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ARTICLE INFO	Anet M. Smit and Frans du Toit (2015). Investigating the financial benefits of green buildings. <i>Environmental Economics</i> , 6(3), 61-71
RELEASED ON	Monday, 14 September 2015
JOURNAL	"Environmental Economics"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

0



NUMBER OF FIGURES

0



NUMBER OF TABLES

0

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Investigating the financial benefits of green buildings

Abstract

Due to the deterioration of the Earth's health and the uncertainty in terms of climate changes, issues such as the economy, food, water and energy supplies, have become worldwide phenomena. Buildings have a huge role to play in addressing the environmental concerns as they play a contributing role in gas emissions, waste disposal and energy use. Although green buildings are regarded as the future, there is a perception, even amongst experts in the property sector that the upfront costs of building green are substantially higher when compared to building conventional, which limits the construction of green buildings. This paper is aimed at investigating whether building green leads to financial benefits which will ultimately provide the differentiator when it comes down to a final decision whether to invest in green buildings or not. The results of the paper showed that experts in the property sector agreed that the concepts applied in green buildings lead to long-term financial savings. This justifies the statement that a realistic comparison between the total costs of building green versus building conventional can only be achieved over the lifecycle of a building. It also finds that there is awareness and understanding of the financial benefits associated with green buildings which implies that green buildings have good growth potential.

Keywords: green buildings, construction, sustainability, financial benefits.

JEL Classification: Q51, L74.

Introduction

The 21st century will be defined as the urban age due to the fact that the increasing global population seeks prosperity in towns and cities across the world. This growth, unfortunately, is set against a backdrop of a lot of uncertainty in terms of the climate, economy, politics, food, water and energy security. The question is whether the environment can sustain society's expectations and still maintain its economic competitiveness. Lawson (2008) states that there has been a fundamental growth in environmental awareness in a variety of industries. Green technology, green products and green buildings have entered the minds of professionals world-wide and are also the topic of discussion between them.

Buildings have a huge role to play in addressing environmental concerns as they contribute around 40% of global greenhouse gas emissions and the same proportion of waste (Williams, 2008). The solution to this problem is building green, which is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life cycle from citing to design, construction, operation, maintenance, renovation and deconstruction (Williams, 2008).

The advantages to cities where green buildings are situated go well beyond reducing energy, water consumption and cutting emissions and waste, as a city's properties can also make a huge difference to its appeal and competitiveness. As energy prices continue to climb and an increasing number of people

become aware of their personal impact on the environment, green buildings have moved from the fringe to the mainstream of the construction industry (Fulton & Caron, 2010). Malarthamil (2012) states that green buildings will certainly create delight when entered, serenity and health when occupied and repentance when departed.

One of the concerning issues in the green building world is whether there is a significant premium to building "green" as opposed to the use of standard building products and practices. It is not uncommon for some members, such as architects, engineers, interior designers and contractors of the construction industry to say that the cost of building "green" can add 10% or more to the cost of construction even though there are studies that indicate the opposite. Although some of the studies reflect that significant higher costs associated with green buildings are perceptions, it still discourages green sustainable building designs (Berman, 2010).

Previous research, such as the Rand and Sense of Green Buildings report, indicated that the perceived cost premium on green buildings was 17%, but reality showed that premiums were far less. Green building sceptics sometimes argue that it is difficult or even impossible to build green without paying a big cost premium. Real world examples prove that a building project which adheres to the standards set by the Leadership in Energy and Environmental Design (LEED) certification for green buildings, can be completed at an average of 2% more in upfront costs. They added that in some instances it could even be cheaper when compared to the standard market construction costs for a conventional building (McKenzie, 2012).

Results from numerous studies referred to in the Rand and Sense report have shown that there is no

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significant cost difference between the construction of green buildings compared with conventional buildings, and green buildings achieve better investment returns and higher valuations (Milne, 2012). The reason most cited for not incorporating green elements into building designs, namely, the increased capital outlay, is unfounded. The majority of reported premiums in the United States are between 0% and 4%. In Australia, the latest studies show that a 4-star green building is actually cheaper to build on average; while a 6-star green building, signifying world leadership, usually has a relatively small premium of about 6%. A common misperception is that building green can add as much as 17% capital cost to a project. The Rand and Sense report on green buildings shows that all of this is simply not the case (Milne, 2012).

Berman (2010) concurs by stating that a study conducted by the Northeast Ohio Chapter of the United States Green Building Council and Sustainable Rhythm revealed that those who have analyzed the market have found that, in reality, there is a negligible premium or as low as a 1-2% premium dependent on the level of green building design solutions and/or the LEED certification level pursued. As indicated in the research studies above, there are different arguments regarding the real costs and benefits of green buildings.

The objective of this paper is to investigate whether the cost of green buildings is substantially more, or is it a mere perception amongst experts in the property sector and whether those experts are aware of the financial benefits derived from green buildings.

1. Literature review

1.1. Introduction. Towards the end of the 20th century, the building environment became a focus of observation within the environmental movement (Hoffman and Henn, 2009). Research disclosed that buildings utilize 55% of the wood cut for non-fuel use, 12.2% of total water consumed, 40% of the world's energy and 71% of the United States of America's (USA) electricity. Buildings in the USA, furthermore produced 40% of non-industrial waste, and 36% of carbon dioxide emissions which inevitably give rise to global warming (Hoffman and Henn, 2009). This argument is confirmed by Rashid, Spreckelmeyer, and Angrisano (2012) which state that buildings are one of the heaviest consumers of natural resources and account for a significant portion of greenhouse gas emissions that affect climate change.

According to the Governor's Green Government Council (GGGC, 2011), there are various definitions of what a green building entails or what it means.

Against the background of the entire green concept the ideal green sustainable building maintains and restores the habitat which is important for sustainable life and develops into a net producer and exporter of resources, materials, energy and water rather than being a net consumer. Scheulen and Wells (2008) define a green building as a compilation of advanced building principles and methods that exceed all existing building codes in creating a better interior environment and at the same time reducing the negative impact on the planet. The industry often uses the following terms to describe green buildings, namely, high performance buildings, intelligent building, or sustainable building (Lewis et al., 2010).

1.2. The cost perception of green buildings. According to Nalewaik and Venters (2008), when the concept of green sustainable buildings started to infiltrate the mainstream consciousness, there was a general perception that green was much more expensive. In the beginning green buildings did cost more, but for the following valid reasons:

- ◆ Technologies around green were new, not readily available and not mass manufactured;
- ◆ Architects who specialized in green sustainable design were scarce and, as a result, in a position to charge a premium for their services;
- ◆ Contractors who were unfamiliar with the changes in construction and management processes experienced inefficiencies and unforeseen productivity losses and, as a result, charged premiums to make up for these losses;
- ◆ The add-on of soft costs like commissioning in order to obtain green certification in addition to the total initial costs could result in higher costs than those of traditional buildings (Nalewaik & Venters, 2008).

Kapelina (2010) states that, although the economics of building green or green retrofits are compelling, there are several building owners which are not taking full advantage of energy efficient technology nor are they enforcing sustainable operating practices. According to the World Green Building Council (WGBC, 2013), an interesting study compared the perception of cost increase by professionals with experience in constructing green buildings with the perception of professionals with little or no experience. Those with experience think the initial cost uplift to be 13% compared to those with no experience to be up to 18%. This is indicative that while the lack of experience does enhance the perceived cost of green buildings, even professionals with experience tend to estimate the initial cost as substantial. Qualk and McCown (2009) concur by

stating that in the building design and construction industry “green” strategies and techniques are perceived to add substantial extra cost to the budget. According to the WGBC (2013), various surveys

from 2000 to 2012 on the distribution of actual design and construction costs in various countries results in a perception gap as evident by Figure 1 and needs to be addressed.



Source: WGBC, 2013, p. 26.

Fig. 1. The perception gap – estimated vs. actual cost premiums for green buildings

Kapelina (2010) states that, although buildings are the largest consumers of global energy as well as natural resources which ultimately have a negative environmental impact, the business case for green sustainable buildings can be built on the direct economic benefits that can be applied by developers, building owners, organizations and tenants. Hartenberger (2013) further confirms the importance of the financial benefits of green buildings by stating that it ultimately provides the differentiator when it comes down to a final decision whether to invest in green buildings or not.

According to Buys and Hurbissoon (2010) both tangible and intangible benefits offered by a green building must be taken into account when the costs of green buildings are considered. The intangible benefits like occupants satisfaction levels in green buildings and that they are more forgiving towards shortcomings in green buildings, could not be ignored (Deuble and de Dear, 2012). The benefits of a green building accrue from savings generated by lower operating costs and potential higher capital values and rent income. The positive impact of green buildings on the environment leads to intangible benefits like higher productivity, decrease in occupants health problems, creation of a green image and higher marketability. A study performed by Singh, Syal, Grady, and Korkmaz (2009) also found that improved indoor environmental quality that adheres to the principles of green buildings, contributed towards reductions in absenteeism. Choi (2009) states that green building developments have the potential to evolve in an engine for green revival

when looked upon on a greater scale. As suggested by Miller, Spivey, and Florance (2008), the sales prices of green buildings could be as much as 10 per cent per square foot higher than conventional buildings. Green development practices provide an avenue to a formidable green economy which will minimize unnecessary spending on energy and other operating costs when compared to those of a conventional building.

The Colliers International Sustainability Advisory Services Report (2013) states that LEED which is a set of rating systems used for green certified buildings implies that on average a green building produces the following savings: 25% to 50% less energy; 40% less water usage; 70% less production of solid waste; and 35% less greenhouse gasses. A study performed by Eichholtz, Kok and Qigley (2013) also suggests that property investors attribute a lower risk premium for more energy-efficient and sustainable commercial space. All of the above leads to financial benefits for both owners and tenants of green buildings.

1.3. Financial benefits of green buildings

Lower operating costs

According to Milne (2012), direct operating costs entail all expenses incurred in the daily operations and management of a building throughout its entire lifecycle. Electricity and water are the main contributors to a building's operating costs and represent at least 30% of total operating costs and, as a result, have a major impact on the bottom line of a business.

Electricity

Electricity tariffs in South Africa have increased significantly since 2008, as Eskom (the state power utility) sources funds in order to construct new power stations. Milne (2012) & Mattson-Teig (2008) concur by stating that energy costs worldwide are much higher than a few years ago which establishes a powerful financial reason for green building practices. Milne (2012) states that green buildings on average are 25% to 30% more efficient when it comes to energy consumption.

Water

According to Watson (2009), potable water is the Earth's most valuable and scarce resource and to put it in perspective, less than 10% of accessible fresh water comes from underground and surface sources. The use of water in buildings constitutes to 80% of the world's potable water, therefore, businesses need to manage their water footprint, the risk of high direct usage at their own premises and indirect consumption at their supply chains.

Langdon (2013) further mentions that a waterless future will lead to increased cost, recycled water, desalination, grey water, black water and water tanks. The strategies used in green buildings address the need for efficient and reduced water usage in buildings through conservation techniques. The LEED concept addresses this need and through green design it effectively minimizes a building's demand for potable water and, as a result, contributes positively to a company's net income (Watson, 2009).

Green buildings lead to higher return on investments

Green buildings go beyond the moral and ethical considerations attached to it by proving that there are tangible economic reasons why sustainable green building practices are a good investment now and in the future (O'Mara & Bates, 2012). The pay-back on green buildings improves as energy prices continuously increase with the result that energy improvements become a better and more attractive investment at all times.

The Green Outlook analysis indicated that Return on Investments (ROI) for green buildings is higher in new construction as well as existing building projects when compared to standard conventional construction, as energy systems used in green buildings maximize ROI. ROI changed for the better in the US as reported by building owners and recorded 9.9% and 19.2% improvements for new construction and existing building projects, respectively (O'Mara & Bates, 2012).

Marketability of green buildings

According to the Colliers International Sustainability Advisory Service Report (2013), building owners or developers of green certified buildings benefit from free publicity. The free publicity favorably impacts a project's marketing budget and, at the same time, increases tenant demand for space which ultimately results in greater occupancy and higher rental rates. Milne (2012) states that owners of green star buildings, mentioned in the Rand and Sense Report, confirmed that they receive increased media coverage and, as a result, enjoy industry awareness. The general manager of the Aurecon engineering firm's offices in Cape Town S.A. which received the first 5-star Green Star S.A. rating in South Africa re-iterates the marketing benefits by stating that the green accomplishment provided them with a lot of reputational gain (Milne, 2012). Leaman and Bordass (2007) find in their study that improved working conditions in green buildings resonate with employees and visitors and that the economic impact also resonates with everyone who is concerned about profitability.

Kapelina (2010) concurs and states that green buildings improve image through more positive media attention and coverage. According to Lamb (2011), the marketing advantages of highly rated green buildings have also been empirically tested and, although landlords will keep an eye on carbon tax, the primary driver for investing in green building technology will be to ensure the future relevance of their buildings.

Green buildings and productivity

The Colliers International Sustainability Advisory Service Report (2013) states that human capital or employees' costs are normally a company's largest expense, as it counts for between 70% and 80% of a company's expense in comparison with rent at 5% and energy costs anything between 1% and 2%. It is evident that enhanced productivity which is associated with green buildings has a huge impact on the profitability of a company and, as a result, can reflect rapid payback for green building retrofits and initiatives. A healthy indoor environment provided by a green building contributes to less illness; reduced absenteeism; lower employee turnover, and retracts top job talents (O'Mara & Bates, 2012; WGBC, 2013). A study performed by Ries & Bilec (2006) concludes that in green buildings productivity increased by about 25%, statistically significant absenteeism varied, and the usage of energy decreased by approximately 30% on a square foot basis.

The ability of green buildings to attract and retain corporate and government tenants

Green buildings has become a front and central issue for tenants on the lookout for office space, which is evident from higher rent premiums caused by high demand and greater value as government and major commercial tenants are continuously seeking spaces that offer high sustainable performance (Kapelina, 2010). Mattson-Teig (2008) concurs by stating that a green title designated to a building could be a key deciding factor in attracting tenants. Milne (2012) states that it involves major costs to find and secure tenants and also includes losses in respect of rental, but studies revealed that green buildings that have a lower tenant turnover are more likely to retain current tenants, which all leads to substantial benefits for property owners and managers of green buildings.

Green buildings reduce liability and risk

Worldwide environmental issues are identified as risk factors in many industries, and that includes the property and construction industry. Unstable and unpredictable weather patterns played a significant role in the volatility of energy prices and, more specifically, electricity, natural gas and oil (O'Mara & Bates, 2012).

Building green and incorporating green initiatives now will guard owners against expensive retrofits in the future, and will also avoid obsolescence as non-green buildings will be less competitive and not well equipped to deal with a resource constraint world (Milne, 2012). Yudelson (2008) adds by stating that green building certification can to a certain extent provide some measure of protection against future lawsuits through third party verification of measures installed to protect indoor air quality which exceeds just meeting building requirements.

The literature reveals that much higher costs are a mere perception and may have a negative impact on future green building constructions. Various authors have highlighted the long-term savings in going green and stressed the financial benefits associated with green buildings.

2. Research methodology

The research could be classified as descriptive and explorative, seeing that the literature study undertaken

was descriptive of the perceptions regarding the cost of green buildings and explorative in the sense that solutions need to be identified in order to address the perception of higher greening costs.

The target population in this instance will be everyone associated with green buildings in South Africa, but this will be impossible. The sampling was done for convenience purposes and has targeted the following specialists in the property sector: facility managers, building managers, leasing agents, finance managers and project managers. A self-administered questionnaire was designed for the purpose of this study. The empirical study was done by distributing questionnaires via e-mail. A total of one hundred and twenty five questionnaires were sent to the sample group of which one hundred and five questionnaires were received, resulted in a response rate of 84%. The respondents were representatives of shopping centres, office buildings and industrial buildings. The results were analyzed to determine the mode, mean value and standard deviation. For the purpose of this study, a 4-point Likert scale was used to collect the data, where 1 is Strongly agree and 4 is Strongly disagree. Descriptive statistics were used in order to analyze the financial benefits of green buildings, and the Cronbach Alpha coefficient was calculated to determine whether the results can be regarded as reliable.

3. Results of the survey

The majority of the buildings in this study were situated in Gauteng. 31.4% of the respondent's work in the facility and building management area and the same percentage works as finance managers. These two areas of work represented the majority of responses. The sample received consisted out of 63.8% males and 36.2% females. 71.4% of the properties that the respondents were involved in were valued in excess of R1 billion. The majority of respondents are between the ages of 30 and 49, and the sample indicates that respondents varied from only one year service to a maximum of 37 years of service in the property sector.

Cost of building green, availability of materials and knowledge of green buildings

Participants were given the opportunity to rate statements pertaining to the cost of building green, the availability of materials used in green buildings and knowledge associated with green buildings.

Table 1. Cost of green buildings, availability of materials and knowledge of green buildings

		Frequencies in %				Descriptive statistics		
		SA	A	D	SD	Mode	Mean	Std. dev
		1	2	3	4			
1	Upfront costs of building green are significantly higher compared to building normal	36.2	49.5	11.4	2.9	2	1.81	0.748

Table 1 (cont.). Cost of green buildings, availability of materials and knowledge of green buildings

		Frequencies in %				Descriptive statistics		
		SA	A	D	SD	Mode	Mean	Std. dev
		1	2	3	4			
2	A lack of knowledge of green buildings limits green building development	42.9	50.5	4.8	1.9	2	1.66	0.663
3	Materials used in green buildings are more readily available compared to a decade ago	24.8	64.8	8.6	1.9	2	1.88	0.631
4	Cost of materials used in green buildings is becoming cheaper	12.4	50.5	33.3	3.8	2	2.29	0.73
5	A realistic comparison between the total cost of building green versus building normal can only be achieved over the lifecycle of a building.	31.4	45.7	22.9	0	2	1.91	0.735

It may be observed from the first statement in Table 1 that most respondents (49.5%) agreed that upfront costs of building green are significantly higher compared to building normal. It's evident that 36.2% strongly agree with the same statement. In general, it may be indicated that respondents agree that the upfront costs of building green are significantly higher when compared to building normal. With reference to statement 2 in Table 1, the majority (50.5%) of the sample agreed and as much as 42.9% strongly agreed that a lack in knowledge of green buildings limits green building development. Relating to statement 3, the majority (64.8%) of the sample agreed, and 24.8% of the respondents strongly agreed with the statement that materials used in green buildings are more readily available compared to a decade ago.

Pertaining from statement 4 in Table 1, it was observed that the majority of the respondents (50.5%) selected 'agree'. However, a large portion (33.3%) of the respondents disagrees. In general, it can be considered that more than a half of the respondents agree that costs of materials used in green buildings are becoming cheaper.

From statement 5 in Table 1, it is evident that a larger portion of the sample (45.7%) opted for 'agree'. As many as 31.4% of the respondents strongly agreed. The respondents reflected an overall agreement to the statement that "a realistic comparison between the total costs of building green versus building normal can only be achieved over the lifecycle of a building".

Table 2. Operating costs

		Frequency in %				Descriptive statistics		
		SA	A	D	SD	Mode	Mean	Std. dev
		1	2	3	4			
Operating cost								
6	Lower energy usage is a financial benefit of a green building.	78.1	21.0	1	0	1	1.23	0.444
7	Lower water usage is a financial benefit of a green building.	73.3	24.8	1.9	0	1	1.29	0.494

Operating costs

In Table 2, the respondents strongly agreed with statement 6 that lower energy usage is a financial benefit of a green building. The majority (78.1%) opted for strongly agree and 21% agreed with only 1% which disagreed. In statement 7 it was observed that the majority (73.3%) of the respondents strongly agree that low water usage is a financial benefit

of a green building, 24.8% agreed with the statement and only 1.9% disagreed. These responses signified undoubtedly that lower energy and water usage are financial benefits of green buildings.

Return on investments

The statements pertained to equipment used in green buildings and the growth of a green buildings appraised value.

Table 3. Return on investments

		Frequency in %				Descriptive statistics		
		SA	A	D	SD	Mode	Mean	Std. dev
		1	2	3	4			
Return on investments								
8	Green building strategies guarantee that equipment (like air conditioners) is only used when necessary resulting in higher return on investments.	43.8	44.8	11.4	0	2	1.68	0.672
9	Green buildings result in positive growth of a property's appraised value.	45.7	48.6	5.7	0	2	1.6	0.598

Pertaining to statement 8 from Table 3, it may be observed that the majority (44.8%) of the respondents agreed and that 43.8% strongly agreed with the statement that “green building strategies guarantee that equipment (like air conditioners) are only used when necessary, resulting in higher return on investments.

With regard to statement 9 from Table 3 the indication was that the majority (48.6%) of the sample opted for ‘agree’. A large number (45.7%) of res-

pondents selected ‘strongly agree’. The responses confirmed that green buildings result in a higher return on investments and also in positive growth of a property’s appraised value.

Marketability

Participants were given the opportunity to rate statements relating to enhanced brand equity, free publicity and media coverage associated with green buildings.

Table 4. Marketability

		Frequency in %				Descriptive statistics		
		SA	A	D	SD	Mode	Mean	Std. dev
		1	2	3	4			
Marketability								
10	Companies associated with green buildings benefit from it through enhanced brand equity.	46.7	45.7	7.6	0	1	1.61	0.628
11	Green development is a global topic resulting in free publicity and media coverage.	35.2	51.4	12.4	1	2	1.79	0.689

From statement 10 in Table 4, it may be conclusively observed that the bigger fraction of the sample (46.7%) opted for ‘strongly agree’ and 45.7% opted for ‘agree’. With regard to statement 11, the highest percentage recorded (51.4%) was for ‘agree’. However, 35.2% strongly agreed with the same statement. In general, it indicated that respondents strongly agreed that companies associated with

green buildings benefit from enhanced brand equity, free publicity, and media coverage.

Productivity

Participants were given the opportunity to rate statements with regard to the workplace in a green building and the productivity associated with green buildings.

Table 5. Productivity

		Frequency in %				Descriptive statistics		
		SA	A	D	SD	Mode	Mean	Std. dev
		1	2	3	4			
Productivity								
12	A healthy workplace originates from building green a harmful toxics and chemicals are excluded.	32.4	56.2	11.4	0	2	1.79	0.631
13	Enhanced productivity is associated with a green building, as building green leads to lower absenteeism of employees.	14.3	50.5	30.5	4.8	2	2.26	0.76

Pertaining to statement 12 in Table 5, it may be observed that the majority (56.5%) of the sample agreed; 32.4% of the respondents strongly agreed, while 11% disagreed. Overall, it may be considered that respondents agreed that a healthy workplace originates from building green. In relation to statement 13 of Table 5, it was observed that the majority (50.5%) of the sample agreed. However, 30.5% of the sample disagreed with the same statement.

Only 14.3% of the responses selected ‘strongly agree’ and 4.8% strongly disagreed. The responses indicated that enhanced productivity is not clearly associated with a green building.

Tenants

Participants were given the opportunity to rate statements with regard to the association of tenants with green buildings.

Table 6. Tenants

		Frequency in %				Descriptive statistics		
		SA	A	D	SD	Mode	Mean	Std. dev.
		1	2	3	4			
Tenants								
14	Green buildings will attract major anchor tenants.	45.2	42.3	12.5	0	1	1.67	0.689
15	Green office buildings will attract international tenants.	42.3	48.1	9.6	0	2	1.67	0.645
16	Green buildings lead to lower tenant turnover.	17.3	45.2	32.7	4.8	2	2.25	0.797

In relation to statement 14 of the preceding Table, it may be observed that the majority (45.2%) of the respondents strongly agreed and 42.3% agreed, while 12.5% disagreed. With regard to statement 15, it was observed that the bigger portion (48.1%) of the sample agreed and 42.3% strongly agreed, while 9.6% disagreed. Pertaining to the last statement of Table 6, it was ascertained that the majority of res-

pondents (45.2%) opted for 'agree', however, 32.7% of the sample disagreed.

Liability and risk

Participants were given the opportunity to rate statements with regard to the relationship of green buildings, liability and risk.

Table 7. Liability and risk

		Frequency in %				Descriptive statistics		
		SA	A	D	SD	Mode	Mean	Std. dev
		1	2	3	4			
Liability and risk								
17	Future steep utility price increase will be minimized by building green.	47.1	48.1	4.8	0	2	1.58	0.586
18	Building green will reduce the strain on natural resources.	56.7	40.4	2.9	0	1	1.46	0.556

From statement 17 it may be conclusively observed that the bigger fraction of the sample (48.1%) opted for 'agree' and 47.1% opted for 'strongly agree'. With regard to statement 18, the highest percentage recorded (56.7%) was for 'strongly agree' and 40.4% for 'agree', while only 2.9% disagreed.

Reliability tests – Cronbach’s Alpha

The Cronbach’s Alpha coefficient is based on the average correlation of variables within a test and implies that the greater the value of the Cronbach’s

Alpha coefficient, the higher the internal consistency, and the greater the reliability of the scale used in the study (Struwig & Stead, 2004). The closer the Cronbach’s Alpha coefficient is to 1.0, the greater the internal consistency of the items in the scale (Struwig & Stead, 2004). There are several notions as to what the acceptable number for reliability is, but Nunally and Bernstein (1994) state that the Cronbach’s Alpha coefficient should be equal or greater than +/-0.6 to be regarded as acceptable.

Table 8. Cronbach’s Alphas – reliability tests for constructs 6 to 11

Construct	Cronbach’s alpha coefficient	Mean	Standard deviation
6: Operating cost	0.91	1.26	0.45
7: Return on investments	0.69	1.64	0.56
8: Marketability	0.60	1.70	0.56
9: Production	0.71	2.02	0.61
10: Tenants	0.75	1.86	0.58
11: Liability and risk	0.70	1.52	0.50

Constructs 1 to 5 were not tested as they were general statements and have no relationship with each other. The test for constructs 6; 9 and 11 only consisted of two questions each and recorded Cronbach’s Alpha coefficients of 0.91; 0.71, and 0.70 respectively which indicates that the internal consistency is high. The test for construct 10 consisted of three questions, recorded a Cronbach’s Alpha coefficient of 0.75 which also reflects high internal consistency. All the results as per Table 8 indicate consistency and the results may be considered reliable.

Conclusions

After the completion of the empirical study it is evident that the majority of the experts in the property sector in South Africa still have the perception that building green is more expensive than traditional buildings. However, when analyzing the financial

benefits of green buildings, most of the participants were confident that green buildings have a variety of financial benefits, whether these benefits are directly or indirectly linked to building green. More detail conclusions regarding separate items are presented below:

- ◆ **Upfront costs.** The majority of experts in the property sector believe that the upfront costs of building green are significantly higher when compared to building normal. The reason for this can be the perceptions associated with the cost of green buildings; the tendency to forget historical data when green materials were more expensive; or additional costly finishes which are not directly linked to green cost. The literature study revealed that the cost premium of green buildings can be the same and, in some instances, even less as that of conventional buildings.

- ◆ **Lack of knowledge.** Responses received from experts in the property sector indicated that there is a general lack in knowledge of green buildings. This has an adverse effect on green building construction in general. A lot of experts are registered with green building councils and undertake courses which mean that it will only be a matter of time before they acquire the necessary expertise.
- ◆ **Green materials become cheaper.** Half of the respondents agree that the cost of green materials used in construction is becoming cheaper. This is in line with the literature study but contradicts to a certain extent the views of respondents that the upfront costs of building green are substantially higher.
- ◆ **Long-term savings.** Various authors pointed out that green buildings can contribute to long-term savings and that a realistic comparison of costs between building green and building normal can only be obtained over the lifecycle of the building. Most respondents agreed with the statement.
- ◆ **Operating costs.** The terms energy and water efficiency are synonymous with green buildings and the cost of these items are main contributors to a building's operating cost. Most experts in the property sector strongly agreed that efficiency in these areas is a financial benefit of a green building which is also in line with the literature study.
- ◆ **Return on investments.** The strategies used in green buildings and the lower operating costs pertaining to green buildings will inevitably result in a higher ROI when compared to that of a normal building. The significant savings in operating costs results in an increased net income which increases the building's appraised value.
- ◆ **Marketability.** Green buildings are globally an important topic and, as a result, buildings that adhere to the green building standards receive a lot of free publicity and media coverage, which inevitably means that companies associated with green buildings will ultimately benefit from it on the long term. Experts in the property sector through personal experience agree with this statement.
- ◆ **Productivity.** It is well known that in most cases, if not all, commercial office buildings' payroll costs are higher than any other cost when running a business. Production is often the differentiator when it comes to the profitability of a company. The study confirms that green buildings provide an environment free of harmful toxins and chemicals which positively impacts the employee's productivity. Green buildings provide a better workplace which leads to lower absenteeism resulting in enhanced productivity.
- ◆ **Tenants.** Tenants of commercial buildings ultimately provide the income for property letting businesses. The financial benefits associated with green buildings indirectly benefit tenants as lower operating costs will positively impact rental rates charged by owners. The lower rental rates charged will encourage tenant loyalty. Although most respondents agree that green building will lead to lower tenant turnover a substantial number of tenants disagreed with the statement.
- ◆ **Liability and risk.** Green buildings will not only limit steep utility price increases in the future, but also reduce the strain on the world's natural resources. Most respondents strongly agreed to these statement.

Recommendations relating to the outcome of the study

In order to encourage the construction of green buildings and to change the way businesses evaluates their facility assets, the following recommendations are made:

- ◆ Experts in the field of property development must engage early and in a collaborative, integrated manner to ensure that savings can be made at the outset.
- ◆ The literature review and empirical study highlighted that there are different views regarding the actual costs of green buildings. Experts in the different fields of green construction must consult and implement a general model pertaining to the various costing elements in building green.
- ◆ Experts must stress the fact that the operational stage of a commercial building is substantially longer than the design and construction phase thereof. They should demonstrate the potential substantial financial savings generated by a green building during the operational stage, as this will mitigate the negative response to the higher initial capital cost when decisions are made by the owners.
- ◆ Experts must point out the potential risk and liability exposure against the background of ever increasing electricity and water tariffs that property owners face by not making use of green building techniques.
- ◆ Although experts are generally aware of green materials, they must be encouraged to improve their knowledge on the topic. Incentive schemes must be implemented to encourage experts to attend green building workshops. This will ensure that there is a shift from using traditional materials to green materials.
- ◆ When faced with choice, potential tenants will definitely opt for a green building with all of its benefits as opposed to a normal building.

- ◆ Lastly, an environment regulatory framework is already in place to protect the environment. All roleplayers in the building industry must continuously be made aware of it to ensure that green building practices are adhered to, as this will encourage the trend towards green sustainable construction.

Areas for future research

The construction of green buildings will improve if it makes sense from a financial perspective. Both the literature and empirical study showed that there are contradictory views when it comes

down to the initial costs of green buildings versus conventional buildings. A costing model should be researched and developed to formalize cost comparisons between the initial costs of green buildings versus conventional buildings in order to prove that the perceived initial costs of building green are not substantially higher than those of a conventional building. This model should be utilized across the property industry and should be an accepted model amongst all stakeholders in order to make green buildings the core of profitable business strategy.

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