

# A Review Paper on Retrofitting of Institutional Building into Green Building in Construction

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## Abstract-

Retrofitting can be defined as changing, modifying certain parts, aspects of a structure with new or better parts which will prove to be beneficial for the user of the building & building itself. In a similar sense, Green Retrofit can be done by changing certain parts of building that damage the environment and changing it with sustainable alternatives which will increase the life of the building and reduce the life-cycle cost of the same. This can also be achieved by undertaking many practices which not only enable conservation the natural resources but also enable us to enhance the environment and contribute towards adopting & encouraging sustainable construction practices.

**Keywords:** Green retrofit, environment, conservation, natural resources. Etc.

## 1. INTRODUCTION

Retrofitting is defined as the addition of new features to the buildings, different structures, bridges etc. & help to increase resistivity, strength & overall lifespan of the structure. Retrofitting an existing building can prove to be one of the most environmentally sustainable, cost-effective method for enhancing & upgrading building quality & living standards, it can also help to prolong the life of existing buildings. Implementation of retrofits of building and industries and converting the same should be promoted. Further analysis has been carried out in order to provide a complete range of quantitative data on the direct and indirect impacts of retrofitting on the environment, the cost differences between retrofitting with traditional structural design, the cost of maintenance as well as the effect on end users and the surrounding area of the modified structures.

Building retrofits include enhancing energy efficiency, upgrading the heating and cooling system, providing a more efficient site, conserving & saving water, incorporating alternative sources and using eco - friendly materials. There are a variety of projects that can be done on a relatively small budget, while some require more effort. While upfront costs appear to be high, there are significant incentives to make these costs valuable. The green construction tag is not restricted to less than new houses; at the same time, it is possible to transform several older structures into sustainable structures. Thus, Green buildings has proved and shown us as to how we can reduce energy and water usage and relative cost, increase employees' efficiency and satisfaction, boost brand awareness and improve community ties. Green building & such Green Retrofits produce results at negligible cost. Although they will not produce enticing headlines that are popular among top construction projects, their continuous effect across the building landscape has raised the profile of sustainable buildings within the general public's awareness. Green practices should reflect an event; they must bring about a perceivable change in our day-to-day corporate, social responsibility towards our ecosystem.

### 1.1 Cost Benefit Analysis

It can be defined as a method which involves calculating all the financial costs and estimating the potential profits to be extracted from a business opportunity or plan.

The analysis procedure can easily be carried out by taking into account the benefits of both the structures and the cost incurrences, there is no such measure to calculate the benefits but the results of assessment for choosing the structure can be done by considering the outputs and cost comparisons.

Cost-benefit analysis (CBA) is the evaluation of a choice in terms of its costs and benefits. The measurement of net income at the expense of a specific CBA program or procedure is one of the strongest dimensions. Cost benefit analysis is the best way to determine the monetary benefit of any available funds and to select and rate the project from a range of capital

choices. The study carried out isn't intended to resolve all these conflicts or to remove uncertainty and thus a call for good judgment, but to include a comprehensive amount of statistical data gathered in a manner that can help decision-makers in the face of difficult investing or compensation decisions. The most important part of the investigation is to translate the cost-benefit figures into today's worth of money. The most critical aspect of the investigation is to turn the cost-benefit figures into today's value of money.

### 1.2 Repayment Time for Green Constructions

The preliminary expense of green structure is often on a higher side than that of traditional buildings, but savings are achieved in long run form green buildings due to low power utilization, water conservation and reduced healthcare costs. The Costs and Financial Benefits of Green Buildings, stated by the Massachusetts Technology for California Sustainable Building Task Force introducing a definitive cost-benefit analysis of green buildings, centered on an evaluation of LEED-certified buildings, According to a study, A 2% nominal raise in green structure design will conserve 20% of total infrastructure expenses over the lifespan of the house, which is more than 10 times its original investment.

### 1.3 Savings in Prices

In the sense of the green building quote, the company often takes into account its design and construction price, taking into account its maintenance, replacement and repairing costs. Integrated structural planning, service and maintenance complement the life-cycle evaluation which provides the client with continuous cost reductions. Taking similar case, Singapore reports that green dwellings save around 10 percent of maintenance costs, while green office towers boost the valuation by around 2 percent. Uma (2011) reported it had analyzed 23 typical buildings, such as commercial, offices as well as restaurants. As a result, they found that its overall savings amounted to around 17 per cent of the total household power consumption. The tax deduction is another saving. LEED Gold certified building; Education Headquarters Building (California) saves taxpayers \$500,000 a year in energy costs alone.

## 2. LITERATURE REVIEW

**Eugen Mitrica (2019)** stated the cost benefit analysis methodology for retrofitting investments. For large scale implementation of green building retrofitting a large volume of investment is required. We need to compare the future flow of yearly energy savings with the investment. The benefits created by saving the energy and consequently reducing the carbon foot print, can be very attractive.

**Mohd. Ahmed & Mohd Abul Hasan et al., (2018)** stated the comparison between the world green building rating systems and presents an insight into green building rating systems aspects and motives. To qualify the building green or sustainable, the developed and developing countries have their own rating systems and certification methods.

**Stefano Cascone (2018)** states that to improve the energy performance of existing buildings, the retrofit with green roof is an effective solution. This study through active thermal simulation estimates the extent of energy savings originating by the use of two different types of green roofs applied on the flat roof of a multi-storey residential building.

**Claudio Favi et al., (2018)** stated new & organized approach to address uncertainty and sensitivity analysis in Life Cycle Assessment (LCA) for the decision-making process in building renovation. The paper proposes a probabilistic LCA approach for building retrofit measures through a simplified case study of building renovation, involving interior insulation as retrofitting measures.

**Alok Thacker and Deepa Joshi (2018)** carried out green audit in existing educational complex and provided suggestions for green retrofitting using LEED rating system. Cost analysis has been carried out for application of proposed measures for the green retrofitting measures. The repayment time of the investments has been evaluated.

**Elizabeth Motunrayo Ojo- Fafore Pretty Ramaru Clinton Aigbavboa (2018)** this study adopted a convenience sampling method. The questionnaires were administered to construction professionals who are at present or have taken a shot at a green building project in Johannesburg. This paper focuses on the section for out the advantages green structures. A five point Likert scale was utilized to rank the benefit of green buildings.

**Nushrat and Saad Bin (2017)** stated the economic and social benefit of green building. Aspects of green building were studied and SWOT analysis was done. In financial analysis, the total economic cost and non-monetary cost are calculated. The excess cost for construction of green building was calculated. It is theoretically possible to calculate the relative benefits of green building.

**Muhammad Khairi et al., (2017)** stated the importance of retrofitting the existing building to green building to reduce the dependency on constructing new buildings. They discussed the application, benefits and disadvantages of retrofitting an existing building. Retrofitting is one of the most environmentally friendly and effective solutions to improve the energy performance of building.

**Binoy and Sharadindu (2017)** stated the sustainable development implies fulfilling the needs of the present without negotiating the ability of the future needs. They studied the amount of electricity generated by renewable energy. This paper suggests us the various alternatives by which we can retrofit the existing buildings considering cost parameters.

**N. Tarun & N. Lokeshwara (2017)** In the studies it has been stated and concluded that the building would be affected by building materials, orientation and temperature surrounding the building, ventilation and insulation. These are the main factors that affect the building which are worked upon.

**Wu zhijiang, Liu Wei (2017)** It comprises study of benefits of green building projects through economic assessment and then studies incremental cost and benefits of multiple projects in combination with the Data Envelopment Analysis (DEA) model in order to evaluate decision making of units.

**M. KhoshbakhtZ Gou a Z. DupreK. Dupre (2016)** stated Cost-benefit prediction of green buildings and SWOT analysis of research methods and recent applications.

**Nandish Kavani & Fagun Pathak (2015)** studied the retrofit of an existing building into a green building taking into account the characteristics of energy, water and materials along with cost considerations in accordance with the rating system of LEED and suggested measures to improve the green performance of the building for efficiency.

**Hadas Gabay et al., (2014)** stated the questions by developing a cost benefit model based on voluntary green building standard, and focusing on office buildings of different sizes and standards. They estimated the best alternative leading to maximum savings in resources use, and the economical alternative, which minimizes initial investment.

**Nandish Kavani & Fagun Pathak (2014)** To carry out study of introducing green retrofitting in campus of Government Polytechnic for Girls, Ahmedabad, India. In the current project they have planned to give credits to rate the chosen building for its several green features according to the rating system of LEED and advise procedures to progress the green performance of the structure thereby growing its rating on application.

**Mrs. Rupali Kapure & Dr. R. K. Jain (2014)** have studied Markets for Green Existing building Marketing benefits of Greening existing office building. Greening existing retail buildings. The business case for Greening existing buildings.

**Sharma et al., (2013)** has studied existing building of central Library of Indian Institute of Technology Roorkee which was studied and recommendation of retrofit options for sustainable aspects such as site planning, energy and water use, materials and resources and indoor environment quality was given. Green retrofit measures with payback in 5 years or less can reduce energy use and carbon emission by 40 %.

### 3. CONCLUSIONS:

Green Retrofitting the existing buildings is one of the most environmentally friendly, economical competent and proven as an efficient solutions to optimize the energy performance and could also help to prolong the life of the existing building. Thus, the application of retrofit should be promoted across the construction and conservation industries. Energy conservation, water conservation, reuse of water plays vital role in green retrofitting.

More research need to be done in order to have complete sets of detail data on the direct and indirect impacts of green retrofit to the environment, cost differences between retrofit with the normal construction of a building, cost of maintenances as well as, the impacts to the end users and to the surround area of retrofitted building

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