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Techniques and Practices in Green Building in India

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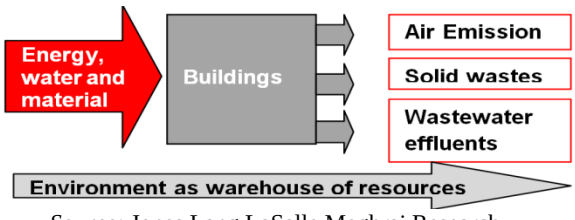
Abstract—*After industrialisation, it was witnessed that there was very fast and random development with serious mistakes committed by we human beings. Building is one of the prime necessesity of human being to live, to perform and to act. It became tough to maintain the equilibrium between building and its surroundings. As the needs of human being were increasing with this development, demands for more supply increased and the result was over exploitation of natural resources. Census graph was the indicator of sudden increment in the growth of population causing more pollution; more the pollution higher will be the threats to sustainability. India is also urbanizing at an enhanced pace in recent decades. India is also sailing in the same boat as the entire world is facing the challenges for sustainability which covers up -growth of slums, inefficient management of solid waste, decrease in water availability and poor water quality, inadequate sewage coverage and deteriorating quality of air. Recent studies reveals that a thick layer of "brown cloud cover" instead of green cover over entire Asia which is a mark to be noted. These issues are not at all new for India, new are the drivers and pressures behind these problems. Hence, it becomes our responsibility to plan, develop and build a new India which is socially, economically and environmentally sustainable. This paper deals and suggests the possible measures adopting environment friendly policies in the built environment which can certainly be able to control the damage already done. Initiative activity is important……..be the change you want to see.*

Index Terms: *BuitEnvironment, Urban growth, Sustainable development, and green building.*

1. INTRODUCTION

Today entire world is facing the scenario of climate change and heavy consumption of energy with the hike in its prices. The construction industry in India is growing rapidly at a rate of 10% compared with the world average of 5.2%.Hence; real estate activity has a significant impact on the environment and resources. It is learnt that GHGs, which are produced and emitted due to human activity, are responsible for global warming showing our future in danger.



Source: Jones Lang LaSalle Meghraj Research

2. SUSTAINABLE DEVELOPMENT

Sustainable development is defined as 'Meeting the needs of the present generation without compromising the ability of future generations to meet their needs.' (Brundtland 1987). The field of sustainable development can be broken into three constituent parts -social sustainability, environmental sustainability and economic sustainability.

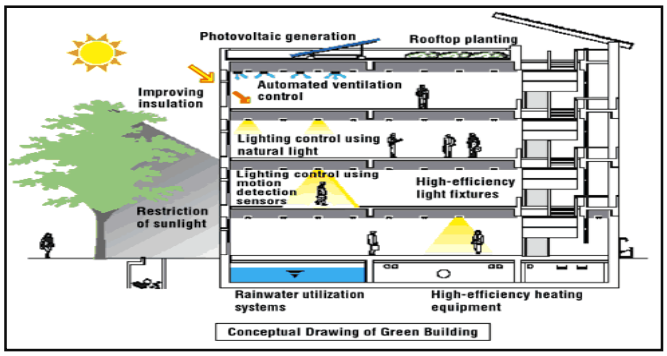
The performance of the industrial economy has always been measured through single bottom-line results. However, striking a balance between environmental, social and economic performance is a holistic key to achieving sustainable outcomes. This has given rise to the concept of triple bottom line.

3. GREEN BUILDING

Growing human activity has increased the concern for sustainability even more in recent times. Sustainability is not only limited to energy conservation, but also includes resource usage, impact on the neighboring environment and working conditions for tenants. The most innovative solution to this problem is being "green", a green building-the home against the unpredictable rising pollution and prices.The green building concept broadly integrates many interests and aspects of sustainability emphasizing reduction of environmental impacts through a holistic approach to the land and building uses and construction strategies. Energy efficiency is the holistic aim of the green building as energy is the foundation

of green building. Green building is well known as sustainable building refers to a structure which "uses a careful integrated design strategy that minimized energy use, maximizes daylight, has a high degree of indoor air quality and thermal comfort, conserves water, reuses materials and uses materials with recycled content, minimizes site disruptions, and generally provides a high 4 degree of occupant comfort" (Kozlowski, 2003, p.27).

Green building is one whose construction and lifetime of operation assures the healthiest possible environment with efficient use of land, water, energy and other resources. Green building need to have optimum effective solutions that incorporates all of natural system and conditions before and after the development of site. The most common objective of Green buildings is to reduce the overall impact of the built environment on human health and the natural environment. This is achieved by optimum use of energy intake, reducing by:

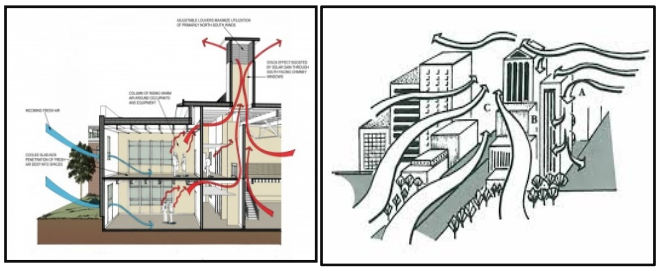


1) Efficiently using energy, water, and other resources.
2) Protecting occupant health and improving employee/ resident health and productivity.
3) Reducing waste, pollution and environmental degradation.

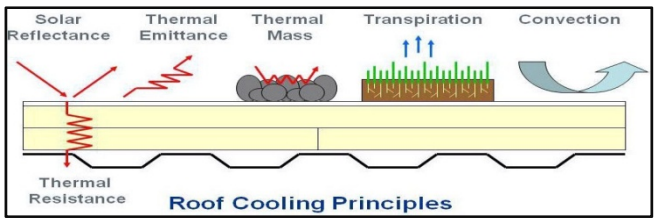
This paper highlights some of the techniques of green building both in traditional as well as in modern building.

4. INNOVATIVE TECHNOLOGIES AND THEIR PRACTICES

Green building Roofing with Stack and wind flow--It helps control the flow of air and moisture into the home and also insulates the home from extremes in temperatures.



Stack effect and wind flow



It is also helpful in creating proper cool air flow with help of solar equipments to catty roof vegetation

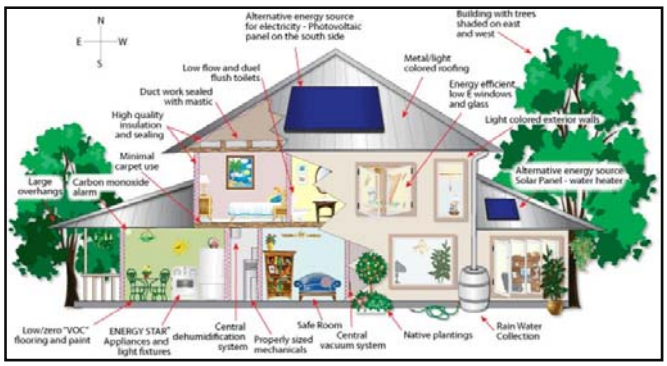
5. RETROFITTING

Green building energy conservation retrofits reduces energy consumption and the cost of heating, cooling, and lighting buildings. But conserving energy is not the only reason for retrofitting existing buildings. It is for sure, housing has been changing rapidly from the model developed in the 50s, and this process will continue over the next generation. Houses today are more energy efficient, and look to accommodate home-based work, as well as extended, multigenerational families. Similarly, the suburbs and low/mid density urban communities are already far more diverse, in terms of ethnicity and age profile, than the homogeneous communities often portrayed in media and academic accounts. The goal is to create a high-performance building by applying the integrated, whole-building design process, to the project during the planning phase that ensures all key design objectives are met. For example, the integrated project team may discover a single design strategy that will meet multiple design objectives. By retrofitting, the building will be less costly to operate, will increase in value, last longer life, and contribute to a better, healthier, more comfortable environment for people in which to live and work. Improving indoor environmental quality, decreasing moisture penetration, and reducing mold all will result in improved occupant health and productivity. The unique aspects for retrofit of historic buildings must be given special consideration.

6. GREEN BUILDING INSULATION

One of the key elements of the building envelope is insulation because it can help dictate comfort for the family. Use of insulation helps create the peace of mind that comes with knowing we have made an investment that not only serves our family, but is energy and cost-efficient.Certain points to be remembered for insulation are - 1)Conduct a Home energy audit, how much insulation is there?

2) Seal all wall penetrations such as wires or pipes or electrical outlets.
3) Add additional insulation to the attic space.
4) Remove window trim and seal around windows positively.
5) Insulate the crawl spaces and between floor joists.
6) Go through the drywall and re-insulate all walls properly.
7) Re-insulate wall cavities from the exterior.



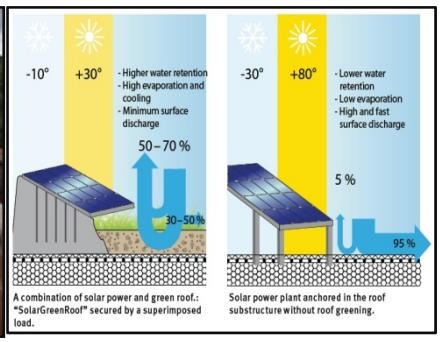
Heat is lost through foundation walls, walls. crawl spaces and concrete slabs. Walls should always be insulated, preferably on the outside to reduce the risk of condensation and make the mass of block walls part of the conditioned space. An insulated wall and foundation becomes part of the house's thermalenvelope,contributing to energy conservation and creating a more comfortable environment.

7. INSULATING ON THE OUTSIDE AND INSIDE

Although exterior insulation offers more advantages, inside wall and basements can be insulated from the inside, too. The key is controlling the movement of moisture & mold-inducing condensation as warm air migrates to a cooler surface.

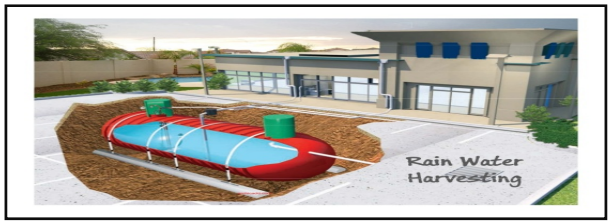
Green building with Solar panels(Concept of self-powered building)

Green Roof Technology has evoloved systems that allow easy and efficient installation of both systems without roof penetration or potential leaks of the roof.Our design solutions consider different growing conditions for the plants when combined with solar panels. By implimenting the needs of both solar and plant system in our design we maximise potential for evaporation.



It reduces the environmental foot print of our building and reduces our electric bill at the same time. Having a combined solar and green roof is the best investment we can make for us and the environment.Making use of solar energy is at the heart of sustainable building. In designing a green house, solar energy comes both first and last. The goal is to create a house that consumes at least 50% less energy than one built conventionally, with a corresponding Suction in heating and cooling costs. Combining green-building techniques with active solar systems can result in a "zero energy" home, one that produces as much energy as it consumes over the course of a year.

Rainwater Harvesting



Rainwater Harvesting is a technology in which individual building or a group of buildings collect and utilize rainwater during the rainy season. This water can be stored in storage tanks and used for non-domestic purposes.In homes and larger buildings, rainwater may also be used for many purposes for which pure drinking water is not required. Besides landscape maintenance and other outdoor uses such cleaning, these include flushing toilets, washing laundry, and operating mechanical heating and cooling equipment that use water. Rainwater Harvesting is one such design feature that is to be incorporated in any kind of building; be it a commercial or residential complex.

8. REUSE OF RESOURCES AND MATERIALS

1. No use of plastics
2. Encouragement to use recycled materials and items.
3. Use and throw and disposable items are avoided.

9. DECENTRALIZED WASTE MANAGEMENT

Decentralized waste Management policy adopted proves quite affective and economical. Instead of one single unit of sewage treatment plant, multiple plants are provided. At present the waste from cafeterias kitchen and other sources can be used for making manure. Further the provision of Biogas plant is already taking its baby steps in pollution free environment.

Green building in India--Traditional buildings

Traditional buildings were well energy efficient. This was because architecture depended on the places and regions. India has got vast climatic regions. Buildings in the hot and dry regions, had corridors directing the wind to cool naturally. In wet regions. Structures using natural light and breeze were used. Some examples are

- **HawaMahal** - Articulated windows provides cool breeze in a desert area


- **Golconda Fort** - Ventilation is designed to let in fresh cool breeze, in spite of summer.
- **Fatehpur Skiri**-Systematic wind channeling and cooling by water body.


Both employ an inter positioning of open and closed spaces that balances one another. Both have strong horizontal elements that tie the complexes together and accent features that emphasize quadrants and sacred. The Panch Mahal at Fatehpur Sikri is a multi-storied structure that maintains its scale through the modular construction, whose components are expressed, imparting the structure scale and proportions. In these historical precedents there are also water bodies and open courtyards which plays vital role in balancing of thermal comfort and quality of air in indoor.

Lotus school in Ladakh.-(based on local materials)

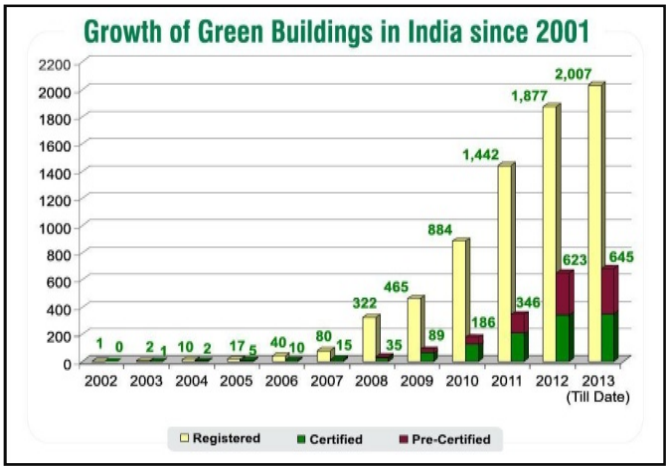
In this desert landscape of severe climatic conditions, 3,500 meters above the sea level, was born a modest school that is adjudged as an example of green building .Many awards being bagged up by this building: The Best Asian Building, Best Education Building, Best Green Building (joint winner).


Lotus school in Ladakh outdoor courts

School was started at the request of the people of Ladakh who wanted a school that would help maintain their rich cultural traditions, based on Tibetan Buddhism, while equipping their children for a life in the 21st century.It is the combination of local building techniques and materials like stone, mud bricks, timber and grass with leading edge environmental design to make them effective in the extreme climate. In 2012, landscape architects from the School of Architecture, Design and Construction at the University of Greenwich began work on landscape master plan and garden for the DWLS School.
Today, India has 267 certified green buildings. Which are fully functional and operational The Indian bureau of Energy Efficiency (BEE) had launched the Energy Conservation Building Code (ECBC). The code is set for energy efficiency standards for design and construction with any building of minimum conditioned area of 1000 Sqmts.BEE had launched a 5 star rating scheme for office buildings operated only in the day time in 3 climatic zones, composite. Hot and dry. Warm and humid.

10. GREEN HOUSES IN INDIA

Green building movement in India startedwith the establishment of the Indian Green Building Council(IGBC) in 2001,which was the first step of the Confederation of Indian Industries (CII) along with the World GreenBuilding Council and the USGBC. The first greenbuilding in India, CII-Sohrabji Godrej Green Business Centre in Hyderabad, was inauguratedon 14 July 2004. Earlier the scenario was negligible and not in practice.



The movement was triggered off when CII-Sohrabji Godrej Green Business Centre building in Hyderabad was awarded with the first and the prestigious Platinum rated green building rating in India and the benefit of green building was felt from that time only till date. The movement started with 20,000 sq ft in 2004 and has grown to the footprint of 15 million sq ft by end-2008. There are 18 LEED certified buildings with a total area of about 8.5 million sq ft and 195 projects registered for LEED certification with a total area of about 110 million sq ft.

1)**CII – Sohrabji Godrej** Green Business Centre (CIIGBC), a division of Confederation of Indian Industry (CII).

Located in Hyderabad, The LEED Platinum for New Construction (NC) v 2.0 certified CII – Godrej GBC building is also home to India's first and largest built green roof (2003), at about 11,000 sf.

2) One Indiabulls Centre

One Indiabulls Centre is being developed by Indiabulls Real Estate Limited. It is one of the first commercial projects to come up on the textile mill land situated in central Mumbai located between Nariman Point (CBD)and Bandra Kurla Complex (SBD).

It is spread over 11 acres of land. It has a total built-up area of 1.89 million sq ft, 1.54 million sqft of which is commercial space an& 0.35 million s.ft isretail space.

3) The Reserve Bank of India's buildings in Delhi, Bhubaneswar in Orissa and in Kerala has been star rated.

4**) World Trade Center (WTC) at Spire Edge in Manresa, Gurgaon.**

Delhi NCR gets its first World Trade Center (WTC) at Spire Edge in Manresa, an integrated 1.6 million sq.ft mixed use IT/ITeS development. The corporate world will now recognize Spire Edge as WTC Manresa, a Business Address of International Stature, bringing to the Local & Global Business Community the same standards of facilities & services similar to any other International WTC. Most green buildings in India are coming up in Mumbai and Chennai. Mumbai, being the financial center of India, is more preferred by large MNCs,especially financial conglomerates. Similarly,Chennai has seen a tremendous influence of IT and multinational manufacturing firms.

11. GREEN RATING SYSTEMS IN INDIA

The green rating systems followed in India are:

1)LEED India- administered by the Indian Green Building Council (IGBC).
2)GRIHA -Green Rating for Integrated Habitat Assessment developed by TERI (The Energy and Research Institute).
3)ECBC- The government has launched the Energy Conservation Building Code (ECBC) under the National Building Codes and Standards to promote green buildings in India.

These tools are new and have not fully considered in practise. There is no doubt that more and more developers are resorting to these systems to get their buildings certified. Rating systems provide a tool to enable comparison of buildings on

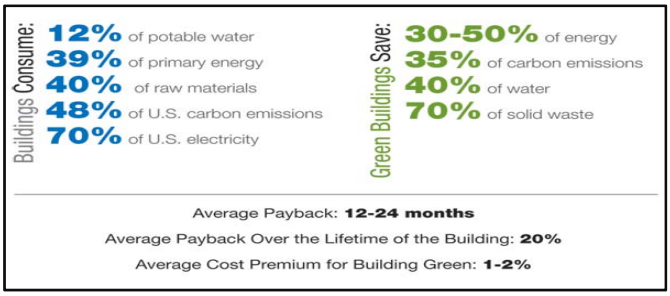
their sustainability credentials and also prevent the negative impact on the environment. Many occupiers,tenants and investors are using these tools as a guide to selecting properties for establishment ,lease or acquisition. Meanwhile, these systems are also being constantly improved as well as modified.

12. CONCLUSIONS

We must implement many measures right at planning, building design/construction and at operation level to sustain for longer time without any compromise and to make it possible to turn the building into sustainable green building

1. Efficient use of energy and other natuarl resources.
2. Reduce waste generation, pollution and to recycle.
3. Climatically comfortable, quality living conditions and life.
4. Provision of better health for the occupant.

There is no difference between green buildings and conventional ones in appearance & in use. The major differences are that green buildings have improved indoor environment and they offer operational savings. Green buildings have tangible and intangible benefits. The tangible benefits like economical advantages are not immediately visible. However, the lifetime payback is much higher compared with that of conventional buildings, which mainly fetched from operational cost savings, reduced carbon emission credits &potentially higher rental or capital values.The conventional homes used up large amounts of power and produced large amount of carbon dioxides annually to reduce it is the holistic aim now.Green Home Concept is an effort made to use less energy, water and natural resources, to provide good air quality and comfort to generate less wastage, and can be considered as a sustainable development that improve the homeowners' lifestyle.If we adopt green technology then the results will be as-



Based on the research analysis, conclusion can be drawn that green home concept is still at infancy stage in India and the homeowners, tenants in India are not really aware of its existence and the level of acceptability and its application is very low. This paper has attempted and highlighted the concept and designs of green home in India. Every individual is responsible to bring the change. At policy level also, not only all the government and non-government organization must bring awareness about benefits of green and sustainable habitat but collectively we must raise our hands to help them to secure our own future.

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BIOGRAPHY

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