

DEVELOPMENT OF AFFORDABLE GREEN BUILDINGS IN INDIA : OPPORTUNITIES AND CHALLENGES

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WHAT IS GREEN BUILDING?

According to the World Green Building Council (WGBC) [1], a green building is the one which is energy-efficient in its design, construction and operation and has no negative impacts on our environment.

FEATURES OF GREEN BUILDING

- Energy efficiency
- Use of renewable energy
- Pollution and waste reduction management systems
- Proper ventilation systems
- Use of emission-free materials
- Enhancements of quality of life of occupants

HISTORY OF GREEN BUILDINGS IN INDIA

- With first platinum rate award been given to CII- Sohrabji Green business Centre building in Hyderabad in India, the green building movement gained acceleration in its growth.
- To promote its growth, India Green building Council (IGBC) was established as part of Confederation of Indian Industry (CII) in the year 2001.
 - Responsible for building a green building certification system.
 - Responsible for conduct training programmes for capacity building.

HISTORY OF GREEN BUILDINGS IN INDIA (Contd.)

- Another contribution was been made by The Energy and Resources Institute (TERI) by establishing another popular certification system named GRIHA.
- It is an independent platform which handles the administrative and scientific issues related to sustainable habitats.

GREEN BUILDING GROWTH IN INDIA

- India witnesses continuous augmentation of green building growth including both commercial and residential buildings.
- India ranks among the top ten countries in LEED registering more than 650 projects under LEED-India.
- According to the IGBC annual report of 2016-17, India ranks second in the world in terms of largest registered green building footprint.

GREEN BUILDING GROWTH IN INDIA (Contd.)

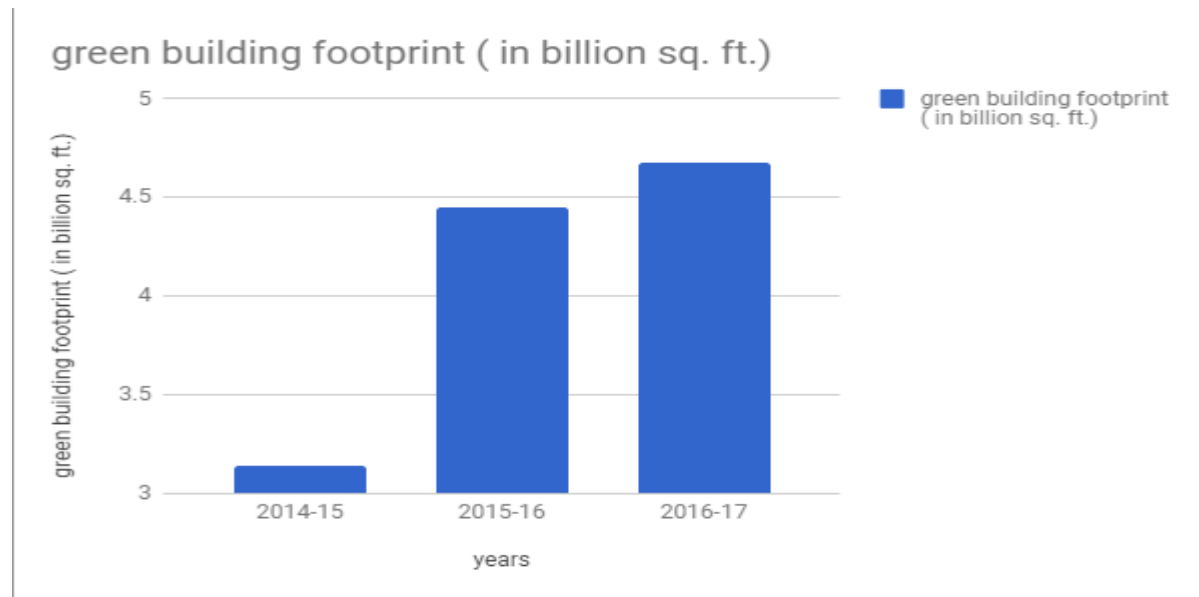


FIGURE-1: GROWTH OF GREEN BUILDING FOOTPRINT IN INDIA

OUR WORK

In our study we:

- Analyse the development of affordable green buildings.
- Mention the practical challenges and opportunities involved in the green building construction.

CHALLENGES AND OPPORTUNITIES

- We follow the seven staged analysis approach of green building construction given by British Columbia Buildings Corporation [2].
- We mention the challenges faced by the builders during this course along with opportunities at every stage.

METHODOLOGY

- This study is conducted using qualitative approach via a semi-structured interview.
- Case study of Centre for Environment and Engineering, IIT Kanpur , a GRIHA 5 star rated green building has been done.
- Other studies related to the green buildings challenges have been analysed.

CHALLENGES

STAGE 1: SELECTION OF SITE AND CONSTRUCTION PLANNING

- Conducting developmental project in brownfield land
 - Lack of properly formulated policy
 - Authenticated data availability on properties owners of buildings
 - Lack of multiple stakeholder contribution.
- Handling construction waste
 - Congested construction sites
 - Lack of ownership of waste
 - Lack of awareness among the construction workers

STAGE 1 (contd.)

- Financing R&D IN GREEN BUILDING
 - High initial cost of green technologies.
 - Lack of demand for green buildings.
 - Lack of awareness among builders makes investors lose their confidence.

STAGE 2: SELECTION OF DESIGN TEAM

- Shortage of educated or skilled staff in India with lack of knowledge in Life Cycle Assessment (LCA) or Capital Cost Accounting.
- Vulnerability of the projects:
 - Which aggravates as design team is incapable of understanding site specific environmental issues.

STAGE 3: SITE DESIGN

The major issue is faced in design of water harvesting systems

- A large portion of India receives less than average annual rainfall.
- States like Haryana, Bihar, Manipur, Uttar Pradesh, Manipur etc. witness deficit of annual rainfall indicating that rainfall harvesting cannot be a dependable source of water [3].
- Lack of understanding and data availability on local hydrological regimes affect the cost structure and potentiality of rainwater harvesting [4].

STAGE 4: BUILDING DESIGN

- Cost of deployment or installation of small wind turbines, solar heaters, solar PV panels, biomass gasifiers inside the buildings is high.
- Inflated maintenance cost.
- Renewable energy technologies are still in their maturing stage and do not produce much demand in market.

STAGE 5: INTERIOR FINISHES AND APPLIANCES

- Lack of economic incentives on energy-efficient equipment.
- Builders or investors are unaware of economic incentives gained from energy-efficient buildings in the long run.
- Non-mandatory nature of ECBC rules gives builders an opportunity to circumvent the guidelines.

STAGE 6: SPECIFICATIONS

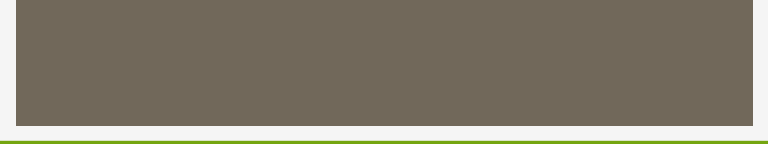
- Assessment is not carried out using an appropriate method and data revealed is not accurate.
- Lack of awareness and motivation for data collection and its importance.

STAGE 7: OPERATION AND MAINTENANCE

- High cost of operation and maintenance of buildings
- Degrading air quality responsible for high depreciation cost of equipment.
- Data on savings on operation and maintenance cost are not properly evaluated.



OPPORTUNITIES

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- Large brownfield area which are unproductive and have easy access to nearby city amenities.
 - International cooperation in this sector has provided India the opportunity to import cost-effective technologies.
 - India is endowed with large amount of skilled unemployed youth which can be trained in the field of sustainable architecture and technologies.

- Potentialities in energy from renewables:
 - It is fourth largest wind power producer in the world.
 - Innovations in biomass energy systems.
 - being a tropical country, it is rich with solar energy. It receives solar radiations equivalent to 5,000 trillion kWh/year.

- Abundance of sustainable materials used in Green buildings-
 - Bamboo, cotton, natural rubbers, straw etc. can be utilised in the green buildings in the form of carpets, floors etc.
 - Period of 2016-17 witnessed high level production of cotton of 33.09 million of bales [5].
 - The annual production of bamboo is estimated to be 4.6 million tonnes [6].
 - In case of natural rubber, production is continuously rising over the past years from 950721 tonnes in the year 2015 to 952806 tonnes in the year 2016 [6].

FUTURE WORK TO BE INCLUDED

- Comparative analysis of green buildings vs. conventional buildings
- Provide suggestions for a sustainable and cost-effective green building growth.

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THANK YOU!