

**IMPLEMENTATION OF SUSTAINABLE RETROFITTING OF EXISTING BUILDINGS AND STRATEGIES OF ENERGY EFFICIENCY IN INDIA: A STUDY**

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*Abstract*

This research presents a conceptual framework aimed at implementing sustainability principles in the building industry and strategies of energy efficiency in India. The proposed structure dependent on the maintainable triple primary concern rule incorporates asset preservation, cost-effectiveness, and plan for human adjustment. Following an intensive writing survey, every guideline including systems and strategies to be connected amid the existence cycle of building projects is clarified, and a couple of contextual analyses are exhibited for clearness on the techniques. The structure will permit configuration groups to have a suitable harmony between monetary, social and environmental issues, changing the way construction experts consider the data they use while evaluating building projects, in this way encouraging the sustainability of building industry.

**1. OVERVIEW**

Retrofitting a current building can discontinuously be more cost-successful than building another office. Since buildings eat up a great deal of energy (40 percent of the nation's full-scale U.S. energy utilization), particularly to warmth and cooling (32 percent), and in light of the fact that current buildings incorporate the greatest piece of the manufactured environment, it is fundamental to begin energy protection retrofits to reduce energy utilization and the cost of warming, cooling, and lighting buildings. Sparing energy isn't the primary reason behind retrofitting existing buildings. The target should be to make a superior building by applying the consolidated, whole building design process, to the endeavor in the midst of the arranging or philanthropy organize that ensures all key design goals are met.

**2. ENERGY-EFFICIENCY IMPROVEMENTS IN COMMERCIAL BUILDINGS IN INDIA**

Over the years, the use of electricity has increased significantly in the commercial sector. Around the world, the construction sector is responsible for 40% of energy consumption. Annual energy consumption in commercial buildings in India exceeds 200 kWh per square meter per year. Air

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conditioning and lighting are the two final applications that consume the most energy in a building. This led the Indian government to include them as "designated consumers" under the Energy Conservation Act (2001). The "designated consumers" identified by BEE are energy-intensive industries or similar establishments recognized by EC law (2001). Buildings that have a connected load of 100 kW or more or a contractual demand of 120 kVA and above are defined as commercial buildings (as modified by the 2001 energy saving law in 2010).

The construction sector is the second largest provider of jobs near agriculture. Its size is expected to reach 60 billion dollars in 2010 and the commercial real estate market will reach 12 billion dollars. The construction sector currently contributes about 10 percent of GDP and is rapidly expanding by over 9 percent a year, driven largely by strong growth in the services sector. The construction industry alone is also one of the largest greenhouse gas producers in India. Electricity consumption in the construction sector in India accounts for 7% of the country's total electricity consumption. In the construction sector, commercial construction space accounts for 33%. The construction sector is growing between 8 and 10 percent a year.

### **Barriers Limiting Increasing Energy Efficiency In Commercial Buildings In India**

By identifying the importance of the construction sector, especially commercial buildings, the Indian government has developed ECBC. This was done voluntarily, as many of the identified obstacles had to be addressed before their mandate. The obstacles identified in the baseline (2010) are those mentioned below.

- Policy and institutional barriers

Absence of mandatory standards: ECBC was developed by the Indian government to encourage increased energy efficiency in commercial buildings. However, this was voluntary. There were no minimum energy performance codes for most buildings and building components in any of the building laws.

- **Technical and managerial capacity barriers**

Strong first cost prejudice: the construction market is diversified and characterized by a fragmentation in different actors. The complexity of the interaction between these participants is one of the obstacles to energy efficient buildings. For example, building owners tend to invest little in energy efficiency during the design and construction of buildings. Developers do not benefit from the initial investments in energy efficiency of buildings.

- **Materials and technology barrier**

Lack of availability of energy-efficient equipment / materials in the local market: most of the equipment and materials that are energy-efficient are imported, often with high supplements and duties.

- **Finance barriers**

Lack of financial incentives for energy efficiency teams: the energy efficiency of buildings does not receive due attention in government funds and incentives. The review of the regulatory framework is necessary as regards the relaxation of taxes, incentives and tax benefits. Furthermore, energy efficiency financing is not too lucrative for financial institutions due to uncertainty about returns. Innovative funding schemes are needed to promote EE in buildings.

### **3. EXISTING BUILDING RETROFITS**

In the building sector, most energy is eaten up by existing buildings while the substitution rate of existing buildings by the new-form is simply around 1.0-3.0% per annum [1]. Like this, quick improvement of energy efficiency in existing buildings is essential for an advantageous decline in overall energy use and progression of environmental sustainability. In the midst of the latest decade, numerous organizations and universal affiliations have put critical effort towards energy capability enhancement in existing buildings. The focal organization of the United States, for example, has given basic financial help to support existing building retrofits [2]. In Australia, the Commercial Building Disclosure (CBD) program, which occurred on the main November 2010, requires the proprietors of Australia's broad commercial places of business to give energy productivity information to potential buyers or leaseholders [3]. In their 2009-2010 state spending designs, the Queensland government contributed \$8.0 million to retrofit existing government buildings to extend their energy capability sensibly.

In 2010, the UK government made a basic duty to redesign the energy capability of \$7.0 million British homes by 2020 going for diminishing carbon releases by 29% [4]. Energy and ozone-harming substance improved building redesign [5]. These undertakings provided strategy guidance, financial help and technical support for the use of energy productivity measures in existing buildings. Meanwhile, a great deal of research has been finished to make and inspect different energy productivity openings to upgrade the energy performance of existing buildings [6].

- **Key phases in a sustainable building retrofit program**

The general procedure of a building retrofit can be isolated into five noteworthy stages. The essential stage is the undertaking setup, and pre-retrofit ponder. In this stage, the building proprietors, or their administrators, need to at first portray the degree of the work and set undertaking targets. The available advantages for diagram the financial arrangement and program of work would then have the capacity to be settled. A pre-retrofit study may in like manner be required to all the more probable grasp building operational issues and the important stresses of occupants. Typically, practice for building proprietors to pick an experienced Energy Services Company (ESCO) to accept risk for arranging and executing the building retrofit.

- **Key Elements Affecting Building Retrofits**

The accomplishment of a building retrofit program depends upon numerous issues. It exhibits the key segments that impact influence building retrofits, including methodologies and controls, client resources and wants, retrofit technologies, building express data, human components, and other powerlessness factors. Courses of action and controls are energy effectiveness standards, which set the least energy proficiency requirements for retrofitting of existing buildings. Governments may give financial support and blessings to help to build proprietors and designers in achieving the required energy performance centers through completing energy retrofit measures. Every now and again the extent of government programs available is staggering, even inside a solitary locale.

- **Improving Energy Efficiency of Existing Residential Buildings Using Effective Thermal Retrofit of Building Envelope**

Warm insurance is the reduction of warmth move between things in warm contact or extent of the radiative effect. Warm security can be cultivated with specially designed methods or procedures, similarly likewise with sensible thing shapes and materials. Warmth stream is an unavoidable result of contact between objects of differentiating temperature. Warm security gives a locale of insurance in which warm conduction is decreased, or warm radiation is reflected instead of devoured by the lower temperature body.

Making a building increasingly feasible while finishing the retrofit could attract progressively higher-paying tenants, which would cause a greater increase when the proprietors intend to move? Properties with Energy Star affirmation have sold for 2-5% more than buildings without such accreditation. Existing buildings represent most of the energy utilized in the building division, while new buildings utilize just a little percentage of energy.

- **Sustainable and Energy Efficient Commercial Retrofit**

Existing buildings will all in all experience performance degradations, change being utilized, and unanticipated faults or glitches after some time. These events routinely result in the colossal crumbling of the general framework performance, inefficient task and unsuitable warm comfort conditions. An investigation supported by the U.S. Bureau of Energy perceived more than 100 sorts of imperfections that may happen in commercial building services systems and these weaknesses could speak to 2– 11 percent of the total energy utilization of commercial buildings. Possibly a champion among the best strategies for propelling the explanation behind sustainability is through the execution of energy retrofit programs. While sustainability is starting at now an indispensable driver in the new building sector, redesign of the commercial building is driving this inspiration ahead. Regardless of continuous enhancements in energy proficiency being made in new buildings, it is imperative that the current commercial building sector furthermore make a move to meet outpouring reduction targets.

#### **4. APPLICATION, BENEFITS AND CHALLENGES OF RETROFITTING THE EXISTING BUILDINGS**

It is consumption of natural assets, and an overall temperature adjustment, and financial powerlessness and therapeutic issues incite viable development developments over the world [7]. There's a prerequisite for systems or methodologies that can reduce the negative effects of development, development, and urbanization to the environment. Retrofitting an existing building is a champion among the most environmentally pleasant, sensible and gainful responses for streamlining the energy performance of the building. When appeared differently in relation to new buildings development, this kind of mediation diminishes the consumption of land energy and could be associated with an extensive building stock.

Retrofit measures not only focusing on energy, but also look into the usage of water and the production of waste as well. As an example, up to 30% - 40%energy cost per annum could be reduced by light-touch retrofit, such as installation of energy-efficient lighting and controls, building services and management systems and controls. In addition to that, recycling water and waste (e.g. in shopping centre, office, school and public buildings) could also bring significant and positive sustainability and cost impacts. Furthermore, research from USA Institute for Building Efficiency also suggests the following retrofit measures are the most common in the commercial property sector

- Energy-efficient lighting and controls;
- Management systems and controls; and
- Building services.

## **5. CONCLUSION**

Building researchers and professionals have endeavoured enormous undertakings towards the progression and utilization of various retrofit technologies and decision support devices to update building performance. The-best in class of such undertakings in latest two decades is exhibited underneath, which is arranged as a once-over of a huge segment of such investigations completed to date. Retrofit technologies are energy conservation measures (ECM) used to propel building energy proficiency and sustainability. Retrofit technologies reach out from the use of energy capable gear, pushed controls and sustainable power source structures to the movements of energy utilization designs, and the utilization of front-line heating and cooling technologies. Retrofit measures should be considered in their demand for financial pay, capriciousness, and straightforwardness of execution.

The framework can accelerate the understanding and implementation of sustainability in building construction. It provides a brief overview of sustainability principles, strategies, and methods, and emphasizes the need for an integrated and comprehensive methodology for implementing sustainability in building projects. It is intended to provide a general framework for enhancing the quality and likeness of methods for assessing the environmental performance of buildings. It identifies and describes issues to be taken into the record when utilizing methods for the assessment of environmental performance for new or existing building properties in the design, construction, operation, refurbishment, and deconstruction stages.

In this way, research on the current practice seeking to improve energy efficiency and material and design of green building aspects is timely. Now, the current researchers seek to investigate the current research issues in the construction industry and to establish sound discoveries for the examination.

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