

LEED-EB IMPLEMENTATION IN INDIA: AN OVERVIEW OF CATALYSTS AND HINDRANCES

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Abstract: Sustainable Development is one of the biggest challenges in today's scenario. Development cannot subsist on a deteriorating environmental resource base; the environment cannot be protected when growth leaves out of account the costs of environmental destruction. Construction is an essential part of any country's infrastructure and industrial development. The way we design, build, and operate buildings has negative impact on people and families as buildings use resources such as energy, water, generate waste and emit potentially harmful atmospheric emissions which are ultimately contributing to climate change. Buildings account for more than one third of total energy use and its associated greenhouse gas (GHG) emissions across the world. At the same time, this sector has the largest potential for cutting GHG emissions responsible for global warming. Thus, it is imminent to go in for green buildings which would bring in energy efficiency and reduce the carbon footprint of the building sector, thereby reducing the negative health impacts on families. In developing countries like India, there is a huge stock of existing buildings that are not so efficient and thus, there is an immense potential for energy efficiency measures in the country. Also, considering the current economic challenges, retrofitting an existing building can be more cost effective than building a new facility. Worldwide, a variety of assessment programs have been developed around environmental and energy impacts of buildings. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System, developed by the U.S. Green Building Council, provides a suite of standards for environmentally sustainable construction. The LEED for Existing Buildings (LEED-EB) is intended to provide the existing building stock an entry point into the LEED certification process. It has become an important benchmark of sustainable building operations and maintenance. But still, there are only a handful of people concerned about making their

existing set-up green. The present paper, thus, throws light on the hindrances and catalysts associated with LEED-EB as a tool for greening of existing buildings in India. Case study method was adopted to have a better understanding of the processes involved in greening of existing buildings. The study was undertaken in India in two buildings, namely Paharpur Business Centre & Software Technology Incubator Park, New Delhi (registered under LEED-EB at the time of data collection) and L&T ECC Division – EDRC Building, Chennai, (certified under LEED-EB), and case studies were developed for the same. Hindrances and catalysts associated with LEED-EB were studied from the perspective of project managers, architects and green building consultants associated with the selected case studies. For the purpose of data collection, Questionnaire and Interview Schedule were used. The tool was administered on some other green building consultants who were not associated with LEED-EB projects to get a wider perspective on the hindrances and catalysts associated with the process as they have a major role in the construction of the building and 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 of greening the existing buildings. On analyzing the data, Prestige, image and reduction in operational costs were found to be major catalysts behind LEED-EB. Better rental value, social responsibility, Improved Indoor Environmental Quality emerged as catalysts with medium and minor importance. The major hindrances were found to be high renovation costs, difficulty in meeting prerequisites and unavailability of the required data for LEED-EB submission. Some hindrances with medium and minor importance were resistance to make changes in the existing buildings, lack of skilled professionals, difficulty in retrofitting, lack of awareness among the stakeholders, lack of technology and no immediate benefit. Adopting the

green initiatives in the existing buildings, including homes, and taking the LEED-EB certification will prove to be a very useful tool in minimizing the negative impact of such a large number of existing buildings on the environment, and in turn, on the health of the people residing in them. The catalysts being revealed by the study need to be made overt and hindrances which have been brought forth by the study can be worked upon so that LEED-EB certification gains momentum and the stakeholders and families start taking initiatives to give the country a sustainable path towards a green built environment. The hindrances like high costs, difficult prerequisites and such can be made easier by more efficient technologies so that this process of greening of existing buildings gains momentum in the country.

Keywords: Existing buildings, Green buildings, Hindrances and Catalysts, LEED-EB

INTRODUCTION

Sustainable development is an evolving concept that emerged in the 1980s in response to a growing realization of the need to balance economic and social progress with concern for the environment and the stewardship of natural resources. Sustainable development is defined as a pattern of social and structured economic transformations (i.e. development) which optimizes the economic and societal benefits available in the present, without jeopardizing the likely potential for similar benefits in the future [1]. The key to sustainable development is balancing the basic needs of the people around the world with the various ecosystems. Some of the main objectives of sustainable development are to do no harm to the environment, no harm to the people of present and future generations related to their physical and socioeconomic status [2]. It can be applied in environmental, social, or economic contexts which is called the Triple Bottom Line [3].

Environment and development are not separate challenges. Development cannot subsist on a deteriorating environmental resource base; the environment cannot be protected when growth leaves out of account the costs of environmental destruction. These problems cannot be treated separately by fragmented institutions and policies. They are linked in a complex system of cause and effect [4]. Historically, India has not been a major emitter, but it now has one of the fastest growing economies in the world and the emissions are set to increase dramatically if it has to achieve the developmental priorities [5]. The Indian economy has seen a growth rate of more than 7% since 1997 [6]. If we look into the construction sector, it can be seen that building construction and operations have many negative impacts on the environment. 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 [7]. According to The Associated Chambers of Commerce and Industry of India's (ASSOCHAM) recent study, the contribution of construction sector in country's gross domestic product (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 [8, 9].

Buildings use resources such as energy, water and raw materials, generate waste (occupant, construction and demolition) and emit potentially harmful atmospheric emissions which effect the environment negatively and thus, need to be taken care of [10]. The way the buildings are designed, built, renovated and operated has an effect on our environment as buildings constitute more than one third of total energy use and its associated greenhouse gas (GHG) emissions throughout the world. At the same time, the buildings have the largest potential for cutting GHG emissions responsible for global warming by incorporating green practices [11].

The mechanisms used in the organizations for lighting, heating, cooling etc. have major emissions and energy utilization which need to be taken care of [12]. The building designers and builders have a challenge to provide new and renovated organizations that are healthy and productive and have minimal impact on environment. Also, in the current economic scenario, it is more feasible to have the existing organizations renovated than to have new facilities [10]. 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" [13].

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 through better siting, designing, construction, operation, maintenance and demolition [14]. The last several years have witnessed an explosive growth in the green or sustainable building movement and it is expected to continue until green buildings become the norm for building design, construction and operation. Building owners and managers are realizing that sustainable buildings not only lead to better building performance and healthier indoor environments, but pay off financially as well [15].

To foster the green building process and provide a benchmark for green standards, green building

guidelines have been developed worldwide. According to Augenbro (1998), the term green building guidelines refers to “the guidelines which evaluates the environmental performance from the ‘whole building’ perspective over the building’s service life”. The US Green Building Council (USGBC) was the first to come up with one such set of guidelines when it launched the Leadership in Energy and Environmental Design (LEED®) guidelines in 2000. At present, LEED has a large number of certified and registered projects across the globe [16]. Since its formulation, LEED has provided a set of standards for environmentally suitable construction [17]. LEED was afterwards adapted to suit the Indian conditions and thus, Indian Green Building Council (IGBC) was developed as an arm of USGBC in 2001. 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). GRIHA has been adopted by The Ministry of New and Renewable Energy and was developed by The Energy and Resources Institute (TERI). It is an indigenously developed rating system completely tuned to the climatic variations, architectural practices, existing practices of construction and attempts to revive the passive architecture [18]. In India, the Green Building Movement spearheaded by CII Godrej GBC since 2001 has come a long way [19]. 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, of which 128 have been certified and fully functional [20].

The sustainability potential of the buildings does not stop once the buildings are built. If we look at the data, 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 [21]. 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, replacing equipment and changing human behavior [22]. In addition, the existing building stock has to be more fully considered, so that fewer resources may be consumed to build new. In any case, in its present state of development, India is not in position to bring down the existing structures and start building afresh. However, combining the reuse of the existing stock with good energy and environmental solutions could result in interesting solutions for sustainable development [23].

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 [24]. The LEED for Existing Buildings Rating System is a set of voluntary performance standards for the sustainable upgrades and operation of buildings not undergoing major renovations. The LEED for Existing Buildings (LEED-EB) Rating System helps building owners and operators measure operations, improvements and maintenance on a consistent scale, with the goal of maximizing operational efficiency while minimizing environmental impacts. Till now, two versions of LEED-EB have been launched, the first one being LEED-EB Version 2.0 and the modified version being LEED-EB O&M [25]. LEED-India has not yet come up with its rating system for certifying existing buildings.

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 organizations, towards greening of existing buildings. Review of literature showed that very few studies of this nature and focus have been carried out. This study therefore adds to the body of knowledge regarding LEED-EB and its implementation. The study was undertaken with the following objectives: (a) To make a profile of the selected buildings in terms of LEED-EB (b) To take a detailed account of the technologies and strategies used to implement the IEQ credits under LEED-EB (c) To gain insight into the hindrances and catalysts associated with greening the existing buildings

For the present paper, however, only the third objective will be discussed.

MATERIALS AND METHODS

It was observed that the number of buildings under LEED-EB in India is very limited. These buildings were contacted and as per their willingness to take part in the study. Two buildings were subsequently selected and developed as case studies for understanding the process of LEED-EB certification better and to have an insight into the catalysts and hindrances associated with LEED-EB certification. One building was registered under LEED-EB (Paharpur Business Centre [PBC™ - STIP], New Delhi) and the other certified under LEED-EB (L&T ECC Division - EDRC Building, Chennai). The sample consisted of Architects/Architectural designers of the building, Managers of the building involved in the process of taking the LEED-EB certification and Green Building consultants. Two groups of consultants were taken for the study. The first group consisted of those consultants who had

done at least one LEED-EB project and the second group consisted of those associated with LEED projects but not necessarily LEED-EB.

The first building selected for study, PBCTM - STIP, 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.

Questionnaire was developed for the managers and architects of the buildings for collecting information of the buildings in terms of LEED-EB. A comprehensive checklist was made to take an account of the LEED-EB credits that the buildings had gone for. Questions related to catalysts and hindrances which they had encountered while going for the greening process were also part of the tool. Another questionnaire was developed for the consultants which was divided into two parts. The first part of the questionnaire had questions related to profile of the consultants and their organizations. The second part had questions related to the LEED-EB project(s) that they had undertaken and hindrances and catalysts associated with such projects. For better clarification and a detailed understanding of the LEED-EB buildings, interviews were conducted with the managers of the building who had been involved in the process of documentation and certification.

RESULTS AND DISCUSSION

The responses obtained from the three groups of the sample (Green Building consultants, LEED-EB consultants, and architects and managers of the buildings) were compiled together and analyzed to gain an understanding regarding the catalysts and hindrances associated with greening of existing buildings and LEED-EB. The catalysts that emerged are as follows.

Prestige and Image

After going in for the LEED-EB certification, they believed that the prestige and image of the organization increased among the peers and the clientele. They further felt that such initiatives

towards sustainable development enhanced the company's credibility and demand for its products or services.

Reduction in Operational Costs

Another catalyst having major importance is reduction in operational costs. According to the respondents, the implementation of LEED-EB certification results in reduction in energy usage, water usage and waste generation. All this, ultimately, results in reduction of the operational costs of the building and provides tangible benefits in monetary terms. This proves to be a major catalyst as money is the major driver behind most of the human actions and especially in the commercial organizations, money holds great importance.

Better Rental Value

As the LEED-EB certification is also for buildings having multi-tenants, the rental value of the building tends to increase after going in for certification. The reason for this is that the owner of the building has an edge over other non-green buildings in terms of reduced energy and water usage, better indoor environmental quality etc. which are the benefits of LEED-EB certification. As a result of all these benefits, the owner can demand a higher price for leasing out space to the clients.

Social Responsibility and Pioneering Green Building Movement in India

In today's scenario, the companies are taking lot of initiatives towards sustainable development of the society as part of their Corporate Social Responsibility (CSR). Buildings are the major emitters of Green House Gases and making them green is a major contribution for moving towards a sustainable society. Consultants felt that the CSR initiative of the building owners tends to motivate them to make their buildings green and if they have not been built green earlier, LEED-EB is an appropriate tool. Also, the visionaries, who want to contribute towards a green and prosperous India, can take advantage of LEED-EB as a tool to pioneer the green movement.

Providing Improved Indoor Environmental Quality (IEQ)

Improvement in IEQ results in better occupants' comfort, decreases incidence of diseases and health problems in the organization. This, in turn, leads to less absenteeism and increased productivity among the employees. Thus, this is a catalyst because the building owners want their employees to be more productive to increase the gains of the organization.

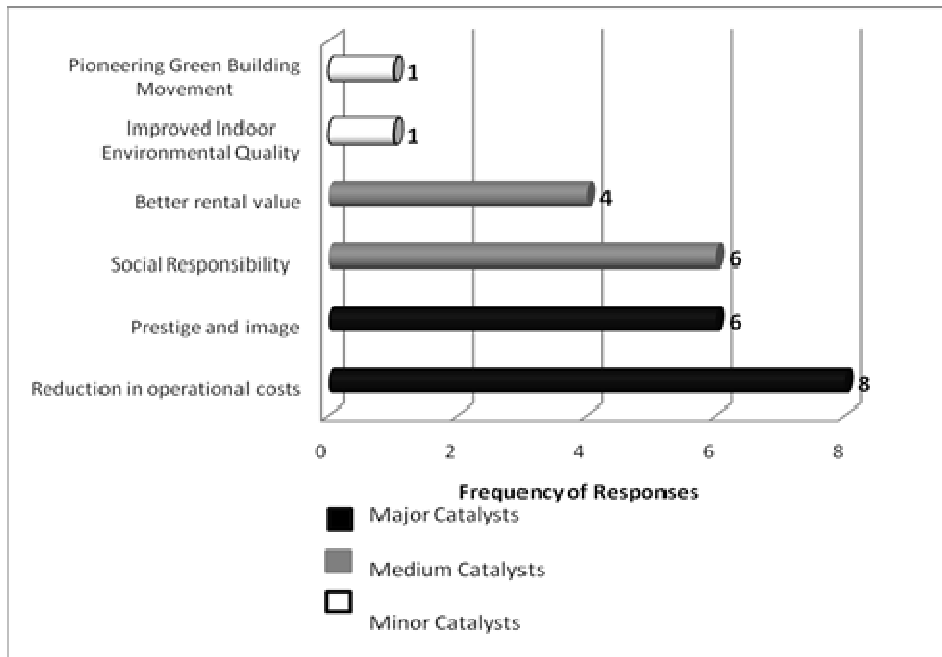


Figure 1: Catalysts according to their importance

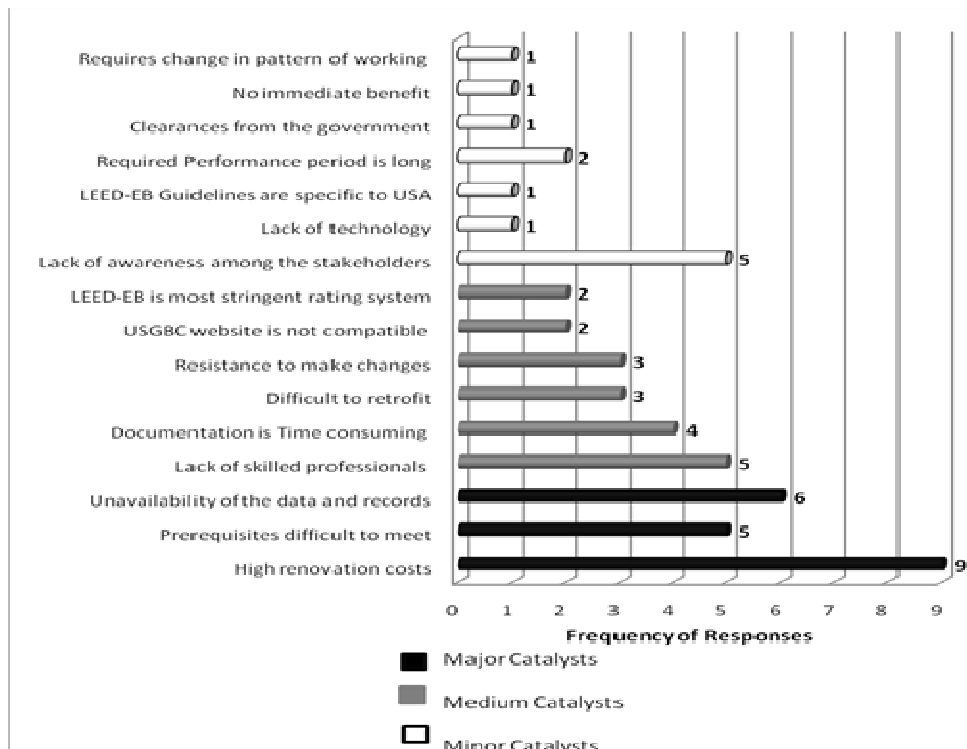


Figure 2: Hindrances according to their importance

Thus, based on the frequency of the responses by the three groups, the catalysts emerged as major catalysts, catalysts having medium importance and minor catalysts. The ones which were reported by all the three groups emerged as the major catalysts, the ones reported by two groups came forth as those holding medium importance and those which were reported by only one of the three groups emerged as the minor catalysts. The responses are illustrated in Fig. 1.

Apart from the catalysts, there are also some hindrances in this process, as per the respondents, which prevent the adoption of LEED-EB certification in India. The hindrances that emerged are discussed as follows:

High Renovation Costs

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.

Lack of awareness among the stakeholders

Here, stakeholders include top management or the owners of the building who are the main decision-takers for the LEED-EB certification. Since many stakeholders are not aware about the advantages of going green, it slows down the adoption of LEED-EB.

Lack of technology

As stated by the respondents, lack of technology in India is another hindrance in LEED-EB certification. Most of the new technologies have been developed in the industrialized nations and India still lacks behind in this area. The technology, if imported, adds additional cost, which is not acceptable to the owners. The technology that we have here is very expensive too. Thus, proper technology needs to be developed in India to foster the process of LEED-EB certification. For example, for retrofitting, appropriate technology in terms of equipment, appliances etc. need to be in place.

Resistance to make changes in the existing building and Poor building envelope design

In India, people are still resistant to making changes in the existing buildings. For instance, it may be required to reduce air infiltration through the building envelope to enhance occupant comfort, but the

owners may not be very open to this idea of modifying the building envelope.

Lack of skilled professionals, Facilities Management teams and their training

Another hindrance in the process of LEED-EB certification is lack of skilled professionals to carry out the operations like retrofitting etc. as this certification is still not very widely used in India. 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. These employees are the ones associated with the cleaning, maintenance operations of the building etc. For example, green cleaning policy directly affects employees as they have to change their pattern of working in terms of usage of cleaning equipments, cleaning methods etc.

Difficult to retrofit, commission and change the internal building planning

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.

Sometimes, prerequisites are difficult to meet

Prerequisites have to be compulsorily fulfilled under all the certifications. LEED-EB also requires some prerequisites to be met. In a new construction, the building can be modeled as per the requirements of the certification. On the other hand, in existing buildings, we cannot do much because everything cannot be restructured. Financially also, it is difficult to achieve. 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.

No immediate benefit

Some of the respondents also reported that there is no immediate benefit of LEED-EB certification. Benefit, here, means financial benefit. As, the changes are more in terms of building operations, the benefits are not felt immediately but in the long run..

Unavailability of the data and records required for LEED-EB submission

Another hindrance for LEED-EB, as per the respondents, is that the data and records required for LEED-EB submission are not readily available. Older the buildings, more displaced are the documents. No drawings of old buildings are readily available. Unavailability of all this data hinders the process of LEED-EB certification as you can not proceed without retrieving all these documents. Sometimes, the drawings etc. have to be re-made which is not an easy task. Compiling all this data and getting the relevant documents is also a very time-intensive process. Thus, some of the respondents also felt that LEED-EB is the most stringent rating system.

USGBC website is not compatible with all net users and is not clear

The submission of application for LEED-EB is an online process. Some of the respondents stated that the USGBC website is not compatible with all the net users. Some also felt that the online channel is not clear. There are no clear instructions as to how we should go about submitting the documents.

LEED-EB Guidelines are specific to USA

USGBC is a USA based rating system but it is being used globally. Because it is originated in USA, the guidelines framed are specific to that place. When people in other countries like India, adopt the certification, they face the problem of adjusting the guidelines according to their local guidelines. For instance, there is a prerequisite on Sustainable Purchasing Policy under the Materials and Resources category under LEED-EB. According to the guidelines given by USGBC, an acceptable way to achieve this prerequisite is by using the U.S. Environmental Protection Agency's Environmentally Preferable Purchasing (EPP) Program guidelines which is as per the USA conditions. Another credit under the same category is Sustainable Purchasing: Ongoing consumables. Under this, USGBC asks the applicants to rely on certifications such as Green Seal and Energy Star which are specific to USA. Thus, many of the guidelines are specific to USA and are difficult to follow.

Required Performance period is long

Some credits in LEED-EB require that performance data and other documentation be submitted for the performance period. The performance period is the specific, defined time interval for which sustainable operations performance is being measured. For the initial LEED-EB certification, the performance period is the most recent period of operations, preceding certification application and must be a minimum of three months for all prerequisites and

credits except Energy and Atmosphere Prerequisite 2 and Credit 1, which have longer minimum durations. Thus, longer minimum performance period is another hindrance in the process of LEED-EB, as per the respondents.

Thus, based on the frequency of the responses by the three groups, the hindrances emerged as major hindrances, hindrances having medium importance and minor hindrances, similar to the catalysts. The ones those were reported by all the three groups emerged as the major hindrances, the ones reported by two groups came forth as those holding medium importance and those which were reported by only one of the three groups emerged as minor hindrances. The responses are illustrated in Fig. 2.

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 as this sector has a major potential of reduction of green house gases. 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 [21]. Considering the current economic challenges, retrofitting an existing building can be more cost effective than building a new facility. Designing major renovations and retrofits for existing buildings to include sustainability initiatives reduces operation costs and environmental impacts, and can increase building resiliency. To address this, the USGBC developed LEED for Existing Buildings, 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, both those new to LEED certification and buildings previously certified under LEED-NC [26].

The study was carried out in two buildings, one was certified under LEED-EB and one was registered under LEED-EB which were developed as case studies. The architects and managers of these two buildings were interviewed to have their viewpoint on the hindrances and catalysts associated with LEED-EB. Apart from this, green consultants were taken as the sample to gain insight into the hindrances and catalysts in the LEED-EB process. 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 were increased prestige and image and reduction in operational costs. Catalysts with medium and minor importance were Better Rental Value, Social Responsibility, 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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