Development and Green Star for communities' assessment criteria.

Table 7.11: SUCCEED Tool Grading system

Grade Level	Percentage	Amount of Sub-Indicators	Assigning Meaning (Weighting System)	Numeric Grade	Colour Index
0	0%-19%	0 – 20	Below standard, Fair, Poor, Not Proficient, Unsatisfactory	0	
1	20% -39%	21 – 35	Insufficient, Partially proficient, Needs improvement	1.0	
2	40%-59%	35 – 50	Satisfactory, Meets standards in Developing Countries	2.0	
3	60%-69%	51 – 65	Good	3.0	
4	70%-89%	65 – 80	Excellent	4.0	
5	90%-100%	81 – 105	Advanced, Exceeds standards, Cutting-edge	5.0	

In addition to this grading system, emphasis is given to economic sustainability due to the analysis obtained from the sets of mixed data. Economic sustainability has shown a high level of recommendation (from the data collected and graphs extrapolated) in regards to the context of Nigeria which is still developing and is trying to incorporate a level of sustainability. To

achieve this, an additional 5 points are allocated to any scheme that shows evidence of economic sustainability being adopted into the project.

7.8.1 SUCCEED Tool grading prioritisation and contextualisation

Also the proposed assessment tool has been designed to respond to the most prioritised dimension of sustainability, core-categories and sub-indicators thereby creating another assessment to support the grading of urban neighbourhoods. This method of grading has been initiated as a result of the need to prioritise the indicators and to know the indicators that are more important within the Nigerian context based on the data collected. This grading is added to the current rating system as an additional criterion for selecting and improving on both indicators and sub-indicators that have been adopted for proposed and existing schemes based on importance, relevance and priority looking at both short and long term perspective. In order to create a measuring approach for this scheme each level has to be properly explained to understand how this can be applied appropriately. There are three grading priority levels which are G1, G2 and G3. G1 which stands for Grade one are grouped under indicators with the least priority and which might be considered to be improved upon in the near future. G2 stands for Grade two and these sets are grouped under the indicators that meet an average standard of importance and have also shown to have incorporated a level of satisfaction and fulfilment with the scheme. The final grading level is the G3 which stands for Grade three and these sets of indicators are specifically for those that meet an extremely important standard when developing a project. The G3 indicators are seen to be extremely important when carrying out a project and should hence meet or surpass all standards in its implementation. The reason for adopting the G1, G2 and G3 prioritisation system was to respond to the six-point Likert scale model. It is also important to note that each grading level responds to the selection of these indicators listed in the questionnaire by the participants (see appendix C at the end of the thesis).

The index value was also based on the difference between highest mean value and lowest mean value. Therefore considering both 4.68 and 3.06 which are both maximum and minimum mean values, the researcher found the difference and rounded up to form the index value of **1.5** for the maximum and **1** for the minimum value of the priority grading system. Hence the minimum index value was classed as **1** (G1) and **1.5**(G3) and the average between both priorities is **1.25** (G2). The researcher concludes that, in general, this grading system tends to focus on creating

a hierarchy on how these indicators are perceived based on each one's level of importance, relevance and necessity in the Nigerian context - see Tables 7.12, 7.13 and 7.14 below.

Table 7.12: SUCCEED Tool Priority Grading system

GRADING PRIORITY	LEVEL OF SIGNIFICANCE	Index value
G1 Grading Level one	Of some importance Important	1.0
G2 Grading Level Two	Very Important	1.25
G3 Grading Level Three	Extremely Important	1.50

Table 7.13: Summary of the questionnaire survey with the amount of participants for Environmental Sustainability.

				N.I	OF.S.I	IMP.	V.IMP	EX.IM	
2	SUS.DIM	CORE.CAT	SUBCAT	1	2	3	4	5	6
3	Environ	Pollution	Water.P.P	0	0	7	15	25	3
4			Noise.P.P	0	4	14	19	12	1
5			Air Q.E	0	3	7	18	18	4
6			Pollution R	0	1	12	13	18	6
7		Material.R	Local R	0	0	19	12	17	2
8			Recycling	0	0	10	21	16	3
9			Site Waste	0	3	9	16	17	3
10			Storage R	0	8	4	23	10	5
11			U.B.M	0	1	14	12	18	5

Examples showing the selection process of grading priorities giving to each sub-category of sustainability indicators.

Example 1: Water pollution prevention G1 which is the amount of participants for of some importance and important has a total amount of 7. G2 which is the total amount of participants for very important has a total amount of 15 and lastly G3 which is the total amount of participants for extremely important has a total amount of 25 participants. Therefore water

pollution prevention is given G3 for the highest amounts of participants choose extremely important.

Example 2: Noise pollution prevention G1 which is the amount of participants for of some importance and important has a total amount of 18. G2 which is the total amount of participants for very important has a total amount of 19 and lastly G3 which is the total amount of participants for extremely important has a total amount of 12 participants. Therefore water pollution prevention is given G3 for the highest amounts of participants choose extremely important.

Example 3: Site waste management schemes G1 which is the amount of participants for of some importance and important has a total amount of 12. G2 which is the total amount of participants for very important has a total amount of 16 and lastly G3 which is the total amount of participants for extremely important has a total amount of 17 participants. Therefore water pollution prevention is given G3 for the highest amounts of participants choose extremely important.

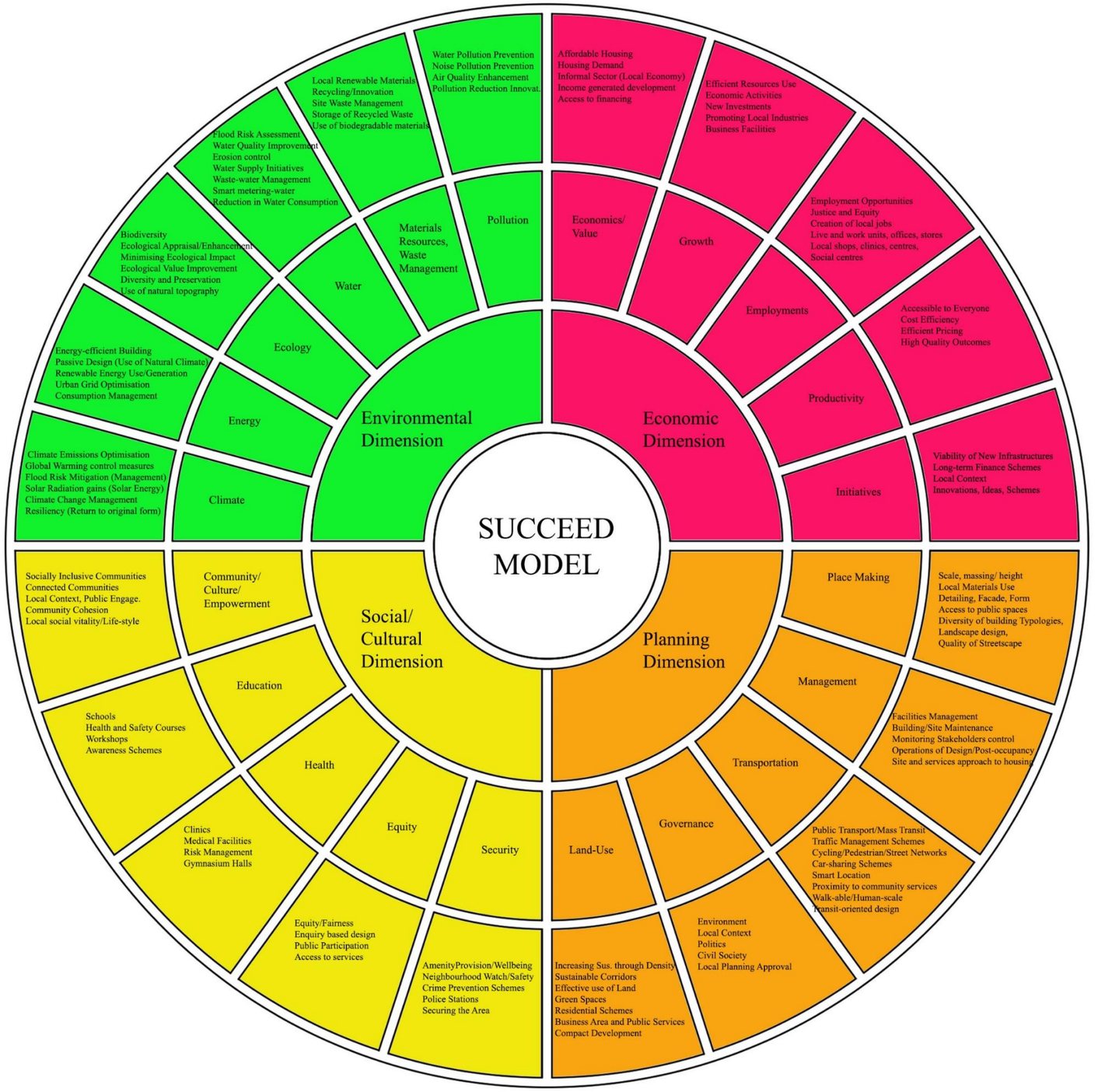
This second template was derived based on the need in personalizing the priorities of this sub-indicators used in this assessment tool. Therefore the rest of the sub-indicators were graded to have either G1, G2 and G3 level of priority which is then multiplied with the grade achieved to get the main figure for each graded priority. See the example in the next chapter for more clarity of how both templates are used to grade a specific urban neighbourhood development.

Table 7.14: SUCCEED ND Tool Prioritisation Assessment Template 2

SUSTAINABILITY DIMENSION	CORE CATEGORIES	SUB-CATEGORIES	GRADING PRIORITY			
			Grade Achieved	G1	G2	G3
ENVIRONMENTAL SUSTAINABILITY	Pollution	Water Pollution Prevention				
		Noise Pollution Prevention				
		Air Quality Enhancement				
		Pollution Reduction Innovation				
	Materials Resources, Waste Management	Local Renewable Materials				
		Recycling/Innovation/reuse of materials				
		Site Waste Management Schemes				
		Storage of Recycled Waste				
		Use of biodegradable materials				
	Water	Flood Risk Assessment				
		Water Quality Improvement				
		Erosion control				
		Water Supply Initiatives(During Shortage)				
		Waste-water Management				
		Smart metering-water (Managing cost)				
		Reduction in Water consumption daily				
	Ecology	Biodiversity (Biophilia design with nature)				
		Ecological Appraisal/Enhancement				
		Minimising Ecological Impact				
		Ecological Value Improvement				
		Diversity and Preservation				
		Use of natural topography (No Alteration)				
	Energy	Energy-efficient Building				
		Passive Design (Use of Natural Climate)				
		Renewable Energy Use/Generation				
		Urban Grid Optimisation (Energy Manag.)				
		Consumption Management				
	Climate	Climate Emissions Optimisation				
		Global Warming control measures				
		Flood Risk Mitigation (Management)				
		Solar Radiation gains (Solar Energy)				
		Climate Change Management				
		Resiliency (Return to original form)				
ECONOMIC SUSTAINABILITY	Economics/Value	Affordable Housing				
		Housing Demand				
		Informal Sector (Local Economy)				
		Income generated development initiatives				
		Access to financing (Loans, mortgage)				
	Growth	Efficient Resources Use				
		Economic Activities				
		New Investments				
		Promoting Local Industries				
		Business Facilities				
	Employments	Employment Opportunities				
		Justice and Equity				
		Creation of local jobs				
		Live and work units, offices, stores, factory Local shops, clinics, centres, Social centres				
	Productivity	Accessible to Everyone				
		Cost Efficiency				
		Efficient Pricing				
		High Quality Outcomes				
	Initiatives	Viability of New Infrastructures				
		Long-term Finance Schemes				
		Local Context				
		Innovations, Ideas, Schemes				

	CORE CATEGORIES	SUB-CATEGORIES	Grade Achieved	G1	G2	G3
SOCIAL/CULTURL SUSTAINABILITY	Community/Culture /Empowerment	Socially Inclusive Communities				
		Connected Communities (United People)				
		Local Context, Public Engagement				
		Community Cohesion				
		Local social vitality/Life-style				
	Education	Schools				
		Health and Safety Courses				
		Workshops				
		Awareness Schemes				
	Health	Clinics				
		Medical Facilities				
		Risk Management				
		Gymnasium Halls				
	Equity	Equity/Fairness				
		Enquiry based design (Participative design)				
		Public Participation				
		Access to services				
	Security	Amenity Provision/Well-being				
		Neighbourhood Watch/Safety				
		Crime Prevention Schemes				
		Police Stations				
		Securing the Area				
PLANNING SUSTAINABILITY	Place-making	Scale, massing/ height (Efficient Design)				
		Local Materials Use				
		Detailing, Facade, Form, Orientation				
		Access to public spaces				
		Diversity of building typologies, Layout				
		Landscape design, Quality of Streetscape				
		Space for future developments				
	Management	Facilities Management				
		Building/Site Maintenance				
		Monitoring Stakeholders control				
		Operations of Design/Post-occupancy				
		Site and services approach to housing				
	Transportation	Public Transport/Sustainable Mass Transit				
		Traffic Management Schemes				
		Cycling/Pedestrian/Street Networks				
		Car-sharing Schemes				
		Smart Location				
		Proximity to community services				
		Walk-able/Human-scale				
		Transit-oriented design of communities				
	Governance	Environment				
		Local Context				
		Politics				
		Civil Society				
		Local Planning Approval				
PLANNING SUSTAINABILITY	Land Use	Increasing sustainability through Density				
		Sustainable Corridors (Roads, Streets)				
		Effective use of Land				
		Green Spaces				
		Residential Schemes				
		Business Area and Public Services				
		Compact Development				
TOTAL SCORE OF INDICATORS						

Figure 7.6: SUCCEED Urban Neighbourhood Development Assessment Methodology



7.9 CONCLUSION

The data collected have highlighted a range of feedback and responses to all questions that were asked in order to understand and create recommendations and contribution to knowledge in regards to topics which include what is the definition of sustainability/sustainable urbanism, the indicators and criteria selection, sustainability and urban governance, and how these can be implemented successfully. This mixed methods approach has created a bank of rich data and an understanding of pressing issues that were addressed prior to the start of this research. It has also been used to validate the most important indicators necessary for the final development of the proposed assessment tool. The analysed data have added valid knowledge within a methodological approach to the knowledge of sustainable development, sustainable urbanism and assessment proving that these vary by context, culture and region. In developing countries, sustainability is seen to have more influence on economic and social dimensions which are the most pressing aspects while most people do not really know much (if anything) about the impact of environmental issues. The rating categories of each grading level for the assessment method was influenced by the amount of indicators achieved on each of these levels. Hence a project would be graded based on the total summation of these indicators. Also it is important to know that each indicator has been given a priority factor which is also based on how the experts rated the importance of each indicator. Therefore the score for each indicator would be the multiplication of the value achieved by each indicator times the grading priority for that specific indicator. This method used in developing this assessment framework focuses on ensuring that each indicator is influenced by the level of importance of that specific indicator within the Nigerian context.

In conclusion the analysed data were used in influencing the proposed assessment tool. The next chapter examines how the proposed framework and assessment tool can be used to measure and assess sustainability within an urban neighbourhood in Abuja Nigeria. In the final chapter, its strengths and weaknesses are also identified as well as how these can be improved.

CHAPTER EIGHT: CASE STUDY ANALYSIS AND ASSESSMENT USING SUCCEED

8.1 INTRODUCTION

The main objective of this research is to propose an effective framework that measures sustainability within urban neighbourhoods and this could be validated through testing this tool on a case study which will then be used to justify its practicality, workability and success. Due to the accessibility of credible data the researcher selected Abuja, Nigeria based on the fact that there are more recent developments in relation to neighbourhood design and also as the countries capital it would be more advantageous to begin with that location where sustainability can be easily influenced and then be extended to other states within the country. For the purpose of this research, one major case known as Mount Pleasant Estates which was developed by CITEC is studied. This chapter provides an explanation of the assessment process applied and the results generated during this research. This includes how the developed scoring methods have been tested and implemented, the findings, discussion and learning outcomes of the framework. Based on this, the researcher creates a new approach where sustainability could be further understood and also establishes how the method could be improved based on a set of recommendations extrapolated from the assessment tool. This chapter presents the results of the case study project which are assessed and examined based on the principles of the proposed framework in order to obtain the rating level of the particular urban neighbourhood scheme. Hence, the extent to which sustainability principles have been achieved in this project is assessed.

8.2 ABUJA CITY

Abuja is the present capital of Nigeria created in order to have a modern city that is not overpopulated, and also an administrative capital not prone to attacks from neighbouring countries. It is centrally located in the country. It was initially set up as an economic, social and cultural capital for Nigeria's unification but ended up as a city that has neglected social and economic sustainability and reflects more of the class divisions between people and society (Alkali, 2005). With the current explosive growth rate in Nigeria, Abuja will continue to have human settlements problems, therefore imposing high demands on infrastructure development, basic services, housing, sanitation, waste management, health, social conflict and governance issues (Oyesiku, 2011). To address this, Nigeria needed to choose a geographically neutral location between the most significant territories. This particular concept was introduced to

overcome the influence of pre-existing city capitals and help regulate demographic imbalance in the country. Figure 8.1 shows the Map of Nigeria identifying the former location of Lagos and the new Federal Capital Territory (AGIS, 2006). The key motivation for the development of a new capital city was to help generate a powerful drive in the development of the country (Dascher, 2000). Abuja became the national capital on 12th December, 1991 and was carved out of Kaduna, Kwara, Jos and Benue. It has six area councils which are Abuja Municipal, Kwali, Kuje, Abaji, Gwagwalada and Bwari. The capital is both headquarters to Economic Community of West African States Monitoring Group (ECOMOG) and Economic Community of West African States (ECOWAS), and also has the headquarters of OPEC, which is the Organisation of the Petroleum Exporting Countries (Abuja Journal, 2006). Abuja also features a 400-metre high monolith rock called Aso Rock where the Presidential Complex, National Assembly Complex, and Supreme Court are located. Some other popular buildings, among others, are the Nigerian National Mosque, National Centre Cathedral and the Nnamdi Azikwe International Airport (Jibril, 2000; Abuja Journal, 2006).

Figure 8.1: Map of Nigeria showing the location of Lagos and the new Federal Capital **Source:** AGIS, 2006

8.2.1 Brief Introduction of Citec Urban Development Schemes

Citec International Estates Limited was established in 2001 and was in charge of delivering 2800 homes in Mount Pleasant. Their overall goal was to deliver top quality, stylish houses within decent life-enhancing environments. Also the company aimed at giving clients both excellent and adequate housing that simulates the people's ways of life thus responding to social sustainability. The core business mandate was to provide affordable housing development in Nigeria. Apart from affordable housing the company seeks to bring luxury into the lives of people and their surrounding environments. Their main passion is to be the main leader and initiator in driving and engaging real-estate urban neighbourhood development and housing delivery in Nigeria (Citec International Estates, 2014). Current housing development focuses on the people and how to use housing solutions to raise the standard of living. Hence most urban development has to undergo a series of research investigations tailored to the needs of the people within the community and with this focus there will be continuous improvement on how to deliver the best housing solutions with modern facilities at comprehensive affordable prices. Due to an increase in demand for construction activities by the government, private sector operators and the public at large, focus has drifted into provisional construction services; hence the incorporation of mixed uses within urban neighbourhood schemes. Citec has created a positive image in urban development in Nigeria and their passion is to put up the best because of their own beliefs that 'only the very best is good enough for our people' (Citec Brochure, 2008; Citec International Estates, 2014). However, based on the information collected there are no signs of any benchmark used in their sustainable housing delivery.

It is increasingly recognised and a well-known fact that good design has an impact on human health and well-being and that individual actions to improve lifestyle or health status are likely to be influenced by the environmental and socio-economic factors as well as context in which they take place (Ipsos Morris, 2008). Within urban areas, the imaginative integration of built and natural features can help to create environments which are unique and interesting enough for people to have healthy lives. This was one of the key reasons why Mount Pleasant urban neighbourhood was developed, not just for affordable housing provision but to also consider the social, economic and environmental factors (Citec Brochure, 2008; Citec International Estates, 2014).

8.2.2 The Urban Neighbourhood Scheme Mount Pleasant Abuja Nigeria

The estate is strategically located along the Jabi/Airport Expressway, near the City Gate and Utako Market, Abuja. Incorporated as a liability company in 2001, Citec International Estates Limited began work at Mbora district in Abuja in 2001 having secured the understanding and approval of the federal government to deliver houses for low-income earners at its Mount Pleasant Estate on about 230 hectares of land. Citec paid compensation to the original inhabitants of the land after taking physical possession of it in 2004 (Citec Brochure, 2008). Mount Pleasant Estate where Citec targets about 2800 housing units features an underground central sewage system, tarred internal roads with pedestrian walkways, schools, recreation areas, a water tank with a 1.4-million-litre storage capacity, shopping mall, worship-centres, gated housing, medical centre, facility management, electricity supply with 2.5 MWA transformer and central generator to complement public power supply, and other modern facilities that makes it unnecessary for residents to look outside the estate for further services. Also street lights are operated by generator for 12 hours for security purposes (Citec Brochure, 2008). The location of Mount Pleasant is 20 minutes' drive from Abuja international airport, 10 minutes' drive from CBD and Aso-Villa, and five minutes' drive from the City Gate and the National Stadium. The development of Mount Pleasant Estate has redefined building standards and has offered the residents and all those interested in acquiring properties in Abuja a wide range of top-quality houses with exquisite finishing in a homely environment (Goke, 2014).

The project was jointly financed by the Federal Mortgage Bank of Nigeria (FMBN) and Citec International Estate Limited, the developer of Citec Villas, Abuja. In recent interviews conducted with the Company's Director of Projects, Mr Goke Odunlami commented that the facilities were built to standard with state-of-the-art materials and modern construction techniques. The mass housing project was a public private partnership (PPP) where the government provides the land and then Citec provides the resources to build on this plot of land. The mass housing initiative was to meet the needs of people ranging from one-bedroom accommodation to five-bedroom duplexes as stated above, as well as to cater for all strata of people within the society. A typical example is a semi-detached, four-bed duplex which features two sitting rooms, four extra-large ensuite bedrooms, five toilets, large front and back outside spaces for car parking in front or for a BQ at the back, fitted kitchen and bathrooms. The downstairs sitting room measures 36'x 15' including dining area; the master bedroom

measures 22’.10’’ x 20’.6’’; and the three other bedrooms measure 20’.1’’ x 18’.6’’ (Citec Brochure, 2008; Goke, 2014).

At the time of writing, about 2000 housing units have been completed and the remaining planned 800 units are still under construction. The urban housing scheme was designed based on site and services provision of housing. Mount Pleasant Estate has scored a first, being the only real-estate development company in Nigeria with such facilities. Its modern factory at Abuja is operated by trained professionals. The materials produced include roofing sheets, enhanced panels, paving stones, electric poles, partition walls, doors, window panels, precast components, furniture, and kitchen fittings, among others (Citec International Estates, 2014).

The design of the estate did not employ the use of conventional building construction method; rather expanded polystyrene (EPS) building material was used to build the individual houses made up of various individual composite panels. Hence the house is constructed from the factory and assembled on-site which is stronger, and faster and easy to construct based on prefabricated method of construction. EPS is a building system based on a group of structural panels of undulated foam polystyrene with a base reinforcement placed against the sides with high-resistance steel mesh and each side joined to one another by means of electro-welded steel connectors (Citec Brochure, 2008). These panels are arranged on the construction site according to the dispositions of walls, partitions and floors. Each structure is then finished ‘‘on-site’’ by applying concrete and crete with pneumatic devices. In this way, the panels form the vertical and horizontal structural elements of a building with load-bearing capacity.

The prices of two- and three-bedroom units range from 2.5million Nigerian Naira to 6 million Nigerian Naira (GBP (£) 9,700 to GBP (£) 23,000 which was about 10 years ago) in this case buyers can access mortgage facilities from the Federal Mortgage Bank of Nigeria, National Housing Funds (NHF), Resort Savings and Loans and other Primary Mortgage Institutions (PMI) (Citec Brochure, 2008). They are expected to pay the initial 10 per cent of the unit cost and the balance over 25 to 30 years through a mortgage. The two- and three-bedroom homes are for low- and medium-income earners while the duplexes are targeted at higher-income earners. At the current time, however, the price for a two-bedroom home has gone up to about 20 million Naira, which equates to 72,000 pounds (Citec International Estates, 2014). This project aims to tackles issues with regards to affordable housing but with the recent increases in housing prices within this neighbourhood most low-income earners will not be able to afford

them, and the purchases will be left to the middle- and high-income earners (Citec Brochure, 2008).

Project's Highlights and Benchmarks

- All housing units were developed with the aim of achieving affordable by embracing both social sustainability and economic sustainability.
- Diverse dwelling types, critical mass, mix of uses and tenure mix
- Water tank of 1.4 –million-litre storage capacity in addition to water supply by the Federal Capital Territory Water Board
- Underground sewage in compliance with FCT recommendations, tarmac roads with landscaping, electricity supply with 2.5 MVA transformer and central generator to complement public power supply
- The buildings were made of expanded polystyrene (EP) to build the individual houses made up of various individual composite panels
- Social mixed uses and good community facilities.

Key sustainable urban thresholds/indicators

- Open space and storm water systems
- The impact of planning on building usage and large district energy systems
- Walk-able streets and networks
- Commercial activities and job opportunities
- Strong communities, ordered development and environmental quality
- Different building typology and good neighbourhood conditions (Citec International Estates, 2014).

a.  b. 

c.  d. 

e.  f. 

Figure 8.2: Collage of Case Study - *Citec Mount Pleasant*

Source: Momoh, 2015

a. Three-bedroom detached bungalow

b. Two- bedroom semi-detached bungalow, with one study

c. Three-bedroom semi-detached duplex and one extra room

d. Five-bedroom detached duplex and two extra room

e. Aerial view of Mount Pleasant Estate

f. Four- bedroom detached bungalow, one study and two extra rooms (boy's quarters) (Citec Brochure 2008).

8.2.3 Analysis of Case Study and testing the developed assessment tool

The development of SUCCEED was as a result of the need to measure the degree of sustainability within urban neighbourhoods in Nigerian urban spaces and also the third objective of this thesis which is to test and examine the fundamental objectives of sustainable urbanism as well as indicators and benchmarks for measuring its successful implementation. This assessment will help the researcher understand how best to determine what is lacking in most developments - both proposed and existing - and to learn how it can be improved and assessed, and produce a more sustainable environment. This tool has been developed based on the most important sustainability indicators needed in achieving various levels of sustainability. To conduct this exercise, it was advantageous to determine the kind of indicators present in this case study with relation to the selected criteria. At the end, a cumulative figure was obtained which includes the indicators present and the ones absent. This process is based on the current analysis of the Mount Pleasant project, which includes the knowledge gained from the studies of the secondary data source, site visits and ethnographic analysis (participant observation) as assessment criteria in selecting the sub-indicators used to achieve this objective of this project. At the end of this assessment the grade or level of sustainability of which Mount Pleasant has attained is presented alongside findings and recommendations. Figure below shows the aerial photograph of Mount Peasant estate Abuja, Nigeria.

The assessment platform is graded based on indicators that were not achieved; these score **0**. Indicators that are partially achieved score **0.5,** and indicators achieved score **1** (see section 7.8).

Figure 8.3: Aerial Photograph of CITEC Estate

Source: Google Earth, 2014

Table 8.1: SUCCEED Tool Assessment Template 1 Grading Weight (Mount Pleasant N.D)

SUSTAINABILITY DIMENSIONS	CORE CATEGORIES	SUBCATEGORIES	GRADING WEIGHT		
			N.A (0)	P.A (0.5)	F.A (1)
ENVIRONMENTAL SUSTAINABILITY	Pollution	Water Pollution Prevention	X		
		Noise Pollution Prevention	X		
		Air Quality Enhancement	X		
		Pollution Reduction Innovation	X		
	Materials Resources, Waste Management	Local Renewable Materials	X		
		Recycling/Innovation/reuse of materials	X		
		Site Waste Management Schemes		X	
		Storage of Recycled Waste	X		
		Use of biodegradable materials	X		
	Water	Water Quality Improvement	X		
		Erosion control	X		
		Water Supply Initiatives(During Shortage)		X	
		Waste-water Management		X	
		Smart metering-water (Managing cost)	X		
	Ecology	Biodiversity (Biophilia design with nature)		X	
		Ecological Appraisal/ Enhancement	X		
		Minimising Ecological Impact	X		
		Diversity and Preservation	X		
		Use of natural topography (No Alteration)		X	
	Energy	Energy Efficient Building	X		
		Passive /Active Design	X		
		Renewable Energy Use/Generation	X		
		Urban Grid Optimization (Energy Manag.)	X		
		Consumption Management	X		
	Climate	Climate Emissions Optimisation	X		
		Global Warming control measures	X		
		Flood Risk Mitigation (Management)	X		
		Solar Radiation gains (Solar Energy)	X		
		Resiliency (Return to original form)	X		
ECONOMIC SUSTAINABILITY	Economics/ Value	Affordable Housing		X	
		Housing Demand		X	
		Informal Sector (Local Economy)		X	
		Income generated development initiatives	X		
		Access to financing (Loans, mortgage)		X	
	Growth	Efficient Resources Use	X		
		Economic Activities		X	
		New Investments		X	
		Promoting Local Industries		X	
		Business Facilities		X	
ECONOMIC SUSTAINABILITY	Employments	Employment Opportunities		X	
		Justice and Equity	X		
		Creation of local jobs		X	
		Live and work units, offices, stores, factory Local shops, clinics, centres		X	
	Productivity	Accessible To Everyone	X		
		Cost Efficiency	X		
		Efficient Pricing	X		
		High Quality Outcomes	X		
	Initiatives	Viability of New Infrastructures		X	
		Long Term Finance Schemes			X
		Local Context		X	
		Innovations, Ideas, Schemes		X	

SUSTAINABILITY DIMENSIONS	CORE CATEGORIES	SUBCATEGORIES	N. A (0)	P. A (0.5)	F.A (1)
SOCIAL/ CULTURAL SUSTAINABILITY	**Community/ Culture/ Empowerment**	Sustainable Behaviors		**X**	
		Socially Inclusive Communities		**X**	
		Connected Communities (United People)	**X**		
		Local Context, Public Engagement	**X**		
		Community Cohesion		**X**	
		Local social vitality/Life Style		**X**	
	Education	Schools			**X**
		Health and Safety Courses	**X**		
		Workshops	**X**		
		Awareness Schemes	**X**		
	Health	Clinics		**X**	
		Medical Facilities		**X**	
		Risk Management	**X**		
		Gymnasium Halls		**X**	
	Equity	Equity/Fairness		**X**	
		Enquiry based design (Participative design)	**X**		
		Public Participation	**X**		
		Access to services		**X**	
	Security	Amenity Provision/Wellbeing		**X**	
		Neighbourhood Watch/ Safety		**X**	
		Crime Prevention Schemes			**X**
		Police Stations	**X**		
		Securing the Area (Security Guards)			**X**
PLANNING SUSTAINABILITY	**Place-making**	Scale, massing/ height (Efficient Design)		**X**	
		Local Materials Use		**X**	
		Access to public spaces		**X**	
		Diversity of building typologies, Layout		**X**	
		Landscape design, Quality of Streetscape		**X**	
		Space for future developments			**X**
	Management	Facilities Management		**X**	
		Building/Site Maintenance		**X**	
		Monitoring Stakeholders control	**X**		
		Operations of Design/Post Occupancy	**X**		
		Site and services approach to housing			**X**
	Transportation	Public Transport/Sustainable Mass Transit		**X**	
		Traffic Management Schemes	**X**		
		Cycling/Pedestrian/Street Networks		**X**	
		Smart Location (Proximity to City Centre)		**X**	
		Proximity to community services		**X**	
		Walk-able/Human-scale	**X**		
		Transit oriented design of communities	**X**		
	Governance	Environment	**X**		
		Local Context	**X**		
		Politics	**X**		
		Civil Society	**X**		
		Local Planning Approval			**X**
	Land-use	Increasing sustainability through Density	**X**		
		Sustainable Corridors (Roads, Streets)		**X**	
		Effective use of Land		**X**	
		Green Spaces		**X**	
		Residential Schemes			**X**
		Business Area and Public Services		**X**	
		Compact Development	**X**		
TOTAL SCORE			**0**	**46**	**8**

Key: 1. NA= Not Achieved (0). 2. PA = Partially Achieved (0.5) 3. FA = Fully Achieved (1).

Table 8.2: SUCCEED ND Tool Assessment Grading Prioritisation Template 2 (Mount Pleasant ND)

SUSTAINABILITY DIMENSION	CORE CATEGORIES	SUB-CATEGORIES	GRADING PRIORITY			
			Grade Achieved	G1 (1)	G2 (1.25)	G3 (1.5)
ENVIRONMENTAL SUSTAINABILITY	Pollution	Water Pollution Prevention	**0**			**0**
		Noise Pollution Prevention	**0**		**0**	
		Air Quality Enhancement	**0**		**0**	
		Pollution Reduction Innovation	**0**			**0**
	Materials Resources, Waste Management	Local Renewable Materials	**0**	**0**		
		Recycling/Innovation/reuse of materials	**0**		**0**	
		Site Waste Management Schemes	**0.5**			**0.75**
		Storage of Recycled Waste	**0**		**0**	
		Use of biodegradable materials	**0**			**0**
	Water	Water Quality Improvement	**0**			**0**
		Erosion control	**0**			**0**
		Water Supply Initiatives(During Shortage)	**0.5**			**0.75**
		Waste-water Management	**0.5**		**0.625**	
		Smart metering-water (Managing cost)	**0**	**0**		
	Ecology	Biodiversity (Biophilia design with nature)	**0.5**	**0.5**		
		Ecological Appraisal/Enhancement	**0**	**0**		
		Minimising Ecological Impact	**0**	**0**		
		Diversity and Preservation	**0**	**0**		
		Use of natural topography (No Alteration)	**0.5**	**0.5**		
	Energy	Energy-efficient Building	**0**			**0**
		Passive Design (Use of Natural Climate)	**0**		**0**	
		Renewable Energy Use/Generation	**0**			**0**
		Urban Grid Optimisation (Energy Manag.)	**0**			**0**
		Consumption Management	**0**			**0**
	Climate	Climate Emissions Optimisation	**0**		**0**	
		Global Warming control measures	**0**			**0**
		Flood Risk Mitigation (Management)	**0**			**0**
		Solar Radiation gains (Solar Energy)	**0**		**0**	
		Climate Change Management	**0**		**0**	
		Resiliency (Return to original form)	**0**	**0**		
ECONOMIC SUSTAINABILITY	Economics/Value	Affordable Housing	**0.5**			**0.75**
		Housing Demand	**0.5**			**0.75**
		Informal Sector (Local Economy)	**0.5**			**0.75**
		Income generated development initiatives	**0**			**0**
		Access to financing (Loans, mortgage)	**0.5**			**0.75**
	Growth	Efficient Resources Use	**0**			**0**
		Economic Activities	**0.5**			**0.75**
		New Investments	**0.5**			**0.75**
		Promoting Local Industries	**0.5**			**0.75**
		Business Facilities	**0.5**			**0.75**
	Employments	Employment Opportunities	**0.5**		**0.625**	
		Justice and Equity	**0**			**0**
		Creation of local jobs	**0.5**		**0.625**	
		Live and work units, offices, stores, factory Local shops, clinics, centres, Social centres	**0.5**			**0.75**
	Productivity	Accessible to Everyone	**0**		**0**	
		Cost Efficiency	**0**		**0**	
		Efficient Pricing	**0**		**0**	
		High Quality Outcomes	**0**			**0**
	Initiatives	Viability of New Infrastructures	**0.5**			**0.75**
		Long-term Finance Schemes	**1**		**1.25**	
		Local Context	**0.5**		**0.625**	
		Innovations, Ideas, Schemes	**0.5**			**0.75**

	CORE CATEGORIES	SUB-CATEGORIES	Grade Achieved	G1 (1)	G2 (1.25)	G3 (1.5)
SOCIAL/CULTURL SUSTAINABILITY	Community/Culture /Empowerment	Socially Inclusive Communities	**0.5**		**0.625**	
		Connected Communities (United People)	**0.5**		**0.625**	
		Local Context, Public Engagement	**0**		**0**	
		Community Cohesion	**0**		**0**	
		Local social vitality/Life-style	**0.5**	**0.5**		
	Education	Schools	**1**			**1.5**
		Health and Safety Courses	**0**			**0**
		Workshops	**0**			**0**
		Awareness Schemes	**0**			**0**
	Health	Clinics	**0.5**			**0.75**
		Medical Facilities	**0.5**			**0.75**
		Risk Management	**0**			**0**
		Gymnasium Halls	**0.5**	**0.5**		
	Equity	Equity/Fairness	**0.5**			**0.75**
		Enquiry based design (Participative design)	**0**		**0**	
		Public Participation	**0**		**0**	
		Access to services	**0.5**			**0.75**
	Security	Amenity Provision/Well-being	**0.5**			**0.75**
		Neighbourhood Watch/Safety	**0.5**			**0.75**
		Crime Prevention Schemes	**1**			**1.5**
		Police Stations	**0**			**0**
		Securing the Area	**1**			**1.5**
PLANNING SUSTAINABILITY	Place-making	Scale, massing/ height (Efficient Design)	**0.5**	**0.5**		
		Local Materials Use	**0.5**	**0.5**		
		Detailing, Facade, Form, Orientation	**0.5**	**0.5**		
		Access to public spaces	**0.5**	**0.5**		
		Diversity of building typologies, Layout	**0.5**	**0.5**		
		Landscape design, Quality of Streetscape	**0.5**		**0.625**	
		Space for future developments	**1**			**1.5**
	Management	Facilities Management	**0.5**			**0.75**
		Building/Site Maintenance	**0.5**			**0.75**
		Monitoring Stakeholders control	**0**		**0**	
		Operations of Design/Post-occupancy	**0**		**0**	
		Site and services approach to housing	**1**		**1.25**	
	Transportation	Public Transport/Sustainable Mass Transit	**0.5**			**0.75**
		Traffic Management Schemes	**0**			**0**
		Cycling/Pedestrian/Street Networks	**0.5**		**0.625**	
		Car-sharing Schemes	**0**	**0**		
		Smart Location	**0.5**	**0.5**		
		Proximity to community services	**0.5**			**0.75**
		Walk-able/Human-scale	**0**		**0**	
		Transit-oriented design of communities	**0**		**0**	
	Governance	Environment	**0**		**0**	
		Local Context	**0**	**0**		
		Politics	**0**	**0**		
		Civil Society	**0**			**0**
		Local Planning Approval	**1**			**1.5**
PLANNING SUSTAINABILITY	Land Use	Increasing sustainability through Density	**0**		**0**	
		Sustainable Corridors (Roads, Streets)	**0.5**			**0.75**
		Effective use of Land	**0.5**			**0.75**
		Green Spaces	**0.5**			**0.75**
		Residential Schemes	**1**			**1.5**
		Business Area and Public Services	**0.5**			**0.75**
		Compact Development	**0**	**0**		
TOTAL SCORE OF INDICATORS			**32**	**4.5**	**7.5**	**25.69**

Key: 1. GA = Grade Achieved 2. Grade Level One. 3. Grade Level Two. 4. Grade Level Three

8.3 Findings and Discussion (Calculation of Mount Pleasant Estate using SUCCEED Tool)

For this analysis to generate a more accurate result it is mandatory to use empirical data collected from interviews, documentary reviews and ethnographic data analysis in order to know the kind of indicators present and also to determine the level in which it has been implemented; and whether wholly or partially implemented. The analysis of this using the first assessment template has generated a result where the following have been identified: Not Achieved **(0) - 50 indicators** present in this design; Partially Achieved **(0.5) - 46 indicators,** and Fully Achieved **(1) - 8 indicators**. To ensure the right calculation for this project the focus is on the averagely present and fully present indicators. For the averagely present indicators, 0.5 was multiplied by 46 indicators which equals 23 points, while for the fully present indicators, 1 was multiplied by 8 indicators to give 8 points. The summation of both classes gives a total sum of 32 points. If this result is placed on the assessment grading scheme, this project can be graded as a level 1 scheme, with a percentile of 30%. The project is classed to be **Insufficient, Partially Proficient** and **Needs Improvement**. Also the results from the grading priorities assessment template 2 have shown that G3 attained 25.6875 while G2 attained 7.5 and G1 attained 4.5. This shows and proves that the level of priority tends to descend from G3 (extremely important) to G1 (important).

The Mount Pleasant project was identified as one of the outstanding urban development schemes in Abuja and it has been assessed as a grade level 1 in achieving sustainability in Nigeria based on the SUCCEED assessment tool. This result has shown that the tool has been tested and graded; hence these results can be further analysed to identify the best possible recommendations and solutions needed to improve or enhance this project to deliver a more sustainable environment for its users. Table 8.3 below indicates the level this project has achieved.

Table 8.3: SUCCEED Tool Grading system for Mount Pleasant Neighbourhood Development

Grade Level	Percentage	Amount of Sub-Indicators	Assigning Meaning	Numeric Grade
0	0% - 20%	0 - 20	Below Standards, Fair, Poor, Not Proficient, Unsatisfactory	0
1	21% -39%	21 - 35	Insufficient, Partially Proficient, Needs Improvement	1.0
2	40% - 59%	35 - 50	Satisfactory, Meets standards in Developing Countries based on our level of development	2.0
3	60% - 69%	51 - 65	Good	3.0
4	70% - 89%	65 - 80	Excellent	4.0
5	90% - 100%	81 - 105	Advanced, Exceeds Standards, Cutting-Edge	5.0

8.4 COMPARISON BETWEEN SUCCEED, BREEAM, LEED AND GREEN STAR

SUCCEED was designed to respond to the context of developing countries; more specifically, the Nigeria urban context. In comparison to existing assessment tools like BREEAM, LEED, CASBEE and Green Star, it has a more robust set of indicators which has been selected with regards to the chosen context and incorporates the environmental, economic, social/cultural and planning dimensions. Also the sets of indicators have been designed to have certain levels of prioritisation. The SUCCEED assessment method comprises of a total of 105 sub-indicators – this is more indicators than BREEAM, LEED and Green Star have. Another very prominent distinction is the grading level which was designed in accordance with the amount of indicators achieved within a project and the final calculation determines the level or stage of sustainability that has been achieved. One other major feature that makes this assessment tool very innovative is the new assessment template that calculates the degree of grade prioritisation which has been achieved (G1, G2 and G3). The indicators achieved under table 8.1 and 8.2 indicates the hierarchy in prioritisation and also the assessor can easily identify which indicator needs to be improved on or upgraded to yield higher outcome within the sustainability grading levels. Table 8.4 below differentiates the four assessment tools with regards to various areas.

Table 8.4: Comparison of BREEAM, LEED, Green Star and SUCCEED

	BREEAM	**LEED**	**Green Star**	**SUCCEED**
Launch Date	1990	1998	2003	TBA
Rating	Pass, Good, Very Good, Excellent	Certified, Silver, Gold, Platinum	1 Star, 2 Star, 3 Star, 4 Star, 5 Star	Unsatisfactory, Needs Improvement, Satisfactory, Good, Excellent, Advanced/Cutting Edge
Weightings	Applied to each issue category	All credits equally weighted	Applied to each issue category	All credits equally weighted and also can be applied to each prioritised indicators
Information Gathering	Design/ Management Team	Design/ Management Team or Accredited Professional	Design Team	Design/Management Team/Trained Assessor
Certification Labelling	BRE	USGBC	GBCA	GBCON (Pending)
Required Qualification	Competent Person Scheme	Passed Exam	Training Scheme and Exam	Recommended Training Scheme and Exam
Updates	Annual	As Required	Annual	Recommended Annual
Design Process	BRE Researchers	USGBC Researchers	GBCA Team	PhD Project using an holistic whole stakeholder approach

8.5 CONCLUSION

In summary this chapter has identified and analysed a case study area and used the innovative assessment model - SUCCEED - to measure the degree of sustainability. By analysing the project in Abuja, known as CITEC Mount Pleasant, the indicators used for the scheme were identified and this helped in understanding how this assessment model could be tested on the project. The result of this project has been classed under level 1 which means that the scheme is insufficient, partially proficient and needs improvement. These improvements can be done by identifying and enhancing the indicators ranked as not achieved and averagely or partially achieved. These indicators can also be selected based on each one's priority level or its level of importance. Also, by identifying their level of priority, each indicator could be selected from one level and upgraded to the next. The level or stage of upgrading can be determined by selecting the indicators under G3 through to G1. This case study was designed to be a prototype for housing solutions that combines all four dimensions of sustainability but the results suggest a need for improvement to the case study and has also shown that there is a gap that needs to

be further studied to enhance both proposed and upgraded urban spaces to attain the desired sustainable spaces of the future. In conclusion, this chapter has evaluated how this project has fared using the innovative SUCCEED tool as the measuring criterion, and also offers guidelines on how the indicators can be upgraded. The workability of this assessment model on this case study has proven to be very successful and has encouraged various suggestions on how further studies could be carried out in improving this model. These are embedded within the last chapter of this thesis, regarding suggestions for further research directions. The final chapter of this thesis provides a set of recommendations, states the overall contribution of this study to existing knowledge, summaries the research and, lastly, makes some final concluding remarks.

CHAPTER NINE: CONCLUSION, RECOMMENDATIONS AND CONTRIBUTIONS TO KNOWLEDGE

9.1 INTRODUCTION

This final chapter concludes the thesis, and presents the summary, key research findings and development of the guidance document for achieving sustainable urbanism through the use of the innovative sustainable assessment tool, SUCCEED. In addition, the chapter makes recommendations for government, industry, practitioners, and academia and sets out directions for future works in the field. Sustainability assessment is established as the basic foundation for, or an essential aspect in, achieving sustainable development and sustainable urbanism but this technique has been adopted in most developed societies, while drawing the interest of developing societies. In addition, sustainability assessment should be seen as a baseline for delivering urban spaces in delivering urban spaces in every community regardless of their level of development or how much knowledge of sustainability has been embedded into the system. This study develops an innovative and holistic approach to sustainability assessment of urban neighbourhoods in order to deliver the future sustainable urban spaces within Nigeria.

9.2 RESEARCH SUMMARY

This research was driven by the need to implement sustainable urbanism through the use of assessment tools and to develop a holistic assessment method for developing countries with specific emphasis on Nigeria. In order to review, discuss and analyse the data in achieving the aim and objectives, the researcher adopted five stages for the structured investigation, which comprises nine chapters. These chapters work hand in hand with the research objectives and the research process which was clearly explained in the methodology chapter. This section summarises the work undertaken to address the identified research problem and presents the context and rationale of the study.

9.2.1 Literature Review

Chapters 2 and 3 (constituting research process **stage 1**) present a review of the literature which identifies knowledge gaps and the present knowledge in the field of urbanisation, sustainability, sustainable urbanism, sustainable development and its association with developing countries, with a specific emphasis on Nigeria.

9.2.2 Methodology

The research methodology in Chapter 4 emphasises that the epistemological and ontological perspectives of this thesis are appropriately situated within interpretivism and constructivism (social constructivism), respectively. The essence of this thesis is to produce an all-inclusive understanding of sustainable urbanism which could be achieved using the sustainable assessment method and develop an innovative and holistic sustainability assessment tool to improve how existing and new urban neighbourhoods can adopt sustainability techniques. This is to *understand* rather than to *explain* human behaviours. Due to this, constructivism was found to be more appropriate for this research; hence the adoption of the mixed-method approach was deemed fit for this research. This research adopted the semi-structured interviews and questionnaires (using Delphi techniques) as the primary methods for the collection of data. The interview process involved 30 participants comprising 10 practitioners, 10 academics and 10 government officials. Also, in this stage, the proposed assessment tool consisting of 105 indicators was used to develop the questionnaire which had a total of 50 respondents. The data collected alongside other complementing data were qualitatively analysed using mainly content analysis while the questionnaires were analysed using statistical tests - mean and standard deviation - which were both run using Microsoft Excel spread sheet 2013. It is also very important to note that the methods are inter-related and they inform and complement each other. The analysis influenced the final development of the SUCCEED neighbourhood assessment tool which was then implemented on a case study (Mount Pleasant) and the results were used to recommend further studies.

9.2.3 Applications and proposed assessment tool

This was achieved in Chapters 5 and 6 which presents **stage 2** of the detailed analysis on how the proposed assessment tool evolved. It started by analysing sustainability indicators and the most important indicators for developing countries. It also analyses the current assessment tools developed in various contexts; three main tools were analysed which are BREEAM ND, LEED v5, CASBEE for Urban Development and Green Star for Communities. Also two other emerging tools developed in the UK were also studied which are SuBETool and SUPD. This analysis and synthesis opened up the concept on how indicators can be selected and used to develop an assessment tool also operating within the envelope of developing countries, hence contextualising the tool to suit the Nigerian urban spaces. The proposed assessment tool, SUCCEED (the Sustainable Urban Composite Cities Environmental Evaluation Design Tool)

was designed through a methodological approach by selecting the most suitable indicators and leaning towards the strengths and weaknesses of existing assessment tools which were analysed earlier. This proposed tool was prepared as a draft and was validated in the following stages.

9.2.4 Analysis and Discussion of Data Collection

This chapter presents the analysis and discussion of **stage 3** of the research process which clearly looks at Chapter 7 and addresses research objective 4. The main focus of this chapter was to analyse, understand and synthesise the data collected from semi-structured interviews, the questionnaires, and documentary evidence. It also explains how data collected are used to streamline or tailor-fit the proposed assessment tools, and also enrich the writing up of the thesis, recommendations, and contribution to knowledge. The analysis presented a cross-sectional discussion and empirical report establishing the facts on sustainability development, assessment tools, urban governance and sustainability indicators prioritisation. Therefore the first section presents the commentary and analysis of sustainability assessment, sustainable urbanism/development and implementation, which then summarises the responses to 13 key interview questions. This section also analyses the questionnaire according to the priorities of the four main dimensions of sustainability (environmental, economic, social and planning – the 'planning' dimension was added later). This was achieved through statistical testing using frequency, mean and standard deviation in order to understand how best these results can influence the proposed assessment tool (the researcher suggests that the quantitative research analysis was key to the validation of the data). The analysis was completed with a remodeled assessment tool showing the grading criteria and the process of assessment.

9.2.5 Analysis, Discussions and Conclusion

Research processes **stages 4** and **5** are combined as they are presented in Chapters 8 and 9 of the thesis. The previous research process **stage 3** presented the development of the novel holistic sustainability assessment tool known as SUCCEED; hence **stage 4** is focused on the testing, implementation and adoption of SUCCEED and its evaluation/workability. Developing the SUCCEED tool and its theories was informed through practices, current assessment tools, and mixed method of data collected. Therefore the development of the SUCCEED tool was a combination of the first four research stages. Chapter 8 presents a cross-analysis of how the tool was used to evaluate and analyse a case study in Abuja Nigeria. Research process **stage 5** which is a combination of Chapters 8 and 9 adapts what has been learnt with regards to the new assessment tool and analyses how this framework can be used in achieving sustainable

urbanism as well as writing up the thesis conclusions and contribution to knowledge. This chapter keeps up with the research questions which were formulated from the research aim and objectives. Therefore this section presents a summary of how the questions were addressed.

- **Question One - How will sustainable urbanism respond to understanding the synergies between technologies, politics, planning, economics, society, culture and environment?**

This research endeavoured to address or redefine what sustainability, sustainable development and sustainable urbanism is in the context of the developing world and also responds to objectives 1 and 2 of this research. In doing so it led to other pressing subtopics which include sustainable development, sustainable assessment and sustainable indicators. The theory and practice of sustainable urbanism complements these subtopics. Therefore, Chapters 3 to 5 construct an understanding of the theory and the synergy between these key areas and how they are interlinked. The core research question, Q1, was discussed in depth within these chapters. However, the main dimension of sustainability used to design the assessment tool includes economic, socio-cultural, planning and environmental sub-dimensions. Within this main dimension are core categories and with the core-categories are sub-categories; for example, economics and value are core categories and under these are situated sub-categories which include affordable housing, housing demand, informal sector, income-generated development, and access to finance. Also community/culture/society has socially inclusive communities, connected communities, local context, public engagement, community cohesion and local social vitality as sub-categories. All the core categories have sub-categories that are interlinked or interrelated in achieving sustainability assessment criteria which is a subset of sustainable urbanism. The synergies between these indicators was used to construct the SUCCEED assessment tool and the tool is an instrument in achieving sustainable urbanism.

- **Question Two - What are the most important indicators and assessment models of sustainable urbanism used in measuring the level of sustainability of urban neighbourhoods in developing countries, and how can they be selected to develop an assessment tool?**

This research question was answered in Chapters 5, 6 and 7 which started by explaining what sustainable indicators were and the various tools that have been developed to measure sustainability in different contexts. Also these chapters respond to objectives 3 and 4 of the research. According to this research, developing countries are lacking assessment tools and it

has been analysed that most indicators are key in achieving sustainability, mostly in developing worlds. These indicators were selected based on the cross-examination of six assessments tools – BREEAM ND, LEED v5, Green Star for Communities, CASBEE, SuBETool, and SUPD. With the analysis, comparison and contrasting of these tools, a list of indicators was selected and used to propose SUCCEED assessment tool. The underlying dimension for designing sustainability assessment is environmental, social/cultural, economic and planning dimension. The indicators selected were based on the indicators used in developing the assessment tools listed above. In Chapter 7, with the aid of both quantitative and qualitative methods, the indicators were prioritised and validated using both questionnaires and interviews to select the indicators that are important within the Nigerian context. This research question is seen as the backbone of this thesis and the empirical analysis of the data was used in prioritising the research.

- **Question Three – What can be learned from the results of implementing sustainable environmental assessment tools and their methodological applications in Abuja Nigerian Urban spaces?**

This research question was addressed in Chapter 7, 8 and 9 and it responds to research objectives 4 and 5 of the thesis. The proposed assessment tool, SUCCEED, was used to assess the level of sustainability achieved in the case study situated in Abuja, known as CITEC Mount Pleasant. This was achieved in order to test the workability of the tool and to analyse the results obtained from using the environmental assessment tool. It was realised that the tool was extremely useful in justifying how this case study has attained the level of sustainability for that neighbourhood. This result comes with special recommendation and the indicators needed to be selected and upgraded to attain a much higher level of sustainability.

Hypothesis

The discussed issues and raised aspects investigated in this research allowed the researcher to test and verify the research hypothesis. The outcomes can be presented as follows:

In terms of the original hypothesis that *If sustainable urbanism and its theories are applied through the use of environmental assessment tools then urban spaces in Nigeria will be more sustainable compared to its present situation*, I believe that this could be the case.

Outcome: This was tested by using the developed framework; the degree of sustainability measured when using the case study showcased the level that has been achieved by the

proposed development, and with these measurement criteria, urban development can be improved in order to achieve sustainability. The answer to this hypothesis justifies the rationale behind achieving sustainable urbanism through the use of sustainability assessment. Therefore sustainable urbanism can be achieved within urban spaces by using the developed assessment model and putting sustainability into practice. The evaluation and design of the SUCCEED tool ensured that the aim, objectives, research questions and hypothesis are fully achieved.

9.3 EVALUATION OF RESEARCH AIM/OBJECTIVES AND CONCEPTUAL FRAMEWORK

The aim of this research is to develop strategies on how sustainable urbanism can be implemented in developing countries and create a framework using Nigeria as a case study. The aim of the project was informed by the claim in literature of the unavailability of assessment methods used in measuring and implementing sustainability within developing countries. Hence the research develops an innovative and holistic approach towards sustainability assessment in such a context. SUCCEED was developed to make sustainable urban places delivery more realistic and attainable within the Nigerian (developing) communities. A comprehensive conceptual framework and mixed-method research methodology showcased in section 4.6 was conducted to achieve the stated aim and objectives. The research objectives were addressed through the questions and hypothesis which can be seen in Table 4.5 in Chapter 4. This study addressed the following objectives through five stages:

Objective 1: To investigate and critically review the existing concepts/definitions and identify the need for sustainable urbanism in developing countries using Nigeria as a case study.

Objective 1 of this research was achieved in Chapters 2 and 3. The concept and definition of urbanisation and sustainability varies from one country to another and from one region to another. Both developed and developing countries have diverse views in relation to urbanisation and sustainability. The literature revealed the current high rate and level of urbanisation in developing worlds and the need to consider a sustainable approach in this movement. Urbanisation is an inevitable trend that will continue and it has come to attention that it needs to be attained alongside development to help developing societies transcend from developing to a developed society. In order to achieve this it is imperative to identify the consequences of urbanisation which includes high levels of unemployment, poverty,

environmental degradation, housing provision deficit, slums, poor infrastructure and services, urban governance problems, health issues, high crime rate, and food insecurity, among many others. These issues are major problems which developing countries experience while some of these problems are not pressing in developed societies; hence urbanisation varies from one region to another. Sustainability and sustainable development have been analysed as the fundamental principles in managing the current problems which these developing urban spaces experience. The concept behind sustainability has influenced the term 'sustainable development' and the current Brundtland definition has given birth to over 70 recognised definitions. Also the emergence of various urbanism movements has shown that it has benefited from the influence of sustainability. New urbanism, smart growth, integral urbanism, green urbanism and everyday urbanism have all experienced and have been influenced by the indicators of sustainability. The result established that urbanism theory or movement has transcended from one form to another and the current most acceptable movement is sustainable urbanism.

Objective 2: To analyse and review the role of sustainable urbanism within the urban neighbourhood fabric of cities in the UK and across the world.

The objective looks at the definition of sustainable urbanism, current views and emerging thresholds or indicators of this movement, and this was addressed in Chapters 3 and 5. Sustainable urbanism has been successfully implemented in various countries across the globe and the case study analysis has shown a remarkable transcendence from the birth of the movement to date. To understand how this movement has been practiced and adopted, five key case studies were analysed based on current literature regarding this cases. The results established a clear difference between the indicators present in each neighbourhood scale project which indicates that sustainability differs from one context to another. This study also revealed a clear redefinition and conceptualisation of the terms 'sustainable development' and 'sustainable urbanism'. Finally summarises a clear list of sustainable indicators needed in achieving sustainable urbanism.

Objective 3: To test and examine the fundamental objectives of sustainable urbanism and propose a neighbourhood sustainability assessment tool (SUCCEED) as well as sustainability indicators and benchmarks for measuring its successful implementation based on the outputs from objective 1 and 2.

The third objective was attained in Chapter 5 and 6. It has been established from the previous chapters that sustainable urbanism can be implemented through the use of indicators which are used to identify the various levels attained through benchmarks. The studies further understood what these indicators are - their definitions, classifications, dimensions and characteristics of sustainability indicators - from various perspectives. Also the methods of selecting, implementing and measuring these sustainability indicators were analysed to know how they are been used in designing assessment tools. The emergence of assessment tools has identified that sustainability assessment is the most effective means of attaining sustainability. To understand this method, key aspects of sustainability assessment were looked at including methodologies, maturation, overview and development of assessment methods. An in-depth analysis was undertaken analysing LEED V4 ND for neighbourhood development, BREEAM for sustainable urban communities and the Green Star rating tool for communities and CASBEE ND. These assessment tools were looked at based on each one's categorisation, limitations and comparison. Other emerging assessment tools that were studied were SuBETool and SUPD model. These are models that are designed or adapted from existing sustainability assessment framework. To understand how it works, Building for Life was used to measure the level of sustainability achieved in a case study from Chapter 3. Using the information synthesised from this, the proposed assessment tool SUCCEED was introduced for developing countries. This was achieved by selecting key indicators needed in achieving sustainability in developing countries.

Objective 4: Propose a framework that visualises a truly sustainable urban development as the future of Nigerian cities using Abuja as a study area based on the neighbourhood sustainability assessment tool developed in objective 3.

The outcome of this objective was attained in Chapters 7 and 8. This was achieved by analysing the outcome of the research methodology which aims at collecting primary and secondary information and data for the purpose of streamlining the proposed assessment to suit the context area. The mixed-method approach was used which included interviews, documentary review and questionnaires among other methods. The findings set the basis and generated the information for the development of the SUCCEED system. The SUCCEED assessment tool was validated and tested on a case study that comprises of a neighbourhood design scheme. The implementation was successful and the result of the assessment showcases the need to improve the urban environment within urban neighbourhoods in Nigeria.

Objective 5: Summarise the research and identify areas of future research.

This objective finalises and creates a summary for the entire thesis. This can be identified through Chapter 9 of the project and it is an evaluation of the research aim and objectives. These objectives also indicate that the research has achieved a satisfactory contribution to knowledge, recommendation and opportunity for further research. It also showcases how the objectives have been achieved through the stages of the research process. Figure 9.1 below illustrates the relationship between the aim, objectives, the research process (methodology) and thesis chapters.

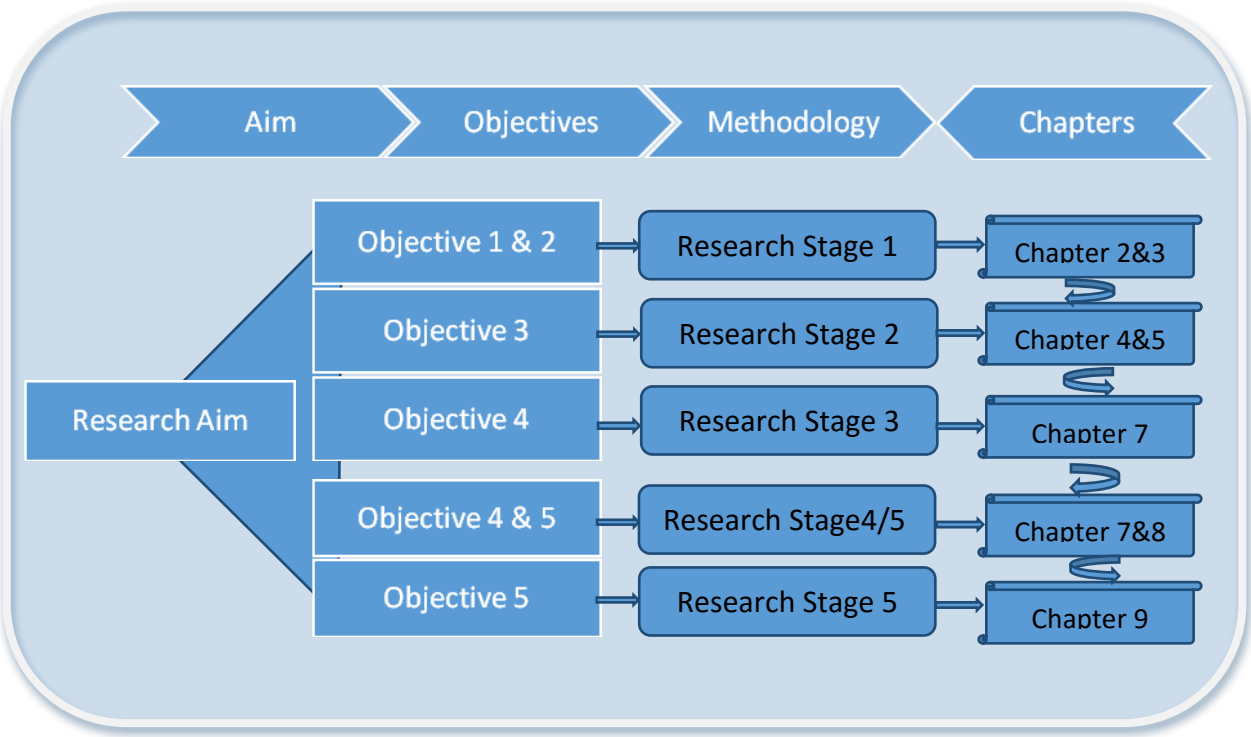


Figure 9.1: The Layout of meeting the Research Aim and Objectives

The conceptual framework developed was based on the literature review discussed in chapter 4 of the research methodology. And based on this framework key issues like the research gap, research aim and objectives, research questions, methodology, methods and analysis were addressed. And the end product of the interpretation of the results feed into the final development of the assessment framework alongside contribution to knowledge. The workability of the conceptual framework is based on how the entire process has been addressed

and how the objectives have been achieved. The uniqueness of this framework has enhanced the outcome of this research findings, knowledge gap and contextual nature of the development and implementation of the assessment method which has led to a novel contribution to knowledge. And lastly the three fundamental questions used in developing the conceptual framework which includes who drives the indicators, what are the benefits of measuring sustainability indicators and how should sustainability indicators are to be measured created an depth understanding on how this framework is to be designed. This then feed into the successful actualisation of the research project.

9.4 FINDINGS AND CONTRIBUTIONS TO KNOWLEDGE

This section includes the summary of the main findings and original contribution to knowledge for this study. The main findings are concerned with the empirical data and its analysis which are presented in Chapters 7 and 8.

9.4.1 Summary of Research Findings

The research was channeled on developing a holistic and novel sustainable assessment tool to enhance and embed sustainability principles into current practice. Hence this research investigation has identified and established the following findings that would be a valuable lesson and result that can be utilised and, also, that other researchers, academics and practitioners could adapt for further research. These main findings were presented in the analysis of Chapters 7 and 8. The research presented a new understanding of and definition for sustainable development and sustainable urbanism, urban governance and sustainability with emphasis on enquiry-based design, the most important sustainability indicators, achieving sustainable urbanism through the use of sustainability indicators and, lastly, sustainability assessment and implementation. The success factors of sustainability development, sustainable urbanism and its principles were established from the practitioners' view point. Furthermore the study discussed how this assessment tool can be adapted or used within the construction industry.

9.4.1.1 Definition of Sustainable Development and Sustainable Urbanism

- It was realised from the interviews and questionnaires that sustainability as a broad term encompasses economic, social and environmental indicators, and that these indicators vary across various contexts even in the developing world. Some indicators prioritised in developing world societies are not pressing issues in developed societies based on the context, environment, climatic factors, level of development, governance and GDP of a country, among other factors. There were different views on what is a sustainable development and sustainable urbanism. Sustainable urbanism in the context of developing countries was defined by the researcher as a movement or a theory that encompasses the four main pillars of sustainability (which are environmental, social/cultural, economic and planning sustainability) but lays more emphasis on economic and social sustainability while minimising the negative environmental impacts in planning, design and operation of urban spaces.
- Sustainable urban development in the context of developing countries can be defined as meeting the needs and aspirations of both present and future generations along both intra-generational and inter-generational timelines through policy implementation, urban design intervention and application of sustainability assessment tools into the urban environment. This can be achieved by adopting sustainability into a project from the very basic level until full maturity.
- Sustainability in developing countries demonstrates that economic and social aspects are the most pressing while most people do not really know about the impact of environmental issues, but in general practice Nigerians tend to manage or conserve their resources, so people do not even know they are practicing a little aspect of sustainability. Sustainability education should be mandatory at all levels of education within the country (primary, secondary, university, local, state, federal and organisational strata) taking into consideration a holistic approach (Momoh, 2015).

9.4.1.2 Achieving Sustainable urbanism through the use of Sustainability Indicators (Prioritising Indicators)

- The research carried out earlier in the thesis suggested that most of the projects which have successfully attained sustainable urbanism status were achieved through the

implementation of sustainability indicators, and that this was initiated based on the aims, needs and achievements of each project. Each case study incorporate a list of indicators based on its relevance and priorities. These indicators, in turn, are used as a benchmark in delivering sustainable communities. The concepts of sustainable development and sustainable urbanism were both derived as a result of the growing enlightenment of the global links between environmental problems and socio-economic issues (Hopwood et al., 2005). Therefore it is asserted that sustainable urbanism combines the three main dimensions in sustainability by ensuring that urban spaces are environmentally aware, socially inclusive and economically productive. The case studies evaluated were Upton (Northampton), Loreto Bay California (Mexico), Newington Sydney (Australia) and Masdar City (Abu Dhabi). All cases indicate a variation in priorities of indicators and shows that their level of importance varies from one context to the other. The bottom line of this analysis was to affirm that sustainable urbanism had been attained through the use of sustainability indicators.

- It is said that sustainable urbanism is also seen as a grand unification of architecture, city development and environmental design for a better way of life (Dominque, 2002). The evaluation and examination of the case studies has proved that achieving sustainability was possible using building codes, assessment tools and sustainability indicators. Based on the literature it became glaringly obvious that sustainability indicators prioritisation was to be achieved by using both quantitative and qualitative methods. The sustainability assessment model designed for the project was based on these methods to create a tool that assesses and implements sustainability on urban development schemes based on its necessity and priority.

9.4.1.3 Urban Governance and Sustainability with emphasis on enquiry-based design

- It was obvious through the study that urban governance is not properly institutionalised within the Nigerian context. According to the literature and interviews, urban governance has been defined as the sum total of the many ways in which individuals and institutions, as well as public, private and civil society organisations participate in the planning and management of the common affairs of a city. This process is a continuous means in which conflicting and diverse interests of citizens are accommodated and cooperative action in their resolutions actively promoted (NUDP,

2012). It was then accepted that to promote good urban governance, decision-making processes must be fully participatory and all inclusive, while implementation strategies and activities must be transparent and accountable to the citizens.

- It was clear that many studies have shown that cities in Nigeria are not properly governed. This situation accounts for their poor state and retards their ability to fully make significant contributions to the national economy. Many Nigerian cities are subdivided into several local governments, militating against their proper governance. For this reason and others there are no institutional structures in place that enhance good governance of Nigerian cities and towns. Without competent and accountable urban governance much of the potential contributions of cities to national economic and social development would not be achieved.
- According to the interviews it was realised that good governance should start from both the bottom-up and top-down approaches. Both methods should complement each other in ensuring that sustainability is been achieved in developing countries. Hence good governance promotes the development of cities which is central to achieving socio-political, economic and environmental sustainability of the country. Also cities operate the national human settlements system and there is the need to re-examine the linkages between the development of rural areas, rural peoples and the growth of urban areas.
- Good governance entails that in promoting sustainable urban development in the country, greater emphasis should be placed on community participation in decision making or EBD. It was also understood that the roles of civil societies which includes neighbourhood and community leaders, professional bodies and non-governmental organisations in the governance and management of our cities need to be more clearly articulated. The growing awareness within the partnership of communities with private sectors in the delivery of services in urban centres should be encouraged in order to deliver more sustainable communities.

9.4.1.4 Sustainability Assessment and Implementation

- The interviews conducted strongly affirm that to implement a proposed assessment tool into a context could be easily attained through a multiple system-based approach by working with necessary key professional bodies, most particularly GBCON, and also presenting a proposal to the government with demonstrated projects or pilot schemes highlighting the key benefits and positive outcomes. Another key method is through

sustainability education enlightenment and community participation, as well as through written papers, conferences, seminars and governmental proceedings explaining the tool and outlining the effects.

- Another method is through the use of standards that are achievable, attainable, measureable and proportionate. Also these standards can be inter-generational and intra-generational, so they can begin from the very basic level of attaining sustainability, following which the yardsticks are increased slowly and steadily in incremental stages until each standard reach full maturity. If for example a span of 10 years is used within intervals, the achievements can be easily managed to make sure that each stage meets that specific target for the timeline.
- This research established the fact that having a pilot scheme to showcase best practices of sustainable places will inform people about the benefits and will help drive such practices into the system. A good example is the Heritage Place Ikoyi, Lagos which is the first LEED-certified building in Nigeria. This project helped to adopt the principles behind LEED assessments' criteria and sustainability into the Nigerian urban spaces. As such, developers, investors and practitioners will be willing to adopt such designs as long as a practical model is displayed to the entire public.
- The research analysed that an agency or a governmental body has to oversee or be in charge of sustainability implementation. This body can help other current agencies to oversee issues like landowners, legal persons, and sustainability assessment and construction, among other responsibilities. They can also be responsible for accepting, approving and enforcing applications. This means that the agency will have the overall responsibility setting the objectives of the development and looking at the plans required and making changes based on what has happened. The most suitable agency to carry out this key responsibility is the Nigerian Green Building Council; currently, they are overseeing the running of sustainability within the built environment but this has not yet commenced in full capacity. They should be the first point of contact in identifying how sustainability techniques can be implemented effectively.

9.4.2 Original contribution to knowledge

Original contribution to knowledge in doctoral research is known to include the following: without copying or imitation, not been done, new style, character, authentic result of thought, and produced within the researcher's facilities. This is also related with the definition of a doctoral degree as an award to a researcher who has critically investigated, evaluated and established an approved topic resulting in an independent and original contribution to knowledge and who has showcased an understanding of research methods appropriate to the chosen field and research area (Mensah, 2013).

According to Silverman (2005 pg. 68), that the determination of originality of PhD research is based on (a) the research genuinely derived by the researcher; (b) the thesis is satisfactory as regards literacy presentation; (c) the thesis is up to the standard of publication; and (d) the thesis forms a distinct contribution to knowledge in the subject area and affords evidence of originality by discovering new facts. This research contributes to existing knowledge in the area of Sustainability, Architecture and Urban Development; the contribution originates from the absenteeism of current sustainability assessment techniques as well as the development of a holistic sustainability assessment tool to promote current practice. This concept led to the development of the **Sustainable Urban Composite Cities Environmental Evaluation Design Tool** (SUCCEED).

9.4.2.1 Primary Contribution

This study mainly contributes to sustainability and urban development/planning knowledge by using mixed methods research to explore the assessment of how sustainable urban spaces have been achieved with emphasis on *developing* countries while *developed* countries can also learn from how this method can improve their system. This led to the design of an innovative assessment model which was developed to be used in applying sustainability into urban spaces.

9.4.2.2 Methodological Contribution

- This research applied social constructivism to decipher and develop an environmental assessment tool which differs from the most commonly used scientific technique or assessment methods, hence contributing to the sustainability assessment knowledge

that social constructivism ontology could be adopted for this research area. Also this research contributes to existing knowledge by emphasising the necessity of conducting and soft protocol in both qualitative and quantitative research data collection.

9.4.2.3 Theoretical Contribution

- This research contributes to the limited amount of literature on sustainable urbanism and sustainable urban development in both developed and developing countries and its development process. It develops the concept of how sustainable urbanism can be achieved using assessment tools and concludes by establishing the methods in which this could be achieved through assessment, implementation, evaluation and recommendation thereby extending existing literature.
- It creates a new approach in developing an assessment tool using the mixed method of data collection and streamlining the indicators to the needs of that context. This procedure opposes existing models that are been developed with more emphasis on environmental aspects.
- It contributes by developing a sustainability model that closes the gap between developed countries and developing countries, like Nigeria, which do not have any form of evaluating sustainability in urban spaces of both existing and proposed development.

9.4.2.4 SUCCEED (Sustainable Composite Cities Environmental Evaluation Design Tool Neighbourhood Development)

- The gap in the existing literature includes understanding the models of achieving sustainable urbanism in Nigerian urban spaces, establishing how the problems resulting from the effects of urbanisation can be managed, and establishing a planning philosophy, process and procedure. The research develops a holistic innovative sustainability assessment techniques tool, SUCCEED. SUCCEED is developed based on the existing globally recognised methods, BREEAM ND, LEED V4 ND, CASBEE UD and Green Star for Communities and three emerging methods, SuBETool and SUPD. This technique is based on indicators' selection, prioritisation and validation based on the context and data collection from academics, practitioners, governments and other participants (including community members).

- This assessment tool is totally new and although, at the time of writing, there is little knowledge of its practicality in context, it has shown strong potential for a change in sustainability and urban planning paradigm in Nigeria and other developing countries. The study developed a framework and relevant implementation strategies which would provide in-depth knowledge and explanation on how useable and friendly the assessment tool is. The tool is also designed to showcase how developed countries can learn from developing the world in regards to sustainability assessment; it also identifies deficiencies in the current assessment methods, and showcases how SUCCEED ND addresses the problems of sustainability in developing countries

- The study covers the key areas of sustainability which include important indicators needed in measuring sustainability of urban spaces. Sustainability in the context of this research is divided in four main dimensions, 21 category indicators, and 105 sub-category indicators and 105 sub-category indicators.

- The study develops the methodology for implementing the SUCCEED ND tool. This includes the introduction of the calculation system using mean and standard deviation to create the grading criteria which the development has attained. The formula for calculating the overall score is based on the number of indicators achieved or partially achieved and the values placed on each indicator.

- The practicality and application of the SUCCEED ND tool was explored through its implementation on the case study project in Abuja Nigeria. The results and feedback identify significant learning outcomes for improving the assessment and evaluation of the sustainability criteria. The result also showcases the need for how the environment can be retrofitted and sustainability could be influenced through design changes. It also shows evidence that sustainability implementation can resolve most problems arising from urbanisation. The successful adaptation of this methodology could lead to a successful adaptation of sustainable urbanism and its principles.

9.5 REFLECTION OF PROBLEMS ENCOUNTERED IN CONDUCTING RESEARCH

Research challenges are inevitable, but can vary from one project to another. The empirical research carried on from July 2014 to October 2014 commenced in the UK with renowned academics who practiced in Nigeria and the United Kingdom. The data were drawn from both

primary and secondary sources. The problems encountered were the proximity of most interviewees; scheduling a perfect time to meet was a problem and those who were not easily reached had to use telephone interviews. Other problems included the number of registered professionals in Nigeria, proximity to data, access to internet for data collection (e.g. questionnaires), the level of education, political system, security situation in the region (mostly Boko Haram threats), diversity in religions, health issues (the Ebola crisis), unequal gender balance (more male than female participants), values attached to research (some participants are not bothered about answering the research questions appropriately), power failures, scheduling time to meet up with the interviewee as most government officials are fully engaged with different types of activities and, lastly, difference amongst individuals in the study area. Most of these problems are common in developing countries.

Most developing worlds are not known to be influenced by knowledge-based research used to improve the economy. Hence this has a knock-on effect on the way in which research is perceived. So it was anticipated that most of the respondents might not keep to time and/or venue, and that there was a high possibility of having to reschedule the meetings. Also making appointments to interview top government officials was very difficult, because of the security problems on the ground, and the fact that movements in and out of government agencies are by nature restricted. The main reason for interviewing such people was their vast knowledge and experience in the subject area. People who could not be interviewed had to be replaced on the list of contacts. Most interviewees lived in different towns and cities, hence long distances had to be covered every day to collect these data, which proved very expensive. Also, in some cases, Skype and telephone interviews were suggested where it was hard to reach those people. Constant threats from the terrorist group Boko-Haram were always being made, which made it difficult to receive the returned questionnaires, make observations and take pictures related to the case study. This case affected both the researcher and the interviewees. Lastly for some of the case studies researched across the globe, the researcher had to rely on secondary data as travelling to each location to collect primary data was expensive and time-consuming, and therefore not feasible, based on such time and cost constraints..

9.6 RESEARCH LIMITATIONS

When carrying out a research project it is known that a number of limitations are bound to be present based on the nature of this study and the vastness of the topic. This list below captures a few areas where limitations are present:

9.6.1 Limitations of the research subject area

This research basically focuses on measuring the level of sustainability in urban neighbourhoods within Nigeria. The newly developed tool can be used at various timescales within the specified designed context or location, but this model can be readapted to different contexts if the prioritisation of sustainability indicators can be identified within the proposed context. Hence it is not flexible to be used in other context but needs to be readapted.

9.6.2 Timescale limits

The timescale of this project is very important to this research due to the vast amount of indicators that are been embedded in the assessment model. It is imperative to measure sustainability along various timelines and within various time frames in order to capture a comprehensive analysis in regards to the tool and shaping a more sustainable urban space. Hence the data used for the purpose of measuring the case studies in Abuja were enclosed within the time frame of 2006 to 2016.

9.6.3 Data Type and Availability

Access to key data is vital in the area of sustainability development, sustainable urbanism and assessment of sustainability which should include both qualitative and quantitative data. Most data in this study, which include monitoring the design of the assessment tool, observations, interviews and assessment of neighbourhood designs, are limited or protected. In other words, the interpretation of assessment models is available to the wider audience or protected depending on the parameters set by the developers of the assessment tool. The development of the model and validation was based on the primary data collected by the researcher. To avoid biased results, extra effort had to be made to collect high- quality information.

9.6.4 Limitations based on the research findings in terms of practical application to the Nigerian context.

The current state and knowledge in the practical application of sustainability is still far-fetched because most developing countries like Nigeria are still in the verge of understanding the

theoretical implications and applicability. Although the researcher stated in the research conducted that some of the ideas, concepts and applications conducted are aspects of sustainability, the Nigerian context still need to consider how to apply this principle looking at an holistic perspective which includes, social, economic and environmental sustainability. Current knowledge of subject area is very basic and in order for the built environment sector to drive sustainability we have to look at the entire stakeholder involved which should include the end users as well. The limitations of sustainability applicability within the Nigerian would be considered looking at who drives the indicators, what are the benefits of measuring sustainability and how such sustainability indicators should be measured.

In terms of who drives the indicators it's should be clearly known that the drivers are the people that implements sustainability as a key principle within the foundation of urban development and planning. And it was agreed that it should be looked at through an holistic perspective although within the Nigerian context it would be challenging for sustainability to be implemented by this drivers. It has to come from the top to bottom approach which should be spear headed by the government and others organisations like NGO's and the Green Building council of Nigeria and other professional bodies. Knowing that its adaptation is one of the key issues it would be advisable for this drivers to promote sustainability through showcasing the key benefits, providing incentives like tax reductions, creating policies that drives the adaptation and other methods that has worked across the globe. Also this key drivers institutions that drives sustainability need to come together to create a framework that truly justify the need for its implementation. This research can actually create the potential in adapting this conceptual framework and working on it to proper suit this context.

The benefits of measuring sustainability within both long-term and short term perspective are profiting. But the limitation is that most benefits look at long term perspective for it to be realised within the context. People are always looking for the quickest solution and its known that the best quick solution is never the best solution. The benefits in measuring sustainability includes successful implementation of high standards in urban planning, influence on other sectors looking at economic, social and environmental sustainability, reduction of CO2 emissions, urban renewal and urban regeneration of most neighbourhoods amongst other key benefits. But the main issue that debunks the adaptation is the time in implementation, cost of adaption, education and current Nigerian situation like poverty, corruption, value system and lots more.

Another question that stood up in this research was how should sustainability indicators be measured and its limitation within the Nigerian context. The indicators were selected based on its priority level and selection within the Nigerian context but the robust nature of the tool has shown that most aspect of sustainability is lacking in this context. The tool has about 105 sub-categories and 21 core-categories of indicators thus using this system to measure urban space would require high skill, knowledge, team work, training and education highlighting the key benefits of this assessment tool. The theoretical and conceptual nature of the framework developed in the thesis raises challenging and problematic issues highlighted above in its application and implementation, and this limitations and developed conceptual framework will potentially open the horizon for new research question, agenda, opportunities and directions.

9.7 RESEARCH RECOMMENDATIONS

Successive governments in Nigeria have shown little concern for solving urban problems. Rather, they have directed more efforts towards promoting agriculture, oil and gas and rural development, to the neglect of urban development. Currently, the general apathy towards urban planning still persists in the country. Facing with the spiraling rate of urbanisation, Nigeria needs to accord high priority to urban development issues, particularly in light of the fact that urbanisation is unstoppable and that cities are the engines that drive the national economy. This research established the fact that there is insufficiency in the conventional assessment planning technique which necessitated this research aim to develop a holistic and innovative sustainability assessment tool. The research is based on mixed research strategy and social constructivism philosophy which utilised a cross-examination of data collection techniques. Hence, in the conclusion of this study, recommendations for practice and future research are made for industry and academia, government, and future scholars.

9.7.1 Recommendations for the Industry and Academia

This research has developed a sustainability assessment tool and system in delivering a fully functional urban space. The study resulted in many essential outputs; some of these are enhancing practice, performance, adaptability and understanding of the subject area.

9.7.1.1 Adopting the SUCCEED Concept

Adopting the SUCCEED assessment tool will enhance the sustainability assessment tool and implementation alongside achieving sustainable urbanism as the overall goal. This will improve performance and overcome the following:

- Limitations of sustainability, assessment and sustainable urbanism
- Communication barriers
- Limitations of indicators used in developing the urban spaces (social-cultural, economic and environmental factors)
- Lack of understanding of the basic principles of sustainable development and sustainable urbanism.
- Limitations of evaluation (thus promoting learning and improving skills).

The SUCCEED system was designed based on construction practice, thus it is flexible to all types of project which ensures a multidisciplinary approach in satisfying client, contractor and community. The researcher recommends that the model should be reviewed more often than its current practice- he suggests one to three years intervals – in order to identify if some of the indicators can be more or less prioritised and also indicators can be embedded or removed from the assessment criteria.

9.7.1.2 Applying the SUCCEED Tool

The outcome of applying SUCCEED to the case study will encourage and recommend the wide adoption of the system so as to ensure and achieve maximum output of effective and sustainable project delivery. The tool was developed to tailor check the limitations which conventional tools may create and ensure that projects are effectively, efficiently, economically and ethically achieved. The tool was designed based on all participating parties through a collaborative process and can be applied by any professional that understands the concept of sustainability assessment based on proper training. This approach gives an opportunity for the entire team to understand how to integrate and improve on the project. The implementation and evaluation process of the tool is important for improvements of projects, both proposed and existing. The SUCCEED system is an innovative tool and is recommended to be adopted in developing countries that it is designed for. It can also be readapted to suit developed societies.

9.7.1.3 Sustainability Assessment in Academia

It has been imperative throughout this research that academia is important in urban neighbourhood design and development. It is also known that there are no conventional techniques available for its use in developing countries. However, from current literature, it is known that assessment tools are starting to be noticed in developed societies ranging from BREEAM, LEED, CASBEE and Green Star, to and codes for sustainable homes. This has established enlightenment in the area with educational institutions but it is still lacking understanding, and appreciation of the value of this system is imperative. Therefore one major recommendation would be to increase training and professional development for practitioners kin order to enhance the knowledge they hold in sustainability assessment systems - specifically, the SUCCEED system.

9.7.2 Recommendations for Government Bodies

Urban development is a multi-faceted process engaging the services of multi-disciplinary professionals. It entails coordinating and harmonising the various land-use decisions and building activities of a multitude of actors (government institutions and agencies, stakeholders, civil society organisations, and individuals) by the established planning agencies at all tiers of government in the country.

- The assessment framework established should act as a mechanism for promoting the participation and collaboration of major actors involved in the process of achieving sustainable urbanism.
- Develop a capacity and promote a shared understanding by all actors of their roles and responsibilities in urban development and management.
- Build capacities of relevant agencies and actors to effectively perform their roles and responsibilities in promoting sustainable urban development and management and supervise the activities of the physical planning regulatory bodies.
- Sustainability assessment can be embedded into the Vision 20:2020 document which targets transforming the country to enter the league of the world's 20 largest economies by 2020. It noted globally that Nigeria is well poised to address the current challenges it faces in promoting sustainable urban development. This is because urban centres provide the spaces that accommodate the functioning of all sectors of the economy. The

thesis recommends promoting functional cities for rapid economic growth and that priority should be given to good governance of the urban planning system.

- The researcher recommends that the government should introduce an assessment strategy which ensures regular checks for CO^2 emissions and recommends strategy on how to manage the amount of CFCs and CO^2 gases expelled into the atmosphere.
- The government has to create measures on how to raise awareness on sustainability and understand how it affects people and the entire globe. They should also understand the consequences of not being sustainable, - not just the economic and social impacts but the environmental impact as well, which is potentially more catastrophic. Raising awareness efficiently can be done through a multi-stakeholder framework with the aid of sustainability experts from GBCON, construction companies, government parastatals, the Ministry of Works and Housing, and the Ministry of Environment and Urban Development through the National Building Codes. These agencies need to come together and look for a way forward on how to create sustainability awareness within a framework. This can be either short-term or long-term sustainable measures. The efficient implementation of sustainability indicators and could then be merged with key performance indicators to be achieved within five years, 10 years and 20 years, and that could be through country-level, regional-level and state-level approaches (inter-generational and intra-generational).
- Rural spaces are home to people with very low productive skills which, when brought to cities, have little relevance for their sustenance. The difference between developed societies like in Europe is that when people migrate they bring in skills while in Nigeria most of the people from the rural spaces are farmers without skills, making them unable to contribute which creates an imbalance of skills. The government should encourage the development of skills in both rural and urban settlements in order to reduce the level of urbanisation and to help increase people's development.
- Most urban spaces in Nigeria are in their infancy and there are opportunities because the country is currently battling with urban planning problems and challenges, in the sense that most of the major metropoles are growing exponentially. The government can intervene in controlling the master plan and proposing a sustainable strategic growth pattern. Overall the researcher recommends that the government reviews master plans for sustainable purposes.
- Build and strengthen the capacities of relevant ministries, departments and agencies to facilitate the adaptation of sustainable urban development principles and also provide

necessary support and incentives to the private sector to effectively participate in the establishment of sustainability assessment schemes.

- Build and strengthen the capacities of state planning boards and local planning authorities to implement these schemes using a top-down approach.

9.7.3 Recommendations for future work

This research identified some areas which are worth recommending for further research.

9.7.3.1 Application of SUCCEED in other projects rather than neighbourhood schemes.

The main purpose of this thesis was to develop an assessment system for urban spaces. This system was implemented and tested on an urban neighbourhood; however, the system can be remodelled for housing design, domestic refurbishment, local and international new construction, non-domestic new/refurbishment and in-use projects.

9.7.3.2 Developing software or application for the SUCCEED Tool

The implementation of SUCCEED was led by the researcher using Microsoft word document and Excel to measure and calculate the level of sustainability attained. This is a rigorous system that needs application and a high degree of accuracy. It is recommended to develop a software application for SUCCEED to help facilitate the process.

9.7.3.3 Collaboration with other closely related techniques

The development of the SUCCEED system was based on established assessment techniques such as BREEAM, LEED and Green Star. It would be recommended to look into the possibility of future collaboration to enhance the system.

9.7.3.4 Exploring the potential of using the SUCCEED system in other developing countries

The researcher suggested testing the tool on other projects in various developing countries across the globe. However, based on the research scope, limitations, contextualisation and adaptation to suit the Nigerian community, this was not applied in this research, but is recommend for future studies. This can be achieved by focusing on other regions within Nigeria that have different climatic zones to make the tool a more regional assessment framework. Also practitioners could look at other countries to understand whether this tool can be used within countries in Africa, Asia and South America, which are mostly developing.

9.7.3.5 Others

The researcher suggests that the process via which the assessor can identify the achieved indicators from those that have not been achieved must be grounded, unbiased and controlled to ensure an accurate result. This is because the current system in Nigeria is known not to be efficient due to well-documented corrupt nature of the agencies and government parastatals. Hence it is advised that measures should be put in place on how to tailor check the assessment of projects in achieving an absolute concise dataset. Lastly, most developing countries in the world, particularly those in Africa, claim that their activities showcase large aspects of management and sustenance due to the nature and level of their development. One of the participant claims that "*we contribute little or none disproportionately to global environmental degradation"*. The researcher recommends that it is vitally important that sustainability is taking seriously from inception in developing countries so that mistakes will not be made. Further research has to be carried out to know how much developing countries contribute to environmental degradation in order to determine the level and pace in which sustainability can be adopted into each context.

9.8 FINAL COMMENTS

The research has developed extensive training skills and techniques for the researcher which has helped in gaining an understanding of the entire research process. The researcher was reminded of the saying that *"the journey is as important as the destination"*. This popular statement kept the researcher in check to appreciate and cherish all important steps taken in achieving the end result of this thesis. Although there were numerous challenges, struggles and setbacks, the goal of this thesis was achieved. This innovative sustainability assessment tool has closed the gap in the unavailability of assessment tools designed for developing countries - particularly Nigeria - and will successfully enhance current practices in delivering sustainable urban places. The assessment and feedback suggests that the SUCCEED system has the capability of becoming established as a conventional assessment technique in achieving a truly sustainable urban space.

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APPENDIX A - ETHICAL APPROVAL FORMS

NOTTINGHAM TRENT UNIVERSITY

JOINT INTER COLLEGE ETHICS COMMITTEE

ETHICAL CLEARANCE CHECKLIST

College of Art & Design and Built Environment; College of Arts and Science; and the Centre for Academic Development and Quality (CADQ)

(TO BE COMPLETED FOR ***ALL*** INVESTIGATIONS INVOLVING PARTICIPANTS)

All staff and PGR students wishing to conduct an investigation involving participants in order to collect new data in either their research projects or teaching activities are required to complete this checklist before commencement. It may be necessary after completion of this form to submit a full application to the Joint Inter College Ethics Committee (JICEC). Where necessary, official approval from the JICEC should be obtained ***before*** the research is commenced. This should take no longer than one month.

IF YOUR RESEARCH IS BEING CONDUCTED OFF CAMPUS AND ETHICAL APPROVAL FOR YOUR STUDY HAS BEEN GRANTED BY AN EXTERNAL ETHICS COMMITTEE, YOU MAY NOT NEED TO SEEK FULL APPROVAL FROM THE JICEC. HOWEVER, YOU WILL BE EXPECTED TO PROVIDE EVIDENCE OF APPROVAL FROM THE EXTERNAL ETHICS COMMITTEE AND THE TERMS ON WHICH THIS APPROVAL HAS BEEN GRANTED.

IF YOUR RESEARCH IS TRANSFERRING INTO NOTTINGHAM TRENT UNIVERSITY AND APPROVAL WAS OBTAINED FROM YOUR ORIGINATING INSTITUTION, THERE IS A REQUIREMENT ON THE UNIVERSITY TO ENSURE THAT APPROPRIATE APPROVALS ARE IN PLACE.
If you believe either of these statements applies to your research, please contact the Professional Support Research Team adbresearch1@ntu.ac.uk with evidence of former approval and the terms on which this approval has been granted.

IT IS THE RESPONSIBILITY OF INDIVIDUAL INVESTIGATORS AND/OR SUPERVISORS TO ENSURE THAT THERE IS APPROPRIATE INSURANCE COVER FOR THEIR INVESTIGATION.
If you are at all unsure about whether or not your study is covered, please contact the Finance & Planning Manager in your Finance team to check.

Name of Applicant: Job Unekwu Momoh

School: Architecture Design and Built Environment

Title of Investigation: The Role of Sustainable Urbanism in Developing Countries

Staff ☐ **Student** ✔☐ (*if student, please complete)

Degree Title and Level*: Doctorate Degree in Architecture and Urban Development 2nd Year

Name of Programme Supervisor*:Professor Benachir Medjdoub and Professor Bandyopadhyay Soumyen

Section A: Investigators

Do investigators have previous experience of, and/or adequate training in, the methods employed?	Yes ✔	No** ☐
Will junior researchers/students be under the direct supervision of an experienced member of staff?	Yes ✔	No** ☐
Will junior researchers/students be expected to undertake physically invasive procedures (not covered by a generic protocol) during the course of the research?	Yes** ☐	No ✔
Are researchers in a position of direct authority with regard to participants (e.g. academic staff using student participants, sports coaches using his/her athletes in training)?	Yes** ☐	No ✔

** If you select ANY answers marked **, please submit your completed Ethical Clearance Checklist accompanied by a statement covering how you intend to manage the issues (indicated by selecting a ** answer) to the JICEC.

Section B: Participants

Vulnerable Groups

Does your research involve vulnerable participants? If not, go to Section C

If your research does involve vulnerable participants, will participants be knowingly recruited from one or more of the following vulnerable groups?

Children under 18 years of age (please refer to published guidelines)	Yes* ☐	No ☑
People over 65 years of age	Yes* ☐	No ☑
Pregnant women	Yes* ☐	No ☑
People with mental illness	Yes* ☐	No ☑
Prisoners/Detained persons	Yes* ☐	No ☑
Other vulnerable group (please specify Click here to enter text.)	Yes* ☐	No ☑

* Please submit a full application to the JICEC.

Chaperoning Participants

If appropriate, e.g. studies which involve vulnerable participants, taking physical measures or intrusion of participants' privacy: NO

Will participants be chaperoned by more than one investigator at all times?	Yes ☐	No* ☐	N/A ☑
Will at least one investigator of the same sex as the participant(s) be present throughout the investigation?	Yes ☐	No* ☐	N/A ☑

Will participants be visited at home?	Yes* ☐	No ☐	N/A ☑

* Please submit a full application to the JICEC.

If you have selected N/A please provide a statement in the space below explaining why the chaperoning arrangements are not applicable to your research proposal:

Click here to enter text.

Advice to Participants following the investigation

Investigators have a duty of care to participants. When planning research, investigators should consider what, if any, arrangements are needed to inform participants (or those legally responsible for the participants) of any health related (or other) problems previously unrecognised in the participant. This is particularly important if it is believed that by not doing so the participants well-being is endangered. Investigators should consider whether or not it is appropriate to recommend that participants (or those legally responsible for the participants) seek qualified professional advice, but should not offer this advice personally. Investigators should familiarise themselves with the guidelines of professional bodies associated with their research.

Section C: Methodology/Procedures

To the best of your knowledge, please indicate whether the proposed study:

Involves taking bodily samples	Yes † ☐	No ☑
Involves procedures which are likely to cause physical, psychological, social or emotional distress to participants	Yes † ☐	No ☑
Is designed to be challenging physically or psychologically in any way (includes any study involving physical exercise)	Yes † ☐	No ☑
Exposes participants to risks or distress greater than those encountered in their normal lifestyle	Yes* ☐	No ☑
Involves use of hazardous materials	Yes* ☐	No ☑

* Please submit a full application to the JICEC

† If the procedure is covered by an existing generic protocol, please insert reference number here Click here to enter text.
If the procedure is not covered by an existing generic protocol, please submit a full application to the JICEC.

Section D: Observation/Recording

Does the study involve observation and/or recording of participants? If yes please complete the rest of section D, otherwise proceed to section E	Yes✔	No☐
Will those being observed and/or recorded be informed that the observation and/or recording will take place?	Yes✔	No*☐

* Please submit a full application to the JICEC

Section E: Consent and Deception

Will participants give informed consent* freely?	Yes☐	No*☐

If yes please complete the ***Informed Consent*** section below.
*If no, please submit a full application to the JICEC.

* Note: where it is impractical to gain individual consent from every participant, it is acceptable to allow individual participants to "opt out" rather than "opt in".

Informed Consent

Will participants be fully informed of the objectives of the investigation and all details disclosed (preferably at the start of the study but where this would interfere with the study, at the end)?	Yes☐	No*☐
Will participants be fully informed of the use of the data collected (including, where applicable, any intellectual property arising from the research)?	Yes☐	No*☐

For children under the age of 18 or participants who have impairment of understanding or communication:

- will consent be obtained (either in writing or by some other means)?	Yes☐	No*☐	NA
- will consent be obtained from parents or other suitable person?	Yes☐	No*☐	NA
- will they be informed that they have the right to withdraw regardless of parental/ guardian consent?	Yes☐	No*☐	NA
For investigations conducted in schools, will approval be gained in advance from the Head-teacher and/or the Director of Education of the appropriate Local Education Authority?	Yes☐	No*☐	NA
For detained persons, members of the armed forces, employees, students and other persons judged to be under duress, will care be taken over gaining freely informed consent?	Yes☐	No*☐	NA

* Please submit a full application to the JICEC

Does the study involve deception of participants (ie withholding of information or the misleading of participants) which could potentially harm or exploit participants?	Yes☐	No☑

If yes please complete the ***Deception*** section below.

Deception

Is deception an unavoidable part of the study?	Yes☐	No*☐
Will participants be de-briefed and the true object of the research revealed at the earliest stage upon completion of the study?	Yes☐	No*☐
Has consideration been given on the way that participants will react to the withholding of information or deliberate deception?	Yes☐	No*☐

* Please submit a full application to the JICEC

Section F: Withdrawal

Will participants be informed of their right to withdraw from the investigation at any time and to require their own data to be destroyed?	Yes☑	No*☐

* Please submit a full application to the JICEC

Section G: Storage of Data and Confidentiality

Please see University guidance on https://www.ntu.ac.uk/intranet/policies/legal_services/data_protection/16231gp.html. You will need your user name and password to gain access to this page on the Staff Intranet.

Will all information on participants be treated as confidential and not identifiable unless agreed otherwise in advance, and subject to the requirements of law?	Yes☑	No*☐
Will storage of data comply with the Data Protection Act 1998?	Yes☑	No*☐
Will any video/audio recording of participants be kept in a secure place and not released for use by third parties?	Yes☑	No*☐
Will video/audio recordings be destroyed within six years of the completion of the investigation?	Yes☑	No*☐

* Please submit a full application to the JICEC

Section H: Incentives		
Have incentives (other than those contractually agreed, salaries or basic expenses) been offered to the investigator to conduct the investigation?	Yes**☐	No☑
Will incentives (other than basic expenses) be offered to potential participants as an inducement to participate in the investigation?	Yes**☐	No☑

** If you select ANY answers marked **, please submit your completed Ethical Clearance Checklist accompanied by a statement covering how you intend to manage the issues (indicated by selecting a ** answer) to the JICEC.

Compliance with Ethical Principles

If you have completed the checklist to the best of your knowledge without selecting an answer marked with *, ** or † your investigation is deemed to conform with the ethical checkpoints and you do not need to seek formal approval from the JICEC.

Please sign the declaration below, and lodge the completed checklist with Sarah Dossor in the Professional Support Research Team, Maudslay 312, City Campus, or via email adbresearchteam1@ntu.ac.uk.

Declaration
I have read the Ethics & Governance Statement http://www.ntu.ac.uk/research/ethics_governance/index.html. I confirm that the above named investigation complies with published codes of conduct, ethical principles and guidelines of professional bodies associated with my research discipline.

Signature of Applicant

Job Unekwu Momoh

(Research Student or Principal Investigator)

Signature of Supervisor/Line Manager
(Director of Studies/ATL)

Click here to enter text.

Date

11/08/2014

If the provision for compliance with ethical principles does not apply, please proceed to the ***Guidance from JICEC*** section below.

Guidance from JICEC

If, upon completion of the checklist you have selected ANY answers marked **, please submit your completed Ethical Clearance Checklist accompanied by a statement covering how you intend to manage the issues (indicated by selecting a ** answer) to the JICEC.

If, upon completion of the checklist, you have selected an answer marked with * or † it is possible that an aspect of the proposed investigation does not conform to the ethical principles adopted by the University. Therefore you are requested to complete a full submission to the JICEC. A full submission to JICEC comprises of

- this form
- a project proposal*
- a copy of consent forms or letters
- an additional statement of up to 800 words outlining the ethical issues raised by the project and the proposed approach to deal with these.

If the project has been subject to ethical review by another University or external body

- a copy of the full application submitted is also required.

*The document may be any of the following: Project Approval Form (RD1PA), Transfer Form (RD2T), Annual Monitoring Form, or a Case for Support for an external funding proposal e.g. AHRC.

Please send this form and any attachments to the attention of Sarah Dossor in the Professional Support Research Team, Maudslay 312, City Campus, or via email adbresearchteam1@ntu.ac.uk.

Checklist OK to file ☐

or

Forward form & attachments to JICEC ☐

Signature of JICEC Chair Michael J White Click here to enter text.

Date 26 March 2015 Click here to enter a date.

APPENDIX B: EMPIRICAL FIELD DATA COLLECTION

Detailed interviews and questionnaires will be conducted with a number of experts within the built environment which includes stakeholders, designers, engineers, planners, landowners, developers, community members and sustainability assessors with extensive knowledge and experience of neighbourhood and city designs within developing societies.

SEMI-STRUCTURED INTERVIEW QUESTIONS

SECTION 1 (Sustainability and Sustainable Urbanism Definition)

Q1. What is your understanding of Sustainability and Sustainable Urbanism in the context of developing worlds?

Q2. Do we have an opportunity to shape a brighter future for the built environment using sustainable measures? If yes, which have you used?

SECTION 2 (Adopting Sustainability)

Q3. How can we develop an urban planning system which integrates buildings and urban spaces designed with sustainability criteria? (Government Level)

Q4. How can stakeholders (built environment experts) develop a system where stakeholders could collaborate in decision making to achieve sustainable development as well as ensure that they adopt sustainable planning systems? (Local Level)

Q5. Are the stakeholders aware of the range of sustainable techniques/indicators both internally and externally? If they are not aware what seems to be the problems and in practice are we using this criterion to measure sustainability and how much are using?

SECTION 3 (Governance)

Q6. How can existing policies, practices and issues like high rate of poverty inadvertently debunk the adaptation of sustainability agenda? How realistically do we need sustainable urban planning and how soon can it be achieved? (Statistics of Income earners in Nigeria are 10 per cent High Income, 30 per cent Middle Income and 60 per cent Low Income)

Q7. Current arguments by builders and economists suggest that we cannot afford to initiate sustainability; reasons include high land prices, inadequate services from the government, and the costs of production and maintenance. What is your opinion on this?

Q8. Is the sustainability agenda amongst the top foci when proposing new developments in Nigeria although other foci include location, capital, investors, economic feasibility and growth amongst others? And how can it create a knock-on effect on these agendas or reasons for developments?

Q9. Are we practicing the use of enquiry-based design which involves the design of our environment, as well as consulting and involving stakeholders and the local communities? Can this be actualised?

Q10. What can the government do to empower local communities to be more active in delivering sustainable places?

SECTION 4 (Sustainability Assessment and Implementation)

Q11. How can we establish an agency that regulates, operates, encourages and supervises the development of spaces in sustainable communities based on a set of standards?

Q12. How can smart tools for well-designed communities be adopted in Nigeria and what do you think can be the problems of these tools?

Q13. If there was to be a proposed sustainability assessment tool developed for Nigeria would the government and stakeholders adopt it? What will be the procedure in achieving it?

APPENDIX C

OVERVIEW OF QUESTIONNAIRE RESPONSE (MOST APPROPRIATE SUSTAINABLE INDICATORS)

Sustainable communities have been defined as the spatial manifestation of sustainable development principles - "they are places where people want to live, work, prosper and enjoy a good quality of life now and in the future" (Roberts, 2009:128). To create an environment that is sustainable, an assessment process is required to embrace sustainability within communities. Sustainability assessment is a process by which the implications of an initiative on sustainability are evaluated (Pope et al., 2004). The main reasons of sustainability assessment are to provide decision makers with an evaluation of the impacts of the proposed or existing developments on nature and also global to local changes of the social system from both short- and long-term perspectives. The most effective approach is made by assessing selected individual fields by way of sustainability indicators. The use of sustainability indicators helps decision makers to be more informed about the impact of future developments based on their understanding and past experiences. The list of indicators selected below is specifically chosen for their adaptation in developing countries.

This survey will be used to identify which of the main indicators' categories and sub-categories of sustainability the key professionals and non-professionals consider to be important when evaluating a new development project, and also to create a process in which perceptions can influence their thinking about community planning and design. This will clarify any areas of uncertainty and allow those responsible for decision making to offer additional information as well as to validate the proposed assessment scheme (SUCCEED Nigeria) creating a more pragmatic tool which will be influenced by the data collected from professionals and stakeholders within the construction industry as well as end users and lastly the general community. The sustainability indicators will be rated in the attached table according to these six categories, which are 1. Not important at all; 2. Of some importance; 3. Important; 4. Very Important; 5. Extremely Important; and 6. Necessary in the near future. This process will be conducted with 50 participants from various fields and people within the local communities as well (end-users or benefactors) which will help in establishing a robust assessment tool to be refined at the end of this exercise. This result will be cross-referenced with the interview response to also establish similarities and differences in the data collected and at the end validate the most important indicators necessary in achieving a sustainable built environment in Nigeria. Therefore the indicators with the highest score of **not important** or **of some importance** will have to be removed from this list due to the fact that they are not considered at relevant to the Nigerian context and will be placed under the ranking 'necessary in the near future'.

Table 1: Sample of Questionnaire showcasing the relevance of sustainable indicators to the built environment in developing worlds

SUSTAINABILITY DIMENSIONS	CORE CATEGORIES	SUB-CATEGORIES	Most Significant Impact on the Development of Sustainable Communities					
			Not important at all	some importance	Important	Very Important	Extremely Important	Necessary in the near Future
ENVIRONMENTAL SUSTAINABILITY	Pollution	Water Pollution Prevention						
		Noise Pollution Prevention						
		Air Quality Enhancement						
		Pollution Reduction Innovation						
	Materials Resources, Waste Management	Local Renewable Materials						
		Recycling/Innovation/reuse of materials						
		Site Waste Management Schemes						
		Storage of Recycled Waste						
		Use of biodegradable materials						
	Water	Flood Risk Assessment						
		Water Quality Improvement						
		Erosion control						
		Water Supply Initiatives(During Shortage)						
		Waste-water Management						
		Smart metering-water (Managing cost)						
		Reduction in Water consumption daily						
	Ecology	Biodiversity (Biophilia design with nature)						
		Ecological Appraisal/ Enhancement						
		Minimising Ecological Impact						
		Ecological Value Improvement						
		Diversity and Preservation						
		Use of natural topography (No Alteration)						
	Energy	Energy-efficient Building						
		Passive Design (Use of Natural Climate)						
		Renewable Energy Use/Generation						
		Urban Grid Optimisation						
		Consumption Management						
	Climate	Climate Emissions Optimisation						
		Global Warming control measures						
		Flood Risk Mitigation (Management)						
		Solar Radiation gains (Solar Energy)						
		Climate Change Management						
		Resiliency (Return to original form)						
ECONOMIC SUSTAINABILITY	Economics/ Value	Affordable Housing						
		Housing Demand						
		Informal Sector (Local Economy)						
		Income -generated development initiatives						
		Access to financing (Loans, mortgage)						
	Growth	Efficient Resources Use						
		Economic Activities						
		New Investments						
		Promoting Local Industries						
		Business Facilities						

SUSTAINABILITY DIMENSIONS	CORE CATEGORIES	SUB-CATEGORIES	Most Significant Impact on the Development of Sustainable Communities					
			Not important at all	of some importance	Important	Very Important	Extremely Important	Necessary in the near Future
ECONOMIC SUSTAINABILITY	Employments	Employment Opportunities						
		Justice and Equity						
		Creation of local jobs						
		Live and work units, offices, stores, factory Local shops, clinics, centres, Social centres						
	Productivity	Accessible to Everyone						
		Cost Efficiency						
		Efficient Pricing						
		High Quality Outcomes						
	Initiatives	Viability of New Infrastructures						
		Long-term Finance Schemes						
		Local Context						
		Innovations, Ideas, Schemes						
SOCIAL /CULTURAL SUSTAINABILITY	Community/Culture/Empowerment	Sustainable Behaviours						
		Socially Inclusive Communities						
		Connected Communities (United People)						
		Local Context, Public Engagement						
		Community Cohesion						
		Local social vitality/Life-style						
	Education	Schools						
		Health and Safety Courses						
		Workshops						
		Awareness Schemes						
	Health	Clinics						
		Medical Facilities						
		Risk Management						
		Gymnasium Halls						
	Equity	Equity/Fairness						
		Enquiry-based design (Participative design)						
		Public Participation						
		Access to services						
	Security	Amenity Provision/Well-being						
		Neighbourhood Watch/ Safety						
		Crime Prevention Schemes						
		Police Stations						
		Securing the Area						
PLANNING SUSTAINABILITY `	Place-making	Scale, massing/ height (Efficient Design)						
		Local Materials Use						
		Detailing, Facade, Form, Orientation						
		Access to public spaces						
		Diversity of building typologies, Layout						
		Landscape design, Quality of Streetscape						
		Space for future developments						
	Management	Facilities Management						
		Building/Site Maintenance						
		Monitoring Stakeholders control						
		Operations of Design/Post-occupancy						
		Site and services approach to housing						

SUSTAINABILITY DIMENSIONS	CORE CATEGORIES	SUB-CATEGORIES	Most Significant Impact on the Development of Sustainable Communities					
			Not important at all	some importance of	Important	Very Important	Extremely Important	Necessary in the near Future
PLANNING SUSTAINABILITY	Transportation	Public Transport/Sustainable Mass Transit						
		Traffic Management Schemes						
		Cycling/Pedestrian/Street Networks						
		Car-sharing Schemes						
		Smart Location						
		Proximity to community services						
		Walk-able/Human-scale						
		Transit-oriented design of communities						
	Governance	Environment						
		Local Context						
		Politics						
		Civil Society						
		Local Planning Approval						
	Land use	Increasing sustainability through Density						
		Sustainable Corridors (Roads, Streets)						
		Effective use of Land						
		Green Spaces						
		Residential Schemes						
		Business Area and Public Services						
		Compact Development						
		Homogeneity of houses						

APPENDIX D

SUMMARY OF PARTICIPANTS FOR ENVIRONMENTAL DIMENSION

2	SUS.DIM	CORE.CAT	SUBCAT	1	2	3	4	5	6
3	Environ	Pollution	Water.P.P	0	0	7	15	25	3
4			Noise.P.P	0	4	14	19	12	1
5			Air Q.E	0	3	7	18	18	4
6			Pollution R	0	1	12	13	18	6
7		Material.R	Local R	0	0	19	12	17	2
8			Recycling	0	0	10	21	16	3
9			Site Waste	0	3	9	16	17	3
10			Storage R	0	8	4	23	10	5
11			U.B.M	0	1	14	12	18	5
12		Water	Flood R.A	0	6	7	14	22	1
13			Water.Q.I	0	0	7	15	26	2
14			Erosion.C	0	2	8	13	25	2
15			Water S.I	0	1	9	15	21	2
16			W.W.M	1	0	14	18	13	
17			S.M.W	2	10	11	13	11	
18			R.I.W.C	9	8	14	4	10	5
19		Ecology	Biodiver	0	8	15	14	8	5
20			Eco.A.E	0	9	14	15	10	1
21			M.E.I	0	6	14	17	11	2
22			E.V.I	0	6	15	14	14	1
23			D and P	0	5	14	17	12	2
24			Use of N.T	2	7	12	17	9	3
25		Energy	E.E.B	0	5	8	9	23	5
26			P.D	0	7	7	14	13	9
27			R.E.U	0	4	6	16	19	5
28			U.G.O	0	5	8	15	18	4
29			Con.M	0	3	10	15	17	5
30		Climate	C.E.O	3	4	9	17	10	6
31			G.W.C.M	0	3	10	12	21	4
32			F.R.M	0	2	6	14	23	6
33			S.R.G	0	2	12	17	16	3
34			C.C.M	0	3	12	20	14	1
35			Resiliency	4	4	17	17	5	3

SUMMARY OF PARTICIPANTS FOR ECONOMIC DIMENSION

	A	B	C	D	E	F	G	H	I	J	K
35			Resiliency			4	4	17	17	5	3
36	**Economic**	**Eco/Val**	Afford.H			0	0	7	9	32	2
37			Housing.D			0	0	11	12	22	5
38			Informal.S			1	2	15	13	18	1
39			I.G.D.I			0	3	11	14	20	2
40			A to Fin			0	3	13	13	18	3
41		**Growth**	E.R.U			2	3	12	9	22	2
42			Eco.A			1	4	12	15	17	1
43			New. Inv			2	4	12	11	20	1
44			Prom.L.I			2	1	8	11	25	3
45			Bus.F			2	5	9	13	20	1
46		**Employ**	Emp.Opp			1	2	4	9	34	0
47			J and E			1	2	5	13	26	3
48			C.O.L.J			1	1	5	12	29	2
49			L.W.O.F			1	2	12	15	18	2
50		**Product**	A to E			1	3	9	20	15	2
51			C.E			0	4	8	18	18	2
52			E.Pricing			0	6	5	20	16	3
53			HQO			0	2	9	15	21	3
54		**Initiative**	V.N.I			0	6	5	16	21	2
55			L.T.F.S			0	5	4	20	16	5
56			Local.Con			0	6	8	18	15	3
57			I.I.S			0	4	6	13	20	7

SUMMARY OF PARTICIPANTS FOR SOCIAL/CULTURAL DIMENSION

58	**Socio.Cul**	**Com.Cul.E**	Sus.Beh	2	4	10	18	13	3
59			Soc.I.C	2	3	13	20	9	3
60			Con.Com	2	2	11	16	15	4
61			Loc.Cont	2	5	5	20	15	3
62			Com.Coh	2	5	9	16	14	4
63			Loc.Soc	2	9	12	11	13	3
64		**Education**	Schools	0	2	5	9	28	6
65			H/S	0	3	7	6	31	3
66			Workshop	0	7	9	11	19	4
67			A/S	0	3	11	10	20	6
68		**Health**	Clinics	0	2	2	10	32	4
69			Med.Fac	0	2	2	13	28	5
70			Risk.M	0	3	6	15	23	3
71			Gym.H	4	10	13	9	10	4
72		**Equity**	Equ/Fair	1	5	8	13	21	2
73			E.B.D	1	4	11	19	11	4
74			P.P.P	1	5	11	19	11	3
75			A to S	1	2	8	13	24	2
76		**Security**	A.P.W	1	4	7	12	22	4
77			N.W.S	2	1	10	12	21	3
78			C.P.S	2	1	5	11	28	3
79			Pol.Sta	2	1	8	12	23	4
80			Sec.Area	1	2	7	11	25	4

SUMMARY OF PARTICIPANTS FOR PLANNING DIMENSION

	A	B	C	D	E	F	G	H	I	J	K
81	**Planning**	**Place.M**	S.M.H			1	9	12	8	13	7
82			L.M.U			0	8	14	13	13	2
83			D.F.F.O			0	7	14	16	9	4
84			A to P.S			0	8	12	14	11	5
85			D of B.T			0	5	15	16	9	5
86			L.D.Q.SS			0	6	11	17	12	4
87			S.F.F.D			0	6	8	8	19	9
88		**Managem**	F.M			2	4	7	13	23	1
89			B.S.M			2	4	6	14	22	3
90			M.S.C			3	6	9	16	13	3
91			O of D.PO			3	7	5	17	14	4
92			S.S.A to H			2	5	7	19	14	3
93		**Transport**	Pub.Trans			2	0	6	12	25	5
94			TMS			0	1	6	16	23	3
95			CPSN			3	0	7	18	17	5
96			CSS			11	6	8	11	8	6
97			Smart.Loc			4	7	15	8	12	4
98			Pro.to.C.S			1	5	8	15	17	4
99			W.H.S			2	5	11	17	8	7
100			T.O.D.C			2	4	10	17	11	6
101		**Governan**	Environ			2	1	10	18	17	2
102			Local.Con			3	4	14	14	14	1
103			Politics			4	11	10	14	10	1
104			Civ.Soc			3	3	13	13	17	0
105			Local.P.A			3	1	11	14	20	1
106		**Land-Use**	I.S.T.D			1	4	9	20	12	4
107			Sus.Cor			1	6	6	15	19	3
108			Eff.U.O.L			0	4	6	12	22	6
109			Green.S			1	4	6	11	25	3
110			Res.Sch			1	2	10	12	21	4
111			B.A/P.S			1	3	7	16	20	3
112			Com.Dev			1	6	14	15	9	5
113			Hom.Hous			11	11	8	8	8	4