Green Technologies

Chapter 3

Green technologies for city wide applications

Green technology for specific approach

Green technologies for city wide applications

In city green technologies are introduced to **reduce carbon emission** which leads to stability of atmosphere.

This can be done at **personal level, local authority and city wide level** .

Carbon emission reduction @ personal level:

- Use public transport instead of using personal vehicles
- Use low emission fuels for usage of cars
- Avoid usage of vehicles for short distance
- Prefer video conference for business meeting in other countries
- Avoid stand by mode for electronic devices and turn off devices after usage.
- Prefer to buy local products(buy local concept)

Carbon emission reduction @ local authority and city wide level:

Electric consumption in city is much affected by

Industries:

Local authority need to set benchmarks for the carbon emission for every industry in the community

Residential consumption:

Electricity consumption is depend on the lifestyle of people ,financial status, location etc.

To decrease the consumption of electricity introduce CER's, carbon credits**.**

Ex: ujala scheme

Genral Lighting:

- Replace street lights CFL bulbs in place of incandescent bulbs.
- Provide solar panels to street lights to decrease the electricity consumption

- Use BEE certified electric products for energy efficiency.

  punjab is first state to use LED with street light.
- Use timer switches to lights.

Misallaneous:

- Adopt solar water heaters in hotels, hostels and guest houses.
- Use solar cookers to prepare food.
- For economic air conditioning use cavity walls, sun breakers and double gazed window panes.
- Use thermostats or sensors to save the electricity.
- Use LED display instead of LCD,CRT monitors.

Green technology for specific approach

PROMOTION OF GREEN BUILDING:

- **Green building** is one which uses less water consumption, optimizes energy efficiency measures, generates less waste compared to other building.
- It conserve the energy by retaining warm in winter and losing heat during summer.
- It can save carbon foot print ,water etc.
- It can be evaluated by using GRIHA ,LEEDS
- Green building is second generation building when water ,energy consumption reduced by 40%-60% and second generation building are reduced energy consumption also generates power.
- Green buildings are 4-6% expensive than traditional buildings but less in operating cost

LEEDS rating system

- The LEED system is Leadership in Energy and Environmental Design is found to be one of the most popular green building certification.
- The LEED system is developed by the U.S. Green Building Council (USGBC). The LEED rating system have a series of rating system for the design, operation, construction and the maintenance of the green buildings.
- The main objective is the development of a structure that make the building owner and the operator to be environmentally responsible and utilizes the resources efficiently.

- All new green building are required to comply with guidelines suggested with following aspect
  1) building construction site
  2) environmental concerns in architectural planning
  3) energy conservation
  4)water conservation
  5)waste management
  6) socila relevance

IGBC Green Homes ratings are awarded according to the following scale:

Certified 32-39

Silver 40-47

Gold 48-59

Platinum 60-80

ADVANTAGES AND DISADVANTAGES OF LEED RATING SYSTEM IN INDIA:

- LEED India certified projects blend enhanced environmental, economic, and occupant-oriented performance.
- They cost less to operate and maintain; are energy- and water-efficient; have higher lease-up rates than conventional buildings in their markets and are healthier and safer for occupants.
- Often when a LEED rating is pursued in India, it increase the cost of initial design and construction.
- One reason for the higher cost is that sustainable construction principles may not be well understood by the design professionals undertaking the project
- Some of the finer points of LEED certification in India could possibly lead to misunderstandings between the design team, construction team, and client, which could result in delays.
- Also, there may be a lack of abundant availability of manufactured building components which meet LEED standards.

ITC GREEN CENTER

- ITC GREEN CENTER is a hotels division Headquarter located in sector-32, Gurgoan.
- It is a LEED PLATINUM certified building with 56 points. At 170,000 sq feet, ITC Green Centre is the world's largest 0% water discharge, noncommercial Green building, and compared to similar buildings, ITC Green Centre has a 30% smaller carbon footprint with the use of sensible technologies.
- One of the strongest aspects of ITC Green Centre is its design. All our systems are integrated in a way so that they can function as naturally as possible.
- For example, the L-shaped architecture of the building serves more than one function in more than one area of the immediate environment. The central atrium allows natural light to form in the heart of the building, thereby reducing the use of artificial light. It also ensures that one part of the façade is always in the shade, preventing too much heat from entering the structure, and the cooling effect is supported moreover by the discreet bodies of water placed in front of the building

WATER CONSERVATION :

- ITC harvests 100% of the rain that falls on the building and recycle 100% of all the water used in the building.
- Along with the rainwater harvesting at ITC Green Centre, there are interlocking tiles placed across the landscape of our building to harvest rain water through the grass that grows between the tiles while ensuring 0% surface run-off.

ENERGY SAVING TECHNIQUES :

- The high albedo roof coating reduces the amount of heat absorbed by reflecting over 90% of visible and infra red radiations away from the building. This reduces the roof surface temperature by 30 degrees and brings down the use of energy for air conditioning in the top floor by 10-15%.
- The building design has ensured that it uses as little energy as possible in terms of basic lighting. The architecture of ITC Green Centre allows enough natural light to penetrate throughout the building during daytime, so it needed very little energy to light the building at night.

ITC GREEN CENTER

GRIHA RATING SYSTEM

- GRIHA (Green Rating for Integrated Habitat Assessment) GRIHA - Sanskrit word meaning – 'Abode'
- An innovative tool for sustainable development by the United Nations.
- A tool for implementing renewable energy in the building sector by 'The Climate Reality project'- an organization founded by Mr. Al Gore

OBJECTIVES OF GRIHA :

- minimize a building's resource consumption, waste generation, and overall ecological impact
- evaluates the environmental performance of a building holistically over its entire life cycle, thereby providing a definitive standard for what constitutes a 'green building'
- Reduced energy consumption without sacrificing the comfort levels
- Reduced destruction of natural areas, habitats, and biodiversity, and reduced soil loss from erosion etc

GRIHA RATING SYSTEM

GRIHA PROCEDURE:

- GRIHA assesses a building out of 34 criteria
- Awards points on a scale of 100
- To qualify for GRIHA certification, a project must achieve at least 50 points Eligibility Except for industrial complexes, all buildings – offices, retail malls, institutions, hotels, hospitals, health-care facilities, residences, and multi-family high-rise buildings – in the pre-design/design stage are eligible for certification under GRIHA
- ADaRSH (Association for Development and Research of Sustainable Habitats) examine project documents to help project eligible for GRIHA rating and render requisite assistance for registration

GRIHA - RATING CRITERIA

Site planning	A) Conservation and efficient utilization of resources	Criterion 1	Site Selection	1
		Criterion 2	Preserve and protect landscape during construction/compensatory depository forestation.	5
		Criterion 3	Soil conservation (post construction)	4
		Criterion 4	Design to include existing site features	2
		Criterion 5	Reduce hard paving on site	2
		Criterion 6	Enhance outdoor lighting system efficiency	3
		Criterion 7	Plan utilities efficiently and optimize on-site circulation efficiency	3
	B) Health and well being	Criterion 8	Provide minimum level of sanitation/safety facilities for construction workers	2
		Criterion 9	Reduce air pollution during construction	2
Building planning and construction stage	(A) Conservation and efficient utilization of resources	Criterion 10	Reduce landscape water demand	3
		Criterion 11	Reduce building water use	2

GRIHA - RATING CRITERIA

		Criterion 12	Efficient water use during construction	1
		Criterion 13	Optimize building design to reduce conventional energy demand	6
		Criterion 14	Optimize energy performance of building within specified comfort limits	12
		Criterion 15	Utilization of fly-ash or equivalent industrial/agricultural waste as recommended by BIS in building structures	6
		Criterion 16	Reduce embodied energy of construction is reduced by adopting material efficient technologies and/or low-energy materials	4
		Criterion 17	Use low-energy materials in Interiors	4
		Criterion 18	Renewable energy utilization	5
		Criterion 19	Renewable energy based hot water system	3
	B) Recycle, recharge, and reuse of water	Criterion 20	Waste water treatment	2
		Criterion 21	Water recycle and reuse (including rainwater)	5
	C. Waste management	Criterion 22	Reduction in waste during construction	2
		Criterion 23	Efficient Waste segregation	2
		Criterion 24	Storage and disposal of wastes	2

GRIHA - RATING CRITERIA

		Criterion 25	Resource recovery from waste	2
	D. Health and well-being	Criterion 26	Use of low-VOC paints/adhesives/sealants	4
		Criterion 27	Minimize ozone depleting substances	3
		Criterion 28	Ensure water quality	2
		Criterion 29	Acceptable outdoor and indoor noise levels	2
		Criterion 30	Tobacco and smoke control	1
		Criterion 31	Provide at least the minimum level of accessibility for persons with disabilities	1
3. Building operation and maintenance		Criterion 32	Energy audit and validation	*Mandatory*
		Criterion 33	Operation and Maintenance	2
4. Innovation		Criterion 34	Innovation Points	4

Energy Conservation Building Code(ECBC)

- Launched by ministry of power, government of India in may 2007 as a first step towards promotional energy efficiency in building sector.
- It was developed by expert committee set by bureau of energy efficiency with the support and guidance of from united states agency for international development

The ECBC provides design norms for:

- Building envelope, including thermal performance requirements for walls, roofs, and windows;
- Lighting system, including day lighting, and lamps and luminaire performance requirements;
- HVAC system, including energy performance of chillers and air distribution systems;
- Electrical system; and
- Water heating and pumping systems, including requirements for solar hot-water systems.

Carbon emission from Industries

- ***Direct carbon emissions***
- Emissions that are directly emitted from the site of the process or service. (industry would be the emissions related to burning a fuel on site)
- Emissions are the other emissions related to purchased electricity, heat, and/or steam used on site.
- ***Indirect carbon emissions***
- Transportation of materials/fuels
- Any energy used outside of the production facility
- Wastes produced outside of the production facility

- Iron and steel production (4%)
- Aluminium and non-ferrous metals production (1.2%)
- Machinery production (1%)
- Pulp, paper and printing (1.1%)
- Food and tobacco industries (1.0%)
- Chemicals production (4.1%)
- Cement production (5.0%)
- Other industry (7.0%)

Over 400 industries reduced CO2 emission by 2% in 2012-15

Bureau of Energy Efficiency (BEE) today said over 400 industries monitored by it have reduced their CO2 emissions by 31 million tonnes (MT) - about 2 per cent of annual CO2 emissions - between 2012-15.

PTI | Last Updated: Oct 25, 2017, 02.23 PM IST

1 Comments

Save

A+

Bureau of Energy Efficiency (BEE) today said over 400 industries monitored by it have reduced their CO2 emissions by 31 million tonnes (MT) - about 2 per cent of annual CO2 emissions - between 2012-15.

"Over 400 industries reduced their emissions by 31 million tonnes of CO2, approximately 2 per cent of annual CO2 emissions, during the first implementation cycle of Perform, Achieve & Trade Scheme (PAT) by BEE between 2012 and 2015," a BEE statement said.

News Report from The Economic Times, dated Oct 25, 2017

GREEN HOTELS

- **Green hotel**, is an environmentally sustainable hotel or accommodation that has made important environmental improvements to its structure in order to minimize its impact on the natural environment.
- It is beneficial for these hotels to get certain certifications in order to be environmentally compliant. One beneficial certification specifically for hotels is the LEED certification.
- A LEED-certified hotel provides benefits to the environment through energy efficient practices.

GREEN HOTELS

- Renewable energy sources like solar or wind energy
- Bulk organic soap and amenities instead of individual packages to reduce waste
- Guest room and hotel lobby recycling bins
- Energy-efficient lighting
- On-site transportation with green vehicles
- Serve organic and local-grown food
- Non-disposable dishes
- Offers a fresh-air exchange system
- Grey water recycling, which is the reuse of kitchen, bath and laundry water for garden and landscaping
- Newspaper recycling program
- Housekeeping uses non-toxic cleaning agents and laundry detergent
- 100% organic cotton sheets, towels and mattresses

GREEN HOSPITALs

A Green hospital is one which enhances patient well being, utilizing natural resources in an efficient environment friendly manner.

Benefits achieved by the rated Green Hospitals :

- Better indoor air quality
- 20-40% energy savings
- 35-40% water savings
- Good day lighting
- No sick building syndrome
- Faster patient recovery




Max Balaji Super Speciality Hospital, New Delhi, Gold Rated




Kohinoor Hospital, Mumbai, Platinum Rated

GREEN TRANSPORTATION

- ***Green Transportation***

  comprises of those modes of **transportation** that do not depend on diminishing natural resources like fossil fuels. These **transportation** modes rely on renewable energy sources. They also have very low impact on the environment as these modes produce minimal or no **green**house gas emission.


Walking
cycling
Green vehicles


গুৱাহাটী
गुवाहाटी GUWAHATI

Indian Railways today launched first solar-powered DEMU (diesel electrical multiple unit) train from the Safdarjung railway station in Delhi.

The train will run from Sarai Rohilla in Delhi to Farukh Nagar in Haryana

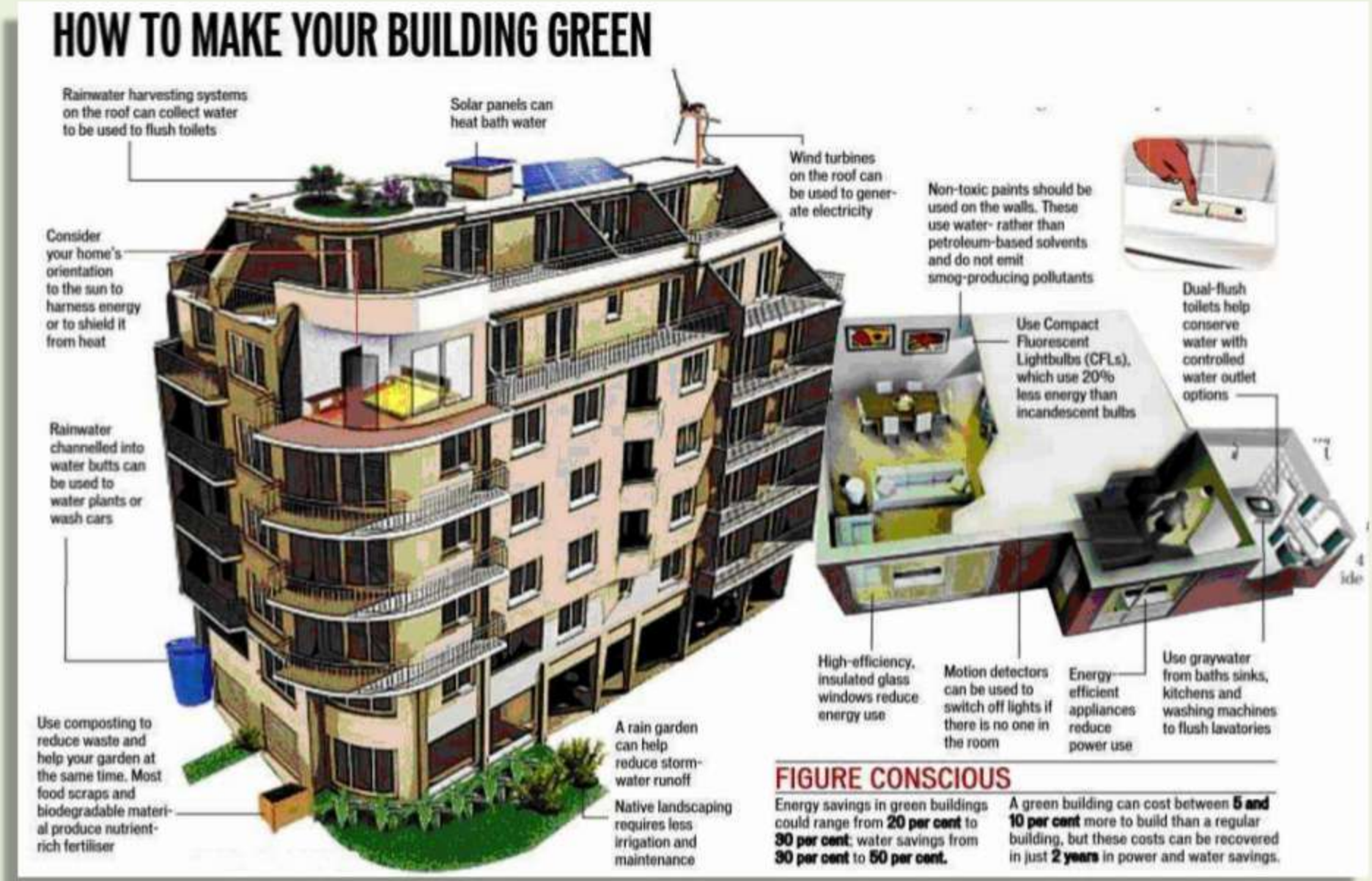

India's Cochin Airport:
The World's First 100%
Solar-Powered Airport

Green Buildings

Introduction

- **Green building (also known as green construction or sustainable building)** expands and complements the building design concerns of economy, utility, durability, and comfort.
- **A 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 conventional buildings.

Green Building



Introduction

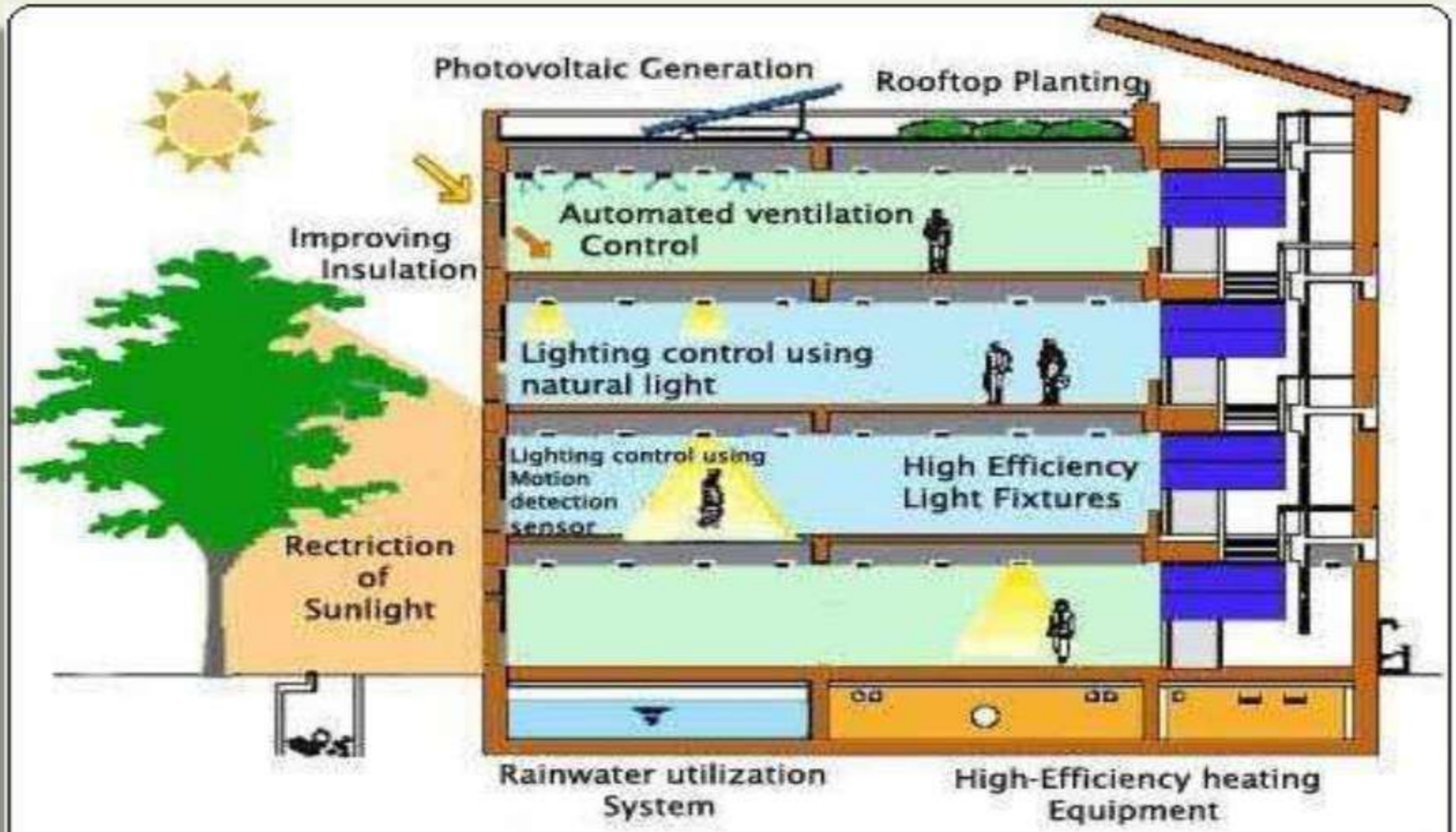
- **Green building is the practice of creating structures and processes that are environment friendly** and **resource-efficient** throughout the life span of a building right from site selection to design, construction, operation, maintenance, renovation and deconstruction.

Green Building

Introduction

- **Green Buildings are designed to reduce the overall impact on human health** and the natural environment by the following ways:
- **Using energy, water and other resources efficiently.**
- **By reducing waste, pollution**, and environmental degradation.

Green Buildings



MODEL DRAWING OF A GREEN BUILDING

Objectives Of Green Building

- **The aim of green building design is to minimize resources, maximize the reuse, recycling and utilization of renewable resources.**
- **It maximizes the reuse, recycling**, and utilization of renewable resources.
- **It maximizes the use of efficient building** material and construction practices, optimizes the use of onsite resources and use of renewable sources of energy, use efficient waste management practices and provide **comfortable and hygienic indoor working conditions.**

Green Building

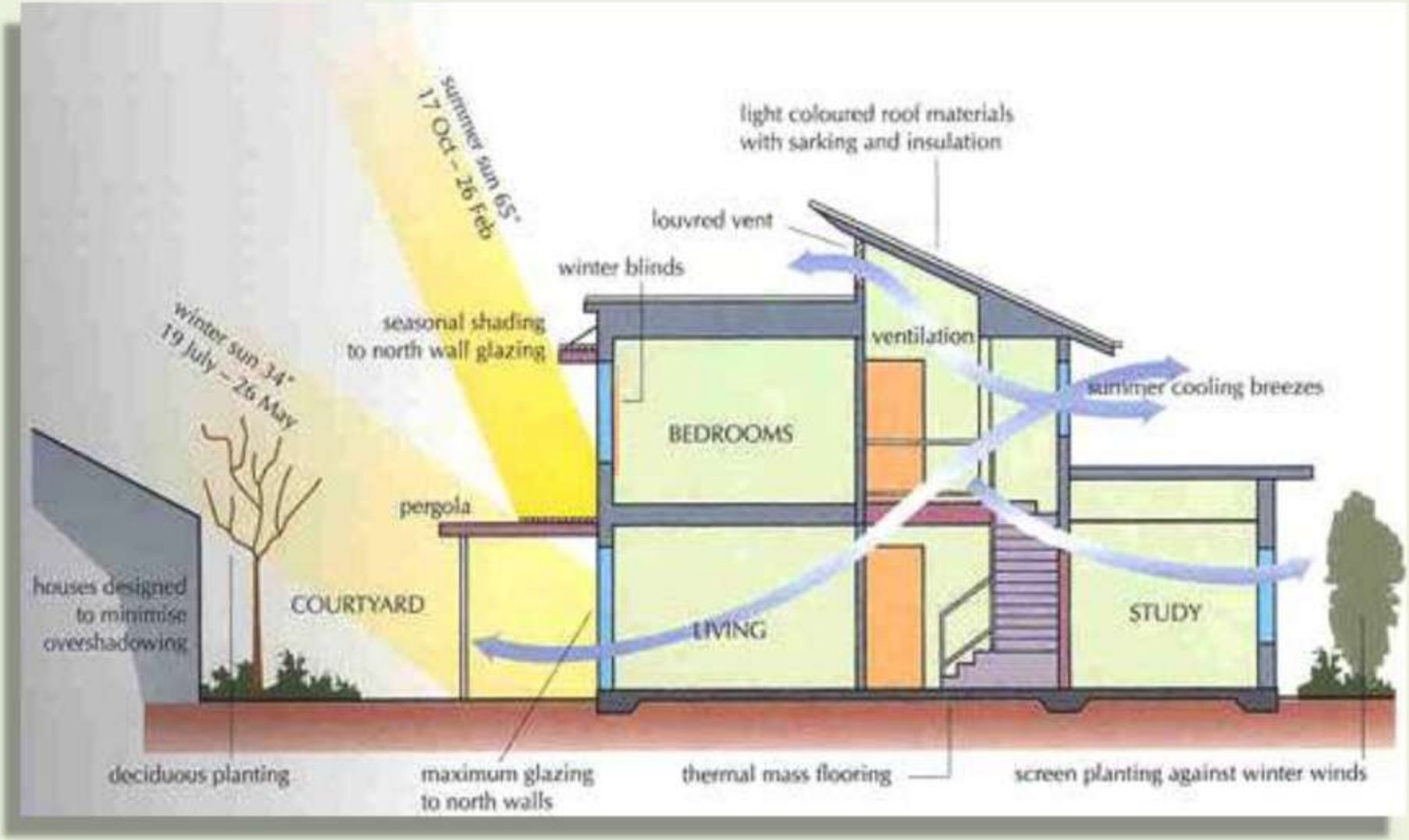
Energy Efficient Green Building

Objectives Of Green Building

- **Low Impact**
  - ***Minimize impact on natural environment***
- **Energy Efficient**
  - ***Reduced Energy usage and Water usage***
- **Healthy**
  - ***Protect occupant health and increase productivity***
- **Minimize waste**
  - ***Designed and constructed in a manner that minimizes waste, pollution, and environmental degradation***

Minimize Impact On Natural Environment

Energy Efficient Green Building



Energy Efficient Green Building

Maximum Utilization of Natural Ventilation

Brownfield Development (Minimize Waste)

Features of Sustainable Building

- **Consideration of sustainability aspects** in all phases of building design and planning
- **Use of healthy and environmentally friendly** building materials and products
- **Use of efficient systems**
- **Use of constructions and systems** which are **easy to maintain and service**
- **High aesthetic and urban design quality**; high public acceptance

Green Building Features

Green Building Features

- Structure design efficiency
- Energy efficiency
- Water efficiency
- Materials efficiency
- Waste and toxic reduction

Structural Efficiency

- **Its main intensions is to minimize the total environment impact** associated with all life- cycles.
- **It has the largest impact** on cost and performance of building.

Energy Efficiency

- **The strategy is to reduce the operating energy use.**
- **Renewable energy through solar power, wind power**, hydro power and biomass can significantly reduce the environmental impact of a building.

Water Efficiency

- **Reducing water consumption and protecting water quality is the key objectives** of sustainable building.
- **The use of non-sewage and greywater for on- site use such as site-irrigation** will minimize demands on the local aquifer.