

Adopting Green Building Technologies for Sustainable Development: Insights from Harare, Zimbabwe

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Abstract

Green building is a fast growing concept that acts as a cardinal instrument of sustainable development, being proven as crucial in the achievement of sustainable development goals. The construction industry is seen as a critical player in the achievement of sustainable development because it makes huge contribution to the environmental degradation. However, in Zimbabwe, the adoption of green building technologies has been very slow, which means that the contribution of the built environment to sustainable development is apparently very minimal. The present study attempts to situate the Zimbabwean construction industry in the sustainable development framework. Technology is the cutting edge of development in the contemporary cities and the adoption of technologies in the construction industry will go a long way in attaining sustainable development. The study also examined the barriers to sustainable construction in the country using Harare as the case study. The study used qualitative methods to collect data. In-depth interviews and observations were employed. The research observed that there is very minimal adoption of green building technologies in Harare with only three buildings that have incorporated these technologies the rest are conventional buildings. Technology in the construction industry is therefore minimally used in the city of Harare and this has severe consequences on sustainability. The major reason for poor adoption of green technologies include lack of government policy, general lack of information and understanding on the need for green buildings, and the hostile economic environment in the country. The study therefore recommends that government should intervene with policies and regulations that promote green technologies.

Keywords: Zimbabwe, green building, sustainable development, building technology, qualitative

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1.0 INTRODUCTION

Sustainable construction is a subset of the overall sustainable development concept that seeks to promote development that is conscious of the development that benefits both the current generation and the future generation. Sustainable construction is predicated on the development of green buildings, which are buildings that are environmentally friendly, economically efficient and aim to create more ambient indoor environments. Green buildings are therefore a key component of the sustainable construction and most environmentally conscious countries are moving towards green technologies. Green buildings have been proven to be the future of the construction industry as they contribute towards sustainable development. The movement is propelled by the need to harness some economic and environmental benefits associated with green buildings. It is also driven by the realization that the real estate industry has a lot to contribute to the sustainable development concept. The construction industry is responsible for consumption of 40% of the energy, 25% of timber and 16% of water, hence has a strong bearing on sustainability (Ahn et al., 2010; Son et al., 2011). Son et al. (2011) further argued that the built environment is also responsible for generation of 30-40% solid waste and 25-45% of greenhouse emissions, which all destroy the environment and exacerbate climate change. Joseph and Tretsiakova-McNally (2010) added that buildings consume 3 billion tons of raw materials in the construction process. When technology is adopted in the built environment, it can play an important role in controlling greenhouse gas emissions and contribute significantly to sustainable development. They also ensure retention of value in property and minimize operation costs of the building (Christensen, 2012; Kibert, 2017; Meyers et al., 2008). Green buildings can achieve this through building orientation, proper setting and adoption of energy efficient designs (Azhar & Brown, 2010; Kreitler, 2011). Kreitler (2011) added that green buildings create healthier atmosphere due to their improved indoor air quality and ventilation. Sustainable construction and green building technologies therefore greatly contribute to the broader sustainable development goal and alleviation of environmental consequences that are associated with conventional buildings.

■2.0 BACKGROUND OF THE STUDY

There is now growing demands for green building technologies because of the efficiency of green building technologies and their contribution to sustainable development (Cooper, 1999). The positive externalities that can be harvested through incorporation of green building technologies in the construction industry include increasing productivity of workforce due to ambient working environments, energy efficiency due to green designs and environmentally friendly buildings. Green buildings worldwide are proving to be the way towards sustainable development in real estate industry (Sunday Mail, 2018). The whole world is adopting these technologies and institutions such as Leadership in Energy and Environmental Design (LEED) and Building, Research Establishment Environmental Assessment Methods (BREEAM) are leading in furthering the environmental consciousness in the real estate industries in countries such as like The Netherlands, New Zealand and Australia. These countries have fully incorporated green building technologies and are benefiting both economically and environmentally from such initiatives. They have already established working green building councils that are helping to facilitate sustainable development in the construction industry. In the global South the concept of green technologies is at different level of inception. They are still lagging behind in their participation in sustainable development. However, South Africa has made some strides and is leading the way in adoption of the green building technologies in the construction industry. They have introduced green star ratings in their construction industry as a way of promoting the adoption of green building technologies in the industry. These rating are used to improve the attractiveness of buildings and are giving rated buildings a competitive edge in terms of attracting good tenants and improving the values of the property. Other countries in Africa that are incorporating green building concept are Kenya (though it is relying on foreign ratings and certifications), Swaziland (though is still experimenting on use of renewable energy in the built environment) and Nigeria who is advocating for inclusion of green building technologies in their construction industry. According to Oyedokun (2017), Nigeria has also made some strides in adopting green building technologies by having green buildings developed and certified under international schemes. Zimbabwe has, however, been lagging behind in adopting green building concept though there are a few vestiges of green buildings in construction industry. A few buildings in Harare such as the Eastgate, Hurudza House and Batanai Gardens are the only buildings have incorporated green building technologies. Zimbabwe has, therefore, been sparingly using green technologies in their construction industry. However, Zimbabwe was the fore runner in incorporating green building technologies in the sub-Saharan Africa when they built the Eastgate building.

In Bulawayo, which is Zimbabwe's the second largest city, there are no buildings that have incorporated the green building technologies. In this globalized world technology is the way to effectively do your business. The construction industry has a critical role in creating sustainable development, therefore, green building technologies are the launching pad to sustainability. While other countries are moving towards technological advancement and sustainable ways of doing their business, it is therefore important to examine why Zimbabwean construction industry has been failing to participate effectively in sustainable construction. The research is, therefore, a situational analysis that tried to situate the construction industry in Zimbabwe in the sustainable development framework and establish barriers to adoption of green building technologies in Zimbabwe using Harare as the case study.

■3.0 METHODOLOGY

The research was done in Harare as a survey in the commercial building of the city. The research employed a qualitative methodology of data collection. The qualitative methods used included in-depth interviews and field observations. Interviews were done with owners of the building, property developers, property managers and some tenants. From the property developers the research gathered data on the green building technologies incorporated in their buildings, advantages they were getting from technologies and why they were incorporating these technologies. Property developers were selected from active construction sites in the city centre of Harare. Since they were very few of these sites all the three sites were selected for research. Another group of interviewees were property managers. These were randomly selected from the register of estate agents' council in Harare. Out of the 70 registered estate agents in the city centre of Harare 15 were systematically selected. Data collected from property managers included the green technologies in properties they were managing, the advantages they were getting from the technologies and the problems they were facing in the conventional buildings. Data on the perceived barriers to adoption of green buildings was also collected. A total of 15 property managers were selected in a systematic random system representing 24% of the sample. The sample was representative enough because it was more than the required 10%. Property owners were randomly selected from the portfolios of the 15 property managers. Each estate agent provided two property owners from their portfolios and the other 3 were purposively selected to examine the green building technologies. Those that were purposively selected were recently constructed buildings. The property owners gave data on the green technologies that were in their buildings, the advantages they were getting from green buildings and the barriers to adoption of green building technologies. In total 33 property owners, 3 property developers, and 15 property managers were interviewed. While doing these interviews at construction sites observations were also done to see the green technologies that were incorporated in the buildings. During observation photos were taken to capture some of the buildings that have the green technologies. The research was observing designs that incorporated green building technologies and other green technologies such as solar systems, water harvest technologies, greenery and other green technologies that were incorporated to ensure sustainable construction. Buildings with green building technologies were purposively selected from Harare city. Since they are only 3 buildings in the city, they were all selected for observations. A total of 33 buildings were selected. New buildings were also purposively selected to see if they were incorporating green building technologies. Data that was collected from qualitative methods was qualitatively analyzed by putting it into thematic issues. The analysis followed Pope et al.'s (2000) five stage qualitative data analysis. The first stage was the familiarization stage where interviews and records were studied, and then created themes and frameworks, which was followed by indexing where data was put into these themes and frameworks, which was then followed by mapping and interpretation of data where concepts were defined.

■4.0 RESULTS AND DISCUSSION

4.1 The Real Estate Industry in Zimbabwe

The Zimbabwean construction industry showed a boom soon after the adoption of the multi-currency system in 2009, where the currency basket included United States Dollar, South African Rand, British Pound and Botswana Pula. This economic move resulted in massive developments that were done throughout the country. In the city of Harare, these buildings include the magnificent Joina Center, the Life Tower and the extensions at Eastgate. Other buildings include the Fidelity Life Tower, the Celestial Office Park in Borrowdale and the Zimdef Center. All these developments are quite recent and are of the latest architectural designs. However, these developments have been erected against high void levels in commercial properties in the city. For example, the Joina Center building has void level is around 50% void level and other buildings in the down town area have occupancy level of 30%. These high vacancy levels can be attributed to the high operational costs that are associated with conventional buildings that are commonly found in the city. The conventional buildings are not taking advantage of the natural resources that can lower their operation costs. Most of the conventional building are using non-renewable such as electricity, whose cost is ever increasing and hence reducing the land lord's profits. The property owners, therefore, are increasing their rents in order to cover for the overhead associated with the high rate of inflation that is currently galloping. Tenants are therefore failing to afford these rentals and are opting to move out of their rented properties. These rentals are usually pegged against US dollar and it ranges from at US\$7-10 per square meter for offices and US\$10-12 per square meter for retail. This translates to ZWL470-680 for offices and ZWL680-812 in local currency at the current exchange rate of 68ZWL to 1USD and the rate is very volatile as the local currency is sharply depreciating on daily basis. Most tenants are therefore struggling to meet their lease obligation due to harsh economic conditions. In the down town area, the situation is worse because some buildings have as low as 30% occupancy levels. According to Knight Frank (2017), there has been a significant high level of void levels in the city of Harare, owing to tenants' voluntary surrender of their spaces in the city center opting for the suburban locations. These surrenders can be attributed to the conventional building that are still in use in the city. These conventional buildings are too expensive to run due to high overheads. Most of the buildings in the city have not been renovated to include the green building technologies that can reduce these overheads. On average, the overheads are consuming more than 35% of the revenues collected on buildings. In some cases, especially where there is high void level the percentage of revenue consumed by these utilities were as high as 55%. In all these expenses electricity is said to be the highest consumer. Such high running costs can be reduced by incorporating green building technologies. The use of natural ventilation and natural lighting through proper designs can be used to reduce these expenses. These green buildings have proved to be economically effective because of their ability to reduce running cost and increasing worker productivity. They reduce the running costs of building because they reduce the need for power to light and ventilate the buildings and also reduce on other amenities that are needed to run buildings. Green building technologies are therefore an important factor in the efficient use of scarce resources because of their efficiency in using resources (Joseph & Tretsiakova-McNally, 2010). They are very efficient in reducing the negative effects of the built environment on the natural and the built environment because they are developed and designed in a way that efficiently use resources (Kibert, 2016). Most of the buildings in the city of Harare are conventional buildings with no green building technologies as a result they are expensive to operate. Simple technologies such as design and use of solar equipment are not utilized in the buildings to take advantage of natural resources, hence the buildings are relying on the expensive non-renewable energy. The continued use of conventional building in the city of Harare can be a contributing factor to high void levels in the commercial buildings because these building are not economically sustainable since they have not incorporated green building technologies that can reduce cost overheads. Green technologies are very critical in reducing running costs on buildings. There are very few buildings in the city of Harare that are achieving a 100% occupancy. Some are running at as low as 30% occupancy and the situation is very bad in the downtown area where some buildings are close to zero occupancy. According to this survey, 33 buildings were studied in the city centre of Harare with only 3 buildings have incorporated some green building technologies. The technologies incorporated included design orientation of buildings that allow natural ventilation and lighting and these technologies can be helpful in reducing the need for electric powered lighting and ventilation.

The buildings with green technologies are Eastgate Building, Batanai Gardens and Hurudza House. Some of these buildings like the Eastgate and Batanai buildings have recorded full occupancy throughout the year and have shown be economically effective in reducing water and electricity bills. For example, Eastgate Building, because of its bio mimicry designs has managed to self-regulate its environment through the passive cooling system thereby creating ambient working environments that can significantly contribute to productivity. It has also managed to reduce its energy cost by 35% because the design has allowed the building to eliminate the use of heating, ventilation and air conditioning systems. See Figure 1 that depicts the Eastgate building which was designed to incorporate natural lighting throughout the day, thereby reducing the need for electricity.

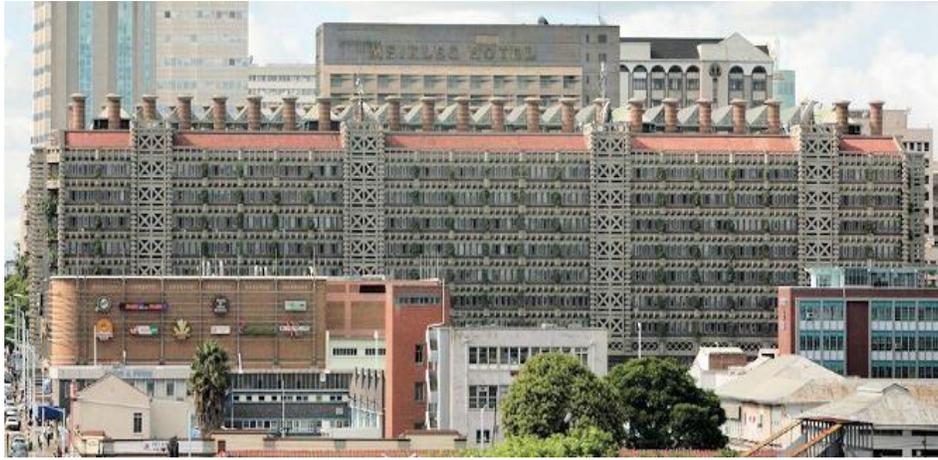


Figure 1 Eastgate Building incorporating natural lighting and greenery for sustainable environment

Other buildings such as the Hurudza (refer Figure 2 below) and Batanai have also been designed in such a way that they allow natural lighting and ventilation and these designs are very critical in reducing the need for powered lighting. Batanai building like Eastgate building has good greenery incorporated in the building and this has made it favorable space for both residential accommodation and office. These two buildings have recorded occupancy rate of between 80-100% throughout the year. Tenants at Batanai Building have applauded the ambient environments that are at these building. One of residential occupants when asked why he prefers his residential apartment at the building said:

[...] the environment here is very ambient, I don't need to go crowded gardens in the city as I can enjoy the same here. I don't even need an air conditioner. I enjoy nature here [...]

This shows that buildings with green building technologies can be favorable in the market than those without.



Figure 2 Hurudza House



Figure 3 Joina Centre - a recently constructed building

4.2 Barriers to Sustainable Construction in Harare

The construction industry in Zimbabwe is lagging behind in the adoption of green building technologies as there are very few buildings with green technologies. Property developers continue to develop buildings that lack green technologies and this is adding to the myriad of problems that the sector is facing. The adoption of green building technologies in the construction industry is being hampered by a lot of factors. One of reasons for lack of green building technology in the construction industry in Zimbabwe is the lack of government policy. Government of Zimbabwe has not shown any initiatives towards adoption of green building technologies. Up to date there is no clear policy from the government on the adoption of green building technologies. According to one of the government officials the government was very slow in coming up with the policy on green building technologies and has resulted in the slow penetration of green building technologies in the country. He elucidated:

[...] there has been too much talk about these green building technologies but there is nothing that has been put in place by the government to make property developers adopt these green buildings [...]

The government has also not adopted green building technologies in their building because of all the buildings that are owned or rented by the government of Zimbabwe none of them has green building technologies. They are all conventional buildings which are very expensive to run. The government is visibly showing difficulties in running these buildings because some of its buildings are running without essential services such as water and electricity. The influence of government is very important in initiating adoption of green building technology as it is the sole player in development of regulations that guide development and adoption of green building technologies. Government is also a major player in the construction industry as it is responsible for construction of a lot of buildings, as such it should actively promote sustainable construction. The government also owns a lot of properties in residential, commercial and institutions, hence, the need for it to champion development towards adoption of green building for sustainable development. In one of the government building in the city, there has been no electricity for more than a month, and people were walking upstairs to the 18th floor. This is a daunting task for government employees in this building and can affect their productivity. Adoption of technologies such as solar energy installation could be long term plan to solve the power problems. However, such plans are not available and the government workers are suffering for that. Of all the ten government buildings that that were studied, none of them have adopted any green building technologies or have been upgraded to incorporate green building technologies.

The government has the legitimacy to create policies and regulations that champion development in a country. However, the Zimbabwean government has not developed any regulations that encourage the construction industry to adopt green building technologies for sustainable development. The three buildings with green technologies in the city of Harare have just been incorporated out of the interest of the property developers. There is no regulation or policy that compels the construction industry to incorporate green technologies in their buildings, despite the huge benefits that can be accrued from green building technologies. The problem cannot, however, be squarely leveled on the government alone because the private sector has also not been playing its part in encouraging the government to come up with the policy on green buildings. New buildings continue to be constructed without green technologies, which is a pointer to unavailability of policy framework that promote adoption of green technologies. However, there are some non-profit making groups that are agitating the construction industry to adopt green technologies in buildings. These initiatives are however at formative stages hence very little can be talked about it now. Although most property owners would like to include these technologies and benefit from these technologies they said costs are prohibitive. However, when asked how much it cost to construct a green building, they did not know the actual cost meaning that they have never made the economic comparisons. They are only afraid of additional costs without comparing the costs to the long term benefits that can be accrued from green technologies. The private sector is also not making enough noise to the government on the need for green building regulations construction industry. According to Zhao and Xu (2010), the poor penetration of green building technologies in the construction industry in Zimbabwe is due to lack of commitment on the part of top management to adopt green building technologies. They have not taken any serious move towards adoption of green building technologies. One of the players in the real estate commented that:

[...] there has been some talks about green building technologies in many fora in the real estate industry but there has been virtually nothing concrete coming out of these discussions. Even though in some of the platform government officials were invited, nothing was developed into a policy [...]

He mentioned that at in many real estate winter schools there has been talks about green technologies in the construction industry and in some cases papers were presented on green building technologies but nothing has been put in practice. The talks have just remains talk shows, they did not even produce a position paper for the government to see the need for a policy in green buildings in the construction industry. Lack of a regulatory or policy framework that compels developers to incorporate green building technologies therefore allows property developers to use or invest less in green building technologies and they continue create conventional building which are very expensive to operate. Political support is very important to encourage participation of both public and private sector in adoption of green building technologies. In Toronto government support played a critical role in the uptake of green building technologies, which is contributing positively to sustainability in the built environment (Bunce, 2009; Hartshorn et al., 2005). Bunce (2009) further argued that government can intervene through policy formulation that will compel the construction industry to adopt green building technologies. Government can also come in to support adoption of green building technologies in the built environment by crafting promotions and regulations that will persuade the construction industry to adopt green building technologies. They can promote incorporation of green building technologies in planning, design and development of properties (Hartshorn et al., 2005; Thomas, 2010). This incorporation will positively affect the adoption of these green technologies in the construction industry. Thomas (2010) argued that in Canada there are mandatory green procurement policies and this has mandated all official plans to incorporate environmental stewardship through incorporation of green technologies and this has increased the uptake of green building technologies in the construction industry. The involvement of the public sector will therefore encourage players to build environmental issues in the building processes starting from planning, design to development and management of properties. In the UK, it is through government policy that all contractors demonstrate how they would contribute to sustainable development for them to win a tender and in this way the government is taking a lead in promotion of green building technologies and the sustainability of the built environment. In Florida, the state has also been taking a leading role in the uptake of green technologies in the built environment as they have made it a policy that all government owned buildings have to incorporate green building technologies so as to save on energy. The government went further to promulgate green legislation that is forcing architects, planners and owners of buildings to incorporate green building technologies (Azhar & Brown, 2009). In this way the government is taking a lead in promoting green building technologies in the built environment. Such interventions are not available in Zimbabwe because the government is not taking any initiative towards legislating green building technologies. Zimbabwe enjoys a lot of sunshine throughout the year but there in so building in the city that is harvesting this resource to power their buildings. There is also significant rainfall that is received annually but no building has technologies that can harvest this water for use in these buildings. The country is also experiencing high power shortages and this should encourage initiatives to promote the use of non-renewable energy such

as solar in built environment in the city of Harare. If buildings could have technologies that can harvest water during rainy season it will go a long way in alleviating the water problems that have also been bedeviling the city of Harare for a long time. The private sector is also another let down in the adoption of green building technologies because they have continued to produce conventional buildings in the city of Harare despite introducing these technologies in the industry when they constructed the Eastgate building. From the interviews that were made with property developers, it was established that property developers in the city of Harare have very little idea on the green building technologies. Most of them were just reading about them in the media but they do not know much about them and this goes to explain why the industry continues to produce conventional buildings.

In China, it is through government policy that all buildings should have at least a 1-star green building rating. Such initiative is very critical in promoting and building the consciousness of green building technologies in the construction industry and it will increase the uptake of green building technologies in the construction industry. According to Perret (2011), government regulations and policies are very important drivers to influence the adoption of green building technologies. In Nigeria, lack of government support is the major barrier to adoption of green building technologies (Olanipekun, 2015; Zhang et al., 2011). Apart from lack of a clear policy to drive the adoption of green building technologies in the construction industry in Zimbabwe, there is a general outcry among property developers that investment in green buildings is very expensive, as it puts a heavy burden on property developers due to limited financial resources. One developer cited the prohibitive cost of green building technologies as the major barrier to the adoption of green building technologies. He said:

[...] most of the materials to implement green building technologies are not found locally but in South Africa and this has a strong cost bearing on the construction industry [...] we are severely constrained in terms of foreign currency [...]

The government can also introduce incentives that will lure property developers to invest in green buildings. Such interventions can assist to lure property developers to invest in green building technologies in order to take advantages of the incentives offered by the government. Initiatives such as tax holidays, providing grants for green buildings and expediting permits of buildings with green building technologies can be adopted by the government to promote the uptake of green building technologies (Zhang et al., 2011). This will encourage other stakeholders to adopt green building technologies and help to contribute to sustainable construction. However, all these initiatives have not been attempted in Zimbabwe, hence there has been very minimal incorporation green building technologies in the construction industry.

4.2 Green Building Technology and the Economy in Harare

Investment in green building involves incurring additional cost in the construction process. It has been established that green buildings cost 2-5% more than the conventional buildings (Olanipekun, 2015). In China the additional costs are estimated to be between 3-4% (Zhang et al., 2011). It is these additional costs that most property developers and property owners are not willing to meet, hence they continue to produce conventional buildings. In Harare the people in the construction industry are not willing to incur such additional costs as shown by the majority (96%) of the surveyed buildings that have no green building technologies. Even government run projects have not incorporated these technologies in their projects. As highlighted earlier most of the green building technologies are not readily available in the country, which means they should be imported from neighbouring countries such as South Africa where such technologies have been developed. The importation of these technologies therefore imposes a huge financial burden on the construction industry especially considering the state of the Zimbabwean economy which is suffering from foreign currency deficits and a hyper inflationary economic environment. Even the government is not affording such expenses as all its buildings have not incorporated green building technologies and this paints a very gloomy picture on the adoption of green building technologies in the construction industry. One of the practitioners in the property development commented that the huge financial cost associated with the green building is forcing property developers to resort to conventional buildings. He stated:

[...] who will build such an expensive building and expect a return in a depressed property environment like what is being experienced in Zimbabwe [...]

Asked why they were not incorporating green technologies in their building one of the property owners argued that it was very expensive to include them in their building because the economy of the country does not allow such expensive technologies. He lamented, “[...] how can you talk of green building technologies in an ailing economy like the one found in Zimbabwe, who can we afford it?”. It therefore supports the view that the current economic conditions have led to depressed property performance, which is watering down any prospects of investing in green building technologies. Further complicating the situation is the fact that there is very little understanding of the benefits of green building technologies in the industry as the majority of property developers have very little appreciation of these technologies. Most of the respondents either do not know benefits or they have very little understanding on the long-term benefits of green buildings. Only 10% of the interviewed actually understood the benefits that can be drawn from investing in green building technologies and the majority of them are property managers and property developers and very few property owners. Most of the respondents are not aware of the benefits that can be accrued from the green building technologies. There is therefore very little appreciation of the economic benefits that green building technologies can play in the construction industry as a result there is very little penetration of these technologies in the construction industry. Most of the interviewed respondents; (86%) property developers and (84%) property owners felt that the costs of incorporating green building technologies are just prohibitive. However, none of them have actual knowledge on what it really cost to include green building technologies because such information is not yet available since the concept is still at its formative stage. There is no research done to establish the actual costs and benefits analysis. They have not even considered how much it is costing

rely on the non-renewable energy like hydroelectric power as compared to use of renewable energy such as solar power. It therefore means that people were just arguing from layman point of view. Research on such issues can help to give stakeholders information that will assist them make decisions on green building technologies. Focusing on the cost only can create a negative impression on green buildings; rather focus should be the long term benefits of green buildings technologies for example to find out how much they can save if they use solar energy rather than hydroelectric power or how much they can save if they can harvest water for their use throughout the year. Such analysis could give a clear picture on the benefits that can be accrued from green buildings technologies. If such information is shared among stakeholders in the construction industry, it will bring the awareness and help to boost adoption of green technologies. The poor penetration of green technologies in the construction industry in Zimbabwe has also been exacerbated by the poor performance of the commercial properties in the city of Harare. The sector has been experiencing high void levels, some buildings were recording as high as 70% vacancy and this has dampened any ambitions to invest in green buildings. Investors in property sector are therefore are not willing to incur additional costs in a sector that is already poorly performing. One of the property owners in the downtown area of Harare argued that it was impossible to think of any benefit that can come from green buildings when the conventional buildings are failing achieve full occupancy. He complained, “[...] *who will use such expensive building [...] right now, our conventional buildings are failing to achieve full occupancy [...] what more of these expensive items!*”

The adoption of the green technologies in Zimbabwe has therefore been further dampened by the economic down-turn that the country has been experiencing ever since the turn of the century. The galloping inflation, which in mid-July 2020 was pegged at 319.04% is the making it difficult to make any investment decision. The budget deficit has also been ever increasing, in 2017 it was only 14% of the Gross Domestic Product (GDP) but by the first half of 2018 it had galloped to 406% (Parliament of Zimbabwe, 2018). Such kind of economic environment is not favourable for investment and investors usually do not make investment decisions in such economic environments, they usually take a wait and see attitude. So property developers and property owners are not willing to invest in green building technologies as alluded by one of the property owners.

[...] the economic environment does not allow us to make such fancy developments, we have to do the bare minimums [...] if I put such a huge investment will I get my return in such an economy [...]

It therefore, means, that investing in green buildings technologies is a luxury the industry cannot afford. However, investing in green building technology can lead to a lot of economic benefits being driven as they reduce running costs of buildings. The economic environment has also seen very few new developments taking place in the city showing that it is proving very difficult to find new investors in the construction industry. To compound the economic situation is the cash crisis that the country is experiencing where banks in the country are failing to avail cash to the economy of Zimbabwe and this is discouraging investments in the country and the construction industry in particular. The cash crisis also discourages foreign direct investments which is a major source of investment in the construction industry. In South Africa this source of finance has been playing a critical role in investments in the construction industry. In Zimbabwe, the lack of investment and the depressed performance of commercial properties has worked to depress investment in green buildings. The poor performance of commercial sector in real estate is not particular to Harare alone as other cities are also experiencing the same. For example, the central business district of Bulawayo has been running on average 50% void levels in commercial properties because of massive closures and downsizing that has been happening in the city due to economic down spiral.

The economic situation makes investors unwilling to put money into green technologies because they are not guaranteed to recoup their investments in the end. Most of the interviewed property owners (85%) argued that they cannot think of investing in green building technologies at the present moment, due to the harsh economic conditions prevailing in the country. However, the performance of buildings with green technologies should be a motivator for others to invest in green building technologies because the few that are in the industry are managing close to full occupancy despite the economic problems. Buildings such as Eastgate building and Batanai gardens have been performing very well in terms of achieving full occupancy levels and retaining their tenants. There are so many benefits that can be enjoyed in the long run by investing in green building technologies. These include low operation and maintenance cost and low business interruption, which are as a result of energy efficiency, enhanced marketing, increase in rentals, durability and serviceability (Oyedukun, 2017). Oyedukun (2017) further argued that green buildings have the potential to increase user productivity because they can create good indoor environments that can allow more productivity. The misconception that green buildings are expensive is a result of looking into it in short term without taking a longer look into the future. There is need to dispel such notions by way of education and awareness campaigns that will educate people in the construction industry on the economic benefits of green building technologies. These awareness and education campaigns will lead to increased acceptability of green building technologies in the construction industry. The increased acceptability of these technologies will result in sustainable construction (Perrett, 2011). Miller et al. (2009) argued that buildings with green technologies can easily be absorbed, accepted and can also easily achieve full occupancy because of their economic advantages. Properties with green building technologies in South Africa, Nigeria, USA, and United Kingdom have proved to be economically efficient and easily marketable (Myers et al., 2008). It is therefore important to take a holistic approach in the appraisal system so that the initial costs of investing in green buildings are compared with the long term benefits that are associated with green technologies on buildings (Isa et al., 2013). Olanipekun (2015) added that there are many multiplier effects that can accrue from investing in green building technologies such as a 20% reduction of the operating future costs. Such information needs to be appreciated in the construction industry so to increase the adoption of green building technologies.

The harsh economic conditions did not spare the tenants as they find hard pressed by the poor performance of the economy and they are finding it difficult to keep up to date with the ever increasing rentals. Their businesses are not performing well, which make them difficult to pay higher rentals that come with these green buildings. One of the tenants in the downtown area mentioned, “[...] *how can I manage to pay rental that are called by these fancy buildings when my business is struggling to support me?*”. It seems that it is difficult to acquire tenants that will pay higher rents that are associated with buildings with green technologies. Already tenants are failing to pay

rentals in conventional buildings as evidenced by high void levels. It will be asking for too much for them to pay higher rental as called by the buildings with green technologies. While tenants appreciate the benefits that come with green technologies they are finding it difficult to pay extra cost for them. The fact that green buildings cost between 2-5% more than the conventional building (Kats et al., 2003; Olanipekun, 2015), should translate in higher rental for these building so that the investors will recoup their investment. However most of the interviewed tenants in Harare (76%) are not willing to pay additional rent for green buildings because of the harsh economic environment. The high void level, some reaching 70% discourages upward review of rentals. When rentals are not adjusted to suite the economic environment it means that the investors will fail to break even hence he will not be able to invest in improving the buildings.

Property developers and managers are also caught in a catch 22 situation, where they think investing in green building will give them a loss, but on the other side considering the performance of other buildings with green technologies losses are due to failure to invest in green technologies. If they invest in such green technologies, they can attract good tenants which will improve the performance of the buildings. They can actually improve the performance of their properties by investing in them. However, property developers and owners just think that it is difficult to charge high rentals to green building in a market that is already depressed. The majority (67%) of interviewed property developers do not value the importance of green building technologies, while 28% are not sure on the benefits of green technologies. A meager 5% are appreciating the role of green building technologies, which means there is very low demand for green technologies in the construction industry in Harare. According to Rohracher (2001), investing in green buildings especially in the global South has been hampered by low demand for such buildings. Property developers and investors are failing to find enough market for such buildings hence they are not encouraged to invest in them (Hakkinen & Belloni, 2011; Olanipekun, 2015; Perrett, 2011). In Harare, however, one building with green technologies has managed 100% occupancy throughout the year and others have managed between 80-100%. However, the fact those buildings with green technologies are few, the obtaining situation might not be reflective of the actual demand of these buildings. If these buildings were many a more realistic situation might be revealed. The general perception about green buildings in Harare is that this concept is still very new in the construction industry, which means that the majority of people in the construction industry do not have enough information about the long term benefits of green buildings. So there is very low appreciation of the need for green technologies on buildings for both the tenants and property owners. According to Tang and Thomas (2014), in situations where there is very little information, tenants are more likely to be guided by issues of locality, available space, amount of rent and the general conditions of the buildings in making decisions on acquiring spaces. Issues of green technologies and sustainability become peripheral issues. Education is lacking in the construction industry on the benefits of green building technologies (Bullen, 2007). In Zimbabwe there are no workshops or sensitization meetings in the construction industry of the need for green technologies on buildings. If they were available, they could go a long way in educating people in the construction industry on green buildings technologies. The players in the construction industry should be educated to try and give information on green buildings so that awareness is raised in the industry on the importance of green building technologies. Bullen (2007) further argued that while there is general awareness on the environmental contribution of green buildings, there seems to be little understating on the cost and benefit analysis of green technologies industry. So education should come in to raise such awareness. Awareness campaigns played a critical role in the LEED programs where it inspired actors in the construction industry to adopt green technologies in the construction industry (Barnes, 2012). Barnes (2012) further argued that lack of information on green building technologies is leading clients to think that green technologies are expensive. Clients should also be informed on the costs that are associated with lack of green technologies on buildings so that they will make informed decisions on adoption of green technologies. Green building is the new thinking in the construction industry especially in the global South such that there is need for strong and widespread education among practitioners in the construction industry so that they are aware and appreciate the benefits that accrue from investing in green buildings. There is very little attention paid to issues of green technology in the construction industry. Hakkinen and Belloni (2011) therefore, advocates for clients to be informed about green buildings and the benefits that are associated with such buildings so that we create demand for buildings for green buildings. There is information gap especially among actors in the construction industry on the specific breakdown of costs and savings that can be accrued from green buildings and education programs can go a long way in informing these clients. Government can take a leading role in this through publishing benefits of sustainable buildings especially costs and benefits (Cooper, 1999). Cooper (1999) added that where there is enough information on green buildings tenants are no longer considering buildings without green ratings for example in Australia where building with green technologies rating are attracting higher premiums that those without.

■6.0 CONCLUSION

While green building technologies are critical players to ensure sustainable construction industry, the concept has not been fully embraced in Zimbabwe's construction industry. Green building technologies are still at its infancy phase in the country as very few properties have embraced these technologies. There is one non-profit making organization that is trying to promote green building technologies in the country but all its efforts are at the formative stage. On the other hand, there are only three buildings in the city of Harare that have incorporated green building technologies. The green technology that is commonly being found, entails only the design technology while other technologies have not been incorporated. There are myriad of reasons which have been attributed to poor adoption of green building technologies in Harare and these include: lack of a guiding policy on green buildings from the government, high costs associated with green building technologies, limited understanding of the real benefits that can be derived from green technologies, poor economic performance and low demand for green buildings. Tenants and property developers have scanty information on green buildings technologies, hence, are not fully aware of the benefits that are associated with them. The government of Zimbabwe has not been helping the situation as they have not taken any lead in the promotion and adoption of green building technologies. They do not have a policy on green building technologies nor do they have promotion that will attract stakeholders in the construction industry to embrace green building technologies. They have also not incorporated green technologies in their buildings nor have they done anything to renovate these

building to incorporate green building technologies. Although there has been too much talk about green buildings, there is very little on the ground implementation to show the adoption of these technologies in the construction industry. The government should take the lead in the adoption of green technologies in their projects and go further to promulgate green legislation that will facilitate adoption of green building technologies in the industry. They can also go further to provide incentives that will persuade the construction industry to adopt green building technologies. All these are lacking in Zimbabwe, hence, resulted to poor adoption of green technologies in the country. Other countries that have adopted the green technologies are making huge strides towards sustainable construction because of the great potential the built environment can make to sustainable construction. They are making huge savings on energy and water which have significantly contributed to sustainable construction. The low appreciation of the benefits of green buildings technologies among property developers, property owners and even tenants has also contributed to low uptake of green building technologies in Harare. There is also no educational program on the possible benefits from green technologies, which go a long way in bringing awareness on these benefits in the construction industry. These benefits should be compared to the cost that can be incurred in using conventional buildings so that they will make informed decisions on the adoption of green building technologies. In countries that have adopted the green building technologies, there are massive education campaigns among actors in the construction industry on the benefits of green technologies and the costs that are associated with conventional building. These educational campaigns have increased the uptake of green building technologies and they are enjoying economic and environmental benefits. Therefore, educational campaigns should be initiated throughout the country, so that stakeholders in the construction industry are encouraged to adopt green building technologies. In countries where green technologies are promoted and have been accepted in the construction industry, these technologies are now being used as promotions and marketing tools for properties. Green buildings are now getting comparatively higher values in terms of both capital and rental. Special emphasis in the educational campaigns should be put on to educate stakeholders on the contribution of what green buildings can offer to the environment and the economy. In Zimbabwe, the few properties that have adopted green building technologies are saving up to 35% on water and electricity. When people are well informed and knowledgeable about green buildings, they will generate demand for green buildings and investors can put more money in their construction and this will create a sustainable construction industry. The fact that there are high void levels in the commercial sector in cities of Zimbabwe should not act as deterrent in investing in green buildings, rather people should be encouraged by the long term benefits that come from green buildings. If people are well informed about green buildings especially the economic and environmental factors, tenants would still prefer green buildings than conventional buildings because of their environmental and economic efficiency.

There is very low void level in green buildings in Harare, which should dispel the myth that investing in green buildings will drive away tenants due to affordability problems. The sustainability of green buildings should be the competitive edge that drives green buildings to full occupancy. If public consciousness is raised on green buildings, it will raise the adoption of green building technologies and it will directly raise the contribution of the built environment to sustainable development. The research has shown that green building technologies in Zimbabwe is still at its infancy as there are very few building with green technologies and there are also no structures and processes for adoption of green building technologies. The construction industry has been doing business as usual with very minimal adoption of green building technologies. Hence, the construction industry is contributing very little to sustainable development. The construction industry is still producing conventional buildings, which are very expensive to run and does not helping in resource conservation. Incorporating green building technologies will go a long way in saving water and electricity. The construction industry in the country has therefore been contributing very little towards sustainable construction. There are no structures that can create processes that will champion sustainability issues in the construction industry.

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