



INVESTIGATE COST EFFICIENCY OF GREEN BUILDINGS IN INDIAN CONTEXT

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ABSTRACT

The tremendous growth in economic activity across the globe is placing pressure on natural and environmental resources. There is increasing evidence that human activities are causing an irreversible damage to the global environment, which will have an adverse impact on the quality of life of future generations. The rising concern for the environment in response to global warming is driving thinkers to seek sustainable solutions. The real estate industry is a significant contributor to the global warming due to extensive emissions of greenhouse gases (GHGs) from the energy use in buildings. In some countries, the built environment accounts for about 40% of the energy used. Buildings are the largest consumer of energy and a major source of greenhouse gas (GHG) emission. This incurs a large sum of money to society. It is evident that incorporating green features in buildings can substantially save energy and water consumption, and reduces GHG emissions; however, it is perceived to be costly both by public and private sectors.

Keywords: - Green Buildings, Indian, Cost, Building, Benefits

I. INTRODUCTION

Buildings are one of the main energy users by sector, which is responsible for consuming 73% of electricity, 40% of raw materials, 13.6% of potable water, and 30% of carbon emissions in the US. The building energy use is projected to be doubled by 2050, and the greenhouse gas (GHG) emission in this area is projected to reach 14.3 GtCO₂e by 2030 due to population growth, increase in building stock, and lifestyle changes. This continued rise in energy use is increasing the operating cost of building, for example, the Australian Government annually spends over \$1 billion on energy and water consumptions. Moreover, the GHG generated from building energy consumption is responsible for an increase in earth temperature, which contributes to disasters linked to climate change.

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II. GREEN BUILDINGS IN INDIA

The green building movement in India started with the establishment of the IGBC in 2001, which was an initiative of the Confederation of Indian Industries (CII) along with the World Green Building Council and the USGBC. The first green building in India, CII-Sohrabji Godrej Green Business Centre in Hyderabad, was inaugurated on 14 July 2004. This was a great symbolic achievement. Since then, the number and volume of green buildings in India has been phenomenal. The movement started with 20,000 sq. ft in 2004 and has grown exponentially, with an expected green building footprint of 15 million sq. ft by end-2008. There are 18 LEED certified buildings with a total area of about 8.5 million sq. ft and 195 projects registered for LEED certification with a total area of about 110 million sq. ft as of year end 2007.

The real estate industry is one of the biggest emitter of GHGs in India. According to a report by the Ministry of Power in June 2004, 20–25% of the electricity consumed in government buildings is wasted due to inefficient design. ‘The scenario is almost the same in the private sector.

III. COST AND BENEFITS OF GREEN BUILDINGS IN INDIA

Green New buildings can have tremendous benefits, both tangible and intangible. The most tangible benefits are the reduction in water and energy consumption right from day one of occupancy. The energy savings could range from 20 - 30 % and water savings around 30 - 50%. The intangible benefits of green new buildings include enhanced air quality, excellent daylighting, health & well-being of the occupants, safety benefits and conservation of scarce national resources.

A growing body of literature has examined the costs and benefits of green buildings. The costs associated with the green buildings are often the direct costs such as initial cost, operating and maintenance cost, and replacement cost. Several studies illustrate the benefits of green buildings in four major categories: economic, social and community, environmental, and government.

- **Economic aspect:** Green buildings have several economic benefits. Firstly, it creates a competitive marketplace for renewable energy, which creates a new job. Secondly, it reduces the life cycle cost of the building, for instance, the installation of the solar panel reduces energy consumption and saves the operating cost remarkably. Thirdly, homeowners capture values from a green building with higher rent and increased productivity with lower medical expenses.
- **Social and Community aspect:** Green building enhances job opportunities for local people thereby reducing unemployment. The experienced employee gets the opportunity for knowledge transfer through training, workshops, which generates additional economic benefits. The green solutions involve the potential for lots of research activities. The results and recommendations of the study increase global networking with the sharing of best practices for the welfare of communities.



- **Environmental aspect:** Environmental aspects are the most widely recognized benefit of green building in reducing the negative externalities in society. Green building reduces CO₂ and increases the proper utilization of renewable energy, which is aligned with sustainable development goals.
- **Government aspect:** Since the green building saves costs, increases economic activities, addresses social and environmental issues; thus, from the government perspectives, it helps the government to achieve sustainable development goals.

In terms of appearance or use, there is no difference between green buildings and conventional ones. The major differences are that green buildings have improved indoor environment and they offer operational savings. Green buildings have been observed to have tangible and intangible benefits. The tangible benefits such as the economic advantages are not immediately visible. However, the lifetime paybacks much higher compared with that of conventional buildings, which mainly accrue from operational cost savings, reduced carbon emission credits and potentially higher rental or capital values.

The intangible benefits such as social advantages are due to the positive impact of green buildings in the neighborhood environment. Moreover, due to better working conditions, the productivity of occupier's increase and health problems decreases.

IV. BARRIERS IN GREEN BUILDING IMPLEMENTATION

A significant number of researchers indicates that high initial investment cost and client demand are the key obstacles in implementing green construction. The cost of the green building starts in the design phase. According to Green Building costs (2016), if the green building features are considered in the design stage, it reduces 10% cost at the construction stage against a 3% increase in the initial cost. Besides, other researchers identify the lack of knowledge and awareness on green construction, and the reluctance of contractor to use new technologies act as a barrier in implementing green building. In summary, the main challenges to implement green buildings are higher initial investment cost, lack of client's interest, knowledge, and awareness on the benefits of green buildings.

To overcome these barriers, the costs and benefits associated with green buildings need to be delineated. Several authors have recommended using cost-benefit analysis as a toolkit to identify and monetize the real costs and the benefits items and to determine the economic feasibility of the project. Until now, in most studies, the cost-benefit analysis of green buildings has only been applied in the context of developed countries, and very few researchers have introduced it to developing countries. In developing countries like Nepal, Bangladesh, and Laos, the characteristics of green technologies are not well understood. The concept of green building is also not widely understood among public officials, policymakers, and decision-makers. Therefore, a number of questions regarding the use of cost-benefit analysis in the project appraisal and the policy formation of the green building remain to be addressed in developing countries.

V. GOAL OF GREEN BUILDING



The goal or objective of the green buildings is to develop buildings in such a way that utilize the natural resources to the minimal at the time of construction and operational stage. Green buildings emphasize on the resource usage efficiency and also press upon the three R's - Reduce, Reuse and Recycle. Green Building is a team effort and the designing and construction includes consultants from architectures, landscaping, air conditioning, plumbing, energy and electrical field. These consultants assess the impact of the each and every design on the environmental condition, keeping in brain the capital involved. The final design needs to be practicable and should minimize the unconstructive impacts that the building would have on the environment. Execution of the green building concept can lead to a decrease of carbon emission by thirty five percent, water handling by forty percent, solid waste decline by seventy percent and diminution in energy consumption by fifty percent. Green Building concept also calculates on the fact that an area with high bio-diversity should be avoided as a site for the construction of a building.

VI. DIFFERENT FROM CONVENTIONAL BUILDINGS

If we will compare the conventional buildings with green buildings then these are more energy efficient, have lower functioning and maintenance costs, provide improved comfort and wellbeing for occupants, have lower risk possible and reduce harmful impact on the atmosphere. A green building is always represents the most efficient and least troublesome way of using land, water and energy resources while ensuring the healthiest likely environment for the occupants. Green buildings use key assets like energy, water, materials, and land more economically than conventional buildings, thus reducing the widespread impact created upon environment by conventional construction till date. Conventional buildings don't integrate these efficient strategies to decrease the impact upon environment. So sometimes, the conventional methods of design and construction lead to utilization of natural resources, increased wastage, increased operational and maintenance costs.

VII. CONCLUSION

The concept of developing green buildings is envisaged as a voluntary action. Hence, the Government was unable to take any proactive action to make the development of green buildings mandatory. However, it has launched the Energy Conservation Building Code (ECBC) under the National Building Codes and Standards. This code is voluntary and is applicable to buildings or building complexes that have a connected load of 500 KW or a contract demand of 600 KVA, whichever is greater. This code addresses the minimum performance standards for a building's energy efficiency, which cover building envelope, Mechanical systems and equipment, service hot water heating, interior and exterior lighting and electrical power and motors. This is an excellent initiative, which will enable the design of high performance buildings.

The growing global crisis has created the need to adopt the concept of sustainability. Real estate activity, being one of the significant contributors to energy consumption and usage of resources, is working towards the development of green buildings to reduce energy consumption and the environmental impact.

After all study and compare the sustainable building or green building, application over the conventional building only one concluded that Green building is versatile art which is adopt not only that safe and



better environment. No doubt initial cost of construction is more but payback is more as compare to other conventional building

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