GREEN BUILDING VALUATION IN THE SOUTH AFRICAN RESIDENTIAL PROPERTY SECTOR: INFLUENCING FACTORS AND BARRIERS TO IMPLEMENTATION

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Abstract

The gains of green buildings are replete in literature. However, the role of the property valuer in the valuation of green buildings still remains unclear. The study aims to assess the barriers and factors influencing the implementation of green building valuation in the residential property sector of South Africa. The research employs a quantitative methodology. The study utilised a closed-ended questionnaire to collect data from professionally registered Valuers at the South African Council for the Property Valuers Profession, in the Gauteng province. Statistical techniques such as frequency count, percentages and mean item score were employed in analysing the data. The result showed that the majority of the respondents agreed that the initial cost of green buildings is higher than conventional buildings. Though, the operational costs often tend to offset this initial cost in the long run. Furthermore, the study found that water and energy efficiency features and materials used for construction are key inputs in the valuation of green buildings. Also, the major challenges to green building valuation are the few numbers of the residential green building stock and the lack of cost data on green buildings. The study concludes on the need for collaboration among various stakeholders such as developers, valuers and green-certifying organizations to make cost data available to property valuers and create a sharing platform where such information can be accessed and used by valuers to arrive at credible value opinions on green buildings. Also, the role of property valuers is germane towards ensuring that the value of properties reflects the green building element, therefore their knowledge of sustainability becomes critical.

Keywords: *green building, sustainability, property valuers, residential property, market value.*

1.0. Introduction

Globally, buildings consume large amounts of energy and they are great contributors to global warming through the release of greenhouse gases (Sagheb *et al.,* 2011). The conventional way of constructing a building is associated with substantial production of waste and environmental pollution (Kyjakova and Baskova, 2016). To minimize these negative effects that come with construction activities, there has been an increasing trend toward green building (Modise, 2018). Thus, while there has been an increasing demand for green buildings and the attendant benefits of green buildings are largely known, the extent to which these investments translate into value still remains unclear.

According to Sustainable Energy Africa (2015), South Africa is the 12th highest greenhouse gas emitter in the world. Moreover, the majority of buildings in South Africa, especially residential buildings are still constructed using the conventional building approaches which are not aligned with sustainable development (Kyjakova and Baskova, 2016). Thus, while green buildings come with a high initial cost and present a scenario of quantity versus environmentally friendly options (Djokoto *et al*., 2014; Olaleye *et al.,* 2015), there is still a gap in ascertaining the role of the valuer in determining market premiums for green buildings, as against conventional buildings.

While green buildings are usually associated with high initial costs, the savings on operational costs tend to outweigh the initial cost (Gadonniex and Riley, 2009). However, property developers, in general, face challenges when it comes to green building. One of such challenges mentioned in the literature is the low value attached to green building and the lack of market data on green building since it is considered a relatively new field (Pitts and Jackson, 2008). Though South Africa has made reasonable progress in terms of green building in the commercial property sector, 140 office buildings are already certified by the Green Building Council of South Africa (GBCSA) (Mahlaka, 2015). In comparison, the residential property sector, however, lags behind the commercial sector in terms of certified green buildings (Mahlaka, 2015; Handerhan 2012).

Even though there are increased efforts geared at increasing green residential housing stock, it suffices to note that investors' willingness to invest in green building is only guaranteed where there are sufficient economic benefits and a commensurate return on investment (Galuppo and Tu, 2010). Extant studies have noted that investing in green buildings creates financial value such as an increase in asset value, reduction in depreciation and increased

rental rates (O'Mara and Bates, 2012). Other studies such as Myers *et al.* (2007); Schumann (2010) and Sinha *et al.* (2013) submitted that green building has multiple benefits such as the competitive advantage of the property and high investment returns. However, Handerhan (2012) states that despite the numerous efforts being made at increasing green building stock, the residential property sector still lags. Qian *et al.* (2015) argued for the need to raise awareness of the value of green buildings. O'Mara and Bates (2012) emphasised that investors need to see the opportunity of investing in green buildings as this creates a competitive edge and enhances return on investment.

If stakeholders including the government and investors understand the market premiums attached to green buildings, there is likely to be a significant shift from conventional buildings to green buildings (Hoffman and Henn, 2008; Olaleye *et al.,* 2015). Thus, while these bring to the fore the role of the property valuers in ascertaining the market value of green buildings, property valuers, however, face a lot of challenges when it comes to "*going green*" (Pitts and Jackson, 2008). Among the challenges faced are the lack of support by the government in implementing green building policies (Nguyen and Gray, 2016), inadequate cost data (Simpeh and Smallwood, 2015) and lack of awareness of the financial and economic benefits of green buildings (Qian *et al.,* 2015). Thus, despite these perceived value-adding benefits of green buildings, these inherent challenges seem to hinder the valuation of green buildings. Also, the role of the property valuer in promoting the valuation of green buildings seems unclear. Towards this end, the study assessed the barriers and factors influencing the implementation of green building valuation in the residential property sector of South Africa. Specifically, the study answered the following research questions:

1. What is the perception of property valuers on the cost associated with green buildings?
2. What are important factors for green building valuation?
3. What challenges are involved in the valuation of green residential buildings?

2.0. Literature Review

Costs Associated with Green Building

There have been attempts to quantify the cost of green buildings since the inception of the green building concept. The case for green building stems from two major cost perspectives, the first is the initial construction costs and the other is the operational cost during the life of

the building.

From the perspective of the initial development cost, Rehm and Ade (2013) argue that while extant studies have elaborated on the benefits of green building, there is little evidence of the capital cost implications. A study conducted by the Green Building Council South Africa (GBCSA) (2016), reports that "the average cost premium of building green over and above the cost of conventional construction – or green cost premium – is a mere 5.0% and can be as low as 1.1%". The study challenged the belief that green buildings cost much more than conventional buildings, thereby supporting the submission of Matthiessen and Morris, (2004) that green buildings do not necessarily cost significantly more than conventional buildings.

Analysis of the operational costs of green buildings shows that buildings that are EDGE certified result in a minimum of 20% savings in energy, water usage and reduced energy (Ecolution Consulting, 2017). Similarly, Hardcastle (2015) states that the most important benefit of green buildings is the lower operating costs, as cost savings are realized through the operational cost when compared to conventional buildings. This is achieved through lower energy consumption and total lifecycle cost. Fowler *et al.* (2010) state that green buildings will also have low maintenance costs.

Thus, the case for green buildings from the perspective of costs, *that is*, the initial cost of construction and/or operational costs could be expected to vary across property types. Suttell (2006) submitted that the construction industry lacks accurate and quantifiable data on the economic impact of efficient building, especially in the residential sector. Hence, more empirical investigations could be required across different property types to ascertain/validate these perspectives. However, when stakeholders have clear goals and focus on the bigger picture when implementing green building, it can be realized that the initial costs are relatively insignificant compared to the benefits that can be achieved in the long run.

Impact of Green Building on Market Value and the Role of the Valuer

One of the economic benefits of green building is increased income, which is achieved through higher tenant retention, occupancy rate and rental growth as well as the attraction rate (Coetzee and Brent, 2015). According to Yiu (2007), green buildings will result in reduced risk of depreciation due to the latest technologies and materials used in the design, construction and operation of the building, which in return increases the building life span.

The United States Green Building Council (2015) reports that the market for buildings with green certifications increased by 10 to 14 per cent more than conventional buildings without green certifications.

The foregoing suggests that property valuers have a key role to play in promoting and implementing green building certifications. Thus, they are tasked with the difficult role of calculating the green building criteria and incorporating them into their valuation model (Jayantha and Man, 2013). To compound the challenge, there is a lack of reliable cost data on green residential buildings (Simpeh and Smallwood, 2015). However, Lorenz and Lützkendorf (2008) state that while the need to reflect sustainability in property value is possible, the validity of such a task depends on the skills and capability of the Valuer as well as the availability of cost data on green building.

Given the reported benefits of green building, it is undeniable that going green affects the market value of the property (Ajibola, 2015), but the problem lies in the difficulty of quantifying the value of those benefits (Pitts and Jackson, 2008) and the market premiums of such properties. Abdullah *et al.* (2018) summarize the role of Valuers in green building to include preparing a valuation report and analyzing the market, identifying and analyzing green building features, collecting data and information on services, acquiring knowledge of green building and providing an opinion on value and advice. This implies that Valuers must have knowledge of green building to prepare a thorough valuation report of a green property. It also implies that Valuers must be able to reflect on market analysis and pay attention to trends to value green property accurately.

Thus, the role of Valuers indirectly influences green building valuations, as they are tasked with the duty of attaching value to buildings that are considered green. According to Abdullah, *et al.* (2018), the Valuer is responsible to ensure that the value reflects the element of green. Kucharska-Stasiak and Olbińska (2018) state that property valuers need to develop more than just a market value but a "*new value*" which will highlight not just the economic benefits but also the social, environmental, ethical and moral features.

The Valuation of Green Buildings

Property Valuers are tasked to assess the worth of real estate investment. Hence, the knowledge of green building is essential (Ajibola, 2015). Extant studies such as Kuiken (2009), Sayce and Ellison (2003) and Schumann (2010), have noted that factors such as the location of the building, the design, functionality and flexibility of the property, material used to

construct the building, energy and water efficiency of the building, pollutants of the building and surrounding area, income expected, risks of green development, and supply and demand of green building should be considered when valuing green buildings.

There is however limited residential green building and a lack of cost and/or market data which pose a challenge to the valuation of residential green buildings. Myers et al. (2007) noted that the market value approach is difficult to use when dealing with sustainability aspects in buildings. While the methods which are used to value a conventional building still apply to green buildings, it is required that Valuers have to take into account the green futures attached to the building and add a risk premium (Marjanovic-Halburd, 2015). Kuiken (2009) suggests that the best method of valuing residential green buildings is the income approach method as this method focuses on income-generating properties and reflects future market expectations, while the other two methods present weaknesses that make them inappropriate to value green buildings. However, Pitts and Jackson (2008) argue that the sales comparison approach is the most appropriate method to value green buildings on the condition that there are other similar green properties. According to Suttell, (2006), a holistic approach does not apply to green buildings as each building is unique and should be valued as such. Hence, for valuers to provide accurate valuation figures for green buildings, all the factors that might affect the value of the property must be considered.

Barriers to Residential Green Building Valuation

These challenges to green building are examined from a generic point of view as well as valuation-specific perspectives. The generic challenges range from incoherent government policies to consumers' resistance to change. For instance, the development and revision of sustainable regulations and policies by the government often take long and contribute to delays in the implementation of green buildings. This primarily impacts property developers as there is a lack of concrete documents focusing on green buildings to ensure that buildings meet certain thresholds (Asian Green Building, 2016). Another challenge is that there are limited incentives and inadequate support by the government for green building uptake (Academy of Science of South Africa, 2014).

Also, there is a perception that green building is associated with high initial cost. Whether real or perceived, it is an obstacle to the growth of green buildings (McGraw-Hill Construction, 2016). Mosier and Gransberg (2013) state that developers who take on green buildings are adding an undetermined incremental cost to their initial budget although there is still uncertainty on the direct cost of green building. The initial cost is offset by the low operating

cost which is realized by calculating the lifecycle cost and the payback period. Pitts and Jackson (2008) point out that the high initial cost can be recouped through energy and operating cost savings.

Further, there is a general resistance to change, and the term “new” may create uncertainty for people, especially where it involves money. According to Sloane (2017), people oppose innovation due to the fear of the unknown and being stuck in their old methods. In addition, due to minimal green technology supply in the market, there is usually no awareness or advertisement to motivate consumers on green buildings. Without clearly presenting the details of the benefits and costs, with their associated extra risks, potential stakeholders could still be discouraged from entering the green building market voluntarily (Qian *et al.,* 2015).

Finally, there is a lack of resources, skill gaps and education in implementing green technology, especially in small organisations (Academy of Science of South Africa, 2014). Thus, there is a need for a thorough knowledge of green buildings as professionals do not have the required education and are not fully trained to develop and implement green building practices (Hankinson and Breytenbach, 2012). Green building education should be encouraged. This is because according to Bilau (2008), built environment education lacks emphasis on sustainable design. Jacobs (2015) expresses similar sentiments that there is a lack of academic institutions offering education and training specifically in green buildings.

In addition to the above-mentioned barriers to green building, there are other peculiar challenges that Valuers face. Valuers find it difficult to assess the real market value of green building and one of the reasons is that green building is new in the built environment (McGraw-Hill Construction, 2016). According to Marjanovic-Halburd (2015), the biggest challenge that Valuers face is translating the characteristics of green buildings into financial benefits. Marjanovic-Halburd (2015) noted that there have been few studies on methods to identify the relationship between sustainability and property value. Other challenges identified by extant studies include limited published data on the cost of green building. This often raises difficulty in justifying the initial cost of green building (Simpeh and Smallwood, 2015).

Also, the residential market has been slow to adapt and incorporate green features (Pitts and Jackson, 2008). Thus, owing to the few residential buildings with green features, it is difficult for Valuers to value residential buildings using the market and comparison approach (Ajibola, 2015). Furthermore, valuers' lack of full understanding of the process of valuing a unit with

green features contributes to the low value attached to green buildings (Kuiken, 2009). The focus is usually on the building location, property square meters and style, rather than on energy and water-saving features (Pitts and Jackson, 2008).

Finally, some of the benefits of green building may be enjoyed by the occupier rather than the developer/owner (CB Richard Ellis, 2009). It is argued by some that the developer should be rewarded for incurring the initial costs (Hera, 2011) and should expect a payback period in a few years (Shabrin and Kashem, 2017). Furr *et al.* (2009) suggest that owners must split their benefits with their tenants as the tenant enjoys the benefit of comfort and energy saving while the owner can expect increased income.

3.0. Research Method

The research employs a quantitative research method. The target population for the study was professional Valuers in the Gauteng province, registered with the South African Council for Property Valuers Profession (SACPVP). Thus, the research population consisted of 311 Professional Valuers in the Gauteng region. Gauteng province was selected as the study area because it is the leading province with green building developments in South Africa (Jack, 2016). Owing to the low response rates usually obtained from study respondents, all the 311 registered property valuers were considered in the study sample.

The data collection instrument was a closed-ended questionnaire that was sent out via email to the Professional Valuers in Gauteng, whose contacts were obtained from the SACPVP website after written permission to conduct the research among the members was obtained. The questionnaire consisted of two sections. The first section sought information about the demography of the respondents such as the highest academic qualification and years of experience in the property industry. In the second section, the questions relate to the barriers and the challenges property valuers face when valuing green residential buildings among others.

The questionnaires were distributed via email to the respondents during the period September 2018 to October 2018. Of the total of 311 questionnaires sent out via email to the respondents, only 37 questionnaires were suitably completed, which constitutes an 11.90% response rate. The low response rate might be attributed to respondents' apathy towards the filling of online surveys. Extant studies such as Ayodele and Kajimo-Shakantu (2021), using an online survey, obtained a similar low response rate with construction professionals in South

Africa.

In assessing the perception of property valuers on the cost associated with green buildings, the study first evaluated the perception of the valuers about some common notions/statements as regards green buildings. The respondents were asked to state their level of agreement or disagreement with the statements (Table 1). These were scaled on a 5-point scale from 1 (strongly disagree, SD), 2 (disagree, D), 3 (neutral, N), 4 (agree, A) and 5 (strongly agree, SA). Afterwards, the factors were ranked using the mean item score. Subsequently, the perception of the respondents on the cost of the green building was evaluated using a binary (Yes/No) scale. To analyse the important factors for green building valuation, the respondents rated on a 5-point scale important factors considered when undertaking valuations of residential green buildings; where 1 is not important (NI), 2 is fairly important (FI), 3 is important (I), 4 is very important (VI) and 5 is extremely important (EI).

Table 1: Literature Sources for Factors

Factors	Sources
Statements on Valuers' Perceptions of Green Building	
There is a market for green buildings in the residential property sector.	Yiu, 2007
Property valuers and developers are key participants to promote the implementation of green building in the residential property sector.	Authors' input
Investing in green buildings creates financial value such as increase in asset value, reduction in depreciation, higher tenant attraction and increased rental rates.	O'Mara and Bates, 2012
Limited availability of cost data in the market leads to slow implementation of green building in the residential sector.	Simpeh and Smallwood, 2015
Lack of financial incentives has a negative effect on the implementation of green building in the residential sector.	Nguyen and Gray, 2016
The initial cost of green building is offset by the low operating cost which is realized by calculating the lifecycle cost and the payback period	McGraw-Hill Construction, 2016; Pitts and Jackson, 2008
Barriers to Green Building	
Lack of Government support and incentives	McGraw-Hill Construction, 2016
High capital cost of green building	Pitts and Jackson,2008
Peoples' resistance to change	Sloane, 2017
Lack of market awareness	Qian *et al.,* 2015
Inadequate resources, skill gap and education	Cole, 2013
Challenges in Valuing Green Residential Buildings	
Lack of cost data on green building	Simpeh and Smallwood, 2015
Few residential green buildings in the market	Ajibola, 2015
Low value attached to green buildings	Pitts and Jackson, 2008
Lack of shared benefits between the Developer and Occupier	CB Richard Ellis (2009), Furr *et al.* (2009)

Finally, in analyzing the challenges involved in the valuation of residential green buildings, the study first examined the barriers to green buildings and subsequently assessed the challenges associated with the valuation of residential green buildings. The respondents were presented with a list of factors (Table 1) and were requested to rank these factors on a scale of 1 to 5 (for the barriers) and 1 to 4 (for the challenges). The total rating/score for each factor is summed up and presented as the total score. The total score is further divided by the number of respondents, *that is*, 37, to arrive at an index which is used to rank the factors.

The instrument used for data collection is attached as Annexure. Summarily, the data collected were processed using Microsoft Excel spreadsheets and analyzed using frequencies, percentages and mean analysis.

4.0. Results Presentation and Analysis

Profile of the Respondents

The profile of the respondents is presented in Table 1. The results showed that the majority of the respondents (32.44%) hold a National Diploma as the highest qualification, which was followed by BTech and Masters with the same percentage (13.51%).

Table 1. Respondents Profile

Profile		Frequency	Percentage
Qualification	National Diploma	12	32.44 %
	BTech	5	13.51 %
	BSc	1	2.70 %
	Honours	1	2.70 %
	MSc	5	13.51 %
	PhD	2	5.41 %
	Other	11	29.73 %
	Total	**37**	**100.00%**
Years of Experience	5 years and below	1	2.70 %
	6 – 10 years	2	5.41 %
	11 – 15 years	3	8.11 %
	16 – 20 years	8	21.62 %
	21 years and above	23	62.16 %
	Total	**37**	**100.00%**

The results show that 67.56% of the respondents hold at least a Bachelor's degree in Property studies. When the respondents were grouped according to years of experience, only 8.11% had less than 10 years of experience. The majority of respondents (83.78%) had more than 15

years of property industry experience. The foregoing suggests that most of the respondents have the requisite academic and professional experience to provide valuable insights into the questions being raised.

Property Valuers' Perception of Green Building

The results as presented in Table 2 show that the respondents were in agreement with all the statements as the mean score for each factor was above 3.0, which was the cut-off point. Lack of financial was ranked first, with a mean score of 4.09. Thus, it is perceived as the main constraint to residential green building implementation. The International Labour Office of Geneva (2011) states that the success of government policies and programs in implementing green building depends on the availability of skills in the field. Thus, incentives only cannot bring about the desired level of success if adequate skills are not available. The item ranked second relates to the availability of a market for green buildings in the residential property sector. The finding is in line with the submissions of Yiu (2007). The study noted that there is a market for green building in the residential sector as buildings that are green result in reduced risk of depreciation due to the latest technologies and materials used in the design, construction and operation of the building, which in return increases the life of the building.

Table 2: Perceptions of Green Building

Statements	Mean	Rank
The lack of financial incentives has a negative effect on the implementation of green buildings in the residential sector.	4.09	1
There is a market for green buildings in the residential property sector.	3.85	2
Limited availability of cost data in the market leads to slow implementation of green building in the residential sector.	3.79	3
The initial cost of green building is offset by the low operating cost which is realized by calculating the lifecycle cost and the payback period	3.78	4
Investing in green buildings creates financial value such as increase in asset value, reduction in depreciation, higher tenant attraction and increased rental rates.	3.69	5
Property valuers and developers are key participants to promote the implementation of green building in the residential property sector.	3.03	6

Limited availability of cost data in the market leads to slow implementation of green building in the residential sector was ranked third with a mean score of 3.79. As a result of the slow progress in green building, there are few residential buildings with green features which makes it difficult for valuers to value these buildings using the cost approach, especially where the market and comparison approach cannot be employed. These findings supported Choi (2009) who states that a major barrier to valuing green buildings is the lack of reliable

cost data to justify the high initial cost of green buildings. According to Hoffman and Cowie (2014), this is quite a challenge and it impacts negatively on the growth of green building in the residential property sector

The statement that the initial cost of green building is offset by the low operating cost which is realized by calculating the lifecycle cost and the payback period, ranked fourth with a mean score of 3.78. UNEP (2011) reports that the initial additional capital outlay, the so-called "*first cost*", could be a deterrent for those who demand finance for green buildings". However, Matthiessen and Morris (2004) state that when stakeholders have clear goals and focus on the bigger picture when implementing green building, it will be realized that the initial costs are relatively insignificant compared to the benefits that can be achieved.

According to Lorenz and Lützkendorf (2008), property Valuers are identified as the key professionals to align economic return with the environmental and performance of properties and to market green buildings. The results showed that this statement was the least rated with a mean score of 3.03. It could be stated that while Property Valuers play a big role in promoting green building, they, however, do not seem to perceive themselves as the key participants in promoting the implementation of green building in the residential property sector. The International Labour Office of Geneva (2011) emphasizes that green building is a value chain and achieving green building excellence requires a collective effort from all stakeholders.

Cost of Green Building

The respondents were asked about their experience, knowledge, perceptions and opinions on the cost of green buildings.

Table 3: Green Building Cost

Question	Yes	No
Do you have experience in green building?	62.50%	37.50%
Are initial costs of green buildings higher than conventional buildings?	96.97%	3.03%
Are operational costs of green buildings lower than conventional buildings?	84.85%	15.15%
Do green building features have an impact on the market value of a property?	81.82%	18.18%
Do Property Valuers play a key role in promoting green building in the residential property sector?	26.47%	73.53%

The results presented in Table 3 show that most of the respondents, 62.50% have experience in green building. Also, the majority of respondents (96.97%) are of the view that green building has a higher capital cost than conventional buildings. This is in line with the findings of Hwang *et al.* (2017) where many industry professionals have the perception that green buildings cost 5 – 10% more than conventional buildings, which is a common reason

hindering green building development. While 84.5% of the respondents agree that operational costs are lower in green buildings, 81.82% affirmed that green building features have an impact on the market value of a property. The results also showed property valuers do not currently play significant roles in promoting green building residential stock. This had a percentage frequency of 73.53%. This perhaps might be due to a lack of legislative or regulatory framework guiding the role of property valuers in promoting green building in the residential housing sector.

Important Factors for Green Building Valuation

From the results presented in Table 4, all the factors were considered important to some extent, as all the factors had mean scores greater than the 3.0 benchmark. However, the most highly ranked were 'material used to construct the building', and 'energy and water efficiency of the building' both ranked first and second with mean scores of 4.21 and 4.20 respectively. Functionality and flexibility of the property' ranked third (mean score = 4.18). 'Risks of green development' and 'income expected" were the least ranked factors with mean scores of 3.94 and 3.30 respectively.

Table 4: Influential Factors in Valuation of Green Buildings

Factors	Mean	Rank
The material used to construct the building	4.21	1
Energy and water efficiency features of the building	4.20	2
Functionality and flexibility of the property	4.18	3
The design	4.12	4
Pollutants of the building and surrounding areas	4.03	5
The Location of the building	4.00	6
Income expected	3.94	7
Risks of green development	3.30	8

When analyzing the results, 'material used to construct the building' and 'energy and water efficiency of the building' were ranked as the most important factors. These factors are often regarded as the most important design criteria for green building as stated by Hendler and Thompson-Smeddle (n.d). Further, Sagheb *et al.* (2011) emphasize that for a building to be considered "green" it must use recyclable and eco-friendly materials for construction.

The functionality and flexibility of a property are very important factors. Akadiri *et al.* (2012) noted that buildings must accommodate all the required activities for which it was built. In meeting these requirements, it must not harm the environment (Balramdas *et al.,* 2016). The

result also showed that the location of a building is an important factor when valuing green buildings. This had a mean score of 4.00. This finding supports the submissions of extant studies such as Knox (2015) and Schumann (2010) which submitted that location is a critical element for green building valuation. This is because the size or design of a building can always be altered but the location cannot be changed. Fitzgerald (2016) states that "location creates desirability, desirability creates demand, and demand raises real estate prices". Thus, it might be expected that urban areas/city centres would readily create demand for green buildings. Thus, regardless of whether it is a green building or a conventional building, location has a great influence on the value of a property as it has a massive bearing on a property's potential investment return and the value thereof.

Barriers to Green Building in Residential Property Sector

The respondents were asked to rank the most common barriers that often impede the progress of green building in the residential sector. The results are presented in Table 5.

Table 5: Barriers to Green Building

Barriers to Green Building	Total Score	Mean	Rank
The high capital cost of green building	129	3.49	1
Lack of market awareness	104	2.81	2
Lack of Government support and incentives	104	2.81	2
Peoples' resistance to change	86	2.32	4
Inadequate resources, skill gap and education	77	2.08	5

The result showed that the majority of respondents indicated the high capital cost of green building, with a mean score of 3.49 as a major barrier slowing the progress of green building in the residential property sector. This result corroborates the findings in Table 3 where 96.97% of the respondents believe that green building has a higher cost than conventional buildings. Investors are reluctant to pay the initial cost of green building which is often high, thereby hindering the uptake/construction of green buildings in the residential sector.

Lack of government support and incentives co-ranked second, with a mean item score of 2.81. McGraw- Hill Construction, (2016) states that though there has been increased government support and emphasis on green building, there are no commensurate support in the residential sector and the available incentives are often not enough. Lack of market awareness (mean – 2.81) co-ranked second and inadequate resources, skill gap and education (mean – 2.08) were ranked fifth. Cole (2013) states that the first step in addressing the barriers to the slow progress of green building in the residential sector is through

education and Qian *et al.* (2015) similarly argued for the need to raise awareness of the value of green building.

The Challenges Associated with Valuation of residential green buildings

The results as presented in Table 6 show that the few number of residential green buildings in the market is a major challenge for valuers in conducting valuations of green buildings. This factor was ranked first with a mean score of 3.03, followed by the lack of cost data on green buildings (mean – 2.65), the low value attached to green buildings (mean - 1.54), and lastly lack of shared benefits between the Developer and occupier (mean - 1.43). The low stock of residential buildings with green features often makes it difficult for valuers to value these buildings using the market and comparison approach.

Table 6: Challenges Associated with Valuation of green residential buildings

Challenges in valuing green residential buildings	Total Score	Mean	Rank
Few residential green buildings in the market	112	3.03	1
Lack of cost data on green buildings	98	2.65	2
The low value attached to green buildings	57	1.54	3
Lack of shared benefits between the Developer and Occupier	53	1.43	4

Although the lack of shared benefits between the Developer and Occupier was ranked last, it was found to be a challenge that Valuers encounter. The results indicate that respondents believe that owners should split green building benefits with their tenants but it is not perceived as an important challenge. CB Richard Ellis (2009) states that some of the benefits of green building are enjoyed by the occupier rather than the developer, thereby suggesting shared benefits. A solution to this challenge may be the incorporation of a Green Lease which according to ESI Africa (2017) is a tool for both parties to discharge the shared benefits of *"going green"* and be explicit with the contractual lease obligations between the landlord and the tenant.

5.0. Conclusions and Recommendations

Green building is the way forward for the construction industry to move toward the protection of the environment. Extant studies have highlighted several benefits of green buildings compared to conventional buildings. However, the capital cost of green buildings is often higher than a conventional building which is a barrier to implementing green buildings

in the residential property sector.

The study found that the material used for construction and water and energy efficiency feature are key inputs in the valuation of green buildings. However, the major challenges are the few numbers of residential green building stock and the lack of cost data on green buildings. Furthermore, the result showed that the majority of the respondents agreed that the initial cost of green buildings is higher than conventional buildings. Though, the operational costs often tend to offset this initial cost in the long run.

While the valuers seem not to play a key role in the promotion of green buildings in the residential property sector, their role in the valuation of green buildings cannot be overemphasized. Valuers are required to reflect market analysis and pay attention to trends in order to value accurately. Valuers have to make sure that the value of a property reflects its green element. Therefore, knowledge and skills in green building are vital for Valuers to play a meaningful role in green building valuations. A role which currently seems not fully optimised. It can also be deduced that for property valuers to be able to play a more meaningful role and add more value to the valuation of green buildings, attention must be directed to improving the knowledge levels of valuers in green buildings valuation. There is also a need for collaboration among various stakeholders such as developers, valuers and green-certifying organizations to make cost data available to property valuers and create a sharing platform where such information can be accessed and used by valuers to formulate credible value opinions on green buildings. Also, the role of property valuers is germane towards ensuring that the value of properties reflects the green building element, therefore their knowledge of sustainability becomes critical.

While the study was focused only on Gauteng province, similar studies could be conducted with a bigger sample size of Valuers across the country. Studies could also be undertaken to investigate the impact of green buildings on the market value of a residential property. Given the low response rate, the findings of the study must be taken with caution. However, the results therefrom could provide invaluable insights into the factors influencing the valuation of green buildings in South Africa.

References

Abdullah, L., Rasid, W. A. & Mohd, T. 2018. The Role of Valuer in Sustainable Valuation: A Review. *International Journal of Academic Research in Business and Social Sciences*, 8(2), pp. 740–749.

Academy of Science of South Africa. 2014. *The State of Green Technologies in South Africa*. Pretoria: Academy of Science of South Africa (ASSAf).

Ajibola, M.O. 2015. Valuing Green Buildings in Nigeria: Issues and Challenges. *Covenant Journal of Research in the Built Environment (CJRBE)*, 3(1), pp. 1-10, June.

Akadiri, P., Chinyio, E. & Olomolaiye, P. 2012. Design of A Sustainable Building: A Conceptual Framework for Implementing Sustainability in the Building Sector. *Buildings*, 2, 126-152.

Asia Green Building. 2016. *Government Incentives and regulations as the main challenges for Green Building development in Asia*. Available from: < http://www.asiagreenbuildings.com/featured/2016/08/16/government-incentives-and-regulation-as-the-main-challenges-for-green-building-development-in-asia/>

Ayodele, T. O., and Kajimo–Shakantu, K. (2021). Challenges and Drivers to Data Sharing among Stakeholders in the South African Construction Industry. *Journal of Engineering Design and Technology.* https://doi.org/10.1108/JEDT-02-2021-0074.

Balramdas, P., Meher, S., Behera, B., Rath, S., & Dash, P. 2016. A comparison between Normal buildings and Green buildings- A case study approach. *International Research Journal of Engineering and Technology*, 3(5), 51-54.

Bilau, G. 2008. Challenges facing the Green building industry. *The Green building revolution: A Primer for plumbing and mechanical officials*, 199-209.

Boshoff, D.G.B. 2011. *The Development Approach to Valuation: An acceptable method*. Pretoria: University of Pretoria.

CB Richard Ellis. 2009. *Who pays for Green? The Economics of Sustainable Buildings*. EMEA Research.

Choi, C. 2009. Removing Market Barriers to Green Development: Principles and Action Projects to Promote Widespread Adoption of Green Development Practices. *JOSRE*, 1(1), 107-138.

Coetzee, D. A., & Brent, A. C. (2015). Perceptions of professional practitioners and property developers relating to the costs of green buildings in South Africa. *Journal of the South African Institution of civil engineering*, *57*(4), 12-19.

Cole, L. 2013. The Green Building as a Medium for Environmental Education. *Michigan Journal of Sustainability*, 1.

Djokoto, S.D., Dadzie, J. & Ohameng-Ababio, E. 2014. Barriers to Sustainable Construction in

the Ghanaian Construction Industry: Consultants. *Journal of Sustainable Development*, 7(1), 134-153.

Ecolution Consulting. 2017. *EDGE Green Building Certification South Africa*. 22 November. Available from: < http://ecolution.co.za/2017/11/17/edge-green-building-certification-south-africa/.

ESI Africa. 2017. *The evolution of energy efficiency in commercial buildings*. Available from: < https://www.esi-africa.com/evolution-energy-efficiency-buildings/

Fitzgerald, R. 2016. Why is Location so Important in Real Estate? *Raleigh Realty*, 4 July. Available from: <https://www.raleighrealtyhomes.com/blog/why-is-location-so-important-in-real-estate.html.

Fowler, K.M., Rauch, E.M., Henderson, J.W. & Kora, A.R. 2010. *Re-assessing green building performance: A post-occupancy evaluation of 22 GSA buildings*. Washington DC: U.S. General Services Administration

Furr, J.E., Kibert, N.C., Mayer, J.T. & Sentman, S.D. 2009. *Green building and sustainable development: The practical legal guide*. Chicago: American Bar Association Publishing.

Gadonniex, H. & Riley, T. 2009. *The Complete Idiot's Guide to Greening Your Business*. New York: Penguin Group.

Galuppo, L.A. & Charles, Tu. 2010. Capital Markets and Sustainable Real Estate: What Are the Perceived Risks and Barriers? *JOSRE*, 2(1), 143-159.

Green Building Council South Africa. 2016. *Building Green Costs on average only 5% more than Conventional Building: Study*. Available from: < https://gbcsa.org.za/building-green-costs-on-average-only-5-more-than-conventional-building-study/.

Handerhan, L. 2012. *Measuring the Savings of Green Building Technologies*. Washington, DC: U.S. Department of Housing and Urban Development

Hankinson, M. & Breytenbach, A. 2012. *Barriers that impact on the implementation of sustainable design*. Johannesburg: University of Johannesburg.

Hardcastle, J.L. 2015. The No. 1 Green Building Benefit: Lower Operating Costs. *Environmental Leader*, 23 November. Available from: < https://www.environmentalleader.com/2015/11/the-no-1-green-building-benefit-lower-operating-costs/

Hendler, P. & Thompson-Smeddle, L. (n.y). *Sustainable Neighbourhood Design Manual*. Sustainability Institute.

Hera, A. 2011. *The Application of Taxation Benefits and Incentives for Green Buildings*. Sydney: University of Technology.

Hoffman, A.J. & Henn, R. 2008. Overcoming the Social and Psychological Barriers to Green Building. *Organization & Environment*, 21(4), 390-419.

Hoffman, D.J. & Cowie, D. 2014. Property developers' perspective on the current status of

green building in South Africa, In: *Proceedings of 8th Built Environment Conference*, Durban, South Africa, 27-29 July 2014,1- 12.

Hwang, B., Zhu, L., Wang, Y. & Cheong, X. 2017. Green Building Construction Projects in Singapore: Cost Premiums and Cost Performance. *Project Management Journal*, 48(94), 67–79.

International Labour Office of Geneva. 2011. *Skills and Occupational Needs in Green Building*. Geneva: International Labour Organization.

Jack, E. 2016. (City Improvement District Manager of the Sandton Central Management District). Sandton is an epicentre for green building in Africa. Sandton. Available from: <http://www.engineeringnews.co.za/article/sandton-is-an-epicentre-for-green-building-in-africa-2016-03-31

Jacobs, E. 2015. *The status quo of green-building education in South Africa*. Bloemfontein: University of the Free State.

Jayantha, W. M. & Man, W. S. 2013. Effect of green labelling on residential property price: a case study in Hong Kong. *Journal of Facilities Management*, 11(1), 31–51.

Knox, N. 2015. *Green Building and Location*. USGBC. Available from: < https://www.usgbc.org/articles/green-building-and-location.

Kucharska-Stasiak, E. & Olbińska, K. 2018. Reflecting Sustainability in Property Valuation - Defining the Problem. *Real Estate Management and Valuation*, 26(2), 60-70.

Kuiken, H. (2009). *Valuation of sustainable developed real estate: A closer look at factors used when valuing green buildings* (Doctoral dissertation, Master's thesis, Division of Building and Real Estate Economics, KTH, Stockholm).

Kyjakova, L. & Baskova, R. 2016. *Advantages and Disadvantages of Modern Methods of Construction used for Modular Schools in Slovakia*. Thesis (PhD). Košice: Technical University of Košice.

Lorenz, D., & Lützkendorf, T. 2008. Sustainability in property valuation: theory and practice. *Journal of Property Investment & Finance*, *26*(6), 482-521

Mahlaka, R. 2015. Green building moves to the affordable housing market. *MoneyWeb*, 10 November. Available from: < <https://www.moneyweb.co.za/investing/property/green-building-moves-to-the-affordable-housing-market/.

Marjanovic-Halburd, L. 2015. Incorporating Green Building Features into Property Valuation Practices. *Journal Für FM*, 10, 24-38.

Matthiessen, L.F. & Morris, P. 2004. *Costing Green: A Comprehensive Cost Database and Budgeting Methodology*. London: Davis Langdon

McGraw-Hill Construction. 2016. *Business Case for Energy Efficiency: Building Retrofit and Renovation*. Bedford: The McGraw-Hill Companies.

Modise, D. 2018. #BizTrends2018: Green building on the rise in South Africa. *Bizcommunity*, 29 January. Available from:

<http://www.bizcommunity.com/Article/196/720/171863.html.
Mosier, R. & Gransberg, D.D. 2013. A Framework to Reconcile Green Goals with Budget Reality. *ISRN Construction Engineering*, Available from: <https://www.hindawi.com/journals/isrn/2013/656742/.
Myers, G., Reed, R. & Robinson, J. 2007. The Relationship between Sustainability and the Value of Office Buildings. *13th Annual Pacific-Rim Real Estate Conference*, Melbourne 21 - 24 January 2007. Curtin University of Technology.
Nguyen, H. & Gray, M. 2016. A Review on Green Building in Vietnam. *Procedia Engineering*, 142, 314 – 321.
O'Mara, M. & Bates, S. 2012. *Why invest in high-performance green buildings?* North Andover: Schneider Electric.
Olaleye, A., Ayodele, T. O., and Komolafe, M. O. 2015. The Relevance of Green Building Practice in Emerging Markets: A Perceptual Analysis of Commercial and Industrial Building Users in Ibadan, Nigeria. *Journal of Sustainable Real Estate,* 7(1), 41-59**.**
Pitts, J. & Jackson, T.O. 2008. Green Building: Valuation Issues and Perspectives. *The Appraise Journal*, 115-118.
Qian, Q.K., Chan, E.H. & Khalid, A.G. 2015. Challenges in Delivering Green Building Projects: Unearthing the Transaction Costs (TCs). *Sustainability*, 7, 3615-3636.
Rehm, M. & Ade, R. 2013. Construction costs comparison between 'green' and conventional office buildings. *Building Research & Information*, 41(2), 198-208.
Sagheb, A., Vafaeihosseini, E. & Ramancharla, P. 2011. The Role of Building Construction Materials on Global Warming Lessons for Architects. In: Ramancharla, P. (ed.). National Conference on Recent Trends in Civil Mechanical Engineering, Hyderabad, March 2011. International Institute of Information Technology.
Sayce, S. & Ellison L. 2003. *Integrating sustainability into the appraisal of property worth: identifying appropriate indicators of sustainability*. The American Real Estate and Urban Economics Association Conference. Scotland, Kingston University.
Schumann, B. 2010. *Impact of Sustainability of on Property Values*. Unpublished thesis (MBA). Frankfurt am Main: University of Regensburg.
Shabrin, N. & Kashem, S. 2017. A Comprehensive Cost-Benefit Analysis of Green Building. *International Journal of Advances in Mechanical and Civil Engineering*, 4(2), 100-108.
Simpeh, E. & Smallwood, J. 2015. Factors influencing the growth of green building in the South African construction industry. *Proceedings of Smart and Sustainable Built Environment Conference*, Pretoria 9-11 December 2015.
Sinha, A., Gupta, R. & Kutnar, A. 2013. Sustainable Development and Green Buildings. *Drvna Industrija*, 64 (1), 45-53.
Sloane, P. (2017). *The leader's guide to lateral thinking skills: unlock the creativity and*

innovation in you and your team. Kogan Page Publishers.
Sustainable Energy Africa. 2015. *State of Energy in South African Cities*. Westlake: Sustainable Energy Africa.
Suttell, R. 2006. The True Costs of Green Building. *Buildings Magazine*, 4 March. Available from: < https://www.buildings.com/article-details/articleid/3029/title/the-true-costs-of-building-green
UNEP. 2011. *Sustainable Housing- A must, not a luxury*. Paris: UNEP.
Yiu, C. Y. 2007. Building depreciation and sustainable development. *Journal of Building Appraisal,* 3(2), 97-103.

Annexure: Questionnaire Sheet

Section A

Demographic Information

1. Highest Academic Qualification (a) Matric (NSC) (b) National Diploma (c) BTech (d) BSc (e) Honours (f) MSc (g) PhD (h) Others……..
2. Years of experience in the Property Industry (a) 5 years and below (b) 6 - 10 years (c) 11 - 15 years (d) 16 - 20 years (e) 21 years and above

Section B

B1. Perceptions of Property Valuers on Green Buildings

On a 5-point Likert scale, indicate the extent to which you agree or disagree with each of the following statements. 1 (strongly disagree, SD), 2 (disagree, D), 3 (neutral, N), 4 (agree, A) and 5 (strongly agree, SA)

Statements	SD	D	N	A	SA
There is a market for green buildings in the residential property sector.	1	2	3	4	5
Property valuers and developers are key participants to promote the implementation of green building in the residential property sector.	1	2	3	4	5
Investing in green buildings creates financial value such as increase in asset value, reduction in depreciation, higher tenant attraction and increased rental rates.	1	2	3	4	5
Limited availability of cost data in the market leads to slow implementation of green building in the residential sector.	1	2	3	4	5
Lack of financial incentives has a negative effect on the implementation of green building in the residential sector.	1	2	3	4	5
The initial cost of green building is offset by the low operating cost which is realized by calculating the lifecycle cost and the payback period	1	2	3	4	5

2. Cost of Green Building

Kindly answer the following question with a Yes or No

Questions	YES	NO
Do you have experience in green building? (If Yes, please answer the questions below. If No, proceed to B3)		
Are initial costs of green buildings higher than conventional buildings?		
Are operational costs of green buildings lower than conventional buildings?		
Are the total costs of green buildings higher than the costs of conventional buildings?		
Do green building features have an impact on the market value of a property?		
Do Property Valuers play a key role in promoting green building in the residential property sector?		

B3. Important Factors for Green Building Valuation

Rate the importance of each of the following factors on a 5-point scale, 1 is not important (NI), 2 is fairly important (FI), 3 is important (I), 4 is very important (VI) and 5 is extremely important (EI)

B4. Barriers to Green Building in the Residential Property Sector
Rank the most common barriers slowing down the progress of green building in the residential property sector from 1 to 5, where 1 is the most common and 5 is the least common.

B5. The Challenges Associated with Valuation of green residential buildings
Rank the most common challenges valuers face when valuing green residential buildings from 1 to 4, where 1 is the most common and 4 is the least common.

Any comments?

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Thank you for your participation!