

# DEVELOPING GREEN BUILDING CONCEPT IN INDIA

Priyanka Rajiv Parikh

Bachelors of architect

[parikh.priyanka.11@gmail.com](mailto:parikh.priyanka.11@gmail.com)

## ABSTRACT---WHAT ARE GREEN BUILDINGS?

- *Buildings have major environmental impacts over their entire life cycle.*
- *Resources such as ground cover, forests, water, and energy are depleted to give way to buildings.*
- *A green building depletes the natural resources to the minimum during its construction and operation.*
- *The aim of a green building design is to minimize the demand on non-renewable resources, maximize the utilization efficiency of these resources, when in use, and maximize the reuse, recycling, and utilization of renewable resources.*
- *It maximizes the use of efficient building materials and construction practices; optimizes the use of on-site sources and sinks by bio-climatic architectural practices; uses minimum energy to power itself; uses efficient equipment to meet its lighting, air-conditioning, and other needs; maximizes the use of renewable sources of energy; uses efficient waste and water management practices; and provides comfortable and hygienic indoor working conditions.*

## I. INTRODUCTION

To an ever-increasing extent, the environment is dominated by structures that constitute the visible cultural landscape of everyday life, thus forming a complex pattern of function and meaning in which people's perception of the world, their attitudes, and sense of relationships with it are closely interrelated. With the global warming phenomena having a profound effect on planet earth, there is a significant need in both developed, industrial countries and developing countries to address environmental concerns, so that not just the ecology but also human societies have a better chance of coping with environmental change.

While environmental protection tends to mean high-tech energy systems and recycled materials in the western world, the word has much broader implications in many of the developing nations. It evokes a hope that is organic, dynamic, and ongoing in this age of rapid globalization and modernization. It is the responsibility of the design community to not only practice design within the context of the natural environment but also to educate people from other disciplines

about the adverse effect of bad design on health, safety, and welfare of people and planet earth.

The term sustainability and green that are often used interchangeably have gained recognition in the architecture, engineering and construction industry. Within the past decade as the world has become more sensitive to the issue of the environment and global climate change.

Building industry is producing second largest amount of demolition waste and green house gases (almost 40%). Resources such as ground cover, forests, water, and energy are depleted to construct and operate buildings. Resource-intensive materials provide the building envelope and landscaping add beauty to it – in turn using up water and pesticides to maintain it.

Energy-consuming systems for lighting, space conditioning and water heating provide comfort to its occupants. Hi-tech controls add intelligence to 'inanimate' buildings so that they can respond to varying conditions, and intelligently monitor and control resource use, security, and usage of fire systems etc.

In the building Water is another vital resource for the occupants, which gets consumed continuously during building construction and operation. Several building processes and occupant function generate large amount of waste. These all are polluting the environment and increasing greenhouse gases (GHG).

## II. GREEN BUILDING PLANNING CONCEPT AND STRATEGIES

The building design are looked into in an integrated way in a green building.

- Site planning.
- Building envelope design.
- Building system design.
- Heating ventilation and air conditioning (HVAC).
- Lighting, electrical, and water heating.
- Integration of renewable energy sources to generate energy onsite.
- Water and waste management.
- Selection of ecologically sustainable materials.
- Indoor environmental quality (maintain indoor thermal and visual comfort, and air quality).

#### A. Basic Green Building Design Strategies

- Carefully planning building orientation, making sure that smaller surfaces are facing east and west.
- Designing buffer zones on east and west facades like verandas, equipment rooms and staircases.
- Integrating screens to allow natural ventilation and cross ventilation to cool the building.
- Designing inclined windows on the south façade to avoid direct sun radiation on the windows.
- To avoid any openings like windows on the east and west.
- Using ceilings which reflect the natural light and bring it deep into the room.
- Using green roofs and green walls.
- Designing rainwater harvesting pits to collect all rainwater from the site.
- Designing proper waste management system to use as manure on site.

#### B. BENEFITS OF BUILDING GREEN

Various benefits from green buildings are discussed below-

- The immediate and most tangible benefit is the reduction in operating energy and water costs right from day one, during the entire life cycle of the building.
- Energy costs can be reduced by 25% - 30% in green buildings.
- A number of peoples are now seeing green building rating as a tool to enhance marketability.
- Green buildings provide financial benefits that conventional buildings do not. These benefits include energy and water savings, reduced waste, improved indoor environmental quality, greater employee comfort/productivity, reduced employee health costs and lower operations and maintenance costs.

#### C. Energy

Energy is a substantial and widely recognized that cost of building operations that can be reduced through energy efficiency and related measures that are part of green building design.

#### D. CHARACTERISTICS OF GREEN BUILDING

Building construction requires huge energy in lighting, air-conditioning, operation of appliances etc.

Green building i.e. energy efficient building is the one which can reduce energy consumption by at least 40% as compared to conventional building.

The cost of constructing energy efficient building is estimated to be 15 – 20% higher as compared to conventional building without energy efficiency.

However, this is more than compensated over the period of time i.e. during life cycle cost and operation & living.

Using green building materials and products, promotes conservation of non-renewable resources internationally and also reduces environmental impacts associated with the extraction transport, processing, fabrication, installation, reuse, recycling, and disposal of these building industry source materials.

#### III. GREEN BUILDING PRODUCT AND MATERIALS

Green building materials are composed of renewable, rather than nonrenewable resources. Green materials are environmentally responsible because impacts are considered over the life of the product. Depending upon project-specific goals, an assessment of green materials may involve an evaluation of one or more of the criteria listed below.

- [Resource efficiency](#)
- [Indoor air quality](#)
- [Energy efficiency](#)
- [Water conservation](#)
- [Affordability](#)

1. **RESOURCE EFFICIENCY** can be accomplished by utilizing materials that meet the following criteria:

- **Recycled content:** products with identifiable recycled content, including postindustrial content with a preference for postconsumer content.
- **Natural, plentiful or renewable:** materials harvested from sustainably managed sources and preferably have an independent certification (e.g., certified wood) and are certified by an independent third party.
- **Resource efficient manufacturing process:** products manufactured with resource-efficient processes including reducing energy consumption, minimizing waste (recycled, recyclable and or source reduced product packaging), and reducing greenhouse gases.
- **Locally available:** building materials, components, and systems found locally or regionally saving energy and resources in transportation to the project site.
- **Salvaged, refurbished, or remanufactured:** includes saving a material from disposal and renovating, repairing, restoring, or generally improving the appearance, performance, quality, functionality, or value of a product.
- **Reusable or recyclable:** select materials that can be easily dismantled and reused or recycled at the end of their useful life.
- **Recycled or recyclable product packaging:** products enclosed in recycled content or recyclable packaging.
- **Durable:** materials that are longer lasting or are comparable to conventional products with long life expectancies.

2. **INDOOR AIR QUALITY** is enhanced by utilizing materials that meet the following criteria:

- **Low or non-toxic:** materials that emit few or no carcinogens, reproductive toxicants, or irritants as

demonstrated by the manufacturer through appropriate testing.

- **Minimal chemical emissions:** products that have minimal emissions of volatile organic compounds (VOC). Products that also maximize resource and energy efficiency while reducing chemical emissions.
  - **Low-voc assembly:** materials installed with minimal voc-producing compounds, or no-voc mechanical attachment methods and minimal hazards.
  - **Moisture resistant:** products and systems that resist moisture or inhibit the growth of biological contaminants in buildings.
  - **Healthfully maintained:** materials, components, and systems that require only simple, non-toxic, or low-voc methods of cleaning.
  - **Systems or equipment:** products that promote healthy iaq by identifying indoor air pollutants or enhancing the air quality.
3. **ENERGY EFFICIENCY** can be maximized by utilizing materials and systems that meet the following criteria:
- Materials, components, and systems that help reduce energy consumption in buildings and facilities.
  - 4. **WATER CONSERVATION** can be obtained by utilizing materials and systems that meet the following criteria:
- Products and systems that help reduce water consumption in buildings and conserve water in landscaped areas.

#### 5. **AFFORDABILITY**

It can be considered when building product life-cycle costs are comparable to conventional materials or as a whole, are within a project-defined percentage of the overall budget.

#### A. **ADVANTAGES OF USING GREEN BUILDING MATERIALS**

Green building materials offer some or all of the following benefits to the building owner and building occupants:

- Reduced maintenance/ replacement costs over the life of the building
- Energy conservation
- Improved occupant health and productivity
- Life cycle cost savings
- Lower costs associated with changing space configurations.
- Greater design flexibility

#### B. **SUSTAINABLE DEVELOPMENT:**

According to United Nations world commission on environment and development, sustainable development is defined as “development that meets the need of present generation without comprising the ability of future generation to meet their own needs.

#### C. **BENEFITS FOR BUILDING OWNERS**

- Potential higher occupancy rates.
- Higher future capital value.
- Reduced risk of obsolescence.
- Less need for refurbishment in the future.
- Ability to command higher lease rates.
- Higher demand from institutional investors.
- Mandatory for government tenants.
- Lower tenant turnover.
- Costs less to maintain and operate.

#### D. **COST OF BUILDING GREEN**

- Green buildings are commonly perceived to be a lot more expensive than conventional buildings and often not worth the extra cost. Considerable research and analysis has been carried out with regard to the cost impacts of a green building. The cost could be slightly higher than a conventional building.
- The incremental cost is always relative and depends on the extent of eco-friendly features already considered during design. The incremental cost would appear small if the baseline design is already at a certain level of good eco-design; it would appear huge if the base design has not considered green principles.
- The second thing is to look at the incremental cost in relation to the life cycle cost.
- This kind of an approach could be revealing. No one knows that, buildings would last for how many years. Over its life cycle, the operating cost would work out to 80-85 % while the incremental cost which is a one-time cost is only about 8-10 %. There is a decreasing trend in the incremental cost over the years.

#### E. **GRIHA – GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT...**

Griha is India’s national rating system for green buildings. It has been developed by teri (the energy and resources institute) and is endorsed by the MNRE (ministry of new and renewable energy).

It is based on nationally accepted energy and environmental principles, and seeks to strike a balance between established practices and emerging concepts, both national and international.

Griha attempts to minimize a building’s resource consumption, waste generation, and overall ecological/environmental impact by comparing them to certain nationally acceptable limits / benchmarks.

Griha is a point based rating system that consists of 34 criteria categorized under various sections such as site selection and site planning, conservation and efficient utilization of resources, building operation and maintenance, and innovation points.

#### F. THE BENEFITS OF GRIHA...

On a broader scale, this system, along with the activities and processes that lead up to it, will benefit the community at large with the improvement in the environment by reducing ghg (greenhouse gas) emissions, reducing energy consumption and the stress on natural resources.

Some of the benefits of a green design to a building owner, user, and the society as a whole are as follows:

- Reduced energy consumption without sacrificing the comfort levels.
- Reduced destruction of natural areas, habitats, and biodiversity, and reduced soil loss from erosion etc.
- Reduced air and water pollution (with direct health benefits).
- Reduced water consumption.
- Limited waste generation due to recycling and reuse.
- Reduced pollution loads.

#### WHAT IS TO BE DONE TO MAKE BUILDING GREEN?

- The study and selection of site should be done based on ecological considerations and holistic perspective for living of people.
- Existing features should be kept undisturbed and design to be done under its consideration.
- Proper underground drainage should be provided. The topography of land should be used for the flow of drainage which would minimize addition pumping cost.
- Soil conservation to be done on site itself by using top soil for landscape.
- Erosion of loose soil to be prevented by growing plantation on it.
- Shades should be provided at least 40% of non-roof impervious surface on site with help of pergolas and tress etc.
- Use tress on east and west sides maximum to reduce direct heat from sun.
- Water bodies should be used where possible for evaporative cooling effect.
- Maximum strategies for thermal comfort should be designed by using shading devise for windows. Vegetation should be planted for shading specially on east, west and south
- Indoor air speed can we improved by providing smaller inlets and large outlets.
- Longer axis of building should be parallel to East-West direction to minimize heat gain.
- Maximum openings to be given on north south for diffused day light, from north in summers and for south to get heat in winters.
- Building form should be compact to minimize heat loss.
- Glazing that allows maximum natural light should be provided.

- Windows and habitable areas should be placed in wind direction.
- Roof garden can provided to minimize heat gain in building.
- Low voc materials to be used in the building which reduces the carbon emission

#### IV. CONCLUSION

Benefits of building green include cost savings from reduced energy, water, and waste; lower operations and maintenance costs; and enhanced occupant productivity and health.

Despite data limitations and the need for additional research in various areas, the data demonstrates that building green is cost-effective today, particularly for those projects which start “green” design early in the process.

Moreover, achieving higher green building construction area in India would require-

- Bridging the knowledge gap on sustainable building strategies, which exists at various levels within the industry.
- Enforcing implementation of strategies to encourage adoption of sustainable, green and energy efficient buildings; and conducting research and development on technology for lowering costs.
- Support and cooperation between all the people of the sector is required. The immediate actions to be considered in developing a sustainable buildings.
- Developing a business model to provide a further impetus to initiatives to minimize the detrimental impacts of construction on the environment and society.
- Introducing a green rating for residential developments and directing real estate developers to adopt this.
- Developing, enforcing and implementing sustainability performance benchmarking for industry sectors.
- The energy saved can be used for further development which creates a large employment opportunity.
- The technologies and the materials used for development should complement the use of local and waste resources.

It can be a key note for the developing country like India that the measures called for sustainable development can be the measures of poverty alleviation.

#### REFERENCES

- Lynn M. Froeschle, "Environmental Assessment and Specification of Green Building Materials," The Construction Specifier, October 1999.
- National rating system -GRIHA booklet  
Ministry of New and Renewable Energy,  
Government of India, and  
The Energy and Resources Institute, 2008.