

GREEN BUILDINGS IN INDIA: A ROAD MAP TO SUSTAINABLE ENVIRONMENT

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Abstract—A green building is one which uses less water, optimises energy efficiency, conserves natural resources, generates less waste and provides healthier spaces for occupants, as compared to a conventional building. Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from sitting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or high performance building.

On the aesthetic side of green architecture or sustainable design is the philosophy of designing a building that is in harmony with the natural features and resources surrounding the site. There are several key steps in designing sustainable buildings: specify 'green' building materials from local sources, reduce loads, optimize systems, and generate on-site renewable energy. Green building practices aim to reduce the environmental impact of new buildings. Buildings account for a large amount of land use, energy and water consumption, and air and atmosphere alteration. Considering the statistics, reducing the amount of natural resources buildings consume and the amount of pollution given off is seen as crucial for future sustainability, according to EPA the building sector alone accounts for 30-40 percent of global energy use.

The concept of sustainable development can be traced to the energy (especially fossil oil) crisis and the environment pollution concern in the 1970s. The green building movement in the U.S. originated from the need and desire for more energy efficient and environmentally friendly construction practices. There are a number of motives to building green, including environmental, economic, and social benefits. However, modern sustainability initiatives call for an integrated and synergistic design to both new construction and in the retrofitting of an existing structure. Green building brings together a vast array of practices and techniques to reduce and ultimately eliminate the impacts of new buildings on the environment and human health. It often emphasizes taking advantage of renewable resources, e.g., using sunlight through passive solar, active solar, and photovoltaic techniques and using plants and trees through green roofs, rain gardens, and for reduction of rainwater run-off. Many other techniques, such as using packed gravel or permeable concrete instead of conventional concrete or asphalt to enhance replenishment of ground water, are used as well.

Index Terms—Component, formatting, style, styling, insert.
(key words)

I. INTRODUCTION (HEADING 1)

Green Building requires combined efforts of the government and community dependent on the natural resources for their livelihood. This necessitates the government to promote green building construction, for that government has to make policies to give subsidies on all aspects of green building construction (design, material, solar or wind and other renewable energy sources plants, rain-water harvesting plants etc.), and minimising taxes. There is a need for facilitating institutions to create interactive forums to bridge the gap between people's needs and government policies and evolve models of participatory natural resources management. It is especially relevant in countries like India where the traditional livelihoods of people are symbiotic to the environment around them. There is need to explore various interventions at different levels to bring environment on the policy (national level) and community participation (at the grassroots) agenda.

II. AIMS AND OBJECTIVES

The main emphasis of this work is to promote and make people aware about the need of construction of green buildings.

- To conserve natural resources and minimise environmental degradation through Green Buildings construction at grass root level.
- Individual green building technologies with the proper synergistic design, may work together to produce a greater cumulative effect. Present work is an attempt to highlight the importance of green buildings in energy conservation in order to spread awareness among general public.

III. SIGNIFICANCE OF THE STUDY

India is the second largest populated country of the world. The construction and expansion of cities in India is mostly unplanned. For the sustainable development in India there is a dire need to conserve natural resources. There are many ways to conserve resources, but this study emphasis on grass root level conservation. This is possible only when everybody realise its responsibility.

IV. LITERATURE REVIEW

Many works have been done on different aspects and impacts of green Building. Brief review of literature is carried out for a better understanding of the topic.

A recent survey by U.S. Green Building Council shows that many of its members believe sustainable building design will become a more common practice once the human benefits are identified, primarily the productivity gains believed to be associated with the provision of high quality interior environments (USGBC, 1999).

A number of articles and case studies show a strong positive correlation between the work performance of employees and the building in which the process takes place. For example, Romm and Browning (1998) reported eight case studies that show up to a 16% improvement in productivity between the employees in existing facilities and the employees in re modeled or new facilities designed according to green building principles. Heerwagen (2001) found significant productivity gains and reported that the workers' "overall [positive] feeling about the environment" increased by 60 per cent.

Literature suggests the awareness and discussion of the environmental and economic impacts of building over design, specification and use of contingency margins is not new but has been with us for some decades (Lovins, 1992; Sorrell 2001; Romm & Browning, 1998). Bordass (2000) suggests that this "collective amnesia" is simply the property industry's mechanism to resist change. Clearly there must be some truth to the notion.

V. METHODOLOGY AND DATA

The present work is mainly an applied research and aims to solve the problems of management and sustainable natural resources by enriching the field of application of Green Buildings. Further the study is also emphasis how things can change with the involvement of community and public participation. Applied research is concerned with actual life research such as research on natural resources conservation, pollution control, etc. Obviously, such research has immediate potential applications. Present work is advances the theory and practice of green building with new approaches to the general public role in making green buildings, integrative strategies to reduce greenhouse gas emissions, new insights into the development and evaluation of public policies, and new approaches to understanding the cost and value premiums associated with sustainable projects. Active research work is focused on spreading awareness among communities. Make people aware by developing tools and educational resources to help in sustaining natural resources by constructing green buildings or at least by using and applying some of the methods to conserve resources and make a pollution free environment.

Data mainly has been collected from various secondary sources e.g. annual reports, bulletins and surveys of The Leadership in Energy and Environmental Design (LEED INDIA), Indian Green Building Council (IGBC), Surveys conducted by school of Architecture and Planning, New Delhi etc.

VI. GREEN BUILDINGS SCENARIO IN INDIA

The Leadership in Energy and Environmental Design (LEED-INDIA) Green Building Rating System is a nationally and internationally accepted benchmark for the design, construction and operation of high performance green buildings. LEED-INDIA provides building owners, architects, consultants, developers, facility managers and project managers the tools they need to design, construct and operate green buildings.

LEED-INDIA promotes a whole-building approach to sustainability by recognizing performance in the following five key areas:

- Sustainable site development
- Water savings
- Energy efficiency
- Materials selection and
- Indoor environmental quality

The Leadership in Energy and Environmental Design LEED INDIA Green Building Rating System is a nationally accepted benchmark for the design, construction and operation of high performance green buildings. There are 150 LEED registered green buildings in India, out of this only 23 LEED certified. Most of the registered buildings for LEED-INDIA rating are private offices, private corporate offices, private institutions, private IT parks. Out of 150 only 10 green Buildings are Public.

India is in the infant stage in the making of Green Buildings. Whatever buildings are registered major share is of private sector, while the public sector share is negligible. Mainly offices, corporate offices, institutions and parks are green buildings in India. No indication of private small level planning e.g. private houses, small offices etc. Keeping in mind the above constraints, the researcher is hopeful that present study would be a stepping stone in this direction.

IGBC GREEN HOMES RATING SYSTEM

Indian Green Building Council (IGBC) Green Homes is the first rating programme developed in India, exclusively for the residential sector. It is based on accepted energy and environmental principles and strikes a balance between known established practices and emerging concepts. The system is designed to be comprehensive in scope, yet simple in operation.

VII. BENEFITS OF GREEN HOMES

A Green Home can have tremendous benefits, both tangible and intangible. The immediate and most tangible benefit is in the reduction in water and operating energy costs right from day one, during the entire life cycle of the building.

VIII. TANGIBLE BENEFITS

- Energy Saving: 20-30%
- Water Saving: 30-50%

IX. INTANGIBLE BENEFITS

- Enhanced air quality,
- Excellent day lighting, □ Health and wellbeing of the occupants,
- Conservation of the scarce national resources

X. ELIGIBILITY

IGBC Green Homes Rating System is a measurement system designed for rating new residential buildings which include construction categories such as:

- Individual homes
- High rise residential apartments
- Row homes
- Existing Residential buildings which retrofit and resigned in accordance with the IGBC Green homes Criteria.

XI. CONCLUSIONS

In India some world class Green Buildings have constructed in past few years, but still the concept of green buildings for general masses is in infancy stage. Present work is an attempt in the direction to make people, communities and general public aware about the advantages of green buildings for sustainable environmental development and management. For that four sustainability steps offer a way to achieve successful energy efficiency.

- Measure energy use to identify potential savings and malfunctions
- Install low consumption equipment and systems
- Improve long term use by deploying automation management, consulting, training and tracking resources while maintaining high performance.
- Continuously analyse energy savings through maintenance, supervision and monitoring.

REFERENCES

- [1] Bordass, B., 2000, Cost and value: fact and fiction, Published in, *Building Research and Information*, Vol 28 number 5/6 SeptDec 2000, pp338-352.
- [2] California Integrated Waste Management Board. (January 23, 2008). Green Building Home Page Retrieved November 24, 2010 from <http://www.ciwmb.ca.gov/GREENBUILDING/basics.htm>
- [3] California Sustainability Alliance, Green Buildings. Retrieved June 16, 2010, from http://sustainca.org/programs/green_buildings_challenges
- [4] Duurzaam en Gezond Bouwen en Wonen by Hugo Vanderstadt Fedrizzi, Rick, "Intro – What LEED Measures." United States Green Building Council, October 11, 2009.
- [5] Finch, P., 2002, BCO; Getting best value out of office design, IN *The Architects Journal*, 14 March 2002, p14.
- [6] Fuerst, Franz; McAllister, Pat. An Investigation of the Effect of Eco-Labeling on Office Occupancy Rates. 2009. Retrieved: November 5, 2010
- [7] Fuerst, Franz; McAllister, Pat. Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Property Values. 2009. [Retrieved: November 5, 2010
- [8] Hawken, P., Lovins, A., Lovins, L. 2000, *Natural capitalism – the new industrial revolution*, Little Brown and company. USA.
- [9] Hopkins, R. 2002. *A Natural Way of Building*. Transition Culture. Retrieved: 2007-03-30.
- [10] Kats, Greg, Leon Alevantis, Adam Berman, Evan Mills, Jeff Perlman. *The Cost and Financial Benefits of Green Buildings*, November 3rd, 2008.
- [11] Kats, Greg; Alevantis Leon; Berman Adam; Mills Evan; Perlman, Jeff. *The Cost and Financial Benefits of Green Buildings*, October 2003, Retrieved: November 3rd, 2008.
- [12] Langdon, Davis. *The Cost of Green Revisited*. Publication. 2007.
- [13] Lange, Jorg; Grottker, Mathias; Otterpohl, Ralf. *Water Science and Technology, Sustainable Water and Waste Management In Urban Areas*, June 1998. Retrieved: April 30, 2008.
- [14] Lee YS, Guerin DA, *Indoor environmental quality differences between office types in LEED-certified buildings in the US*, *Building and Environment* (2009),
- [15] Lovins, A., 1992, *Energy Efficient Buildings: Institutional Barriers and Opportunities*, Lawrence Berkley National Laboratory, Strategic Issues Paper, December.
- [16] Lovins, A & Browning, W., 1992., *Negawatts for Buildings*, accessed at: <http://www.rmi.org> last accessed 10/03/02. P 1-9.
- [17] Mackley, C. J., 2002, *Economics of sustainable building*, RAI Environment Design Guide, February 2002, Gen 44, pp1-8.
- [18] Mackley, C. J., 2001 (a), *Application of LCA and LCC tools for decision making in design*, Guest Lecture as part of Royal Melbourne Institute of Technology, Life Cycle Decision Making Short Course, RMIT, Melbourne 18-19 October, 2001.
- [19] Mackley, C.J., 2001 (b), *Delivering 5 star energy efficient commercial buildings*, 6th Commercial Building Energy Forum, Summary Notes, Sustainable Energy Authority, Victoria, June 12, Melbourne.
- [20] Mao, X., Lu, H., & Li, Q. (2009). *International Conference on Management and Service Science, 2009. MASS '09.*, 1-5. doi:10.1109/ICMSS.2009.5303546
- [21] Pivo, Gary; Fisher, Jeffrey D. *Investment Returns from Responsible Property Investments: Energy Efficient, Transit-oriented and Urban Regeneration Office Properties in the US from 1998-2008*. 2009. Retrieved: November 5, 2010
- [22] Pushkar, S., Becker, R., & Katz, A.(2005). *A methodology for design of environmentally optimal buildings by variable grouping*. *Building and Environment*, 40. doi:10.1016/j.buildenv.2004.09.004
- [23] Romm, J. and Browning, W. 1998, *Greening the building and the bottom line*, Rocky Mountain Institute, USA.
- [24] Shah S. D. *New Urbanism - An Automated Approach*, GIS Development, 2008
- [25] Simpson, J.R. *Energy and Buildings, Improved Estimates of tree-shade effects on residential energy use*, February 2002, Retrieved:2008-04-30.

- [26] Shipworth, D., 2002, Environmental impact mitigation is not sustainable development, editorial, in *Building, Research and Information*, 30(2), 139-142.
- [27] Sorrell, S., 2001, *Making the Link: Climate Policy and the Reform of the UK Construction Industry*, Draft paper for submission to Energy Policy, Environment Group, University of Sussex, Brighton, UK.
- [28] U.S. Environmental Protection Agency. (October 28, 2009). Green Building Basic Information. Retrieved December 10, 2009, from <http://www.epa.gov/greenbuilding/pubs/about.htm>
- [29] U.S. Environmental Protection Agency. (October 28, 2009). Green Building Home. Retrieved November 28, 2009, from <http://www.epa.gov/greenbuilding/pubs/components.htm>
- [30] WBDG Sustainable Committee. (August 18, 2009). Sustainable. Retrieved November 28, 2009, from <http://www.wbdg.org/designsustainable.php>
- [31] WBDG Sustainable Committee. (August 18, 2009). Sustainable. Retrieved October 28, 2009, from <http://www.wbdg.org/design/ieq.php>
- [32] WBDG Sustainable Committee. (August 18, 2009). Sustainable. Retrieved November 28, 2009, from http://www.wbdg.org/design/optimize_om.php
- [33] Williams, A., 2001, Quay to Success, Published in *AJ Building Study*, Vol 214, No. 16, November, pp28-37.