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## Concept of green building and its impact on environment and economy

**Abdul Wahid Raza and Misbah Danish**

**Abstract**

In today's age of urbanization the environment is being ignored by human beings. Environmental imbalance is produced due to different activities made by us. Construction industry is doing a massive role in this. While construction processes and after construction due to faulty planning, pollution is created as well as lots of natural resources are wasted. Water scarcity is a major problem in front of society even though while using water for construction, gardening and other domestic purposes proper care is not taken and water is wasted. In normal constructions proper care is not taken to save energy and energy is not efficiently used. As demand of energy is increasing rapidly therefore there is excessive load on big thermal power projects, which adds into the pollution. The water falling on the roof top is not utilized in normal buildings. The waste produced in homes is also contributing to pollution and in making unsanitary and anaesthetic atmosphere. A Green Building design provides solutions to all above -mentioned problems and contributes in keeping the environment clean and green. The study shows that Green Buildings are only way to a sustainable future Environment comprises of man built as well as natural environment, which are the result of several human activities done by them to enhance their standard of living, greed of attaining the power, money, control and luxurious life. These activities performed by humans lead to disturbance in eco-system, the human activities such as use of non- renewable resources up to such extent that they get extinct or remain a few, not only harm ecology but also reduce the chance of meeting these resources with future generation, not only wild and marine life suffer from these but a large number human population also such as those are fully dependent on forest. A few of such activities are extraction of unlimited ground water and its further wastage, deforestation on large scale, burning of fossil fuels on large scale, land excavation for several purposes, dumping of wastage on un-appropriate places etc. If we wishes for healthy, wealthy, well maintained, and systematic life cycle for a community in present as well as to meet these achievements in future i.e. for the next generation, then we should have a balanced systematic cycle of resources used. The sustainability requires a transition to environmentally conductive habitat based on judicious energy and resources used to enhance a society that is happy, harmonious, healthy, and productive.

**Keywords:** Renewable resources, non-renewable resources, sustainable development, human adaptation, human comfort, recycling

**Introduction**

The combined environmental movement of 1960s and 1970s led to experiments emphasis on the concept of green building, it became more popular in 1990s as American Institute of Architects (AIA) formed the Committee on the Environment (1989), Environmental Resource Guide published by AIA, funded by EPA (1992), U.S. Green Building Council (USGBC) founded (1993). The concept of green building gives us an idea about the construction of such building which could have lesser and lesser negative impact on environment and help us to attain the sustainable development. It is also known as sustainable building as it helps to attain the sustainable development. A building should be environmentally responsible and resource efficient during planning phase, design phase, construction phase as well as during its complete life cycle. Economy, Durability, utility and comfort should be kept in mind while designing and constructing a green building. It should be environmental friendly in every aspect such as siting, design, construction, operation, maintenance, renovation and deconstruction. The green building movement in India started with the establishment of the IGBC in 2001, which was an initiative of the Confederation of Indian Industries (CII) along with the World Green Building Council and the USGBC.

The first green building in India, CII-Sohrabji Godrej Green Business Centre in Hyderabad, was inaugurated on 14 July 2004. In India, the Indian Green Building Council (IGBC) provides LEED ratings to structures and aims to make the country one of the leaders in green buildings by the year 2015. The Green rating for Integrated Habitat Assessment (GRIHA) is the National Rating System of India. It has been conceived by The Energy and Resources Institute (TERI) and developed jointly with the Ministry of New and Renewable Energy, India. The primary focus of the LEED rating system is for commercial buildings, but there has also been a recent addition of LEED for homes in the residential sector. The main format for sustainable building is organized into five different categories to maximize the efficiency of a building system relating to siting, water conservation, energy, materials, and indoor environmental quality. 20 (Figure 4.1). There is also a special category for innovation and design. All LEED standards address three types of requirements:

1. Prerequisites – Required elements before a project can be considered for LEED certification.
2. Core credits – Specific actions a project may take in the five main areas.
3. Innovation credits – “Extra Credit” given for exemplary performance beyond the core requirements or new actions that show significant environmental benefit.

### Concept of green building

Green building may be conceptually defined as the tool of increasing efficiency of buildings resources in the form of energy, water and materials while reducing building impacts on human health and the environment.

The Green Building idea is picking up significance in different nations, including India. These are structures which govern waste reduction, low cost, less energy consumption, cooling effect and environmental compatibility. Moreover, green building encourages saving in water consumption, recycling, waste minimization, social and economic benefits. The US EPA define "Green building is the act of making structures and utilizing forms that are naturally dependable and asset effective all through a building's life-cycle from siting to plan, development, activity, support, remodel and deconstruction"

### Benefits of green building

The innovative and advance technologies with new approaches tend to supplement current practices in making greener structures, the advantages of which can extend from natural to financial and to social. By embracing greener practice. We can take most extreme preferred standpoint of ecological and monetary execution. Green development techniques when effectively coordinated and implemented at planning and development stage produce extensive benefits. The green buildings may have multidimensional benefits either directly or indirectly, some of which are reflected here under

- Efficient technologies.
- Easier maintenance.
- Return on investment.
- Improved indoor air quality.
- Energy efficiency.

- Water efficiency.
- Reducing waste, contamination and environmental pollution.
- Efficiently utilizing resources, water and different assets.
- Protecting inhabitant wellbeing and enhancing efficiency.
- Waste reduction.
- Temperature moderation.
- Water conservation.
- Economical construction for poor.
- Healthier lifestyles and recreation.
- Improved health.

### Another typical green building

Resources - Recycling-and-waste-management-solar-panel  
Green building with solar panel.

### Demerits of green building

Though there are significant benefits of green building yet some disadvantages also observed which are listed as under

- Initial cost is high.
- Lack of availability of materials.
- Need of more time to construct.
- Need skilled worker.

### Materials used in green constructions

It would be desirable to use material for construction which are eco-friendly and environmentally compatible in as much as those renewable sources are used along with materials from recycled and reuse of waste like the waste from old plumbing, doors etc. Moreover, following materials may be used for constructing green building specifying their merits.

### Wool brick

#### Resources-recycling-and-waste-management-brick wool brick

- Obtained by adding wool and a natural polymer found in seaweed to the clay of the brick.
- 37% More strength than burnt bricks.
- Resistant for cold and wet climate. Sustainable concrete (Figure 4).

#### Resources-recycling-and-waste-management-concrete Sustainable concrete

- Crushed glass.
- Wood chips or slag-a byproduct of steel manufacturing.
- Reduces the emission of CO<sub>2</sub>. Solar tiles.

#### Resource-recycling-and-waste-management-tiles solar tiles

- Exist to simply protect a building.
- They spend a large portion of the day absorbing energy from the sun. Paper insulation

#### Resources-recycling-and-waste-management-insulation Paper insulation

- Made from recycled newspapers and cardboard.
- Then filled with chemical foam.
- Insect resistant and fire retardant. Triple-glazed windows.

## Resources-recycling-and-waste-management-glazed

### Figure 7: Triple glazed window

- Super-efficient windows.
- Stops heat to enter the building and from direct sunlight.
- Using bamboo replacing the steel bars advance technologies with new approaches tend to supplement current practices in making greener structures, the advantages of which can extend from natural to financial and to social. By embracing greener practices, we can take most extreme preferred standpoint of ecological and monetary execution. Green development techniques when effectively coordinated and implemented at planning and development stage produce extensive benefits. The green buildings may have multidimensional benefits either directly or indirectly, some of which are reflected here under
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Another typical green building is shown in Figure 2 below



Fig 1: Green building with solar panel demerits of green building

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- Need skilled worker.

It would be desirable to use material for construction which are ecofriendly and environmentally compatible in as much as those renewable sources are used along with materials from recycled and reuse of waste like the waste from old plumbing, doors etc. Moreover, following materials may be used for constructing green building specifying their merits<sup>[4]</sup>. Wool brick (Figure 3).

### Materials used in green constructions

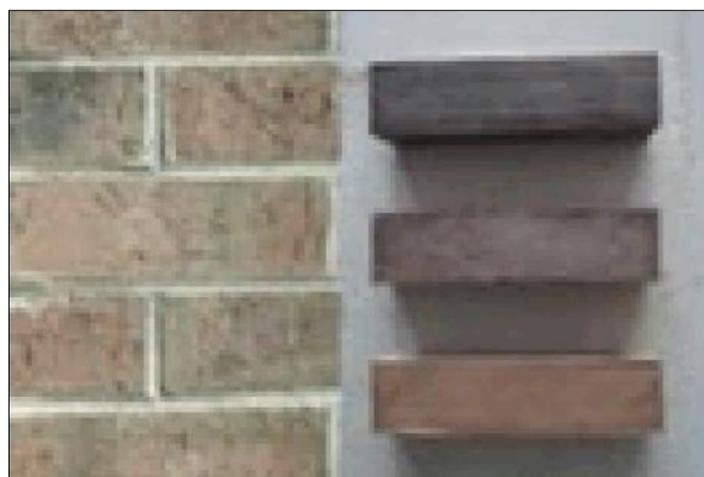


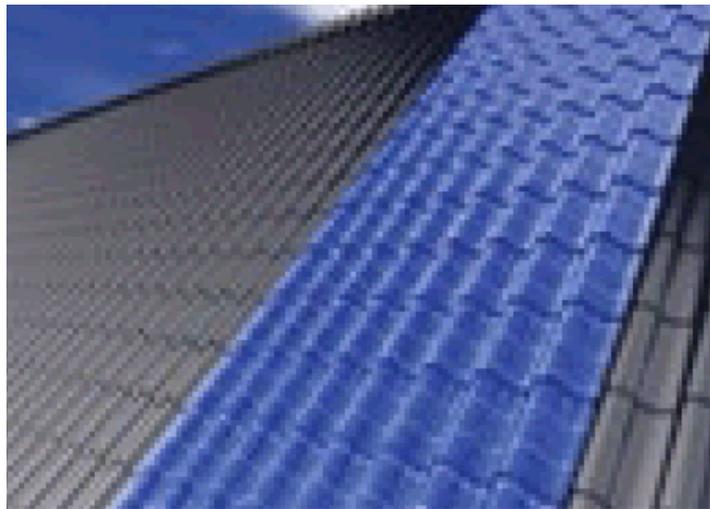
Fig 2: Wool brick

- Obtained by adding wool and a natural polymer found in seaweed to the clay of the brick.
- 37% More strength than burnt bricks.
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**Fig 3:** Sustainable concrete

- Crushed glass.
- Wood chips or slag-a byproduct of steel manufacturing.
- Reduces the emission of CO<sub>2</sub>. Solar tiles (Figure 5).



**Fig 4:** Solar tiles

- Exist to simply protect a building.
- They spend a large portion of the day absorbing energy from the sun.

**Paper insulation (Figure 6)**



**Fig 5:** Paper insulation

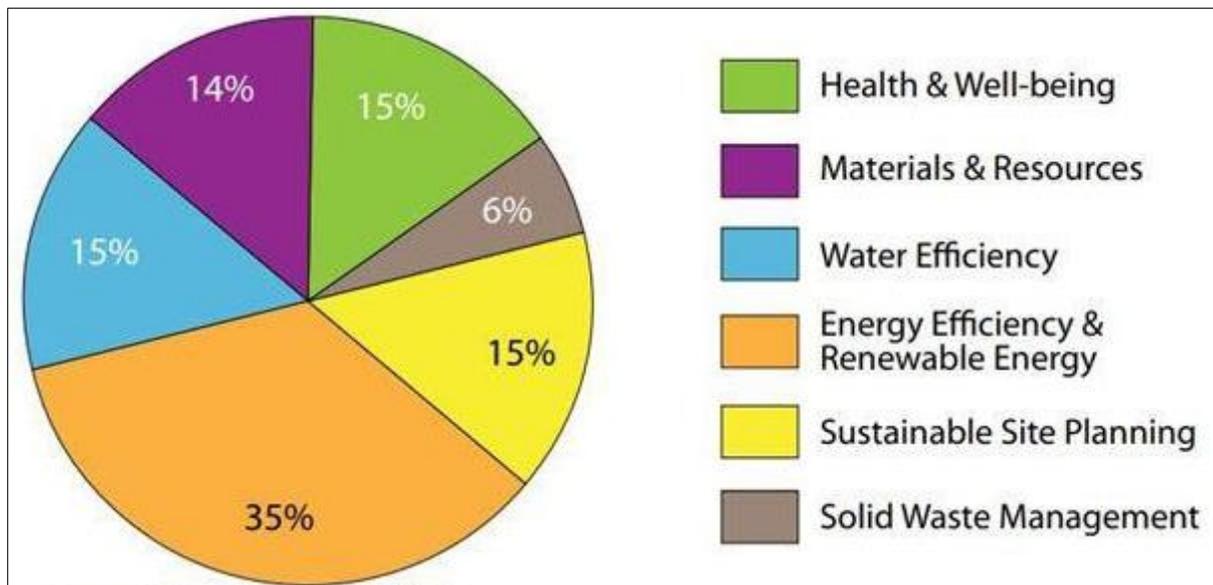
- Made from recycled newspapers and cardboard.
- Then filled with chemical foam.
- Insect resistant and fire retardant. Triple-glazed windows (Figure 7).



Fig 6: Triple glazed window

- Super-efficient windows.
- Stops heat to enter the building and from direct sunlight.
- Using bamboo replacing the steel bars.

**GRIHA Rating Criteria**



Source: Majumdar M (2008), TERI

Fig 7: Weighting of various criteria as per GRIHA

GRIHA provides a rating of up to five stars for green buildings and dispenses points based on criteria’s met by any builder. It comprises a set of 34 criteria, few of them are:

- > Preserving the existing landscape and protecting it from degradation during the process of construction can fetch 5 points.
- > Enhancing energy efficiency of outdoor lighting and promoting usage of renewable forms of energy to reduce the use of conventional/fossil-fuel-based energy resources can gain 3 points.
- > Preventing or minimization of air pollution from construction activities is also a GRIHA point.
- > Reducing volume, weight and time of construction by adopting efficient technology (such as pre-cast systems, ready-mix concrete) can fetch 4 GRIHA points.

**2] Leadership in energy and environment design (LEED)**

LEED (Leadership in Energy and Environmental Design) is the most widely used green building rating system in the world. It was the Indian Green Business Center (IGBC), under the Confederation of Indian Industries (CII) that facilitated the LEED rating of the United States Green Building Council (USGBC).

At present, to strengthen the global consistency of the LEED rating system, effective June 5, 2014, GBCI (Green Business Certification Inc.) began managing the certification process for all LEED rating systems in India, which was previously managed by the Indian Green Building Council (IGBC)

**Conclusions**

This paper study reported all the technical and also the economic aspects related to green buildings worldwide. Also, through this live case study of a small residential

bungalow in a small town of India it is expected to attract at least the researchers all over the world especially in India and also to all the readers towards planning of their new homes or retrofitting their old ones by simple modifications and converting it into a green or a sustainable building for future long term savings (economic aspects) and also for saving our environment (environmental aspects). The conclusion for the studies can be classified into three different categories i.e. definitions and scope of green building, benefits and costs of green building and ways to achieve green building. It has been observed that in most of the literature reviews, the focuses are on environmental aspects of sustainability such as energy consumption, water efficiency and greenhouse gas emissions and also with their technical solutions. Also, the life cycle assessment approach, which is extensively applied in the environmental aspects of green building can be a useful tool for social sustainability. New rating tools are developing rapidly worldwide. But more studies in these fields are required to support these new rating tools and also help in assisting the decision-making for the investors and the developers. Also, awareness amongst the people should be spread about the green building concepts and its long term profits. Current scenario is that people in countries like India are ignorant about this concept and also lack of awareness can be observed. Government initiative will help largely in spreading awareness.

Also, provisions of educating and training people or the occupants will help to regulate their behavior of using the green building which may affect the building performance significantly. Also, the discussion on cost and benefits of the green building are quite noticeable. It is also worth noticing that all the leading green building assessment tools are designed according to their local climatic and geographic conditions. Thus to set benchmarks for the world with references to green building, this point needs to be taken into considerations when comparing the effectiveness of these green building rating tools. The case study considered into this research paper is specially selected, designed, and constructed keeping in mind the green building concepts and its necessity to the environment and also to our pockets in the long considerations.

### Objectives

- i. Reducing trash, pollution and degradation of environment.
- ii. Efficiently using energy, water and other resources.
- iii. Protecting occupant health and improving productivity.

### Environmental Benefits

- Reduce wastage of water
- Conserve natural resources
- Improve air and water quality
- Protect biodiversity and ecosystems

### Economic Benefits

- Reduce operating costs
- Improve occupant productivity
- Create market for green product and services

### Social Benefits

- Improve quality of life

- Minimize strain on local infrastructure
- Improve occupant health and comfort

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