



## A STUDY OF SUSTAINABILITY OF TRADITIONAL BUILDING INTO GREEN BUILDING

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### Abstract:

Using sustainable techniques in the building industry is not a new notion; it has already acquired a lot of traction throughout the globe. It covers a wide range of topics, including environmental, social, and economic concerns. With the construction industry's growing awareness of sustainable growth, today's market is brimming with new green building materials and technology. LEED is becoming a worldwide certification system for measuring and verifying sustainable practices used in the design, building, and management of commercial real estate throughout the globe. Despite the growing popularity of the LEED Rating Systems, the real estate market still has little understanding of how to "green" existing buildings by implementing sustainable practices. Knowledgeable and hardworking people are pushing the implementation of green techniques in existing structures. Converting existing buildings to green buildings, unlike meeting green building criteria for new construction, requires a continuous commitment to monitor building systems, educate employees, and stay current with certification requirements. We can save up to 30%-40% of water, 40%-50% of energy, and 20%-40% of building materials by doing so. While this may seem to be more effort with additional expenditures, the financial advantages of adopting green practices are substantial and long-term.

**Keywords:** Sustainability, growing awareness, "green" existing buildings, financial benefits.

### Introduction:

In comparison to a regular structure, a green building consumes less energy, water, and other natural resources, produces less waste and Green House Gases, and is healthier for people to live or work in. Green Structure also refers to a clean environment, clean water, and healthy life. Green architecture isn't just about increasing efficiency; it's about designing structures that benefit the local ecosystem, employ local resources, and, most importantly, use the least amount of energy, water, and materials possible. As a result, if these considerations are kept in mind, we will see that traditional architecture was, in fact, highly green. Today, we have lost how to establish a natural environment and instead replicate what wealthy nations have done. Buildings are a significant energy consumer in the economy. Buildings use 35 to 40 percent of total energy during construction. Buildings use the most energy during construction and afterwards in lighting and air-conditioning systems. This consumption must be kept to a minimum. It's possible that this should be restricted to 80-100 watts.

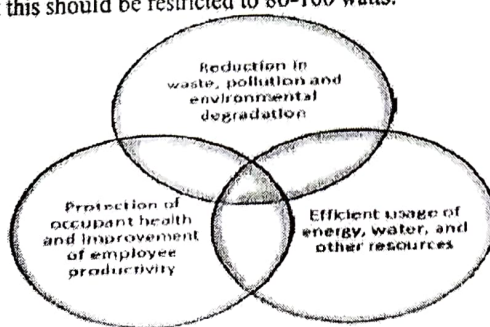


Fig-1: Parameters defining green building concept





Green construction is becoming more popular in India. Green construction accounted for 37 percent of respondents' overall activity in the nation, according to the World Green Building Trends 2016 Smart Market Report. Furthermore, those polled predict that by 2018, it will be 57 percent, the second highest figure among all nations polled.

**Levels of Green Building Activity for Respondents in India (2015 and Expected 2018)**

Source: Dodge Data & Analytics, 2016

Legend:

- 1% to 15% Green Projects
- Explaining (No Green Involvement)
- More Than 50% Green Projects
- 31% to 50% Green Projects
- 16% to 30% Green Projects

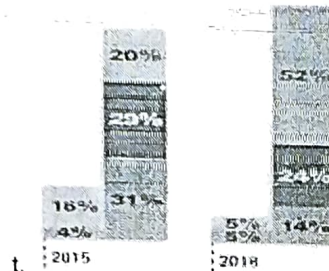


Fig2: Level of Green Building Activity

Despite the growing popularity of the green building idea in India, the real estate sector is still confused with how to transform existing structures into green buildings using different sustainable approaches. The real estate business is lacking in information on how to "green" an existing structure by incorporating sustainable methods. The LEED Rating System for New Construction was announced in 2000, while the LEED Rating System for Existing Buildings was not until late 2004. There were 715 LEED certifications in February 2007, with 550 of them representing new construction and just 45 representing older structures. Almost majority of the current structures graded were single tenant buildings. Green practices in existing buildings are still hindered by a lack of education, training, and expertise. For LEED Accredited Professionals working with existing buildings, the USGBC now provides training and tests.

Green construction practices may assist solve national challenges such as water efficiency, energy efficiency, reduced fossil fuel usage in commuting, waste management, and natural resource conservation. Above all, these notions have the potential to improve occupant health, happiness, and well-being.

To meet national goals, the Indian Green Building Council (IGBC) has established the "IGBC Green Existing Building O&M Rating System." Existing buildings may be made more sustainable across their whole life cycle by using IGBC Green Existing Building O&M standards. This grading scheme allows the building owner/developer to use green principles and standards in order to eliminate demonstrable environmental consequences.

Existing buildings that are greened may provide several concrete and intangible advantages. The decrease in water and energy use is the most visible advantage. The operational savings from energy and water efficiency might be in the region of 15% to 30%. In addition, the amount of consumer waste created in the building may be significantly decreased. Improved air quality, health, and tenant happiness are some of the intangible advantages of green existing buildings.

### Literature review

#### 1. IGBC Green Existing Buildings O&M Rating System-Pilot Version

Greening Existing Buildings is a programme run by the International Green Building Council. O&M is India's first grading system designed specifically for existing buildings. It is founded on well-established environmental principles and finds a balance between well-established procedures and new ideas. The system is intended to be both comprehensive and easy to use. Existing buildings that are greened may provide several concrete and intangible advantages. The decrease in water and energy use is the most visible advantage. The operational savings from energy and water efficiency might be in the region of 15% to 30%. In addition, the amount of consumer waste created in the building may be significantly decreased. Improved air quality,

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**Water conservation:** The majority of Asian nations are water-stressed, and the water table in countries like India has dropped dramatically over the previous decade. The Green Existing Buildings O&M Rating System promotes the use of water in a self-sustaining way via measures such as decreasing, recycling, and reusing. Existing buildings that are green may save 15–30% of their potable water by using this grading system.

**Handling Consumer Trash:** Handling garbage in existing buildings is highly challenging since most waste produced is not separated at the source and is likely to end up in landfills. This continues to be a problem for towns, and it must be handled. The IGBC plans to alleviate this by encouraging existing buildings to recycle their garbage.

**Energy Efficiency:** The construction industry consumes a lot of electricity. Buildings may minimize energy consumption by using energy efficient lighting, air conditioning systems, motors, and pumps, according to the IGBC Green Existing Building O&M grading system. The operational energy savings that may be generated by implementing this rating scheme range from 15 to 30%.

**Reduced Reliance on Virgin Materials:** The grading system promotes projects to employ recycled materials and discourages the use of virgin wood during renovations, reducing the environmental effect of virgin material extraction and processing.

**Occupant Health and Well-Being:** The most significant feature of Green Existing Buildings is occupant health and well-being. The IGBC Green Existing Buildings O&M Rating System guarantees that important components of a building, like as ventilation and occupant well-being, are met. Measures to reduce indoor air pollution are also recognized by the rating system.

2. The study "Energy Saving of Green Buildings Using Solar Photovoltaic Systems" by Jigneshkum R. Chaudhari and Prof. Keyur D. Tandel explains that the concept of green buildings encourages the use of renewable energy, recyclable, and recycled items. Green building design decreases energy usage throughout the course of a structure's lifespan. In comparison to normal construction, green buildings must save 36–40% of water, 30–40% of energy, and 25–40% of material. High thermal insulation, rainwater harvesting, terrace gardening, ventilation, and energy efficient appliances are all examples of green architecture.

#### Methodology

We conducted a study on green retrofitting in existing residential buildings, and we chose Swami Krupa in Pune, India, as the location for this study. We studied the present energy and water use of the total 6 flats - 3 2BHK flats and 3 1BHK flats - in this study. Using this information, we assessed the building's energy and water use by including green ideas such as solar photovoltaic panels, rainwater collection, and WTP. We also provide several green construction options for converting existing conventional structures to green structures. The following are some of them:

#### Energy conservation:

##### 1. Energy efficiency in lighting systems:

1. Replace incandescent bulbs with compact fluorescent lamps (CFLs).
2. The most common fluorescent tube is the T12, which uses 40W of electricity from the tube + 10–18W from the electromagnetic ballast. These lights should be replaced with more energy-efficient T8 or T5 lamps.
3. Metal halide lamps are used instead of LPMV or HPSV lamps.
4. Make use of LED lights.
5. Proper lighting installation.
6. Better lighting control (Occupancy Sensors).
7. Take use of as much natural light as possible.
8. Care and maintenance. 9. Systems for energy management.

##### (B) Solar photovoltaic system:

Solar energy is directly transformed to electric electricity in a solar photovoltaic system. When compared to thermal solar energy conservation techniques, this makes the system significantly more practical and compact. It converts the energy of sun radiation in the visible and infrared ranges into electric power.

Items	Wattage	Nos.	Approx. Working hours per day	Energy consumption (w/h/day)
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Incandescent lamps	60	21	7	8820
Fluorescent tubes in Flats	40	24	7	6720
Fluorescent tubes in common area	40	15	10	6000
Fan	70	21	5	7350
Computers	100-200	6	3	2700

Encourage the use of environmentally friendly refrigerants and halons in the facility, therefore reducing leakage into the atmosphere and the resulting effect on the ozone layer.

Encourage the use of on-site renewable technology to reduce the environmental consequences of fossil-fuel-based energy production and show renewable energy generation for at least 2.5 percent of the building's total annual energy consumption.

Energy metering and monitoring - Encourage continual energy monitoring to uncover chances for improving a building's energy performance.

Refrigerators	225-500	6	10	21750
T.V.	210-400	9	10	27450
Microwave	800-1000	5	1.5	6750
Heater/Geyser	1000-1500	5	1.5	9375
Mixer	150-450	6	0.5	900
Iron	40-60	6	0.5	150
Washing Machine	600-800	6	2	8400
Radio	50-200	4	2	1000
DVD	80-85	3	2	495

If we use CFL lights of 15 watts instead of incandescent bulbs, we can save up to 205.065 KWh per month, and if we use LED tubes of 18 watts instead of fluorescent tubes, we can save up to 216.876 KWh per month. That works out to roughly 422 KWh every month, or about 10% to 12% of the total energy used in the building.

We'll require 20 solar panels if we employ a 5kW solar system as a renewable energy source (250W panel). The panel will be roughly 1.6m by 1m, therefore you'll need at least 32m<sup>2</sup> of roof space. This image may help you visualize how large 32m<sup>2</sup> is (fig 1). Depending on the location and a number of other circumstances, this 5kW solar system will create roughly 23kWh per day. This will also save around 18% to 20% of the building's power use. Fig 3: 5kW solar panel- using 250W panels

#### **WATER CONSERVATION:-**

Principles of Conservation: While talking about any conservation, we should remember the basic principles as shown below:



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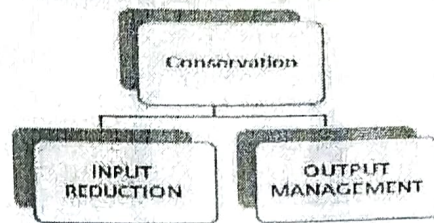


Fig4: Basic principles of conservation

Methods for water conservation may reduce input, output, or both. Here it is shown how water changes its form after getting used in buildings.

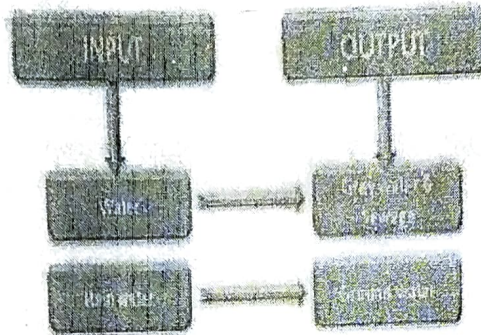


Fig5: Input & output process of water in buildings Reduce Consumption

A cursory look at the statistics of water consumption in different types of buildings will reveal which areas need to be stressed upon so that we can make an effective reduction in the consumption of water at all levels.

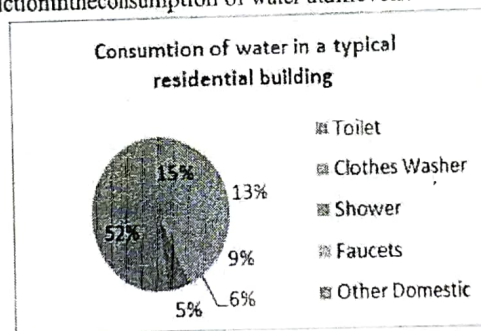


Fig6: Consumption of water in a residential building

On average, the majority of water is used for flushing and outdoor functions in residential buildings, whereas air conditioning and cooling play a large role in commercial structures. This makes it very apparent what our main areas of focus should be. The following are a few of the ways that might be useful: Fig7: Methods to reduce the consumption of water

#### A. Reuse Water Onsite

Plumbing systems should be designed in such a way that water may be reused onsite, in addition to planning for efficient water usage. There are two kinds of water consumed in buildings:

*Dr. Sanil*



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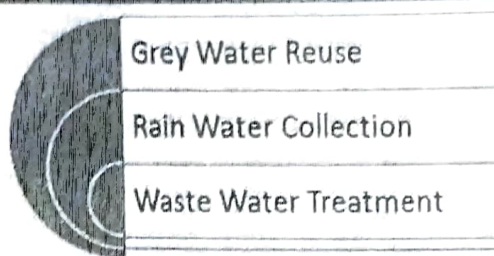


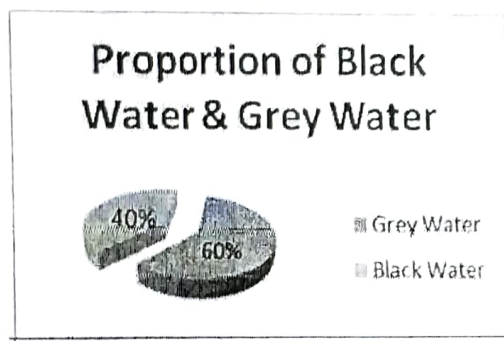
Fig8: Methods that can be adopted to reuse water on site

### B. Grey Water reuse

Wastewater collected from clothes washers, baths, showers, and laundry or bathroom sinks is referred to as "grey water." It may be safely re-used if properly collected and stored, lowering both fresh water usage and the burden on septic tanks. As a result, it may be recycled inside a building, either to irrigate attractive plants or to flush toilets, thanks to well-designed plumbing systems that separate grey water.

### C. Sewage/Black water treatment:

The rate of decomposition of contaminants in black and grey water is perhaps the most important distinction between the two.



We may use black water as odor-free fertilizers and a useful soil conditioner, as well as protect ground water from contamination, by isolating it. Because it is an expensive process, black water is generally disposed of into the main sewer on a small scale, and separate Sewage Treatment Plants are installed in large scale buildings, such as commercial and industrial buildings, to treat the black water and recycle the soft water for air cooling and irrigation. The procedure for doing so is as follows:

#### Rain Water collection:

1. Some rain may be caught and diverted to the landscaping by providing impermeable surfaces on the plot, such as bare ground or pavement, or a roof with gutters and downspouts.
2. By contouring the ground surface, surface runoff may be channeled to turfing areas or shallow basins surrounding trees and bushes. The purpose is to collect runoff, guide it to a useful location, and slow it down so it can soak into the earth.
3. Rain that falls on rooftops may be directed to landscaping plants or saved in tanks or rain barrels for later use in vehicle washes, firefighting, and toilet flushing, among other things.

#### Health & comfort

- A. Smoking is prohibited- Minimize non-smokers' exposure to the negative health effects of passive smoking in the building.
- B. Adequate outside air ventilation is required to prevent contaminants from impacting indoor air quality.
- C. Carbon dioxide monitoring and control- Constantly monitor and manage the carbon dioxide level in the building to ensure occupant comfort and well-being.
- D. Environmentally Friendly Housekeeping Chemicals- To promote the use of environmentally friendly housekeeping chemicals in order to prevent negative health effects on building occupants.
- E. Occupant Happiness At least two tenant well-being amenities (such as a gym, aerobics, yoga, meditation, or any

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indoor/outdoor activities) are provided for at least 10% of the building's inhabitants.

#### **Innovationcategory**

- A. Green building accredited professionals- To bring in green building certified specialists to help with the design and execution of environmentally friendly measures.
- B. Terrace Gardens- Terrace gardens assist in maintaining the building's interior temperature. The greenery on the rooftops contributes to a better environment while also helping to keep the temperature down.
- C. Insulated water tank- A water tank is created that collects hot water from the solar panels and stores and distributes it as needed. This technique guarantees that hot water is distributed evenly throughout the day.

#### **Conclusion**

To summaries, we can claim that by integrating the above-mentioned green ideas, we can convert an existing structure into a green structure that will save roughly 20-22 percent on energy use. Water is also preserved, recycled, and reused for diverse purposes utilizing environmentally friendly ways. We can assure a healthier and cooler climate by growing plants around the plot and on the roof, and therefore increase the residents' quality of life. These ideas meet IGBC standards for existing green buildings and aid in the building's LEED certification. Other engineers and builders will be encouraged to embrace green methods and promote sustainability not just in new construction but also in existing buildings as a result of such efforts.

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