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Title of the project: Design, Analysis and Performance assessment of Green Building.
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INTRODUCTION:

Being one of the important activities for the socio-economic development of our country, Construction sector is undergoing rapid innovation and growth. On the contrary, it results in huge environment impacts by natural resource depletion, solid waste generation and pollution by various means.

The building sector represents the third largest domain of total energy consumption after the industrial and transportation sectors. According to the International energy agency (IEA), buildings account for approximately 28% of global energy related CO_2 emissions. Buildings account for around 40% total energy consumption and 36% of CO_2 emission (Energy Conservation Building Code of India (ECBC));

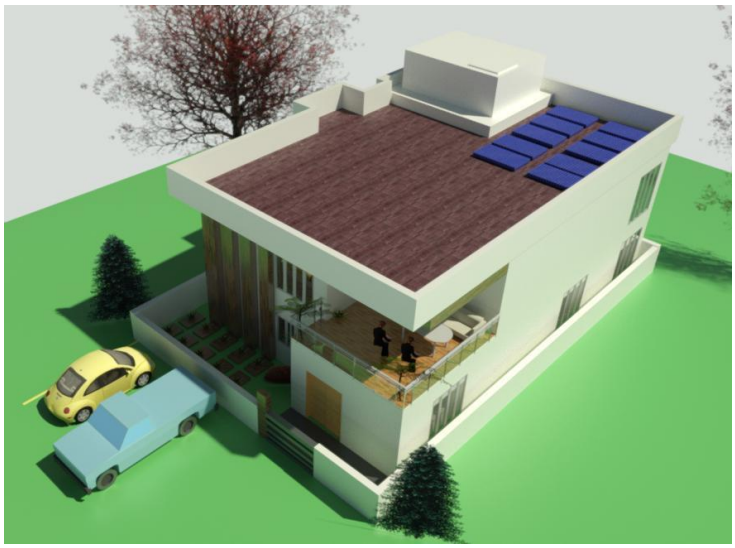
The energy used to heat and run our buildings is large, mainly comes from burning of fossil fuels, oil, natural gases and coal, which generate significant amounts of CO_2, most noted greenhouse gas. The major consumption of energy in buildings is during construction and later entire life span of building i.e., operational phase (enhancing comfort conditions).

The present study focuses on existing concepts, building standards and analyzing the main methodological challenges faced by the reference residential building, it's implications as a green building. Finally, the study concludes by the arriving at an outlook on necessary steps towards a successful implementation of nearly green building. It is seen that the result of the new model concluded is significantly more energy efficient and cost effective in comparison with conventional building as rated by IGBC and LEED systems.

OBJECTIVES:

- To assess the conventional building standards in terms of materials, energy usage and living standards.
- To design and prepare green building model by applying various efficient equipment and materials towards a sustainable approach.
- To reduce energy consumption by implementing efficient lighting and HVAC systems.
- Utilizing renewable energy sources to reduce dependence on fossil fuels and promote energy independence.
- Minimize the use of harmful chemicals to promote better indoor air quality.
- Design rainwater harvesting systems to reduce water usage and promote water conservation.
- Using locally available materials to reduce transportation emissions and support the local economy.
- To evaluate the building performance by IGBC and LEED rating standards.

METHODOLOGY:



- The methodology involves analyzing various factors related to site selection, water efficiency, energy conservation, materials and resources, indoor environmental quality, and innovation in design.
- Collect data on conventional buildings and green buildings that have obtained certification from IGBC and LEED. Gather information on building characteristics, construction methods, materials used, energy consumption, water usage, and indoor environmental quality parameters. Obtain data from building owners, architects, and facility managers, and refer to official certification documents.
- Compare the locations of conventional buildings and green buildings. Evaluate factors such as proximity to public transportation, availability of amenities, access to open spaces, and efforts made to preserve natural habitats.
- Analyze water usage data for conventional and green buildings. Compare water conservation strategies implemented, such as rainwater harvesting, low-flow fixtures, and water-efficient landscaping.
- Assess energy consumption patterns for both types of buildings. Compare energy-efficient design features, use of renewable energy sources, insulation techniques, efficient HVAC systems, and energy management practices.
- Examine the materials used in conventional and green buildings. Evaluate the percentage of recycled content, sustainable sourcing practices, waste management strategies, and the use of low-emission materials
- Evaluate indoor air quality, thermal comfort, and lighting conditions in conventional and green buildings. Compare ventilation systems, use of natural lighting, presence of volatile organic compounds (VOCs), and occupant comfort levels.
- Compare the data collected for conventional and green buildings using appropriate statistical methods. Quantify the differences in performance based on IGBC and LEED parameters. Identify the strengths and weaknesses of each building type in terms of sustainability and environmental impact. By following this methodology, a comprehensive comparison and evaluation of conventional buildings and green buildings can be conducted based on the

parameters provided by IGBC and LEED, shedding light on the environmental benefits and sustainability advantages of green building practices.

RESULTS & CONCLUSIONS:

Residential buildings are occupied with many appliances which use electricity. By using energy efficient devices, we can save and reduce shortage of power. In our present study, efforts have been made to minimize the power consumption by two ways: One to utilize energy efficient equipment's in operation and two, by on-site solar energy generation by the installation of solar panels on roof top. Altogether, this leads to a total cost savings of Rs. 48,432 (54.5%) annually.

Furthermore, Rain Water Harvesting system is designed which results in water cost savings of Rs. 9000 annually.

On a comparison with using conventional building materials and locally available alternative building materials and green materials, a total cost savings can be achieved up to Rs. 2,88,405.202 (6%).

Finally, efforts are made to rate the designed green building according to IGBC and LEED standards. The resulting building achieved outstanding performance status by IGBC scoring 69 points and silver rank status by LEED standards obtaining 57 points.

It can be concluded that, the design, analysis and assessment of green buildings can prove to be compelling evidence in addressing the energy efficiency, environmental sustainability and occupant well-being.

It plays a pivotal role in creating a sustainable and resilient built environment serving a potential solution to combat climate change.

SCOPE FOR FUTURE WORK:

- Grey water recycling systems can be incorporated.
- Green roof can be widely practiced to improve insulation.
- Unique strategies beyond the standard requirements of IGBC and LEED certifications can be identified such as net-zero energy designs, biophilic design elements, and advanced building automation systems.
- Certain areas can be suggested for future research and improvements in green building design and operation. Any potential modifications to the IGBC and LEED parameters can be identified to address the emerging sustainability challenges and evolving industry practices.
- Acknowledge the limitations encountered during the study, such as different types of buildings, availability of data etc.
- The evaluation can be applied to large scale structures such as commercial and institutional buildings.
- Green Audit can be carried out periodically to the existing buildings to know how the adaptations towards achieving SDGs.