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## Green Building Development in Nigeria: The Willingness of Property Developers a Determinant

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### Abstract

*In view of recent development in science that points to a strong correlation between adverse climate conditions and greenhouse gas emission. The quest to reduce carbon emission by most sectors of the economy is the vogue, hence the real estate sector seeks the integration of sustainable property development options in most housing project. This study intends to evaluate the willingness of real estate property developers to invest in green buildings. The focus of the study is to determine the casual relationship between awareness of Green building development options and willingness of property developers to invest in green building, on the extent of green building development in Nigeria. The study adopts the quantitative approach with questionnaire survey options. The level of willingness to invest by property developers shows that there is 71% willingness to invest in Green building with an average mean of 3.5697. This reveals a very high level of willingness to invest in green buildings by property developers. Furthermore, the level of awareness of green building development has an average mean value of 3.2015 which represents a 64% by the 5 point likert scale analysis. Awareness of Green building and Willingness to invest into Green building projects are significant determinants of level of green building development and adoption, with a P-value  $0.003 < 0.05$ . Hence, the study concludes that willingness to invest has a significant positive effect on Green building adoption and development. The study recommends public policy to improve willingness to invest in sustainable buildings, moreover awareness should be created on the social, economic and environmental benefits of green buildings projects among stakeholders in housing developments.*

**Keywords:** Developers, Awareness, Willingness to invest, Property, Green building

### 1. Introduction

Human activities around the world has altered the relationship between the natural world and the manmade world, and over time brought with them increasing level of hardship and frustration, resource problems and degradation. Price and Ochieng (2016)

reported that rapid development around the world has hastened environmental degradation and exacerbated resource problems. Such developmental activities include construction which converts natural habitats into more space from the natural to the man-made

world, and the use of construction materials such as wood, steel and concrete which ultimately depend upon activities such as forestry, mining and manufacturing that certainly disrupt and may at times destroy the natural world, continued operation and maintenance of infrastructure that requires energy and other materials that ultimately come from the natural world, normal operations, accidents and decay that may release toxic substances that can affect air quality, water quality and soil composition and limit or destroy the ability the plants and animals to survive near project sites (Dangel, 2016; Ariffin, et al., 2022).

However, there is an increase in the need to encourage sustainable building practices as a contribution of the building sector's activities to the overall global warming and climate change agenda. For example, Abramov, Sokolov and Derevianko (2019) identified the building sector as a major future contributor to climate change. Also, Khalili, Rantanen, Bogdanov and Breyer (2019) documented that the built environment account for a sizeable amount of total energy consumption and total greenhouse gas emissions around the world. Furthermore, conventional building activities have the deficiency of good energy system, water conservation, good indoor air quality, sometimes good site location/selection, site design, good landscape ecology, building ecology waste and recycling etc with little regard to economic social and environmental consideration triple bottom line approach which are the hall marks of green building. Therefore, green buildings in corporate existing buildings with green features promote sustainable development to ameliorate the environmental impact of a conventional building. Green building according to Khosla and Janda (2019) is the display of attributes that reduces environmental impact through all parts of the building life-cycle and focuses on the improved health of the occupiers, optimising utility for their owners and occupiers and the wider public whilst minimizing the use of natural resources and environmental impact.

It has been proven that global warming and climate change threaten the environment and all living creatures. Jurigova and Lencsesova (2015) said buildings are by far the greatest producers of carbon-dioxide and this "eco-footprint" can only increase with a large population increase predicted to occur by 2050. Kiper (2013) stated that building is responsible for more than 330 million tons a year of carbon-dioxide and greenhouse gas emissions (GHG), leading toward global warming with an unpredictable result. In Nigeria, the energy crises which covers affects the nation for decades has been great and largely added to the issue of poverty by crippling industrial and commercial activities. The council for renewable Energy of Nigeria estimated that power outages brought about a loss of 126 Billion (US & 984.38 million annually (Antai, Udo & Ikpe, 2015). This amount may be more due to the current economic situation of the country. Aside from the income loss energy crisis has resulted in health has and due to the exposure to carbon emissions caused by the regular use of backyard generators in different households and business enterprises and even the use of firewood, and charcoal for cooking in some households. The resultant effect of this problems are unemployment, a high cost of living and an overall fall in the living standard of the people.

As a result of global acceptance of the green building concept, many research works have been conducted, Zheng (2021) studied the how application of green building design concept to property development design can improve overall outcome, the study provided results for development of the construction industry toward green building adoption. Diputa, Uday & Chowdhury (2022) in green building construction in the modern world took

global views of on the extent of green building development. While most studies focused on developed economic the need for studies in other emerging economies, though Kalu 2016 studies the participation of corporate real estate companies in carbon reduction through the adoption of green initiatives, yet current studies on developing countries are still necessary. Therefore, this paper seeks to bridge the gap by investigating the casual effect of property developers' willingness and awareness on the extent of green buildings development and investment in Nigeria.

## 2. Literature Review

### 2.1 Concept of Green Building

In the 1970s, there was an energy crisis in which Earth's resource supply and environmental health became an increasingly serious problem. At that time, people began to rethink the values of the industrial era and re-adopted the green thinking of ancient agricultural civilisations. China's building consumption accounts for approximately one-third of all social energy consumption, and the environment has a substantial impact on the natural environment, human health, and the social economy, leading to discussions of energy conservation, green building and environmental sustainability issues, and their practical significance (Zhang, Kang & Jin, 2018). Reviews of research on the development of China's green building practices, usually with time trends as the main presentation style, summarize typical events and their influence on the development of a green building. This paper provides a summary analysis of the development process and the effectiveness of the factors associated with green building. The development of green buildings in China is based on the constant stimulation of government policy, the constant innovation of scientific research, continuous improvement in the standard system, and continuous technological innovation. Therefore, from the perspective of energy savings, this paper reviews the history of green building in China from the four perspectives of policy development, scientific research, the assessment standard system, and technological innovation, and analyses the effects of implementation and effects on energy savings (Doan, Ghaffarianhoseini, Naismith, Zhang, Ghaffarianhoseini & Tookey, 2017).

### 2.2 Principles of Green Building

A Green building is a building designed to have quality environmental performance compared to its conventional counterpart. By improving the efficiency with which energy, resources and materials are used over the building's life time, a green building made effort to balance environmental responsibility, users' comfort and well-being, community development and economics of building construction and operation (Zuo & Zhao, 2014; Ariffin, et al., 2022). Much of the focus to date in meeting building performance objectives has been on improving energy and resource efficiency, as reflected in mainstream green building rating systems such as LEED (Leadership in Energy and Environmental Design). As Zuo et al. (2014) write, saving energy and carbon has been seen as mostly a technical challenge (e.g. doing things more efficiently) or an economic one of payback period, (and) internal rate of return. However, Weiss et al 2004 opined that green buildings need to do more than effectively use natural resources within economic means. They must also support the health and well-being of their occupants so that the "human resources" can contribute to (rather than impede) the building's sustainability.

Green buildings often depend on natural conditioning to meet the comfort needs of end- users, engaging a combination of passive

strategies to provide indoor conditions that are more closely related to daily and seasonal variations outside (Kibert, 2016). Green buildings may bring an opportunity to impact knowledge about sustainability, connecting individual actions to larger social and ecological issues, through demonstration (e.g. signs and exhibitions), direct experience and observation and active participation (Kibert, 2016). The general adoption of green building demand for consideration of social and cultural factors typically omitted from techno-economic models of technology transfer. As Sinha, Gupta and Kutnar (2013) argue that technological, social and political aspects of energy efficiency cannot be separated. In their work applying a social-technical model to building energy efficiency, they argued that: decisions about energy should not be isolated from their social and cultural context; designers should explicitly acknowledge the network of actors involved in the reproduction and use of more energy-efficient buildings and associated technologies, and energy efficiency knowledge does not only derive from the top-down but also evolves from local contexts and users everyday experiences. In accordance with this last point, the successful adoption of environmental strategies, systems and practices in green buildings will eventually depend on the consideration given in the design of users' needs, habits, expectations and norms.

Shad, Khorrami and Ghaemi (2017), if productivity gain can be achieved in sustainable building, it will help to build a business case to show the financial viability of investment in green buildings at the corporate level. Green development involves three key factors, economic profitability, environmental reasonability, and social awareness and achieving the balance between them (Ikediashi, Ogunlana & Ujene, 2014). Zhao, Zhao, Davidson and Zuo (2012) define Green construction as the contribution of construction to sustainable development. The real estate and construction industry affect the environment in its contribution to waste creation, energy use, water use, recycling and reuse of materials, pollution and biodiversity. Environmentally, the building industry has the largest impact and, therefore, has the biggest opportunity to make a difference. The industry also contributes economically to the UK with employment, an emphasis on profitable growth and socially responsible investment (SRI). The social effect of the built environment affects the way society lives and works. Due to this, the need to build sustainably is necessary as what we build today will provide the built environment of the future and will influence the ability of future generations to meet their needs (Shad et al., 2017). The UK Government's strategy for sustainable construction was published in the year 2000 by the Department of the Environment, Transport and the Regions (DETR) (now Department of the Environment, Food and Rural Affairs (DEFRA) which follows from the 1999 priorities (DETR, 2000). The document set out ways that the building industry could contribute to the achievement of more sustainable development. These are: being more profitable and more competitive; delivering buildings and structures that provide greater satisfaction, well-being and value to consumers and users; respecting and treating its stakeholders more fairly; enhancing and better protecting the natural environment; minimizing its impact on the consumption of energy (especially carbon-based energy and natural resources).

These provide the framework for discussion on the environmental effect of sustainable construction. The recent strategy for green construction (2008) builds on the principles developed in 1999 by focusing on the need for a behavioural change in the industry. The strategy aims to support not only environmental objectives but can

make the overall project to be more viable. Investment is important to any real estate project and sustainability issues are becoming a factor in this area too. Some research has shown that green buildings may be healthier than conventional buildings. Zhao, He, Johnson and Mou (2015) contend that green buildings use resources such as energy, water, materials and land more efficiently, with more natural light and better air quality so these buildings contribute to improving health, comfort and productivity.

### **2.3 Willingness to Invest in Green Building**

Willingness to invest with the ability to make higher returns is often seen as a good measure to assess the feasibility of investment in green buildings. USAID (2009) stated that investment is considered viable when an investor perceives it as profitable. Matisoff et al. (2020) argued that willingness to invest in green building is recognized in terms of image and reputation which may allow the investors to charge higher sales values. So analyzing the willingness to invest in green buildings is linked with balancing costs and benefits. Generally, long-term decision-making to invest in property is associated with a higher willingness to pay. Investments in a sustainable buildings suffer when price-sensitive decision-makers do not directly benefit from energy savings and related amenities (Stephan & Stephan, 2016; Milala, et al., 2022). Signalling a certain premium price does not necessarily mean that real estate decision-makers would pay the announced price. According to Stephan et al. (2016) to analyze firms' preferences and willingness to invest, both revealed and stated preferences a common technical approach. Revealed preferences referred to a real observation of individual/developer's preferences to real market behaviour. Therefore, revealed preferences are defined as a real-world evidence for individual choices. The analysis of premium prices of green buildings, actual choices, and real market behaviour is often taken from real estate transaction data or from selling prices difference (Allcott & Greenstone, 2012) Due to a lack of data availability, stated preferences are used to take responsibility for hypothetical situations and questions on the willingness to invest. Allcott et al. (2012) opined that the willingness to invest depends on the profile of the company, especially years of experience, capital base and expertise & technical knowledge.

Lee and Chang (2018) referred WTP/I (Willingness to Pay/Invest) approach as a preventive or mitigating expenditure. This indicates the minimum value that an individual /firm will commit/invest in the quality of an environmental issue. In other words, the value represents how much developers are prepared to commit to preventing damage to the environment. The approach as put by Lee has the benefit of examining actual expenditures, in other to determine the importance that each developer attaches to the impact on the environment including itself.

### **2.4 Factors Influencing Developers' Willingness to Invest in Green Buildings**

It has been gathered from the literature that investment in green building development could be a mirage if there is no motivation to encourage the willingness to investment in such. According to Milala, et al., (2022) and Lee and Chang (2018), company finance and budget structure; interest and believe in green building; support from upper management and employees and government policies through regulations, incentives and directives can influence the willingness and decision of developers to invest in green building Lee et al. (2018) stated that interconnections between local governance, the planning process and citizen

involvement are critical to the sustainability. Allcott and Greenstone (2012) that, some primary concerted actions should be implemented that will pave way for the adoption of sustainable construction in developing countries which include: Create an advisory stakeholder government, Raise awareness among government officials and politicians, Introduce compulsory continued professional education, Provide funding to support emerging businesses and innovative technologies, Provide funding for training and education, led by example, Sustainable construction is leading to the development of an entirely new market inches in terms of services, materials and tools and to create a market for sustainable constructions clients will have to develop their understanding of what sustainability means. Lee (2018) identified major factors that can influence the developers' willingness to invest in green building, these are discussed below;

#### **2.4.1 Incentives**

According to Lee (2018), incentives can be used to generate interest, bridge Knowledge gaps and foster green building practices over conventional ones. He added that incentives should be used as a tool to encourage specific behaviour that may not have happened if the incentive was not available. He further identified two types of incentives as a monetary and non-monetary incentives. The monetary incentive can be informed of tax breaks, grants, vouchers and rebates. The monetary incentives can cancel any cost differential or provide loans for savings for choosing green development over conventional development, making the adaptation to sustainable development more possible for property owners, developers/investors. Also, it can be by providing sales tax exemptions and property tax exemptions the government partially or wholly offsets the cost of purchasing, creating, installing and building new green technologies. In order to prevent the owner's property tax from increasing due to the improvement it is important to structure applicable exemptions before investment. Other options for sharing the cost of development practices include using vouchers, rebates and grants. A voucher is a check for credit against future expenditures while a rebate is a credit for expenditures made in the past and a grant is a monetary gift; often used in a specific manner. These three monetary tools can be used to offset the cost of developers/investors or property owners who are learning how to build green or who are literally calculating the difference between conventional and green technologies in order to properly finance their projects. The non-monetary incentives can save developers/investors and property owners time and money by mitigating risk and process issues. These incentives include preferred loans, expedited permitting; zoning/floor area ratios, technical assistance regulation relief, and dedicated staff for green development in building and planning departments.

Non-monetary incentives work especially well in a situation where financial options are politically difficult to pass or where the existing infrastructure or regulatory atmosphere is complex or restrictive. They are also flexible and can be set up to fit local conditions. To corroborate this, Green and Denniss (2018) stated that fiscal incentives include tax incentives for green practices. In addition, Green et al. (2018) indicated that it was found in British Columbia provincial government's green building strategy that the government is working on a regulation under the Clean Energy Act to establish a financial model that buildings or home owners to undertake energy efficiency incorporation into their property with no upfront payment, and to pay some or all of the cost over time out of savings on their utility bill.

#### **2.4.2 Regulatory Processes and Codes**

Green Development Practices is been promoted by regulatory processes and codes. Public policies and procedures can heavily influence developers to incorporate green design into their projects. To encourage green development practices, codes and ordinances can be used as a tool by setting criteria that developers and property owners need to meet. Codes are often developed by an agency such as the International Code Council (ICC), which works with engineering organizations or they are created by municipalities. Municipalities may extract parts of these codes to create a framework for their codes. Codes require an ongoing process of improvement regular review and adaptive change once it is established, this will help to accommodate new information on green system performance improvements to encourage Green Development Practice. In 2011, City amended its policy for the higher building which significantly exceeds height limits (e.g. taller than 500ft or 150m) and or enter into key view corridors). It now requires all such buildings to advance City's objective for carbon neutrality for new buildings with a state objective to achieve a 40-50% reduction in energy consumption from 2010 levels. City believes that this standard should result in an energy use intensity of approximately 115KWh/m<sup>2</sup> per year for high-rise residential buildings based on ASHRAE assessment criteria. Lee (2018), stated that some municipalities have chosen to create expedited permitting programs shortening waiting periods. Such programs allow developers and property owners who integrate the green features into the design and site selection of the building to bypass the normal permitting system, with guaranteed approval or denial within a certain period.

Also, impact fees and performance bonds may be used as a tool to encourage green development. Impacts fees are payments required by the local governments of new development to provide new or expanded public capital facilities required to serve that development. Performance bonds can be used as leverage to guarantee satisfactory completion of development as well as guarantee that funds are available to complete the project. The performance bond shifts the responsibility for controlling, monitoring and enforcement to individual producers and consumers who are charged in advance for the potential damages. Green development can be subsidized with the fund from the impact fee. In order for the government to lead by example, it should incorporate green development requirements into its plans and projects. In all Lee (2018) states that the adoption and alignment of codes to meet environmental goals and the use of codes, ordinances, utility fees and process improvement to promote green development practices.

#### **2.5 Awareness of Green Building Development**

According to Kibert (2016) awareness of green building refers to an ideal strategic model and promotion exercise which makes people understand the reason a particular issue is important and the desires of goals and what is necessary to accomplish a task. Also, Kibert (2016) opined that awareness of green building is determined by the understanding of individual actions, the pursuit of knowledge and absolute involvement and allegiance to the principle. The primary meaning of awareness in the communication industry is to create a base audience for a product, service or issue. So the primary goal of awareness is to achieve enlightenment for the people. Innovation in technology has contributed to a positive means of delivery and collecting information, for example, the internet, sign and print media. However green building concept must be disseminated in layman's

terms to assist in general public acceptance (Marszal, Heiselberg, Bourrelle, Musall, Voss, Sartori & Napolitano, 2011). Formal knowledge and awareness for built environment professionals is an important mechanism for developing green building knowledge and skills in a number of studies (Nduka & Ogunsanmi, 2016). Ahn, Pearce & Ku (2011) have been conducted by researchers on awareness of green building in recent times. The study of Ahn *et al* (2011) affirms that built environment professionals in Nigeria are aware of sustainability principles.

Papargyropoulou, Padfield, Harrison and Preece (2012) explore the present knowledge, the level of awareness and the acceptability of Kuwait's construction industry stakeholders to adopt the concept of green building. This study discovered that the level of awareness of sustainability and green construction is considered to be in the moderate to good range. Meanwhile, the study recommends that education programmes such as training courses, conferences, seminar tours, public announcements and workshops are the actions to be taken by the stakeholders in order to improve the level of awareness and knowledge. Also, Hassler and Kohler (2014) investigate public knowledge and public awareness regarding this issue in the Kingdom of Saudi- Arabia where it was discovered that a higher percentage of the respondents are not fully aware of green building practices. Conversely, Hassler (2014) assesses Nigerian built environment professionals' familiarity with green buildings (Architects, Quantity Surveyors and Engineers). The study discovered that the awareness of green building is very high in a higher percentage of the respondent.

#### Awareness of green building development

- i. energy conservation
- ii. indoor air quality
- iii. material use concentration site selection, design and landscape
- iv. building ecology, water and recycling owner and occupant education
- v. medium of awareness: sales office/modern homes, home shows, television, magazine, newspaper, website, friends and family, builders/suppliers, real estate agent, purchase of homes, radio, brochure

### 3. Research Methodology

The study adopted the use of exploratory and descriptive design because it will use objective methods to uncover facts about its background and problems. The study approach considered most appropriate for this study is quantitative as numerical data was collected and analysed. Survey research strategy with questionnaire as instrument of data collection was adopted in this research. The study was conducted in Abuja the seat of the Federal Government where real estate development is ongoing to cope with the rapid population growth. Therefore, target respondents for this study are real estate developers comprises both private and public developers. To determine the sample size for this research, Krejcie and Morgan's (1970) table of determining sample size was adopted. Since the population size of this study is (60) active registered Estate Development Companies.

### 4. Results and Discussions

A descriptive statistics measured the level of investors' willingness to invest in the development of green building. The results in the Table 1 and 2 showed the mean and standard deviation for each Item.

**Table 1: Level of willingness to invest in Green buildings by property developers**

The level of willingness to invest in Green buildings by property developers has an average mean of 3.5697. This mean score is above average with the 5 point likert scale analysis.

SN	Willingness	Mean	Std. Deviation
1	Willingness to invest in material use and conservation	4.5536	0.53664
2	Willingness to invest in water, rainwater and sewage efficiency	4.5357	0.60194
3	Willingness to invest in site selection	4.4821	0.57179
4	Willingness to invest in indoor air quality	4.3393	0.69483
5	Willingness to invest in building ecology, waste and recycling	3.9500	1.0530
6	Willingness to invest in energy conservation/efficiency	3.9340	1.0510
7	Willingness to invest in owner and occupant education	3.7471	1.1081

Table 1 showed that the level of willingness to develop Green buildings by property developers in Abuja, Nigeria. The results indicated that there is 71% willingness to invest in Green building by current property developer involved in building development projects. The finding reveal a very high level of willingness to invest in green buildings by property developers in Abuja. This result agrees with Jang, Kim and Kim (2018) that shows that green building certification increased potential tenants' willingness to rent; and with higher levels of eco-friendliness attributes in buildings potential tenants exhibited a higher willingness to rent such green buildings.

**Table 2: Awareness to invest in green building by property developers in Abuja**

The level of Awareness of Green buildings by property developers has an average mean of 3.2015. This mean score is above average with the 5 point likert scale analysis.

SN	Awareness of green building development	Mean	Std. Deviation
1	Awareness of water efficiency	4.6607	.66815
2	Indoor environmental quality	4.6071	.65167
3	Awareness of energy efficiency	4.4464	.71146
4	Awareness of use of sustainable material	4.4464	.76085
5	Awareness of site practices	4.2500	.85812

Table 2 showed the level of awareness of green building development by property developers in Abuja with an average mean value of 3.2015 which represents a 64% by the 5 point likert scale analysis. This result indicates a high level of Green building development options and technology by property developer involved in mass housing projects. The finding reveal a very level of Awareness of green buildings by property developers in Abuja. However, this research is in line with the work of Gou, Lau and

Prasad (2013) where the study finds that the Green Building Market in Hong Kong is matured with a high level of awareness of the technology by stakeholders. However, the motivation for green development is confined to commercial buildings for lease, while government legislation is agreed by developers as an effective incentive for green building development.

**Table 3: Regression Model for the Effect of the Awareness and Willingness on Green Building Development.**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.593 <sup>a</sup>	.352	.327	.18374	14.378	.000 <sup>b</sup>
a. Predictors: (Constant), Willingness, Awareness						

Table 3 shows the regression model summary and the ANOVA results of the awareness and willingness on green building development, shows a model with R-Value of 0.593 and an R-Square value of 0.352 with F-statistics value of 14.378 which is statistically significant as it is greater than the p-value of 0.000. The model shows that 35.2% of the green building development is influenced by Awareness and Willingness to invest in Green Building.

**Table 4: Effect of awareness and willingness to invest on green building development**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.841	.351		8.105	.000
	Awareness	.178	.081	.283	2.201	.032
	Willingness	.242	.079	.396	3.077	.003
a. Dependent Variable: green building investment						

The beta coefficient shows that awareness of Green building by Property Developers and Willingness to invest into Green building development are the significant determinants of the extent of green building development and investment as indicated by the standardized beta coefficient of 0.283 and 0.396. Also the model shows that Property Developers Willingness to invest in sustainable real estate is statistically significant determinant of development and adoption of green building investment with P-value 0.003 < 0.05. Hence, Willingness to invest has significant positive improvement on Green building adoption and development.

## 5. Conclusion

The study submits that there is a very high level of willingness to invest in green buildings by property developers in Abuja. The level of Awareness of Green buildings by property developers has an average mean of 3.2015. This mean score is above average with the 5 point likert scale analysis. The level of willingness to develop Green buildings by property developers in Abuja, Nigeria. The results indicated that there is 71% willingness to invest in Green building by current property developer involved in building development projects. The finding reveal a very high level of

willingness to invest in green buildings by property developers in Abuja. Furthermore, the level of awareness of green building development by property developers in Abuja has an average mean value of 3.2015 which represents a 64% by the 5 point likert scale analysis. This result indicates a high level of Green building development options and technology by property developer involved in mass housing projects. Awareness of Green building by Property Developers and Willingness to invest into Green building development are the significant determinants of extent of green building development and investment as indicated by the standardized beta coefficient of 0.283 and 0.396. The model shows that Property Developers Willingness to invest in sustainable real estate is statistically significant determinant of development and adoption of green building investment with P-value 0.003 < 0.05. Hence, the study concludes that willingness to invest has a significant positive improvement on Green building adoption and development. The study recommended that the property developers should improve the level of willingness to invest in sustainable buildings, moreover property developers should educated social, economic and environmental benefits of green buildings projects.

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