

# Green building in India

Rashmi Aggarwal, Narinder Kaur, YMCA University of Science and tech., Faridabad

**Abstract**—Energy demand of India is rising day by day. The increase in energy demand is due to the economic growth, rising income levels and availability of better goods and products. There is equal pressure on the natural and environmental resources due to the economic growth. Human activities are causing irreversible damage to the global environment. Definitely it will have adverse impact on the life of future generation. The increasing concern for the environment, in response to the global warming, is driving thinkers to seek sustainable energy solutions. Green building uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier space for occupants, as compared to a conventional building. Green Building is 'high-performance building,' 'sustainable design' and 'preserving precious resources'. This paper will try to emphasis on the green building benefits and also will try to show the decision maker that even though there are risks factors involved of going green, these can be managed. The main purpose of this paper is to develop a framework for benefits and risks of retrofitting existing buildings to green standards. The Indian companies should think on the idea of the green building projects in India.

## I. INTRODUCTION

In recent days, the concept of the “green” buildings is getting popularity day-by-day. It is best way to reduce the resource footprint of traditional buildings. Green building is one which uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier space for occupants, as compared to a conventional building. The conventional buildings construction and operation consumes large amount of water and electricity. And also, they produces large amount of waste and have adverse impact on the life of many people. Green building design is preserving the interrelationship between nature and buildings.

## KEY ATTRIBUTES OF GREEN BUILDING

It is expected that green buildings will be efficient in their use of energy, water and other resources. It also has lower energy, operating, and life cycle costs and can, thus, yield

higher building values.

## INDIAN GREEN BUILDING COUNCIL (IGBC)

The Indian Green Building Council (IGBC), was formed in the year 2001 by Confederation of Indian Industry. IndianGreen Building Council (IGBC) Green Homes is the first rating programme developed in India. It is based on accepted energy and environmental principles. It strikes a balance between known established practices and emerging concepts.

## BENEFITS OF GREEN BUILDING

The benefits of the green building can be categorized along three fronts- environmental, social and economic.

### 1. ENVIRONMENTAL BENEFITS

The environmental benefits of having green buildings are:

- Reduces waste generation (any type either liquid or solid)
- Efficient water management
- Uses minimum energy
- Minimizes pollution (air, water, soil etc.)
- Maximizes the use of renewable energy sources
- Depletion of the natural resources will be minimizing
- Emissions like carbon-dioxide/GHG will be reduced.

### 2. SOCIAL BENEFITS

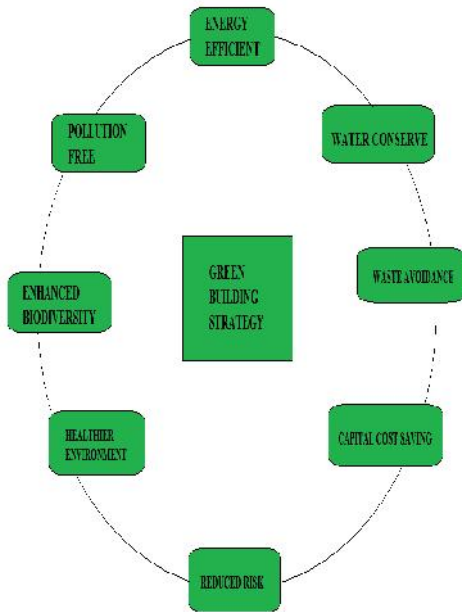
The social benefits of having green buildings are:

- Habitable working and living environment for the workers and minimal negative impact on the surroundings
- Improved health of the occupants.

### 3. ECONOMIC BENEFITS

The economic benefits of having green buildings are:

- Overall operating cost is less
- Capital cost saving
- Higher future value of property
- Reduce life cycle energy cost
- Improvement of employee productivity and satisfaction
- Increased productivity
- Lower health related costs
- Lower litigation risks because of improved indoor air quality.



GREEN BUILDING RATING SYSTEM

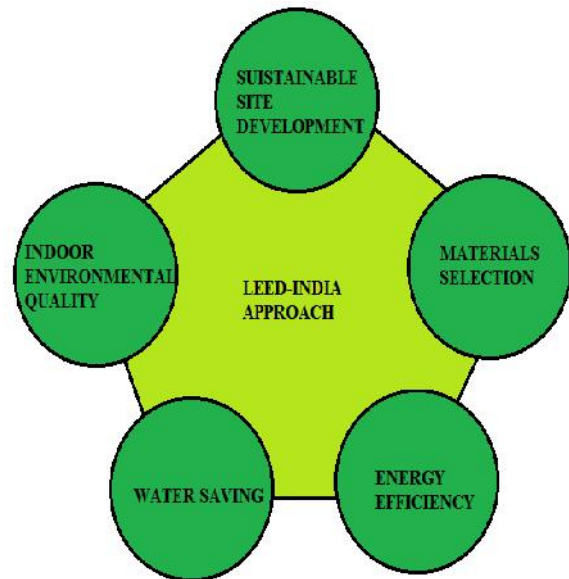
It is basically a tool in measuring and evaluating the environmental performance of a building. These rating systems cover a broad range of environmental considerations. From the building site selection, design, and construction, to building operations and workspace quality are considered in it.

The most widely recognized certification system around the world today is the LEED (Leadership in Energy and Environmental Design) and GRIHA (Green Rating for Integrated Habitat Assessment).

## 1. LEED-INDIA

It is developed by the United States Green Building Council (USGBC) in 1998. It is internationally and nationally accepted benchmark for the design, construction and operation of high performance green buildings.

According to the Indian Green Building Council, the market for LEED-rated green buildings in India is projected to increase to a \$5 billion by 2012. And the total market for green building materials and equipment is estimated to be more than 10 times the size of the LEED-rated green building market in India. The new version of LEED (LEED v3), launched in April 2009, emphasized more on carbon-dioxide emissions and energy performance. LEED has application categories of new construction (LEED-NC), existing buildings operation and maintenance (LEED-EB), core and shell (LEED-CS) commercial interiors (LEED-CI) homes, schools and healthcare. LEED-NC is a green building rating system that helps to guide and design high-performance commercial buildings. LEED-CS is a set of performance standards for certifying the design and construction of Core and Shell buildings.



## 2. GRIHA

It is basically a tool to evaluate the ‘greenness’ of a building in India. The Energy and Resources Institute (TERI) developed GRIHA in 2007.

It is accepted as the national rating system for green buildings by the Ministry of New and Renewable Energy (MNRE), Government of India. It is suitable for all kinds of buildings in different climatic zones of the country.

The main purpose of GRIHA is to provide a series of guidelines and benchmarks to those interested in construction of a sustainable and green building. All new buildings of the central government/public sector undertakings would at least meet the requirements of GRIHA-3 Star. This star base rating system consists of 34 criteria (which are categorized under various sections) and 100 point system with differential weightage and applicability of various criteria. The minimum points required for certification is 50.

#### MYTH ABOUT GREEN BUILDINGS

Many people think that green building is expensive. They think that green building means insulation, highperformance glass, energy-efficient lighting and HVAC equipment, control systems, all of which are expensive, and renewable systems, such as solar PV, windmill, which are also expensive.

#### FACT ABOUT GREEN BUILDINGS

A research study done by TERI on seven green-rated buildings shows that green buildings are cheap than conventional buildings. Even though the capital investment for these green buildings are higher than conventional buildings. Cash savings that take place through these green buildings not only compensate for the initial cost increment, but provide benefits to the occupants throughout the lifetime of the building.

#### OBSTACLES IN THE PATH OF GREEN BUILDINGS

There are many obstacles that are often come path in the success of the green buildings. Some of these obstacles are:

- Absence of the integrated design approach
- Lack of awareness of low-cost solar passive principles
- Extensive cost of the certification process, including consultancy for green building
- Higher construction cost due to the lack of knowledge.

#### OVERCOMING THESE OBSTACLES

The real challenges for green buildings in India lie in

creating market mechanism using some methods. These methods are:

- Improving certified training, quality education:  
People in India should adopt integrating approaches. They should be aware about the greenness in the building. Our country should have credible institutions to provide training and education the area of green buildings.
- Implementing proven financial mechanism:  
India should work on their financial mechanism, such as loans with lower interest rates, reduced taxes, and tariff on carbon-dioxide emissions of green building rating system.

#### GREEN BUILDING PROJECTS IN INDIA

1. Biodiversity Conservation India Ltd (BCIL)
2. Suzlon Energy Limited– Pune
3. Olympia Technology Park-Chennai
4. ITC Green Centre – Gurgaon
5. The Druk White Lotus School-Ladakh
6. Doon School- Dehradun
7. Nokia- Gurgaon

#### CONCLUSION

The market growth and demand for green building will continue to grow in time with more experienced professionals, higher performance & quality and reduced cost.

Green building is the solution to many problems from environmental to financial, from community to industrial. The future of green building will be carbon neutral and zero emission buildings. In the future, green building will be the common practice for the construction industry and common necessity for owners, facility managers and tenants in if not now.

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