

Green Energy and Indoor Technology for Smart Building

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Abstract: Buildings all-round the planet consumes a significant quantity of energy that is about one third of the entire primary energy resources out there. This has semiconductor diode to loads of challenges with regard to provides of energy, energy resources fast depletion, increase in building service demands, jury-rigged comfort life-style in conjunction with time increase pay in builds; this all has exaggerated the energy consumption. Even the planet-wide property is in addition pushing the implementation of inexperienced buildings at intervals the world. Researchers and scientists square measure acting on this issue for a very whereas, however still the issue is rife. The aim is to gift comprehensive and significant analysis conducted to date with regard to inexperienced buildings. This provides in-depth analysis of style technologies (i.e., passive and active technologies) that lay a sturdy foundation for inexperienced building and conjointly highlights the good automation technologies that facilitate in energy conservation in conjunction with varied performance metrics. The renewable sources square measure domestic sources of energy. It enhances the protection of energy provides. The main goals of property style were to scale back depletion of essential resources like energy, water, and raw materials; forestall atmospheric degradation caused by facilities and infrastructure throughout their life cycle; and make engineered environments that square measure safe, productive and effective utility of the water and solar power.

Keywords: Renewable energy, Zero-energy buildings.

1. Introduction

The beginning of the twenty-first century has ushered in the era of green buildings. Normal buildings use energy inefficiently, generate large amounts of waste in their construction and operation and emit large quantities of pollutants and greenhouse gases. In contrast to conventional buildings, green buildings seek to use land and energy efficiently conserve water and other resources impure indoor and outdoor air quality- and increase the use of recycled and renewable materials While green buildings still constitute a tiny subset of existing buildings their numbers are increasing rapidly. Green building (also known as green construction or sustainable building) refers to a structure and the application or processes that are environmentally responsible and resource efficient throughout a building's life cycle: from planning to design, construction, operation, renovation, and demolition This requires close cooperation of the contractor, the architects,

the engineers and the client at all project stages_ The Green Building practice expands and complements the classical building design exonerates of economy utility durability and comfort. Green building brings together a vast array of practices, techniques and skills to reduce and eliminate the impacts of buildings on the environment and human health. It often emphasizes taking advantage of renewable resources. using sunlight through passive solar active solar and photovoltaic equipment and using plants and trees through green roofs, rain gardens and reduction of rainwater run-off-Many other techniques are used such as using low impact building materials or using packed permeable concrete instead of conventional concrete or asphalt to enhance replenishment of ground water.

2. Future Scope

The future scope for Green Energy and Indoor Technology for Smart Buildings is highly promising, driven by global sustainability goals, rising energy costs, and advancements in AI and IoT. Here's a breakdown of future directions and opportunities in each domain, along with their integration:

A. Green Energy in Smart Buildings – Future Scope

1. Decentralized Energy Production
2. Energy Storage Solutions
3. Smart Grid Integration
4. Sustainable Building Materials
5. Green Certifications & Regulations

B. Indoor Technology for Smart Buildings – Future Scope

1. IoT & Sensor Integration
2. AI-Driven Building Management Systems (BMS)
3. Healthy Indoor Environments
4. Touchless and Voice-Controlled Interfaces
5. Digital Twin Technology

3. Objectives

Here are clear and structured objectives for a project or initiative focused on 'Green Energy and Indoor Technology for Smart Buildings'

1. Energy Efficiency and Sustainability

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2. Smart Technology Integration
3. Indoor Environmental Quality
4. Cost Reduction and ROI
5. Data Collection and Analytics
6. Regulatory Compliance and Innovation

4. Necessity of the Project

The necessity of a project focused on Green Energy and Indoor Technology for Smart Buildings arises from the urgent global need to address energy efficiency, sustainability, and human comfort within the built environment. Here's a breakdown of why such a project is essential:

- Increasing Energy Demand and Environmental Concerns
- Sustainability and Regulatory Compliance
- Advancements in Smart Technology
- Improved Indoor Environmental Quality
- Economic Benefits
- Integration and Resilience

5. Methodology

A solid methodology for Green Energy and Indoor Technology for Smart Buildings should blend sustainability, smart systems integration, and human-centric design. Here's a structured methodology you can follow, often suitable for academic or practical projects:

1. Define Objectives and Scope
2. Literature Review & Benchmarking
3. System Design & Integration
 - a. Green Energy Technologies
 - b. Indoor Technology Solutions
 - c. Building Management Systems (BMS)
4. Simulation and Modeling
5. Implementation & Deployment
6. Testing & Validation

7. Feedback & Optimization
8. Reporting and Documentation

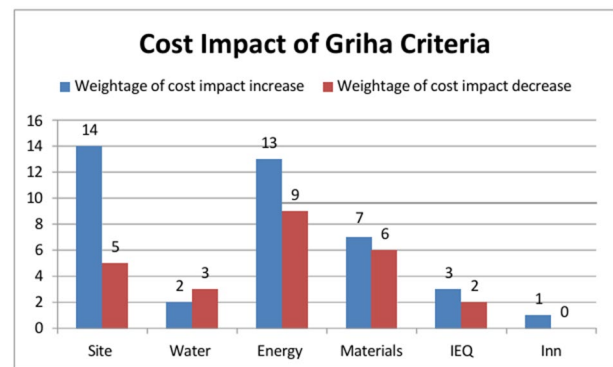


Fig. 1.

6. Conclusion

The integration of green energy and advanced indoor technologies in smart buildings represents a crucial step toward a more sustainable and efficient future. By harnessing renewable energy sources such as solar and wind power, and combining them with intelligent systems for lighting, heating, ventilation, and air quality monitoring, smart buildings significantly reduce environmental impact while enhancing occupant comfort and productivity. As urbanization accelerates and climate concerns intensify, the adoption of these innovations is not only a technological advancement but a necessary evolution toward resilient, eco-friendly living and working environments.

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