MAKING A BUSINESS CASE FOR GREEN HOUSING INVESTMENT IN LAGOS, NIGERIA

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ABSTRACT

The construction and occupation of environmentally sustainable buildings, also known as green buildings, rather than the conventional high-energy type, are increasingly being widely accepted as modes of environmental degradation abatement in the built environment. In spite of this, green housing units are not a regular feature in the Nigerian city of Lagos. Global warming, climate change and environmental degradation are some of the most popular phrases in modern day political and non-political discourses. Erratic weather and increasing natural disasters are evidence of the importance of these phenomena and why they must be abated as a matter of urgency. Therefore, this study set out to create a framework for effective green housing investment, by examining the various factors affecting the feasibility and viability of such investment in the Lagos context and using the results as bases for creating the framework.

Based in one of Africa’s largest cities, the study objectives included assessing the level of awareness of green housing, especially as a form of environmental degradation abatement, among housing stakeholders in Lagos. Having a largely private-sector driven housing sector, the study investigated the perception of private property developers and their behaviour towards green housing investment. The study also set out to identify the various green housing investment drivers, which are factors that can motivate investment in green housing. Various housing related policy instruments and documents were also reviewed to assess their efficacy in supporting green housing investment in Lagos. The study also assessed the cost and value of hypothetical green housing units, and their viability as housing investment options.

The study used the ecological modernisation theory to explain the interrelationship of the state and the private sector to achieve environmental sustainability. It also used the theory of planned behaviour to examine property developers’ behaviour towards green housing investment. The study employed both quantitative and qualitative research instruments, including focus group discussions, to survey home users, estate surveyors and valuers, real estate developers, policy makers and architects, and subsequently establish a viable framework among the various property market players all located in Lagos. The quantitative data was analysed using various statistical tools including a structural equation modelling tool, while the qualitative data was analysed thematically.
The findings of the study reveal that the paucity of green housing units in Lagos is attributable to a number of factors. These include a general lack of awareness of green buildings among parties that make up both the supply and demand sides of the housing market in Lagos. Also, property developers stated factors such as lack of demand for, and high cost of constructing green housing units as reasons for their lack of interest in such investments. The findings and results of the study were used to create a framework that recommends actions such as the formulation of green housing targeted policies and the creation or adoption of a local green building rating system. The study also recommends that the state government should identify environmentally responsible property investors, actively involve them in policy-making driven discussions and create an enabling investment environment for them in line with the investment drivers identified in this study.
DECLARATION

I Tenigbade Yewande Odu declare that

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DEDICATION
This work is dedicated to the actualization of a ‘greener’ environment.
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## LIST OF ABBREVIATIONS

3BL – Triple Bottom Line  
ANN - Artificial Neural Network  
BE – Behavioural Economics  
BREEAM - Building Research Establishment Environmental Assessment Methodology  
BRI – Building Related Illness  
CAM – Common Areas Maintenance  
CASBEE – Comprehensive Assessment System for Building Environmental Efficiency  
CBA – Cost Benefit Analysis  
CDM – Clean Development Mechanism  
CO₂ – Carbon dioxide  
CBS – Cost Breakdown Structure  
CGT – Capital Gains Tax  
CSR – Corporate Social Responsibility  
CSIR - Council for Scientific and Industrial Research  
DARE - Development Association of Renewable Energies  
DGNB - German Sustainable Building Council  
DISCO – Electricity Distribution Company  
DSM – Demand Side Management  
EDGE - Excellence in Design for Greater Efficiencies  
EIA – Environmental Impact Assessment  
EMT – Ecological Modernization Theory  
EPA - Environmental Protection Agency  
EPI - Energy Performance Index  
EPI – Environmental Policy Index  
EPRI - Environmentally Responsible Property Investment  
ESG – Environmental, Social and Governance  
ESV – Estate Surveyor and Valuer  
FSC - Forest Stewardship Council  
FGD – Focus Group Discussion  
GB – Green Building  
GBCs - Green Building Councils  
GBCSA - Green Building Council of South Africa
GBRS - Green Building Rating Systems
GDP – Gross Domestic Product
GRA – Government Reserved Area
GSSA-MUR - Green Star SA – Multi Unit Residential v1
GH – Green Housing
GHG – Greenhouse Gas
HK-BEAM - Hong Kong Building Environmental Assessment Method
HQE - High Quality Environmental standard
HVAC - Heating, Ventilation and Air-Conditioning
IAQ – Indoor Air Quality
IEQ – Indoor Environmental Quality
IFC – International Finance Corporation
JI – Joint Implementation
LAHA – Lagos State House of Assembly
LASEPA - Lagos State Environmental Protection Agency
LCA - Life Cycle Assessment
LCC – Life Cycle Costing
LCDA – Local Council Development Area
LEED - Leadership in Energy and Environmental Design
LGA – Local Government Area
LI – Lagos Island
LM – Lagos Mainland
MDGs – Millennium Development Goals
MCPD - Mandatory Continuous Professional Development
MCS – Multiple Chemical Sensitivities
MOE – Ministry of Environment
NBC – National Building Code
NCF – National Conservation Foundation
NIESV – Nigerian Institution of Estate Surveyors and Valuer
NOA – National orientation Agency
NOI – Net Operating Income
OCED - Organization for Economic Co-operation and Development
ODP - Ozone depletion potential

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PBC – Perceived Behavioural Control
PET - Polyethylene Terephthalate
PM – Political Modernization
POE – Post Occupancy Evaluation
REDAN - Real Estate Developers Association of Nigeria
REIT - Real Estate Investment Trusts
RI – Responsible Investment
RICS – Royal Institution of Chartered Surveyors
ROI – Return on Investment
RPI - Responsible Property Investment
SBS – Sick Building Syndrome
SC – Sustainable Construction
SD – Sustainable Development
SEM – Structural Equation Modelling
SN – Subjective Norm
SPI - Sustainable Property Investment
SRI – Sustainable, Responsible and Impact Investing
SRI \textsubscript{1} - Socially Responsible Investment
SRPI - Socially Responsible Property Investment
SSB – Stabilized Soil Blocks
TPB – Theory of Planned Behaviour
TRA – Theory of Reasoned Action
UK – United Kingdom
UN – United Nations
UNFCCC - United Nations Framework Convention on Climate Change
UNILAG – University of Lagos
USA – United States of America
USGBC – U.S. Green Building Council
WCED - World Commission on environment and development
WGBC - World Green Building Council
WHO – World Health Organization
WTP – Willingness-to-Pay
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CHAPTER ONE

1. INTRODUCTION

1.1 Background to the study
Shelter is generally known to be one of the basic human needs alongside food and clothing. The ubiquity of human shelter however calls for an assessment of its effects on natural life and how its continued increment in number affects environmental sustainability. Sustainability is undeniably a present-day global concern. The word has become a household term used in almost every sphere of human endeavour. Sustainability concerns have been voiced in various matters including wildlife conservation, technology, innovation and even human lifestyles. One major issue that sustainability sets out to tackle is Carbon dioxide (CO₂) emission as a result of daily human activities. CO₂ emission is produced from the burning of fossil fuels, among other human activities. Activities in the housing sector from conception to demolition of the buildings are major contributors to CO₂ emission, hence the clamour for the adoption of sustainable buildings in place of the conventional high-energy stock.

The concept of sustainable buildings is not a new phenomenon and can conveniently be seen as a branch-off from the sustainability subject as a whole. This sustainability drive is being particularly campaigned for in the housing sector because of the pervasive nature of housing units and the continuous need to increase the existing stock to accommodate the growing population. Thus, there is an increased call for sustainable housing by various international organisations. While sustainable housing is seen as housing that takes environmental, social, economic and in fact cultural and institutional factors into consideration (UN-Habitat, 2012a, Irurah, 2002), green housing is basically concerned with minimizing the effect of housing on the environment (Jian and Zhen-Yu, 2014).

In some developed countries like the United States of America (USA), adoption of green principles in building is not treated merely as an ‘environmentalists’ project but has been imbibed by all tiers of government to taper environmental problems (Abair, 2008). Various presidents of the USA at various times have taken on projects to ‘Green the White House’, for example. From Jimmy Carter to Barak Obama, the bid has been to improve energy efficiency and environmental performance of the White House complex
by identifying opportunities to reduce waste, lower energy use, and make appropriate use of renewable resources, all while improving the indoor air quality and building comfort (Poveda and Lipsett, 2011). Other less developed countries like South Africa have also taken the initiative by putting a framework in place to green all public buildings (Republic of South Africa, 2011). Though some authors have opined that the rationale behind these projects may be political (Korkmaz et al., 2009), the actions portray the countries’ inclination towards or at the very least, acknowledgement of the need for more sustainable environments through sustainable environmental policies.

The Environmental Policy Index (EPI) measures different countries’ level of commitment to goal number 7 of the Millennium Development Goals (MDGs) which is “To ensure environmental sustainability” (Yale Center for Environmental Law & Policy, 2014p.15.). The EPI does this by focusing on two major objectives viz. reducing environmental stress to human health and promoting ecosystem vitality and sound natural resource management. To this end, the report uses a ‘proximity to target’ approach by identifying national set goals and measuring the level of achievement of such goals. In the 2014 Environmental Performance Index Report, of 149 countries featured, Switzerland ranked first with an index of 87.67, the United Kingdom ranked 12th with an index of 77.35, USA ranked 33rd with 67.52, South Africa ranked 72nd with 53.51, Nigeria ranked 134th with 56.2 and Somalia was at the bottom of the list with an index of 15.47. The foregoing results may not be unconnected to the sustainability information gap still existing in most countries in the global south (Du Plessis, 2002). These aforesaid indices showing national attitudes towards sustainability, may also be a reflection of investors’ attitudes towards greener alternatives in various business sectors in the different countries, especially where there is a paucity of enabling or motivating factors.

The housing sector is one which continues to attract attention regarding sustainability issues. With a population of over 160 million people, the Nigerian housing sector is unlikely to be over-invested in. The growth of the Nigerian housing sector is evident from the sector’s growing contribution to the national Gross Domestic Product (GDP). The nation’s building and construction sector’s contribution to GDP has grown from 1.99 percent in 2010 to 3.5 percent in 2014 (National Bureau of Statistics Federal Republic of
Nigeria, 2014), proving not just its essence but also its lucratives. Lagos, which is one of the three mega cities in Africa and with a population of about 20 million, has a current average population growth rate of 3.9 percent (United Nations, 2014). This has a large implication on the demand for shelter and by extension the demand for resources and energy to power the housing sector. The resultant effect is an increase in the amount of CO2 being emitted into the atmosphere. Haapio and Viitaniemi (2008) state that an increase in land activities including fossil fuel utilization translates to increased CO2 levels in the environment. Various studies have also revealed that a substantial amount of the carbon emitted can be attributed to activities in the built environment. Ali and Al Nsairat (2009) state that the built environment accounts for over 38% of carbon emitted in the USA. The rate is put at between 30% - 40% in Organisation for Economic Co-operation and Development (OCED) countries (OCED, 2003). In South Africa, the rate is put at 23% (Ali and Al Nsairat, 2009).

Construction of green buildings has almost unanimously been pitched as an effective means by which the built environment can tackle global warming. Despite the large and varying researches on the subject of green buildings, there is a general consensus that embracing green buildings in place of conventional buildings is a step towards reducing the impact of the built environment on the ecology (Jian and Zhen-Yu, 2014, Eichholtz et al., 2013, Nelson et al., 2010). There is therefore the need to diversify real estate investments to include green buildings.

A prerequisite to any successful investment is a feasibility and viability assessment based primarily on historical data and market indicators. Likewise, for investment in green housing to be attractive to the real estate investor, there needs to be proof that the venture is profitable or worthwhile. Hence, there is a large body of research in developed countries dedicated to providing data and information related to green buildings investment. The onus for adoption of green buildings over the conventional types does not however lie solely on the investor or developer. The consumers of the product including occupiers and buyers also have a responsibility to choose to occupy such properties. Hence Häkkinen and Belloni (2011) suggest that proponents of sustainable buildings should engage with end users of the product to stimulate demand. Herein also
lies the problem of information gap as most end users are not aware of the existence of green alternatives and their purported advantages (Otegbulu, 2011).

While pecuniary gains are a good reason for any investor to decide to invest in a venture, there is a place for non-monetary gains both to the investor and other related parties. Hence, the notions of sustainable, responsible and impact investing (SRI) and corporate social responsibility (CSR) are also common topics in the sustainable development discourse (Falkenbach et al., 2010, Yam, 2013). Thus, in the light of the necessity of ‘going green’ in the building sector, developers and investors are becoming increasingly sensitive to their roles in environmental protection.

The successes being recorded in the sustainable building markets in various developed countries and the constant growth of the markets in developing countries like South Africa is evidence that with the right factors in place, there is the possibility of an effective green housing market in Lagos. These factors include the key players in the market; home users, real estate developers and investors, estate surveyors and valuers, architects, policy makers and regulatory bodies. This study examines these various factors with a view to formulating a workable framework for green housing investments in Lagos.

1.2 Research problem

The Report of the World Commission on Environment and Development (WCED) also referred to as the Brundtland report (World Commission on Environment and Development, 1987) defines sustainable development (SD) as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (p.37). Although this definition has severally been critiqued as being ambiguous, it holds the basic idea of the concept of (SD) which is, that the continual indiscriminate depletion of currently available resources will eventually end life as it is currently known. Human life has always been hinged on development which has constantly produced undeniable improvements in living conditions. However, also undeniable are the barrage of negative effects of development that have accumulated to the point that they are now a major global concern.
Lack of adequate housing is a global challenge, so much so that it has become a major agenda for bodies such as the World Health Organisation (WHO), United Nations (UN) and the World Bank. Attention has shifted from mere provision of housing to provision of housing that is both beneficial to its occupants and not detrimental to the environment. Sustainable development has therefore become a major criterion for housing development, investment and selection. However, as much as the concept of sustainable development has been widely accepted in developed and developing countries, there is yet to be any significant show of an intention to increase the stock of sustainable buildings in Nigeria. The oil-producing giant still largely engages in the production of ‘high energy’ buildings at the cost of depleting natural resources and a healthy environment. Nigeria is yet to align with the global trend of investing in environmentally sustainable properties. This shortfall has been explained variously.

The unavailability of tools, methods or criteria of assessment of sustainable buildings is likely to be a major factor contributing to the lack of investments in the commodity. Assessment tools aid in determining the level of sustainability of a building or/and building materials, guiding property developers towards sustainability practices during the construction of buildings and also setting standards for the certification of such buildings as sustainable (Reed et al., 2011). There have been various studies identifying, comparing and analysing various methods of building sustainability rating and assessment used in different countries (Reed et al., 2011, Jayantha and Wan Sze, 2013, Singh et al., 2012, Lützkendorf and Lorenz, 2006).

The Leadership in Energy and Environmental Design (LEED) is the most common green building rating system in the world (U.S. Green Building Council, 2017). Though it was developed in the USA, it is being used by many other countries. The United Kingdom uses the Building Research Establishment Environmental Assessment Methodology (BREEAM). Other systems include the German DGNB (German Sustainable Building Council) system, the French High Quality Environmental standard (HQE) and the Green Star SA of South Africa. To date however, there is no known method, tool or set of criteria for assessing sustainable buildings in Nigeria.
The necessity for an effective certification system cannot be overemphasised if investment in green building is to thrive in Nigeria. Various advantages of certification systems have been identified. Akadiri and Olomolaiye (2012) opine that since it is easier for sustainability features to be integrated into a building design from the material selection stage, it is necessary to have such materials certified, thereby acting as a guide to builders. Ali and Al Nsairat (2009) state that assessment criteria help save operating costs as most of them are based on life cycle analysis (LCA) which takes account of the building from construction to demolition, thereby giving the builder a wider perception of the building costs. This lack of a common local building certification system in Nigeria is not to say however, that there has been no expression of interest in developing an assessment or certification system in Nigeria. Michael (2013), comparing different green building rating systems and their adaptability to the Nigerian context, suggested the adoption of the LEED. There has however been no actualisation in this regard.

Nigeria is primarily a private sector driven economy, largely leaving the activities of the market in the hands of private investors. The housing sector is not an exception. Investment in any sector is largely driven by existing data and information which form the basis for decision making. Unlike in other parts of the globe where extensive studies have been carried out to ascertain the profitability of sustainable development investments (Sah et al., 2013, Eichholtz et al., 2010, Madew, 2006), Nigeria lacks any such study. This may however be connected to the fact that there is no established sustainable buildings market in the country. To date, there is no known published research on the viability or otherwise of investments in green housing delivery in the country. A lack of detailed and proven data for any form of investment automatically increases the risk of such investment and makes it unattractive to investors. The research results that would ordinarily guide investors in decision making (Babawale, 2013) are simply unavailable. This problem may also be magnified by the fact that real estate valuers or appraisers who are tasked with the responsibility of property appraisal are not properly equipped with the skills for appraising this special kind of properties. (Babawale and Oyalowo, 2011)

Nigeria as an economy attracts a sizable amount of investment by foreign corporations in its various sectors. The absence of foreign investments in sustainable buildings in
Nigeria is strongly connected to the unavailability of the required investment information. Cheng et al. (2006) highlight lack of knowledge of the workings of the local markets as a deterrent to international investors’ willingness to invest in the African real estate market, while Bartlett and Howard (2000) emphasise the importance of accurate cost and value information of green building to investment decision making. Bruhns (2004) is of the opinion that the poor representation of sustainability in the built environment is more due to a lack of information than it is to poor implementation. This means that the availability or unavailability of critical business information is essential for business decision making. Hence, enough information about the risks, returns and other issues associated with investments in sustainable housing may stand as motivators to would-be investors. Various writers refer to these motivators as ‘drivers’ for investment in sustainable buildings (Häkkinen and Belloni, 2011, Belniak et al., 2012, Sayce et al., 2007). Identifying the drivers and promoting them also presents a business case for sustainable housing investment, thereby motivating investors to develop an interest in this market. Falkenbach et al. (2010) advocate further research on identifying the corporate and portfolio level drivers and benefits of this investment type.

The knowledge of consumer behaviour is also very instrumental to investment decisions. The forces of supply and demand are basic market drivers for any form of investments as supply naturally reacts to demand. Demand on the other hand is a function of various factors including price of the commodity, income and preferences of consumers and prices of other related items (Lipsey and Harbury, 1992, Raghavan et al., 2010). Therefore, understanding the inclination of consumers towards environmentally friendly choices and more especially residences, serves as a major determining factor for willingness of investors to venture into green housing investments. There is obviously a paucity of studies in this regard in the Nigerian context. Oladokun et al. (2010) assessed the perception of tenants in Lagos of green buildings and found that they are hardly aware of the benefits. The survey however did not explicitly explain what a green building is and this might have led to ambiguity of its proposed intent.

The need for accessible data in any sector of a national economy cannot be underrated. Data is necessary for proper planning, projection, evaluation and informed decision making. As in almost every other sector in Nigeria, there is no known source for reliable
and accessible data on the effects of the building sector on the Nigerian environment and especially the measure of GHG emission that the built environment in the country is responsible for. For instance, the United Nations put CO₂ emission in Nigeria at 70,177 metric tons as at 2009, and 0.4 metric tons per capita (Lützkendorf and Lorenz, 2007), but there is no known available data on Carbon emission rates as produced by various sectors and the built environment in particular, within the country. Green buildings research in more developed countries is usually based on the existing body of data pertaining to the available sustainable building stock (Swidler et al., 2011, Madew, 2006). There is however no known database on the current stock of sustainable housing in Nigeria, nor any body to which such enquiries may be made.

Since the country’s independence in 1960, housing policies have gone through a series of evolution and reforms. Most of these reforms have suffered setbacks due to problems such as improper implementation and inadequate infrastructural amenities (Ibimilua and Ibitoye, 2015). One element that has been conspicuously missing from these policies is a conscious strategy to drive sustainable development and particularly environmental sustainability in the housing sector and the built environment at large. Policies pertaining to sustainable housing depend largely on the built environment professionals. Lützkendorf and Lorenz (2006) opine that built environment professionals are required to respond to issues concerning policies, initiatives and change in legislation as regards sustainability in the building construction industry. Jian and Zhen-Yu (2014) assert that public policies are crucial to green developments in any country. It can therefore be said, that there is no proper form of public backing for would-be investors in the sustainable buildings market. It is also rather unclear if there are even policies tending towards sustainable developments in the building and construction sector in Lagos. Public and enabling policies would not only serve as motivators to investors but would also serve as regulators that will help to maintain environmental standards in the building industry.

Considering the declining quality of the environment, the necessity for a paradigm shift in the Nigerian housing investment market from the extant high-energy conventional buildings to a more environmentally conscious form of investment is expedient. The previously stated issues are deterrents to a buoyant green housing market and consequently a green environment in Lagos. An in-depth study of the various issues
raised is therefore necessary to create a working system for all parties involved in the realization of a more environmentally sustainable housing market.

1.3 Aim
Globally, the green housing sector is a product of an interplay among various factors. The success of the sector is a product of how efficiently these factors are combined to generate the needed results. Therefore, this study aims to examine various factors that affect the growth of the green housing stock in Lagos and subsequently, create an effective framework for green housing investment in the state.

1.4 Objectives
The following are the objectives emanating from the aim of this study:

i. To define green buildings in the Nigerian context and investigate the current status of green housing investment in Lagos.

ii. To ascertain the current status of the green housing market in Lagos.

iii. To assess the level of awareness of Nigerian stakeholders viz: government, real estate investors and developers, architects and consumers about green housing in Lagos.

iv. To investigate the impacts of the elements of environmental sustainability on the value of residential property values in Lagos.

v. To assess the viability of green housing investment in Lagos.

vi. To establish the existence and evaluate the effectiveness of any policies, institutions, corporate bodies or strategies in place, that support green housing investments in Lagos.

vii. To investigate the practicability of the creation of a green building rating system in Lagos.

viii. To determine appropriate investment drivers for green housing investment in Lagos.

ix. To develop a framework for effective green housing investment in Lagos.

1.5 Main research question
This study focuses on the housing sector, given its inevitability both for human survival and for economic growth. The study is further motivated by the need for environmentally
sustainable developments and the fact that the built environment has great potential to contribute to that cause. Hence, this study seeks to find answers to the following question: Given the necessity of a robust green housing stock for environmental protection and Greenhouse Gas (GHG) abatement, is it feasible and viable for Nigerian real estate investors to invest in green housing in Lagos and if not how can this type of investment be made attractive to them?

1.5.1 Subsidiary Research Questions
To answer this question, the following sub-questions must also be answered:

i. What are green buildings in the Nigerian context?

ii. What is the current status of green housing investment in Lagos?

iii. How knowledgeable are the Nigerian stakeholders viz. government, real estate investors and property developers, estate surveyors and valuers, architects and consumers about green housing in Lagos?

iv. What would be the impacts of environmentally sustainable building features on residential property values in Lagos?

v. Does the open market value of a typical green building justify investment in the market?

vi. Are there any effective policies, institutions, corporate bodies or strategies in place to institutionalize investment in green housing in Lagos?

vii. What would constitute an effective green building rating system for Lagos and what is the practicability of its creation in the Lagos context?

viii. What factors besides financial profitability can make green housing attractive to investors?

ix. What would an effective green housing investment framework in Lagos entail, i.e. what will be its constituents?

1.6 Hypothesis
Investments in real estate depend largely on the investor’s expectations from such investments. Greer and Kolbe (2003) identify four factors that inform real estate investment decisions viz: rates of return of and on investments, rapidity of returns, risk bearing capacity of the investment and attractiveness in terms of risk-returns
combination. These factors can further be broken into more definite components which make up the elements referred to as investment drivers and explored in this study.

The study therefore hypothesizes that the real estate investor will, if motivated by proven profitability and other attractive investment drivers, invest in green housing in Lagos.

1.7 Justification of the study

Sustainability as a concept is perceived to be in its formative stages in developing countries like Nigeria (Du Plessis, 2002). This juvenility may be responsible for the poor representation of green buildings in Nigeria and Lagos in particular. Energy consumption by the residential sector in non-OECD countries to which Nigeria belongs, is projected to increase at an average of 2.2 percent per annum through 2040 (U.S. Energy Information Administration, 2016), indicating increased GHG emission levels. It is now common knowledge that buildings are major contributors to greenhouse gas emissions globally. The UNEP Sustainable Buildings Climate Initiative (2009b) states that a third of the world’s greenhouse gas (GHG) emission is generated by buildings which are also responsible for using about 40 percent of total global energy. The body goes further to identify the building sector as having the greatest potential for mitigating against GHG emission and green building methods as a means to that end.

This study intends to establish a practicable system for investments in green housing in Lagos, consequently reducing GHG emission by the built environment and mitigating climate change by extension. Various programs including the Kyoto protocol, the Durban Platform for Enhanced action and the United Nations Environmental Programs have aimed at enhancing international cooperation in addressing climate change. Thus, it is a timely study and in line with a major global agenda.

Like many other countries globally, steps are being taken in Nigeria to inculcate sustainability principles in various sectors of the polity. Sustainable development principles and elements are being inseminated into the various programs and systems in the country, thus requiring continuous research in the field. Though studies in the built environment bordering on sustainable development are few and far between, there is an extensive list of issues that need to be researched in the sector. Some of the earlier
researched subjects include suitable building materials for sustainable buildings (Alagbe, 2011), trado-modern architecture as a panacea for low income housing deficits (Odebiyi, 2010) and even a proposal for the establishment of a Nigerian National Standard for Green Buildings (Dodo et al., 2014).

This growing body of knowledge shows that there is a growing consciousness of the need for a more sustainable building and construction sector in Nigeria. However, in comparison to current practices in the developed world where retrofitting and construction of green buildings is becoming mainstream practice, the building sector in Nigeria is yet to scratch the surface. Green buildings and particularly housing will only become mainstream when the right actors including government, professionals, investors and consumers are availed of the right information and adequately equipped with the tools for this kind of investment. This study focuses on bringing to light the feasibility and viability of such investments or factors that can make them attractive to investors by exposing the real costs of investing in green housing in Nigeria.

Foregoing statistics and facts show that adoption of green principles in building construction is not negotiable. If the building sector intends to tackle climate change, construction of green buildings must be adopted. Beyond financial performance, there is need for investors to see good reason to invest funds in a market with no proven track record in Nigeria. It therefore becomes expedient to identify investment drivers or those factors that can act as motivators to real estate investors in the midst green housing market uncertainties. This study seeks to contribute to literature by exploring how these investment drivers can interrelate to grow the green housing market in Lagos.

Nigeria has up to the current moment been largely dependent on high energy methods and designs in the building industry. From steel production to concrete preparation and even to paint production, many of the methods used are major contributors to CO₂ emissions. Naturally, since these are the methods that investors have known, they become the methods believed to be viable for their portfolio. As earlier stated, real estate as a sector contributes significantly to the economic growth of the nation. It is therefore expedient that all housing stakeholders properly understand all the options available to them, whether for investment or for consumption purposes. This study therefore intends
to create a framework for proper decision making as regards green housing investment in Lagos and as such broaden the scope for real estate portfolio investments.

1.8 Scope of the study
The phrases ‘sustainable buildings’ and ‘green buildings’ are often loosely used interchangeably. However, this study focuses on green buildings which in the strict sense of the phrase refer to environmentally sustainable buildings as against the former which also comprises of social and economic elements in addition to environmental. The study also only concentrates on residential buildings, hence the recurring use of the phrase ‘green housing’ or ‘green homes’. However, the continued use of the phrase ‘green building’ throughout this thesis is indicative of the abundance of data/information for the entire building sector as opposed to data pertaining to just the housing sector. This study is based in metropolitan Lagos as delineated by the Lagos state government and considers the nineteen (19) Local Government Areas (LGAs) within this geographical location.

1.9 Working definitions of terms

1.9.1 Housing
In the context of this study, housing is appropriately defined by Clapham et al. (2012, p.10) as consisting of “a designed physical structure of connected and sheltered spaces and systems, constructed of materials and components through the use of capital, labour and land or existing property”.

The Nigeria Federal Ministry of Works and Housing (2006) also defines housing as “the process of providing functional support by sustainable maintenance of the built environment for the day-to-day living and activities of individuals and families within the country”.

1.9.2 Sustainable buildings
This study adopts the definition of sustainable buildings as described by UN- Habitat (2012a, P.9) as “houses that are designed, built and managed as:

- Healthy, durable, safe and secure
- Affordable for the whole spectrum of incomes
Using ecological low-energy and affordable building materials and technology

- Resilient to sustain potential natural disasters and climatic impacts
- Connected to decent, safe and affordable energy, water, sanitation and recycling facilities

- Using energy and water most efficiently and equipped with certain on-site renewable energy generation and water recycling capabilities
- Not polluting the environment and protected from external pollutions
- Well connected to jobs, shops, health- and child-care, education and other services

- Properly integrated into, and enhancing, the social, cultural and economic fabric of the local neighbourhood and the wider urban areas
- Properly run and maintained, timely renovated and retrofitted.”

The concept of sustainable building is broader than green building in that it encompasses all aspects of sustainable development while green building is only concerned with the environmental aspect.

### 1.9.3 Green buildings

UNEP Sustainable Buildings Climate Initiative (2009b, p.37) defines green buildings as buildings designed such that they “combine design and technology, usually renewable energy systems, to meet the needs of the occupants with very low or even zero carbon emissions”.

U.S. Green Building Council (2014b) also defines Green buildings as “the planning, design, construction, and operations of buildings with several central, foremost considerations: energy use, water use, indoor environmental quality, material selection and the building’s effects on its site” and further describes it as “an effort to amplify the positive and mitigate the negative of these effects throughout the entire life cycle of a building”.

### 1.9.4 Green housing

The term Green housing in this study is an adaptation of ‘Green buildings’ to exclude all other property types except the residential type. Imperatively, Green housing simply means green residential buildings.
1.9.5 Sustainable development

Sustainable development is defined by the World Commission on Environment and Development (1987, p.43) as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

while the UN-Habitat (2012a, p.4) describes it as:
“A multidimensional process that links environmental protection with economically, socially and culturally sound development”.

1.9.6 Investment

Baum (2015, p.3) describes investment as “Putting money into an asset with the expectation of earning interest or dividends plus capital appreciation”.

Sirota (2013, p.4) also defines real estate investment as “the commitment of funds by an individual with a view to preserving and increasing capital and earning a profit”.

1.9.7 Real estate investment drivers

Real Estate investment drivers are factors or elements that enable or motivate investors to commit their funds to the investment of real estate. They are the factors perceived by investors that determine the success of such investments.

1.10 Assumptions

This study assumes the following:

For the purpose of this study, property developers are representative of real estate investors. Given the working definitions of investment stated previously, property developers who commit funds to building projects, do so in anticipation of return of investment and return on investment and are therefore regarded as a form of investors.

Electricity bills are used as a proxy for utility bills in Lagos in this study. The study adopts this assumption because electricity is the main utility which is used state-wide and has a standard method of assessment which is through the bills issued by the Electricity Distribution Companies (DISCOs). Water supply from the public mains and waste disposal which are the other main utilities in residential settlements, are limited to
particular parts of the state resulting in many households making private arrangements for their water supply and waste disposal.

1.11 Structure of the thesis
Chapter one: Introduction – This is a general introduction to the study, detailing the research problem, objectives, questions, and hypothesis. The chapter also justifies the study, states adopted assumptions and defines basic terms used in the body of the thesis.
Chapter two: Research Methodology – The blueprint for conducting the research is outlined and explained in this chapter. The study area, research approach and design, sources of primary and secondary data, hypothesis testing methods and data analysis methods are outlined in this chapter.
Chapter three: Conceptual and theoretical frameworks – This chapter states the concepts and theories upon which the study is based.
Chapters four, five and six: Literature review – These chapters present the concept of green housing and the various related issues. Features of green housing, the business case for green housing and green housing policies and rating systems are all succinctly discussed in these chapters.
Chapter seven: Data presentation, analysis and discussion – this chapter presents the findings of research surveys, while analysing them and also discussing the implications of the results to the research.
Chapter eight: Conclusion – This chapter concludes the study, stating the research limitations and the recommendations of the researcher.
Figure 1.1 shows the structure of the thesis.
Figure 1.1 Structure of the thesis
CHAPTER TWO

2. RESEARCH METHODOLOGY

2.1 Introduction

Nigeria is majorly a capitalist economy, largely driven by the private sector with the government agencies as regulatory bodies in most cases. The failure of various housing policies and programs over the years has contributed to the almost total privatization of the Nigerian housing sector. Housing provision in any clime is a result of the interrelations of all players in the housing value chain. The supply and the demand sides of the chain are equally instrumental to the realization of a functional housing delivery system. Though each country or economy may have a value chain that is peculiar to their real estate industry, there are basic players that make up a typical real estate value chain. This study focuses on examining major actors of the Lagos housing value chain and how they interconnect with a view to creating a feasible framework for green housing investment and delivery in the Lagos property market. The Lagos housing sector actors from whom data was gathered in the course of this study are home users, estate surveyors and valuers, architects, policy makers, quantity surveyors and real estate developers.

2.2 Study area

The study is set in the coastal state of Lagos, popularly known as the commercial capital of Nigeria. Lagos state is made up of metropolitan Lagos or Lagos city and the Lagos suburbs. The state lies within latitudes 6°23′N and 6°41′N and longitudes 2°42′E and 3°42′ and is demarcated from the Atlantic Ocean by a stretch of barrier islands and beaches measuring about 100 kilometers on the side of the Atlantic Ocean. The proximity of Lagos to water bodies and the increasingly rising water levels due to global warming make it particularly susceptible to flooding. The climate of Lagos is the Tropical Savanah; thus, the state enjoys a fair share of sunshine and rainfall all through the year. The climate in Lagos has a major influence on building features and construction methods. Lagos state

The state is popular for being the economic and trade hub of Nigeria, housing the country’s major seaports. The concentration of commercial activities in Lagos, along with the fact that the state was the country’s capital between 1914 and 1991, contribute
to the massive urbanisation that the state is experiencing. Lagos is the country’s smallest state with a total area of 3,577km²; it is however also the most populous, with a population of 17.5 million as at 2006 (Lagos Bureau of Statistics, 2015). It is projected that Lagos city will be the 9th most populous city in the world by 2030, with a current population growth rate of 4.08%. (United Nations, 2014).

About 85% of the population lives in metropolitan Lagos, also known as Lagos city, which covers 37% of the land area and has an average density of 7,941 per square meter. Lagos state is commonly and loosely divided into the Lagos Island and the Lagos Mainland areas and the two areas are physically separated by the Lagos lagoon. Lagos State consists of 20 Local Government Areas (LGAs) and 37 Local Council Development Areas (LCDAs). However, metropolitan Lagos contains 16 LGAs; 13 on the Lagos Mainland and 3 on the Lagos Island. Figure 2.1 is the map of metropolitan Lagos showing the 16 component LGAs, while Table 2.1 shows a list of the LGAs.

Figure 2.1 Metropolitan Lagos Showing 16 LGAs
Source: (Lagos State Government, 2011)
Table 2.1 List of Local Government Areas in Metropolitan Lagos

<table>
<thead>
<tr>
<th>LAGOS MAINLAND (LM)</th>
<th>LAGOS ISLAND (LI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agege</td>
<td>Apapa</td>
</tr>
<tr>
<td>Ajeromi-Ifeodun</td>
<td>Eti-Osa</td>
</tr>
<tr>
<td>Alimoso</td>
<td>Lagos Island</td>
</tr>
<tr>
<td>Amuwo-Odofin</td>
<td></td>
</tr>
<tr>
<td>Ifako-Ijaye</td>
<td></td>
</tr>
<tr>
<td>Ikeja</td>
<td></td>
</tr>
<tr>
<td>Kosofe</td>
<td></td>
</tr>
<tr>
<td>Lagos Mainland</td>
<td></td>
</tr>
<tr>
<td>Mushin</td>
<td></td>
</tr>
<tr>
<td>Ojo</td>
<td></td>
</tr>
<tr>
<td>Oshodi-Isolo</td>
<td></td>
</tr>
<tr>
<td>Somolu</td>
<td></td>
</tr>
<tr>
<td>Surulere</td>
<td></td>
</tr>
</tbody>
</table>

Source: Lagos Bureau of Statistics (2016)

The residential property market in Lagos is largely private sector driven, which explains the large percentage of investment properties. As at 2010, owner-occupied residential properties were 25.4% of the total housing stock in Lagos, while 60% were occupied by renters (National Bureau of Statistics, 2012). The rented properties are largely privately-owned properties as there is still only an insignificant number of state-owned residential rental properties in Lagos currently. The overwhelming population coupled with a steadily increasing rate of urbanisation puts pressure on the housing sector which has a current deficit of about 5 million units (Oshodi, 2010). Lagos was chosen for this study because by virtue of its position as the commercial nerve of the country. Lagos has the highest number of housing transactions in the country (Northcourt Real Estate, 2015) and therefore has the country’s largest housing market, which allows for a thorough assessment and evaluation of varying views of the housing stakeholders.

2.3 Research approach and design

2.3.1 Research approach
This study assumes a pragmatic approach as described by Feilzer (2010), combining both participatory and post-positivism paradigms. This approach is informed by the ultimate aim of this study which is to create a motivational basis for green housing investment in Lagos. The study recognized that the realization of this aim is largely dependent on the interactions of human actions, inaction, behaviour, perceptions and beliefs, and therefore sought to employ various methods to engage with the different participants to collect
data. The study also employed a phenomenological strategy of inquiry by seeking and establishing the various participants’ experiences, perceptions and opinions about the subject matter.

2.3.2 Research design
The research is a convergent parallel mixed methods research. As described by Creswell (2013), this design provides an analysis of the research problem by combining both quantitative and qualitative data. Both forms of data are collected concurrently and integrated for interpretation and inference. In this study, data on Lagos home users’ awareness and perceptions of green housing is collected using quantitative methods, while qualitative data is gathered from various real estate practitioners and property developers, as further described in this chapter. The study uses both primary and secondary sources of data.

2.4 Secondary data
This study cuts across disciplines of economics, real estate, housing and environmental studies, among others. Therefore, this study entailed a detailed literature review across these various fields. Of particular interest to the study were works based on the adopted theories and concepts as discussed earlier. Therefore, relevant literature bordering around sustainable development, green building investment in international markets, market mechanisms of green housing, policies on green buildings, factors influencing investment in green buildings, practicability of green housing in developing countries, green building certification systems, among others were critically and analytically reviewed for this study.

Apart from literature, the study reviewed various green building rating and certification systems to determine their adaptability to the Lagos market. The three major rating systems reviewed and analysed in the course of this study are the Leadership in Energy and Environmental Design (LEED) for Homes, Green Star SA - Multi –Unit Residential v1 (GSSA-MUR) and the Excellence in Design for Greater Efficiencies (EDGE). The policies reviewed in the course of the study are the Nigerian National Housing Policy, the National Building Code, the Lagos State Climate Change policy, Lagos State Environmental Management and Protection law and the Lagos State Urban and Regional Planning and Development Law. Also, related housing and environmental policies both
locally within Nigeria, and internationally were examined. Statistics and reports relevant to the study, most importantly from the Nigerian National Bureau of Statistics (NBS), Lagos Bureau of Statistics (LBS) and the United Nations Environment Program – Sustainable Building Climate Initiative (UNEP-SBCI) were used as sources of information and secondary data also used in this study.

2.5 Primary data

2.5.1 Residential Property Users (Home Users)
Home users are considered as the consumers of housing units. This explains their importance in this study. The population of this group of participants was made up of the members of Lagos households who are able to make decisions concerning purchasing a home or payment of rent and payment of utility bills. They were important to the survey because they make up the demand side of the housing value chain. It was therefore necessary to understand their viewpoints concerning green housing. Since there is no available database that provides information on the above-stated population characteristics explicitly, the study adopted the statistics for the population of economically independent persons within the state as stated in Lagos Bureau of Statistics (2013). The population of metropolitan Lagos was projected to be 20 million as at 2015, from the 18 million figure derived during the last national census exercise in 2006 (Lagos Bureau of Statistics, 2015). Of this figure, 36% are classified as economically independent (Lagos Bureau of Statistics, 2013). This study therefore adopted a population size of 7.2 million. For this population size, a sample size of 384 is advised using the sample size determination table by Krejcie and Morgan (1970) This table is derived using the following formula:

\[ s = \chi^2 NP(1 - P) + d^2(N - 1) + \chi^2 P(1 - P) \]

where
- \( s \) = required sample size
- \( \chi^2 \) = chi square for 1 degree of freedom
- \( N \) = the population size
- \( P = 0.50 \) assumed population proportion
- \( d = \) degree of accuracy (0.05).

However, a sample size of 600 was adopted to properly accommodate the variety of strata within the population of study.
To ensure proper representation of this target population, a multi-stage sampling technique was employed. Firstly, residential neighbourhoods were stratified by income distribution, based on the income classification of Lagos by PricewaterhouseCoopers (2015), as shown in table 2.2 into low income, middle income and high-income neighbourhoods. Subsequently, participants were drawn using the simple random technique from the chosen neighbourhoods. Since there is no available data on the population distribution of the various income groups, the 600 questionnaires were divided into 3 batches. Each batch of 200 questionnaires was administered in each identified residential neighbourhood stratum, to ascertain that the required sample size for each group had been adequately covered.

*Table 2.2 List of selected neighbourhoods and their classifications*

<table>
<thead>
<tr>
<th>Low income</th>
<th>Middle Income</th>
<th>High Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agege/ Oko-Oba</td>
<td>Ojokoro</td>
<td>Ikeja Government Reserved Area (GRA)</td>
</tr>
<tr>
<td>Iju Isaga</td>
<td>Adeniyi Jones Avenue</td>
<td>Apapa GRA</td>
</tr>
<tr>
<td>Ipodo/ Seriki Aro</td>
<td>Ojota/ Ogudu</td>
<td>Ajah/ Ilasan</td>
</tr>
<tr>
<td>Onipanu/ Somolu</td>
<td>Surulere</td>
<td>Ikoyi</td>
</tr>
<tr>
<td>Akoka</td>
<td>Festac Town</td>
<td>Victoria Island</td>
</tr>
<tr>
<td>Igbobi/ Fadeyi</td>
<td>Opebi/ Allen Avenue</td>
<td>Parkview</td>
</tr>
<tr>
<td>Bariga</td>
<td>Satelite Town</td>
<td>Victoria Island</td>
</tr>
<tr>
<td>Ebute-Meta</td>
<td>Opebi/ Allen Avenue</td>
<td>Banana Island</td>
</tr>
<tr>
<td>Iwaya-Onike</td>
<td>Ketu/ Alapere</td>
<td>Akodo</td>
</tr>
<tr>
<td>Igbosere/ Campos</td>
<td></td>
<td>Lekki Peninsular</td>
</tr>
</tbody>
</table>

Source: Author’s construction (2016)
The instrument of data collection was a questionnaire with closed-ended questions (Questionnaire A). The questionnaire was designed to collect data concerning respondents’ demographics, details of rent or rental values in the case of owner occupiers, awareness of green buildings and willingness-to-pay a premium for green housing. Closed-ended questions were used to capture demographic, green building awareness, socio-economic data and to assess the maximum premium home users are willing to pay for green housing. A 5-point Likert scale ranging from strongly agree to strongly disagree was used to assess home users’ willingness to pay a premium for green housing, while an open ended question was used to ask respondents to describe a green building. The questionnaires were administered with the aid of trained research assistants who visited these neighbourhoods on weekends to collect the necessary data on a door-to-door basis. The choice of weekends was based on the assumption that more participants are likely to be found at their residences on weekends.

2.5.2 Estate Surveyors and Valuers

Data gathered from this group was particularly pivotal to the study considering the role they play in the housing market specifically, and the real estate market at large. In various other parts of the world, estate surveyors or estate appraisers specialise in a particular aspect of the profession like property management or agency. Nigerian real estate surveyors are however usually involved in all the major specialisations, only having these specialisations as different departments within their firms. Hence, a typical Nigerian Estate surveyor practices estate agency or brokerage, including property letting and sales, property management, property valuation and feasibility and viability appraisals. They are also able to practice anywhere within the country. The Nigerian Institution of Estate Surveyors and Valuers (NIESV) is the umbrella body for all qualified estate surveyors and valuers in the country. One criterion for registration with this body is at least two years tutelage with a real estate firm within Nigeria. The need to survey this group of informants arose from the necessity to assess market values of conventional and green buildings. Also, members this group were surveyed to establish their familiarity with green buildings, the presence of green buildings in their portfolio and the perceived and/or actual marketability of the product as the case may be.
Data collection from this group of participants was two-phased. The first phase entailed the administration of a questionnaire (Questionnaire B) with close ended questions to obtain quantitative data. The population of study for this group was the 325 registered estate surveyors and valuers practicing within Lagos state (Nigerian Institution of Estate Surveyors and Valuers (NIESV), 2015). The sample frame was the list of registered estate surveyors and valuers in Lagos state as compiled by NIESV. The sample size was determined using the sample size determination table by Krejcie and Morgan (1970). Therefore, a sample size of 175 was adopted for the study and the simple random sampling technique was used to engage participants. The NIESV held a ‘Head of Practice’ forum on the 16th of March, 2016 which brought about 200 members of the institution from across the state together. The questionnaires were administered at this forum.

Questions covering details of the estate surveyors’ practices and their knowledge and perception of green buildings were asked with close ended questions, while an open-ended question was used to ask for a description of green buildings from the respondents. Questions on the marketability of green housing units were asked using a 5-point level Likert scale ranging from strongly agree to strongly disagree.

The second phase of the survey of this group was the collection of qualitative data. This study is strongly influenced by the researcher’s academic and professional background in real estate, hence, the emphasis on understanding the perception of the estate surveyors in this regard. Therefore, the researcher realises that the marketability of an investment property is as important as its provision. This informed the need for a validation of data gathered from the questionnaires. While the questionnaires were used to collect data of a more general character, the qualitative data was more specific as it was collected from the estate surveyors and valuers who had either had some form of involvement with green buildings or were inclined towards green buildings. A Focus Group Discussion (FGD) was therefore used to gather the needed data. The essence of the FGD was to engage more personally with the participants whose experiences in real estate investment in Lagos are particularly instrumental to the study. To determine this sample group, a snowballing sampling technique was used by soliciting the aid of the Lagos branch of the NIESV in identifying ESVs who are familiar with green or sustainable buildings.
A total of eight (8) estate surveyors were identified for the FGD which was held in the office of one of the estate surveyors. The participants are identified in this study as ESV1, ESV2, ESV3, ESV4, ESV5, ESV6, ESV7 and ESV8. The focus of the discussion was determining the perception of green building by surveyors who actually had dealings with such buildings. Also discussed were tenants’ housing preferences, green housing marketing, green housing valuation techniques and housing policies as they affect green housing investments. The service of an estate surveyor, recommended by participants of the FGD, was employed after the development of prototype building plans, described subsequently, to assess their market value and viability.

2.5.3 Architects
This group was of interest to the study for its role in building design. It was necessary to reach a consensus on what the minimum standards and features for designing green housing in Lagos should be. To facilitate this, a FGD was conducted with this group with a view to establishing a minimum working standard for green housing in Lagos. The group participants were determined using the snowball sampling technique with recommendations from the head of the architecture department of the University of Lagos (UNILAG), who himself is notable for his involvement in various sustainable building projects. The selection of participants was made on based on their prior involvements with green or sustainable building projects. A group of 7 participants drawn from both academia at the University of Lagos and from practice were invited to participate in the discussions, which took place in the office of the head of architecture department, UNILAG. For the purpose of this study, the participants are identified as ARC1, ARC2, ARC3, ARC4, ARC5, ARC6 and ARC7. It was a 2-hour session. Permission was sought for video and audio recording of the session from the participants. Issues discussed included:

- The practicability of green housing designs in Lagos
- Green housing features practicable in Lagos
- Perceived challenges to green housing designs in Lagos
- The formulation of an effective green buildings rating/certification tool/system

The housing typology that typically dominates the Lagos residential property investment market comprises blocks of four units of 3–bedroom flats (Babawale et al., 2012), usually constructed on two floors. As such, this type of property was adopted by the researcher
as the benchmark for investment performance of a similar green structure. Thus, 3 different architectural designs, each of a block of 4 units of 3–bedroom flats, incorporating various green building features were produced for the purpose of the study. To develop these designs, three architects recommended by the FGD participants, being parts of the architectural teams on previous projects, were commissioned and were presented with the brief developed from the FGD with architects and asked to design a sample green building each. The brief administered expected the architects to focus on the following in their designs, emanating from the discussion with the participants of the FGD:

- Practical reduction of water and energy use in the operation of the building
- Practical designs for optimal ventilation and daylighting
- Incorporation of building materials with relatively lower embodied energy compared to conventional building materials
- Other features considered by the architects to make the designs more environmentally sustainable.

The various designs were therefore developed as green prototypes of blocks of 4 units of 3-bedroom flats. The designs were subsequently assessed for cost estimation by a quantity surveyor and market value by an estate surveyor and valuer.

2.5.4 Quantity surveyor

The services of a quantity surveyor, also recommended by some participants of the architects’ FGD, based on their experiences in previous jobs, were engaged to quantify and put costs to the prototype residential buildings designed by the architects. Their recommendation was based on the credibility of the quantity surveyor’s previous jobs for the architects. It was necessary to determine the cost of the building to determine the viability of the projects in comparison to the market values of same.

2.5.5 Policy makers

In Lagos state, while policies are formulated by the executive arm of government, laws are made by the Lagos state house of assembly. This study uses the ecological modernisation theory which propounds the interrelation between the state and private sector for the realisation of environmental quality protection. This theory is described in detail in the next chapter. Therefore, this group of participants was surveyed as
representatives of the state in the Lagos housing sector. The state agencies represented at the FGDs were the: Lagos state ministry of housing, Lagos state ministry of environment, Lagos state ministry of physical planning and urban development and the Lagos state house of assembly.

A planned single focus group discussion for all the participants from the various agencies proved abortive. Hence, various FGDs were held for the different agencies. While the FGDs for the ministries’ representatives held at their respective ministry offices at the Lagos state secretariat, the FGD for the LAHA members held at the Lagos State House of Assembly complex in Alausa, Lagos. At each FGD, permission was successfully sought for audio recordings of the sessions and the following issues were discussed:

- The state of the environment in Lagos particularly
- The knowledge about, need for and benefits of green buildings and green housing in particular
- Existing policies enabling the construction of green buildings and green housing in particular
- The role of the various institutions/ offices represented in increasing green housing stock in Lagos
- Deterrents to a viable green housing market in Lagos
- Framework for a sustainable green housing policy in Lagos.

2.5.5.1 The Lagos state ministry of housing

This ministry is charged with the responsibility of overseeing all issues regarding housing, including housing research, development, financing and the provision of housing units. This research took particular interest in the departments of architecture and building services, estates and real estate transactions of the ministry, because they are directly related to the study. Four officers drawn from the architectural and building services unit, estate department, physical planning and survey department and the quantity surveying department participated in the FGD. All participants were selected either by virtue of being the heads of their units, or were selected by the head of the unit. Table 2.3 shows a detailed account of each participant and their designations.
2.5.5.2 The Lagos state ministry of environment

This ministry has the responsibility of overseeing all environmental issues including climate change, conservation and ecology and environmental research and development. The departments under this ministry that are particularly instrumental to this study, considering their relevance to the subject of this research are the Lagos State Environmental Protection Agency (LASEPA), conservation and ecology department, climate change department, research and development department and the planning, research and statistics department. Four officers drawn from these various units participated in the FGD. Table 2.3 shows the details of the various participants from this ministry and their respective designations.

2.5.5.3 The Lagos State Ministry of Physical Planning and Urban Development

This ministry is charged with the responsibility of building plan approvals for housing and other forms of building developments within the state, among other roles. This ministry is of interest to the study because of its role in setting the standards for optimal building performance and environmental impacts. Departments within this ministry that are of particular interest owing to their significance to the study are the Lagos State Building Control Agency (LASBCA) and the Lagos State Physical Planning Permit Authority (LASPPPA). Four officers were drawn from these departments including the heads of both departments. Table 2.3 shows details of the participating officers and their designations.

2.5.5.4 The Lagos State House of Assembly (LAHA)

The LAHA is the legislative arm of the Lagos state government. The Lagos state house of assembly is sub-divided into various committees, covering varying special interests. For the purpose of this study, the members of the committee on land and housing and the committee on environment and a member who had formerly worked in the committee for environment were the participants of the FGD for policy and law makers. Four law-makers participated in the FGD. Table 2.3 shows the details of FGD participants from LAHA.
Table 2.3 Policy makers' focus group discussion participants

<table>
<thead>
<tr>
<th>AGENCY</th>
<th>PARTICIPANTS’ DESIGNATION</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Housing</td>
<td>Head of architectural and building designs</td>
<td>PM 1</td>
</tr>
<tr>
<td></td>
<td>Director, Estate department</td>
<td>PM2</td>
</tr>
<tr>
<td></td>
<td>Officer, Estate department</td>
<td>PM3</td>
</tr>
<tr>
<td></td>
<td>Officer, physical planning and survey department</td>
<td>PM4</td>
</tr>
<tr>
<td>Ministry of Environment</td>
<td>Head of climate unit</td>
<td>PM5</td>
</tr>
<tr>
<td></td>
<td>Head of environment planning unit</td>
<td>PM6</td>
</tr>
<tr>
<td></td>
<td>Head of environmental assessment unit</td>
<td>PM7</td>
</tr>
<tr>
<td></td>
<td>Head of environmental protection unit</td>
<td>PM8</td>
</tr>
<tr>
<td>Ministry of Physical Planning</td>
<td>Director of physical planning</td>
<td>PM9</td>
</tr>
<tr>
<td>and Urban Development</td>
<td>Assistant director of physical planning</td>
<td>PM10</td>
</tr>
<tr>
<td></td>
<td>Director, planning information centre</td>
<td>PM11</td>
</tr>
<tr>
<td></td>
<td>Head of Building matters unit</td>
<td>PM12</td>
</tr>
<tr>
<td>Lagos State House of Assembly</td>
<td>Chairman committee on environment</td>
<td>PM13</td>
</tr>
<tr>
<td></td>
<td>Member committee on environment</td>
<td>PM14</td>
</tr>
<tr>
<td></td>
<td>Member committee on housing</td>
<td>PM15</td>
</tr>
<tr>
<td></td>
<td>Member committee on physical planning and urban development</td>
<td>PM16</td>
</tr>
</tbody>
</table>

Source: Author’s construction

2.5.6 Real Estate Developers and Investors

As earlier stated, the largest group of players in housing provision in Nigeria is the group of property developers and investors. The theory of planned behaviour is used in this study to examine the effects of property developers’ and investors’ attitude among other variables, on green housing investment behaviours. The theory is explained in detail in subsequent chapters (see section Theory of Planned Behaviour (TPB)) of this thesis. This group was therefore important in this study as it is a major player in the supply side of the housing value chain. The population for this group comprised of corporate property developers in Lagos, who specialise in residential property development within the Lagos metropolis. The sample frame was 127 property developers extracted from the directory of the Real Estate Developers Association of Nigeria (REDAN) which is the government registered agency for private sector real estate developers in Nigeria. Sixty property developers were selected for the study, based on their availability to partake in the survey, as they indicated in initial phone conversations with the researcher. Because of the nature
of the respondents’ occupation and the difficulty entailed in securing their responses to questionnaires, data was gathered through interviews.

The interview outline was based on the constructs of the theory of planned behaviour model as explained in section 3.3 of this thesis. A pilot study was carried out on 6 respondents to test the feasibility and reliability of the interviews. Questions were asked to address each construct of the TPB as follows:

- **Attitude** – questions were asked on factors they perceived to affect green housing provision within Lagos.
- **Subjective norms** – questions about parties e.g. institutions or people that influence their business decisions were asked.
- **Perceived Behavioural control** – these included questions as to factors that are perceived to be green housing investment drivers.
- **Actual behaviour** – this data was obtained by asking questions on their current business operations in relation to green housing.

The researcher conducted the interviews personally, recording the responses in the TPB format and reading them back to the participant for confirmation of accuracy. The structure of the responses was based on the TPB questionnaire structure as recommended by Ajzen (2011a) (see section Theory of Planned Behaviour (TPB)). Responses were structured using bipolar adjectives on a 7-point scale, with the positive adjective on the extreme right and the negative adjective on the extreme left. For instance, in measuring perceived behavioural control, the following question was asked:

- Green housing will be a priority for our company if there is proof of higher capital values on the properties
  - Definitely: __ __ __ __ __ __ __ Definitely not
  - 1 2 3 4 5 6 7

Table 2.4 shows the constructs of the TPB and how they were measured.
Table 2.4 Measure of constructs used for Theory of Planned Behaviour

<table>
<thead>
<tr>
<th>CONSTRUCTS</th>
<th>MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>Cost of green housing</td>
</tr>
<tr>
<td></td>
<td>Home Users awareness</td>
</tr>
<tr>
<td></td>
<td>Built environment practitioners awareness</td>
</tr>
<tr>
<td></td>
<td>Green housing profitability</td>
</tr>
<tr>
<td></td>
<td>Availability of supporting policies</td>
</tr>
<tr>
<td></td>
<td>Availability of supporting technologies</td>
</tr>
<tr>
<td></td>
<td>Availability of green building materials</td>
</tr>
<tr>
<td></td>
<td>Availability of demand for green housing</td>
</tr>
<tr>
<td>Subjective Norm</td>
<td>Influence of business influencers on GH investment decisions</td>
</tr>
<tr>
<td></td>
<td>Influence of competition on GH investment decision</td>
</tr>
<tr>
<td>PBC</td>
<td>Accessibility to technical know-how</td>
</tr>
<tr>
<td></td>
<td>Accessibility to green building materials</td>
</tr>
<tr>
<td></td>
<td>Accessibility to GBRS</td>
</tr>
<tr>
<td></td>
<td>Accessibility to supporting policies</td>
</tr>
<tr>
<td></td>
<td>Availability of incentives for investing in GH</td>
</tr>
<tr>
<td></td>
<td>Proof of higher rents for GH</td>
</tr>
<tr>
<td></td>
<td>Proof of lower risk of vacant GH units</td>
</tr>
<tr>
<td></td>
<td>Proof of lower life cycle costs</td>
</tr>
<tr>
<td></td>
<td>Boost in corporate image</td>
</tr>
<tr>
<td>Intention</td>
<td>GH projects as short-term goals</td>
</tr>
<tr>
<td></td>
<td>GH projects as Long-term goals</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Current GH project</td>
</tr>
</tbody>
</table>

Source: Author’s construction

The interviews also included questions on the operations of the development company to gain a better understanding of how conversant they are with the Lagos housing market. There was also an assessment of green building features currently being employed by the developers in their building projects. These features were adapted from the study by Hlad (2009). The following features were assessed:

- Use of recycled or salvaged building materials
- Use of readily renewable materials
- Use of solar orientation
- Optimisation of daylighting
- Use of vegetated (green) roofs
- Use of photovoltaic (solar) energy
- Use of passive designs
- Use of renewable energy systems
- Use of solar water heaters
- Greywater reuse systems
2.6 Research objectives and measurements

Table 2.5 sums up the various instruments used in the achievement of the set research objectives for this study.

Table 2.5 Research variables and measurements

<table>
<thead>
<tr>
<th>RESEARCH OBJECTIVES</th>
<th>INSTRUMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of green buildings in Nigerian context</td>
<td>FGD with architects; secondary data sources</td>
</tr>
<tr>
<td>Examination of current status of green housing market in Lagos</td>
<td>FGD with Estate surveyors, architects and policy makers; secondary sources</td>
</tr>
<tr>
<td>Identification of green housing investment drivers</td>
<td>Questionnaire A, Questionnaire B, FGD with estate surveyors and valuers, policy makers, architects and property developers; secondary sources</td>
</tr>
<tr>
<td>Value and viability assessments of prototype green housing units</td>
<td>FGD with Architects, building design plans developed by architects; bill of quantities prepared by quantity surveyor, estimation of value by estate surveyors and valuers</td>
</tr>
<tr>
<td>Awareness of green housing among Lagos green housing stakeholders</td>
<td>Questionnaire A, Questionnaire B, FGD with policy makers, developers and architects</td>
</tr>
<tr>
<td>Assessment of green housing related policies</td>
<td>Secondary data sources, FGD with policy makers</td>
</tr>
</tbody>
</table>

2.7 Hypothesis testing

The hypothesis of this study was tested using Ajzen’s (2006) model of the Theory of Planned Behaviour (TPB) as shown in figure 2.2. The details of the theory are discussed in the following chapter. However, the model constructs for which data was obtained from the property developers are attitude, subjective norm, perceived behavioural control and actual behaviour.
The model is tested using a path analysis with the IBM SPSS AMOS Structural Equation Modelling (SEM) tool. This tool is used to establish the relationships among the various constructs of the model and to assess the model fit. This means that the SEM shows the various interrelationships among the various observed variables of the model (Schreiber et al., 2006), and how they affect each other. In the case of this study, the SEM measured the effect of attitude, subjective norm and PBC on the intention to invest in green housing and the actual behaviour of investing in green housing, as well as how the constructs affect each other.

### 2.8 Data analysis

Data extracted from questionnaires A and B was analysed using Microsoft Excel 2016 and IBM SPSS version 23. The variables were analysed and presented using descriptive.
statistics in frequency tables, pie charts and cross-tabulations. Housing attribute ranking was measured using the ranking formula by Van Calker et al. (2005):

\[ W_{ij} = \frac{\bar{X}_j}{X_{ij}} \]

Where \( W_{ij} \) = Relative importance weight
\( X_{ij} \) = Value of attribute i for respondent j
\( \bar{X}_j \) = Average ranking of all attributes for respondent j

In testing the willingness-to-pay a premium for green housing units, a Kruskal-Wallis H test was employed to determine if there are significant variations among selected variable groups. Hence, the test was used to check if respondents’ willingness to pay is dependent on neighbourhood type, residency status, annual rent currently paid or monthly utility bills currently paid.

The FGDs were analysed by using the thematic analysis technique. This technique was used to identify and determine relationships among concepts emerging from the discussions. The audio recorded group discussions and interviews were transcribed into texts, and key and recurring themes emerging from the discussions with the various participants were identified, presented and examined, in consideration of how they would be worked into the proposed framework. The themes were also analysed to determine the peculiarity of the green housing market in Lagos, in comparison to cases identified in literature. The identified themes and sub-themes were examined and discussed in light of the research questions.

Based on all the above explained analyses, a framework, that in the least, would trigger a vibrant green housing market in Lagos was developed.
CHAPTER THREE

3. THEORETICAL AND CONCEPTUAL FRAMEWORKS

3.1 Sustainable Development (SD) and Environmental Sustainability

The discourse on sustainable development continues to form a significant part of various global concerns. The inevitability of development and the need for the sustenance of various resources form the basis for the concerns that have birthed this ubiquitous phenomenon. The terms ‘sustainability’ and ‘sustainable development’ are often used interchangeably and rightly so. Ironically, while sustainability seeks to maintain certain standards, development seeks the continuous alteration of others like infrastructure, economy and society at large. SD therefore involves the daunting task of juxtaposing both conflicting phenomena amicably. So, while sustainability looks to preserve life for the coming generations, sustainable development (SD) advocates doing so while improving the present quality of life. Jabareen (2008) refers to this ability of one phenomenon to combine two seemingly conflicting concepts, as the concept of ethical paradox.

Adams (2009) emphasizes that SD is founded on the premise that continuous economic growth and a high environmental quality can work together if economic activities are undertaken in such a way that the environment is not put in jeopardy. To ensure practicability, the different components of the SD concept should be adapted to the different contexts in which they are to be used. Because what development is in one context may be different in another, what is sustainable also differs over varying circumstances. Du Plessis (2002), in discussing key issues in the Agenda 21 for sustainable construction in developing countries, identifies that one problem of the global south is that they pattern development after the developed world. The peculiarity of the developing countries’ socio-economic features among other factors, causes these practices to impact on them negatively. Hence SD is not necessarily a ‘one cap fits all’ solution to global problems, but a circumstance induced approach to solving evolving issues.
What SD sets out to achieve in one field e.g. agriculture may be different from what it sets out to achieve in another e.g. housing. Hence the inappropriateness of giving SD one definition.

The concept of sustainability historically came to the fore because of concerns over depletion of natural resources (Grober, 2007) which is the result of constant and resource intensive developments. Adams (2009) writes that SD has evolved through time from a period of global environmentalism or global environmental concerns which started mainly in the northern hemisphere, to a current period in which this scientific concern is reflected all over the globe. The latter period has seen to the establishment of various bodies and institutions in as many fields as are given to continuous research. Common research foci include determining the practicability and applicability of SD in their respective fields. The built environment is a major beneficiary of these.

Though the phrase ‘Sustainable Development’ gained prevalence after the World Commission on Environment and Development report of 1987 and further through the ‘Earth Summit’ of 1992, the concept dates back to a much earlier time. The concept is recorded to have been debuted in 1713 by Hanns Carl von Carlowitz, who used it in relation to the conservation of forestry at the time (Grober, 2007). Over the years, the concept of SD has grown to have a more political connotation, judging by its inclusion in major global political circles. Adams (2009) describes SD as the merging force between academics and policy making by its ability to combine development studies, ecology, economics, ethics and various other disciplines in its practicality. This becomes evident with various SD targets such as the United Nations (UN)’s ‘2030 Agenda for Sustainable Development’.

There have been various attempts to define SD and as many criticisms of those definitions. One of the earliest and commonly used definition is by the World Commission on Environment and Development (1987, p.43), which describes SD as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. As widely used as this definition is, it is usually criticized for being vague and not necessarily addressing the given concerns. SD definitions tend to tilt more towards the context of relevance to the definer, thus the
definition of SD is a function of who is defining it. For example, Berke and Conroy (2000, p.23) from an urban planning perspective define SD as “a dynamic process in which communities anticipate and accommodate the needs of current and future generations in ways that reproduce and balance local social, economic and ecological systems, and link actions to global concerns”. On the other hand, in business parlance, SD is usually defined as making business sustainable (Adams, 2009). Choguill (2007, p.145) defines SD in the housing context as housing initiatives that “must be economically viable, socially acceptable, technically feasible and environmentally compatible”. He adds that government policies must also support these attributes. Kauko (2012) identifies three important issues in defining SD in the housing context; they must be of high health and quality standards, they must be affordable across all income classes and they must present a wide range of consumer choices.

SD is one concept that is usually viewed through various lenses, depending on the school of thought in question. Prominent among these is the view that SD is widely believed to be an interaction among three imperatives; environmental, social and economic development (Akadiri and Olomolaiye, 2012, Willard, 2012, Ding, 2008). These have become commonly known as the three ‘pillars’ of SD and in other cases the ‘Triple Bottom Line’ (3BL) of SD; which act as the lenses through which the concept is usually interpreted. The 3BL framework may however be insufficient to accurately represent the complexity of SD.

The 3BL conceptualisation of SD is believed to be the brainchild of various international conferences, conventions and summits addressing SD issues (Lorenz, 2006).

- The social pillar advocates equity in standards of living and social welfare and that people should have the choice to live as they will and not as they have to.
- The economic pillar entails wealth generation and distribution. Development is defined as the act of bringing out the latent capabilities of a thing. This definition in itself is economic in nature and shows that economic benefits may be a primary aim of development. It advocates that development should meet basic human needs.
The environmental pillar advocates that development should not be to the detriment of the natural environment, flora and fauna, but must be undertaken in a way that protects these elements.

Proponents of the 3BL emphasize the need to balance economic, social and environmental goals of sustainability (Marshall and Toffel, 2005, Zaccai, 2012, Sneddon et al., 2006). However, though many writers agree that the three pillars are equally important to achieve SD, it is almost impossible for the three dimensions to be treated with accurate equality. Firstly, the environment forms the basis for all human activities including economic and social activities and as such is in a position of priority among the pillars, a view also supported by Turner and Hartzell (2004). Secondly, the environment is more complex than just being a platform that supports the existence and well-being of human beings. Rather it is a whole ecosystem consisting of organisms other than humans for which economic and social imperatives may be unjustifiable and thus ignored. Thirdly, striking a balance among the pillars gives a sense of compromise rather than maximisation of their embedded potentials. For instance, the environment may have to be compromised if sustenance of same is not socially or economically beneficial. Given these views, a perfect balance is unlikely to be achievable among these different dimensions.

Emerging literature identifies other supporting pillars such as the cultural pillar (UN-Habitat, 2012a) and the institutional pillar (Irurah, 2002) which are obviously also necessary for meaningful SD. There is however still a dearth of literature to adequately adopt a framework in this regard.

There are other schools of thought on how SD should be conceived. One of such is the anthropocentric view, which uses a dualistic approach, seeing SD as being made up of the environment and the people (Robinson, 2004). Another school of thought proposes the concepts of weak sustainability, which states that a depletion of natural capital stock can be compensated by increasing manmade capital stock (Pearce et al., 1989) and strong sustainability (Neumayer, 2012), which is of the opinion that natural capital stock is irreplaceable and must be maintained alongside man-made capital stock. Also, Sneddon et al. (2006) in their pluralism argument advance the view that SD should be approached
using the concepts of ecological economics, political ecology and ‘development as freedom’. Their view is more tilted towards policy development and political discourses. Wallis et al. (2011) identifies three main streams for assessing sustainability:

- The interdependent pillar models
- The human – ecosystem linked models
- Principles necessary for achieving sustainability

It is however obvious that whichever way SD is being viewed, environmental sustainability remains an integral deterministic factor in the assessment of its successful achievements. As earlier argued, social and economic human activities are largely dependent on the environment in which they exist for location. Also, the environment is the supplier of natural capital stock which is necessary both for the production of man-made capital stock and the entire process of development. The words ‘environmental’ and ‘ecological’ are commonly used interchangeably in SD discourses. Morelli (2013) however explains that while the environmental concept assesses the human impact on the natural environment, the ecological concept focuses on the interdependence of organisms in the ecosystem and states that environmental is a subset of ecological. He goes ahead to define environmental sustainability as “a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity” (p.5).

The importance of environmental sustainability has become apparent in light of recent growing concerns over the constantly degrading state of the environment. The effects of climate change and global warming are now closer home than ever, with the earth experiencing its highest recorded temperatures ever. Naturally, these events cause sustainability assessments to tilt more towards environmental than other dimensions. Marshall and Toffel (2005) identify four frameworks for assessing sustainability; the triple bottom line, the natural step, the ecological footprint, and Graedel and Klee’s method. Of these four, three are almost purely environmental in nature. They (Marshall and Toffel, 2005) go further to depict sustainability needs hierarchically. The pyramid shows concepts which are currently tagged ‘unsustainable’, and that each tier has a need for environmental sustainability, showing the importance of the concept. This hierarchy is depicted in Figure 3.1.
Bell and Morse (1999) describe sustainability as the improvement or maintenance of current systems’ quality; therefore, a decline in a system quality represents unsustainability. In their description, the system depends on the type of user in question. The system in question in this study is the natural environment in which buildings exist and the ecology whose quality must either be maintained or improved. There has been a long-standing argument about the impact of development on the environment between the ‘environmentalists’ who believe that climate change is as a result of human activities and the ‘sceptics’ who are of the opinion that the facts are simply overstated. Unfortunately, paucity of relevant statistics leaves this debate unresolved (Adams, 2009). Whichever way the argument sways though, facts and figures showing increasing GHG levels, rising sea and atmospheric temperature levels, among many other phenomena, are proof that the natural pattern of the environment has been altered as a result of continually increasing human interference. This undeniable fact prompted the adoption of
Environmental Impact Assessment (EIA) principles in developed countries from the 1960s. Nigeria also followed suit by the promulgation of the EIA Decree No. 86 of 1992, following incidences of dumping of toxic waste in the former Bendel state (Echefu and Akpofure, 2002).

The institution of EIAs and various other environmental management programs and systems are examples of forms of regulation in administrating environmental sustainability. The need for such regulatory intervention in environmental issues cannot be overstated. The role of the state in this regard is therefore assessed in this study through the lens of Ecological Modernisation theory.

3.2 Ecological Modernisation Theory (EMT)

The earliest known literature on environmental issues focused on identifying and explaining degradations that the natural environment was experiencing and the parties that were to blame for same. This era was closely followed by a wave of environmental policy and law enactments in the early 70s and shortly after by a period of ‘state failure’ to adequately address environmental issues (Mol et al., 2014). To date, sociologists, environmentalists, among other professionals, as well as politicians, continue to be at loggerheads on the issue of the effect of society on the environment. This wide spectrum of environmental stakeholders may be broadly categorised into two groups. While one group agrees that both society and environment can be amicably reconciled for mutual benefit, the other group sees the attempt as an act of hypocrisy. EMT was formed against the strong structuralists’ premise that ecological improvement is mutually exclusive of capitalism and industrialisation (Mol et al., 2014).

The earliest identified crusaders of the concept of EMT were Martin Jänicke, who was of the strong opinion that environmental management is the responsibility of the state, and Joseph Huber, who was more on the side of greening modernisation by what he refers to as ‘ecologizing of economy’ and ‘economizing of ecology’ (Spaargaren and Mol, 1992). The relatively young but continually evolving theory now balances both schools of thought to produce what Adams (2009) refers to as a ‘reformist and regulatory approach’. The theory is largely dependent on technological innovations as a tool for ecologically sustainable development and effective institutions for regulating these kinds
of developments. Mol et al. (2014, p.2) describe the concept of EMT very simply as a body of scholarship that:

“reflects on how various institutions and actors (attempt to) integrate environmental concerns into their everyday behaviour, practices, developments, and relations with others and the natural world”.

There is no separating modernisation, capitalism and industrialisation from many economies. It is also practically impossible to separate these phenomena from the natural environment within which they exist. Spaargaren and Mol (1992) identify three schools of thought on the causal effects of modernity on the environment: the neo-Marxist approach, the post-industrial society and the counter-productivity thesis. These schools blame capitalists, the industrial system and the existing system of production respectively for the degradation of environmental qualities. Ironically, these three phenomena interplay to produce what is generally known as development. Imperatively, from whichever angle it is observed; capitalism, industrialism or modernism supplies society with the needed goods and services and cannot, either individually or collectively, solely be blamed for the current state of the ecology.

It may be argued that products supplied are products consumed and the supplying class of the economy has a responsibility to ensure sustainable environmental standards are upheld in the discharge of their duties. However, considering the power of the consumer in determining the output of the supply side, especially through expression of preferences, the demand side may equally be held responsible for upholding environmental standards. For example, as in the case of this study, a high rate of demand for environmentally sustainable housing units will in turn cause a surge in the supply of the product. This is however subject to sufficient knowledge of the various alternatives available to the consumer.

Political Modernisation (PM) is one of the results of the evolution of EMT over the years. Jänicke (2009) refers to it as ‘the institutionalisation of significantly higher problem-solving power’. PM is the concept that deals with policy formation and innovation within the environmental administration discourse and elaborates the role of the state in integrating environmental issues into various sectoral politics (Mol and Janicke, 2009).
Arts et al. (2006) however states that PM is not limited to environmental policies, but rather can be administered across a wide spectrum of political domains. Jänicke (2009) explains that in PM, environmental policy enforcement takes place in stages, which include first making the environmentally driven policy and then taking measures against defaulters. He argues that these measures act as a form of motivation for innovation among the target actors, as they find ways to continue in business while avoiding penalties. Jänicke’s assertion is however arguable as its effectiveness may largely depend on the level of environmental consciousness of the society in which it is being enforced. In other words, the success of environmental policies may depend on the level environmental sensitization of the society in which it exists. Hence, a dearth of environmentally sustainable buildings as in the case of this study, may primarily be for reasons of lack of awareness of such option of investment to property developers, rather than a lack of relevant policies.

Van Tatenhove and Leroy (2003) bring an interesting argument into the PM discourse as they discuss political participation in PM. They refer to participation as the involvement of non-governmental actors in the political process of governance. They argue that the ‘societalisation and marketization’ of environmental policies by the inclusion of civil societies and market representatives in policy making allows for more actors to have a sense of responsibility over the environment. This argument is particularly relevant in a capitalist economy, where it enables market players including producers and consumers to influence policies concerning their environmental choices. An example would be residential property renters insisting that the level of ‘greenness’ of properties must be clearly stated when they are advertised.

The practicability of EMT has been demonstrated in countries like the Netherlands. The Dutch government has been able to synergise with various stakeholders of the building construction sector to formulate environmental policies that are widely acceptable (Melchert, 2007). A reflection of this is the development of sustainable building covenants such as the ‘As Low As Reasonably Achievable’ (ALARA) principle, which seeks to reduce building impacts to the most practicable possible and financially feasible level. Melchert (2007) proposes that developing countries should tackle property and product development from the vantage position of learning from the mistakes of the
developed world and be more proactive in environmental policy making as against being reactive. He also proposes intentional innovation in the construction sector and proper regulation of building practices. Hirigoyen (2017) also explains that as environmental stewards, public officers must be intentional in the bid to increase the low-energy building stock. In the global south similarly, evidence emerges from South Africa showing a shift towards the integration of EMT in the country’s social and environmental discourses (Oelofse et al., 2006).

EMT has not been without its own criticisms though. Fisher and Freudenburg (2001) adduce to the fact that the majority of these criticisms are rooted in neo-Marxist scholarship. They identify a number of popular criticisms including the impossibility of ‘sustainable capitalism’ and that the theory presents a fallacy of a perfect fix for ecological problems. Ajzen (2011b) also states four major challenges to the EMT. He insists that:

- EMT must give evidence that environmentally inclined policies actually produce the desired effect on the ecology
- There is insufficient evidence across the various economic sectors to show that modernisation may indeed aid in ecological improvement
- There should be proof that actors engaged in reducing negative environmental impacts in some industries are not indirectly increasing same by their actions in others
- The pace of acclaimed resource efficiency in some economies must be shown to be significant in relation to the pace of overall production.

These criticisms by Ajzen (2011b) however seem more like issues that should be used to test the theory and are quite long term in nature.

Another major criticism of the theory is the fact that it cannot totally assume the status of a social theory because it lacks the ‘identifiable postulates’ cognate to social theories (Buttel, 2000). Buttel (2000) himself however proposes that the theory should be further developed in connection with existing related theories.

It is obvious from a review of the above criticisms and recommendations of scholars including major proponents of the theory (Buttel, 2000, Fisher and Freudenburg, 2001, Mol et al., 2014) that there is need for further and extensive research, particularly in
varying case scenarios for the establishment of the theory. However, the fact remains that the EMT is a more practical and realistic approach to environmental preservation and protection than radical environmentalism has to offer. Whereas, radical environmentalism, in its many concerns about the cost of development to the environment, deters development, the EMT seeks a juxtaposition of both in a way that is mutually beneficial (Adams, 2009). In the housing sector for instance, there may be no ‘environmentalist’ alternative to the provision of shelter that does not involve the depletion of natural resources in one way or the other. Housing however cannot be compromised since it is a basic human need. EMT is therefore a valid tool for reconciling shelter and the preservation of the environment, through the enablement of the provision of green housing units.

### 3.3 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) is one of the theories of Behavioural Economics (BE). BE is increasingly being chosen over traditional or neoclassical economics to understand the bases of decision making in investment. Neoclassical economics is constantly being critiqued for its assumption that humans are rational beings and will always make rational choices (Pollitt and Shaorshadze, 2011). However, BE which is more psychological in nature, seeks to understand and explain irrational decisions. The TPB is a modification or an extension of Ajzen and Fishbein’s Theory of Reasoned Action (TRA) (Ajzen, 1991). The theory, simplified, states that an individual’s intention to behave in a particular way coupled with their ability to perform the behaviour subsequently leads to a formation of the behaviour.

TPB has three main constructs; attitude, subjective norm and perceived behavioural control.

#### 3.3.1 Attitude towards a behaviour

According to the theory, the positive or negative attitude towards a behaviour is a product of the combination of beliefs about the behaviour and an evaluation of the outcome of the behaviour. This is represented by what is known as the expectancy – value model (Ajzen, 2011a). Ajzen (1991) states that attitude towards an act is directly proportional to the sum of the indices of a person’s beliefs about the act as shown in the following formula:
Where: $A$ is attitude towards a behaviour,

- \( b_i \) = subjective probability/belief that behaviour produces outcome $i$
- \( e_i \) = the evaluation of the outcome $i$
- \( n \) = number salient beliefs

Ajzen (2011a) however points out that behavioural attitudes are not necessarily formed based on all possible outcomes of the behaviour. It is therefore important to assess attitude based on beliefs that are readily assessable and easy for the participants to relate to.

### 3.3.2 Subjective Norm (SN)

The theory’s construct of subjective norm is drawn from the belief that behaviour is also a function of the standpoint of certain people of influence on that particular behaviour. Ajzen (2011a) states that the subjective norm is a summation of the weighted set of beliefs concerning the expectation of the ‘referent’. Ajzen (1991) expresses this using the following formula:

$$ SN \propto \sum_{i=1}^{n} n_i m_i $$

Where SN is Subjective Norm

- \( n_i \) = normative belief
- \( m_i \) = the motivation to comply with referent $i$

While among individuals’ referents may be peer groups, mentors or people in position of leadership, in business spheres, referents may include actors whose decision affects the business performance or stakeholders such as shareholders, customers, business mentors, financiers, etc.

### 3.3.3 Perceived Behavioural Control (PBC)

PBC is the construct that sets the TPB apart from the TRA. While the TRA takes only behaviours over which subjects have control into cognisance, the TPB accommodates behaviours over which control is limited. Ajzen (2011a) defines PBC as “the extent to which people believe that they can perform a given behaviour if they are inclined to do so”. The essence of this construct lies in the fact that people are more likely to behave in a certain way if they believe they are capable of the behaviour. Thus, for example, a
person is more likely to form a reading habit if they think they have the ability to read and understand texts. Ajzen (1991) explains that a person’s perceived control increases with their perception of availability of enabling resources and opportunities. He expresses this in the following formula:

\[ PBC \propto \sum_{i=1}^{n} c_i p_i \]

Where PBC is Perceived Behavioural Control

\( c_i = \) subjective probability/belief that control is present

\( p_i = \) the power of control factor \( i \) to motivate behaviour

A combination of the three explained constructs produce the model that explains the TPB. Figure 3.2 shows the constructs of the TPB and how they relate to produce intention and behaviour.

\[ Figure \ 3.2 \ Theory \ of \ Planned \ Behaviour \]

(Ajzen, 1991)
The TPB is a predictive theory used to understand behaviour of interest in fields of study including social studies such as, and particularly behaviours towards environmental concerns.

In a study by De Groot and Steg (2007) using the TPB, it was found that positive attitude, positive SN and high levels of PBC motivated the uses of a transferium transportation system as an alternative to individual private cars. It was however also discovered from the study that ego was the strongest predictor of attitude towards using the transportation system. Wu et al. (2016) also propose the use of the TPB in a framework to understand how green buildings affect their occupants’ pro-environmental behaviours. A knowledge of the different variables and how they interplay can aid in developing practicable models for the promotion of particular products or systems like green housing as in the case of this study. Kumar (2012) also used the TPB to establish a positive relationship between environmental knowledge and positive behaviour towards purchasing environmentally sustainable products. He however also discovered an insignificant subjective norm value affecting the stated behaviour. Kumar (2012) reiterates that the information gathered is necessary for policy making and market strategizing, and thus important in environmental protection programs.

TPB has also been used in studying investment behaviours. Adam and Shauki (2014) used TPB in a study to examine the decision-making behaviour of socially responsible investors in Malaysia. They found that subjective norms, especially influences from social circles have a significant impact on investors’ attitude. Hofmann et al. (2009) also employ the TPB to identify factors that influence ethical behaviour in investors. They also find that subjective norm has a significant effect on their decision to invest ethically. The study also reveals that while ‘conventional’ investors are primarily profit driven, ethical investors are motivated by their intention to promote change. TPB has even been used to identify factors that cause investors to abstain from committing to sustainable investment. Paetzold and Busch (2014) identify the perceived highly volatile nature of sustainable investments, as well as unavailability of adequate professional information concerning such investments as such deterrents.

Major criticisms to the theory however lie in its subjectiveness. Armitage and Conner (2001) state that the self-reporting model of the TPB is a threat to its validity and
reliability. They also establish that PBC should not be assessed in isolation; but in combination with ‘self-efficacy’ which is defined as a person’s confidence that they can behave in a particular way. Armitage and Conner (2001) also point out that subjective norms may be too subjective a construct to use in the theory and that there is evidence to show that it is actually a weak predictor of behaviour. There is however a need to assess the circle of influence of a decision-taker, especially when the subject is a corporate entity. They (Armitage and Conner, 2001) however suggest the inclusion of moral norms as additional variables to increase the predictive power of the theory.

Joachim et al. (2015) develop a framework for motivations for green building investment and users’ demand using the TPB model and the theory of Value Belief Norm. The model is shown in figure 3.3. The framework includes moral norms such as personal and altruistic values in addition to the established variables. The assessment of moral norms may actually be too subjective to be used in the construction of a theory, as the mode of assessment of such is unclear and the assertions may be unverifiable. There is therefore need for further research into the proposition to assess behaviour using moral norms.

![Figure 3.3 Environmental Motivations and Expectations of Green Building (Joachim et al., 2015)](image-url)
3.4 Environmentally Responsible Property Investment (ERPI)

Responsible Investment (RI) is defined as an investment approach that takes environmental, social and governance (ESG) factors into consideration for business decision making (Hebb et al., 2015). This is a basic definition of the concept which has been seen to have different variants in literature, depending on the context of use. Variants such as Socially Responsible Investment (SRI1) (Adam and Shauki, 2014, Lorenz and Lützkendorf, 2008, Madew, 2006, McNamara, 2009), Responsible Property Investment (RPI) (Burrows, 2011, Pivo, 2008b, Pivo and McNamara, 2005, United Nations Environment Programme Finance Initiative, 2012), Socially Responsible Property Investment (SRPI) (Daniel et al., 2007), Ethical Investment (EI) (Hofmann et al., 2009), Sustainable Property Investment (SPI) (Lorenz et al., 2008, Lützkendorf and Lorenz, 2005) and even Corporate Social Responsibility (CSR) (Adam and Shauki, 2014, Bauer et al., 2011, Van Marrewijk, 2003, Yam, 2013) have been used in literature to describe the basic concept of RI.

This study however focuses on environmentally sustainable housing provision as a form of property investment and therefore adapts the RPI concept to a strictly environmental viewpoint (ERPI). The study however uses relevant literature in all forms of RI for want of literature on ERPI specifically.

Property investment is one of the major traditional investment opportunities (Isaac, 1998). However, unlike investments in fixed income securities or company stock and shares, property investment has the additional role of supplying a basic human need – shelter, which may either be for residence (housing) or other human activities. Hargitay and Yu (2003) define investment as ‘an activity which requires cash outlay with the aim of receiving in return future cash inflows’. The futuristic nature of the expected returns automatically introduces the element of risk into the investment and consequently, decision taking must be done painstakingly to ensure profit maximization, as well as risk minimization. For other forms of investment, these decision-taking criteria can be quite straightforward, considering the required data and indices for such decisions are usually readily available. However, real property investment is unique and bundled with several technicalities which make business decisions a more laborious process. Some unique
characteristics of real estate include fixity in location, heterogeneity in nature and the various legalities involved in the acquisition, holding and administration of same.

Property investment in the actual sense of the term would mean the acquisition of property in anticipation of a regular stream of income in the form of rent or dividends in the case of securitized property ownership. However, in the short term, property developers are also seen as investors with a different aim. The aim of the property developer is to fill an existing gap by constructing real property units which are to be sold off for profit and possibly reinvestment. The short-term nature of this investment does not in any way eliminate the associated risks and uncertainties. Among other responsibilities, the developer is also burdened with the responsibility of understanding the trend of market demand to create the expected value (Gehner, 2008). Investment decisions therefore entail committing to careful evaluation of the development process and their alignment with the developer’s goals and objectives (Gehner, 2008).

Buildings and real estate in general have massive implications on environmental sustainability. It is estimated that buildings use roughly 40 percent of global energy and emit about a third of the world’s GHG (UNEP Sustainable Buildings Climate Initiative, 2009b). Eight percent of global carbon emission is attributed to residential and commercial buildings (World Bank, 2009), which continues to grow with urbanization rates reaching as high as 4.4 percent in developing countries like Nigeria (World Bank, 2015) and increasing property development to accommodate the influx. As the effects of the increasing GHG levels becomes more evident in the environment, climate change mitigation and adaptation strategies are being integrated into almost every sector of the economy including the built environment. These strategies inform the concept of RPI. Burrows (2011) explains that RPI takes account of environmental, social, ethical and resource depletion impacts of buildings in investment decisions.

Lorenz et al. (2008) identify three types of property investment: conventional property investment, Responsible Property Investment and Sustainable Property Investment (SPI). SPI involves strictly taking sustainable business decisions to the detriment of financial gains where necessary. Pivo (2008b) refers to RPI as a new paradigm in property investing that ensures a more detailed and accountable process of decision taking. Pivo
(2008a) also adapts a definition of RPI from a definition of CSR to mean “efforts by property investors that go beyond compliance with minimum legal requirements to better manage environmental, social and governance issues associated with property investing” (p.235). The majority of existing literature on RPI is on securitized property investment which is a more organized and regulated sub-market in the building sector. However, in developing countries like Nigeria, Real Estate Investment Trusts (REITs) and other related types of securitized real estate investments are yet to become commonplace and as such are very unlikely investment choices, hence the interest of this study in direct property investment. McNamara (2009) states that developers or investors who engage with properties at the construction stage have the greatest opportunity to adopt RPI. At this stage the investor is at liberty to determine the forms and extent of the impact of their asset on the environment and society. Other forms of engaging with properties include refurbishing and management of the building. At these stages, the investor may decide to retrofit the building or adopt sustainable management practices.

The following are some highlighted actions taken by property investors which make their investments qualify as RPI (Pivo and McNamara, 2005):

- Management and Governance
  - Independent environmental auditing for all contractors
  - Life cycle costing (LCC), value management and risk analysis for project planning and decision taking
  - Staff are trained on RPI
  - Joint efforts with other sector stakeholders to create framework for CSR

- Social
  - Health and safety certifications
  - Urban revitalization and provision of affordable housing
  - Community development programs

- Environmental
  - Employment of renewable energy sources
  - Targets for reduced water, energy, waste and GHG
  - Habitat conservation strategies
  - Natural hazard mitigation strategies
This study however takes particular interest in environmentally sustainable forms of housing and investments in such properties. Therefore, the RPI concept has been adapted to specifically accommodate the environmental impacts of property investment decision making. This informs the use of the Environmentally Responsible Property Investment (ERPI) nomenclature. There is presently a paucity of studies dedicated solely to ERPI, however it is possible to adopt criteria from studies that have been carried out on the broader topic of RI and its different variants. Cadman (2000) in his depiction of the vicious circle of blame shows that the provision of sustainable buildings must be a result of a synergy of conscious efforts by all stakeholders concerned. He uses the vicious circle of blame to explain the apparent shortfall in the supply of sustainable building as shown in Figure 3.4.

![Vicious Circle of Blame](image)

**Figure 3.4 The vicious circle of blame**  
(Cadman, 2000)

Adapting the definition by Pivo (2008a) for the purpose of this study therefore, ERPI can be defined as: efforts by property developers or investors to consciously adopt investment or development decisions that ensure that buildings have minimal effects on their natural environment. The term ‘consciously’ is used because it is believed that it supersedes just
‘going beyond compliance’ as in the definition by Pivo (2008a) but rather, compels the investor to seek innovative ways to invest in a safer environment where there are no stated regulations. Table 3.1 shows components of ERPI as identified by various authors:

Table 3.1 Criteria for ERPI

<table>
<thead>
<tr>
<th>ERPI Components</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Energy Conservation</td>
<td>Pivo (2008a)</td>
</tr>
<tr>
<td>Green power generation and purchasing</td>
<td>Adam and Shauki (2014)</td>
</tr>
<tr>
<td>Energy efficient building</td>
<td></td>
</tr>
<tr>
<td>Use of renewable energy in buildings</td>
<td></td>
</tr>
<tr>
<td>2 Environmental protection</td>
<td>Pivo (2008a)</td>
</tr>
<tr>
<td>Recycling, habitat protection and water conservation</td>
<td>Adam and Shauki (2014)</td>
</tr>
<tr>
<td>Use of low environmental impact materials</td>
<td></td>
</tr>
<tr>
<td>3 Building retrofitting</td>
<td>McNamara (2009)</td>
</tr>
<tr>
<td></td>
<td>Pivo (2008a)</td>
</tr>
<tr>
<td>Membership of standards organisations, certification and rating bodies</td>
<td></td>
</tr>
<tr>
<td>Publication / declaration of green performance/ features of buildings</td>
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<tr>
<td>Engagement with property users to advise energy saving methods</td>
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<tr>
<td>Responding to user demands e.g. request for green leases</td>
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<tr>
<td>Environmental due diligence before investment decisions</td>
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<tr>
<td>Knowledge and information sharing to support academic and professional research</td>
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</tbody>
</table>

3.5 Profitability

The primary goal that drives investment, whether responsible or otherwise is the anticipation of deriving profit from such an investment. Profitability in its simplest form is the ability of a venture to yield gains after the deduction of all expenditures. Hence, profitability is important not just for the satisfaction of the investor but also for the
sustenance of the business in question. Bhaskar and Glyn (1995) assert that the main factors that drive investment are profitability or the profit margin, expected demand and relative factor costs. It therefore becomes expedient for a proposed investment to be able to provide proof of guaranteed return of investment as well as return on investment. In housing, profit is a function of the differential between total building costs and total revenue. Agunbiade et al. (2013) describe anticipated gross development profit as a percentage of the difference between the open market value of a property unit and its cost of production. The accruable profit is usually a major determinant of the viability of housing projects.

The evidence of profit in an investment is usually a motivation for growing and extending the business (Agunbiade et al., 2013). Therefore, despite lack of sufficient evidence (Chegut et al., 2013), one of the major deterrents to increasing green housing stock has been the belief that they have greater costs of production compared to their conventional counterparts and that this erodes the accruable profits to such investments. Until it is proven otherwise however, green buildings will continue to be perceived as luxury items, thus the unlikeliness that investments in green housing products for the low-income population will be a choice for property developers (Ilesanmi, 2012). This high level of uncertainty is usually protected against by the introduction of premiums. In the housing context, a premium is an amount over and above the prevailing market capital or rental value, usually willingly paid by the consumer for a perceived additional benefit in the property. The concept of willingness-to-pay premiums is discussed in detail subsequently in this thesis.

The state or the government has a monumental role to play in climate change mitigation. However, this role is almost impossible without the meaningful impact of the private sector. The Kyoto Protocol (United Nations framework convention on climate change, 1997) reflects the need for and roles of private entities in the bid to regulate climate change and even emphasises that the state (government) must enable them in this quest. If climate change mitigation is taken as an item of national concern therefore, the state has a role of ensuring that green housing investments are profitable enough to be attractive investment items for property developers. Chan et al. (2009) like many other
authors solicit state intervention and the introduction of incentives to increase sustainable building profitability and hence motivate investments in the venture.

Tladi (2007), criticizing profitmaking under the guise of complying with sustainable development issues, states that such profit is made at the expense of social and environmental concerns. He argues that the inclusion of private actors in climate change regulation programs allows them to take undue financial advantage of the situation as they influence policies, mainly to their advantage. However, in economies that are majorly capitalist like Nigeria, it is impossible to successfully take on a project of national importance like climate change mitigation without involving the private sector. As earlier stated, private business owners, who as in the case of Nigeria are the major providers of housing, can only be drawn to such investments by evidence of adequate return on investment among other factors. In spite of this though, profit must not be the sole motivation for investment in sustainable housing. There is a strong likelihood that investors will quickly revert to conventional building methods to keep profits at expected levels, hence the need for motivations other than financial profits (Kauko, 2012).

Interestingly, Amiolemen and Adegbite (2012) are of the opinion that corporate organisations that integrate sustainable development into their operations are likely to increase profitability due to a more positive public image. This view is also supported by Nastanski and Baglione (2014) who propose a model for a sustainability–profitability relationship as shown in figure 3.5. They propose that mutually beneficial exchanges among the various players in the sustainability market, would not only sustain the investor’s profits, but also ensure the survivability of the business.

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![Figure 3.5 Sustainability-profitability relationship model](image)

Nastanski and Baglione (2014)
3.6 Green housing investment drivers

Real estate investment like many other forms of investment, is primarily profit driven. Hudson-Wilson et al. (2005), though referring to institutional real estate investments, identified motivating factors for including real estate investments in portfolios, which are also applicable to direct real estate investments. These are; to reduce risk by diversifying portfolio with investments having various shock bearing capabilities, to act as a hedge against inflation, to act as a source of strong cash flow, to ensure absolute return of investment and to ensure a universally diversified investment portfolio. These motivating factors or ‘investment drivers’ may be the reasons or partly the reasons for investment in conventional buildings. However, to invest in sustainable buildings, an investor may need to be motivated by more than just these factors.

As established in discussing ERPI, the decision to take on RPI is more behavioural than it is economic. Joachim et al. (2015) explain that ERPI drivers are firmly attached to the investor’s environmental attitude and behaviour. Hence, there is a need to understand what motivates investors to take on an investment which has high uncertainty levels, considering the paucity of information concerning their performance. In a bid to properly understand and rationalize green building investment drivers, various writers have identified different drivers. There seems to be a consensus on the subject as most authors identify the same set of drivers. Table 3.2 shows a list of various authors and the different identified drivers.

<table>
<thead>
<tr>
<th>Investment Drivers</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Improved Occupants’ Productivity</td>
<td>Nelson (2008)</td>
</tr>
</tbody>
</table>
The various investment drivers are hereby discussed.

3.6.1 Tenant demand

There is a slowly growing sustainability awareness among real property users, which may be tilting demand towards green buildings. There is however more evidence for commercial property tenants whose motives include better CSR reputation and increased productivity (Chegut et al., 2013), than there are for residential property tenants. Nonetheless, there are a few pointers to the fact that residential tenants who prefer green buildings do so for their perceived savings on operational costs, including utility bills (Jayantha and Wan Sze, 2013). An ascertainment of tenants’ stance on green building has a major effect on the investor’s decision to invest. The more a particular kind of accommodation is in demand, the more investors tend towards that kind of development. Also, it must be noted that population trends are a major determinant of commodity demand (Millington, 2013). Therefore, there is a likelihood that increase in demand for green housing may result to an increased interest of developers in that sector of the market.

3.6.2 Reduced operating costs

Though this factor recurs quite frequently in literature, there is little or no evidence from residential green building users that it is a significant reason for choosing green buildings. There is however a substantial amount of evidence that savings in operating costs in the form of utility bills especially, is a driving factor for investment in green commercial buildings. There is therefore the need to establish that this factor works for residential
buildings as it does for commercial buildings. This however is outside the scope of this study and is thereby discussed minimally.

3.6.3 Global market property trends
The necessity of GHG mitigating measures is driving green buildings to a point where they may become more of a necessity than just a variant of building types. This trend is also being further enhanced by increasing tenant demand (Nelson et al., 2010). Progressive investors are therefore taking advantage of the currently under-saturated market, as they are seen as forms portfolio diversification, CSR and the chance to be first movers in an emerging market.

3.6.4 Government interventions
These include subsidies on green building materials, legislation and policies that enable the seamless development of green buildings. The Kyoto Protocol, which Nigeria is a party to, states in Article 10 paragraphs 1(b) and (c) that all parties shall “Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change and measures to facilitate adequate adaptation to climate change” and “Cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries, including the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector, to promote and enhance the transfer of, and access to, environmentally sound technologies” (United Nations framework convention on climate change, 1997, p.9 & p.10). Government creation of an enabling environment for green housing investors is therefore a necessary driver for investment.

3.6.5 Increased return on investment
This factor also is more applicable to long term investors, as it is envisaged that green buildings will attract higher rents which also translate to higher returns. It is however possible for factors such as government intervention through subsidies on materials and tax rebates to increase the returns accruable to these investments. Also, there is a
possibility that green building values will respond to increased demand for the product, causing a rise in expected income of the properties.

3.6.6 Moral right
Responsibility towards the environment is also an investment driver. Again, this factor may also be dependent on the investor’s knowledge of or about environmental issues and their ability to make a change through their business decisions.

3.6.7 CSR
Businesses see CSR as a way of giving back to the community in which they are located. However, CSR enhances not only the host community but the triple bottom line of the business in question. Carroll and Shabana (2010) write that CSR does in fact improve company performance by improving their image and in some cases reducing costs and business risks.

It is assumed that an investor’s decision to undertake a particular investment is dependent on what is important for the realisation of the business targets set. However, external influences such as state agencies may introduce investment drivers to stimulate a particular form of investment in a bid to realize state goals. For instance, the Lagos State Government (2012) states in its investor handbook, the various incentives available to investors of different categories. Among these are concessions on statutory fees for property developers and fast-tracking the land registration process. These are incentives given with the objective motivating property development in the state both to increase internally generated revenue and solve the perennial housing problem in Lagos.

For the purpose of the study, a framework has been adapted from the work of Falkenbach et al. (2010) to show the focus of this study on investment drivers:
Figure 3.6 Drivers for green building investment adapted from Falkenbach et al.

In the following chapters, this framework is explored through a review of existing literature and the various surveys to see how these drivers interplay and correlate in the particular context of the study.
CHAPTER FOUR

4. ENVIRONMENTAL SUSTAINABILITY AND HOUSING

4.1 Housing and the environment

Housing is an integral part of the built environment. In many societies, the residential space is used as a means of categorizing the population either into social class, status, ethnicity, religion and various other groups. One factor that cuts across all residential spaces however, is that in one way or the other they interact with their natural environment. Depending on the form of construction and type of activities that take place in housing units, the environment is usually affected to various degrees. It can be assumed that over the years, housing construction projects have been undertaken somewhat ‘carelessly’ and without proper consideration for the environment. However, more recent natural phenomena and occurrences have awakened stakeholders, including players in the built environment to more responsible methods of housing provision and in fact, building construction in general.

Global warming is most likely one of the biggest concerns of the twenty-first century. Global warming is simply the unusually rapid increase in global atmospheric temperature, which is mainly caused by increased levels of atmospheric GHG (Riebeek, 2010). National Center for Environmental Information (2016) states that in 2016, atmospheric temperatures had risen to up to 1.2°C higher than the 20th century averages, making it the warmest year in history. Increased GHG levels have been confirmed to be caused by human activities, most especially the burning of fossil fuels for the generation of energy (Stocker, 2014). GHG, which are made up of gases including carbon dioxide (CO₂), water vapour and methane act as a blanket in the atmosphere, trapping heat from the sun and causing atmospheric temperatures to rise. The effects of global warming include rising sea levels both as a result of expansion due to heat and melting ice caps, loss of habitat for various species, increased occurrences of natural disasters like flooding, earthquakes and storms, among many other phenomena. Coastal cities like Lagos are even more vulnerable to flooding from rising sea levels.

The built environment is generally considered as being responsible for roughly 40 percent of global energy use and a third of global GHG emission. Between 1971 and 2007,
electricity use in residential buildings is said to have been increasing at an average rate of 1.7 percent per annum (UNEP Sustainable Buildings Climate Initiative, 2009a). Improved technology, increased population and changes in lifestyles are a few causes of these unprecedented increases. The basic energy needs of residential buildings include heating, cooling, lighting and ventilation. However, almost every function in an average modern residential home is electrically powered, further driving up the energy needs. In a lot of developing countries where electrical power supply is still very erratic, the bid to find alternative sources of power supply leads to the use of petroleum-powered generators, which result in further pollution of the atmosphere and increasing GHG levels. Methods of commuting from places of residence to places of interest is also a major contributor to environmental pollution within the housing sector.

UNEP Sustainable Buildings Climate Initiative (2009a) identifies the major energy consuming phases in a building’s life cycle. These begin during the production of building materials and continue through the process of transporting the materials to construction sites from production sites, construction of the buildings, operational energy used in the buildings and demolition of the buildings. Of all these phases, the most energy is consumed during the operation of the buildings. Rising global population and high urbanization rates lead to increased demand for housing units. These trends are bound to continue to contribute to increasing atmospheric GHG levels if current housing consumption practices persist. Du Plessis (2012) recommends a regenerative sustainability paradigm which promotes a symbiotic relationship between humans and nature in both design and implementation of building projects. As in all other human endeavour, the built environment continually seeks ways and methods for more sustainable practices, hence the concept of sustainable buildings/ housing and green buildings/ housing.
4.2 Sustainable housing, the triple bottom line and green housing

4.2.1 Triple Bottom Line (3BL)

As capitalism takes deeper roots in more economies, there is increasing public expectation on the responsibility of businesses to the environment and to society. It is expected that businesses do not only work towards healthy books in terms their finances, but must also work towards being holistically sustainable. The term Triple Bottom Line (3BL) was coined by John Elkington (1998), as he proposed that businesses should be more transparent and explicit in reporting and assessing not just their financial, but their environmental and social performances also. Through the ‘People, Planet, Profit’ concept, he proposed seven revolutions – transparency, values, corporate governorship, time, life-cycle technologies, partnerships and markets that can harmonize the three aspects of sustainability.

Many businesses have adopted the 3BL principles, as there is an increased corporate participation in Corporate Social Responsibility (CSR). CSRs are widely accepted programs that businesses engage in, in a bid to give back to their host communities or societies. There are however opposing opinions about the true motives of CSR. For instance, Elkington (1998) views it as a strategy by businesses to circumvent regulatory penalties or public disapproval. On the other hand, Burrows (2011) opines that CSR motivates responsibility in investment decisions.

CSR is also becoming a trend in the built environment, albeit at a slower rate. It is however envisaged that eventually, majority or all property companies will be compelled to produce performance information based on 3BL (Boyd and Kimmet, 2005). Investors who adhere to 3BL accounting are generally described as being involved in Socially Responsible Investments (SRI) or Responsible Property Investment (RPI), when the focus is on real estate investments. Studies speculate that SRIs represent about 10 percent of investments in the USA and Europe (Nelson, 2008). Another related concept is Sustainable Construction (SC) which is basically the gearing of activities in the construction sector towards achieving sustainability. SC is particularly important in developing countries because of the rapid rate of infrastructure development, especially as a result of urbanization (Dania et al., 2013). Whatever nomenclature is used however, the important thing is that business activities, particularly in the built environment are
carried out to ultimately achieve sustainability. Dixon et al. (2008) advocate that real estate surveyors should be major proponents of SD because they are associated with a sector that directly affects the environment and society. This is to buttress the fact that real estate investments must be for more than just financial gains, especially since the sector has tendencies of leaving behind mammoth negative footprints.

It should be noted that the three ‘pillars’ of the 3BL are not necessarily mutually exclusive of one another. There is usually an overlap of what constitute different features under each aspect. For instance, while the use of rainwater harvesting in a building may be an environmentally sustainable practice, it also is economically sustainable as it reduces the cost of water provision for the building. There is therefore some kind of confusion as to how to capture such overlaps in the accounting process without unduly over-bloating figures. The 3BL has been criticized by a number of authors too. The common argument is that the 3BL does not offer any methodology for determination of values for the additional bottom lines and is therefore vague in its delivery. It is also argued that 3BL is simply a single bottom line with businesses making commitment to society and the environment (Marshall and Toffel, 2005, Norman and MacDonald, 2004). Whatever the case, the employment of the 3BL in business reporting should not be discouraged. The fact that the 3BL affords the user some form of accountability to society makes it a useful tool. Lapses to this system can be researched and resolved in relation to the fields in which they are being used.

4.2.2 Sustainable Housing

Shelter has always been known and referred to as one of man’s three basic needs, the others being food and clothing. However, shelter of which housing forms an integral part, has assumed a more strategic role than just meeting basic needs and has become a key player in the quest for sustainable development. The focus of this study is on housing hence, the concentration on issues of sustainable housing. Adequate housing has become the concern of many international organizations, notable among which is the United Nations (UN). The UN-Habitat is the programme of the UN that is concerned with ensuring adequate shelter and the promotion of environmentally and socially sustainable housing. The body defines adequate shelter as “...more than a roof over one’s head. It also means adequate privacy; adequate space; physical accessibility; adequate security;
security of tenure; structural stability and durability; adequate lighting, heating and ventilation; adequate basic infrastructure, such as water-supply, sanitation and waste-management facilities; suitable environmental quality and health-related factors; and adequate and accessible location with regard to work and basic facilities: all of which should be available at an affordable cost...” (UN-Habitat, 2012b).

As much as there is a focus on adequate shelter and adequate living conditions, it must continually be emphasized that housing is undeniably a commodity of economic worth. Many writers have agreed to the fact that housing is an economic sector and a significant contributor to national GDP (Mayo and Angel, 1993, Zheng, 2003, Chen and Zhu, 2008). It is therefore important that housing is not just seen as a social project but also as a business venture. It can be argued that based on the quest for sustainable development in all sectors, ‘housing’ and ‘sustainable housing’ should not be separate from each other. Rather than focusing on housing provision, the focus should be on sustainable housing provision. There is therefore a need to establish how sustainable housing should be defined.

Having established and adopted the triple bottom line as a method of assessing SD, it is imperatively expected that the three aspects of the concept should be contained in a sustainable housing definition. It is however seen in literature that many attempts to define sustainable building usually neglect the economic aspect and more often than not concentrate on defining it by viewing it through the environmental lens only (Yakub et al., 2012). The International Organization for Standardization (ISO) (2008) describes a sustainable building as one in which the impacts of the products, process and services involved in the construction contribute to the maintenance and improvement of the natural, social and economic aspects of the building. Lorenz (2006) defines sustainable buildings by enumerating their attributes which are: minimizing life cycle costs, reduction of ecological footprints, protection of health of occupants and neighbours, resource conservation, promotion of building’s cultural value, maximization of serviceability, functionality and adaptability.

Defining sustainable housing specifically as against the broader concept of sustainable buildings however is subjective, partly because most available literature concentrates on
the broader subject. It is assumed that whatever attributes apply to sustainable buildings can also apply to housing. Meng et al. (2015) describes sustainable housing through two perspectives. These are the micro-scale point of view, which takes cognizance of construction method, materials and energy efficiency and the macro-scale point of view which is concerned more with the social form of housing, including urban form, transportation, affordability and land use. Though the focus of this study is not sustainable housing, it suggests that the concept of ‘sustainable housing’ must be viewed more holistically and aim to integrate the various aspects of sustainability into housing. UN- Habitat (2012a) illustrates a practical format for cross-dimensional assessment of sustainable housing as shown in Table 4.1.

Table 4.1 Cross-dimensional assessment of sustainable housing

<table>
<thead>
<tr>
<th>Project considerations</th>
<th>Environmental considerations</th>
<th>Social considerations</th>
<th>Cultural considerations</th>
<th>Economic considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy efficiency</td>
<td>Will it be safe for health and local environment?</td>
<td>Does it provide for the varied needs of different social groups?</td>
<td>Are energy efficiency features easy to operate?</td>
<td>Does it include local materials and techniques?</td>
</tr>
<tr>
<td>Rental housing development</td>
<td>Does it incorporate green spaces?</td>
<td>Does it allow for social mix?</td>
<td>Does it consider cultural habits and expectations of residents?</td>
<td>Are public transport and access to jobs considered?</td>
</tr>
<tr>
<td>Heritage restoration</td>
<td>Is it water and energy efficient?</td>
<td>Does it help or harm community cohesion?</td>
<td>Does it protect current residents from displacement?</td>
<td>Is it financially viable?</td>
</tr>
<tr>
<td>Slum upgrading</td>
<td>Will it improve resilience to climate change?</td>
<td>Does it include social services?</td>
<td>Does it include opportunities for cultural development?</td>
<td>Does it cater for the needs of local entrepreneurs?</td>
</tr>
<tr>
<td>New ‘social’ housing</td>
<td>Does it negatively affect the local ecosystem?</td>
<td>Is it integrated as part of the city and its services?</td>
<td>Does it support local cultural norms, traditions and ways of life?</td>
<td>Will it be affordable for the intended beneficiaries?</td>
</tr>
</tbody>
</table>

4.2.3 Green Housing (GH)

The emphasis various authors lay on environmental sustainability in defining sustainable buildings is an indication of the weight of its relative importance. It is in fact assumed that when the environmental aspect of sustainability is covered, it is easier to implement the other two forms of sustainability. Morelli (2013) gives a typical example. He states that the wild can be said to be sustainable, yet it does not necessarily have an economic
or social structure to sustain. This suggests that the other two aspects of sustainability are largely dependent on the existence of an environment. However, it must be noted that there are dangers to isolating and focusing on particular aspects of sustainability. For instance, in cases of investments like this study is focused on, user experience and level of satisfaction which contribute to social sustainability are essential to the success of such investments, otherwise there is the risk of flooding the market with unoccupied environmentally sustainable buildings. This study focuses on the environmental sustainability of housing units in the anticipation that achieving environmental sustainability in housing will further motivate a more holistic approach to sustainable building. Moreover, given the available statistics and physical evidence available on the state of the environment, there is a need to expedite climate change mitigation actions, especially in the built environment.

An environmentally sustainable building is generally known as a Green building (GB). The history of green buildings cannot be tied to a particular time or event since historic and vernacular architecture can be regarded as forms of GB, given that they have minimal effects on the environment. However, some writers have tied the more recent conscious awakening of the GB ideology to the awareness of the degrading environment (Kibert, 2004, Korkmaz et al., 2009). The emergence of GBs is associated with the various landmark events that brought sustainable development issues to the limelight; e.g. the Johannesburg Summit 2002, among others. The concept of GB is an offshoot of the sustainable development ideology. The term ‘green building’ is commonly used interchangeably with terms such as passive buildings, especially according to the German Passivhaus standards (Hauge et al., 2011), low-energy buildings, eco-efficient buildings (Pivo, 2008a) high performance buildings (Mao et al., 2009), low Carbon buildings (Reid and Houston, 2013, Lovell, 2004), low emission buildings (Nelson et al., 2010) and sometimes sustainable buildings.

Though GB cannot be given a ‘one size fits all’ definition, the main idea is that the phrase portrays buildings that generally promote low energy consumption and emit GHG minimally throughout their life cycle. Howard (2003) defines GB as “the practice of (1) increasing the efficiency with which buildings and their sites use energy, water, and materials, and (2) reducing building impacts on human health and the environment,
through better siting, design, construction, operation, maintenance, and removal—the complete building life cycle.” Rather than try to define GBs however, it may be an easier task to describe them and there are a good number of descriptions for GB in literature. Retzlaff (2009, p.4) describes green buildings as a “type of development that seeks to increase the sustainability and efficiency of buildings and development” through energy efficiency, resource intensity, environmental compatibility, health issues and socio-cultural aspects. Falkenbach et al. (2010) on the other hand simply define green buildings as environmentally sustainable buildings.

It is commonplace for the terms ‘sustainable buildings’ and ‘green building’ to be used interchangeably. However, the difference lies in the more specific nature of green buildings. While sustainable buildings provide shelter while tackling economic, environmental and social problems, green buildings are particularly set to mitigate environmental degradation. To many authors, the descriptions of green buildings are synonymous with standards used by various green building rating or certification systems (Abair, 2008, Madew, 2006, Muldavin, 2010). McGraw Hill Construction (2013, p.5) even describes it as “a construction project that is either certified under any recognized global green rating system or built to qualify for certification”. Hence, to get a well-rounded view of what green buildings are, it may be pertinent to assess leading building certification systems and their minimum requirements for green buildings.

Liu et al. (2010) compared eight building certifications from around the world to find a generally accepted definition of green buildings. The eight systems considered were: The American LEED (Leadership in Energy and Environmental Design), the British BREEAM (BRE Environmental Assessment Method), the French HQE ((Haute Qualité Environnementale), the German DGNB (Deutsches Gütesiegel nachhaltiges Bauen or German certification for Sustainable Construction), the Australian Green Star, The Japanese CASBEE (Comprehensive Assessment System for Building Environmental Efficiency), the Singaporean BCA Green Mark and the Indian TERI GRIHA. They discovered that of the eighteen different features, which were gathered collectively from the different systems, only three were common across all eight systems. These are:

- Energy and atmosphere
- Water efficiency
- Materials and resources.
The other features were addressed in some systems and not in the others. They noted that some of the features that were not mutual to all the certification systems were either social or economic in nature, rather than environmental.

Defining or describing green buildings is also a function of the context in which they are defined. For instance, what constitutes a GB in temperate Europe is likely to be different from what it is in tropical Nigeria. Also, while indoor air quality may be a prioritized consideration in countries with high pollution rates like China, it may not be rated as important in less developed and populated countries in the global south. The definition of GB should therefore be properly suited to each environment and its peculiarities. Ali and Al Nsairat (2009), in their bid to develop a green housing rating system for Jordan had to take into consideration the peculiarity of the subject environment. They therefore considered social indicators, geographical features and economic indicators in developing the framework. In Turkey, defining green buildings seems to be inclined towards buildings that maximize the use of solar energy (Korkmaz et al., 2009). This may be because of the abundance of sunshine available in that region.

The green building movement is not limited to developed countries only. Developing countries are also taking cue in a bid to align with sustainable development goals. In India for instance, the encouragement of sustainable development and adoption of green building techniques was a government initiative that saw them establishing relevant institutions and promulgating enabling policies. Also, Turkey has an interesting case of ‘going green’, not only through government policies but also with the aid of local and international investors (Korkmaz et al., 2009).

In Sub-Saharan Africa, South Africa is taking the lead in increasing the available stock of GB. The World Green Building Council (WGBC) is the global body administering the different national Green Building Councils (GBCs). There are currently seventy-five-member countries of various status, eight of which are African. However, the Green Building Council of South Africa (GBCSA) is the only established African member of the WGBC (World Green Building Council, 2016). The GBCSA website shows a record of over 190 certified green projects around South Africa. This study therefore considers South Africa as the regional leader and point of reference. It is difficult to ascertain how
large the GB stock in Nigeria is, mainly because there is no certification body that would keep such records in the country. However, Lagos has recently been able to boast of the first LEED certified commercial building.

Once again, as in the case of sustainable buildings and sustainable housing, green housing is simply the residential subset of green buildings. There is a larger body of literature on commercial green buildings than there is on green housing. Therefore, the study adapts commercial green building features to residential buildings where necessary.

4.3 Features of green housing
In spite of cultural, social, climatic or economic differences, the underlying features of GB should be aimed at achieving resource efficiency, optimal occupants’ health and minimal environmental impact (Salami and Olaniyan, 2010). For the purpose of this study, GB features are categorised into materials, design, operation and construction.

4.3.1 Concepts of Green Housing
The definition of a green building is dependent on its intended use of the term. Bauer et al. (2009) identify good air quality and good thermal comfort as requirements for green living spaces. They recommend demand-oriented and need-based lighting and ventilation. Indoor air quality or Indoor Environmental Quality (IEQ) is a major determinant of occupants’ health and comfort. Poor air quality leads to phenomena such as Sick Building Syndromes (SBS), Building Related Illnesses (BRI) or Multiple Chemical Sensitivities (MCS) which are the causes of a myriad of illnesses for the occupants of the building (Public Technology Incorporated and US Green Building Council, 1996). Adequate ventilation via well-proportioned windows or other mechanical means and the use of low-emission or emission-free materials is therefore key to high IEQ.

Energy efficiency is also a major characteristic of green housing. Basic energy needs in a building include heating, ventilation and air-conditioning (HVAC) and lighting. Though there may be no outright replacement for these household needs, it is possible to design buildings in such a way that they consume less energy. Public Technology Incorporated and US Green Building Council (1996) suggest that to reduce these needs, the design should consider factors such as placement of doors and windows, types of
doors and windows, solar orientation, insulation, building materials choice, floor plate depth, space ventilation and even occupant education. They also state that passive solar designs should be used where possible for space lighting, heating and even cooling.

In considering space lighting in residential spaces, daylighting allows enough daylight into the building, consequently reducing lighting needs. Solar water heaters are also especially effective in residential building, where hot water demand is not so high, and passive solar heating can be achieved with proper building orientation and natural shading. Energy efficiency is easier when incorporated into the design before actual construction. Also, the planting of trees in surrounds aid with natural cooling of the building. The use of energy efficient lighting fittings such as motion and daylight sensor lights, and smart air-conditioning controls are also energy use reducing techniques. Figure 4.1 is an example of how daylighting can be used to reduce the artificial lighting needs of a living space.

Figure 4.1 Living/ dining room lit using daylighting
Source: (www.archdaily.com, 2015)

The need to conserve water is drawn from the fact that there is a dwindling supply of global fresh water, which is just about 2.5% of total global water supply (Rekacewicz and UNEP/GRID-Arendal, 2005). Households are heavy dependants on freshwater and there are usually tendencies for waste to occur in the everyday usage of water. Apart from developing conservation habits, Bauer et al. (2009) suggest the use of water-conserving appliances, such as toilets with economy switches, single lever handle faucets (for taps
and shower heads) and sensor enabled fittings. They also encourage the use of harvested rainwater and recycled greywater for domestic uses other than direct human consumption. It is estimated that 60 litres of greywater is generated per person per household daily (Bauer et al., 2009).

Rainwater can be harvested effectively, if the system is planned into the design of the building. A rainwater cistern and piping are specially installed to collect rainwater and the harvested water is connected to the parts of the house that need it. This method is especially useful in areas that record high rainfall rates like Nigeria. Greywater on the other hand is basically waste water generated from the use of showers, baths and washing machines. Because of the mild soap content, it is possible to recycle greywater for reuse in toilets and gardens and for cleaning. Figure 4.2 is an illustration of a rainwater harvesting system, while figure 4.3 depicts a domestic greywater recycling system.

![Figure 4.2 Rainwater harvesting](https://www.thegutterman.co.za)

Source: (www.thegutterman.co.za, 2016)
4.3.2 Green Housing Designs

In the construction of green buildings, the design of the building is as important as the materials used. Designing a green building has to go beyond aesthetics and functionality but must also consider the environmental impact of the building. Bauer et al. (2009) identify some basic features to take into consideration when designing a green building:

i. Climate – In designing green buildings, both the global climate zone and the regional and local climatic conditions must be taken into consideration. Weather patterns are also an important consideration for green building construction. Therefore, while wall insulations may be appropriate in the temperate regions, building designs in the tropics may have to allow for influx of air for natural cooling purposes.

ii. Building shape and orientation – Building orientation has a large impact on the energy consumption of the building. It is necessary for a building to be oriented in such a way that it takes advantage of daylight in the right places. Therefore, while it is advised that bedrooms are as far from the direct glare of the sun as possible...
possible, living rooms are to be oriented facing south in such a way that they take in as much solar glare as possible.

iii. Solar protection – Green buildings need shading from sunshine to reduce air conditioning needs. In very warm regions in particular, there should be a means of shading the building while also not compromising adequate natural light into the building. For instance, the use of external vertical shutters can serve the dual purpose of shading and aesthetics while still letting daylight in. Figure 4.4 show vertical shutters on the exterior of a building for solar protection.

![Figure 4.4 Vertical shutters on exterior of building](source: (www.alibaba.com, 2016))

iv. Daylight utilization – While windows and roof atria serve the purpose of light transmission into the building, there is need for shading, glazing and solar protection to all be factored into the design as heat control measures.

4.3.3 Green Housing Materials

While GBs aim to reduce GHG emission, they also aim at reducing energy consumption and this must also be considered in the selection of materials. Biswas (2014) identifies two types of energy consumed in a building. These are the embodied energy which is energy associated with the processes of construction, including transportation and fabrication of material and even demolition at the end of its life, and the operational energy which is energy used for the running of the building, especially heating, ventilation and air-conditioning (HVAC). Thus in selecting building materials it is
important that care is taken to ensure that the project is not saving on operational energy only to increase the embodied energy consumed. Kim and Rigdon (1998) identify three phases in the life cycle of building materials:

i. Pre-building phase, which is the phase from extraction to the transportation of the materials to site. They note that this is the phase in which materials have the greatest effect on the environment.

ii. Building phase, which is effectively the useful life of the materials used

iii. Post building phase, at which point the materials may either be recycled or may form waste of various kinds.

The earlier sustainability principles and assessment techniques are integrated into the decision-making process of material selection, the more likely it is to achieve environmental sustainability in building (Ogunkah, 2015). In countries with more established green rating systems, there are usually systems to assess the ‘green-ness’ of building materials. Kim and Rigdon (1998) developed a chart that can be used to compare the sustainability quality of different materials meant for the same purpose as shown in Table 4.2

Table 4.2 Chart for comparison of sustainable properties of building materials

<table>
<thead>
<tr>
<th>Green Features</th>
<th>Manufacturing Process (MP)</th>
<th>Building Operations (BO)</th>
<th>Waste Management (WM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste reduction (WR)</td>
<td></td>
<td>Energy Efficiency (EE)</td>
<td>Biodegradable (B)</td>
</tr>
<tr>
<td>Recycled (RC)</td>
<td></td>
<td>Water &amp;Conservation (WTC)</td>
<td>Recyclable (R)</td>
</tr>
<tr>
<td>Embodied Energy Reduction (EER)</td>
<td></td>
<td>Non-toxic (NT)</td>
<td>Reusable (RU)</td>
</tr>
<tr>
<td>Natural Materials (NM)</td>
<td>Renewable Energy Sources (RES)</td>
<td></td>
<td>Others (O)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Longer Life (LL)</td>
<td></td>
</tr>
</tbody>
</table>

Kim and Rigdon (1998) assert that the greater the presence of the features of the chart in building materials, the more environmentally sustainable the building materials are likely to be. The features are explained as follows:

- Waste reduction – This occurs when production has been done in such a way that eventual waste from the building material that ends up in the landfills is reduced to the barest minimum.
• Pollution prevention – This means that measures have been taken to ensure that material manufacturing results in minimal air, soil or water pollution e.g. recycling of production water.
• Recycled content – This is when the building material is partially made of previously generated waste.
• Embodied energy reduction – This ensures that measure have been taken to reduce the energy that goes into producing and processing the building material.
• Employing natural materials – Natural materials are renewable and generally have low embodied energy, making them greener choices.
• Reduction of construction waste – This calls for the efficient use of materials during construction, especially in conjunction with a design that takes standard material sizes into consideration and thereby produces less waste during construction.
• Energy efficiency – materials can be produced in such a way that their use encourages less generation of energy for the building e.g. shading and luminous efficiency or the use of the innovative transparent concrete (Kamdi, 2013).
• Water treatment and conservation – These materials either encourage a reduction of water used in the building or improve the quality of water by their use. E.g. low flow faucets.
• Non/ less toxic materials – These are materials that are unlikely to pose health threats to both construction workers and occupants of the building.
• Renewable energy systems – These are building materials that are produced in-situ such that power generation on site is either done from waste, natural sources or for shared purposes at once.
• Longer life – The longer the life of a material the less the need to replace it due to wear and tear. Thus, such materials conserve both natural resources and energy.
• Reusability – This is the ability of a building material to outlive the building and be reused in a new construction.
• Recyclability – this is the ability of a material after being used for one purpose to be used for the creation of another product.
• Biodegradability – This measures how easily materials decompose after they turn into waste.
4.4 Examples of green building materials

There are various examples in literature of materials which are more environmentally sustainable than conventional materials. It is however pertinent to note that the practicability of using such materials must also be taken into consideration. For instance, when taking on housing projects within urban or city centres, as in the case of this study, aesthetics, longevity and regularity of maintenance are common features to be considered in choosing the needed building materials. Ideas of green building materials exist in various extremes. While some green buildings have been constructed using materials with practically no form of sophisticated technology or highly technical processing like recycled materials, there are others that require special technologies to make them perform green functions. The following materials are some of the identified unconventional green building materials.

4.4.1 Clay bricks

These may be either rammed for a compactness or simply moulded to form. They are made out of naturally available raw materials of various textures and composition depending on the location in which they are found. Clay can be used in combination with other materials such as straw and gravel for durability. They are naturally good insulators when used as walls as they retain both heat and coolness for longer periods (Council for Scientific and Industrial Research (CSIR), 2009). These materials are used even in modern residential and commercial buildings.

4.4.2 Stabilized Soil Blocks (SSB)

Smith (2010) describes SSB as the process of waterproofing soil bricks by adding supplements and extra force to it. Hydraform® is an example of an African indigenous company that produces machines which makes dry stack bricks using environmentally SSB. In the process the resultant buildings are able to eliminate mortar use in about 70% of the building (Hydraform, 2016). Examples housing units made out of SSB are shown in figure 4.5.
4.4.3 Wood

Wood is another popular building material choice, basically because of its versatility and relative durability. It is also a renewable resource, though currently being threatened by rapid deforestation rates. Wood may be used as the main building material i.e. for cladding or as part of the building materials. Waste from wood processing can also be further processed to produce other materials such as compressed boards. Other forms of wooden building materials include bamboo and timbercrete. Timbercrete is formed by a combination of sawdust and concrete mix to produce a material that is light in weight yet durable. Examples of wooden housing units are seen in figure 4.6.

Figure 4.5 Examples of houses built using SSB
(Hydraform, 2016)

4.4.4 Hempcrete

Hempcrete is a building material which comprises combed hemp stalk fibres with a binder, usually lime to form a lightweight yet durable building material. Hempcrete is
continually becoming a preferred choice building material because of its high renewability. The plant takes four months between the time it is planted and the time it is ready for harvest. Hemporium® is a South African company championing the promotion of hemp materials including hempcrete. A hemp brick and hemp building are shown in figure 4.7.

![Figure 4.7 Hemp building and brick](Source:(www.hemtecusa.com, 2015))

### 4.4.5 Slag

Slag is a stone-like waste product that comes from the processing of ore. The substance is hydraulic in nature due to its glass content. When granulated, slag can be combined with other materials to form building materials such as masonry cement, lime-slag bricks and lime-slag mixtures (Malhotra and Tehri, 1995).

### 4.4.6 Recycled plastic

Recent research has seen to the processing of waste plastic to form part of a concrete aggregate. Kim and Rigdon (1998) mention the use of plastic lumber made out of recycled lumber as a choice component for outdoor furnishings. Also, waste polyethylene terephthalate (PET) bottles have been used as cladding materials in conjunction with either earthen binders or cement-based binders. The Development Association of Renewable Energies (DARE) built the first PET bottle house in Kaduna, Nigeria. Examples of these buildings are shown in figure 4.8.
4.4.7 **Recycled shipping containers**

This is another budding concept of green housing. Shipping containers usually constitute large and obnoxious waste. However, modern day architecture is finding a way to convert them to housing units with the right designs, treatments and location. Because the containers have rigid size specifications, they take experienced professionals to handle. However, they are a cheaper and greener alternative to block walls, especially as they drastically reduce the amount of cement needed for construction. The containers are stackable allowing for multi-storey constructions. Examples of these are shown in figure 4.9.

![PET bottle construction](Source: (www.inhabit.com, 2011))

![Shipping container houses](Source: (www.containerhomeplans.org, 2016))

Kim and Rigdon (1998) also suggest alternatives to some commonly used conventional building materials. They suggest fibreglass windows as an alternative to aluminium or vinyl windows since they are low maintenance, have longer lives and do not require wood or steel framing. Large glass panels for Atria or skylights can be replaced by smaller
periscope-like devices which capture daylight and diffuse it into the living space. This reduces maintenance issues and also eliminates the resultant solar heat from sky roofs. The use of recycled aluminium weatherproof shingles is an alternative to the traditional slate roofing sheets. They are heat reflective, thereby keeping the living space cooler and are also fire proof and relatively long lived. For flooring, recycled tire crumbs are suggested for carpet underlays, while natural cork and ceramic tiles are also good alternatives to traditional rendering.

4.5 Green housing movement – examples from developed countries
Developed countries are usually more privileged in terms of availability of data, resources and ability to undertake developmental projects. Therefore, green building is a more established phenomenon in developed countries and a budding ideology in the developing nations. It is however, necessary to understand how green housing is fairing in developed countries so as to learn how the idea has evolved, adapt the methods and where possible improve on the short-comings, all for use in developing countries.

Singapore has a green building rating tool called the ‘Green Mark’. The country also completed her first ‘eco town’ in 2010. The estate, which is called treelodge@puggol, is made up of 712 flats in 7 blocks of 16 stories each. The estate features a passive design, taking advantage of the wind for ventilation, energy efficient solutions including the use of solar panels and motion sensors, appropriate daylighting, water and waste recycling and management systems and adequate greenery including roof-top gardens (Housing and Development Board - Singapore Government, 2015).

Construction of the buildings, which are government owned, cost 7 percent more than their conventional counterparts. Therefore, the government is researching cheaper methods to achieve green housing (Neisloss and Vanessa Ko, 2012). The interesting aspect is the management of the solar energy generated. The government pays the start-up cost for the solar panels, and then private companies install and manage the panels to subsequently recoup their invested funds. Deng et al. (2012) state that Singaporean Green Mark labelled houses commanded a premium of about 6 percent more than their conventional counterparts.
Switzerland on the other hand is highly dense in energy efficient buildings (Swidler et al., 2011). The Swiss green building rating tool is known as the ‘Minergie’ and the tool aims at a 25% reduction of total energy use in buildings. It is however notable that Swiss private home owners are actually championing the cause of green housing in their localities. By 2009, over 90 percent of Minergie certified buildings were said to be residential (Swidler et al., 2011). In the Swiss case, proper education and awareness may be responsible for the high environmentalism among the home owners. Swidler et al. (2011) find that the most likely trigger for green building certification among Swiss home users is the perception of better building comfort and quality as against factors such as government incentives for green buildings. However, Switzerland is a very rich country with one of the world’s highest GDP per capita (International Monetary Fund, 2016). It is therefore likely that what is priority for a country like Switzerland may not be so important to a developing country.

This chapter has discussed the concept of green housing as well as the features that earn residential buildings the appellation ‘green’. In light of the foregoing definitions and descriptions, it is possible that existing buildings even in the study area may already be ‘unconsciously environmentally sustainable’. It is also possible that home users are unaware of unsustainable practices or features being used in the buildings they own or occupy. There is therefore need for a dispersion of knowledge among property owners and home users about what constitutes environmentally sustainable and unsustainable building features and practices. Literature also emphasises the need for property users on both sides of the market divide to know the property options available to them (Smith, 2010, UNEP FI North American Task Force, 2010, Sunikka, 2006). Green housing awareness will enhance increased demand, which has earlier been established to be a green housing investment driver.
CHAPTER FIVE

5. BUSINESS CASE FOR GREEN HOUSING

5.1 The real cost of green housing

Cost is usually an integral component of investment feasibility and viability assessment. Agunbiade et al. (2013) note that anticipated profits from building investments are strong motivators for the kind of building construction embarked on. There are varying stances on the costs of green buildings in comparison to their conventional counterparts. Building construction cost is however highly relative and the cost of construction largely depends on the choices of building materials and methods used, among other factors. It is therefore difficult to categorically state the cost of a green building. Hirokawa (2009) states that the perception of higher costs of green buildings than conventional buildings is a product of cost exaggerations that accompanied the construction of the early green building stock. These costs included elements such as cost of acquisition of alternative and green building materials and cost in terms of time and effort to seek approval for buildings that were not mainstream and scarcely understood by officials. Madew (2006) has also stated that it may be incorrect to assert that green buildings cost more since there is no set green building method and greening techniques largely vary in cost.

Abidin et al. (2013) identify four major influencers of sustainable practices in the housing sector viz: institutional, technological, internal action and market influence (Figure 5.1). They assert that while institutional enablers provide the political framework and stimulate development, technological enablers provide the requisite knowledge and technical support. They explain that internal action is the will and determination of property developers to engage in sustainable practices in the housing sector, while market influences which include demand and affordability, basically depend on the cost of the product. In their view, the cost of a sustainable building may not necessarily be higher than a conventional building because, since developers are interested in immediate gains that accrue to them at the point of sale of the properties rather than savings on operational costs over the life of the property, they are unlikely to unduly attach premiums to green developments. Thus, Abidin et al. (2013) are of the opinion that though the value of a green housing unit may be higher than that of conventional unit, the cost need not be higher.
Because property developers are concerned not only about return on investment, but also marketability of the product, accurate determination of green building cost is an important factor in investment decision making. The true picture of the cost of green buildings can only be determined by the availability of sufficient evidence of transactions which still remains a challenge in many climes and particularly in developing countries, where the market is just emerging. For instance, real estate practitioners identified high cost of premiums as a deterrent to the growth of the green building market in Canada, contrary to claims in literature that the premiums are low (Issa et al., 2010), an assertion that could only be made from evidence of transactions.

![Four enablers of sustainable building practices](image)

*Figure 5.1 Four enablers of sustainable building practices* (Abidin et al., 2013)
While a significant amount of literature asserts that building green is a costlier alternative (Bartlett and Howard, 2000), green building proponents are of the opinion that they cost lower, especially when operating costs over the life of the building are taken into consideration (Cole, 2000). Abair (2008) also notes that increasing accessibility to green building materials and expertise is gradually decreasing the additional costs associated with green buildings. There are even assertions that integration of green features at the design stage may almost eliminate these extra costs, as Cole (2000) identifies ‘design integration’ as a means of lowering the cost of energy efficient buildings. Morris and Langdon (2007) advise that advanced technological features which may significantly increase the building cost may be assessed independently, so as not to exaggerate the building cost.

Hendrickson and Au (2000) categorize building costs into capital costs and operation and maintenance costs. The costs are further broken down in table 5.1 as follows:

Table 5.1 Components of construction costs (Hendrickson and Au, 2000)

<table>
<thead>
<tr>
<th>CAPITAL COSTS</th>
<th>OPERATION/ MAINTENANCE COSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land acquisition and preparation</td>
<td>Rent</td>
</tr>
<tr>
<td>Feasibility and viability appraisal</td>
<td>Building operating staff</td>
</tr>
<tr>
<td>Building design drawings</td>
<td>Maintenance and repairs</td>
</tr>
<tr>
<td>Construction – labour, materials and equipment</td>
<td>Renovations</td>
</tr>
<tr>
<td>Construction supervision</td>
<td>Insurance and taxes</td>
</tr>
<tr>
<td>Construction financing</td>
<td>Finance servicing</td>
</tr>
<tr>
<td>Insurance and taxes</td>
<td>Utilities</td>
</tr>
<tr>
<td>General overhead etc.</td>
<td>Other overhead costs</td>
</tr>
</tbody>
</table>

The construction of green buildings attracts additional costs to the afore stated costs, which include ‘soft costs’ relating to designing the building and consultation for certification, cost of actual certification, costs of relevant technology application, costs of purchasing and importing foreign green products where necessary and customizing foreign products to suit local building requirements (Abidin et al., 2013). Cole (2000) however asserts that product misinformation and inaccurate building material benchmarking are sometimes reasons for wrong judgements on the cost of green buildings. Morris and Langdon (2007) suggest that instead of allowing the cost of greening to dictate the cost of the total budget of the project, developers can set a budget
and incorporate green features that can work within that budget. They explain that a good way to implement this may be by choosing a suitable plan from the various certification levels used by green building rating systems, rather than unnecessarily aiming for the highest standards.

Costs in building construction are traditionally determined by quantity surveyors. The challenge with adequately costing green buildings is that they are not as common as conventional buildings, thereby making cost comparison of green materials difficult. In climes with more developed green building markets, the cost differences between a green and non-green building is simply done by comparing a certified building to a similar non-certified one. However, in the absence of suitable comparable information, property costing becomes highly subjective and dependent on the professionals’ expertise. Solutions to this challenge have birthed different suggestions, but no generally acceptable method or framework for costing these special properties. For instance, Morris and Langdon (2007) suggest that when doing cost analysis of a green building, the green features can be priced as added features, while the building is priced devoid of those features to give a true picture of the cost.

Muldavin (2010) estimates a 0% - 2% difference in costs between uncertified and certified green building costs, depending on the level of the certification. The difference could increase to about 10%. He notes however, that beyond monetary costs, the costs in terms investment risks, including risk of vacancy of property, are quite unquantifiable. Morris and Langdon (2007) assert that when costing green features in a building, it is pertinent to ask what the features will cost ‘compared to what?’ They note that by comparing the project to the originally anticipated cost or to the original budget, the true cost of green features in the building can be exposed. This method however, is also subject to the accuracy of the project budget in the first place.

5.2 Valuing green housing

5.2.1 Traditional and advanced methods of valuation

Property valuation is an important aspect of asset management that involves the estimation of the worth of a property by a valuer or property appraiser. The appraiser takes all necessary factors into consideration before offering a professional opinion on
the value. Factors considered in property valuation include prevailing market conditions, physical attributes of the property, social factors, and institutional factors, among others. These factors are what differentiate property cost from property value. While cost describes the financial sacrifice made for the acquisition of a commodity or property as in the case of this study, value describes the amount a willing buyer is ready to pay for the property, taking the aforementioned factors into consideration. Hence, while in most cases value is expected to be greater than cost, it is not out of place to find that value is lower than cost in some cases. This may happen especially in cases where there is low demand for the commodity in question. However, in the determination of value, cost is also a very integral factor to consider. It is therefore pertinent that the valuer is abreast of prevailing institutional, economic and even political issues especially as they affect various properties.

Properly valuing green housing is as important as the need to put an accurate cost to it. The challenge with valuing sustainable or green buildings and green housing in particular is the subjective nature of environmental sustainability features, which makes it difficult to adequately capture the value that sets them apart from conventional buildings in the valuation process. Dixon (2008, p.1) defines environmental valuation as “the process of putting monetary values on environmental goods and services”. Ecological economists argue that any form of economic analysis, including property valuation, must vividly include the external effects of production and consumption (Lorenz, 2006). They therefore propose monetizing ecological components and services in ways that quantitatively depict their contributions to the economy. This is however a daunting task, considering the complex nature of the ecosystem generally. Ruth (2006) also highlights the lack of empirical and conceptual frameworks for such exercises. The Royal Institution of Chartered Surveyors of the United Kingdom (2005) states that one major problem of green building valuation is the fact that many of the benefits from green buildings do not fit into standard accounting methods and are therefore usually ignored or down-played in the assertion of value.

Determination of green property value is as complicated as determining the appropriate methods of valuing these properties. Lorenz (2006) cites traditional and advanced methods of valuation that can be used to reflect sustainability features in real estate
property valuation. For the traditional methods of valuation, he points out that only the sales comparison and the investment methods of valuation are practicable for valuing sustainable properties. The sales comparison method is however largely limited by the availability of appropriately comparable transactions data, especially with regards to sustainable features. He advises dependence on tools such as energy certificates and building files for comparison and in the absence of such tools, the valuer’s personal professional judgement should be employed. Lorenz (2006) goes ahead to state that in the absence of adequate comparable data, a building can be broken down into various elements e.g. energy efficiency, lighting, etc.: elements with comparable data can then be assessed comparably while those without comparable data are valued using the valuer’s professional judgement. These methods must however be properly defended by the valuer.

In using the income method of valuation, the annual rental income is usually capitalized using a yield capitalization rate, while taking the reversion value at the presumed point of sale into consideration. Another element that is considered in the income method is the outgoings, which may also be known as the operating costs, which are deducted from the rent to arrive at the net rental value before capitalization. The issue with using this method for green building valuation is the determination of a prevailing rental value for the property. In literature, premiums on green buildings have varied from as low as 0% to as high as 30%. Thus, the value of premiums is subjective. Morris and Langdon (2007) state that the more the sustainability features used in a building, the higher the premium on rental value is likely to be. The operating cost is usually reduced in buildings with sustainable features compared to their conventional counterparts. However, unless the property is owner-occupied, valuers are wary of taking such reductions into consideration when valuing such properties. This is because the benefits of reduced operating costs are more accruable to property users or tenants than they are to the property owners who do not occupy them. Therefore, considering the effects of sustainability features on the maintenance and management of the building would be a better approach to making a business case to property owners as these are features that directly affect them.

The market capitalization or discount rate as the case may be, is a product of prevailing market and economic indicators. Thus, this rate presents the best opportunity for
reflection of sustainability among the parameters for the income method of property valuation. The rates can be adjusted to reflect lower risk of vacancy, or in climes where government incentives prevail or of lower rates and taxes, the rates can reflect lower risk of capital depreciation. Once again however, this method is highly subjective and relies largely on pre-existing data and the professional judgement of the valuer. The traditional cost method of valuation is largely biased in reflecting the true value of green building. This method emphasizes the additional costs incurred by green buildings while ignoring their benefits, making it an unsuitable method of valuation (Royal Institution of Chartered Surveyors, 2005).

In light of the challenges posed by using the traditional methods of valuation, the advanced methods are more suitable green building valuation tools. These methods are more scientific in their approach as most of them rely on pre-tested and simulated models in their operations. However, they also suffer almost the same setback as the traditional methods. However, as effective as advanced valuation methods such as hedonic pricing methods, spatial analysis method and Artificial Neural Network (ANN) may be for valuing sustainable properties, they are also largely dependent on existing property transactions data as they basically describe the relationship between observable property features and property prices (Lorenz, 2006). As a matter of fact, with these methods, the larger the comparable dataset, the more effectively the methods work. For instance, Tatari and Kucukvar (2011) used an ANN to model premiums on 74 LEED certified green building and found that they produced more accurate results than regression analysis using subject properties from a database of LEED certified properties. The accuracy was established by comparing the green building premiums predicted by the model against market data.

Though using these methods may not present much of an issue in climes where sustainable buildings are quite a regular feature, the use of these methods is not feasible for valuing sustainable properties where there is almost no traceable transaction data. Where these valuation methods are used, available property data must include not only information on transaction values, but also adequate information on property attributes and features for accurate comparison. This data is usually easily accessible through state land or property registries, which are the public custodians of such data. It is therefore
worthy of note that property markets that are just entering into the sustainable property scene must strive to keep comprehensive records of transactions and property attributes to aid in building a strong database, which is needed for effective valuation models as the market advances.

There is a continuous search for the most appropriate green building valuation methods giving rise to different views and opinions on the subject. In a bid to establish the effects of green building attributes on their values, Boyd (2006) identified four broadly grouped attributes and their possible effects on the property values. Figure 5.2 shows the possible impacts green features may have on the value of a building, according to Boyd (2006). He identified improved working environment, reduced operating costs, reduced maintenance costs and higher capital input as the four broad attributes. Of these four attributes, he states that only higher capital outlay will have a negative effect on the property value.

Working with the case study of a commercial building in Brisbane Central Business District (CBD), Boyd (2006) stated that the subject property was valued by first identifying the key variables that would be affected by green features in the building. These features are construction cost, first year rent, rental growth rate, operating expenses and capital expenses. He then used a survey of built environment stakeholders, including property managers, tenants and surveyors to estimate the impact of the environmental features on the variable values. The adjusted variables were then applied to a cash flow analysis to determine the total returns from the property. This method is also highly subjective and must be applied with caution, considering that survey responses were based on perception and not on fact. The verification of this method of valuation is still largely subject to market data.
The RICS also gives guidance on the effects of green features on property value elements such as the return on investment (ROI), the net operating income (NOI), operating cost, the net lease, common area maintenance (CAM) and the yield. Table 5.2 shows a comprehensive list of how green features in buildings affect value. The linkages to value in this list can be useful, especially in the income method of valuation as they can be used to adjust the yield or capitalization rates accordingly.

Table 5.2 Effects of Green Features on property values
(Royal Institution of Chartered Surveyors, 2005)

<table>
<thead>
<tr>
<th>GREEN OBJECTIVES</th>
<th>GREEN IMPACT</th>
<th>THEORETICAL LINKAGE TO VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable site</td>
<td>• Improved site aesthetics</td>
<td>• Reduced development costs, improved marketability,</td>
</tr>
<tr>
<td>development</td>
<td>• Greater public support for the development</td>
<td>improved natural appearance, higher sales/rents, absorption and re-tenanting, NOI/ROI</td>
</tr>
<tr>
<td></td>
<td>and accelerated local approval process</td>
<td>benefits</td>
</tr>
<tr>
<td></td>
<td>• Lower energy costs</td>
<td>• For gross leases, higher NOI; may have impact for net leases if benefit can be demonstrated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to tenants</td>
</tr>
<tr>
<td>Water efficiency</td>
<td>Lower water consumption/costs</td>
<td>Lower tenant CAM charges; direct NOI benefit for gross leases, potential for net leases requires communicating benefit to tenants</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>Lower capital costs</td>
<td>Reduced operating costs, longer life cycle, lower development costs</td>
</tr>
<tr>
<td></td>
<td>Occupant benefits</td>
<td>Improved occupant productivity, lower churn, turnover, tenant inducements, etc.</td>
</tr>
<tr>
<td></td>
<td>Lower energy costs</td>
<td>Higher net income for gross leased buildings, improved yield</td>
</tr>
<tr>
<td></td>
<td>Operational savings (can offset higher capital costs)</td>
<td>Lower operating costs; on gross leases, higher ROI/NOI; on net leases, potential for improved ROI/NO</td>
</tr>
<tr>
<td></td>
<td>Reduced capital cost of mechanical systems because control systems reduce the need for oversizing</td>
<td>Marginally higher initial soft costs should be offset by long term operating cost benefits, higher ROI</td>
</tr>
<tr>
<td></td>
<td>Lower maintenance costs</td>
<td></td>
</tr>
<tr>
<td>Indoor environmental quality</td>
<td>Superior indoor air quality, quality lighting and thermal quality</td>
<td>Risk reduction</td>
</tr>
<tr>
<td></td>
<td>Fewer occupant complaints</td>
<td>Greater marketability</td>
</tr>
<tr>
<td></td>
<td>Higher occupant productivity</td>
<td>Faster sales and lets</td>
</tr>
<tr>
<td>Reduced consumption of building materials</td>
<td>Longer building lifecycle</td>
<td>Improved churn/turnover</td>
</tr>
<tr>
<td></td>
<td>Lower maintenance costs</td>
<td>Higher ROI/NOI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

5.2.2 Other methods of valuation

Other methods of environmental valuation have also been identified in literature. These include the following:

Cost - Benefit Analysis (CBA) – Though this is more of a financial analysis technique than a valuation method, it is an indicator of the financial performance of the property and thus a useful tool in investment decision making. Muldavin (2010) supplies a
comprehensive cost-benefit analysis checklist which can be used to assess green buildings. The checklist is presented in Table 5.3.

Table 5.3 Green building cost-benefit analysis checklist

<table>
<thead>
<tr>
<th>Potential benefits</th>
<th>Potential building costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reduced development costs</strong> including better private financing, reduction of some building elements like HVAC and access to government incentives.</td>
<td><strong>Increased development costs</strong> including higher costs of green products, costs of certification and consultation and increased equity costs are some items that may drive up the development cost.</td>
</tr>
<tr>
<td><strong>Reduced development risks</strong> including reduced exit risk and reduced construction risk</td>
<td><strong>Increased development risks</strong> including legal or contractual risk and in emerging markets especially, the risk of incompetent technicians for new technologies.</td>
</tr>
<tr>
<td>Increased user demand – this usually results in higher revenue</td>
<td><strong>Decreased or unchanged occupier demand</strong> resulting from building operation problems or general lack of public interest in the developments.</td>
</tr>
<tr>
<td><strong>Reduced resource use and operating cost</strong> including benefits such as reduction on building waste, lower GHG emission, lower energy use, lower maintenance cost, lower water use, etc.</td>
<td><strong>Increased operating cost</strong> including property handlers’ trainings and system underperformance are likely to drive up the operating costs of the building.</td>
</tr>
<tr>
<td><strong>Improved operation</strong> including benefits like higher occupier satisfaction, lower churn, reduced frequency for capital expenditure. Reduced building ownership risk – this includes compliance with future building trends, access to government incentives, security of property value, etc.</td>
<td><strong>Building operation problems</strong> including capital expenditure, especially if products or service providers underperform or tenants refuse to cooperate with the system.</td>
</tr>
<tr>
<td><strong>Public benefits</strong> including mitigation of climate change and resource conservation.</td>
<td><strong>Increased cash flow risk</strong>; the possibility of most or all the aforementioned risks to result in a lower cash flow is very high.</td>
</tr>
<tr>
<td><strong>Increased investor demand</strong> leading to reduced capitalization and discount rates which subsequently leads to higher property values and better access to debt financing.</td>
<td><strong>Poor investor demand</strong> resulting from lack of a convincing business case for green buildings.</td>
</tr>
</tbody>
</table>

These costs and benefits may serve as guides, not just for CBA but for most valuation methods. The various indices used in the determination of property value for most other methods of valuation previously discussed are based on observations of the
aforementioned factors. Other valuation methods identified in literature include the following:

i. Techniques based on changes in productivity or production - Dixon (2008) states that it includes phenomena such as cost-of-illness approach using morbidity or mortality costs. This technique measures the cost of lost productivity as a result of sickness and the cost of treating or avoiding sickness among occupants of buildings with inadequate indoor air/environment quality. It is a form of revealed or stated preference valuation.

ii. Replacement cost techniques (Aisbett and Kragt, 2010, PERSGA, 2015, Ness et al., 2007) – these value commodities by estimating the cost of replacing an ecological service artificially.

iii. Market price-based techniques – these techniques are used in markets with organized and accessible information on ecological goods and services for comparison.

iv. Hedonic Pricing (HP) (Ness et al., 2007) – the basis of this technique is that the price of a commodity is a function of the aggregate of the values attached to its various attributes. This aggregate value is referred to as the Total Economic Value (TEV).

v. Benefit transfer – this entails using values of ecological benefits from one site in the valuation of another site.

vi. Stated preference methods – these are survey-based techniques, usually based on consumers and their Willingness-To-Pay (WTP) a premium or Willingness-To-Accept-Compensation (WTAC) for a particular good or service. Techniques used to measure value include contingent valuation and choice modelling.

While a myriad of methods have been discussed in this section, Kolawale and Grace (2017) state that the payback period on investment is the most adopted viability appraisal technique by Lagos ESVs. This method assesses the viability of a property by calculating the time it takes to recoup the capital expended on the project. While it does not exactly state the worth of the property, it gives the investor a sense of how the asset will perform in the accounting books. This method is particularly suitable for this study because of the apparent lack of related data which deters the employment of most of the previously stated methods. Pivo and McNamara (2005) state that there is scientific evidence that
green buildings exhibit short a payback period, although, the definition of ‘short’ stands to be debated. Popescu et al. (2012) also propose the payback period method as a valid tool for capturing the economic values of energy efficient features in buildings specifically.

5.2.3 Life Cycle Costing (LCC) and Life Cycle Assessment (LCA)

Lützkendorf and Lorenz (2005) identify three tools that can be used to assess building performances economically, environmentally and socially. These are Life Cycle Costing (LCC), Life Cycle Assessment (LCA) and Post Occupancy Evaluation (POE). While the first two tools are able to assess building performance prospectively, the POE can only be used after the building has been occupied. Thus, the POE values are based on feedback and may not necessarily be suitable where the intent of assessment is for viability or feasibility appraisals.

LCC or whole life cost of a building covers the costs attributed to operation, maintenance, renovation, productivity and health, over the life span of the building (Issa et al., 2010). Ness et al. (2007) also define it as the total cost of a building, discounted over its life time. It is a sustainability assessment tool that integrates both environmental and economic components of the building to form a decision about its value (Ness et al., 2007). This method of assessment has been the major defensive method for assessing green buildings against the widely perceived and accepted marginal cost of green buildings over conventional buildings. The effectiveness of the LCC is dependent on the comprehensiveness of the details covered in its use. All costs covered by each stakeholder to the building must be meticulously accounted for, to get a true picture of the overall cost of the building.

For an LCC to be effective, there are some basic system components which must be defined from the onset. Ciroth et al. (2011) states that these include the functional unit which is the reference measure to which all inputs and outputs into the system are related. In buildings, these include measures such as number of occupants, meters square or the unit surface of a building component protected for a certain number of years, etc. The system boundaries define the extent of the study being undertaken i.e. if the study entails the whole building or a section of it (Khasreenu et al., 2009). Perspectives of the life cycle actors are reflected in the LCC and cost types are also considered, creating a Cost
Breakdown Structure (CBS), which is a detailed statement of the costs of the various components of the building. To arrive at a present day value in LCC, costs are usually discounted over time. Ciroth *et al.* (2011) gives the discounting formula as:

\[ P(T) = \frac{1}{(1+r)^T} \]

Where \( P(T) \) = Present Value  
\( r \) = discount rate (%)  
\( T \) = time unit (years)

Muldavin (2010) reiterates that the importance of discounting cash flows is to correctly depict the effect of sustainability features and their financial performance implications. Lorenz and Lutzkendorf (2004) also identify the elements that are used in the LCC calculations. These are the initial building costs i.e. design, construction/acquisition, management and operating costs, maintenance and renovation costs and cost/benefit of demolition.

Swarr *et al.* (2011) note that the administration of LCC has some challenges. Firstly, this method of assessment seeks to document all costs over the life of a building. These various costs are however in most cases borne by different and sometimes conflicting parties, which may result to difficulty in accounting and disparity in figures from building to building. Also, the issue of accessibility to cost, especially since it may need to be gathered from different sources, can be a hindrance to the valuation process. This challenge is also magnified by the fact that the costs are unitized differently over various sectors. Therefore, reconciling them to a particular currency unit for LCC purposes may be quite challenging. Ciroth *et al.* (2011) also notes that there is the danger of allocating particular financial burdens to more than one product or component of the building. An example may be taking account of an insured item with its embedded insurance cost and then subsequently providing for insurance of the same item separately. Lorenz and Lutzkendorf (2004) also identify other issues affecting the effectiveness of the LCC, like the determination of the costs of future maintenance and renovation.

An LCA on the other hand is used to evaluate environmental impacts of processes and products through their life span (Khasreen *et al.*, 2009). In the case of buildings, this evaluation considers the processes and products from the extraction of building materials to the demolition of the building at the end of its life. Often wrongly used interchangeably with LCC, the difference between the two is that the LCA tilts more towards
environmental evaluation. Rebitzer and Hunkeler (2003) depict in Figure 5.3 the framework for environmental LCC assessment. The framework shows the distinction between LCC and LCA, as it shows that the assessment of externalities is assessed within the social and environmental boundary while cost is assessed within the economic boundary.

![Figure 5.3 Framework for LCC](image)

*Figure 5.3 Framework for LCC*  
(Rebitzer and Hunkeler, 2003)

The issue with LCA as a method of green properties assessment, is the lack of standardization of performance and weighting criteria for environmental elements. Thus, Lorenz and Lutzkendorf (2004) propose a combination of the two tools for the assessment of green buildings. They however note that the challenge with this is the differences in methods of the two tools. For instance, while LCC is discounted to the present value, LCA does not discount environmental impacts. Also, while LCA considers the environmental impacts starting from the production of building components, LCC only considers costs within the existence of the building.

These issues however should not deter the exploration of a synthesis of the methods. Lorenz and Lutzkendorf (2004) assert that a combination of these two tools presents the most feasible option for green building valuation once the outstanding issues are overcome. Keeping (2000) also states that the consideration of life cycle approach in
sustainable buildings decision making is likely to increase the demand for the product by investors.

5.3 Profitability of green housing and Willingness-To-Pay (WTP) a premium for green housing

The growth of the existing number of green buildings globally is an indication that at least some form of benefit is being realised by the property developers and investors. There is also indication that this growth is not just occurring in developed countries but gradually seeping into developing countries too. For instance, McGraw Hill Construction (2016) reported that the percentage of firms that had ongoing green building projects in South Africa was expected to grow from 16% in 2012 to 41% in 2015. They also reported that in contrast to ‘doing the right thing’ being the major trigger for global green building growth in 2008, client demand and market demand were seen to be the major triggers in 2015.

These figures show that there is an increasing awareness of the business opportunities in the green building market. The major challenge however has been promoting those business opportunities by making a business case for green buildings. There is a dearth of literature pertaining to the profitability of green housing. While more attention is being paid to ascertaining the cost of green buildings, profitability of such investments also needs to be ascertained if a business case is to be made. Wilkinson and Warren-Myers (2011) assert that this business case can only be made when there are established links between energy efficiency and property values.

Prospectively, considering the reality of climate change and environmental degradation, there are strong indications that the construction of green housing will become mainstream or somewhat mandatory in the near future, even as various governments are already taking steps to invigorate their respective green building markets. This action is likely to lead to a massive spate of retrofitting and green housing construction in the near future. In light of this, profitability of these properties may be assessed futuristically, considering not just current gains but profits that are also likely to accrue to green property holders in the future. Such benefits may include savings on cost of retrofitting and certification. Lorenz and Lützkendorf (2011) even suggest that in the medium to long
term, sustainable buildings will become so mainstream that conventional buildings will experience a sharp decline in value and will have to attract discounts in their transactions. Also, the ‘first-mover advantage’, which is the advantage gained as a result of being a first entrant into a particular market sector or segment, may cause green housing owners to have the competitive edge over the market’s subsequent entrants.

Most existing literature on profitability of green buildings uses two elements as proxies for profit. These are the intrinsic premiums obtained in rental and capital values and operational cost savings over the life time of buildings, which include reduced emission and environmental taxes (Madew, 2006). Eichholtz et al. (2010) however state that adjustment of property prices based on these elements alone does not do justice to the benefits earned from green buildings. They identify improved (corporate) image and improved occupant productivity or health as intangible benefits also accruing to green property owners. Whatever the case, the challenge remains the task of ascribing a price to intangible benefits in ways that convinces a prospective investor of their profitability (Wilkinson and Warren-Myers, 2011).

Whether in business or in public decision making, it is important to know the stance of those for whom such decisions are being made. It is not enough therefore to consciously increase the green housing stock without considering the end-users and the level of their interest and ability to meet the financial obligations involved. Breidert et al. (2006) states that valid WTP estimates are needed in business to develop optimal pricing strategies. WTP is an economic tool which according to Baines and Fill (2014) is used to determine the consumer’s perception of a fair price to pay for a particular good or service. WTP is also an indication that end-users are concerned about certain issues and are willing to make sacrifices in some way to mitigate such issues.

For instance, Chen et al. (2006) found that about 80% of home-owners and 60% of residential property renters were willing to pay a premium on their taxes, to conserve green spaces in Hangzhou City, China. This public interest in saving green spaces is spurred by the fact that rapid urbanisation is threatening the existence of the spaces that earned the city the China and U.N. Habitat prizes. It is therefore appropriate to assume
that WTP is largely dependent on the level of information or knowledge that a user or prospective user has about the product or service in question.

In the green building market, WTP is a measure of demand for green buildings (Zieba et al., 2013). Demand for green housing is a contributor to premium in more matured green building markets, especially where the public is more sensitised towards the environment. In these climes, it is normal for the forces of demand and supply to dictate the value of green buildings. For example, Chegut et al. (2013) found that the newer green buildings entering into the commercial property market in London did not command as much premium as properties that had been constructed earlier. However, in emerging markets, the perception and willingness of the consumer must be considered in the determination of both price and value of the property. There have been various studies on WTP in green residential buildings. In one such study, Zalejska-Jonsson (2014) tabulates a summary of findings (Table 5.3) which shows varying premium rates across different locations.

The common factor of all these studies however is that they were all carried out in developed countries, where it is assumed that there is a higher environmental consciousness than in the global south because of the difference in priorities of the two regions. The results indicate that in each of these locations, consumers were willing to pay a premium for more environmentally sustainable features in housing as there is no indication of a negative WTP.
Variations in the WTP rates depend largely on the peculiarities of the respective locations. It is also likely that consumers will be willing to pay for particular green features rather than the bundle of features that make a building environmentally sustainable. Chau et al. (2010) found that home users in Hong Kong were more willing to pay a premium for energy conservation than for other green features presented in the survey. This may imply a desire to also save on home maintenance while exhibiting pro-environmental behaviour. Imperatively, the WTP of housing consumers may also be a reflection of the residency statuses in the residences they occupy. For instance, it is likely that a resident in an owner-occupied property will be more willing to pay a premium for
green features because of his vested interest in the property. However, this assertion is yet to be empirically confirmed.

Zalejska-Jonsson (2014) identifies two types of WTP viz: stated WTP and revealed WTP. While stated WTP is based on proposed intentions of the subject service or product beneficiary, the revealed WTP is based on observed behaviour of the beneficiaries towards the service or product. The stated preference methods are particularly useful in climes where there is no notable green housing market since consumer survey can be premised upon a hypothetical market or product. Revealed WTP however can only be determined in places where there is an existing market, by an analysis of property transactions. Therefore, to determine the revealed WTP of green housing, there must be a vibrant market with a buoyant transaction database. In emerging markets, therefore, research and investment decisions are forced to rely on stated WTP. The result of this is however highly subjective and must be used with caution as in many cases, it may not be a true reflection of consumers’ actions in eventual real-life situations. Warren-Myers (2012) warns that repeated studies on stakeholders’ perception of green buildings found reducing WTP among respondents over the years as green building were continually considered as a futuristic concept.

While the WTP may not be an accurate reflection of property users’ behaviour towards environmentally sustainable properties, it may give some of indication as to their intent. Regarding this, Falkenbach et al. (2010) warns that WTP surveys may be insightful but should not be taken as evidence for actual premium.

Conclusively, Lorenz and Lützkendorf (2011) assert that though there is no one formula for valuing sustainable buildings, there is no particular need for new methods for the purpose. They suggest that dedicated market research, detailed transaction databases and succinct transaction analyses are the elements needed for the existing methods to fill the current gap in the sustainable property valuation practice. The onus also lies on the property valuers while continually developing skills for these special property valuations, to pay attention to the peculiarity of each property and properly document the effects of its unique characteristics on property values.
CHAPTER SIX

6. GREEN HOUSING POLICIES AND REGULATIONS

6.1 Green housing policies

A policy is “a course of action for dealing with a particular matter or situation, especially as chosen by a political party, government or business company” (Oladapo and Olotuah, 2007, p.331); while a regulation is a “law, rule or other order prescribed by authority, especially to regulate conduct” (Dictionary.com, 2017).

Climate change policies have become an integral component of most governments, given the magnitude of the global warming crisis. While adaptation strategies are necessary to appropriately cope with the effects these changes are already causing to human life and properties, mitigation strategies and policies present more aggressive methods to tackle the menace. Adaptation policies are more likely to be localised, as the effects of climate change vary widely from place to place (Hasegawa, 2004). For instance, because Australia is prone to natural disasters, adaptation policies such as requirements that local building plans provide for likely sea level rise are operational (Hamin and Gurran, 2009).

The aim of sustainable development is however to preserve life and resources for future generations (World Commission on Environment and Development, 1987). As such, there is more focus globally on developing climate change mitigation strategies in various economic sectors.

Regulations, policies and laws have been known to be effective for stabilising imbalance in different sectors of a polity. Therefore, in the drive for an increased green housing stock, relevant policies and regulations are capable of acting as a catalyst, if properly harnessed. The UN-Habitat Global Housing Strategy Framework document (UN-Habitat, 2012b) aimed to use housing policies to “(re)position” housing to achieve environmental, among other aspects of sustainability. This shows that policies are potentially essential tools, even in the climate change challenge. Koeppel and Ürge-Vorsatz (2007) state that policies may be used as tools for overcoming green building implementation barriers. For instance, they state that information barriers can be tackled using instruments such as voluntary labelling, procurement regulations and demand-side management (DSM) programs, while economic barriers can be minimised with tax
exemptions, public benefit charges and mandatory labelling programs, among others. Most importantly, the public sector is expected to ‘lead by example’. By greening public facilities, the government plays the dual roles of regulator and motivator. Policies also play an informative role. Hirokawa (2009) points out that informative green building laws are highly successful in the USA, also partly because the formulation of these laws usually calls for training, education programs and the general agreement of stakeholders.

In Nigeria, there are various government agencies responsible for environmental monitoring and regulation. Ijigah et al. (2013) identify the National Environmental Protection Board, the Ministry of Environment (MOE), and the Nigeria Conservation Foundation (NCF) as the most important agencies for environmental regulation in Nigeria. At the Lagos state level, these roles are covered by the state ministry of environment and partly by the Lagos state ministry of physical planning and urban development. The existence of these relevant agencies is an indication that the deficit in green buildings in Lagos is not necessarily due to a lack of regulatory bodies, but rather, may be as a result of a lack of the political will to drive the cause, among other reasons. Melchert (2007) also points out the fact that environmental protection is not politically internalised by developing countries’ governments because of perceived high costs. This causes such countries to become reactive rather than proactive in pursuing environmental conservation.

In places where the public is only now being sensitised towards environmental stewardship such as in most developing countries, it may be expedient for the government to be visibly involved in the regulation of the green housing market. Circo (2007) notes that government intervention is needed in promoting green buildings to maintain consistency in their supply. The state needs to drive the cause for greener places of residence, as well as to inculcate a sense of responsibility towards the environment in its citizens. To this end, various environmental regulatory policies and instruments have been identified and discussed by various authors. For instance, Chegut et al. (2013) state how in the UK’s bid to reduce carbon emission, the government mandates that all new construction or retrofit of government buildings must meet zero-carbon standards by 2018. As a matter of fact, Madew (2006) suggests that governments must go beyond
greening their properties and adopt life cycle costing (LCC) as a pre-requisite to
government tender contracts and for other accounting purposes.

Tella (2016) identifies national and state policies that aid in regulating society-wide
energy use and carbon emission. These include emission taxes and charges, voluntary
agreements between government and industry, environmental subsidies, research and
development policies and green power policies. Lorenz (2006) also identifies
performance-based building regulations, building related energy efficiency codes and
economic tools such as subsidies, as some governmental tools being used to drive
analyse various forms of green building policy instruments identified from 52 different
countries and their effectiveness. Table 5.2 shows the policies analysed in their study.

Table 6.1 Policy instruments analysed by Koeppel and Ürge-Vorsatz

<table>
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<tr>
<th>Control and regulatory instruments</th>
<th>Economic and market-based instruments</th>
<th>Fiscal instruments and incentives</th>
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<tr>
<td>Normative:</td>
<td>Informative:</td>
<td>Energy performance contracting:</td>
<td>Voluntary certification and labelling:</td>
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<tr>
<td>• Appliance standards</td>
<td>• Mandatory audits</td>
<td>• Cooperative procurement</td>
<td>• Voluntary and negotiated agreements</td>
</tr>
<tr>
<td>• Building codes</td>
<td>• Utility Demand-side management (DSM)</td>
<td>• Energy efficiency certificate schemes</td>
<td>• Public leadership programs</td>
</tr>
<tr>
<td>• Procurement regulations</td>
<td>• Mandatory labelling and certification programs</td>
<td>• Kyoto Protocol flexible mechanisms</td>
<td>• Awareness raising, education, information campaigns</td>
</tr>
<tr>
<td>• Energy efficiency obligations and quotas</td>
<td></td>
<td></td>
<td>• Detailed billing and disclosure programs</td>
</tr>
</tbody>
</table>

One important finding from their study is that many of the different policy instruments
are effective at little or no cost to the society in which they are used. Instruments which
exhibited high emission reduction capability and cost effectiveness include appliance
standards and building codes, energy efficiency obligations and quotas, DMS programs,
cooperative procurement, energy efficiency certificate schemes, tax exemptions and reductions, and labelling and certification programs. They state that the success of these instruments are however subject to various factors, including regular and periodic updating and improvement of the codes and standards, public leadership championing the green building cause and effective sensitization and information programs.

Fiscal incentives are effective tools that governments use to promote a cause without necessarily financially committing to it. Dictionary.com (2017) defines incentives as “something that incites or tends to incite to action or greater effort as a reward offered for increased productivity”. Incentives, which are largely made up of, but not limited to financial rewards act as motivators in adopting green housing options in various ways. Koeppel and Ürge-Vorsatz (2007) state that incentives are good for initiating energy efficient products, as they act as attractions towards the new products. Hirokawa (2009) cites reduced building permit fees, fast-track permits, solar water heater incentives, posting certified building site signs and publishing green building participants’ details on public websites as some of the green building incentives used in some USA counties.

Tax incentives are granted by the way of tax holidays, such as tax exemptions, abatements or reductions to handlers of qualifying or certified green buildings. The beneficiaries of these incentives may be the developer or the end user of the building (Hirokawa, 2009). Madew (2006) states that administering tax incentives may be granted either by rewarding compliers with green building standards or imposing penalty taxes on defaulters. He also describes various types of tax incentives that may be used in the regulation of green buildings:

i. Tax deductions – These may take various forms but simply entail the reduction of payable tax for green properties.

ii. Reduced Capital Gains Tax (CGT) – CGT on sale of green properties can be reduced.

iii. Franking credits – Franking credits are tax refunds usually paid back to company shareholders along with their accruing dividends. These can be used to increase dividends to responsible property investors. This tool is however likely to be more useful in countries with organised securitized real estate markets or Real Estate Investment Trusts (REIT).
iv. State and local council concessions – In Lagos, the relevant rates for such incentives would be the Land Use Charge (LUC). Concessions on such charges for green buildings can encourage not only construction of new green buildings, but retrofitting existing ones.

Questions have been raised as to the morality of using taxpayers’ funds, whether directly or indirectly, to incentivise private investors in a bid to promote sustainable buildings (Circo, 2007). It should however be noted that environmental degradation is in fact a public issue and a pressing one at that. Therefore, the use of government incentives is a mitigation strategy that compares to any other climate change mitigation strategy. However, governments owe their citizens the duty of accountability in this regard. Such programs must be regularly evaluated to ascertain their effectiveness. The effectiveness of these fiscal incentives is however dependent on the extent to which the public is aware of such programs. Therefore, as stated earlier, fiscal policies should be properly matched with information policies to ensure their success. McGraw Hill Construction (2013) reports lack of government support and incentives and lack of public awareness as two of the major challenges to increasing green building stock in nine profiled countries. The countries are Norway, UK, Germany, South Africa, USA, Brazil, Australia, United Arab Emirates and Singapore. These two issues can be solved through government policies as stated above.

The issues of climate change and global warming have seen many countries setting national GHG emission reduction targets. To achieve these targets, strategies are developed for different sectors of the economy to contribute towards them. UNEP Sustainable Buildings Climate Initiative (2009b) states that the consideration of emission reduction and control targets are instrumental to the choice of climate change policies that governments adopt for the building sector. They identify the following as targets that relate specifically to the building sector:

- Increasing energy efficiency of buildings
- Increasing energy efficiency of building appliances
- Encouraging energy generation and distribution companies to support emission reduction in the built environment
- Change in environmental behaviour and attitudes
• Increasing the use of renewable energy in place of fossil fuels.

To achieve these targets, governments are encouraged to ‘mix and match’ policies as considered suitable for the peculiar characteristics of their countries or areas of jurisdiction. So, for instance, to achieve attitudinal and behavioural change towards the environment, information programs, voluntary labelling programs and billing and disclosure programs have been highlighted as relevant policy instruments which may be combined in a package to motivate emission reductions.

Global attempts at GHG reduction have birthed various policy instruments over time. Significant among these are the Clean Development Mechanism (CDM) and the Joint Implementation (JI) contained in the Kyoto Protocol (United Nations framework convention on climate change, 1997), carbon taxes and international emission trading systems. Some of these instruments have been effective in what they set out to achieve. Others however, like the international emission trading system have been criticised for actually slowing down the transition to carbon-free economies by allowing participating countries to buy their way out of emission reduction (Goulder and Nadreau, 2002). The international emissions trading system is a regulatory system that authorises either corporate bodies or governments to sell their right to emit a specified amount of pollution, thereby mandating them to abate that amount of pollution. It is argued that by paying for emission permits, participating countries are able to avoid actually reducing emissions in their own localities. There are however divided opinions about emission trading as Madew (2006) argues that the technique may actually be beneficial to the building sector. He suggests that schemes must be set up nationally to allow the building sector to sell emission credits earned from energy efficiency in buildings. The McGraw Hill Construction (2013), also in support of carbon offsets and credits, describes it as a form of subsidy for renewable energy. From all indications, international mechanisms and instruments have hardly been effective in the building sector and worse still in developing countries.

The CDM for instance was created to award emission reduction credits to developed countries, for reducing GHG emission in developing countries by investing in projects directed towards that cause (United Nations framework convention on climate change, 1997). The UNEP Sustainable Buildings Climate Initiative (2009b) regards it as one of
the most important international tools for emission reduction. However, the CDM has had little or no impact in the building sector since its inception. This is because the building sector, unlike others, is perceived by investors to present opportunities for numerous but significantly small energy savings which CDM experts refer to as ‘long tail’ projects (UNEP Sustainable Buildings Climate Initiative, 2009b). This means that the building sector presents small energy savings, compared to the costs of technologies involved in securing the savings, resulting in higher cost and difficulty to manage. Other reasons cited are fragmentation of the building sector, lack of adequate and appropriate information about energy consumption and GHG emission, and lack of adequate energy management indicators. The challenges can however be overcome by using performance-based indicators, developing common performance-based energy baselines, and allowing national agencies to promote CDM (UNEP Sustainable Buildings Climate Initiative, 2009b).

The carbon pricing and carbon tax policy are other international policies aimed at GHG reduction. Carbon pricing refers to ‘initiatives to put an explicit price on GHG emissions’ (World Bank, 2014) while a carbon tax is a fee levied for the burning of fossil fuels, with the aim of discouraging their use. Carbon tax is identified as an effective GHG reduction tool being used by an increasing number of countries (World Bank, 2014). Though most of these are developed countries, developing countries like South Africa have also been identified for the implementation of the policy. It is unclear how carbon taxes can aid in GHG reduction in the building sector though, especially since they have the potential to drive up fuel prices and consequently, the price of construction. Also, in developing countries like Nigeria where provision of electricity is still very erratic and the populace is still largely dependent on fossil fuel-powered generators for electricity supply, the government may have no moral justification to tax the resulting carbon emission. However, it is likely that such taxes could motivate the installation of low-energy or renewable energy-powered equipment and features in residential buildings.

Professional bodies also have a role to play in regulating environmental sustainability in their respective practices. Professional proficiency in environmental sustainability largely depends on the training and inclination of professionals towards the subject, mostly through their umbrella bodies. Lorenz (2006) highlights the need for sustainable
buildings and sustainability topics to be included in valuation professionals’ training programs. The role of these professional bodies in policy making can also not be underestimated. Obo et al. (2014) identifies three types of ‘publics’ involved in the policy formulation process. These are the mass public, the interested public and the opinion making public. They describe the opinion making public as those that can influence policy because of their social position or resources available to them. In this discourse, professional bodies can be categorised as a form of opinion making public, and must therefore use their status to push the green housing agenda by influencing effective polices.

6.2 International examples of environmental regulations in the building sector

Governmental regulation of green building construction is done either directly or indirectly in various countries. Some governments use tools like tax relief akin to what obtains in Quebec for instance, where tax rebates of up to 75% and for up to 10 years, depending on the level of compliance of the building to green building regulations, are offered for new green constructions (Reynolds, 2014). In other countries like Australia, UK, Italy, Germany and France, investors are required to disclose the extent to which Environmental, Social and Governance (ESG) issues influence their business or investment decisions (Lorenz, 2006). Also in Australia, measures such as immediate tax write-off on purchase of high-energy efficient equipment and 5% tax credits on qualifying green building expenses have been implemented (Madew, 2006). In Qatar, the Global Sustainability Assessment System (GSAS) is the green building standard specially adapted to the Qatari context (Alhorr et al., 2014). The main aim of the GSAS is to promote the construction of sustainable low-carbon buildings and Qatar has gone ahead to enforce the standards on every building in new cities. Covering all phases of the building’s life, the GSAS represents a holistic national approach to tackling climate change.

The states of New York, Maryland and Oregon in the US provide tax credits for building expenses that are made to meet energy efficiency standards, while in the states of Idaho and Minnesota and in Canada, the governments provide tax reductions or exemptions on the purchase of energy efficient equipment (Madew, 2006). The Action Plan for Energy-
Efficient Housing (AHPEEH) in the United Nations Economic Commission for Europe (UNECE) was birthed to use the housing sector as a tool to tackle environmental degradation while also providing shelter (Golubchikov and Deda, 2012). The key policy areas that the action plan focused on were: governance frameworks, technological advancements and access to affordable energy efficiency. Once again, technological advancement is being highlighted as a precondition to successful green housing delivery. The action plan aimed to use policy to stimulate innovation and research into new and efficient methods, to achieve low-energy housing. This use of innovation combined with policy may be one aspect in which developing countries are lacking. The role of the EMT in greening the housing stock is again brought to the fore in this discourse. The need to combine state regulation, technological innovation and private sector participation to produce climate GHG reduction tools and techniques is reiterated.

Some authors are of the opinion that green buildings can only become mainstream if they are constructed mandatorily rather than voluntarily as is currently the common practice (Hirokawa, 2009, Landman, 1999). However, to make such laws mandatory, there must be a conducive and enabling environment, even as care must be taken to consider the protection of citizens’ rights. Choguill (2007) asserts that there are generally three policy-supported ways in which governments intervene in housing provision. These are construction and distribution of housing units at subsidised rates, regulation of the housing prices or regulation of the money market to make housing finance more accessible. With regards to green housing provision in a developing economy like Nigeria, while green housing provision and green housing price regulation may be unrealistic, given the country’s track record in housing provision, it is feasible to steer fiscal policies towards green housing provision. Such fiscal policies include governmental guarantee for carbon emission reduction (CER) (Lee et al., 2013) and green funds akin to those set up by the South African Department of Environmental.

McGraw Hill Construction (2013) reports from its survey of nine different countries that energy efficiency targets are the commonest form of government policy used in administering the green building market in those countries. Others included green building certification for public buildings and water efficiency targets. Figure 6.1 shows
a ranking of the various government policies based on frequency of use, as reported by McGraw Hill Construction (2013)

![Figure 6.1 Government policies in international green building markets](image)

(McGraw Hill Construction 2013)

As countries become more developed and citizens become more inclined towards principles of environmental sustainability, the involvement of the state can gradually be minimized, as they slowly begin to deregulate the market (Lorenz, 2006). While initial regulations may need to target particular aspects of the building, the long-term aim should be an integrated sustainability performance of buildings. Also, the achievement of an environmentally sustainable housing sector should not be an end in itself, but a means to the achievement of holistic sustainable development in the housing sector.

### 6.3 Existing regulations and policies as they affect green housing in Lagos

Lagos state is subject to a vast array of national and state policies and laws affecting almost every aspect of the state. There are also a number of the laws that deal with environmental issues within the state. However, a scrutiny of these documents reveals that environmental impacts of the built environment are not considered as a pressing issue, as most of the laws are either vague or do not address the issue at all. Discussed below are some of the relevant laws operating in Lagos state.
6.3.1 National Housing Policy (2012)

The Nigerian housing sector has evolved tremendously since the formation of the Association of Housing Corporations of Nigeria, the first post-colonial housing regulatory body in 1964. The current housing policy was however formulated to address the inadequacies of the first National Housing Policy (1991) in meeting the advances of economic and developmental trends in the housing sector (Federal Government of Nigeria, 2012).

The policy defines housing as “the process of providing safe, comfortable, attractive, functional, affordable and identifiable shelter in a proper setting within a neighbourhood, supported by continuous maintenance of the built environment for the daily living activities/families within the community, while reflecting their socio-economic, cultural aspirations and preferences. In addition, housing includes the sustainability attributes of energy efficiency and resource conservation for improved quality of life.”

Though the policy takes environmental sustainability into cognizance in defining housing, the document provides only one strategy that can be directly linked to environmental sustainability. Under paragraph 3.4.2, article xix the policy states an intention to “ensure that provisions are made for formal parks, gardens, open spaces, greens, trees and general landscaping elements to enhance ecological balance.” Thus, while this policy does recognize the place of greenery in achieving environmental sustainability, it is however grossly deficient in holistically pursuing the concept. This deficiency further shows the minimum understanding of policy makers, of the links between housing and environmental sustainability. Achieving environmental sustainability in the housing sector entails more than just the inclusion of greenery and landscaping but must deliberately seek to use the building as an instrument for GHG reduction.

There are however sections of the policy that can indirectly be used as tools for promoting green housing. For instance, one of the policy thrusts is to “promote the use of locally made building materials and appropriate production technology” and another strategy is to “promote and encourage partnership between research institutions and private
organisations...to finance research work related to innovations in design, local materials and their applications”. These aspects of the policy can be used to drive innovation in developing green building materials, methods and technologies, while the emphasis on local building materials could promote the reduction of embodied energy of building materials. There may be another need to revisit and review the current housing policy as it falls behind in effectively and holistically addressing the present climate change mitigation and adaptation campaign.

6.3.2 National Building Code of 2006

The National Building Code (NBC) of Nigeria (Federal Republic of Nigeria, 2006) was birthed to deal with issues perceived to have become problematic in the Nigerian built environment. These issues include unplanned cities, man-made disasters in the built environment like buildings’ collapse and fire incidences, non-professional construction, and use of untested building materials. The code aimed to “set minimum standards on building pre-design, designs, construction and post-construction stages with a view to ensuring quality, safety and proficiency in the building industry”.

The code covers various issues, but of particular interest to this thesis is the section that discusses the issue of environmental and general building requirements. This section generally sets guidelines for lighting, ventilation and sound transmission in building. The code however does not insist on natural lighting or ventilation as it states in section 6.2.1.1 that “Every room or space intended for human occupancy shall have natural and or artificial light” and in 6.2.1.1 (b) “Every room or space intended for human occupancy shall be provided with natural and or mechanical ventilation”. The provisions of the code in this regard seem to allow for the opposite of what it sets to achieve i.e. environmental protection. By providing for alternatives to natural lighting and ventilation in buildings, the building design already allows for increased energy requirements which impacts negatively on the environment.

In section 10, the code also covers building materials and components requirements. This section opens by stating that “all materials and components used in the construction of buildings must be such that they will achieve aesthetics, durability, functionality, character and affordability. Locally available building materials should be integrated
for their additional advantages of availability, identity, job creation and affordability”. This provision totally excludes the element of environmental sustainability in building material selection which portrays the Federal government’s disposition towards the subject. It is however unclear if this is as a result of ignorance, a lackadaisical attitude towards environmental protection or simply non-prioritization of environmental protection. An attempt to examine the possible reasons is made in the course of this study.

6.3.3 Lagos State Climate Change policy
The Climate Change policy (Lagos State Government, 2013) is aimed at augmenting pre-existing inadequate policies on the implementation of strategies to tackle climate change through mitigation and adaptation strategies. The document intends to impact on all sectors of the economy and boasts of conforming to international conventions, treaties and protocols, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol.

The policy is however vague on its implementation in the housing sector. It mentions nothing about energy use or GHG emission from residential buildings as a sectoral challenge of human settlements, nor does it categorically spell out any strategies for mitigating same. The policy rather speaks of undefined plans to “Ensure compliance with physical planning principles and building standards in the design of infrastructure including human settlements to reduce their vulnerability and enhance adaptive capacity to climate change” and “Build the capacity and awareness of architects and engineers to take into account climate change in the profession”.

For a document which was purposely formulated for climate change abatement strategies, this instrument lacks the necessary propulsion to drive environmental sustainability in the housing sector.

6.3.4 Lagos State Urban and Regional Planning and Development Law
The Lagos State Urban and Regional Planning and Development Law (2010) was promulgated with a view to properly administer physical planning, urban development, urban regeneration and building development within the state. The Lagos State Physical Planning and Development Regulations (Lagos State Government, 2005) is the document
that guides the construction of buildings within Lagos state. The only provisions of the document that pertain to the environmental sustainability of buildings are stated in Section 35(2), where it states that ‘Every room in a building shall be provided with the following: (a) Natural lighting by means of windows, doors and other recognized transmitting media; (b) Natural ventilation by means of windows, doors or any other recognized openings.’ These provisions are vague and not particularly directed towards the reduction of energy use in the building.

6.3.5 Lagos State Environmental Management and Protection Law

The Lagos State Environmental Management and Protection Law (2017) was promulgated to “provide for the management, protection and sustainable development of the environment in Lagos State” and is administered by the Lagos state Ministry of Environment. The Ministry of Environment is also responsible for overseeing the activities of the Lagos State Environmental Protection Agency (LASEPA), which is, among other functions responsible for prescribing the “basic standard requirements for nature conservation” (Lagos State Government, 1996). However, a perusal of both the Lagos environmental and LASEPA laws reveal that the state has no specific provision for GHG monitoring, evaluation or reduction either by the building sector, or indeed any other sector.

A review of these existing laws and policies only reiterates the views of Melchert (2007) that the legislative framework in most developing countries contain “limited environmental content”, thereby causing the construction industry to lack the required push to pursue environmental sustainability. However, one way of harnessing the ‘latecomer advantage’ in this regard is to study, adopt and adapt successful policy making models of developed countries to suit the developing countries’ specific needs.

The Dutch building sector model of environmental policy making largely engrains the ethos of the ecological modernisation theory. Melchert (2007) suggests that this model is well suited to developing countries. The model seeks to combine financial and environmental objectives in the policy making framework. The Dutch model also limits the role of the state in environmental regulation to that of ‘constraining’ and ‘enabling’ environmental reforms in the building sector, while leaving the sector actors to
implement the environmental agenda. The model therefore calls for policies that promote synergies between government and the private sector and within the various sub-sectors of the private sector, for successful environmental regulation within the building sector. However, the place of technological development or at least a moderate form of modernisation is also emphasised in this model, as a precondition to the EMT process.

In the UK, the employment of ‘performance oriented’ regulations and ‘smart regulation’ allows firms to choose their preferred technology for achieving government approved green building standards (Greenwood et al., 2016). This is achieved by mixing mandatory and voluntary regulatory standards in the building sector. This model is well suited to the Nigerian context, considering the fact that the Nigerian economy is largely capitalist and the fact that state efforts at the provision of housing have failed in the past. The model has the potential to give housing investors and business entities the chance to make profit, while the environmental sustainability goal is being achieved. With innovative and enabling voluntary regulatory standards, the private sector can find a viable business opportunity in green housing provision. The mandatory standards can then be used to ensure that the system is not abused and is achieving the intended purpose.

6.4 Green Building Rating Systems (GBRS)
It has already been stated in this thesis that the definition of a green building is highly subjective and largely depends on the context in which it is defined. Hence, while one person may decide to refer to a building as green because of the use of solar sources for electricity, another person may disagree because of the lack of proper ventilation and insulation of the same building. It is for such reasons that there are various standards and systems put in place to regulate the construction of green buildings. These systems are either administered by private voluntary organisations, or by the government of the country or locality. It is worthy of note that though this study adopts the use of the term ‘green building rating system’, various terminologies including certification tools or labelling are often used interchangeably to mean the same thing (Cole, 2005).

GBRS are tools used in assessing buildings, to determine among other things, the extent to which they have reduced negative environmental impacts. Hirokawa (2009) refers to them as mechanisms put in place to “standardise the process of comparing and
measuring green performance” of buildings. The McGraw Hill Construction (2013) reports in its survey of a list of nine previously stated countries, that a high number of surveyed property firms asserted that GBRS were beneficial because of their roles in creating better performing buildings and a competitive market advantage. However, the same survey showed that some property firms were opposed to these certifications because they perceived them to be costly, time intensive, difficult to understand and not localised enough.

The concept of GBRS is largely a private sector initiative (Hirokawa 2009), which has become an effective tool for stimulating the green building market and consequently increasing the green building stock (Cole, 2005, Lockwood, 2006). The Building Research Establishment’s Environmental Assessment Method (BREEAM) was the pioneer GBRS launched in 1990 in the UK in response to the need for more sustainable measures in property development. Numerous GBRS have since emerged across the globe, though with varying frameworks and methods, but with basically the same aim of preserving the natural environment (Vierra, 2011).

GBRS are largely developed country initiatives, only now being adopted by developing countries, as they begin to embrace and align with the global sustainable development drive. While developing countries enjoy the advantage of having GBRS forerunners and literally just stepping into an already made structure, it may be dangerous to ‘homogenize’ these systems without taking cultural differences of participating countries into consideration (Cole, 2005). In most developing countries, the major national priorities are the provision of basic infrastructural and social amenities. Thus, driving green housing in those societies may easily be looked upon as an elitist project. Therefore, at their incipient stage, GBRS in developing countries should be less restrictive in nature to encourage the increase in the green building stock.

The spread and use of GBRS in developing countries may not be as rapid as the need for them calls for. In Africa, South Africa has the most established green building market and GBRS with an established green building council (GBCSA). In Nigeria, the case is rather different as the country is yet to have either an established green building council or a nationalised GBRS. A few constructions in the country have been certified by some
international GBRS, based on their private individual or corporate values. One of the most recent examples is the Heritage Place in Lagos (shown in figure 6.2) which boasts of being the first LEED certified commercial building in Lagos. The U.S. Green Building Council (2017) (USGBC) states that, as at March 2017, Nigeria had only four LEED certified building projects and eight other registered but uncertified projects, only one of which is residential. Apart from such isolated cases, green building certification is not a trend in Nigeria. The reason for this gap may be traced to inadequate information and public enlightenment on environmental issues, along with the country’s prioritising socio-economic needs over environmental needs.

![Figure 6.2 Heritage place, Lagos](image)

Developing a national GBRS is a daunting task. However, the late-comer advantage once again comes to play for Nigeria, as there is a plethora of GBRS available to be chosen from and adapted to the Nigerian context. Michael (2013) identified seven GBRS, in a bid to assess their adaptability to the Nigerian context viz. The Building Research Establishment’s Environmental Assessment Method (BREEAM), Comprehensive Assessment System for Building Environmental Efficiency (CASBEE), Green Globes, Green Star, Hong Kong Building Environmental Assessment Method (HK-BEAM), IGBC Green Homes Rating System and Leadership in Energy and Environmental Design (LEED). The GBRS were assessed based on the following criteria: popularity and influence, availability, methodology, applicability, data collecting process, accuracy and
verification, user-friendliness, development and result presentation. His study found that the LEED is the most suited and most preferred, among the surveyed Nigerian built environment practitioners for the Nigerian context.

The study did not explain the reasons for the participants’ choices nor did the analysis deal with issues of climatic, economic and cultural differences or similarities between Nigeria and the home countries of each GBRS. It is therefore difficult to understand the basis for the choice of LEED for Nigeria. A more localised system should consider the peculiarities of the subject region to create a tailor-made and effective GBRS. Reed et al. (2011) note that most GBRS originate from developed countries with open property markets and accessible transaction data. Developing countries adopting these same methods may therefore not be doing so effectively without the availability of similar criteria. The dynamics of every country must therefore be carefully considered in the administration of a GBRS.

For instance, the potential for harnessing solar energy in a Nigerian building is greater than the same potential in a building in the temperate region, because of the generous supply of sunshine experienced in Nigeria. Using standards from the temperate region in Nigeria may therefore mean that the possibility of maximising solar power in buildings may be limited. Another example of this disparity is evident in the LEED V4 For Homes Design and Construction (US Green Building Council, 2014). The document states in its discussion on the use of environmentally preferable products, that wood products used must be Forest Stewardship Council (FSC) certified or USGBC-approved. Such clauses may end up being deterrents to certification, considering that it may prolong the process and discourage Nigerian developers, since the structure for transactions in wood may be different in Nigeria. It is therefore not enough to simply adapt a particular system for Nigerian use. Rather, a more holistic approach, including identifying loopholes in the subject systems must be employed. Chuck and Kim (2011) note that the BREEAM and some other GBRS do not adequately address the issues of Indoor Air Quality (IAQ), which is particularly important because of its effect on health of the building occupants. Considering the population and density of Lagos, IAQ is one factor that must be a priority. Therefore, as effective as BREEAM may be, it may be inappropriate in the Lagos context.
6.4.1 Basic components of GBRS

As stated earlier, most GBRS set out to measure, monitor or evaluate basically the same building features and components. The various labels use credit or point systems to qualify the buildings in question. Reed et al. (2011) compared four major international GBRS and identified the following as issues that are all assessed in the systems:

- Indoor air quality
- Management
- Transport
- Health and well-being
- Water
- Material
- Land use and ecology
- Pollution
- Energy efficiency

Energy efficiency is particularly contributory to the potency of a GBRS because of its ability to significantly reduce energy use and GHG emission. Pérez-Lombard et al. (2009) state that performance certification in buildings must at the very least have an overall Energy Performance Index (EPI), overall minimum efficiency requirement, an energy grading label, with a well-defined scale, energy consumption details by building components and a guide, as to energy efficiency measures.

Though extensive analysis of various GBRS have previously been carried out by different authors (Michael, 2013, Reed et al., 2011, Mao et al., 2009, Haapio and Viitaniemi, 2008, Ali and Al Nsairat, 2009), these analyses are broad based and do not speak specifically to residential buildings. Three GBRS have therefore been identified and analysed in this study that can be adapted and used in the green housing certification in Lagos. These are the LEED for Homes, the Green Star SA – Multi Unit Residential v1 and Excellence in Designs for Greater Efficiency (EDGE). These systems have been chosen because of their specificity to residential building units and their wide acceptance and use across the African continent in comparison to other GBRS.
6.4.2 LEED for Homes

LEED for Homes is the residential building specific rating system created by LEED. As at 2016, 10 buildings in Africa and 192 buildings in the Middle East and North Africa had attained LEED for Homes certifications (USGBC, 2016). LEED for Homes was launched by the U.S. Green Building Council in 2008, though the ‘mother’ brand, LEED pre-dates it back to 1998. The system has 8 different categories that can attain up to 136 points in either certified, silver, gold or platinum certifications. LEED for Homes certification is made available for both single-family homes and multi-family housing projects up to eight storeys. The US Green Building Council (2014), in the Reference Guide for Homes Design and Construction v4, which is the official document that gives guidance for achieving LEED certification in buildings, describes the categories assessed for homes certification:

i. Innovation and design process – this category covers the project planning, determination of targeted level of certification and evaluation of building plan for risks to building durability.

ii. Location and linkages – this requirement is concerned with the location of the projects. Issues such as proximity to existing infrastructure, avoidance of environmentally sensitive sites, locations that discourage dependence on cars, building in or near existing communities and providing access to open spaces are taken into consideration. Alternatively, compliance with LEED for Neighbourhood Development rating system, which integrates principles of urbanism, smart growth and green building into neighbourhood design, can also earn the developer credits under this category.

iii. Sustainable sites – this category appoints credits for reduced site disturbance, reducing heat island effects, having a compact development design, sustainable landscaping and non-toxic pest control measures.

iv. Water efficiency – this category caters for water conservation in the building. Issues such as rainwater harvesting, and greywater recycling systems, reduction of indoor water and water-efficient irrigation systems earn credits for the developer in this category.

v. Energy and atmosphere – this category can earn up to 38 credit points. The prerequisites include insulation, reduced heating and cooling distribution losses, efficient HVAC system and ENERGY STAR® lights. Energy efficient
appliances such as water heating systems earn the developer more points in this category.

vi. Materials and resources – in this category, three major areas are assessed viz: Material-efficient framing, which seeks to reduce the unnecessary framing of materials, environmentally preferable products and construction waste management program. Developers are expected to give details of sources of materials and wood used is expected to be FSC-certified. Adequate provision must also be made for recycling of construction waste.

vii. Indoor environmental quality – certification on this category can either be by meeting the Environmental Protection Agency (EPA) Indoor airPLUS (an American voluntary indoor air quality labelling program) standards, or by a prescriptive path. The prescriptive path assesses issues such as ventilation, combustion venting, room-by-room HVAC distribution and local exhaust.

viii. Awareness and education – this category basically ensures proper documentation of the requirements for the building certification and the maintenance plan manual. These documents are handed over to the building users for the purpose of educating them on building and equipment use and maintenance.

6.4.3 The Green Star SA – Multi Unit Residential v1 (GSSA-MUR)
This system was selected for this study because of its use in South Africa, a country in close proximity to the study area and a forerunner in green buildings in the African continent. The tool is based on various national and international systems including the US LEED, the Australian Green Star and the UK BREEAM systems. The GSSA-MUR assesses residential developments with 3 or more dwelling units. Certification may be awarded for design at the end of the design phase, or for the building following construction. The GSSA-MUR Eligibility Criteria (2011) states that the aim of the system is to allow for innovation in building, reduce buildings’ environmental impact and reconcile sustainable building designs with sustainable building management and user behaviour. The achievable certification levels are 4 Star for best practice, 5 star for South African excellence and 6 star for world leadership.
The GSSA-MUR is assessed in nine environmental categories:

i. Management – this category assigns credits and oversees issues relating to environmental management, waste management, airtightness testing, occupants and user guides, commissioning and assessment of the building.

ii. Indoor Environment Quality – this category assesses ventilation, daylighting, thermal comfort, use of hazardous materials, private outdoor space, internal noise levels and the use of volatile organic compounds.

iii. Energy – under this category, issues such as heating and cooling, lighting energy use, hot water energy use, low emission energy generation, energy efficient appliances, conditional energy requirements and maximum electricity demand reduction are assessed and certified.

iv. Transport – this category covers issues such as local connectivity, access to fuel efficient commuting and mass transportation, cyclist facilities, and parking facilities provision.

v. Water – the assessments in this category cover water use efficiency, landscape irrigation, water efficient appliances, fire system water consumption and water sub-metering.

vi. Materials – the materials category assesses issues concerning recycling of building construction waste, local sourcing of materials, recycled contents and reused materials in construction, use of sustainable timber, minimisation of the use of steel and concrete and maximisation of dwelling unit sizes.

vii. Land Use and Ecology – the ecology category assesses reclaimed contaminated land, urban heat island effects, change of ecological value of sites and provision of outdoor communal facilities.

viii. Emissions – this assesses issues such as discharge to sewer, power generator emissions, refrigerant and gaseous ozone depletion potential (ODP), insulant ODP and watercourse pollution.

ix. Innovation – this category assesses and ascribes credits for innovative technologies and strategies, environmental design initiatives and exceeding the GSSA-MUR set standards.
6.4.4 Excellence in Design for Greater Efficiencies (EDGE)
EDGE is a specially designed GBRS created by the International Finance Corporation (IFC), a member of the World Bank, for emerging markets. EDGE certifies buildings that achieve 20% reduction in embodied energy, water and materials, each compared to a similar conventional building. Developers can use the EDGE software to explore technical options for building construction while simultaneously monitoring savings or additional costs in energy, water and materials used at the design stage. The Edge software takes location-specific details like city, climate and income category of users into consideration, while depending on a constantly updated databank to achieve custom-made assessments for various locations. Figure 6.3 is a screen shot of the EDGE software, showing some indicators used by the software to determine the greenness of subject buildings.

![Figure 6.3 Partial screenshot of the EDGE software](image-url)
Categories assessed in EDGE GBRS are as follows:

i. Energy Efficiency Measures – to assess energy efficiency in a building, EDGE considers factors such as reduced Window-to-Wall ratio (WWR), which seeks to find the right balance between maximising daylight and ventilation and proper enveloping of the building, solar reflectivity of roof and external walls, external shading devices, insulation of roof and external walls, low emissivity (Low-E) coated glazing for glass, use of multi-paned glazed glass, use of natural ventilation, HVAC, hot water generation, refrigeration and washing machines, energy saving and controlled lights, solar energy use and smart meters.

ii. Water Efficiency Measures – EDGE assesses water efficiency by examining factors including the use of low-flow taps for kitchen sinks and wash basins, single flush for water closets, rainwater harvesting and recycled greywater and black water for flushing.

iii. Material Efficiency Measures – this category assesses the building materials and their embodied energy content. Building elements assessed include floor slabs, roof construction, external walls, internal walls, flooring, window frames and wall and roof insulation. EDGE however does not assess the structural designs of a building to check that the structural integrity of the building is not compromised in a bid to achieve material efficiency.

6.5 Comparison of the systems
Mao et al. (2009) did a comparison of six major global GBRS viz. LEED, BREEAM, SBTool, CASBEE, BCA-Green Mark and the Evaluation Standard for Green Building (ESGB). Using the following attributes, they assessed the similarities and differences of the various systems based on the region in which they are operational:

- Organisation providing rating tool
- Market oriented
- Accredited professionals (assessors)
- Flexibility
- Usage domain (building types)
- Assessment issues
- Life cycle coverage (building phases)
- Weighting system
- Rating benchmark and labelling system.
This study adopts these same criteria to compare the three stated GBRS. However, the flexibility criterion is modified to assess how adaptable the system is to a different context to that which it is domiciled in. Also, the study adds another criterion – ease of use, to measure accessibility and ‘user-friendliness’ of the systems. The purpose of the comparison is to examine the adaptability of each system to the Lagos context. Table 6.1. shows the comparison of the three GBRS adopted in this study.

Table 6.2 GBRS comparison table

<table>
<thead>
<tr>
<th>Comparison Criterion</th>
<th>Residential Green Building Rating Systems</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LEED for Homes</td>
<td>Green Star SA</td>
<td>EDGE</td>
</tr>
<tr>
<td><strong>Market impact</strong></td>
<td>Over 50,000 housing units (U.S. Green Building Council, 2014a)</td>
<td>3 projects (Green Building Council South Africa, 2017b)</td>
<td>22 residential properties (EDGE, 2017)</td>
</tr>
<tr>
<td><strong>Accredited assessors</strong></td>
<td>LEED Accredited Professionals</td>
<td>Green Star Accredited Professionals</td>
<td>EDGE experts and auditors</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td>Developed for the US and must be adapted to other locations</td>
<td>Developed for South Africa and must be adapted to other locations</td>
<td>Uses database of climatic and socio-economic indicators for various countries, thus, is easily adaptable</td>
</tr>
<tr>
<td><strong>Building types</strong></td>
<td>Single family and multi-family housing units up to 8 storeys</td>
<td>Apartment buildings, blocks of flats, townhouses, detached or semi-attached single access housing developments of 3 or more dwellings, self-catering student accommodation and multi-family buildings which include communal kitchen/living/ablution facilities to a maximum of 9 bedrooms per kitchen/living facility.</td>
<td>All residential building types</td>
</tr>
<tr>
<td><strong>Assessment categories</strong></td>
<td>Innovation and design process, management, indoor environment quality, energy efficiency</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
location and linkages, sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality and awareness and education  
energy, transport, water, materials, land use and ecology, emissions, innovation  
measures, water efficiency measures and material efficiency measures.

<table>
<thead>
<tr>
<th>Building phases coverage</th>
<th>Design, construction and operation</th>
<th>Design and construction</th>
<th>Design and construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighting system</td>
<td>yes</td>
<td>yes</td>
<td>none</td>
</tr>
<tr>
<td>Rating benchmark and labelling system</td>
<td>Total points attainable – 136 Certified – 40 -49 points Silver - 50 – 59 points Gold – 60 – 79 points Platinum 80 or more points.</td>
<td>Total points attainable – 151 Four star – 45- 59 points Five star - 60 -74 points Six star – 75 points and above.</td>
<td>No point system</td>
</tr>
<tr>
<td>User-friendliness</td>
<td>Needs consultation with an accredited professional</td>
<td>Needs consultation with an accredited professional</td>
<td>May not need consultation, software allows for self-assessment before certification</td>
</tr>
</tbody>
</table>

Source: Author’s construction

While all the systems analysed are potentially feasible to be used in the Lagos context, the EDGE appears to be the most appropriate system to be used in the immediate. Given the system’s lack of ‘strictness’ and allowance for the user to be creative in determining the needed energy, water and materials saving techniques, this system may be a preferred choice for would-be green housing investors. The fact that the EDGE is also user ready, without any need for adaptability before use is an added advantage over the other systems.
The administration of a GBRS can only improve over time. As it is being used continually, flaws and areas that need to be restructured will be exposed, even as changes in lifestyles and technology call for constant upgrading of the systems. Even established systems continue to need upgrading from time to time, as flaws are noticed. Reeder (2010) also notes that GBRS usually certify buildings before they are occupied and are therefore ‘occupant-neutral’. However, the environmental sustainability of a building is also largely dependent on the way it is used. It is therefore expedient that an effective GBRS has a well-structured information and education plan for both property owners and occupiers, if they are different parties. Certification of buildings should also not be a one-off exercise, but should include a plan for regular and periodic evaluation, to ensure that the aim of GHG reduction is still being achieved over time.
CHAPTER SEVEN

7. Data presentation, analysis and discussion

7.1 Introduction

This chapter presents and discusses the findings of the various surveys carried out for the case study. The findings are collated from the home users, estate surveyors and valuers, architects, quantity surveyors and the property developers that provided the primary data used in this study. The study seeks to find a connection between various factors influencing green housing investment and property developers’ decision to invest in green housing. Thus, while data on basic characteristics and green housing knowledge of home users was sought for assessment of the demand side of the commodity, property practitioners’ perceptions and professional opinions formed the data acquired on the supply side.

7.2 Quantitative data presentation

7.2.1 Home users’ survey

To achieve the overall aim of this study, which is to create a framework for green housing investment in Lagos, a survey of residential property (home) users, resident within the Lagos metropolis was conducted. The objective of the survey was to assess the level of awareness of green buildings and the willingness to pay for the commodity among Lagos residents. The data, which was gathered via a structured questionnaire was analysed using the IBM SPSS version 23 software package and Microsoft Excel 2016.

A total of 600 survey questionnaires were distributed to home users in the three strata that were adopted for the study viz: Low density, medium density and high-density neighbourhoods. Two hundred questionnaires were distributed within neighbourhoods in each stratum as presented in Table 2.2 of chapter two. The total number of responses received were 446, out of which 399 were valid. Of these, 47 responses were invalidated due to unanswered questions in some sections of the questionnaire and multiple answers in sections that required single answers. The valid response rate of the administered questionnaires was 67%. The response rates of the various strata within this subject group are represented in the table 7.1.
Baruch (1999) recommends that for quantitative surveys in the behavioural sciences, the acceptable response rate of questionnaires should be higher than or within 1 standard deviation rate from the average of 55.6%. In this study, the rate of responses obtained from residents in the high-income neighbourhood fall short of this recommendation with a response rate of 51% and a standard deviation of 3.3. This may be attributed to the exclusive nature of high-income neighbourhoods, which makes accessibility to residents difficult. However, the data is being used, considering that the same number of questionnaires were administered in high-income neighbourhoods with lower population in comparison to the other neighbourhoods.

Table 7.1 Frequency Distribution of Home Users’ Questionnaires

<table>
<thead>
<tr>
<th>Neighbourhood type</th>
<th>Questionnaires distributed</th>
<th>Responses received</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Valid Responses</td>
<td>% Frequency</td>
</tr>
<tr>
<td>Low income</td>
<td>200</td>
<td>187</td>
<td>163</td>
</tr>
<tr>
<td>Medium income</td>
<td>200</td>
<td>151</td>
<td>134</td>
</tr>
<tr>
<td>High income</td>
<td>200</td>
<td>108</td>
<td>102</td>
</tr>
<tr>
<td>Total</td>
<td>600</td>
<td>446</td>
<td>399</td>
</tr>
</tbody>
</table>

Source: Field survey (2016)

7.2.1.1 Socio-demographic characteristics

Basic demographic details were obtained from the respondents. The frequencies and percentages are presented in table 7.2 below. The results indicate that majority of the respondents fall between the active working ages of 20 and 50. This particular statistic is important because this age group forms the bulk of housing acquisition decision makers, both presently and in the near future. The results also show that the respondents are well spread among various occupation sectors, indicating that the responses are not drawn from particular professional viewpoints.

An assessment of the education levels of respondents showed that only 1% of the respondents had not had some form of formal education. At least 78% of the respondents have a first degree while over 20% have an ordinary level (secondary school leaving) certificate. This data suggests that the respondents have a basic understanding of the questions asked in the administered questionnaire. Table 7.2 shows the distribution of respondents by age group, occupation sector and education levels.
Table 7.2 Demographic distribution of respondents

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>% Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group</td>
<td>20 – 34</td>
<td>20.8%</td>
</tr>
<tr>
<td></td>
<td>35 – 49</td>
<td>61.7%</td>
</tr>
<tr>
<td></td>
<td>50 – 64</td>
<td>9.5%</td>
</tr>
<tr>
<td></td>
<td>65 and above</td>
<td>6.2%</td>
</tr>
<tr>
<td></td>
<td>Below 20</td>
<td>1.8%</td>
</tr>
<tr>
<td></td>
<td>Finance</td>
<td>23.1%</td>
</tr>
<tr>
<td>Occupation Sector</td>
<td>Education</td>
<td>19.4%</td>
</tr>
<tr>
<td></td>
<td>Built Environment</td>
<td>8.4%</td>
</tr>
<tr>
<td></td>
<td>Consumer goods trading</td>
<td>11.2%</td>
</tr>
<tr>
<td></td>
<td>Medical Services</td>
<td>6.3%</td>
</tr>
<tr>
<td></td>
<td>Information Technology</td>
<td>6.3%</td>
</tr>
<tr>
<td></td>
<td>Oil and gas</td>
<td>3.7%</td>
</tr>
<tr>
<td></td>
<td>Environment and ecology</td>
<td>1.6%</td>
</tr>
<tr>
<td></td>
<td>Civil Service</td>
<td>5.2%</td>
</tr>
<tr>
<td></td>
<td>Media</td>
<td>5.2%</td>
</tr>
<tr>
<td></td>
<td>Legal Services</td>
<td>1.6%</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>7.6%</td>
</tr>
<tr>
<td></td>
<td>O’ level Certificate</td>
<td>7.1%</td>
</tr>
<tr>
<td>Education level</td>
<td>National Diploma</td>
<td>6.6%</td>
</tr>
<tr>
<td></td>
<td>Professional Certification</td>
<td>6.6%</td>
</tr>
<tr>
<td></td>
<td>B.Sc. / Higher National Diploma</td>
<td>46.0%</td>
</tr>
<tr>
<td></td>
<td>Masters</td>
<td>31.3%</td>
</tr>
<tr>
<td></td>
<td>Ph. D</td>
<td>1.5%</td>
</tr>
<tr>
<td></td>
<td>None of the above</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Source: Field survey (2016)

The study also set out to determine the status of residency of the respondents, in a bid to assess if it had an effect on their knowledge of green buildings, or on their WTP for the commodity. Table 7.3 shows the distribution of respondents by residency status.

Table 7.3 Distribution of respondents by residency status

<table>
<thead>
<tr>
<th>Neighbourhood type</th>
<th>Tenants</th>
<th>Owner-Occupiers</th>
<th>Employer provides housing</th>
<th>Squatter</th>
</tr>
</thead>
<tbody>
<tr>
<td>High density</td>
<td>135</td>
<td>24</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Medium density</td>
<td>106</td>
<td>16</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Low density</td>
<td>55</td>
<td>28</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>296</td>
<td>68</td>
<td>13</td>
<td>22</td>
</tr>
</tbody>
</table>

| % Frequency         | 74.19%  | 17.04%          | 3.25%                     | 5.51%    |

Source: Field survey (2016)
The high rate of home renters among the respondents aligns with the earlier stated residency statuses of residents within Lagos metropolis (see page 20).

### 7.2.2 Estate surveyors and valuers’ (ESV) survey

As major stakeholders in the Lagos housing market, estate surveyors and valuers practicing in Lagos were surveyed to assess their level of awareness of green housing. This group of respondents was also surveyed to understand the green housing market in Lagos, with a view to identifying possible green housing investment drivers and deterrents. Data collected from this group of participants was both quantitative and qualitative in nature. While the quantitative data was used to get a general sense of ESVs perception of green housing, the qualitative data was used to gather information on the marketability of the commodity.

A total of 175 survey questionnaires were administered to this group of participants. The total number of responses received was 112, of which 103 were valid, representing 58.9% of the participants. Nine responses were invalidated for providing multiple answers to single answer questions. The survey sought to determine the duration of practice of the respondents. Table 7.7 shows the distribution of respondents by location, to ascertain that the sample represents the two major divisions of the state, and duration of practice. The results show that 83% of respondents had been practising for at least 5 years in Lagos. This minimum duration of practice suggests a good working knowledge of the housing market in Lagos, hence the requisite experience needed to answer the questions.

#### Table 7.4 ESVs practice location and duration

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>% Frequency</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location of practice</td>
<td>Lagos Island</td>
<td>44.7%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lagos Mainland</td>
<td>55.3%</td>
<td></td>
</tr>
<tr>
<td>Duration of practice</td>
<td>Less than 5 years</td>
<td>17.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 – 10 years</td>
<td>47.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 – 15 years</td>
<td>15.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 -20 years</td>
<td>16.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 – 30 years</td>
<td>3.9%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s survey (2016)
7.2.3 Property developers’ survey

The questionnaire for the property developers was constructed to measure the key variables of the theory of planned behaviour (TPB) as stated in the methodology chapter (see Real Estate Developers and Investors), viz. attitude, subjective norms, perceived behavioural control, intention and behaviour according to the TPB structure by Ajzen (2011a). However, the questionnaire also contained other questions to obtain basic operational data from the property developers. A total of 60 questionnaires were administered by the researcher and 48 questionnaires were retrieved, resulting in an 80% rate of return. 100% of returned questionnaires were valid with no missing values.

7.2.3.1 Property developers’ operational data

The respondents were asked to state their companies’ key areas of operation, with the aim of establishing their levels of experience in the property development sector. All the respondents stated that they were involved in new property development and property marketing. Forty three percent (21) respondents stated that they renovated old buildings for resale, while one respondent stated that his firm is involved in retrofitting. Forty eight percent of the respondents stated that they had been in the industry for between 11 and 15 years. Figure 7.1 shows the distribution of respondents by duration of practice.

![Figure 7.1 Duration of practice of property developers](image-url)
The study assumed that the longer the developers have been in practice, the more conversant they are likely to be with the property development market. Therefore, with 73% of the respondents having experience of over 10 years, the generality of the respondents is well experienced. It was also important to know the frequency of residential building projects being handled by the various firm, as that information is also likely to have an effect on their knowledge of the market and business decisions. Figure 7.2 shows the distribution of respondents by number of projects executed.

![Figure 7.2 Residential projects in the last 5 years](image)

The subjective norm construct of the TPB suggests that the behaviour of a person is, among other things, a product of the influence that certain personalities may have on that person. Hence, the respondents were asked to state those personalities or entities that could be said to have major influences on their business decisions. While 92% of the respondents stated that they were influenced by investors in their products i.e. property purchasers and company shareholders, 85% stated that they are influenced by the performance of the property market. Figure 7.3 shows how the property developers responded. A smaller percentage of 38% mentioned their business financiers as their business decision influencers while 19% stated that competition businesses influenced their business decisions.
Figure 7.3 Major influencers of business decisions

The study sought to assess the extent to which property developers currently integrate green building practices into their building projects. The building features were adopted from the study by Hlad (2009) and adapted to this study (see section Real Estate Developers and Investors and Figure 7.4 where the features are recaptured). The results show that only 4 of the 11 features stated had been used by the respondents in residential building construction projects. These features are: use of renewable materials, solar orientation, daylighting and passive designs. Figure 7.4 shows how the developers responded to this question.

Figure 7.4 Features used in construction by property developers
7.3 Awareness of green housing among Lagos stakeholders

7.3.1 Knowledge of green housing among Lagos State home users

In the assessment of the level of awareness of green buildings among the home users surveyed, 59% (234 respondents) reported that they had not heard the term ‘green buildings’ at all. However, 33% (134 respondents) claimed to have heard the term, while 8% (31 respondents) were uncertain that they had heard the term. Figure 7.5 shows the frequency of responses to the question ‘Have you heard of the term ‘green buildings’?’

![Have you heard of the term 'Green buildings'?](image1)

**Figure 7.5 'Have you heard of the term 'green building'?’**

The respondents were also asked to indicate if they actually knew the meaning of, or in the least, had an idea of what green buildings are. Figure 7.6 shows the frequency of respondents’ knowledge of green buildings.

![Do you know what a 'Green building' is?](image2)

**Figure 7.6 'Do you know what a green building is?’**
To further assess the extent to which the respondents’ perceived knowledge or ideas of green buildings match reality and translate into actual knowledge, they were asked to briefly describe what a green building is. The respondents’ descriptions were then checked against an adopted basic green building definition by Howard (2003):

“the practice of (1) increasing the efficiency with which buildings and their sites use energy, water, and materials, and (2) reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal — the complete building life cycle.”

Valid responses were then identified to establish actual knowledge of green buildings. The following are some valid descriptions of green buildings given by the respondents:

Description 1:

“Building that is designed to be energy efficient, by minimizing waste and utilising nature and materials that leave a low energy footprint and reduce damage to the environment.”

Description 2

“A house with better indoor air quality, lower electricity bills and less hazardous environmental pollution.”

Description 3

“An environmentally friendly building.”

Description 4

“Provides less environmental pollution.”

Description 5

“It is an environmentally sustainable building, design or construction.”

While some of the invalid descriptions given by the respondents are as follows:

Description 1

“A house made of glass.”

Description 2

“Any building with pent house painted green.”
Description 3

“It has to do with planting of trees around the building.”

Description 4

“Buildings that are built from natural or man-made materials.”

Table 7.5 shows the relationships between the perceived knowledge and actual knowledge of green buildings among the respondents. The result shows that while 20.1% had correct ideas of green buildings, determined by how they were described, 79.9% of the respondents either had no idea of what green buildings are, or were inaccurate in their descriptions.

Table 7.5 Knowledge of green buildings among respondents

<table>
<thead>
<tr>
<th>KNOWLEDGE OF GREEN BUILDINGS</th>
<th>No knowledge</th>
<th>Incorrect Description</th>
<th>Correct Description</th>
<th>Uncertain but Correct Description</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of green buildings</td>
<td>No</td>
<td>100.0% (248)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>31.4% (31)</td>
<td>68.6% (69)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uncertain</td>
<td>50.0% (25)</td>
<td>26.9% (14)</td>
<td>23.1% (12)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>68.6% (273)</td>
<td>11.3% (45)</td>
<td>17.2% (69)</td>
<td>2.9% (12)</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

The results show a low level of green housing awareness among the respondents. Only about 20% of the respondents could accurately describe a green building. Since the demand for the commodity is highly dependent on the users’ knowledge of its purpose and benefits, this low level of awareness may be a deterrent to the adequate demand required to motivate investment in green housing. This result also further confirms the fact that the respondents’ desire for green housing attributes, as stated in the previous section, is not directly linked with their knowledge of the green housing concept.

In the FGD with the policy makers, the participants identified lack of awareness of green buildings among the general populace of Lagos home users as a major factor deterring the growth of the green housing market in Lagos. They were of the opinion that a lack of interest, knowledge and understanding of fundamental environmental issues among all stakeholders is responsible for the lack of awareness in the first instance, and the
insignificant green housing stock in Lagos. Comments on the lack of awareness among the general citizenry of current environmental issues and green housing as an alternative to conventional housing units, featured severally in the discussions.

“Ignorance has its own role. Not many people even understand what you mean by green buildings.” – PM3

“Well, as the chairman of the environment committee, I can tell you that as a principle of law states, you can’t give what you don’t have. Now we have people who don’t even understand when we are talking about climate change, both among the legislators and the executives that are meant to implement; because if they do they would have given environment more serious attention.” – PM13

“(Environmental) Knowledge is low even among political decision makers.” – PM9

“Well, apart from the fact that it’s a new concept here in Nigeria, I think we also need to define green buildings, because when we talk about green buildings, there is a biased for the technology intensive kinds, the more elaborate structures with more glass, water recycling and zero waste etc. So basically, there needs to be more enlightenment about what green buildings really are.” – PM15

### 7.3.2 Knowledge of green buildings among ESVs

To assess whether the ESVs had knowledge of green buildings, they were asked if they knew what green buildings are. While 71.8% (72) of the respondents stated that they had knowledge of green buildings, 28.2% (31) stated that they had no knowledge of green buildings and none of the respondents stated that they were uncertain of what green buildings are. Figures 7.7 shows distribution of GB knowledge among the ESVs.
To confirm the accuracy of the ESVs knowledge of green buildings, they were asked to briefly describe what a green building is. As in the case of the home users, the basic definition by Howard (2003) was used to check the validity of the responses. Of all the respondents that indicated knowledge of green buildings, 54% (39) provided valid descriptions of green buildings, while 46% (33) provided invalid descriptions. Stated below are some of the responses provided by the participants.

Valid responses:

Description 1

“Resource efficient building, characterised by saving from increased building value, higher lease rates and decreased utility cost.”

Description 2

“Energy efficient buildings, that make use of eco-friendly products, renewable energy for construction and operation.”

Description 3

“Environmentally sustainable buildings, designed constructed and operated to minimise the total environmental impact.”

Description 4

“Use of environmentally friendly materials/items in building.”
Description 5

“Homes that use less energy”

Invalid responses:

Description 1

“A way by which a house is being decorated with flowers in a green form.”

Description 2

“A building that can sustain itself.”

Description 3

“Cost effective houses.”

Description 4

“Building using modern technology.”

Description 5

“Homes or developments that have good attributes or natural green trees.”

A total of 31% of the respondents claimed to have green buildings in their companies’ property portfolios, while 69% stated that they did not have green buildings in their portfolios. While 36% of the respondents claimed to have pitched the idea of investing in green buildings to clients at some point, 64% stated that they had not. However, a cross-tabulation of these responses against the correctness of their descriptions of green buildings was carried out to verify the validity of these claims. The cross-tabulation was necessary, since a possession of basic knowledge of green buildings is pre-requisite to having them in their portfolio and being able to pitch them as an investment idea to clients.

Table 7.6 shows that only 12 out of the 22 respondents who claimed to have green buildings in their portfolio had accurately described green buildings in the earlier question. Also, only 14 out of 26 who claimed to have pitched green building to their clients at some point, had accurately described green buildings. The table therefore may reflect the true number of respondents that have green buildings in their portfolio and have pitched same to clients at some point.
Table 7.6 Cross-tabulation for response validity

<table>
<thead>
<tr>
<th>Validity of GB description</th>
<th>‘Do you have green buildings in your company portfolio?’</th>
<th>‘Have you ever pitched green building investment to clients?’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>(12) 17%</td>
<td>(14) 19%</td>
</tr>
<tr>
<td>No</td>
<td>(10) 14%</td>
<td>(12) 17%</td>
</tr>
<tr>
<td>Valid</td>
<td>(27) 37%</td>
<td>(25) 35%</td>
</tr>
<tr>
<td>Invalid</td>
<td>(23) 32%</td>
<td>(21) 29%</td>
</tr>
</tbody>
</table>

Hence, only about 54% displayed correct knowledge of green buildings as against the 78% that indicated that they did. This represents about half of the sample size. It can therefore be said that there is an average level of awareness of green buildings among the estate surveyors and valuers. This level of awareness can be considered as low, as the estate surveyors and valuers are the main interface between property owners and renters, and the expected promoters of green housing. Therefore, the ESVs may be said to be partly responsible for the gap in green housing awareness among home users, which they have also stated as a reason for the non-vibrancy of the green housing market.

Discussing how home users can be more aware of green housing, the ESVs stated that green homes would have to be marketed in a more specialised manner than other conventional properties. They stated that the product would have to be marketed in a way that would make environmentally friendly buildings attractive to users. They were also of the opinion that there is a need to identify a class of environmentally conscious users and market such housing type to them specially. The following comments emanated in this regard during the FGD with the ESVs.

“It would appear that the buyers or users of green buildings must be persons well informed of the benefits to be prepared to pay the extra Nairas for its ownership or use.” – ESV7

“You have to identify those who are concerned about the environment enough to be willing to pay a premium for green housing units or as a contribution to society” – ESV4

“Green housing will definitely have to be marketed differently because of the general lack of awareness among the Nigerian populace. Emphasis must be laid on benefits both to the environment and to the user during marketing.” – ESV2
The discussion with the ESVs also pointed out that sensitizing clients on green housing as an option for accommodation, through professional advice or other media, is a role of ESVs necessary for growing the green housing market. Some of the comments that ensued are as follows:

“(ESVs) have to be at the forefront of creating awareness as to the benefits of green buildings. ESVs get the most feedback on buildings from the users, they are therefore in the best position to suggest building preferences both to the construction team and the project investors while also advising users on beneficial features of the building. Unfortunately, most times, the ESV is only invited when the project is 30 – 40% done. So, it’s difficult to have any meaningful impact at that time.” – ESV1

“I just think we need to be more aggressive as a professional body in advocating green building practices. When people need accommodation, they come to estate agents, which gives us a chance to propose green alternatives to them alongside conventional ones and also the chance to state the advantages of green buildings over conventional ones.” – ESV7

“It will be useful to actually have a sort of consortium of this kind of property developers (ERPI), you know. Because that in itself is bound to spread awareness of green buildings among stake holders by generating public interest in what they are about.” – ESV2

The discussion indicates that while the ESVs acknowledge a low level of awareness among ESVs, they also recognise their role as professionals in bridging the information gap, by virtue of their relationship with the consuming public.

7.3.3 Knowledge of green housing among policy makers

Some of the policy makers also exhibited a lack of awareness of environmental degradation, and green housing. Their apparent ignorance of the subject was evident in their comments in green housing. Some of such comments are listed below.

“In our own case here, with due respect to whatever you are researching, our contribution to this environmental degradation is not that much, because we are a developing nation. If you go outside to the western world, those are the ones
that are causing more havoc, and it’s because of their industries and not the residential buildings you are talking about now.” – PM7

“This climate change we are talking about, when did we start talking about it, when did I hear about it? Just a few years ago and I am even in government. We are starting very late here.” – PM13

The discussions revealed a minimal level of knowledge of environmental issues among majority of the respondents. There was also an indication that the policy makers do not prioritise or place the necessary importance on these issues. Except among policy makers in the ministry of environment, there was very minimal mention of green buildings, though the participants from the various agencies were asked about it. This implies a lack of in-depth knowledge of green buildings among the class of people that are supposed to formulate policies to drive the sector.

7.3.4 Knowledge of green buildings among property developers

The study also sought to assess the knowledge of green buildings among property developers. While 96% (46) of the respondents stated that they knew what green buildings are, the other 4% (2) respondents stated that they did not. Again, the accuracy of this knowledge was tested by the respondents being asked to furnish the researcher with a short description of what green buildings are. The descriptions were once again checked against the adopted definition by Howard (2003). While 98% (47) of the respondents that stated knowledge of green buildings described them accurately, 2% (1) described green buildings wrongly. Valid responses provided include the following:

“Green building refers to construction of a structure and the using of processes that are environmentally responsible and resource-efficient throughout a building’s life-cycle from siting to design, construction, operation, maintenance, renovation, and demolition.”

“Low energy buildings.”

“Environmentally friendly buildings or buildings that use materials and systems with minimal negative environmental impact.”
From the responses, majority of the property developers do have a basic understanding of the concept of green buildings. However, as discussed in later sections of this thesis, this knowledge does not necessarily mean that the developers are involved in green housing projects. During the discussion with the ESVs, they pointed out that investors’ inclination towards environmental responsibility is key to increasing the green housing stock in Lagos. They however pointed out that there are very few investors and developers in Nigeria that are environmentally inclined, a factor they associated with lack of awareness of the related issues. They stated that there should be a deliberate effort to identify and engage ERPIs, in a bid to growing the green housing sector. The following comments were made:

“In more developed countries, there are property investors who are noted for being responsible and therefore invest in sustainable properties. However, that is hardly the case here, primarily because the investors don’t even know what it means to be a responsible investor. Until it becomes fashionable to be called a responsible investor, or until it becomes needful for certain benefits, green buildings will remain an unattractive option for property investors.” - ESV1

“I am of the opinion that clients that exhibit even the minutest traits of environmental responsibility should be identified and properly oriented about the relationship between buildings and the environment. You’ll be surprised at the results that will produce.” – ESV8

A general consensus from this section is that there is a dearth of green housing information that is available to the major decision-makers in green housing transactions in Lagos. On the part of the consuming public, relevant enlightenment on the environment and housing type options available to them would definitely have an effect on demand for the product. On the part of the investors and developers, adequate market information including a specialised marketing strategy, provided by the relevant professionals would serve as tools for informed business decision making. The discussion also pointed to the fact that environmentally responsible investors need to be
identified and possibly organised into a recognised group in a bid to develop the green housing market in Lagos.

7.4 Ranking of housing attributes

The research sought to assess how knowledgeable housing stakeholders in Lagos are about green housing. However, considering the unfamiliarity of Lagos residents with the term ‘green housing’, their perception of how important they perceived some basic housing attributes to be and how they ranked the attributes, were the bases of assessment. The interval ranking method (Churchill and Iacobucci, 2006) was used to determine the perceived level of importance of each of the attributes. This was done using a scale of 1 to 8, with 1 being the most important attribute and 8 being the least important. To compute the final ranking of the attributes, the following formula employed by Van Calker et al. (2005) was inverted since the attribute scale they used in their study was also inverted (i.e. 1 to 5, 1 being the least important and 5 being the most important attribute).

\[ W_{ij} = \frac{X_i}{X_{ij}} \]

Where \( W_{ij} \) = Relative importance weight
\( X_{ij} \) = Value of attribute i for respondent j
\( \overline{X_j} \) = Average ranking of all attributes for respondent j

Table 7.7 presents the ranking of the various attributes, as perceived by the sample of home users in Lagos. The respondents prioritised attributes such as no negative effect of building on occupants’ health, improved indoor air/environment quality and savings on both utility bills and rent/cost of acquisition of building over more physical attributes such as aesthetics and large room sizes.
Table 7.7 Interval ranking and relative importance weights for housing attributes

<table>
<thead>
<tr>
<th>No.</th>
<th>Attributes</th>
<th>Average Interval ranking</th>
<th>Std.Dev.* Interval Ranking</th>
<th>Average Importance Weight</th>
<th>Std.Dev. importance Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No negative effect of building on occupants’ health</td>
<td>2.90</td>
<td>1.65</td>
<td>1.50</td>
<td>0.37</td>
</tr>
<tr>
<td>2</td>
<td>Improved indoor air/environment quality</td>
<td>3.09</td>
<td>1.78</td>
<td>1.42</td>
<td>0.38</td>
</tr>
<tr>
<td>3</td>
<td>Reduced utility bills</td>
<td>2.92</td>
<td>1.58</td>
<td>1.20</td>
<td>0.17</td>
</tr>
<tr>
<td>4</td>
<td>Savings on rent/cost of acquisition</td>
<td>3.62</td>
<td>1.67</td>
<td>1.20</td>
<td>0.26</td>
</tr>
<tr>
<td>5</td>
<td>Reduced impact of building on the environment</td>
<td>4.24</td>
<td>1.74</td>
<td>1.03</td>
<td>0.38</td>
</tr>
<tr>
<td>6</td>
<td>Aesthetics</td>
<td>5.84</td>
<td>1.48</td>
<td>0.74</td>
<td>0.35</td>
</tr>
<tr>
<td>7</td>
<td>Large room sizes</td>
<td>5.90</td>
<td>1.80</td>
<td>0.74</td>
<td>0.40</td>
</tr>
<tr>
<td>8</td>
<td>Modern design</td>
<td>6.33</td>
<td>1.46</td>
<td>0.68</td>
<td>0.32</td>
</tr>
</tbody>
</table>

*Standard deviation

It can be inferred from the results, that home users have a preference for green housing attributes, even if they did not label them as green characteristics. Based on this therefore, there could be demand for green housing units, if the green attributes are made glaring to the prospective home-user. These attributes can therefore be viewed as selling points for green residential homes.

The ESVs were also asked to rank stated housing features in the order of their perceived importance. The attributes were to be ranked from 1 to 7, 1 being the most important and 7 being the least important feature. The ranking by the ESVs is considered important, because this group of participants constantly deals with the demand for housing and hence has a clearer understanding of its clients’ preferences. Table 7.8 shows these attributes and how important they are perceived by the estate surveyors and valuers to be.
Table 7.8 Ranking of housing attributes

<table>
<thead>
<tr>
<th>No.</th>
<th>Attributes</th>
<th>Average Interval ranking</th>
<th>Std.Dev. Interval Ranking</th>
<th>Average Importance Weight</th>
<th>Std.Dev. importance Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Energy/ Water efficiency</td>
<td>1.86</td>
<td>1.42</td>
<td>2.15</td>
<td>0.36</td>
</tr>
<tr>
<td>2</td>
<td>Life Cycle Cost Savings</td>
<td>3.39</td>
<td>1.55</td>
<td>1.18</td>
<td>0.39</td>
</tr>
<tr>
<td>3</td>
<td>Improved occupants’ health</td>
<td>4.06</td>
<td>1.77</td>
<td>0.99</td>
<td>0.44</td>
</tr>
<tr>
<td>4</td>
<td>Improved Indoor Air Quality</td>
<td>4.12</td>
<td>1.55</td>
<td>0.97</td>
<td>0.39</td>
</tr>
<tr>
<td>5</td>
<td>Environmental protection</td>
<td>4.45</td>
<td>1.73</td>
<td>0.90</td>
<td>0.43</td>
</tr>
<tr>
<td>6</td>
<td>Reduced cost of construction</td>
<td>5.03</td>
<td>2.15</td>
<td>0.79</td>
<td>0.54</td>
</tr>
<tr>
<td>7</td>
<td>Aesthetics</td>
<td>5.09</td>
<td>1.79</td>
<td>0.79</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Contrary to the attribute ranking presented by the home-users (Table 7.7), the ESVs considered energy/water efficiency as the most important housing attribute. However, an examination of the rankings shows a similarity in the first four attributes ranked by both the ESVs and the home users. This iterates a conflation of perceptions between the home users and the ESVs. This also iterates the earlier stated assertion, that these attributes would constitute viable selling points for green housing units.

7.5 Qualitative data presentation

7.5.1 Public attitude towards the environment and green buildings

Public attitude towards the environment in particular and green housing in general was a recurring theme in the discussions. Various participants expressed on one hand and identified on the other, that attitudes towards green housing in particular and environmental sustainability in general, are factors affecting the growth of the green housing stock in Lagos. One participant from the ministry of environment (MOE) and another from the ministry of housing (MOH) commented that one of the reasons the built environment contributes to global warming is the publics’ general attitude of over-dependence on technology. Their comments are stated below:
“Everybody is now dependent on technology and the more we depend on technology, the more we extract resources from the earth, the more we extract these resources, the more we lose resources the more emission goes out.” – PM6

“Times are changing and machines are taking over activities that humans used to perform. Machines are produced using natural resources and powered using generated energy. Microwaves, washing machines, vacuum cleaners etc. are all directly or passively responsible for our degrading environment.” – PM3

The comments show that these government officials are not totally oblivious to the issues surrounding global warming and climate change generally. The participants also acknowledged that attitude changes, from their current methods living to more environment friendly methods are necessary to effectively tackle climate change. Commenting on the role of the built environment and especially the housing sector in reducing GHG emission, participants expressed the need for attitude changes among property owners, users and governing bodies. Participants used words including ‘mentality change’, ‘attitude change’, ‘reorientation’ and ‘rethinking’ to express the need for positive changes in behavioural dispositions towards environmental issues, building methods and building operations, by considering more environmentally sustainable options. The participants also expressed that on the part of citizens, there is a need for change in attitude towards choices made in regards to location of residences, types of residences, and modes of commuting from one point to another. The following are the responses of participants in this regard:

“We are living individualistic lives and there needs to be an attitude change. For example, in Lagos, it’s an idea that everybody wants to own a car or cars. And the more those things are in place, the more emission goes out, the more materials we need to maintain them. So instead of us moving to an advanced way of commuting like urban transportation where a train can move over a long distance of space, in Lagos, everyone wants to own theirs and the government is not even doing anything about it.” – PM5

“We need a mentality change. People need to start consciously incorporating greenery into their building plans. Instead of finding ways to over-develop the site to maximise profit, allowances must be made for green areas that have
positive effects on both the environment and the occupants of the building.” – PM4

“One problem in Lagos is that property developers always try to maximise space and develop every available space on the site. This practice is however harmful to the environment.” – PM16

These comments however show a limited knowledge of the concept of green housing or green buildings at large, among the policy-makers. None of the respondents categorically mentioned green buildings as a possible tool for abating climate change, rather, responses were focused on greening the environment and methods of commuting.

In response to how the government can drive the green housing sector, participants expressed the need to rethink and recreate the current space planning techniques used in the state. They stated that the current planning laws applicable and social amenities available in Lagos do not essentially promote environmental sustainability. The following comment was made in this regard:

“We need to make a case for urban designs or physical planning, how we think of the cities. Say for example, what it means for people to get up early in the mornings and go to work and why we have to live far away from the urban centres and commute long distances. It is the rethinking of physical planning of the cities, so that there is less need for mobility, there is better connection, ...just those types of long-term planning that can redesign clusters of communities, where people can live and work in close proximity. Also, deciding to reduce urban sprawl by densification by building taller and bigger buildings that cover less space on the ground so that you can have more green open areas for people to share. Just generally rethinking how we build our cities.” – PM12

The public’s obstinate attitude towards ‘different from the usual’ building methods and techniques was identified by participants as one of the factors responsible for a shortfall in the current green housing stock. It was noted that the growth of the green housing market may be negatively affected by the unwillingness of property developers to embrace different building techniques, which also include green building techniques. One participant commented as follows:
“We are stuck in our ways; we already have a mind-set of what a building is supposed to look like or how it is supposed to be built. So, if any other method or technique is being introduced, people are averse to it.” – PM3

Another participant stated:

“If we had more institutionalised developers (referring to developers recognised by governing bodies) investing in the development of green housing units, like members of the (Real Estate Development Association of Nigeria) REDAN, it is likely to become a more fashionable trend to build green.” - PM10

The attitude of some building practitioners was also identified by the policy makers as a likely deterrent to promoting green housing. Architects and builders especially were noted to be in the habit of deviating from the approved building plans during actual construction of the buildings. This factor however is subjective, as it may be more of a development control inadequacy than an attitudinal problem. Since building control is the job of public officers, who in this case are making the assertion of plan deviation against the building practitioners, the inadequacy may actually be from the policy makers rather than the building practitioners. Some participants from the Ministry of Physical Planning and Urban Development expressed their views as follows:

“When we insist that no matter what, there must be cross ventilation and natural lighting in every room, even architects that are supposed to educate their clients argue with you because they want to adopt some designs that don’t incorporate those things.” – PM11

“Honestly, we have more problems with architects than we have with property owners as regards the building designs. They present one plan to the ministry just to get approval and go back to execute another plan on site.” – PM9

Participants from all the agencies represented shared a common view about the public, including policy makers’ changing from the status quo to an environmentally aware attitude, as a driving force for green housing construction and investment in Lagos. The following are four different comments emanating from the four agencies:

“For green housing to become mainstream in Lagos, there needs to be a reorientation of everybody including policy makers. Everybody needs to know
that things have really changed and there should be awareness for people to know that the way we used to build should change in order to protect the environment.” – PM7

"An attitude change is necessary to drive this thing (green housing investment) you are talking about, and that may not happen until people see the need for it.” – PM4

“There are no enabling policies because this country has not yet taken environmental issues seriously.” – PM13

“The government has to be more purposeful in enforcing building regulations, because presently, profit maximisation is what drives real estate investors rather than the need to do the right thing.” – PM10

The discussions revealed that the policy makers acknowledge that policy making is a necessary tool for driving the Lagos green housing sector. Significantly, the policy makers indirectly implied that the issues they raised as deterrents to the green housing sector growth, are issues that can be solved by proper policy formulation and implementation. For instance, the act of deviating from approved building designs by architects can be checked by proper policy enforcement. Policies can also be used to compulsorily infuse green features into building designs.

7.5.2 Feasibility and viability of green housing

The practicability of green housing investments is dependent on various factors. Therefore, this study in a bid to identify those factors, especially as they pertain to the Lagos market, examined the current status of green housing investments in Lagos. In the quantitative survey, ESVs were asked to state reasons for the insignificant GB stock in Lagos. This was a multiple-choice question, in which respondents were allowed to choose more than one response. Figure 7.8 shows how the estate surveyors and valuers perceive the factors responsible for the apparent shortage in the Lagos green housing stock. While most of the ESVs (68.9%) assert that property investors’ ignorance is a cause of this shortage, only 14.1% stated the unavailability of a green building rating system (GBRS) as a factor. Other leading reasons asserted by the ESVs include the fact that green buildings are expensive and that there is a dearth of investment supporting
policies. It is important to note that very few of the respondents (16.2%) perceived that the shortage of green housing is due to its unprofitability, or due to a lack of renters’ interest in the product.

Figure 7.8 Reasons for limited GB stock in Lagos

The ESVs were also asked to express their perceptions of the green housing market in Lagos using a 5 – point Likert scale. Various factors that may affect the green housing market were presented to the respondents, from which they were to pick responses ranging from strongly agree to strongly disagree. Group modes rather than means were used to determine significance of the responses, as is recommended for non-parametric data (Sullivan and Artino Jr, 2013). The responses showed a general agreement on two factors – (i) tenants are ignorant of green buildings and (ii) reduced utility bills as incentives for tenants to prefer green housing. Though the rate of agreement for the other factors was higher than the rates of disagreement and indifference, the responses showed a significant rate of indifference and disagreement in some cases. For instance, while 31% of the respondents were indifferent that proof of being able to get a premium on green housing values will be an investment driver for investors, 15% of the respondents disagreed. Also significant (38%) is the proportion of respondents that were indifferent and disagreed with the fact that home users will pay a premium to live in a green home. This contradicts the results for the home users’ survey which asserts that they are willing to pay premiums for residing in green homes. Table 7.9 analyses the perception of the respondents on the various factors presented.
Table 7.9 Perception of ESVs of green housing market in Lagos

<table>
<thead>
<tr>
<th></th>
<th>STRONGLY AGREE</th>
<th>AGREE</th>
<th>INDIFFERENT</th>
<th>DISAGREE</th>
<th>STRONGLY DISAGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most home users do not have an idea of what green buildings are</td>
<td>47%</td>
<td>53%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Home users will prefer to live in green homes if they know they can save on utility bills</td>
<td>31%</td>
<td>69%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Home users will prefer to live in green homes if they know that by doing so, they can contribute positively to the environment</td>
<td>14%</td>
<td>70%</td>
<td>16%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Home users will pay a premium to live in green homes if they know the benefits.</td>
<td>8%</td>
<td>54%</td>
<td>30%</td>
<td>8%</td>
<td>-</td>
</tr>
<tr>
<td>Real estate investors will invest more in green homes if they know they can get a premium on the rents</td>
<td>8%</td>
<td>46%</td>
<td>31%</td>
<td>15%</td>
<td>-</td>
</tr>
<tr>
<td>Real estate investors will invest more in green buildings if there are supporting policies</td>
<td>15%</td>
<td>70%</td>
<td>15%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Real estate investors will invest more in green buildings if it will boost their public image</td>
<td>7%</td>
<td>61%</td>
<td>32%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Real estate investors will invest more in green buildings if they understand that they are contributing positively to the environment</td>
<td>7%</td>
<td>61%</td>
<td>32%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Real estate investors will invest more in green buildings if they know they can save on the life cycle cost of the property</td>
<td>23%</td>
<td>70%</td>
<td>7%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Issues relating to the feasibility and viability of green housing also emerged during the various FGDs. The various themes ensuing from the various FGDs are discussed below.
7.5.3 Willingness-To-Pay (WTP) a premium for green buildings

As earlier stated, this study sought to assess green housing investment drivers in Lagos. The purpose of this is to present the current status of the various factors that may motivate green housing investment, in a bid to create a practical framework. Hence, home users were asked if they were willing to pay a premium to reside in a green home. It should be noted that to avoid episodes of respondents misinterpreting the term ‘green homes’, they were asked to state their willingness to pay for a home with stated green building features viz: improved indoor air quality, lower electricity bills and less environmental pollution. Responses were assessed on a 5-point Likert scale ranging from strongly agree to strongly disagree. Table 7.10 shows the distribution of respondents’ WTP.

Table 7.10 WTP premium on green residential buildings

<table>
<thead>
<tr>
<th>WTP</th>
<th>Frequency</th>
<th>% Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>106</td>
<td>26.5%</td>
</tr>
<tr>
<td>Agree</td>
<td>192</td>
<td>48.0%</td>
</tr>
<tr>
<td>Indifferent</td>
<td>70</td>
<td>17.6%</td>
</tr>
<tr>
<td>Disagree</td>
<td>30</td>
<td>7.4%</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>2</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

The table shows that while 74.5% of the respondents agreed with payment of a premium for green housing, 7.9% did not agree while the other 17.6% were indifferent about such payments. To further understand the responses given, a Kruskal-Wallis H test was used to compare differences among the responses of the various groups of respondents in respect of their WTP. The test was used to determine if WTP of variables such as neighbourhood type, status of residency, average monthly rent or average monthly utility bills had any effects on the respondents’ WTP. This was achieved by comparing the mean ranks of the groups within each variable. The results, as shown in Table 7.11, show that there is no statistically significant difference in the WTP among residents of the various neighbourhood types, residency statuses, annual rent of properties or the monthly utility bills incurred by residents, as the respective Chi square values exceed the significant level of 0.05 for all the variables.
This is interpreted to mean that the afore-stated variables have no influence on the respondents’ WTP. However, results based on monthly utility bills and residency statuses tended more towards the p-value of 0.05 than the other variables. Therefore, these two variables were further assessed by comparing their mean. This assessment reveals that, of the different residency statuses surveyed, tenants are most willing to pay a premium on rent. Also, residents that pay over N17,000 in monthly utility bills, are most willing to pay a premium to reside in green residential buildings. This is so determined considering that the WTP premium options are coded from strongly agree (2) to strongly disagree (-2), hence a higher mean rank is an indication of a higher agreement level of respondents.
In the FGD with the ESVs however, the participants were of mixed opinions on the efficacy of premiums as a green housing investment driver. While some noted that being able to identify a class of clients that is willing to pay a premium over the market rates for similar properties may be an incentive for investing in green housing, others pointed out that WTP may not be an investment driver in the early stages of the market, but rather in a more established market. They stated as follows:

“The ability to prove that clients will be ready to bear extra costs for the building will be a marketing tool. But how exactly do we ascertain that in a market that is just emerging?”

“Willingness to pay a premium will work for the green housing market but only in association with meaningfully sizeable demand.”

7.5.4 Maximum premium (MP) home users are willing to pay

This variable was assessed based on the amounts home users were willing to pay as premium for green housing units, over the current going rates of the properties they currently occupy. The current going rates had been determined from responses to an earlier question in the questionnaire where respondents were asked to state their average rent per annum. The stated rents were either actual rents for tenants or estimated going rents for other forms of home users. For data analysis purposes, the options were coded from 0 to 4 as follows:

- Less than 10% over the going rate 0
- 10% - 29% over the going rate 1
- 30% - 49% over the going rate 2
- 50% - 70% over the going rate 3
- More than 70% over the going rate 4

The mean range of MP of the respondents is 0.68, with a standard deviation of 0.63. Hence, the mean MP falls within the 10% - 29% range. This variable was further assessed by cross tabulating it against age group, residency status, annual rental values of properties and monthly utility bills to determine the effects of these variables on the MP respondents are willing to pay. The results, as presented in Table 7.12, show that most of the respondents of all age groups excluding those less than 20 years and those older than 65 years, are willing to pay 10%-29% premium over the going rental values of residential
properties. This infers that the active working age respondents are more willing to pay up to 29% premium over going housing rental values, while other respondents are only willing to pay less than 10%.

Table 7.12 Percentage of respondents WTP premium

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>&lt; 10% over the going rate (%)</th>
<th>10% - 29% over the going rate (%)</th>
<th>30% - 49% over the going rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 20</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20 – 34</td>
<td>12.0</td>
<td>16.0</td>
<td>2.5</td>
</tr>
<tr>
<td>35 – 49</td>
<td>26.8</td>
<td>32.8</td>
<td>5.3</td>
</tr>
<tr>
<td>50 – 64</td>
<td>0.3</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>&gt; 65</td>
<td>0.8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Residency status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner-Occupier</td>
<td>9.3</td>
<td>11.6</td>
<td>2.3</td>
</tr>
<tr>
<td>Tenant</td>
<td>30.0</td>
<td>38.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Employer provides housing</td>
<td>1.3</td>
<td>1.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Squatter</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Annual Rent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 100,000</td>
<td>6.5</td>
<td>5.0</td>
<td>2.8</td>
</tr>
<tr>
<td>100,000 - 299,000</td>
<td>10.8</td>
<td>15.0</td>
<td>1.5</td>
</tr>
<tr>
<td>300,000 - 499,000</td>
<td>8.8</td>
<td>13.8</td>
<td>3.0</td>
</tr>
<tr>
<td>500,000 - 699,000</td>
<td>5.3</td>
<td>6.8</td>
<td>0</td>
</tr>
<tr>
<td>700,000 - 899,000</td>
<td>2.0</td>
<td>2.3</td>
<td>0</td>
</tr>
<tr>
<td>900,000 and above</td>
<td>7.0</td>
<td>8.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Monthly utility bills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 2,000</td>
<td>10.8</td>
<td>2.5</td>
<td>13.8</td>
</tr>
<tr>
<td>2,000 - 4,999</td>
<td>11.3</td>
<td>22.1</td>
<td>36.8</td>
</tr>
<tr>
<td>5,000 - 7,999</td>
<td>5.5</td>
<td>14.8</td>
<td>21.8</td>
</tr>
<tr>
<td>8,000 - 10,999</td>
<td>5.5</td>
<td>4.3</td>
<td>10.8</td>
</tr>
<tr>
<td>11,000 - 13,999</td>
<td>3.5</td>
<td>3.0</td>
<td>7.5</td>
</tr>
<tr>
<td>14,000 - 17,000</td>
<td>0.5</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Above 17,000</td>
<td>3.3</td>
<td>2.8</td>
<td>7.3</td>
</tr>
</tbody>
</table>

The study results show that about 75% of the surveyed home users are willing to pay a premium to reside in green housing units. Despite the lack of awareness of GH as a variant of housing unit types, respondents displayed affinity towards green attributes in housing units. The results moreover show that property renters are more willing to pay premiums on green housing units than property owners are. This implies that GH would be easier to market to the renting populace than those who want to purchase housing units.
for owner-occupation. With the majority of Lagos residents being renters (see page 20), this is a driver for green housing investments. In addition, the results imply that home users are willing to pay up to 30% over the going market rates of their properties, to enjoy green attributes in the buildings. This presents a business angle for green housing projects to housing investors. The knowledge that if extra expenses are incurred in the construction of green housing units, they can be recouped through rents constitutes an investment driver for housing investors.

7.5.5 High cost of green buildings construction

Various participants expressed that they perceive that the cost of constructing green buildings is higher than for conventional buildings. It was argued that this potentially makes green housing is an expensive commodity and hence, is likely to be unaffordable for most home users. They also argued that this cost potentially erodes the expected profit on investment, thus making green housing an unattractive form of investment. The following were responses in this regard:

“The major deterrent to increasing green homes in Lagos has to be cost. Green buildings are potentially more expensive than non-green ones. Remember an investor is looking to maximize profit and reduce cost.” – ESV4

“Green buildings are generally associated with high initial costs, which most businessmen try as much as possible to avoid.” – ESV7

“You see, because of the level of poverty in the country, no matter how much you explain the effect of unsustainable practices to our people, it will not interest them. Affordability is more important to home users going through economic hardship than any other thing. If we want to introduce a new concept to people, we must be conscious of where we are in terms of our standard of living.” – PM16

“(Green housing consumption) is function of your economic power and what you can afford. It is like telling someone who cannot afford to pay for public water that drinking straight from a stream is harmful. You must come to the common man’s level.” – PM5
However, the respondents could not provide proof, or state for a fact that green buildings actually do cost more than conventional ones. The discussions revealed that this perception was based merely on speculation, fuelled by limited experience in the green housing sector. Also, considering that some of the comments emanated from policy makers, who are responsible for policy making and implementation, their opinions on green housing are likely to affect the policies that may or may not emerge concerning green housing. Commenting on the lack of local green building materials and high cost of green building construction, the architects stated as follows:

“Motion sensor and daylight sensor light fittings for instance, are also a great way to save energy. However, because they are imported, they are quite pricey and are only enjoyed in savings over the lifespan of the building and so may not be attractive to an investor who is looking to minimise costs.” – ARC1

“One major building feature that we haven’t really harnessed in this country is building into the roof. There’s so much space waste because unlike more developed countries, we just leave the roof lying fallow. Meanwhile, with a bit more insulation using materials like glass wool that space can be turned into a comfortable living space. But then, that brings us back to the issue of expensive building materials. Glass wool is imported which automatically makes it expensive. I believe though that with extensive research we may find local alternatives. This system of building will encourage more compact buildings which also means a reduction in development space.” – ARC7

7.5.6 Utility bills

Reduced utility bills have been identified as a long-term benefit of green buildings. In Lagos, electricity bills form the major measurable component of utility bills. Water supply from the public mains is unreliable in Lagos, which causes home users to seek alternative means of water supply. Hence, there is no uniform system of measuring domestic water costs or usage within the state. The participants were of the opinion that given the failure of public agencies to effectively deliver the basic utility services in Nigeria and the need for most home users to source these services alternatively, reduced utility bills may not necessarily be a practical selling point for green housing in Lagos. The related responses are as follows:
“Using reduced utility bills to market green buildings is not practicable in Nigeria. The reason is that the utilities to pay for are not readily available. Most citizens have to provide their utilities themselves, so reduced bills will not necessarily be an incentive.” – ESV2

“Also, Nigerians have a culture of evading bills payment, so if they can find a way around paying bills, why will they pay extra for a property just because it offers reduced utility bills?” - ESV1

An architect also explained why a building with water saving techniques may not necessarily be attractive to a Lagos home user as follows:

“Rainwater harvesting was mentioned earlier, but it’s not exactly a choice for Nigerian houses because most developers already make provision for a bore hole or well when constructing the building. So, they are hardly ever reliant on public water, therefore why go through the trouble of harvesting rainwater when it doesn’t really cost you more than borehole maintenance to get water whenever you need it” - ARC2

7.5.7 Demand for green housing

The participants unanimously stated that investment in green housing would definitely be driven by demand for the commodity. Some comments are stated below:

“We can organise seminars and conferences (promoting green housing) all we want, but the truth is that you can only sell a product when there is a demand for it. If there is no demand for green housing, it is automatically unattractive to investors.” – ESV6

“Demand is key in pushing this product. Properties are not like your everyday products; the financial implications are so much that investors want to start earning returns on funds immediately the building is commissioned.” – ESV3

“Developers consider patronage before deciding to take on a project. Without the assurance of that, no matter how good the project looks on paper, it won’t fly.” – PM4
The FGD with the architects also revealed that there is an extremely low demand for green building designs, which translates to a low output of the product. The following comments ensued form the discussions:

“Awareness of green buildings is low in Nigeria. Imperatively demand for such designs is very low, so these are not things we engage in, nor do we suggest them to clients.” – ARC4

“We supervised a project that used bricks which is supposed to have less embodied energy and even be cheaper. We however had a lot of challenges with the project. We did that project finishing the buildings internally so carefully hoping that there would be no need to render it on the inside. However, we discovered that users became easily bored with the monotonous colour of the bricks and some even went ahead to render their living room walls. So, at the end of the day, it defeated the purpose of using bricks in the first place” - ARC2

The comments on insufficient demand for green housing is best described with the vicious circle of blame (see Figure 3.4), a part of which implies that architects do not churn out sustainable building designs because developers do not ask for them. This is a major factor responsible for the insignificant number of green buildings available. The discussions also imply that a boost in the public’s awareness of green buildings would translate to a boost in green housing demand.

7.5.8 Neighbourhood class

The ESVs stated that the viability of investments in green housing is largely dependent on the neighbourhoods in which they are sited. They noted that such investments are bound to thrive in medium to high income neighbourhoods, where rent received can justify the high capital required for the projects. The following comments ensued:

“These developments will definitely do well in locations where reasonably high rents can be achieved. However, finding primary locations worth the added costs that comes with their development, and cultivating a crop of users or owners in a glutted property market may prove a challenge.” - ESV6
“For a market that is literally just taking off, green housing will have to be totally separate from affordable housing. So, if a green housing trend is to be started, it will have to be targeted at high-end clients.” – ESV5

This stance was further iterated by the property developers, who were asked to state what they perceived to be the most viable neighbourhoods of residence for green housing in Lagos. The results show that 44% of the respondents stated medium income neighbourhoods, while 56% stated high income neighbourhoods as the most viable markets in Lagos. This result, which conflates with the perception of the ESVs, shows that while property developers see both high income and medium income neighbourhoods as viable markets for green housing units, they do not see low-income neighbourhoods in the same light.

7.5.9 Technical/technological Expertise

The participants stated that Nigeria presently lacked the technology and technical expertise to effectively deliver a green housing market. Stating that green buildings had not been prioritized in Nigeria, they pointed out that the necessary skills for executing such projects have not been developed. The following were their comments in this regard:

“We do not have the requisite technology and maintenance capacity to incorporate (green buildings) into the current building stock, largely because most of them depend on imported technologies and therefore cannot be certain to always be readily available here.” – ESV1

“Green housing is not a priority in Lagos, as such, I am not aware of any immediate plan to develop technology in that line. So, that is obviously a deterrent.” – ESV4

“Building green in Lagos today may mean that we have to bring in materials and skilled workers from outside the country. That invariably adds to the cost of the project. So, if that extra cost is avoidable, any rational investor will avoid it.” – ESV6

The foregoing statements portray the lack of depth of understanding of green housing workings among the ESVs. It was established earlier in the literature that simple features including designs that effectively incorporate lighting and ventilation can produce a
green building. Hence, the concerns over technical expertise and imported technologies by the ESVs may not necessarily be valid. On the other hand, lack of technical expertise may also be explained by the fact that building practitioners do not have the requisite knowledge of the concept of green housing and are therefore unable to integrate such techniques into current building methods.

The architects expressed concerns about the ability of Nigerian built environment practitioners to efficiently execute green building constructions. They commented that without track records in such constructions, the practitioners lack the requisite experience to successfully execute such projects. On unavailability of adequate technical expertise, some participants commented as follows:

“Now there is a general lack of technical knowledge of green buildings among Nigerian building professionals and the reason is not far-fetched, people don’t ask for it. So, even if we say we want to start rolling out green housing units today, there is still the large gap of technical expertise to be filled. So, what happens when we design the buildings and there are no professionals to execute the projects?” – ARC6

“We had a lot of challenges with (a) project (which I supervised) using landcrete bricks instead of concrete blocks. First was the issue of piping; because the size of the brick is smaller than the conventional cement blocks that we use, we were having problems fitting water pipes through them. However, for the piping a solution can be to employ technicians that will be careful enough to set the bricks in such a way that the pipes can go through the hollows easily. That may add to the cost of labour, because you may even have to bring in an expatriate to supervise that aspect of the project.”ARC2

The architects argued that there is in fact some form of technicality involved in the construction of green buildings. This highlights the necessity for technical dexterity in the execution of green housing projects, which according to the architects is currently largely unavailable. The employment of expatriates as suggested by the architects potentially further raises the cost of construction of the buildings.
7.5.10 Lack of enabling policies

Adequate and relevant policies have been identified from literature as integral criteria for a buoyant green housing market in any clime. The availability of policies such as government incentives for green housing investors, developers and users and various forms of tax reliefs have also been identified as tools for boosting the green housing market. The various FGDs sought to determine the level of GH awareness and environmental consciousness, especially of the bodies in charge of policy making, as it concerns housing and the environment in Lagos state. They also sought to establish the availability or otherwise of policies that would promote investments in green housing, and to ascertain plans towards the further formulation of such policies.

Regarding the availability of existing policy instruments that support green housing in the state, the policy makers stated that there are none currently. They were also unanimous about the fact that there are currently no policy-driven incentives, to parties planning to develop, developing or occupying GH in Lagos. The following comments emanated from the discussions:

“I don’t think there is any policy that supports green buildings for now. Policies can only be enacted if people in power see an issue as a problem within the state, so a lack of policies in a particular area means that the incumbent administration do not see the need to motivate green buildings within the state.” - PM7

“The new Lagos Homes Ownership Mortgage Scheme (HOMS) for instance incorporates rainwater harvesting in the design of their buildings and tree planting on their site. So, the state is trying to incorporate greenness into the new public buildings. But apart from that, there is no specific instrument that speaks to green building in the state.” - PM8

There were however suggestions as to what types of policy-driven incentives may be made available by the government to such parties. One participant pointed out that a program by the government through agencies like the Lagos State Parks and Gardens Agency (LASPARK), to plant trees at no charge around emerging green developments, may be an incentive for green housing developments. This comment however reflects a
limitation of green building to buildings developed around vegetation, which is an extremely narrow view of such buildings. The policy maker commented as follows:

“LASPARK can volunteer to plant trees in development estates at no cost to the developers as an incentive to green housing developers.” – PM11

Another comment that emerged on green housing incentives suggested that policies to discount fees associated with green building developments, should be formulated as a form of motivation for intending green housing developers. The comment follows:

“Our focus can be how the government can come in to alleviate other costs incurred over land acquisition for green property developers. For instance, as an incentive to green compliant building designs, there may be concessions on building assessment fees, because, the truth is that the government does not have direct control over the price land is sold, but can influence other charges that accrue to the building developer.” – PM3

It is noteworthy that none of the participants suggested any form of tax relief as a form of incentive to green housing investors. When asked if tax reliefs are practicable forms of incentives in Lagos, the policy makers replied that it is not a tool that can be accommodated by the state in the short term, given the current economic state of Lagos. They claimed that the state is currently in need of extra revenue and cannot afford to give tax reliefs. This is however a short-sighted approach to cost saving by the government, because what seems to be saved in tax revenue may still be lost in environmental management in the long-run. The following responses ensued:

“Tax rebates? Not at this point in our economy. I feel that tax reliefs should be given serious concern actually. However, we cannot legislate on issues like that here. It does not require legislation; what it requires is a policy statement. But our economy can’t absorb such a policy presently.” – PM16

“Tax reliefs will have to be a recommendation for the future and it can only be declared by the state governor. But they are not currently practicable.” – PM13
The discussions with the policy makers showed a lack of dedicated green housing policies, policy plans or incentive programs in Lagos. Also, the inability to employ tax reliefs as a form of investment incentive means that other innovative means will have to be used by the state to stimulate green housing investment.

The ESVs suggested creating enabling policies as a factor that may enhance investment in green housing in Lagos. They were however of the opinion that policy formulation may not be the fastest way to boost the green housing market. The following comments emanated from the discussion:

“Policies may boost the (green housing) market, but even with the right policies, the government will have to take the lead in green housing provision to trigger the market.” – ESV2

“Policies may not be the fastest way to stimulate the green housing market, but it sure will make a difference if they are in place.” – ESV8

“The truth is that estate surveyors and valuers also have a duty to liaise with government bodies and other stakeholders in the (building) industry to formulate these policies that will encourage green building in Lagos.” – ESV5

The indication from the discussion is that the availability of enabling policies is a green housing investment driver. However, the effects of these policies are envisaged to be felt in the green housing market only in the long-term, and not necessarily as soon as they are implemented, as it will take a period of time for market forces to be significantly affected by such policies.

7.5.11 Deficiencies in urban planning regulations

While housing, among other factors, is responsible for the environmental conditions of any settlement. Urban planning is a tool for controlling development and its effects on the environment. In the FGD with architects however, there was mention of unfavourable planning regulations as a challenge to green housing in Lagos. This is in the light of the fact that plot allocation in Lagos is the responsibility of the ministries of lands and planning and urban development. The following comment ensued in this regard:
“There is a fundamental problem with building designs in Lagos and that is plot allotment. Those in charge of allotting plots do so without considering the orientation of the plot or the proposed building. So, by the time you get to site as an architect, you are forced to fit your design into a particular direction which may not produce the optimal orientation to harness ventilation and lighting.” – ARC7

Issues with planning tie back the earlier discussion on relevant policies. There is definitely a need to review existing urban planning policies to reflect environmental sustainability needs, while working with the relevant professionals. Urban planning was also identified both as a source of environmental degradation and as a possible panacea for increasing the green housing stock, if effectively employed. The policy makers commented as follows:

“Our urban planning in the state for instance is flawed, and this is mainly because as opposed to building our urban centres on laid out plans, much of our planning is taking place after development or existing plans are just blatantly violated. However, most of the existing plans also have to be updated to intentionally incorporate measures that support sustainability, and especially as concerns your research, environmental sustainability.” – PM6

“You know there are different dimensions to how planning can solve environmental problems. I’ll give you an example. Do you know that in the recently updated Lagos master plan, there is no provision for sewerage? What this means is that when one administration now decides to take on that project, they will start needing to compulsorily acquire property, start demolishing and reconstructing affected areas not considering that all these activities are environmentally unfriendly. However, if all necessary consideration is taken into such plans, there will be minimal disturbance to the natural environment.” – PM11

7.5.12 Appropriate methods for valuing green housing units

Proper asset valuation is a necessity for proper business decision making. The case is not different for green housing investment decisions. It is therefore important to establish the most appropriate methods for and approaches to green housing valuation. The ESVs,
being the professionals responsible for property valuation were asked about the most appropriate methods and approaches in this regard. The respondents unanimously agreed that the cost and Discounted Cash Flow methods are most appropriate as shown in the following responses:

“I should think the cost method should or may be appropriate in valuing green buildings, because that’s the method that can capture the uniqueness of this kind of building.” – ESV3

“Discounted Cash Flow (DCF) methods that can factor in the unique qualities in real economic analysis. Bear in mind that since there aren’t many green buildings out there, this is not the kind of brief we really get regularly.” - ESV4

“Having had to value a green building, the cost of replacement method seems most appropriate because you need to look at the cost of the unique building materials or designs that make up the building.” – ESV2

It is notable that the ESVs comments displayed an apparent lack of familiarity with valuing green buildings. Whereas literature prescribes other more technical valuation techniques such as life cycle costing, cost benefit analysis and the hedonic pricing method, the ESVs prescribe the replacement cost method, which does not essentially capture the true value of environmental sustainability. This may reflect a lack of awareness of other more suitable methods of valuation, which is also a product of limited transactions in green housing. There is a need for a more consolidated approach to green housing valuation in Lagos, especially if the market information is to be standardised enough for investment decision making.

### 7.5.13 Green housing features

In the course of the discussions, the definition of green buildings in the Nigerian context was solicited from the participants. This was necessary as it was noted in the literature review of this study that the definition of a green building is relative and dependent on the context of definition. There was a general agreement as to the basic definition of green buildings being buildings with minimal environmental impact and maximum health benefits for the occupants. The participants also discussed the basic features that make a GB. The following are comments that emerged under this theme:
“Green building is a very uncommon concept in Nigeria. However, these buildings are necessary for the environment. So, we define them as buildings that are designed to minimize their negative effects on the environment.” – ESV8

“Green buildings are defined in Lagos as they are defined anywhere else. They are buildings that are environmentally conscious and also conscious of the comfort and well-being of the occupants.” – ESV2

“Generally, the features of GH should include adequate lighting and ventilation, to reduce dependence on electricity, taking the wind direction and orientation into consideration before design, basically houses with passive designs.” – ESV3

“We can also talk of rainwater harvesting, and in some very advanced cases, recycling of water used in the house, these are systems put in a building to make them green.” - ESV6

“In more advanced territories of the world, GH will also include homes that have been constructed in such a way that as much as possible, the embodied energy is reduced to the barest minimum. Meaning that the use of energy intensive building materials such as concrete and steel are reduced drastically.” – ESV7

“While materials are very influential in making a building green, sometimes all a building needs to be green is the right design. A building can achieve a great degree of environmental sustainability just by being designed in a way that cuts down the energy needs of the building. So, design is also very key and so are the systems put in place for the running of the building.” – ESV4

There is no significant difference between the definitions of green buildings given by the architects and those found in literature as presented in earlier sections (see section Green Housing (GH)). Since the basic understanding of the concept of green housing is necessary for sufficiently designing buildings to achieve environmental sustainability, this alignment with literature implies a working understanding of the concept among the architects. Though the definitions did not necessarily include characteristics or features peculiar to Lagos, the architects discussed various features of green housing. They
zoomed in on the impracticability of the ‘common’ designs of green housing in the Lagos context, owing to factors such as insecurity associated with green buildings designs:

“Very honestly, because we have not really bought into the green building concept, it’s difficult to say that all these (green) features in developed countries can work in Nigeria. For instance, while larger windows are good for lighting and ventilation, we must consider security which is quite fragile in our own context unless you want to start talking of securing (the windows) with burglar proof steel bars, which then defeats the whole low energy idea anyway.” - ARC1

“No matter how sustainable we are trying to be with the designs, we can’t compromise the use of steel and concrete because we live in a society where security is quite fragile. So, we really have to find a way to reconcile environmental sustainability and adequate security in the designs.” – ARC6

In the literature review, local building materials are noted to be preferred for green buildings, basically because of their characteristic low embodied energy, due to reduced transportation distance and also their reduced cost of purchase. The architects discussed practical features that could be included in green housing designs, using building materials that are readily available locally. The participants were of the opinion that clay bricks and wood should be harnessed in the construction of green housing units in Lagos. The following comments emanated from the discussion:

“I will suggest the use of land-crete (clay) bricks for (the construction of) walls. However, we still need to do a lot of research into how it can be more aesthetically acceptable and easy to work with. Many high-rise buildings already use hollow clay pots for their suspension floors and they are very functional and lighter in weight, so there is great potential in that direction.” – ARC3

“We may also need to consider doing more construction with wood than we presently do. Although, this is really not a fashionable trend in Nigeria and the fear of fires also make us shy away from such designs.” – ARC2

“I think that in conventional buildings, we sometimes construct too many walls within the building. For instance, we don’t always have to enclose the kitchen
and dwarf walls are also functional to reduce embodied energy and let light and ventilation through to spaces that do not have direct contact with windows.” – ARC3

Research into the use of local building materials was proffered by some policy makers as a method of enhancing green housing production in Lagos. The following comments emerged in that respect:

“Maybe when we say green housing, we are making an otherwise simple concept look complex. I mean, considering that the kind of houses we lived in in the villages can be considered green, it is not a very new concept after all. So, I think one of the things we should thrive for is to research into how our local materials can be developed to the extent that they become more attractive to builders and home users as choice building materials. I’m talking of things like laterite bricks, wood and the likes.” – PM7

As noted earlier in this study (see section Green Housing Materials), the amount of embodied energy a building possesses is a determinant of how green the building is, along with other factors. Since locally sourced building materials possess less embodied energy than imported materials, they are preferred in the construction of green buildings. Hence, the building materials mentioned by the architects, present alternatives to the more energy intensive materials that are common features in conventional buildings.

7.5.14 Infrastructure as a factor affecting green housing investment in Lagos

Basic social amenities are auxiliary structures necessary for the effectiveness of the green housing market, or any property market for that matter. The policy-makers identified inadequate and ineffective infrastructural amenities as a deterrent to a buoyant green housing market in Lagos. Prominent sub-themes that emerged were power supply, the transportation system and other basic infrastructural amenities. The erratic state of power supply in the country and the resultant need for power generators were identified as deterrents to increasing the GH stock in Lagos, because it is perceived that the use of fossil fuel powered generators for electricity goes totally contrary to the purpose of green housing. The following are some comments on this sub-theme:
“GH is a very wonderful idea. But in a country where the supply of electricity is very erratic, where we depend more on power generators than electricity supply from the mains, how do you achieve this? Because if you are thinking of a green environment, it should be devoid of things like those generators.” – PM13

“We are still at the bottom of the GH ladder, so we should be thinking water conservation and energy conservation ...but all these things are subject again to the realities of living in Nigeria where there is inadequate power supply.” – PM6

Ironically, these issues pointed out by the respondents as deterrents to green housing are issues that green housing actually resolves when incorporated. For instance, green homes should effectively see to the reduction of electricity consumption from the main grid. Erratic power supply therefore should be a motivating factor for green housing consumption rather than a deterrent. This further concretizes the lack of in-depth understanding of the green housing concept among the policy makers.

7.5.15 Green housing research and data

Inadequate research in respect of local environmental indicators and green building techniques and materials, as well as lack of sufficient relevant data were identified by the policy makers as deterrents to the mainstreaming of green housing in Lagos. Participants made comments on the apparent lack of GHG data for decision making and the general lack of relevant data to inform policy-making. GHG data was identified as a necessary and basic tool for environmental planning and environmental policy-making, the lack of which negatively affects any climate change abatement efforts. The following comments were made in relation to the availability GHG data:

“Even areas that are more germane to the economy have a low level of data, not to talk of GHG or environmental data. But now every ministry has a unit of research and statistics and we are trying to work on data collection. The ignorance is diminishing.” – PM9

“Environmental data? That’s a high level of research, it’s a very high level of research, where will we get that from?” – PM1
“One thing I have found out in this part of the world is that we have data but they are not easily accessible... In Nigeria, researchers come from outside the country, carry out studies in this part of the world and they have patent to that data. The country where that data is useful will not have access to them unless we pay heavily for them. We just don’t have data collection and research as a foundation.” – PM7

“We don’t do enough (environmental) research, the little we do is protected, by the funder; because he’s thinking ‘if this is my money, why should I share the data?’ Having said that, I know the state government has just established about 3 years ago a research fund, administered by a trust fund and they call for proposals every year by research institutions.” - PM5

Lack of adequate environmental and housing data was identified as a factor deterring the formulation of relevant policies:

“Getting a framework for any policy-making in the first place means you have the requisite data or the government has funded a department to collect (the needed) data and that has to be written into the budget etc. so it’s quite a cycle and it is easy for any meaningful policy to be lost in that cycle.” – PM12

“Generally, research and development is not taken as seriously as it ought to be in this country. And how do you make effective policies without the requisite data? Until we get research and development right, I don’t see any meaningful policies in view, even in regards to green housing or the environment.” – PM7

“I am aware that there are GHG emission targets in more developed countries, which they work towards meeting and probably surpassing. But, think about it, they can only set these targets because they have figures to work with, right? So, tell me how can we follow suit if we don’t have similar figures to work with? Unfortunately, the excuse of the government is always funding.” – PM2

Both policy makers and estate surveyors expressed concerns that a lack of adequate and relevant data is a deterrent to effective green housing policy making.

“For those of us into policy making, we need to be presented with information to build cases for particular policies and we don’t have that information (for
green housing policies). So, since in developing countries, most of our governments’ main concern is revenue, most policies are built around revenue generation.” – PM14

“And there is also the policy making angle. Policies cannot be made blindly, it is these data that we are talking about that will still form the basis for policy formulation, so data is definitely key.” – ESV8

Participants also expressed concerns that a dearth of relevant data on green property transactions is a deterrent to the effectiveness of the green housing market. The following are comments from the participants:

“I’m not saying (green housing) is not possible in Lagos, I’m just wondering how feasible (practicable) it is? You know, we may need evidence of its practicability to successfully drive this thing.” – PM5

“Look, this concept can only become attractive if developers can see the evidence that it is profitable. We as a people are not exactly in the culture of keeping records or even making them public. So, what I’m saying is lack of access to data (on green housing transactions) may also be a problem hindering the increasing of green housing stock that you are talking about.” – PM4

The policy makers, who ordinarily are expected to have access to data, variously stated the lack of adequate relevant data both to drive policy formulation and the green housing sector at large. Though the lack of data on green buildings may be excused owing to the unestablished nature of the sector, the growth of the sector is dependent on other environmental and economic data. Hence, unavailability of sufficient transaction data is a demotivating to investments in green housing.

The ESVs also variously expressed views that estate surveyors and valuers have a duty to provide the general public with the necessary real estate data for the promotion of green housing investment. They stated that public availability of relevant data would aid real estate market players in the formulation and establishment of the green housing market. The following comments ensued from the discussion:
“Basically, ESVs should provide data on performance of building components, revealed (housing) user preferences and satisfaction, (housing) investment appraisal scenarios, etc. By so doing, they make investment decisions easier for would-be property investors.” – ESV4

“Estate surveyors are in the forefront of property transactions in Lagos, therefore, they are more eligible than any other professional to determine the marketability of the products. So, information on property trends, both in monetary and preference terms, should be made available to stake-holders to enable them chart a course for green housing investment.” – ESV6

7.6 Presentation of hypothetical green housing unit designs

Three different hypothetical building designs were obtained in the course of the study. The designs were produced by two architects who were recommended by participants of the FGD, having previously jointly worked on green building projects. The brief given to the architects was that they each design a block of 4 units of 3-bedroom flats on 2 floors, all to be constructed on a Lagos standard sized plot of land, which measures about 650 square meters. The reason for this choice of building design, as stated in the methodology, is because it is the commonest type of investment property in Lagos (Babawale et al., 2012). The architects were briefed on basic features that the buildings were expected to have, which are basically energy use reduction systems, reduced embodied energy of materials, reduced environmental footprint and functionality of the building. The 3 building designs (Design 1, Design 2 and Design 3) are shown and discussed in detail.

For the various designs, the architects produced designs that are quite minimalist in nature as they incorporate only features deemed necessary to the buildings’ occupants. The floor plans of design 1 (Figure 7.11) show the use and arrangement of windows to maximise lighting and ventilation and hence reduce energy use in each flat. The average measurement of each window is about 1.5m by 2.4m, as against the 1.2m by 1.2m conventionally used. The portion of the floor plans between sections 3 to 4 and 6 to 7 allow for cross-ventilation and natural lighting, further enhanced by the citing of dwarf walls between the kitchens and the lounges. The design also features solar shading fins around the exposed windows. This feature aids in controlling the amount of solar heat
that is admitted into the building. Also incorporated into the design, is soft landscaping including trees which aid in reducing the island heat effect on the building.

Designs 2 and 3 concentrate on the provision of adequate natural space lighting and ventilation, use of low-energy materials and rain-water harvesting. While design 2 incorporates the use of terraces to enhance lighting in the various spaces, design 3 uses terraces and a courtyard in the middle of the building to ensure that all spaces receive an adequate supply of daylighting and natural ventilation. Designs 2 and 3 also feature the use of land-crete blocks for some parts of the building. These blocks are produced using locally available materials, which means they possess less embodied energy and are more energy-efficient compared to concrete blocks. The land-crete bricks were used only externally and partially, to assuage the monotonous effect they have on buildings, as pointed out by the architects during the FGD and stated earlier in this thesis.

Compared to similar conventional buildings, the bathrooms in the units of all 3 designs have been reduced to the barest minimum. Designs 1 and 2 reduced the number of bathrooms per flat to 3 instead of 4, as guests are expected to share a bathroom with one of the bedrooms. Design 3 conservatively reduced the number to two per flat. This feature reduces the embodied energy of the building by reducing the amount of building materials to be used during construction. The various designs also used different roof types that facilitate effective rain water harvesting. Design 1 uses a skillion roof, which apart from being effective for rain water harvesting, also reduces the total embodied energy of the building by using minimal building materials. In designs 2 and 3 however, the gable roofs are clad by roof gutters at the end of each pitch to maximise the collection of rainwater for reuse in the buildings. The discussed features of the building design are shown in the following figures:
Figure 7.9 Layout of First floor (Design 1) showing dwarf walls between kitchen and lounge areas and expansive windows
Figure 7.10 Approach and rear elevation views (Design 1) showing windows, solar shading fins and skillion roof
Figure 7.11 Exterior view (Design 1) showing soft landscaping
Figure 7.12 Layout of ground floor (Design 2) showing terraces for enhanced ventilation and lighting of flats
Figure 7.13 Approach view (Design 2) showing the incorporation of land-crete blocks in wall construction
Figure 7.14 Roof plan (Design 2) showing how the roof pitches and drains into the roof gutters
Figure 7.15 Layout of ground floor (Design 3) with courtyard in the middle of the building and multiple windows.
Figure 7.16 Approach view (Design 3) showing the incorporation of land-crete blocks into wall design
Figure 7.17 Roof plan (Design 3) showing gable roof clad with roof gutters at the ends of the pitches
7.7 Estimation of costs and values of hypothetical green housing units

This study set out to determine the value of typical green housing units and if their open market value justifies investment in the commodity. This is achieved by assessing the payback period of the hypothetical properties designed by the architects, based on market values of the properties as assessed by the appointed ESV and cost estimates as assessed by the appointed quantity surveyors. Because of the striking similarities between Designs 2 and 3, and to avoid repetitiveness of figures, only Designs 1 and 2 were quantified and subsequently valued. The cost estimates for both designs produced very different results. While the total cost estimate for ‘Design 1’ is N86,334,690.20, ‘Design 2 produced a cost estimate of N48,286,895.00. The quantity surveyor notes that the wide disparity in the final figures obtained is attributed to the differences in the designs and sophistication of materials incorporated into each of the building designs. The summaries of both estimates are presented in the following tables.

Table 7.13 Bill of Quantities for ‘Design 1’

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<td></td>
<td>SUBSTRUCTURE</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>CONCRETE FRAME</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>BLOCKWORK</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>ROOF</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>DOORS AND WINDOWS</td>
<td></td>
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<tr>
<td></td>
<td>FITTINGS AND FIXTURES</td>
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<tr>
<td></td>
<td>FINISHES</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>PAINTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SERVICES: Electrical &amp; Plumbing Installation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EXTERNAL WORKS: Organic landscaping, Overhead water tank, Borehole/ Water treatment plant,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ADD: VALUE ADDED TAX</td>
<td></td>
<td>5%</td>
<td></td>
<td>4,087,366.20</td>
</tr>
<tr>
<td></td>
<td>ADD: CONTINGENCIES (Provisional sum)</td>
<td></td>
<td></td>
<td></td>
<td>500,000.00</td>
</tr>
<tr>
<td></td>
<td>ESTIMATED TOTAL COST</td>
<td></td>
<td></td>
<td></td>
<td>86,334,690.20</td>
</tr>
</tbody>
</table>
Table 7.14 Bill of Quantities for ‘Design 2’

<table>
<thead>
<tr>
<th>S/NO</th>
<th>DESCRIPTIONS</th>
<th>QTY</th>
<th>UNIT</th>
<th>RATE</th>
<th>AMOUNT (₦)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GENERAL SUMMARY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PRELIMINARIES (including setting out, water supply and site supervision)</td>
<td></td>
<td></td>
<td></td>
<td>1,833,500.00</td>
</tr>
<tr>
<td></td>
<td>SUBSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONCRETE FRAME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BLOCKWORK</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>ROOF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DOORS AND WINDOWS</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>FITTINGS AND FIXTURES</td>
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<tr>
<td></td>
<td>FINISHES</td>
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</tr>
<tr>
<td></td>
<td>PAINTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SERVICES: Electrical &amp; Plumbing Installation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EXTERNAL WORKS: Organic landscaping, Overhead water tank, Borehole/ Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>treatment plant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ADD: VALUE ADDED TAX</td>
<td></td>
<td></td>
<td>5%</td>
<td>2,275,880.89</td>
</tr>
<tr>
<td></td>
<td>ADD: CONTINGENCIES (Provisional sum)</td>
<td></td>
<td></td>
<td></td>
<td>500,000.00</td>
</tr>
<tr>
<td></td>
<td>ESTIMATED TOTAL COST</td>
<td></td>
<td></td>
<td></td>
<td>48,287,495.00</td>
</tr>
</tbody>
</table>

For the purpose of analysis and estimation of cost of land, the estate surveyor and valuer was asked to assume that the properties are situated in particular middle income neighbourhoods within Lagos. The estate surveyor advised that the building design with the higher cost should be assumed to be located in an upper-middle income neighbourhood (assumed cost of land is ₦35,000,000 per plot), while the building design with the lower cost should be assumed to be located in a lower-middle income neighbourhood (assumed cost of land is ₦25,000,000 per plot). The ESV stated that assuming the locations of the two properties in that manner, would provide a true reflection of the achievable incomes from both properties, considering their varying designs and levels of sophistication. Therefore, for the purpose of this study, Adeniyi
Jones Avenue was adopted to represent the upper-middle income neighbourhood, while Ketu/Alapere was adopted to represent the lower-middle income neighbourhood. Also, rental values used in the determination of costs are values for comparable conventional properties. It was reasoned that in the early stages of the market, increased rents may have negative effects on demand for green housing. The payback period analysis of the two properties is also presented below.

**Design 1**

Assumed annual rent per flat  ₦2,000,000.00
Total assumed rent of building  ₦8,000,000.00
Maintenance/outgoings  10% of annual rent (except in the first three years)
Rental increase  20% every third year
Assumed cost of land  ₦35,000,000.00
Cost of land documentation  13% of cost of land
Estimated cost of building  ₦86,334,690.20
Total estimated cost of building  ₦125,884,690.20

*Table 7.15 Payback period analysis for building design 1*

<table>
<thead>
<tr>
<th>YEARS</th>
<th>1-3</th>
<th>4-6</th>
<th>7-9</th>
<th>10-12</th>
<th>13-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Rent @ 20% increase after every 3 years</td>
<td>8,000,000</td>
<td>9,600,000</td>
<td>11,520,000</td>
<td>13,824,000</td>
<td>16,588,800</td>
</tr>
<tr>
<td>Gross rent</td>
<td>24,000,000</td>
<td>28,800,000</td>
<td>34,560,000</td>
<td>41,472,000</td>
<td>49,766,400</td>
</tr>
<tr>
<td>Less Maintenance/outgoings @ 10%</td>
<td>2,880,000</td>
<td>3,456,000</td>
<td>4,147,200</td>
<td>4,976,640</td>
<td></td>
</tr>
<tr>
<td>Net Income</td>
<td>24,000,000</td>
<td>25,920,000</td>
<td>31,104,000</td>
<td>37,324,800</td>
<td>44,789,760</td>
</tr>
<tr>
<td>Cumulative Net Income</td>
<td>24,000,000</td>
<td>49,920,000</td>
<td>81,024,000</td>
<td>118,348,800</td>
<td>163,138,560</td>
</tr>
</tbody>
</table>

From Table 7.15, the total cost of construction of the building would be recouped in the 13th year, hence the property has a payback period of 13 years. Table 7.16 presents a payback period of 16 years for building design 2.

**Design 2**

Assumed annual rent per flat  ₦750,000.00
Total Assumed rent of building  ₦3,000,000.00

192
Maintenance/outgoings 10% of annual rent (except in the first three years)
Rental increase 20% every third year
Assumed cost of land ₦25,000,000.00
Cost of land documentation 13% of cost of land
Estimated cost of building ₦48,286,895.00
Total estimated cost of building ₦76,536,895.00

Table 7.16 Payback period analysis for building design 2

<table>
<thead>
<tr>
<th>YEARS</th>
<th>1-3</th>
<th>4-6</th>
<th>7-9</th>
<th>10-12</th>
<th>13-15</th>
<th>16-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Rent @ 20% increase after every 3 years</td>
<td>3,000,000</td>
<td>3,600,000</td>
<td>4,320,000</td>
<td>5,184,000</td>
<td>6,220,800</td>
<td>7,464,960</td>
</tr>
<tr>
<td>Gross rent</td>
<td>9,000,000</td>
<td>10,800,000</td>
<td>12,960,000</td>
<td>15,552,000</td>
<td>18,662,400</td>
<td>22,394,880</td>
</tr>
<tr>
<td>Less Maintenance/outgoings @ 10%</td>
<td>1,080,000</td>
<td>1,296,000</td>
<td>1,555,200</td>
<td>1,866,240</td>
<td>2,239,488</td>
<td></td>
</tr>
<tr>
<td>Net Income</td>
<td>9,000,000</td>
<td>9,720,000</td>
<td>11,664,000</td>
<td>13,996,800</td>
<td>16,796,160</td>
<td>20,155,392</td>
</tr>
<tr>
<td>Cumulative Net Income</td>
<td>9,000,000</td>
<td>18,720,000</td>
<td>30,384,000</td>
<td>44,380,800</td>
<td>61,176,960</td>
<td>81,332,352</td>
</tr>
</tbody>
</table>

While the analysis produced a payback period of 13 years for the property assumed to be in an upper-medium income neighbourhood, it produced 16 years for the property assumed to be in a lower-medium income neighbourhood. Though there are no hard and fast rules in determining payback periods on investment, there have been suggestions on what the expected time frames are. While the assessing ESV stated an average of 8 – 10 years payback period for residential properties in Lagos, Actis et al (n.d.:cited in Pricewaterhouse Coopers 2015) state that low-cost housing in Lagos has a payback period of 14 years, and luxury housing, a period of 3 years. Buckley and Logan (2016) cite the median payback period of a green building project globally to be 6 years. It is difficult to adopt these figures as the indices for arriving at them are unclear. However, it is expected that GH would have a slightly longer payback period in the early stages of the product entering the market, especially if charging premiums on the properties is to be avoided to induce the growth of the market. Notwithstanding, payback periods for GH are supposed to be shortened by savings on utility in the building (Pivo and
McNamara, 2005). But, as earlier discussed in the literature, unless the properties are owner-occupied, such gains do not accrue to the investor.

### 7.8 Testing the hypothesis using the TPB

This study hypothesized that the real estate investor will, if motivated by proven profitability and other attractive investment drivers, invest in green housing in Lagos. The TPB was adopted in this study as a framework for understanding property developers’ behaviour towards green housing investments in Lagos. Hence, data was gathered to fit into the different constructs of the theory, viz. Attitude, subjective norm, perceived behavioural control, intention and behaviour. Cronbach’s alpha was used to test the inter-item reliability of the various items and results were 0.82 for attitude, 0.96 for Subjective norm, 0.87 for PBC and 0.73 for intention. Table 7.17 shows the summated mean item scores for the various constructs. The mean item scores are an indication of the property developers’ disposition towards the various constructs. Based on the construct measurement used in this study (see section 2.5.6), low mean item scores indicate the respondents’ affirmation of the stated items, while high means item scores indicate a refutation of the items.

**Table 7.17 Summated mean item scores for TPB constructs**

<table>
<thead>
<tr>
<th>TPB Constructs</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude:</strong>&lt;br&gt;Developers have the following perceptions about green housing:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High cost of green housing</td>
<td>1.24</td>
<td>0.33</td>
</tr>
<tr>
<td>Inadequate home users’ awareness of GH</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>Inadequate built environment practitioners’ awareness</td>
<td>1.19</td>
<td></td>
</tr>
<tr>
<td>Green housing units are not as profitable as conventional buildings</td>
<td>1.31</td>
<td></td>
</tr>
<tr>
<td>Unavailability of supporting policies</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>Unavailability of supporting technologies</td>
<td>1.27</td>
<td></td>
</tr>
<tr>
<td>Unavailability of green building materials</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td>Inadequate demand for green housing</td>
<td>1.20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.16</td>
<td></td>
</tr>
<tr>
<td><strong>Subjective Norm:</strong>&lt;br&gt;Decision to invest in green housing would be influenced by:</td>
<td>5.92</td>
<td>1.54</td>
</tr>
<tr>
<td>Business influencers</td>
<td>6.06</td>
<td></td>
</tr>
<tr>
<td>The competition</td>
<td>5.77</td>
<td></td>
</tr>
<tr>
<td><strong>Perceived Behavioural Control:</strong>&lt;br&gt;Decision to invest in green housing will be motivated by:</td>
<td>5.36</td>
<td>0.62</td>
</tr>
<tr>
<td>Accessibility to technical know-how</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td>Accessibility to green building materials</td>
<td>5.17</td>
<td></td>
</tr>
</tbody>
</table>
Accessibility to GBRS  
Accessibility to supporting policies  
Availability of incentives for investing in GH  
Proof of higher rents for GH  
Proof of lower risk of vacant GH units  
Proof of lower life cycle costs  
Boost in corporate image

<table>
<thead>
<tr>
<th>Intention</th>
<th>4.75</th>
<th>5.00</th>
<th>5.18</th>
<th>5.73</th>
<th>6.3.3</th>
<th>5.92</th>
<th>5.89</th>
</tr>
</thead>
</table>
Developers intend to invest in green housing as: | | | | | | | |
Short-term goals | 2.67 | 2.50 | | | | | |
Long-term goals | | | | | | | |

<table>
<thead>
<tr>
<th>Behaviour</th>
<th>2.58</th>
<th>0.94</th>
</tr>
</thead>
</table>
Developers are involved in: | 1.00 | 0.58 |
Current green housing project(s) | 1.00 | |

The hypothesis was tested with regards to this study, through a path analysis using the IBM SPSS AMOS Structural Equation Modelling (SEM) tool. The SEM was used to establish the relationship among the different constructs of the theory. Ajzen’s model of the TPB depicts a causal flow from Attitude, Subjective Norms and PBC, which are exogenous variables through Intention (an intervening variable), to produce Behaviour, which is the output variable. This model has been tested in this study with a path analysis, to test the fit between the model, as propounded by Azjen and as observed in this study. Figure 7.18 shows the graphical presentation of the model generated in AMOS.

*Figure 7.18 Path analysis results*
The results of the model show that, intention correlated positively with attitude (0.266) and subjective norm (0.132). This means that, both attitude and subjective norms positively influence the intention to invest in green housing, among the developers. However, subjective norm fell short of statistical significance (p>0.05). Attitude presented the strongest path coefficient in the analysis, implying that attitude towards the act of investing in green housing, would have a positive effect on the intent to invest in such buildings. Intention was negatively correlated with PBC, indicating that every unit increase in PBC, translates to a 0.06 decrease in intention. Though behaviour correlated positively with intention (0.104) and PBC (0.017), the correlations did not present adequate statistical significance (p>0.05). Table 7.18 shows the effects of the model predictors (Attitude, PBC and Subjective Norm) on the output variables.

**Table 7.18 Effects of model predictors on variables**

<table>
<thead>
<tr>
<th>Model predictor</th>
<th>Attitude</th>
<th>PBC</th>
<th>Subjective Norm</th>
<th>Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>0.266*</td>
<td>0.028</td>
<td>0.017</td>
<td>0.132</td>
</tr>
<tr>
<td>Indirect</td>
<td>0.266*</td>
<td>0.028</td>
<td>0.017</td>
<td>0.132</td>
</tr>
<tr>
<td>Total</td>
<td>0.266*</td>
<td>0.028</td>
<td>0.017</td>
<td>0.132</td>
</tr>
</tbody>
</table>

* Two-tailed tests of significance p<0.05

This model can be interpreted to mean that Lagos property developers’ decision to invest in green housing, is mainly influenced by their attitude towards the product. However, the survey also shows that the developers have a generally negative attitude towards green housing investments. Also, the path analysis returned a significance level greater than 0.05 (n=48, p>0.29). In practical terms, this implies that attitude, PBC and subjective norm are not accurate predictors of intention to invest in GH or the actual behaviour of investing in such among Lagos property developers. Hence, proven profitability and other investment drivers will not necessarily motivate Lagos property developers to invest in green housing.

The results of this study do not invalidate the TPB model, but rather signify that it is not suited to the particular context in which this research has used it. Various factors may be responsible for the discrepancy between Ajzen’s model and this study’s observed model. It is possible that there are other variables that may be responsible for intention, which
have not been adequately assessed in the model. The results of this study for instance show varying durations of practice, experience with green building features and perceptions about profitability of GH among the surveyed property developers. Any of these variables could have impacted the observed model.

To determine the construct reliability of the model, the ‘goodness of fit’ of the observed data to the TPB was run in the path analysis. The AMOS software reported fairly satisfactory results in line with recommendations by Schreiber et al. (2006). The study used the Root Mean Square Error of Approximation (RMSEA) and absolute/predictive fit Chi square ($\chi^2$) to determine the goodness of fit of the observed model, considering recommendations for the sample size adopted (N=48). Table 7.19 shows the results of the observed model compared to the recommended results.

Table 7.19 Measures of model fit / observed values

<table>
<thead>
<tr>
<th>Measure</th>
<th>Recommended Value</th>
<th>Model Value</th>
<th>Model Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi square</td>
<td>P≥0.05</td>
<td>0.29</td>
<td>Fit</td>
</tr>
<tr>
<td>$\chi^2$/df</td>
<td>≤ 2 or 3</td>
<td>1.239</td>
<td>Fit</td>
</tr>
<tr>
<td>RMSEA</td>
<td>≤ 0.08</td>
<td>0.071</td>
<td>Fit</td>
</tr>
</tbody>
</table>

The satisfactory goodness of fit produced by the model indicates a good sample data fit to the general population of property developers, and further confirms the reliability of the various variables and the appropriateness of the interpretation given.

The result of the observed model can therefore not be discarded in its totality. Independent observations of the correlation between various pairs of variables reveals a positive relationship between attitude and intention to invest in GH. The survey analysis however returned a low mean score for attitude towards GH, meaning that the developers have a somewhat negative disposition towards the commodity. This negativity may not be unconnected to the lack of adequate information about green housing and its potential performance in the property market.

### 7.9 Evaluation of green housing investment drivers

In the conceptual framework of this study, green housing investment drivers were identified from literature and used to conceptualise the study (see Figure 3.6). The themes that emerged in the course of this study are consistent with the identified drivers, albeit to a varying degree of correlation. Table 7.20 shows a list of the identified investment
drivers and how they are evaluated from the results and discussions. In the course of the evaluation, the effect of these drivers on the developers and subsequently on the potential green housing market are brought to light.

Table 7.20 Evaluation of green housing drivers

<table>
<thead>
<tr>
<th>GREEN HOUSING INVESTMENT DRIVER</th>
<th>EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 User level drivers</strong></td>
<td><strong>Demand for green housing units by Lagos home users is currently insignificant. Hence, there is also no supply of the commodity by real estate developers. This is not unconnected with the low level of awareness of green buildings among home users and even among estate surveyors and valuers who are usually the brokers between property owners and consumers.</strong></td>
</tr>
<tr>
<td><strong>WTP</strong></td>
<td><strong>Home users expressed a willingness to pay up to 30% above the current market rates of properties they currently reside in as premiums for residing in homes with green housing features. However, the estate surveyors and valuers did not express total conviction that home users will pay a premium to reside in green homes. The stance of the estate surveyors and valuers is once again deemed important by virtue of their role as the interface between property owners and consumers.</strong></td>
</tr>
<tr>
<td><strong>2 Property level drivers</strong></td>
<td><strong>Property performance</strong></td>
</tr>
<tr>
<td><strong>Property performance</strong></td>
<td><strong>Property performance in this study was determined by an assessment of the payback period of investments in hypothetical green housing units in two chosen locations. The properties displayed a below average performance with extended payback periods. This performance is further affected by the inability of the receivable rents to reflect the true costs incurred in constructing the buildings.</strong></td>
</tr>
<tr>
<td><strong>Decreased life cycle costs</strong></td>
<td><strong>This driver could not be thoroughly examined because of a lack of evidential transactions on green housing in Lagos. However, utility bills, which is a major component of the life cycle cost was discussed severally in the course of the study. Lagos home users ranked reduced utility bills as the third most important of the housing attributes listed to be ranked. The estate surveyors and valuers also unanimously agreed that home users will prefer to live in green homes, knowing they can make savings on their utility bills. The analysis further showed that home users that paid the highest utility bills were more willing to pay a premium to reside in a green home. However, in the FGDs, the estate surveyors and valuers pointed out that the erratic state of power supply and the fact that</strong></td>
</tr>
</tbody>
</table>
most home users had to provide their own alternative source may
not make reduced utility bills an effective selling point for green
housing.

<table>
<thead>
<tr>
<th>3</th>
<th>Corporate level drivers</th>
<th>The mean score of the property developers’ attitude towards green housing investments was 1.24. Given that the scale for measuring attitude was such that high scores consistently reflected a positive attitude towards green housing investments and vice versa, this means score depicts a general negative attitude towards green housing investments by the developers.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attitude of property developers to GH</td>
<td>The mean score for the developers’ subjective norm was 5.92. On a scale of 1 to 7, this is a high mean score indicating that major business decision influencers, as identified by the developers, are capable of steering their operations towards green housing investments. The developers identified their financing institutions, investors in their businesses and trends in the property market as the major influencers of their business decisions. However, a standard deviation of 1.54 indicates that the mean score may not be an accurate representation of all the sampled developers in this regard.</td>
</tr>
<tr>
<td></td>
<td>Subjective Norm</td>
<td>The perceived behavioural control had a mean item score of 5.36 and a standard deviation of 0.62. This relatively high mean score indicates that the developers are willing to invest in green housing projects given the availability of certain favourable factors like proof of higher property values and adequate demand for the commodity.</td>
</tr>
<tr>
<td></td>
<td>Perceived behavioural control</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>External level Drivers</th>
<th>There was no significant discussion on a plan to create or the need for a GBRS suited to the Nigerian context. When assessed under the PBC construct among the property developers, GBRS produced a mean score of 4.75 meaning that a fair number of developers perceive that a local GBRS will motivate them into developing green housing units.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green Building Rating Systems (GBRS)</td>
<td>Policies supporting investments in green housing were repeatedly voiced across the various surveys as a necessary tool for boosting the green housing market in Lagos. However, a review of relevant existing laws revealed a lack of commitment towards a vibrant green building sector by the government.</td>
</tr>
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<td></td>
<td>Policies</td>
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<td></td>
<td>Incentives</td>
<td>While incentives for green housing developers was recommended in the FGDs, there is currently no such form of incentive. Also, the policy makers almost unanimously stated that incentives in the form of tax reliefs are currently impractical for the government. Thus, a need for innovative ways of incentivise green housing investors and developers are needed.</td>
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CHAPTER EIGHT

8. RECOMMENDATIONS AND CONCLUSION

8.1 Introduction

The overall purpose of the study was to create a framework for green housing investment in Lagos, by assessing various investment drivers and their effects on GH investment decisions. In so doing, it was assumed that given the right investment drivers, property developers will invest in green housing in Lagos. While chosen concepts were used to understand and establish the various investment drivers, the Theory of Planned Behaviour (TPB) was used to inquire into the ultimate attitudes and investment behaviours of Lagos property developers towards GH investment. The following sections discuss the major findings from the results of the study and the conclusion of the thesis.

8.2 Summary of major findings

8.2.1 Green housing in Nigeria

The study set out to understand how the concepts of green housing and green buildings at large are perceived by Lagos housing stakeholders. The first objective of the study was to define green buildings in the Nigerian context. While the definition and descriptions of green buildings were established in literature in earlier chapters, it was also established that depending on the context in which it is being described, the definition of a green building is subject to variations. It was discovered that the concept of green housing and green buildings in general are currently largely unexplored by the Nigerian building industry. This is evidenced by the insignificant number of green buildings in the country, a factor established by the results presented in the previous chapter. Discussions with Lagos home users, estate surveyors, architects and policy makers pointed to the fact that there is a general lack of awareness of both the vulnerability of the environment and the need to alleviate such through green buildings.

Thus, the definitions of green housing in the Nigerian context was adapted from discussions with architects, related policy documents and policy makers. These discussion participants defined green buildings based on design, materials and landscaping. Policy makers defined GH in terms of the presence of adequate greenery (soft landscaping) and made very limited mention of adequate ventilation and lighting.
There was no specific mention of green, or environmentally sustainable buildings in all the related policy documents reviewed. Rather, there were vague mentions of expected green features such as adequate ventilation, lighting and landscaping around buildings. There is also an expectation in one of the documents that buildings should be adaptable to climate change albeit with no specific definitions of those expectations, or how to achieve adaptability.

The architects in their descriptions, concentrated on the inclusion of locally sourced and produced building materials in buildings and the modification of current building design methods to incorporate more efficient lighting and ventilation. It is however observed that the architects are limited in their theoretical knowledge, as green building designs are not in high demand. This restricts their experience with green buildings as there is no real pressure to research into optimising green building designs for the local and in the case of this study, the Lagos market.

Also, tying into the second objective, which is assessing the current status of green housing investment in Lagos, adopting a working definition of GH in Lagos is likely to be dependent on the degree of related stakeholders’ involvement in such projects. In other words, the product may be easier to define if there are sufficient activities in the GH market or sector. The non-existence of a proper definition and lack of a strong presence of GH in Nigeria, may also be attributed to the absence of any local GBRS, or green building regulatory body to champion the cause in the country. During this study, there was limited mention of GBRS among the discussants, even when questions were asked as to the role of such bodies in growing the GH market. This portrays a lack of understanding of the necessity of a green building regulatory body in the country, among the practitioners that practise in the housing sector. Literature reveals that in many other climes, green building councils not only see to the certification of buildings but also enlighten the public on what green building standards should be. For instance, one of the roles of the Green Building Council South Africa (2017a) is stated as “supporting government to lead by example, to legislate and facilitate the adoption of green building practices”. This suggests that the role of the GBCSA is not only regulatory, but also instructional and supervisory.
The study revealed that GH is not a primary investment choice among property developers in Lagos, as evidenced in the results from the interview with property developers. Firstly, because ERPI is not a concept that is operational among the property developers in Lagos, they are not motivated to, or indeed knowledgeable enough to consider environmental implications of investments. Secondly, since supply is driven by demand, and according to the estate surveyors and valuers, there is no significant demand for green housing in Lagos, developers are not motivated to invest in GH. Hence, the study found no documented case of completed or ongoing GH developments in the state. However, in testing the TPB, the Perceived Behavioural Control of surveyed developers showed that the availability of favourable investment drivers would have a positive effect on the developers’ GH investment behaviour.

8.2.2 Awareness of green housing among Lagos stakeholders

The third objective of the study was to assess the level of awareness of green buildings among Lagos state housing stakeholders. The study uncovered a significant level of ignorance of green housing among home users, building professionals and policy makers (see sections 7.3.2 and 7.3.3). The results also show that though there is a general desire for individual green housing attributes among home users, as displayed in the housing attributes ranking, green housing as a concept is relatively unknown. In literature, the increasing presence of green building has been associated with increasing awareness of worsening environmental conditions (Kibert, 2004, Korkmaz et al., 2009) as is the case in the Swiss housing market (Swidler et al., 2011). Increasing GH stock in Lagos may therefore be directly dependent on increasing environmental awareness among the populace.

The environment, its protection and regulation are primarily state responsibilities (Adams, 2009), as was discussed under the ecological modernization theory. As noted in the literature review according to Hirigoyen (2017), public enlightenment on environmental issues and the need to increase the GB stock should be a governmental responsibility. However, the study showed only minimal knowledge and interest in GH, even among policy makers responsible for both the environment and housing sectors in Lagos, as shown in the data from the policy makers’ FGD (see section Knowledge of green housing among policy makers). Apart from officers of the Ministry of
Environment, other ministry officers and legislators did not have explicit knowledge of the workings of or the importance of GH.

While the architects exhibited a relatively high level of awareness of GH, their knowledge seemed to be more-theory based than practical, as evidenced by their correct definitions of green housing, but lack of significant GH project experience. The estate surveyors and valuers however exhibited a far lower level of knowledge of GH. Considering that the estate surveyors and valuers are the ‘middle-men’ between property owners and home users, it is expected that they have proper knowledge of the commodity to stimulate both demand on the consumers’ side and supply on the developers’ side. Therefore, the task of increasing GH stock in Lagos may partially depend on the wealth of knowledge of the ESVs on the role of the built environment in environmental preservation. While the ESVs identified unavailability of environmentally responsible property investors as a contributory factor to the GH deficit in Lagos, they demonstrated a minimal sense of responsibility towards the enlightenment of their clients. This gap may be as a result of lack of technical exposure of ESVs to changes in the global built environment.

The property developers displayed a fair knowledge of GH, though they expressed averseness towards investment in the product. The reason for this averseness is tied to unavailability of relevant data for investment decision making in this respect. The developers stated that proof of profitability will be a driver for green housing investment. Data including accurate market value of GH, returns on GH investments and demand for the product is the necessary but unavailable data to the property developers. In such regard, the UNEP FI North American Task Force (2010) succinctly states “We are stuck in a chicken-and-egg situation, where investors are interested in [Responsible Property Investing] but need data to support investments, while the lack of investments, of course, restricts data” (p. 5). The foregoing statement is also applicable to the Nigerian GH context.

8.2.3 Practicality of green housing construction in Lagos
The fourth and fifth objectives of this study set out to establish the impact of green features on residential property values and the viability of such properties. The study
therefore sought to explore the practicality of a green housing market in Lagos in terms of design, building materials and cost. To establish this, the study produced three different building designs. The brief given to the designing architects was to, as much as is practically possible, incorporate green features in the designs, while ascertaining that the properties remain marketable in terms of the cost of construction, in the Lagos residential property market. Discussions with the architects revealed that the inclusion of green features in buildings in Lagos had to be done conservatively. This is because the GH is still perceived as new to the Lagos housing sector. It was also agreed that since the properties in question are for investment purposes, there is a need to keep the costs within reasonable limits such that profit margins are achievable at competitive market prices.

The designs were therefore devoid of common high technology green features such as solar photovoltaic panels and sensor taps found in GH designs in other climes. During the FGD, the architects noted that these building components are uncommon in Nigeria and usually only available on special order from outside the country. This process of acquisition automatically drives the cost of the building up and therefore was avoided in the designs. However, design modifications were used to reduce energy and water needs of the buildings. The need to maintain environmental sustainability, while keeping costs as realistic as possible, reinforces the need for further research into local green building materials and methods. The use of recycled materials, improvement on technologies for producing existing local building materials and the production of new local building materials were highlighted as green building research foci. Locally sourced and produced building materials were perceived to be both cost and energy-efficient, as they possess less embodied energy and therefore a major choice for GH constructions.

The discussion with the estate surveyors and valuers revealed that green housing units are likely to be most profitable in high and medium-income neighbourhoods. Hence, the building designs produced were those that can easily fit into these kinds of neighbourhoods. The cost estimations produced by the quantity surveyors and subsequent payback period calculations by the ESVs showed that the properties will only be reasonably profitable in medium to high income neighbourhoods of Lagos. This assertion is not unconnected to the perceived high cost of construction and the need to recoup same with adequate profit margins. Therefore, it is gathered that, as a budding market in Lagos, the GH market cannot be related to low-cost or affordable housing.
8.2.4 The business case for green housing

Also, in connection with the fourth and fifth objectives, the study sought to assess both the feasibility and viability of GH investments in Lagos. A combination of these two factors forms the drivers that motivate investment decisions. It was discussed in the conceptual framework that beyond financial benefits, the non-pecuniary business enabling factors are also important criteria for the decision to invest in green housing. It was discovered in the study that property developers generally have pessimistic dispositions towards GH as an investment choice, made evident by the low mean attitude score achieved while assessing planned behaviour. They however expressed high interest in investing in the commodity, given the availability of a list of business supporting and enabling factors, itemised in this thesis under the perceived behavioural control (PBC). This high interest was expressed in the high mean PBC score (see Table 7.17). In particular, developers exhibited high scores for high returns on investment, lower risks of investment, lower life cycle costs and better corporate image. Other factors which the developers expressed higher than average scores for were availability of technical expertise, accessibility to green building materials, enabling legislation and proof of consumers’ environmental consciousness.

As important as creating the right business atmosphere is, return of and on investment are still major determining factors for investment decision taking. In attempting to establish the viability or otherwise of GH investments, the costs and values of hypothetical prototype green buildings designed by the architects were determined. While costs were determined by a quantity surveyor, the viability of the investment was assessed by an ESV using the Discounted Payback Period technique to capture the time value of money. The analysis of the payback period of the properties was based on the cost estimates produced by the quantity surveyors. The payback period was the most appropriate method for assessing the viability of the properties, as lack of comparable data hindered other more appropriate methods of valuation (see section Estimation of costs and values of hypothetical green housing units for the payback period data). In comparison to earlier stated expected payback periods on conventional residential properties, the hypothetical green building units presented weaker results. However, the presented calculations serve as a form of information for business decision making.
It was stated earlier in this study that WTP is a measure of demand which, as noted in literature, forms a major investment driver for GH investments. The study produced conflicting results between the home users and the estate surveyors and valuers in this regard. While the home users displayed a high rate of WTP, the ESVs expressed doubt that home users in Lagos are willing to pay a premium to reside in green homes. Although the ESVs gave opinions as professionals in the field, the fact remains that there is insufficient prior data to back this opinion. The study however produced data on home users WTP that can be used as a basis for investment decision making. Though Breidert et al. (2006) warn that there is a high possibility of biases when assessing stated preferences as against revealed preferences, Carlsson and Martinsson (2001) found no significant difference between preferences observed through hypothetical and actual choice experiments. As such, the results in this study can be interpreted to mean that home users’ willingness to pay a premium is a green housing investment driver.

The role of data and information cannot be underestimated in the bid to increase the GH stock in Lagos. However, even as there is a need for housing stakeholders to be fully informed of the workings of the market, there is still the need for ‘first- movers’ to stimulate the market and invariably bear the risk of investing in uncharted territory. This then highlights the importance of ERPI in increasing the green housing stock. In the literature review (see section Environmentally Responsible Property Investment (ERPI)), ERPI was defined as efforts by property developers or investors to consciously adopt investment or development decisions that ensure that buildings have minimal effects on their natural environment. The onus lies on stakeholders in both the public and private sectors to innovatively create opportunities to make the product at least minimally profitable for would-be investors.

8.2.5 Environmentalism and policy

Environmentalism involves the political methods adopted in managing the environment. In this light, the sixth objective of the study was to assess the availability of policies or instruments that support the GH sector in Lagos. The study revealed that there are currently little or no environmental management strategies particularly linked to the housing sector in Lagos. There was no categorical mention of green housing schemes, plans or strategies among all surveyed policy makers. Also, all reviewed policies and documents revealed the seemingly phlegmatic stance of the government on environmental sustainability in the housing sector. Of particular interest were the newly
promulgated Lagos State Environmental Management and Protection Law (2017) and the National Building Code, which are expected to deal comprehensively with environmental issues. While some of these instruments may need to be updated to accommodate current pressing issues, the fact that even policies that have only been reviewed as recently as in the previous year do not cater for environmental protection from the housing sector depicts ineptitude on the part of the policy makers.

The architects cited unfavourable planning regulations that made effective green designs difficult. This however may be more of an implementation than a regulation issue, as pointed out by the policy makers, during their discussions. Naess (2001) who himself advocated more ambitious policies in tackling environmental degradation, states that plot allocation and regulation have major influences on the practicability of green buildings. He suggests that plot allocation techniques must take environmental implications into consideration. The ESVs, during their discussion session, suggested that beyond policy formulation, active participation of the government in the provision of GH is an effective stimulant for the GH market. Additionally, the property developers also expressed a high mean score of agreement, when asked if GH would be a priority, if there were related business supporting policies or legislations. While officials from the ministry of environment expressed heightened interest in the idea of increasing the GH stock, discussions exposed a level of “institutional ambiguity”. Oelofse et al. (2006) Institutional ambiguity as state institutions’ incapability to effectively implement policies. The ministry officials complained about inadequate empowerment tools to enforce current laws and policies, a factor they stated may also affect any emerging GH policies.

The FGDs with the policy makers and estate surveyors and valuers produced various policy suggestions. However, the strongest suggestions from the discussions included: tax relief or holidays for GH investors and developers, subsidies on green building materials targeted at property developers, the facilitation of easy land and property documentation for GH developers and public enlightenment programs on environmental issues. As earlier stated, the ESVs suggested a government initiative to retrofit public buildings as well as incorporate green features in public housing unit designs. It is worthy of note that both the policy makers and the built environment professionals
acknowledged the fact that policy formulation had to be a joint effort among all related stakeholders.

The seventh objective of this study was to assess the workability of a Green Building Rating System (GBRS) in Nigeria. Three systems were reviewed and compared in literature. These are the LEEDS for Homes, the Green Star SA – Multi Unit Residential v1 and EDGE. These GBRS were assessed based on their adaptability to the Nigerian context. While the three systems assessed can be adapted to the Nigerian market, EDGE appeared to be the most uncomplicated and ‘user friendly’ for reasons given in section Excellence in Design for Greater Efficiencies (EDGE). During its prime entry into a local market, a GBRS will need to be both easily accessible and applicable to encourage voluntary use by property developers.

EDGE appeared to possess both qualities. No concrete direction could however be agreed on from the various discussions on the subject of GBRS formation in Lagos. The various parties differed on the bodies responsible for its creation. While the policy makers stated that it should be the responsibility of professional bodies, the professionals did not show any strong sense of commitment to the creation of such systems, as evidenced by the lack of concrete comments on the issue. Therefore, no conclusion can be drawn from the discussions as to the modalities of a GBRS formation in Nigeria. Literature reveals that most GBRS are created voluntarily by non-governmental organizations, mostly which are green building councils of their respective countries. Thus, the absence of a functional green building council in Nigeria is a deterring factor for the formulation of a local GBRS.

The eighth objective, which sought to identify non-pecuniary factors that would motivate green housing investment drivers in Lagos, has been discussed in details in section Evaluation of green housing investment drivers. The ninth objective of the study which sought to create a framework for green housing investment in Lagos, is discussed in details in the following section.
8.3 Recommendations

Figure 8.1 shows the proposed framework for green housing investments in Lagos, which is the ninth objective of this study.

![Framework for green housing investments in Lagos](source)

The framework recommends a synergy among all relevant stakeholders that will translate to an increase in GH developments and investments. The study revealed the extent to which lack of knowledge of green housing among Lagos stakeholders affects the ability
of the sector to thrive. Thus, technical environmental sensitisation programs in the form of continuing professional development workshops or seminars, for built environment professionals and public orientation programs for housing consumers are hereby recommended in Lagos state. In the case of the architects, while research into alternative building materials, components and methods would increase demand for green housing among property developers, increased demand by developers, for green housing will also translate to more GH research among the architects. This explains the ‘two-ended arrow’ between the architects and the developers in the framework. The more accessible and affordable green building materials and methods are, the more likely that GH becomes a commodity of choice for investors and developers. On the part of the ESVs, technical and environmental enlightenment programs must include better understanding of green housing and its benefits, specialised green housing marketing strategies and ideal valuation methods and appraisal techniques. It is recommended that the NIESV consciously includes the subject of green housing in its Mandatory Continuous Professional Development (MCPD) programs.

While different parties are responsible for contributing to a conducive business atmosphere, it must be stated that environmental reform is largely dependent on institutional shifts towards environment-centric policies. Thus, purposive policies aimed at stimulating the GH market are necessary if the housing sector is to make a meaningful impact on the environment. As previously discussed in the literature and with the policy makers, green building stock in various climes thrives when the government takes the lead in developing it. Therefore, it is not only essential that upcoming government housing developments are conceived and executed as green developments, but that the government advances positive gestures that aid business and investments towards GH developers.

These gestures may be in form of enabling policies and incentives to developers. Imperatively, environmental policies must also include financial policies aimed at promoting GH market efficiency and increasing the stock of environmentally responsible investors. Examples of such policies include governmental guarantee for Carbon emission reduction and green funds, which provide financing for environmentally sustainable projects. The need for GH investment enabling policies cannot be overstated.
Hence, in view of the employment of the ecological modernisation theory, the study recommends the conscious participation of the government and the private sector in GH investments by the former creating a conducive political atmosphere for the GH market growth. This entails prioritisation and formulation of clear-cut green housing targeted policies, that would without ambiguity, enable and encourage such development projects. As a matter of necessity, formulation of these policies must actively include the input of the various stakeholders, as identified in this study, involved in both the supply and consumption of housing. Berger et al. (2001) state how the EU partners with the private sector in policy formulation and implementation to achieve the continent’s environmental goals. Policies formed solely by the government, without input from the built environment professionals or practitioners are likely to ignore vital elements that make them practicable for the parties they are targeted towards.

It was established previously in this study that incentives are green housing investment drivers. Therefore, green housing policy formulation must actively include incentives significant enough to trigger interest in green housing projects. For these incentives to be effective, a survey of all related stakeholders and their housing related preferences must be carried out. In this regard, special attention should be given to tax related incentives, as they were identified during the discussions as a form of potentially effective investment driver. This study has also identified a plethora of GH related policies and policy instruments available internationally that can be adapted to the Lagos context for effective green housing market administration and regulation.

The framework also recommends that policy makers should create targeted programs for public environmental sensitization. The study revealed a level of environmental illiteracy which is the basis for the apathetic attitude to GH. Therefore, considering the national significance of environmental degradation and climate change, the state should be innovative in enlightening the public about the environmental hazards and abatement techniques, which include embracing GH in place of conventional housing units. The popularisation of GH is dependent on the understanding of the underlying environmental issues. Thus, environmental sensitisation programs, explicitly stating how adopting green housing is one of the most effective methods to mitigate current environmental problems, are recommended. These programs could be successfully implemented through agencies
such as the National Orientation Agency (NOA), in the form of media jingles and as the subjects of town hall meetings.

Also, as earlier stated, the estate surveyors and valuers are mostly the immediate contacts that home users have with the housing supply side. Hence, the study recommends that the state could implement these sensitisation programs through the ESVs. For instance, ESVs may be mandated to advertise green buildings separately and differently from other conventional buildings, and the basic attributes that qualify them as green should be expressly stated in the adverts. Further in this light, the study also recommends the immediate development or adoption of a state-wide GBRS, or the adoption of the EDGE system as discussed in section Comparison of the systems. While there are isolated cases of buildings that have been certified by recognised international GBRS, the existence of a local system which is easily assessable and understandable by local developers would further aid in growing the GH market in Lagos. Recognition and utilization of such systems by the government would also be a good strategy for growing the GH stock. For instance, in the US, governments at various levels require that certain buildings must be LEED certified at one level or the other (Matisoff et al., 2016). Though most of such buildings are either public owned or commercial, the recognition of the GBRS by the government boosts public confidence in the systems.

The ESVs during their discussion, were of the opinion that to stimulate the GH market, there is a need for a specialized kind of marketing for the product. This entails marketing the unique features of the property and their benefits, against the conventional forms of property marketing. The need for this is apparent, considering the anomaly and somewhat newness of the product to the Lagos housing market. While lack of adequate data on green housing users’ experience may hinder the use of tools like Post Occupancy Evaluations (POE) for marketing GH in Lagos, there is a need for creativity in selling the product. Therefore, considering the results of the home users’ housing attributes ranking and WTP, targeted and customized GH marketing strategies would boost demand and subsequently, the market for GH. Apparently, the responsibility of marketing lies with both ESVs and the property developers. The framework also suggests that being the main interface between property owners and users, the ESVs should be responsible for educating their clients on the need for GH whenever they are consulted, both as an investment and as a residential option and providing them with the necessary
data and information needed for business decision making. Such data should include housing consumer behaviour and WTP for GH.

Being a largely capitalist economy, the growth of the GH market in Lagos is mainly dependent on the private sector. Imperatively, the concept of ERPI needs to become more popular if the GH stock is to be increased. Therefore, the study recommends the creation of a recognised body of ERPIs, either by the government or voluntarily by professional bodies or other forms of pressure groups. Giving incentives for ERPI will not only increase profitability of this class of properties, but will also increase business interests in environmentally sustainable building projects.

With the threats and manifestations of climate change and global warming becoming more apparent, environmental management is a time constrained exercise that must be given utmost priority. It is therefore advised that bureaucratic processes and bottlenecks should be reduced to the barest minimum or in fact completely eliminated in environmental management for all sectors of the economy. Also, the ineffectiveness of environmental management in Nigeria may not be unconnected to the general lack of basic relevant data. For instance, GHG emission data is a basically necessary data for climate change mitigation at all levels. A sector by sector analysis of GHG emission would aid calculated strategizing towards its management and control by each sector. Therefore, there is a need to put a system in place for the monitoring and administration of such data.

The study highlights the fact that a vibrant GH market is dependent on a robust inter-relationship between various actors in the housing sector. Thus, estate surveyors and valuers, architects, quantity surveyors and builders must find ways to synergize towards a common goal of an environmentally sustainable built environment. This is likely to initiate a sense of commitment towards the common cause of climate change mitigation.

8.4 Contribution of study to knowledge

This study fills a gap in existing literature, bringing to light the factors deterring the growth of the GH stock in Lagos. The study also suggests an investment framework from the findings, which takes all the assessed variables into consideration. The study contributes to a continually expanding body of research on the globally significant issue of environmental degradation and its mitigation strategies, in the housing sector. The
results have further established the paucity of environmentally sustainable residential buildings in Lagos and the reasons for the shortage. It is understood from this study that a wide range of factors contribute to the poor performance in Lagos. These factors have been identified in previous sections and recommendations as to how they may be abated are offered in the next section.

The exponentially growing population of Lagos and concomitant housing shortage elicits the need for this study. With its reputation as Africa’s largest megacity, Lagos must be at the forefront of climate change management in every sector, including the housing sector. Hence, in gathering and analysing data concerning green housing in the housing sector, this study exposes an investment option that until now has not been effectively explored by property developers. The employment of the theory of planned behaviour in understanding property developers’ behaviour towards green housing investment creates an opportunity for business strategizing, by policy makers and the built environment practitioners. With an understanding of this additional housing investment option, the various parties involved in the actualisation of an effective green housing market are equipped with the necessary tools for proper implementation.

The study also exposes the incapacity of current policies and regulatory instruments to effectively promote the cause of green housing in Lagos. Thus, it instigates a review of existing policy instruments and formulation of new ones, to adequately accommodate environmentally sustainable practices in the housing sector in Lagos. Also, the study intends to trigger a series of research in green housing that will facilitate the growth of the green housing sector, in Lagos to start with, but more broadly, in other Nigerian cities.

8.5 Recommendations for further research
Since the research was only carried out from a housing sector perspective, it may be pertinent to also assess the market from other perspectives. Notably, assessing finance structures that can boost the GH market, the role of engineers in developing a locally adaptable GBRS and health implications of GH on occupants are of particular interest. Results from this study highlighted low and medium density residential areas as the most viable targets for GH in Lagos. Considering that a greater part of the population resides in low income neighbourhoods, research into low-cost GH options is recommended.
While this study focused on the construction of new green housing sector, retrofitting has been highlighted in literature as a faster and alternative method for greening the housing stock. Thus, research into retrofitting the current housing stock is encouraged as a climate change abatement strategy. Lagos is a heavily commercialised city and commercial developments abound in different shapes and sizes around the state. Therefore, beyond residential buildings, attention must also be paid to the environmental sustainability of other classes of property in Lagos for a holistic approach to greening the building stock.

Emphasis in this study has been on green features and designs in residential buildings. However, consumer behaviour is another important factor to consider in the evaluation of the environmental sustainability of residential buildings. This reiterates the need for public enlightenment programs on environmental issues.

8.6 Conclusion
This research set out to create a framework for Green Housing investment in Lagos. Having surveyed relevant stakeholders in the housing sector, the study has brought to the fore the factors deterring the growth of the green housing market in Lagos, in spite of its apparent necessity in the face of global climate pattern changes. It also gives an insight into the varying perspectives of green housing that are held by different actors in the housing sector, thus providing some form of direction for the development of a vibrant green housing market.

The concept of green housing is not borne out of the need for a new housing trend or a different variant of residential properties. Rather, green housing provides a solution to a pressing global issue with already ravaging effects. As such, green housing can be likened to a vaccine which may not necessarily cure the already degraded environment completely, but can be effective in checking its further degradation. Hence, this study has also shown the necessity for such buildings, especially in a city like Lagos. The framework created from this study is expected to create a ripple effect of increased green housing structures in anticipation of a more sustainable environment.
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APPENDICES

APPENDIX 1: ETHICAL CLEARANCE LETTER

15 March 2016

Mrs Teni Ogbeide Odu
School of Built Environment and Development Studies
Howard College Campus

Dear Mrs Odu

Protocol reference number: HSS/1828/015D
Project Title: Making case for Green Housing Investment in Lagos

Full Approval – Expedited Application

In response to your application received 15 December 2015, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted FULL APPROVAL.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Dr Shekukwa Singh (Chair)
Humanities & Social Sciences Research Ethics Committee

Cc Supervisor: Dr Pauline Adekeye
Cc Academic Leader: Research: Dr Cathy Sutherland
Cc School Administrator: Ms Lindile Danisa/Ms S Naicker
APPENDIX 2: HOME USERS’ QUESTIONNAIRE

My name is Tenigbade Odu, I am a Housing PhD student at the University of KwaZulu-Natal Durban. I am currently doing a research ‘MAKING A BUSINESS CASE FOR GREEN HOUSING INVESTMENT IN LAGOS’, which is aimed at creating a framework for green housing investment in Lagos. This questionnaire is to gather data in that regard. Your input will be appreciated and your responses are strictly confidential. Results will also be made available to you on request. Please contact me for any enquiries at tenigbade@gmail.com.

Kindly answer questions by checking the box with your most preferred answer.

1. Gender
   □ Male
   □ Female

2. Age group
   □ Below 20
   □ 20 – 34
   □ 35 – 49
   □ 50 – 64
   □ 65 and above

3. Occupation sector
   □ Finance
   □ Education
   □ Built environment
   □ Medical services
   □ Information technology
   □ Oil and gas
   □ Environment and ecology
   □ Other please specify ______________________________

4. Education level
   □ O level certificate
   □ National diploma
   □ Professional Certification


☐ B.Sc. / Higher National Diploma
☐ Masters
☐ Ph.D.
☐ None of the above

Residential details
5. Neighbourhood of residence ______________________________________

6. Type of residence
   ☐ Detached house
   ☐ Semi-detached house
   ☐ Flat in a block of flats
   ☐ Self-contained apartment
   ☐ Room in a house with shared conveniences
   ☐ Other, please specify ______________________________________

7. Average rent per annum (₦)
   ☐ Less than 100,000
   ☐ 100,000 – 299,000
   ☐ 300,000 – 499,000
   ☐ 500,000 – 699,000
   ☐ 700,000 – 899,000
   ☐ 900,000 and above

8. Average monthly electricity bills (₦)
   ☐ Below 2,000
   ☐ 2,000 – 4,999
   ☐ 5,000 – 7,900
   ☐ 8,000 – 10,999
   ☐ 11,000 – 13,999
   ☐ 14,000 – 17,000
   ☐ Above 17,000
Green buildings

9. Rate the following housing features in order of importance, 1. is the most important and 8. is the least important. (Mark only one box per row).

<table>
<thead>
<tr>
<th>HOUSING ATTRIBUTES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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</thead>
<tbody>
<tr>
<td>Reduced utility bills</td>
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<tr>
<td>Reduced impact of building on the environment</td>
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<tr>
<td>Improved indoor air/environment quality</td>
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<td></td>
<td></td>
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<tr>
<td>No negative effect of building on occupants’ health</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Aesthetics</td>
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<td></td>
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<tr>
<td>Savings on rent/cost of acquisition</td>
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<td></td>
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<tr>
<td>Modern design</td>
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<td></td>
<td></td>
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<tr>
<td>Large room sizes</td>
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</tbody>
</table>

10. Have you heard of the term ‘green buildings’?

☐ Yes
☐ No
☐ I am uncertain

11. Do you know what a green building is?

☐ Yes
☐ No
☐ I am uncertain

12. If your answer in 11. Above is yes or uncertain, briefly describe what a green building is

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

13. If you have to pay more than the going rate of your choice property to reside in a green similar one, bearing in mind that you may have reduced electricity bills, a healthier living space and less negative effect on the environment, how much more will you be willing to pay?

☐ Less than 10% over the going rate
☐ 10% - 29% over the going rate
☐ 30% - 49% over the going rate
☐ 50% - 70% over the going rate
☐ More than 70% over the going rate
APPENDIX 3: ESTATE SURVEYORS AND VALUERS’ QUESTIONNAIRE

My name is Tenigbade Odu, I am a Housing PhD student at the University of KwaZulu-Natal Durban. I am currently doing a research titled ‘MAKING A BUSINESS CASE FOR GREEN HOUSING INVESTMENT IN LAGOS’ which is aimed at creating a framework for green housing investment in Lagos. This questionnaire is to gather data in that regard. Your input will be appreciated and your responses are strictly confidential. Results will also be made available on request. Please contact me for any enquiries at tenigbade@gmail.com.

Kindly answer questions by checking the box with the most appropriate answer.

1. Location of practice
   - □ Lagos Mainland
   - □ Lagos Island

2. Years of Practice
   - □ Less than 5 years
   - □ 5 – 10 years
   - □ 11 – 15 years
   - □ 16 -20 years
   - □ 20 – 30 years
   - □ Over 30 years

3. Rate the followings services according to your strength of specialisation i.e. 1. is your strongest specialty and 6. Will be least
   - □ Valuation
   - □ Sales
   - □ Letting
   - □ Property management
   - □ Real estate research
4. Rate the following property features in order of importance, 1. is the most important and 7. is the least important

- [ ] Energy/ water efficiency
- [ ] Life cycle cost saving
- [ ] Reduced impact of building on the ecology
- [ ] Improved indoor air quality
- [ ] Improved health of occupants
- [ ] Aesthetics
- [ ] Reduced cost of construction

5. Do you know what green buildings are?

- [ ] Yes
- [ ] No
- [ ] Uncertain

If your answer in 4. Above is ‘No’, kindly end here.

6. Briefly describe what a green building is

________________________________________________________________
________________________________________________________________
____________________________________

7. Do you have any green buildings in your company’s property portfolio?

- [ ] Yes
- [ ] No

8. Have you ever pitched the idea of investing in a green building to any of your clients seeking to invest in housing?

- [ ] Yes
9. Why is the green building stock in Lagos so small? (Tick more than one option if necessary)

- [ ] They are considered expensive to construct
- [ ] There is no awareness of green buildings among investors
- [ ] There is no awareness of green buildings among built environment professionals
- [ ] They are not as profitable as conventional buildings
- [ ] There are no policies that encourage investment in green buildings
- [ ] Renters may not be interested in them
- [ ] There is no green building rating/certification body or institution
- [ ] Other (please specify)-

10. Please answer the following questions from your experience with dealing with clients.

<table>
<thead>
<tr>
<th></th>
<th>STRONGLY AGREE</th>
<th>AGREE</th>
<th>INDIFFERENT</th>
<th>DISAGREE</th>
<th>STRONGLY DISAGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most tenants do not have an idea of what green buildings are</td>
<td></td>
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<tr>
<td>Tenants will prefer to live in green homes if they know they can save on utility bills</td>
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<tr>
<td>Tenants will prefer to live in green homes if they know that by doing so, they can contribute positively to the environment</td>
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</tr>
<tr>
<td>Tenants will pay a premium to live in green homes if they know the benefits.</td>
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<tr>
<td>Real estate investors will invest more in</td>
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<tr>
<td><strong>green homes if they</strong>&lt;br&gt;<strong>know they can get a</strong>&lt;br&gt;<strong>premium on the</strong>&lt;br&gt;<strong>rents</strong></td>
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<tr>
<td><strong>Real estate investors</strong>&lt;br&gt;<strong>will invest more in</strong>&lt;br&gt;<strong>green buildings if there are supporting</strong>&lt;br&gt;<strong>policies</strong></td>
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</tr>
<tr>
<td><strong>Real estate investors</strong>&lt;br&gt;<strong>will invest more in</strong>&lt;br&gt;<strong>green buildings if it</strong>&lt;br&gt;<strong>will boost their</strong>&lt;br&gt;<strong>public image</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Real estate investors</strong>&lt;br&gt;<strong>will invest more in</strong>&lt;br&gt;<strong>green buildings if they understand that</strong>&lt;br&gt;<strong>they are contributing</strong>&lt;br&gt;<strong>positively to the</strong>&lt;br&gt;<strong>environment</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Real estate investors</strong>&lt;br&gt;<strong>will invest more in</strong>&lt;br&gt;<strong>green buildings if they know they can</strong>&lt;br&gt;<strong>save on the life cycle</strong>&lt;br&gt;<strong>cost of the property</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
APPENDIX 4: PROPERTY DEVELOPERS’ QUESTIONNAIRE

11. Which kind of projects is your company mostly involved in? (Tick more than one option if necessary)

☐ Residential developments
☐ Commercial developments

12. What are your company’s key areas of operations? (Tick more than one option if necessary)

☐ New property development
☐ Old property renovation
☐ Property retrofitting
☐ Property marketing
☐ Other (please specify)__________________________________________________________

13. Years of Practice

☐ Less than 5 years
☐ 5 – 10 years
☐ 11 – 15 years
☐ 16 – 20 years
☐ 20 – 30 years
☐ Over 30 years

14. How many housing development projects has your company undertaken in the last 5 years?

☐ 1
☐ 2
☐ 3
☐ 4
☐ 5
☐ More than 5
15. Rate the following residential property features in order of importance in line with your company objectives, 1. is the most important and 9. is the least important

- ☐ Energy/water efficiency
- ☐ Efficient use of building materials
- ☐ Life cycle cost saving
- ☐ Reduced impact of building on the ecology
- ☐ Improved indoor air quality
- ☐ Improved health of occupants
- ☐ Aesthetics
- ☐ Reduced cost of construction
- ☐ Easy marketability

16. Who are the major influencers of your company’s business decisions?

- ☐ Investors
- ☐ The property market
- ☐ The competition
- ☐ Mentor businesses
- ☐ The company’s financing institutions
- ☐ Others (please specify): __________________________________________

17. Which of the following features does your company use when constructing residential buildings?

- ☐ Use of recycled or salvaged building materials
- ☐ Use of readily renewable materials
- ☐ Use of solar orientation
- ☐ Optimisation of daylighting
- ☐ Use of vegetated (green) roofs
- ☐ Use of photovoltaic (solar) energy
- ☐ Use of passive designs
Use of renewable energy systems
Use of solar water heaters
Greywater reuse systems

18. Do you know what green buildings are?
   - Yes
   - No
   - Uncertain

19. If your answer in 9. Above is ‘Yes’, briefly describe what a green building is:
   ________________________________________________________________
   ________________________________________________________________

20. Do you have any green buildings in your company portfolio?
   - Yes
   - No

21. If your answer in 11. Above is ‘No’, why not? (Tick more than one option if necessary)
   - They are expensive to construct
   - There is no awareness of green buildings in Lagos
   - There is no awareness of green buildings among the professionals we consult
   - They are not as profitable as conventional buildings
   - There are no policies/ laws/ regulations that encourage investment in green buildings
   - The required technologies are not available
   - Green building materials are not easily accessible
   - Buyers/renters may not be interested in them
   - There is no green building rating/ certification body or institution
   - Other (please specify)______________________________________________

22. Green residential homes is likely to be most profitable among which class of home users?
   - High income class
   - Middle income class
   - Low income class
23. Kindly indicate how important the factors below are to your company’s decision to invest in environmentally sustainable housing units:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Rating Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of green housing units is:</td>
<td>Cheap __  __  __  __  __  __  __  __  __ Expensive</td>
</tr>
<tr>
<td>Awareness of green housing among Lagos Home users is:</td>
<td>High __  __  __  __  __  __  __  __  __ Low</td>
</tr>
<tr>
<td>Awareness of green housing among the building professionals that we consult is:</td>
<td>High __  __  __  __  __  __  __  __  __ Low</td>
</tr>
<tr>
<td>In comparison to conventional buildings, green housing units are:</td>
<td>more profitable __  __  __  __  __  __  __ less profitable</td>
</tr>
<tr>
<td>policies/ laws/ regulations that support investment in green housing are:</td>
<td>widely available __  __  __  __  __  __  __ unavailable</td>
</tr>
<tr>
<td>Technologies that support investment in green housing are:</td>
<td>widely available __  __  __  __  __  __  __ unavailable</td>
</tr>
<tr>
<td>Green housing building materials are:</td>
<td>widely available __  __  __  __  __  __  __ unavailable</td>
</tr>
<tr>
<td>Demand for green housing by home users is likely to be:</td>
<td>High __  __  __  __  __  __  __ Low</td>
</tr>
<tr>
<td>Suggestion, approval or insistence of our business influencers, financiers or mentors would influence our decision to invest in green housing</td>
<td>Definitely __  __  __  __  __  __ Definitely not</td>
</tr>
<tr>
<td>Our decision to invest in green housing would be influenced by the competition</td>
<td>Definitely __  __  __  __  __  __ Definitely not</td>
</tr>
</tbody>
</table>

Our decision to invest in green housing will be motivated by:

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Rating Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility to building professionals with adequate technical know-how.</td>
<td>Definitely __  __  __  __  __  __ Definitely not</td>
</tr>
<tr>
<td>Accessibility to green building materials.</td>
<td>Definitely __  __  __  __  __  __ Definitely not</td>
</tr>
<tr>
<td>Accessibility to a green building rating system.</td>
<td>Definitely __  __  __  __  __  __ Definitely not</td>
</tr>
<tr>
<td>Accessibility to green housing investment supporting policies.</td>
<td>Definitely __  __  __  __  __  __ Definitely not</td>
</tr>
<tr>
<td>Availability of incentives for investing in Green housing.</td>
<td>Definitely __  __  __  __  __  __ Definitely not</td>
</tr>
<tr>
<td>Proof of higher rental returns for green housing.</td>
<td>Definitely __  __  __  __  __  __ Definitely not</td>
</tr>
</tbody>
</table>
• Proof of lower risk of vacant housing units. Definitely __ __ __ __ __ Definitely not

• Proof of lower life cycle costs of housing units. Definitely __ __ __ __ __ Definitely not

• Boost in company’s corporate image. Definitely __ __ __ __ __ Definitely not

• We intend to take on green housing projects as a short to medium term goal. Definitely __ __ __ __ __ Definitely not

• We intend to take on green housing projects as a long-term goal. Definitely __ __ __ __ __ Definitely not

• We are currently developing green residential buildings. Definitely __ __ __ __ __ Definitely not
APPENDIX 5: FOCUS GROUP DISCUSSION (FGD) WITH ESTATE SURVEYORS AND VALUERS

Objective
To create a framework for a sustainable green housing market in Lagos.

Introduction (10 minutes)
- Moderator introduction
- Purpose and format of FGD
- Participants’ introduction

Discussion
- What is a green building? (5 minutes)
- What are the features peculiar to green buildings? (10 minutes)
- Why is there a deficit of green buildings in the current housing stock in Lagos? (15 minutes)
- What methods are suitable to value green buildings? (15 minutes)
- Should green buildings be marketed differently from conventional buildings? (15 minutes)
- What are the likely deterrents to increasing the current green building stock in Lagos? (15 minutes)
- What is the estate surveyor and valuer’s role in the creation of a green building rating/certification system? (10 minutes)
- What role can policies play in Lagos green housing market? (10 minutes)
- Other related issues from participants, questions and conclusion. (15 minutes)
APPENDIX 6: FOCUS GROUP DISCUSSION (FGD) WITH POLICY MAKERS

**Objective**

To assess the role of policy makers in the establishment of a sustainable green housing market in Lagos.

**Introduction (10 minutes)**

- Moderator introduction
- Purpose and format of FGD
- Participants’ introduction

**Discussion**

- How does the built environment contribute to global warming? (10 minutes)
- What is the role of the built environment in tackling global warming? (10 minutes)
- Why is there a deficit of green housing stock in Lagos? (10 minutes)
- Is increasing the green housing stock an agenda of the Lagos state government. (10 minutes)
- Why are there no available data on Greenhouse Gas emission from the built environment in Lagos? (10 minutes)
- What policies, laws, acts or regulation are available to enable green building construction? (10 minutes)
- What incentives are given to developers/ investors and home users to encourage investment and residence in green buildings? (10 minutes)
- Given the urgency of the need for change in building style from conventional to green, how soon can enabling policies be promulgated; what are the potential delays? (10 minutes)
- What is the government’s role in the creation of a green building rating/certification system? (10 minutes)
- Closing remarks
APPENDIX 7: FOCUS GROUP DISCUSSION (FGD) WITH ARCHITECTS

Objective
To establish a set of minimum standards for green housing designs in Lagos.

Introduction (10 minutes)
- Moderator introduction
- Purpose and format of FGD
- Participants’ introduction

Discussion
- How does an architect define green buildings? (15 minutes)
- What are the features of a green building (15 minutes)
- What will be the ideal green residential building features in the Lagos context, taking the peculiarity of the local climate, culture, security of life and property, availability of materials, affordability etc. into consideration? (20 minutes)
- What is the architect’s role in the creation of a green building rating/certification system? (15 minutes)
- Other related issues from participants, questions and conclusion. (15 minutes)

Closing remarks