

Customer's perceived benefits of LEED certified sustainable residential buildings

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Abstract- There has been an increased interest in sustainability in recent times and both business organizations as well as consumers have shown a rising concern for environmental issues. Construction industry in particular has been criticized for its contribution to environmental degradation. The study is based on a questionnaire survey of 100 customers in Delhi and their views regarding sustainability issues in residential real estate was analyzed to determine their preferences and analyze their views regarding the benefits that LEED certified sustainable residential real estate provides. Green construction projects have been found to be reducing carbon emissions , managing waste , use of cleaner fuels , low electricity bills , better quality of air etc. There is improved quality of lives and comfort for the occupants on account of the fact that there is better ventilation and good air quality. Based on the findings it could well be said that there seems to be a lack of awareness among people about the various certification schemes but the consumers have shown a growing interest in purchasing residential units that offer sustainable attributes. Environmental benefits have been perceived to be the strongest .

Index Terms- Sustainable , LEED , Carbon emission , Lifecycle costs

I. INTRODUCTION

The recent decades has witnessed an increased concern for ecological issues such as ozone depletion , global warming and carbon emissions and the business community has shown an increased commitment towards incorporating sustainability principles in their policies and strategies. The real estate industry has been seen as a major contributor to ecological degradation and has been held responsible for wastage of resources , carbon emissions , cutting down of forests etc. Green building construction has been a significant initiative by the real estate construction industry towards minimizing the negative impact on the environment. In spite of the fact that the real estate industry in recent times has been considered to be important in the development process of the emerging nations yet it has been criticized for its adverse impact on environment . The real estate industry not just offers job opportunities to large sections of the population but is also a significant contributor to the gross domestic product of the country yet its negative impact on environment has been a cause of concern. In response to the environmental issues the real estate industry has focused on construction of residential projects that seek to minimize the negative impact on the environment. Green buildings have been found to be relevant and significant in dealing with

environmental issues as they not just seek to reduce carbon emissions but they have also been found to be helping in conservation of resources as they minimize the use of resources such as water , energy , materials. There have been several studies that have reflected upon the significance of green buildings in terms of conservation of scarce natural resources , less consumption of water , reduced energy needs , enhancing of air and water quality leading to improved lifestyle for the residents etc. . The green buildings have also been found to be resulting in an increased productivity for the occupants . The economic value of green buildings has been another issue that various studies have talked about and such benefits have resulted as a result of low maintenance and operational cost leading to low lifecycle costs. Apart from this the owners of green buildings believe that these buildings do offer higher rent as well as easy resale. The demand for residential properties offering greater environmental and economic value in recent times has witnessed a significant rise and there has been a continuous rise in the number of green buildings across the globe including India.

II. OBJECTIVES OF THE STUDY

- To study perceived benefits of LEED certified green residential buildings in Delhi.
- To analyse awareness level of customers about rating schemes like LEED.
- To study various benefits derived from sustainable buildings

Green building and LEED certifications : Review of literature

A green building has been defined as a building that offers several benefits such as diminished operational and maintenance costs , low lifecycle costs and focuses strongly on efficiency of resources. Energy efficiency is focused upon in development of green buildings and carbon emissions are significantly reduced. There are several organizations that have been established globally that are involved in setting standards and laying down principles that need to be adhered to while construction. There can be different names for green buildings such as energy efficient buildings , sustainable buildings , eco friendly buildings , low energy buildings etc. However the essence of such real estate construction lies in their focus on sustainability issues. The term sustainability focuses on ecological conservation and has several dimensions. Kohler (1999) has talked about the 3 key dimensions of sustainability . As far as the ecological dimension of sustainability is concerned it talks about the environmental

aspects such as reduced carbon emissions , reduced resource use , resource efficiency and reduced wastages. The economic dimension of sustainability focuses on the cost benefit analysis in terms of financial returns on investments and diminished maintenance and operational costs that are associated with sustainable real estate. The social dimension of sustainability is related to the enhanced lifestyle , reduced adverse impact on well being and health , better quality of air and increased comfort.

Kilbert (2008) has referred to the green buildings as a eco friendly healthy facility that has been constructed and designed in a manner that it promotes resource efficiency , well being of dwellers , neutralizes the impact of construction activities on environment and offers greater lifecycle value to the customers. Such constructions are aimed at reducing the adverse impact on the environment.

A green building looks to diminish the adverse environmental impact of construction activities and leads to well being , good health and satisfaction of the people living or working over there. There are several organizations across the world that have been responsible for promotion of construction of green buildings and they have laid down elaborate mechanisms and standards on the basis of which they offer certifications. Some of the most widely used standards that are followed globally in construction activities include the Green Star certification that is prevailing in Australia , BREAM has had its origins in the UK and as far as the most popular of such standards is concerned its the LEED certification that originated in the US but is widely followed across the globe. These standards have proved to be a set of models for development ,assessment and evaluation of green buildings globally and most of the countries have adopted these models or they have developed their own standards that is a slightly modified version of the standards. Several research studies have reflected upon the fact that recent times has seen consumers showing an increased concern and awareness of environmental issues. There has been an increased demand for residential and commercial properties that have incorporated sustainability attributes. Several studies have talked about the benefits of such buildings and the different benefits that have been cited by the authors can broadly be categorized into different categories such as economic , social , environmental and organizational.. Consumers across the globe are influenced by the benefits such as low construction , operation and maintenance costs , eco friendly design , reduced emission of green house gases , reduced resource requirement , efficiency in use of space , aesthetics and comfort and convenience for the occupants. LEED certification mechanism has been developed by the US Green Building council and it provides an evaluation mechanism for assessing and evaluating the green credentials of construction projects. LEED stands for Leadership in Energy and Environment design and it refers to a set of standards that reflect upon the sustainability attributes and green credentials of a construction project in both residential or commercial areas. As far as the development of green buildings in India is concerned although efforts were made earlier also to bring about sustainability issues in the construction projects the efforts gained momentum in 2001 with the setting up of Indian green building council . With a humble beginning in the year 2003 with just over 20000 square feet of area allocated to green building there has been a phenomenal growth in the construction

of green buildings and currently more that 30000 green projects have been registered. There are several hotels , hospitals , schools ,universities , commercial complexes , airports , special economic zones and residential projects that have been certified .

There are several tangible and intangible benefits derived from green buildings. As far as tangible benefits are concerned some of the most prominent ones include reduced resource requirement , low cost of construction , maintenance and low operational costs. As far as the intangible benefits of sustainable construction projects are concerned it includes conservation of resources , better marketability enhanced health and well being of occupants. According to several estimates the energy saving resulting from construction of green buildings is in tune of around 25 to 35 percent and the water savings is in tune of around 35 to 50 percent. The certification of LEED have different levels based on the standards that they adhere to. Construction projects that adhere to the best practices are offered a basic certification level. Construction projects that are able to attain outstanding performance in construction are offered a silver certification. Gold certification is offered to those construction projects that are able to achieve relatively higher standards. Those housing projects that have been able to achieve the global excellence are able to attain platinum certification. LEED certified construction projects seek to enhance water efficiency by having a strong focus on recycling and re use. There is a strong focus on increased use of cleaner fuels and use of renewable sources of energy. Waste management practices are a strongly focused area. LEED certification ensures that the occupants can expect an affordable , healthy and comfortable life. Energy efficient infrastructures are set up and vegetative buffers are present to deal with the noise pollution.

Both developers and consumers perceive green buildings to be offering greater returns in comparison to conventional buildings. Some of the significant reasons behind increased profitability from green buildings emerge from the fact that these buildings make use of renewable energy sources and this positively affects the lifecycle costing. There is increased focus on using recycled materials in the construction process and debris are used often for construction. The different benefits from the green buildings can be broadly categorized into the following heads.

Economic benefits : A great deal of studies on benefits of Green buildings have talked about the economic benefits from these buildings. Some of the most widely perceived economic benefits that might result from green sustainable buildings are related to decreased capital costs , maintenance and operational costs , greater productivity of the employees and occupants , reduced life cycle costs and better appreciation in terms of resale value . There are several studies that have talked about the fact although there can be an initial increase in construction costs but the overall life cycle costs of green buildings turn out to be relatively lower as compared to other conventional buildings. A study conducted by Kats et al (2003) emphasized upon the idea that by slightly increasing the construction costs by just around 2 percent there is a significant savings of around 10 times in the life cycle costs. The economic benefits in terms of cost savings result from low resource requirement , less wastes , enhanced productivity .

Social Benefits : The design of green buildings is such that it offers better ventilation , day lighting and better air quality. It is on account of these factors that there is significant gains in terms of better health , greater productivity and less incidence of illness. There have been several studies such as the ones conducted by Fisk (2009) and Leaman et al (2007) that have tried to evaluate the gains in terms of enhanced productivity and well being of occupants of green buildings in comparison to non green buildings (Mathur et al 2013). Both these studies have found that green buildings result in enhanced productivity of residents. On critical evaluation of literature one also finds examples of research studies that have found no significant correlation between green sustainability characteristics and productivity levels. A research study conducted by Kats (2003) for 33 green buildings of US found that in case of construction projects of value of 5 million dollars if there is an increased investment of about 100 thousand dollars there is a saving in tune of around 1 million dollars over the life cycle of the project. In yet another study that was conducted by Ries et al (2006) it was found that green buildings resulted in an increased productivity of around 25 percent and reduced energy usage in tune of around 30 percent. Several others have also conducted the study in this direction and a large number of studies have also talked about the fact that green buildings offer increased rental and sale value in comparison to the traditional non green buildings.

Environmental benefits : There is no doubt that green buildings lead to environmental benefits and have been able to significantly deal with adverse impact of construction projects on the environment. The nature of construction industry is such that it results in waste generation , use of significant non renewable resources and greater consumption of energy. Green buildings have been found to be significant in dealing with some of these adverse impacts and construction industry professionals perceive these to be an attractive alternative that has been to a significant measure been able to reduce the carbon footprint and environmental pollution resulting from construction. The construction waste in case of green buildings construction gets reduced to about 40 to 50 percent and so there is less scrap . Apart from this some of the other environmental gains derived from construction of green buildings include better quality of air , better ventilation , reduced carbon emissions , use of renewable sources of energy etc. Some of the other characteristics of sustainable green buildings include use of less toxic materials including paints adhesives and use of natural lighting that ensures that there is better health for the occupants .

Organizational benefits : Several construction companies all across the globe are resorting to construction of green buildings. There are research studies that have indicated that there appears to be a direct relationship between green buildings attributes and the organizational performance. Construction companies that have been able to bring about an element of sustainability in their construction projects are able to benefit immensely from improved relationship with the different stakeholders such as the suppliers customers employees government. Business organizations in the business of real estate have been able to enhance their corporate image and reputation and have been able to present themselves as a socially responsible business organization. Ecological responsiveness has helped business firms to have a loyal base of customers and employees and have

been able to improve upon their relationship with suppliers and government. They have also been able to Benefit from the government patronage. Thus it can be said that pursuing of sustainable business practices has not only helped business firms to manage their stakeholders but it has also helped them improve their competitiveness in the market.

Summary of literature

Jonsson et al (2012) conducted a questionnaire survey and the respondents of the study were the project managers involved in construction of green buildings in Sweden. The aim of the study was to analyze the profitability potential of low energy buildings construction and based on the findings of the questionnaire survey it was found that there is significant benefits in terms of low cost of labor and energy requirements for low energy green buildings in comparison to the conventional buildings. In yet another study conducted by Jonsson et el (2012) based on study of customers perception it was found that the occupants in the green buildings were more satisfied than the occupants of the traditional buildings. The green buildings resulted in favorable perception among the customers mainly on account of better indoor living quality. Further another significant findings of the survey was that the occupants of the green buildings felt a strong sense of pride due to the fact that they were living in a green building. When it comes to the study of customers perception in India about the green buildings a significant study was conducted by Midha et al (2013) and the study was aimed at analyzing the customers perception about the sustainable green buildings in India. The study talked about the fact that green buildings construction is still an emerging field unlike the development that has made rapid progress in the western developed nations. The study conducted a questionnaire survey for 100 respondents and sought to evaluate the awareness about the various benefits of green sustainable buildings. The study found that there was a green deal of awareness about green buildings and its benefits and the buyers were more than willing to pay a premium price for sustainability attributes in the buildings. There were significant number of customers who were aware of the benefits and low life cycle costs associated with the green buildings. Ecological benefits were considered to be the key benefit that buyers believed resulted from purchase of green residential units and this had also proved to a dominant influence in the decision to purchase of residential units. A key finding of the survey was lack of awareness of rating standards like the LEED. A similar study was also conducted by Mathur et al (2013) for residents of Delhi and the study was based on a questionnaire survey that had structured questions. The study arrived at quite similar findings and it was seen that the awareness of rating systems like LEED was not significant. For a significantly large number of customers investments in green residential units was a good decision and it was perceived to be resulting in long term benefits. Some of the significant benefits that the customers believed resulted from investing in green buildings included reduced level of pollution , low carbon emission , low energy need , great productivity better , air quality and a healthy life style.

Research methodology

In order to conduct the research the researcher was guided by the positivist philosophy. The study was focused on gaining an objective understanding of consumer's preferences, views and opinions that reflects upon the different perceived benefits of green certified buildings. Such a philosophy makes an attempt to remain detached from the research in the sense that researchers own biases and opinions do not come into the way of discovering the reality. The study has focused on quantitative analysis of the issue and this is amply clear from the fact that in order to attain the views of the respondents a questionnaire was designed comprising of questions that were structured and the respondents had to express their opinion by choosing an appropriate response from the different alternatives. Quantitative methodology of research has been a widely popular strategy adopted by researchers who focus on objectivity and quantitative analysis of the data (Saunders et al. 2009).

Sampling and population

In order to decide about the population of the study the researcher has undertaken a comprehensive survey of existing literature and based on the findings arrived at the conclusion that the consumers of green buildings are numerous and diverse and therefore it was difficult to single out specific group of customers. Thus the study has looked at only the customers who have purchased residential properties that have green credentials. The study has sought to approach those customers who have made investments in green construction projects even if the projects were not LEED certified. The sample size of 100 was decided upon after a careful consideration of the limitation of resource, time and ease of conducting the study. All these respondents belonged to the national capital region.

Limitations of the study

The present study suffers from several constraints that have limited reliability and validity of the findings of the study. A small sample of just 100 respondents is perhaps the most significant limitations for such a study. The reason for deciding upon a sample size of 100 respondents was on account of constraints of time and money. Further the study had used convenience and snowball method of sampling. The researcher had to resort to snowball method of sampling because of lack of easy availability of respondents. There were some initial respondents who were accessed from some of the known sources and during the process of collecting the data these respondents were asked to give the names of some of the other people who have made investments in green projects.

Findings and analysis

The questionnaire comprised of questions aiming to analyze the demographic profile of the respondents and based on the response following information was revealed. There were 12 percent respondents who were under 20 years of age and 13 percent respondents were in the age category of 20 to 30. There were 25 percent respondents in the age group of 30 to 40 and 27 percent respondents in the age group of 40 to 50. The remaining 23 percent of respondents belonged to the age group of 50 and above. The information about the marital status of the respondents revealed that that most of the respondents were married. There were 86 percent respondents who were married

and only 14 percent respondents were not married. In response to a question about the academic qualification of the respondents there were 28 percent respondents who replied that they were undergraduates and a significantly large number of 59 percent respondents said that they were graduates. There were remaining 13 percent respondents who said that they had their academic qualification as post graduation. One of the questions that was asked from the respondents was related to their occupation. There were large number of respondents who said that they were self employed. There were 35 percent respondents who said that they were self employed. 25 percent respondents had business as their occupation and another 24 percent had government jobs. There were 7 percent respondents who said that they were professionals and the 9 remaining percent of respondents said that they had some an occupation other than that mentioned above.

The strong preference for green sustainable housing was reflected from the choice of the customers and based on the response given it could be inferred that customers were willing in general to pay a greater price if the housing had a certification like LEED. There were 72 percent respondents who said that they were willing to shell out a greater price for an LEED certified housing unit. There were 20 % respondents who said that they were not willing to pay a greater price for the certification. The remaining 8 percent respondents were neutral.

In response to a question regarding the yearly household income of the respondents there were 20 respondents who said that their yearly household income was less than 5 lakh rupees. There were 25 respondents who said that their yearly household income was between 5 lakh to 10 lakh rupees. There were 30 respondents whose yearly income was between 10 to 15 lakh. For 20 % respondents the annual household income was between 15 to 20 lakh rupees and the remaining 5 percent respondents said that their yearly income was more than 20 lakh rupees.

One of the questions in the questionnaire sought to determine the level of awareness of LEED certification standards and the findings of the survey clearly reflected upon the idea that the awareness of certification mechanisms like LEED is not high in India. There were 72 percent respondents who said that they did not have the awareness of the LEED certification standards. Only 28 percent respondents said that they had the awareness of LEED certification standards. One of the questions in the questionnaire sought to determine the views and opinions of the respondents regarding the idea that LEED certification and sustainable characteristics of residential properties resulted in long term benefits for the occupants. Based on the responses that were provided by the respondents it can be said that a large number of respondents do believe that long term benefits result from investing in LEED certified residential properties. There were 64 percent respondents who replied that the LEED certified buildings do result in long term benefits. There were 10 percent respondents who did not say anything about long term benefits resulting from investment in LEED certified residential buildings. The remaining 26 percent respondents did not believe in the idea that long term benefits resulted from investments in LEED certified buildings.

Benefits of LEED certified sustainable residential properties

Economic benefits	Strongly Disagreed	Disagreed	Neither agree nor disagree	Agreed	Disagreed
High productivity	17	23	21	19	20
Lower maintenance and operating costs	12	8	6	30	34
Higher resale and rental value	16	19	5	28	32
Low construction costs	24	28	12	16	20
Environmental benefits					
Positive impact on environment	8	12	6	38	36
Organizational benefits					
Improved profitability and sales	22	19	8	21	30
Enhanced corporate image and reputation	10	12	4	36	38
Social benefits					
Improved well being and health of occupants	18	24	22	26	10

III. CONCLUSION AND DISCUSSION

Based on the questionnaire survey it was evident that environmental benefits and organizational benefits emerged as the dominant influencing factor as perceived by the consumers. The perception of respondents clearly reflected upon the fact that all the 4 major economic benefits were considered to be important. In response to the questions whether LEED certified sustainable residential properties offer the benefit of high rental and resale value there were significant positive responses from the respondents. There were 32 percent who strongly agreed and 28 who agreed to it. Low maintenance and operational costs associated with LEED certified residential buildings was another significant benefit as when the respondents were asked a question whether LEED certified sustainable residential buildings offered the benefit of low maintenance and operational costs there were 34 percent of respondents who strongly agreed and 30 percent who agreed. There were very few who did not agree with the statement. High productivity did not seem to be an evident benefit as when the respondents were asked as question whether LEED certified sustainable residential properties led to high productivity only 20 % strongly agreed and 19 % agreed to the statement . Low construction cost was not perceived to be a strong economic benefit as can be seen from the responses of the respondents. There were 24 percent who strongly disagreed and another 20 percent who disagreed to the idea that LEED certified residential properties offered the benefit of low construction costs. Social benefits did not prove to be major influencing factor as the respondents did not perceive the social benefits to be strong. When asked whether LEED certified sustainable residential properties offered the benefits of improved health and well being there were significantly large percentage who did not seem to be in agreement with the statement. There were 24

percent who disagreed and another 18 percent who strongly disagreed. 22 were neutral in this regard and there were only 26 percent respondents who agreed and 10 who strongly agreed. Environmental benefits were perceived to be one of the strongest benefits of LEED certified sustainable properties as was evident from the survey. When the respondents were asked a question whether LEED certified sustainable properties resulted in a positive impact on the environment in terms of low carbon emission and less use of resources there were significantly large number of respondents who strongly agreed. There were 36 percent people who strongly agreed and another 38 percent agreed to this statement. There were just 12 percent people who did not agree and another 8 percent who strongly disagreed to this statement. There are several organizational benefits to be derived by incorporating sustainability attributes in residential buildings. The most prominent organizational benefits include improved sales and profitability and enhanced corporate image and reputation . When the respondents were asked this question whether LEED certified sustainable residential buildings resulted in an increased sales and profitability for the business organizations this was not perceived to be a significant factor as only 30 percent strongly agreed and another 21 percent agreed to it. There were 19 respondents who disagreed and another 22 percent who strongly disagreed to it. Sustainability does have a significant impact on the perceptions of customers about the image and reputation of the business and therefore a large number of business organizations are increasingly adopting sustainability issues in their strategies. When the respondents were asked whether LEED certified sustainable residential properties enhance the corporate image and reputation for the business there were 38 respondents who strongly agreed and another 36 percent agreed. Thus this was the most significant benefit according to the perceptions of the customers. Business

organizations need to be strongly focused on incorporating sustainability issues and the marketing strategies of the business needs to focus on these issue as a positioning strategy.

REFERENCES

- [1] Fisk, W., (2009) Providing better indoor environmental quality brings economic benefits. *Real Estate Journal* , 39, 1, 46-69.
- [2] Barshilia , K . (2014) “ Innovation in Design: A Study of Green Buildings . International Journal of Scientific and Research Publications, Volume 4, Issue 5.
- [3] Kilbert, R. (2018). “The Importance of Affordable Green Housing.” *National Civic Review*, 102(2), 36-40.
- [4] Midha , H. Qualk, D., McCown, P. (2009) “Busting the myth that green costs more green”, in: *Strategic planning in energy and the environment*, vol. 28:5-4, pp. 36-48.
- [5] Jonsson, A., and Wilhemson, J.(2012), “Institutional motivations and barriers in construction of green buildings . *International journal of sustainability*. Vol. 8., no.3, pp. 339-354.
- [6] Ries R., Bilec, M., Gokhan , M., Needy, L. (2006). “The economic benefits of green buildings: a comprehensive case study”, : *The engineering economics*, vol. 51, pp. 259-295.
- [7] Saunders, M. , Lewis, P. and Thornhill, A. (2009) “Research methods for Business Students “ ; 3rd edition., Prentice Hall
- [8] Mathur , S. Midha , S. , Midha , A. (2013) “ Buying Behavior of Consumers towards Green Buildings in Delhi-NCR.” *Gyan Jyoti , E-journal* Vol. 3, Issue 3.

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