CONCEPT OF GREEN BUILDING AND ITS IMPACTS ON ENVIRONMENT AND ECONOMY

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ABSTRACT

Environment comprises of man built as well as natural environment, which are the result of several human activities done by them to enhance their standard of living, greed of attaining the power, money, control and luxurious life. These activities performed by humans lead to disturbance in eco-system, the human activities such as use of non-renewable resources up to such extent that they get extinct or remain a few, not only harm ecology but also reduce the chance of meeting these resources with future generation, not only wild and marine life suffer from these but a large number human population also (such as those are fully dependent on forest).

A few of such activities are extraction of unlimited ground water and its further wastage, deforestation on large scale, burning of fossil fuels on large scale, land excavation for several purposes, damping of wastage on un-appropriate places etc. If we wishes for healthy, wealthy, well maintained, and systematic life cycle for a community in present as well as to meet these achievements in future i.e for the next generation, then we should have a balanced systematic cycle of resources used.

The sustainability requires a transition to environmentally conductive habitat based on judicious energy and resources used to enhance a society that is happy, harmonious, healthy, and productive. So in order to save our environment , and to save the resources for future we can't compromise with present living standard, health and productivity of community, so this lead the idea of sustainable development to fulfill the present requirements as well as to meet the future needs.

AS we all knows buildings uses a significant amount of our natural resources (i.e, forest, fossils) and have a wide range of harmful impacts on environment. Such economical and environmental concerns are the main reason behind the sustainable building design movement. Using eco-friendly building materials and methods are ways to minimize a building's environmental impact. However, the energy efficiency reductions in the construction and operation of buildings are offering most significant opportunities to reduce financial burden to owners through cheaper operation and maintenance cost. The main motto of this paper is to illustrate how the sustainable or green buildings benefits the stakeholder environmentally as well as economically.

Keywords: - *renewable resources, non-renewable resources, sustainable development, human adaptation, human comfort, recycling, reuse, utilization*

1. GENERAL INTRODUCTION

The combined environmental movement of 1960s and 1970s led to experiments emphasis on the concept of green building, it became more popular in 1990s as American Institute of Architects (AIA) formed the Committee on the Environment(1989), Environmental Resource Guide published by AIA, funded by EPA (1992), U.S. Green Building Council (USGBC) founded (1993).The concept of green building gives us an idea about the construction of such building which could have lesser and lesser negative impact on environment and help us to attain the sustainable development. It is also known as sustainable building as it helps to attain the sustainable development. A building should be environmentally responsible and resource efficient during planning phase, design phase, construction phase as well as during its complete life cycle. Economy, Durability, utility and comfort should be kept in mind while designing and

constructing a green building. It should be environmental friendly in every aspect such as siting, design, construction, operation, maintenance, renovation and deconstruction. The green building movement in India started with the establishment of the IGBC in 2001, which was an initiative of the Confederation of Indian Industries (CII) along with the World Green Building Council and the USGBC. The first green building in India, CII-Sohrabji Godrej Green Business Centre in Hyderabad, was inaugurated on 14 July 2004. In India, the Indian Green Building Council (IGBC) provides LEED ratings to structures and aims to make the country one of the leaders in green buildings by the year 2015. The Green rating for Integrated Habitat Assessment (GRIHA) is the National Rating System of India. It has been conceived by The Energy and Resources Institute (TERI) and developed jointly with the Ministry of New and Renewable Energy, India.

2. OBJECTIVE :-

Objective of green building concept is to construct a building with least negative environmental effects with rising standard of living by full filling the following goals:-

- Economy
- Life Cycle Assessment(LCA)
- Siting and Design efficiency
- Energy efficiency
- Water efficiency
- Material efficiency
- Use of Renewable resources
- Waste reduction
- Operation and Maintenance optimisation
- Indoor environmental quality

  - By providing the following features in the building:-

- Efficient use of energy, water and other resources
- Use of renewable energy, such as solar energy
- Pollution and waste reduction measures, and the enabling of re-use and recycling
- Good indoor environmental air quality
- Use of materials that are non-toxic, ethical and sustainable
- Consideration of the environment in design, construction and operation
- Consideration of the quality of life of occupants in design, construction and operation
- A design that enables adaptation to a changing environment

3. WORK PROCESS

3.1 – General introduction

The CII-Sohrabji Godrej Green Business Centre (CII-Godrej GBC) is an unique and successful model of public & private partnership between the Government of Andhra Pradesh, Pirojsha Godrej Foundation and the Confederation of Indian Industry (CII), with the technical support of USAID (United State Agency for Iternational Developement). The 1858m2 building consists of a building for offices, a seminar hall and a Green Technology Centre, displaying the latest and emerging green building materials and technologies in India. The building is the first LEED Platinum-rated building for New Construction (NC) outside of the US and a large number of visitors toured the building to view its green features annually. According to the Indian Green Building Council, the CII-Godrej GBC building has “marked the beginning of the Green Building movement in India.”

3.2 – Data collection

- 6.72 billion sq.ft green building footprint
- 5142 project registered green building project

- 1700 detailed energy audits carried out
- Rs. 3210 Million annual recurring energy saving realized
- 202 Green Co-rated companies
- **The increamental cost was <u>18 %</u> higher than conventional building, however, the Indian Green Building Council claims that green buildings are now being delivered at an incremental cost of just <u>6-8%</u> in India and this initial incremental cost usually gets paid back in <u>3 to 4 years</u>.**
- Benefits achieved so far are:
    - 31000 kWh of renewable energy is generated per year.
    - Over 120000 kWh energy savings per year is done as compared to ASHRAE 90.1 base case.
    - A reduction in CO2 emissions of 100 tons per year since 2004 is happening.
    - Potable water savings of upto 40% compared to a conventional building.
    - Excellent indoor air and environment quality.
    - 100% day lighting till sunset (Artificial lights are switched on just before dusk).
    - Higher productivity of occupants as a result of heathier environment.
- Energy Efficiency:
    - Installed a state-of-the-art Building Management System (BMS) for exact real-time monitoring of energy consumption.
    - Use of aerated concrete blocks for partitions and façade reduces 15-20% load on air-conditioning system.
    - Double-glazed units with argon gas filling between the glass panes enhanced the thermal properties of building.
    - Water-cooled scrolling chillers.
    - Installed 2, 25 TR chillers.
    - Secondary chilled water pumps are installed with Variable Frequency Drives (VFDs).
    - Energy efficient lighting design is provided by Compact Fluorescent Lamps (CFLs).
    - Roof garden covering is 60% of area.
- Renewable Energy:
    - 20% of the building energy requirements is generated by Solar Photovoltaics (PVs).\
    - The Solar PVs have installed capacity of 23.5kW.
- Water Efficiency:
    - Zero water discharge from building.
    - The entire waste water, grey and black water which get generated in the building is treated biologically through a process called the 'Root Zone Treatment System'. The treated water is reused in landscaping.
    - Waterless urinals are used in men's restrooms.
    - Rain water harvesting system for reuse of storm water.
    - Water-efficient fixtures including low-flow, low-flush fixtures.
- Indoor Environmental Quality:
    - Indoor Air Quality is continuously monitored and a minimum of fresh air is pumped into the conditioned spaces at all times.
    - Fresh air is drawn into the building through wind towers also.
    - Use of low Volatile Organic Compounds (VOC), paints and coatings, adhesives, sealants and carpets etc.
    - Maximum day light usage.
    - Operable windows and lighting control system for better day-lighting and views.
    - Fenestration is maximized towards the north orientation.
- Materials and Resources:
    - 80% of the materials used in the building is sourced within 500 miles from the project site. Most of the construction material contains post-consumer's and industry's waste as a raw material during the manufacturing process.
    - Fly-ash based bricks, glass, aluminium and ceramic tiles, those were post-consumer's and industry's waste were used in constructing the building to encourage usage of recycled material.
    - Office furniture contains of bagasse-based composite wood.
    - More than 50% construction waste was recycled within the building or sent to other sites and diverted from landfills.

3.3 – Conclusions

- **Incremental cost of green building is 6 – 8 % more than conventional building as initial cost but this cost usually get paid back in 3 – 4 years though these means;**
  - Amount of renewable energy generated per year.
  - Amount of energy saving per year.
  - Amount of potable water saved is about 40% more than a conventional building per year.
  - 100 % day lightning till the dusk.
  - Load of air-conditioning is reduced by 15 – 20 % by using aerated concrete blocks as façade or partition wall blocks.
  - Recycled material usage reduces the cost of construction.
  - Rain water harvesting reduces the amount of water required for plantation.
  - Grey water is also be used for gardening.
- **Impacts of green building on environment are conservation of non-renewable resources, energy, land, and water which is essential for a balances eco-system are obtained by;**
  - Using of renewable sources of energy as **Photovoltaic cells** for the production of energy.
  - Usage of waste material and recycled material for construction.
  - Recycling and reuse of water for several purposes.
  - Using environmental friendly materials such as strawballs for insulation of walls.
  - Usage of green concrete.
  - Optimum utilization of day light.
  - Design of building in order to get natural ventilation.
  - Roof gardening to reduce the land usage.
  - Better indoor air quality by use of non-toxic materials such paint, varnish, carpets etc.
- **Impacts of green building on occupant are good health, healthier environment, enhanced productivity that achieved by;**
  - Good internal environment of building.
  - Good air quality.
  - Optimum utilization of day lightning and natural ventilation.

Use of non-toxic material like paint, primer, varnish, carpets etc.

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