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Sustainable Green Construction in India: Catalysts and Hindrances

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Abstract:
One of the biggest challenges of sustainable development is the building sector which is one of the major polluters of the environment. The way we design, build, renovate and operate buildings has an effect on our planet. Given a huge stock of existing buildings that are not so efficient, there is immense potential for energy efficiency measures in the country. For the purpose of creating a green built environment, many green building rating systems have emerged throughout the planet. The present paper focuses on the catalysts and hindrances associated with LEED-EB as a tool for greening of existing buildings. The study was undertaken in two buildings in India, one certified under LEED-EB (L&T EDRC, Chennai, India) and the other registered under it (Paharpur Business Centre & Software Technology Incubator Park, Delhi, India). Architects and managers of these two buildings were the key respondents to understand hindrances and catalysts associated with the process. In addition, green building consultants were included in the sample to get their perspective on the hindrances and catalysts associated with LEED-EB. The consultants included those who had done LEED projects and others who were not associated with LEED-EB but other LEED projects. The study revealed prestige and image and reduction in operational costs as the major catalysts behind LEED-EB. Better rental value, social responsibility, better indoor environmental quality and pioneering green building movement in India emerged as some other catalysts. The major hindrances in the process were found to be high renovation costs, difficulty in meeting the prerequisites and unavailability of required data for LEED-EB submission. Some other hindrances in LEED-EB were resistance to make changes in the existing buildings, lack of skilled professionals, longer time frame required, and difficulty in retrofitting, USGBC website not being user friendly, lack of awareness among the stakeholders, lack of technology and no immediate benefit.

I. INTRODUCTION

Environmental consideration is an essential component of sustainable development and it accelerates the economic development (Ministry of Environment and Forests, Government of India, 2009). Kates, Parris and Leiserowitz (2005) said that the real challenges of sustainable development are so diverse and multifaceted that they can be compared to the complexity of human societies and natural ecosystems across the globe. In today's developing India, Environment and development stand as parallel challenges (World Commission on Environment and Development, 1987 cited in United Nations Educational, Scientific and Cultural Organization, 2010). India now has one of the fastest growing economies in the world and the emissions are set to increase dramatically (India Climate Portal, 2010). It has seen a growth rate of more than 7% since 1997 (Central Intelligence Agency, 2010). Development patterns of India show that construction forms a major element of its infrastructure (Credit Analysis and Research Limited, 2008). It is second only to agriculture in terms of employment generation and contributes heavily towards the gross domestic product of the country (India Brand Equity Foundation, 2010). According to a study by ICRA (The International Credit Rating Agency), the construction industry ranks 3rd among the 14 major sectors in terms of direct, indirect and induced effects in all sectors of the economy (Confederation of Real Estate Developers' Associations of India, 2009). According to The Associated Chambers of Commerce and Industry of India's (ASSOCHAM) recent study, the contribution of construction sector in country's GDP is expected to be 8 per cent during the current fiscal year as compared to 6.1% in 2002-03 and 6.9% in 2006-07 (The Associated Chambers of Commerce and Industry of India, 2011; Planning Commission, Government of India, 2008). Buildings use resources such as energy, water and raw materials, generate waste and emit potentially harmful atmospheric emissions which effect the environment (WBDG Sustainable Committee, 2010). According to the Sustainable Construction and Building Initiative of the UNEP, around 30% of the global energy is consumed by the building sector itself (Bhatia, 2009). Buildings contribute about one third of the total green house gas emissions related to energy use (United Nations Environment Program, 2009). Also, building sector has the major potential for the reduction of these carbon emissions and thus, it is imperative to look to the real sector to play a leading role in reduction of carbon footprints (Nelson, 2008). In the current economic scenario, it is more feasible to have the existing buildings renovated than to have new green facilities (WBDG Sustainable Committee, 2010). According to Energy Efficiency in Buildings (EEB) India Forum (2007), "Given the spurt in construction activities in India at present, and a huge stock of existing buildings that are not so efficient, there is immense potential for energy efficiency measures in the country" (cited in The Energy and Resources Institute, 2010). A green building focuses on increasing the efficiency of the resources being used in construction and operations of the buildings. It also reduces the impacts of buildings on human health and environment during the complete life cycle of the building (Indian Green Building Council, 2007). By adopting green practices in buildings, we can

maximize their environmental as well as economic performance (United States Environmental Protection Agency, 2010). "Several green building rating systems have been developed to objectively evaluate energy and environmental performance that spans the broad spectrum of sustainability" (Gowri, 2004, p. 56). According to Augenbro (1998), the term green building guidelines refers to the guidelines which evaluate the environmental performance from the 'whole building' perspective over the building's service life (cited in Potbhare and Syal, 2008). Many countries, both developed and developing, have come up with their own rating systems. United States Green Building Council was among the first few who worked in this area of developing such systems and it came up with Leadership in Energy and Environmental Design (LEED) guidelines (United States Green Building Council, n.d.). LEED was afterwards adapted to suit the Indian conditions and thus, Indian Green Building Council (IGBC) was developed as an arm of USGBC. LEED-India (developed by IGBC) provides building owners, architects, consultants, developers, facility managers and project managers the tools they need to design, construct and operate green buildings. India also came up with the formulation of GRIHA (Green Rating for Integrated Habitat Assessment) which has been adopted by The Ministry of New and Renewable Energy and was developed by The Energy and Resources Institute (TERI) (United Nations Environment Program, 2007). In India, the Green Building Movement spearheaded by CII Godrej GBC since 2001 has come a long way(CII - ITC Centre of Excellence for Sustainable Development, 2009).As December 2010, over 825 green building projects have been registered amounting to a total of over 522 Million sq. ft of green building footprint (CII - ITC Centre of Excellence for Sustainable Development, 2011). To certify green existing buildings, USGBC has come up with LEED for Existing Buildings (LEED-EB) which is intended to provide the existing building stock an entry point into the LEED certification process. The LEED for Existing Buildings (LEED-EB) rating system has become an important benchmark of sustainable building operations and maintenance and addresses exterior building site maintenance programs, efficient/optimized use of water and energy, purchasing of environmentally preferred products, waste stream management and ongoing indoor environmental quality (IEQ). The sustainability potential of the buildings does not stop once the buildings are built. To cater to this, USGBC has developed LEED for Existing Buildings (LEED-EB). This system focuses on greening the building's operations and maintenance procedures so that it can perform to environmental standards over its entire lifetime. Studies show that as much as ninety nine percent of the buildings are already standing today and every year, only 1% of new buildings are added to the existing stock. Hence, the issue of energy efficiency should be tackled immediately to secure our future (Power, n.d.). In a developing country like India, where a huge section of buildings is already standing, they can be made green by making various renovations/alterations to the building structure (Jain, 2010). In any case, in its present state of development, India is not is position to bring down the existing structures and start building afresh. We have to find ways to retrofit the existing buildings and incorporate better and green mechanisms for their operations and maintenance. However, it is seen that not many buildings have gone in for LEED-EB in India as compared to LEED-NC. Thus, the present study investigates the hindrances and catalysts, as reported by the respondents, towards greening of existing buildings and going in for LEED-EB certification. The sample included architects of the buildings, managers of the buildings who were involved in the process of going for the certification and green building consultants. The architects and managers were taken because their perspective on the catalysts and hindrances which they might have encountered while going for the greening process was very crucial. Secondly, Green Building Consultants were taken as they have a major role when it comes to making a building green. Hence, it is imperative to take their viewpoint on the greening process in terms of the hindrances that they face or the catalysts, which they feel, can accelerate this process. Out of the total sample of the consultants, two were those who were associated with LEED projects but not specifically LEED-EB and the rest six were associated with at least one LEED-EB project.

Catalysts and hindrances in Greening of Existing buildings

The study was conducted in two buildings in India. The first building was PBC™ - STIP which was a retrofitted building & it aimed to get USGBC LEED-EB Platinum Certification for existing building at the time of data collection. The building attempted 71 points out of the total 92 possible points under the LEED-EB O&M category to achieve a Platinum rating under LEED-EB. The second building taken for the purpose of the study was L&T EDRC (Chennai). The US Green Building Council (USGBC) has awarded Silver rating for L&T EDRC under LEED certification for the Existing Building (EB) V2.0 category. It got the certification in the year 2006. L&T EDRC attempted fifty points under the LEED-EB (V2.0) category out of the total 85 possible points. Out of those attempted, they could earn forty-three points to get a silver rating under LEED-EB. For information on the catalysts and hindrances related to LEED-EB, compilation of the responses given by the three groups (General LEED consultants, LEED-EB consultants, and architects and managers of the buildings selected for the study) was done. The ones reported by all the three groups emerged as the major catalysts/hindrances, the ones reported by two groups came forth as those holding medium importance and the ones reported by only one of the three groups have been listed as minor catalysts/hindrances. The responses are illustrated in Fig. 1 and Fig. 2. The major catalysts were revealed to be Prestige and Image and Reduction in Operational Costs. The adoption of LEED-EB certification results in reduction in the operational costs of the building and majority of the respondents felt that this acts as a catalyst for the building owners to go for LEED-EB certification due to several factors like reduced waste generation, reduced energy and water consumption etc. A large percentage of the respondents opined that prestige and image is another catalyst in taking the LEED-EB certification. They further felt that such initiatives towards sustainable development enhanced the company's credibility and demand for its products or services. Catalysts having medium importance were better rental value and social responsibility of organizations and acceleration in the sustainable development movement in the society. The catalysts having minor importance were providing improved indoor environmental quality to occupants and pioneering green building movement in India.

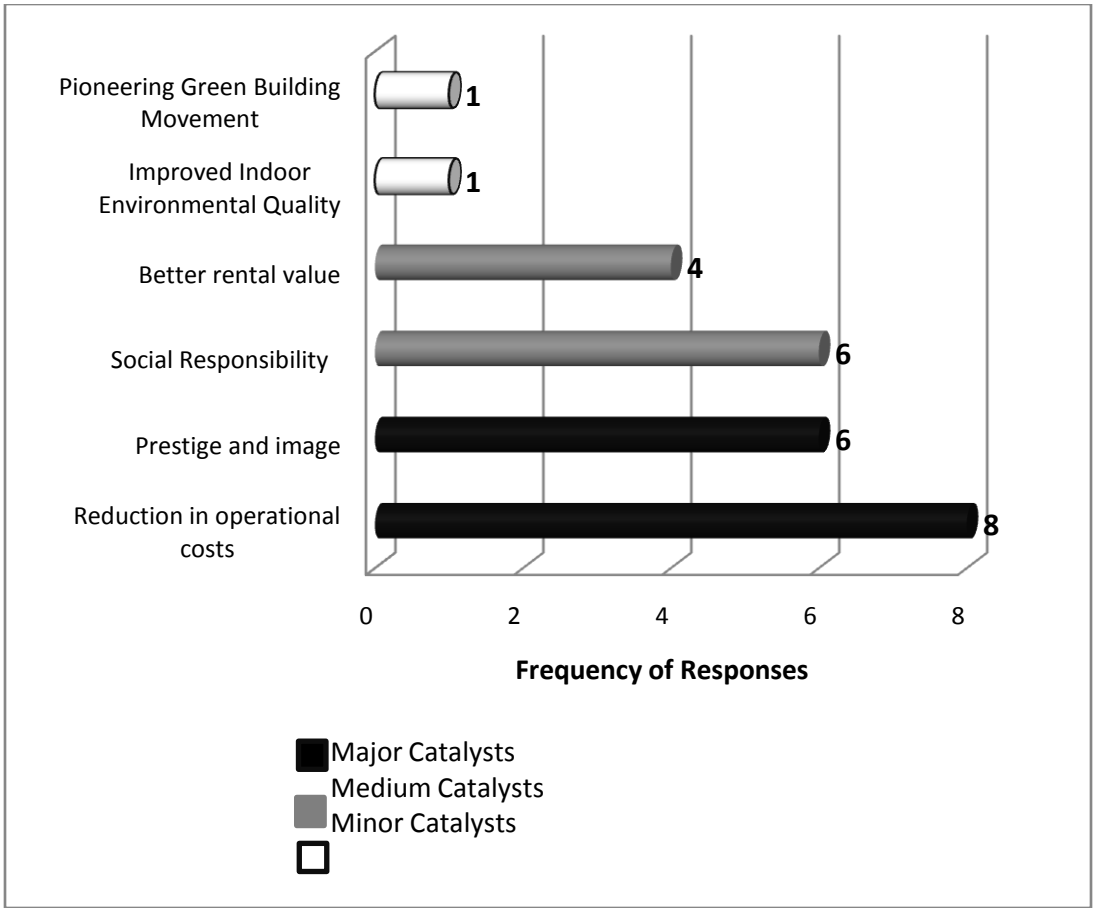

Figure.1. Catalysts according to their importance

Apart from the catalysts, there are also some hindrances in this process, as per the respondents, which prevent the adoption of LEED-EB certification. Majority of the respondents felt that one of the major hindrances in the LEED-EB process is the high renovation costs required for retrofitting of some of the building systems for the sake of certification. Retrofitting or renovation is a cost-intensive process. Renovation means changing several systems inside the existing building set-up. These systems are HVAC, plumbing systems, electrical systems, lighting fixtures, fire systems, sanitation, etc. which are required to be modified as per the LEED-EB standards. Renovation of such systems requires a huge investment. According to the respondents, this is more so in a developing country like India where finance is still an issue and hinders the decision to take the LEED-EB certification. Most of the respondents also reported unavailability of the data and records required for LEED-EB submission as a hindrance. This is because many of the building are very old and it was often very difficult to retrieve drawings, plans and other documents of these buildings. The documentation process of LEED-EB certification requires all these documents to get the certification and unavailability of such data and documents acts as a hindrance in going for the certification. In existing buildings, sometimes it was difficult to meet all the prerequisites for the certification process as compared to a new construction. In a new construction, you can modify the things as per the requirement but in an existing set-up, you cannot do much and at the same time all the prerequisites also have to be fulfilled which becomes somewhat difficult and proves to be a hindrance in the process of LEED-EB certification. For instance, the first prerequisite in the Indoor Environmental Quality category requires them to modify the outdoor air exhaust introduction and exhaust systems, which is a difficult task to carry out. Another prerequisite under Energy and Atmosphere category - Refrigerant Management: Ozone Protection – is also a difficult one to get. One of the managers of the buildings had reported that many fire extinguishers had to be replaced for this prerequisite. Financially also, it is difficult to achieve. Apart from these some more hindrances having medium and minor importance were reported by the respondents. Lack of skilled professionals and Facilities Management teams emerged as a hindrance having medium importance.LEED-EB deals with operations & maintenance of the building which is being looked after by facilities management teams. In India, many buildings do not have designated teams for facilities management. Hence, a proper plan of action is not there for operations & maintenance procedures like cleaning etc. Also, the people involved in such processes need to be trained which requires changes in the working pattern. Also, they felt Difficulty in retrofitting is one of the hindrances. As the building is already there, it is difficult to retrofit the systems because one cannot destroy the building and re-do the things. Everything has to be done in the existing building itself. Re-commissioning of existing building's HVAC, controls, and electrical systems is very difficult to carry out. The reason for this is that the building is operational and it is very tedious to evacuate the whole building and re-commission the systems. Evacuating the building means a break in the work being carried out in the building, leading to monetary losses. Some other hindrances were found to be time consuming documentation process, lack of awareness among stakeholders, lack of technology, no immediate benefit and so on.

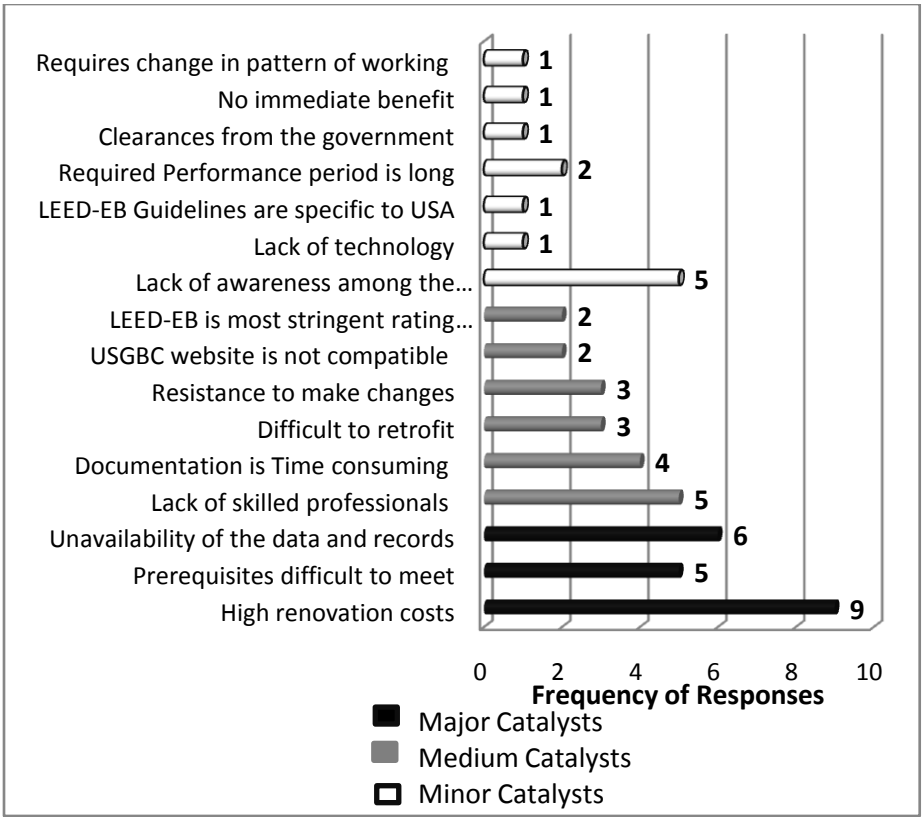

Figure.2. Hindrances according to their importance

II. SUMMARY AND CONCLUSION

It is perhaps inevitable that society is looking to the real estate sector to play a leading role in reducing the "carbon footprint" of economic activities. In today's scenario, when most of the buildings have already being built, there is an immediate need to make the existing buildings more sustainable and green to reduce their negative impacts on the environment (Power, n.d.). Considering the current economic challenges, retrofitting an existing building can be more cost effective than building a new facility. To address this, the USGBC developed LEED for ExistingBuildings, or LEED-EB. This system greens a building's operations and maintenance procedures so that it can perform to environmental standards over its entire lifetime. It also enables building owners to continually reap the cost savings associated with improved building operations. LEED for Existing Buildings, together with other LEED products, is intended to provide the existing building stock an entry point into the LEED certification process (USGBC, n.d.). The study focuses on the catalysts and hindrances associated with greening of existing buildings. The catalysts and hindrances emerged as the major ones, those having medium importance and the ones with minor importance based on the frequency of responses. The two major catalysts that emerged were increased prestige and image and reduction in operational costs. Catalysts with medium and minor importance were Better Rental Value, Providing Improved Indoor Environmental Quality (IEQ) and Pioneering Green Building Movement in India. The study also indicates some of the hindrances associated with greening of existing buildings as the areas which need to be worked upon. One of the major areas of concern that has been brought forth by the study is difficulty in meeting some of the prerequisites. Thus, these prerequisites should be made easier so that more and more stakeholders go for the certification.. Another major hindrance which emerged was unavailability of data and records required for LEED-EB submission. Sometimes the required data is not even retrievable like some old drawings, plans etc. which hinders the process of certification. Similarly, other medium and minor hindrances like longer time period required for documentation, Lack of skilled professionals, Facilities Management teams and their training etc. also need to be taken care of. This study gives a larger picture of the hindrances being faced in India for LEED-EB certification which can be worked upon to foster the green building movement in India. Hence, the study will help taking this process ahead so that the country has an edge over others in terms of environmental sustainability.

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