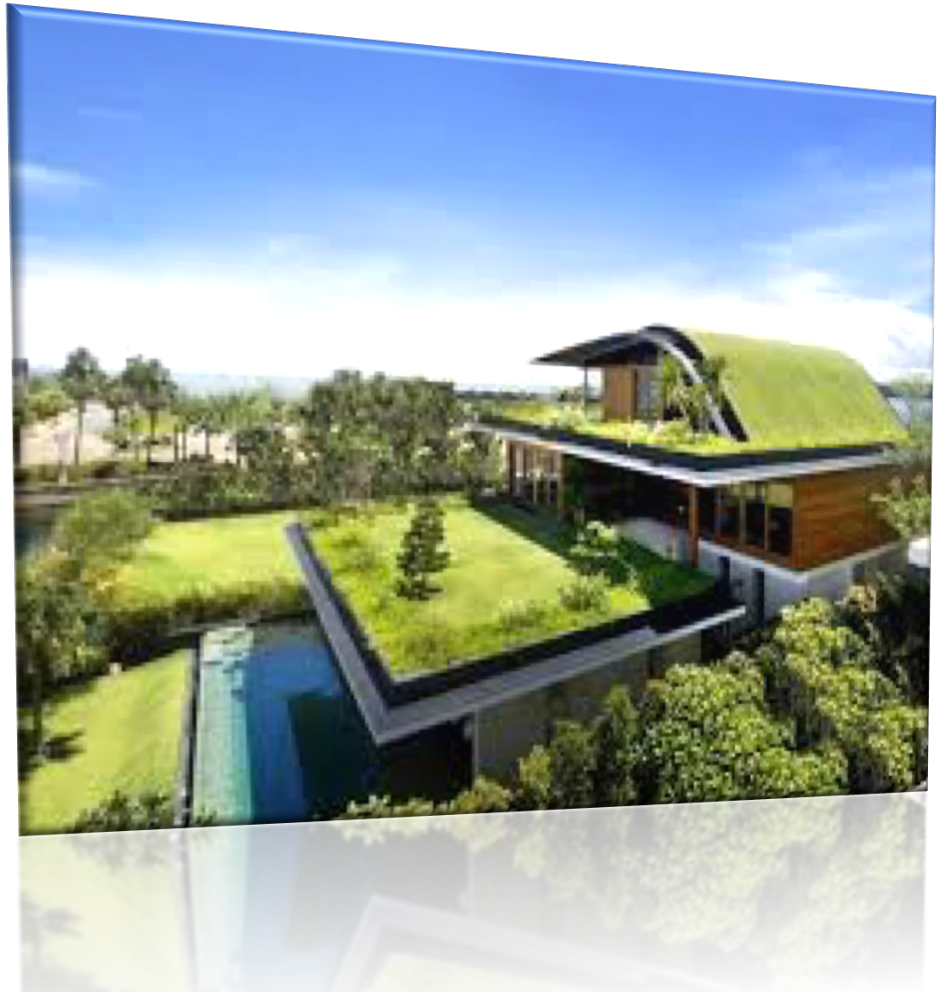

Sustainable
radiation
ecology
architecture
conscious
Buildings
conservation
Environmentally
Design
Straw
Health
Shui
building
design
sustainable
Ecological
Architecture
reuse
Indoor
use
houses
Conservation
Pollution
alternative
Environmental
Houses
Adaptive
Need
Recycling
aspects
environmental
Green
materials
Remodeling
energy
eco
Syndrome
Environmentalism
Feng
health
solar
Building
forestry
technological
Products
recycling
bale
Air
Sick
innovations
Industrial
engineering
Ecology
friendly
Eco-architecture
particularly
salvaging
Sustainability/sustainable
Embodied

The Shard Architecture: Renzo Piano

SUSTAINABLE ARCHITECTURE



REUSE
REDUCE
RECYCLE

SUSTAINABLE ARCHITECTURE:

❑ **Sustainable architecture** is architecture that seeks to minimize the negative environmental impact of buildings by efficiency and moderation in the use of materials, energy, and development space. Sustainable architecture uses a conscious approach to energy and ecological conservation in the design of the built environment

❑**Sustainability -** Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

SUSTAINABLE DESIGN:

Reduces the negative impact on the environment and human health, thus improving the performance during a building's life cycle. Careful consideration is given to water, energy, building materials, and solid waste.

GREEN BUILDING:

❑ **Green building is the practice of increasing the efficiency of buildings and their use of energy, water, and materials, and reducing building impacts on human health and the environment, through better sitting, design, construction, operation, maintenance, and removal — taking into account every aspect of the complete building life cycle.**

Sustainable development and sustainability are integral to green building. Effective green building can lead to

1) *reduced operating costs* by increasing productivity and using less energy and water,

2) *improved public and occupant health* due to improved indoor air quality,

and

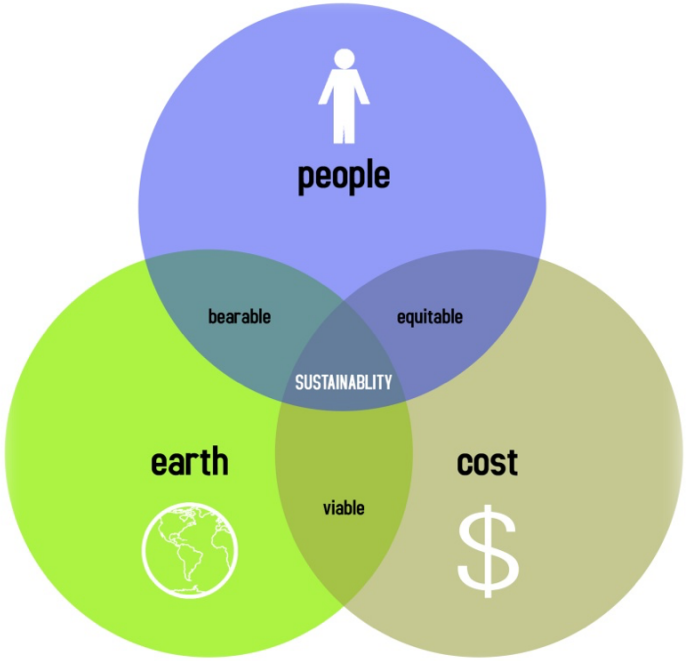
3) *reduced environmental impacts* by using sustainable resources.

NEED FOR SUSTAINABLE ARCHITECTURE:

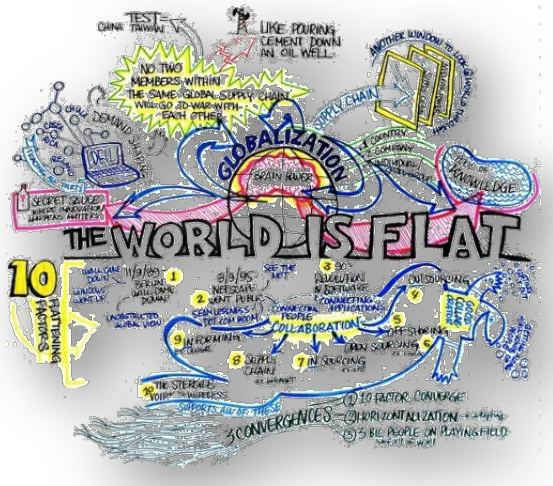
Architecture is an essential **arena** for sustainable innovation.

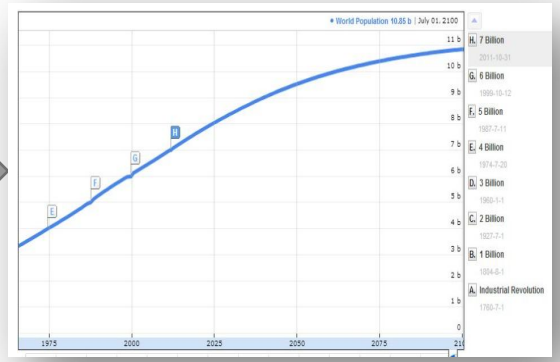
❑Our homes are one of the most important assets of our lives. Our world needs help gaining popularity on that list. With the help of sustainable architecture , a green design can successfully meld beauty and functionality together to save our planet from us.

❑ Increase of population day by day .
❑ People migrating from rural to urban with hope.
❑Depletion of natural resources.
❑High energy and natural resources are consumed due to huge population.
❑Effect on bio diversity.



NEED FOR SUSTAINABLE ARCHITECTURE:





A CROWDED WORLD

MIGRATION-
RURAL TO URBAN

DEPLETION OF
NATURAL RESOURCES

HIGH ENERGY AND
HIGH RESOURCE
CONSUMING

EFFECT ON BIO
DIVERSITY

METHODS FOR ACHIEVING SUSTAINABLE DESIGN:

Economy of Resources

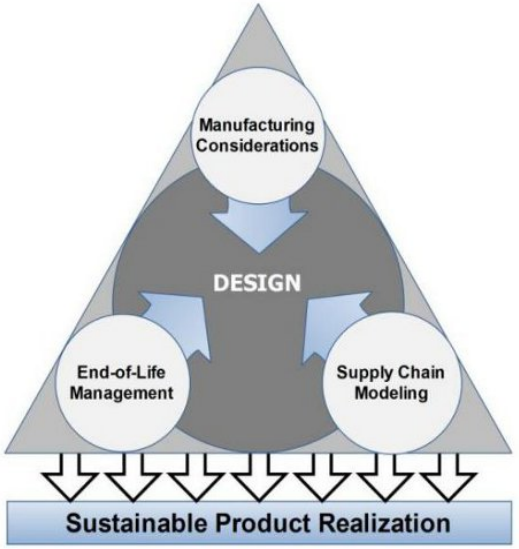
- Energy Conservation
- Water Conservation
- Materials Conservation

Life Cycle Design

- Pre-Building Phase
- Building Phase
- Post-Building Phase

Humane Design

- Preservation for Natural Conditions
- Urban Design and Site Planning
- Design for Human Comfort



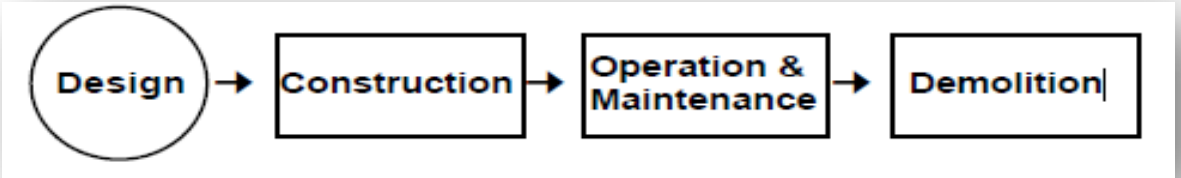
Economy of Resources:

- By economizing resources, the architect reduces the use of Non-renewable resources in the construction and operation of buildings.
- There is a continuous flow of resources, natural and manufactured, in and out of a building.
- This flow begins with the production of building materials and continues throughout the building's life span to create an environment for sustaining human well-being and activities.
- After a building's useful life, it should turn into components for other buildings.

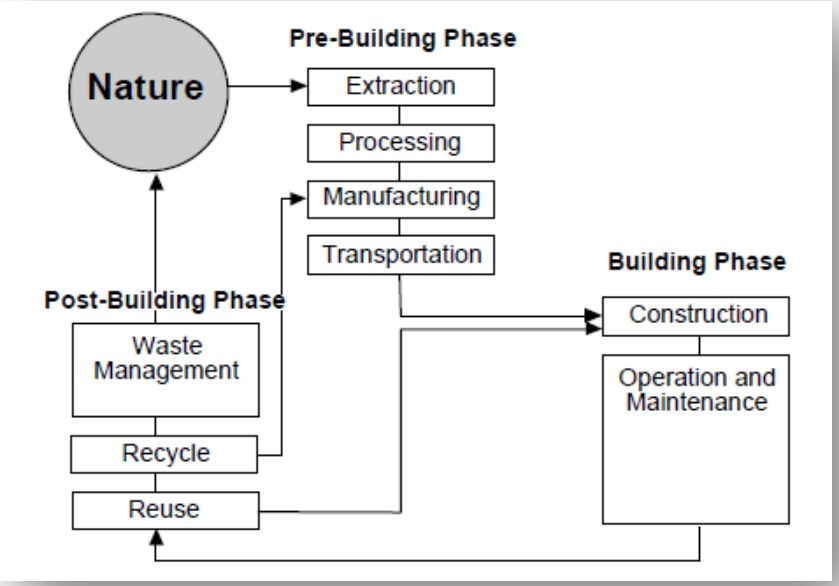
Life Cycle Design:

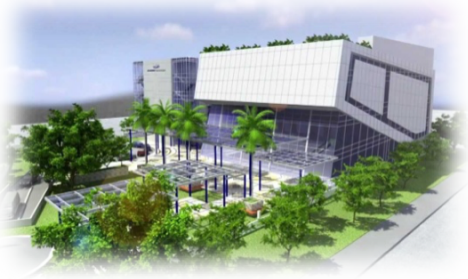
- The second principle of sustainable architecture is **life cycle design (LCD).**
- This "cradle-to-grave" approach recognizes environmental consequences of the entire life cycle of architectural resources, from procurement to return to nature.

LCD is based on the notion that a material transmigrates from one form of useful life to another, with no end to its usefulness.



Life Cycle Design:





Humane Design:

- While economy of resources and life cycle design deal with efficiency and conservation, humane design is concerned with the livability of all constituents of the global ecosystem, including plants and wildlife.
- This is deeply rooted in the need to preserve the chain elements of the ecosystems that allow human survival.

ELEMENTS OF SUSTAINABLE ARCHITECTURE:

1. Green roof:

- A green roof can lower the temperature in your house, improve local air quality and help add green space in urban areas where concrete is the major material.
- Green roofs can be as simple as a couple of types of ground cover or include a beautiful mix of moss, succulents, ground cover, and even herbs and plants.

2. Solar shingles:

- Solar panels are an excellent way to save energy and reduce energy bills.
- Solar shingles are a bit pricier to install than traditional solar panels, since they not only help power the building, but they're actually roof shingles.

3. Cob houses:

- **Cob** is an ancient building material that's basically wet earth and straw mixed together and rolled into loaf-sized pieces or **cobs**. The mixture is very similar to clay, and what makes cob houses unique and beautiful is the organic shape.

4. Rainwater harvesting:

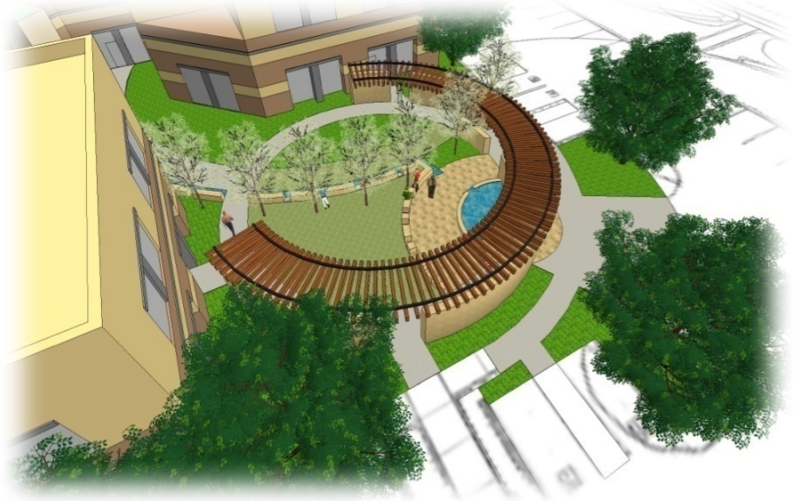
❑The basic idea behind a rainwater harvesting system is to capture water to irrigate your garden and sometimes to use in the home.

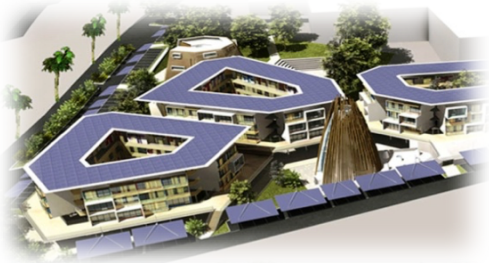
❑To install any sort of rainwater harvesting system, it's important to check local laws first. Some areas don't allow any rainwater harvesting.

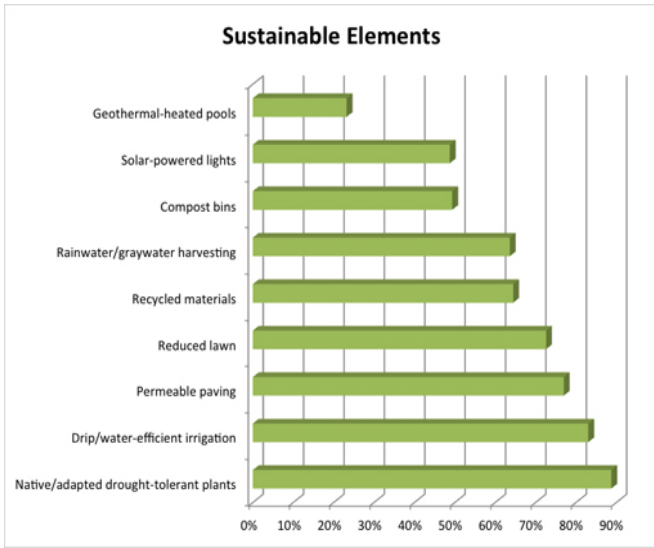
5. Shipping container buildings:

❑Like with cob houses, shipping container buildings address the high impact associated with traditional building materials.

❑ Instead of using new materials that have to be manufactured, shipping container homes reclaim old shipping crates and use them to create prefabricated structures. Shipping crates can be stacked vertically or lined up side-by-side to create residential or commercial buildings.







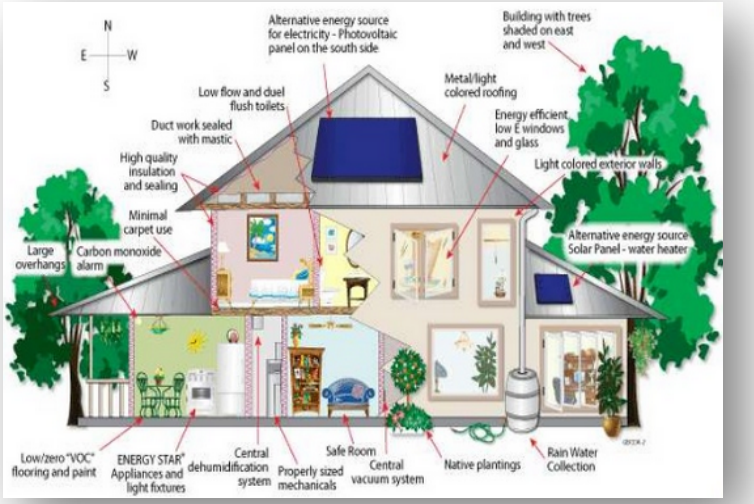
PRINCIPLES OF SUSTAINABLE ARCHITECTURE:

- ❖Small is beautiful.
- ❖Heat with the sun.
- ❖Let nature cool food.
- ❖Energy efficient.
- ❖Conserve water.
- ❖Use of local materials.
- ❖Use of natural materials.
- ❖Save the forests.
- ❖Recycle materials .
- ❖Built to last.
- ❖Grow your food.
- ❖Share facilities.

HOW TO ACHIEVE SUSTAINABLE DESIGN:

❑ENERGY EFFICIENCY

-SMALL IS GOOD
-PASSIVE SOLAR DESIGN
-ACTIVE SOLAR DESIGN
-HIGH LEVELS OF INSULATION
-EFFICIENT HEATING OF AIR & WATER
-THERMAL MASS
-VENTILATION
-EFFICIENT LIGHTING

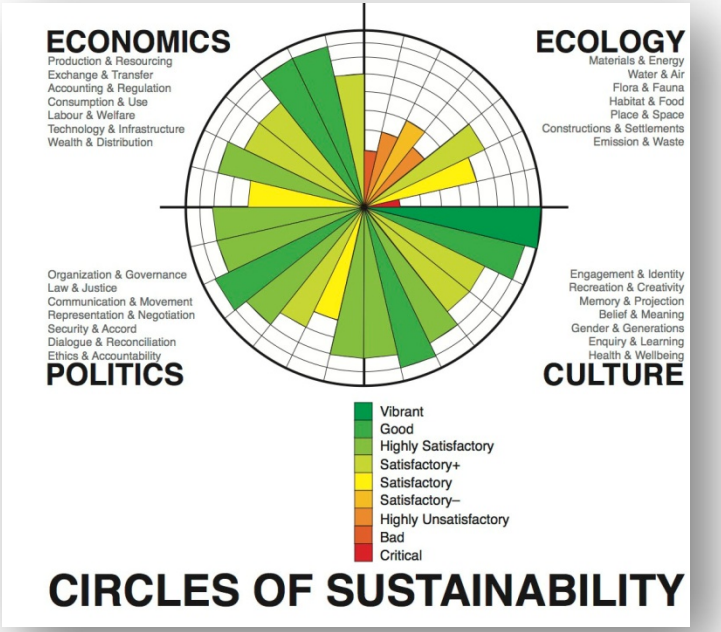


❑WASTE MANAGEMENT

-THROUGH DESIGNING IN MODULES
-RECYCLING WHILE BUILDING
-GREY WATER SYSTEMS
-LOW FLOW TAPS & SHOWERS

❑BUILDING MATERIALS

-USE OF RENEWABLE, NON TOXIC MATERIALS
-USE OF RECYCLABLE/RECYCLED MATERIALS
-LOCALLY SOURCED TO REDUCE TRANSPORT



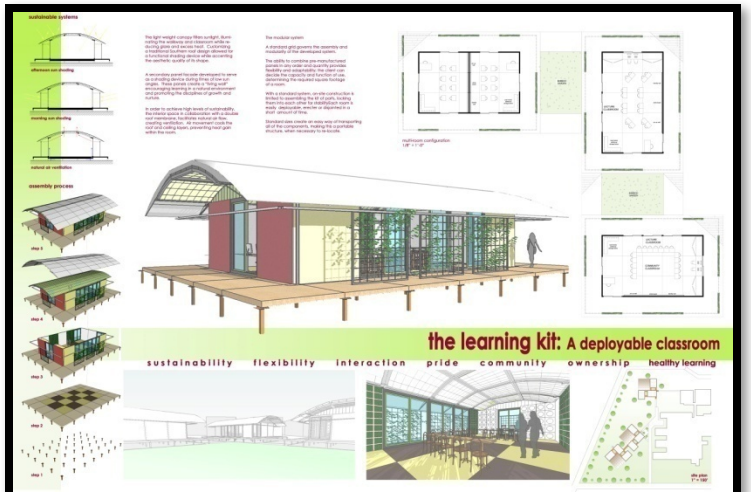
ENERGY DESIGN STRATERGY:

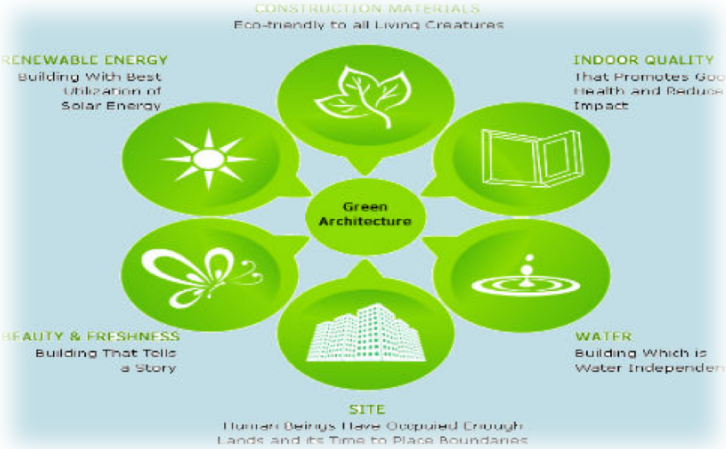
Optimize building envelope, minimize demand through serious conservation, and supply energy with maximum efficiency and using renewable:

- ❑Site micro-climate
- ❑Energy conservation
- ❑Passive solar heating
- ❑Passive cooling and natural ventilation
- ❑Day lighting
- ❑Renewable resources

Spectrum:

- ❑Traditional vernacular -sustainability by default.
- ❑Existing-architecture-made-more-sustainable.
- ❑Environmental determinism.
- ❑Symbiotic relationship with natural environment.





INDOOR ENVIRONMENTAL QUALITY:

Comfort:

- ❑Conventional standards seek stasis or ‘optimum’.
- ❑Change is the natural state of affairs.
- ❑People are more ‘forgiving’ of buildings which offer more control.
- ❑Dynamic environments stimulate –within limits.

IAQ:

- ❑Ventilation.
- ❑Air quality.
- ❑Pollutants.

SUSTAINABLE BUILDING MATERIALS:

- ❑Sustainable sources.
- ❑Extraction, processing, manufacture.
- ❑Embodied energy.
- ❑Transport, assembly.
- ❑Life cycle maintenance.
- ❑Emissions.
- ❑Recycling, disposal.
  - -NB composite materials.

SUSTAINABLE MATERIALS:

❑ENGINEERED WOOD

Use structural elements manufactured with a minimum amount of high-grade wood.

❑SUSTAINABLE LUMBER

Use certified sustainable lumber.

Use fast-growing materials like bamboo flooring.

❑RE-USED WOOD

Use re-cut lumber from recently dismantled buildings.

❑RECYCLED MANUFACTURED MATERIALS

Use materials manufactured with a high recycled content.

❑LONG-LIFE AND LOW-MAINTENANCE MATERIALS

Use materials that last, with minimum or no maintenance costs.

❑LOW-ENERGY MATERIALS

Use materials that require minimal energy to manufacture, transport, and grow.

❑RECYCLED AND ALTERNATIVE CONSTRUCTION SYSTEMS

Straw-bale construction.

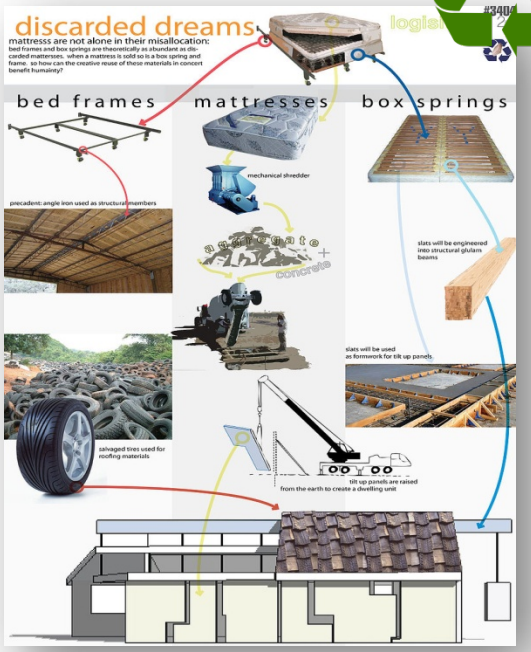
Cob (straw and earth) construction.

Pre-fabricated panel wall & roof systems.

Post and beam construction.

Construction methods that the owner can use to build the home themselves.

RECYCLED MATERIALS:



- Sustainable architecture often incorporates the use of recycled or second hand materials, such as reclaimed lumber and recycled copper.
- The reduction in use of new materials creates a corresponding reduction in **embodied energy** (energy used in the production of materials).
- Often sustainable architects attempt to retrofit old structures to serve new needs in order to avoid unnecessary development.
- When older buildings are demolished, frequently any good wood is reclaimed, renewed, and sold as flooring. Any good dimension stone is similarly reclaimed.
- Many other parts are reused as well, such as doors, windows, mantels, and hardware, thus reducing the consumption of new goods.
- When new materials are employed, green designers look for materials that are rapidly replenished, such as bamboo, which can be harvested for commercial use after only 6 years of growth, sorghum or wheat straw, both of which are waste material that can be pressed into panels, or cork oak, in which only the outer bark is removed for use, thus preserving the tree.

SUSTAINABLE REMODELING:

- Existing buildings can remodel and install improved mechanical components and update operating systems to make a building green.

RENEWABLE ENERGY GENERATION:

Solar panels:

- Active solar devices such as photovoltaic solar panels help to provide sustainable electricity for any use. Electrical output of a solar panel is dependent on orientation, efficiency, latitude, and climate—solar gain varies even at the same latitude.
- Roofs are often angled toward the sun to allow photovoltaic panels to collect at maximum efficiency.
- Solar panels can produce adequate energy if aligned within 30° of south.

Wind turbines:

- The use of undersized wind turbines in energy production in sustainable structures requires the consideration of many factors.
- In considering costs, small wind systems are generally more expensive than larger wind turbines relative to the amount of energy they produce.
- Building integrated wind turbine performance can be enhanced with the addition of an aerofoil wing on top of a roof mounted turbine.

Solar water heating:

❑Solar water heaters, also called solar domestic hot water systems, can be a cost-effective way to generate hot water for a home.

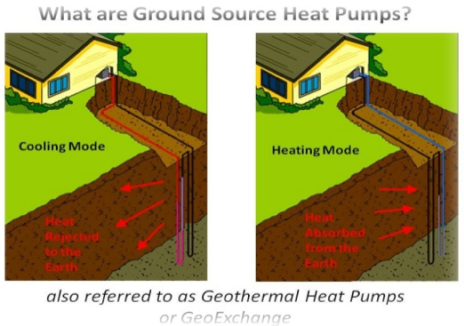
❑ They can be used in any climate, and the fuel they use—sunshine—is free. Solar water heaters, also called solar domestic hot water systems, can be a cost-effective way to generate hot water for a home.

❑They can be used in any climate, and the fuel they use—sunshine—is free.

❑There are also two types of circulation, direct circulation systems and indirect circulation systems. Direct circulation systems loop the domestic water through the panels. . Indirect circulation loops glycol or some other fluid through the solar panels and uses a heat exchanger to heat up the domestic water.

❑With the use of solar collectors, the energy use is cut in half.

Heat pumps:



❑Air-source heat pumps are inexpensive relative to other heat pump systems. However, the efficiency of air-source heat pumps decline when the outdoor temperature is very cold or very hot; therefore, they are only really applicable in temperate climates

❑Other types of heat pumps are water-source and air-earth. If the building is located near a body of water, the pond or lake could be used as a heat source or sink. Air-earth heat pumps circulate the building's air through underground ducts. With higher fan power requirements and inefficient heat transfer, Air-earth heat pumps are generally not practical for major construction.

TYPES OF GREEN AND SUSTAINABLE BUILDINGS:

Any type of building can incorporate green and sustainable design principles. Depending on the function of the building, consideration is given to efficiency in materials, mechanical systems, and operating cost in the design process.

- **Homes.**
- **Schools.**
- **Commercial and public buildings.**
- **Laboratories.**
- **Health care facilities.**



Sustainable buildings examples:

- **CII-Sohrabji Godrej Green Business Centre, Hyderabad.**
- **Infinity Benchmark, Salt Lake City, Kolkata.**
- **Suzlon One Earth, Pune.**
- **Patni (i-GATE) Knowledge Center, Noida.**
- **Great Lakes Institute of Management, Chennai.**
- **ITC Royal Gardenia, Bangalore.**

CII-Sohrabji Godrej Green Business Centre, Hyderabad:

- This building is one of the world's best example of passive architectural design**.** **(GBC)** is unofficially world's most environment friendly construction for the use of water and energy efficient technologies. The building is literally made completely out of recycled material.
- The building does not discharge any waste water and recycles all the used water. The building design comprises of two air conditioning towers.
- The roof is covered with roof garden as well as solar photovoltaic thereby reducing the energy consumption by almost 60% against a comparable conventional building.

Infinity Benchmark, Salt Lake City, Kolkata:

- Inaugurated in 2009, this 5,60,000 sq. feet of space spread over 20 floors was then to receive a LEED Platinum rating.
- This building is equipped with CO_2 monitoring sensors, intelligent humidification controls, rainwater harvesting & waste water recycling systems. The building design reduces the overall energy costs by 30% .

Infinity Benchmark, Salt Lake City, Kolkata:

❑This headquarters of India's largest green energy company truly lives up to the expectations. Suzlon one earth is 100% powered by onsite and offsite renewable sources. The campus has 18 hybrid wind turbines that fulfil 7% of the total energy consumption, the rest of energy demand is met from offsite wind turbines.

❑90% of the occupied spaces in the campus have daylight exposure, all the lighting used is also LED that reduces the overall consumption. Daylight sensors & occupancy sensors are installed across the building that automatically controls the artificial lighting in presence of daylight and turn off the lights when no one is around.

❑More than 70% of the building material used has a reduced carbon footprint. Jet fans are installed in the basements that push out stale air and bring in fresh air from time to time, this systems consumes 50% less energy as compared to conventional ducted basement ventilation system.

❑ Even the pavements and roads within the campus are designed to enable water percolation and thereby control storm water runoff thus, contributing towards an increased water table level.

Patni (i-GATE) Knowledge Center, Noida:

❑This Noida office of Patni (now i-gate) is one of India's largest LEED Platinum certified office space. The building design utilizes passive (architectural) and active (mechanical/ electrical) strategies to minimize energy consumption. The building depth has been optimally designed to capture daylight for more than 75% of the occupied interiors. More than 95% of the occupied workspace in the building receives outdoor view. Almost 50% of the land cover is green area and the building does not discharge any waste recycling all its sewage water.

Great Lakes Institute of Management, Chennai:

❑Located at the scenic Chennai Pondicherry highway, the campus of this b-school lives up to its name. The institute is of the few LEED Platinum certified educational institutions in the world. Spread over 27 acres it certainly is the most energy efficient academic center in India.

ITC Royal Gardenia, Bangalore:

❑ITC Gardenia in Bangalore has reduced heat gain to large extent by their design and have experienced serious energy savings. High performance Envelope includes cavity walls which has two skins of bricks with a hollow space in between which helps in slowly drawing rainwater or even humidity into the wall.

❑This has also flavored the living walls that they have adopted by decorating the walls in interiors with plants.

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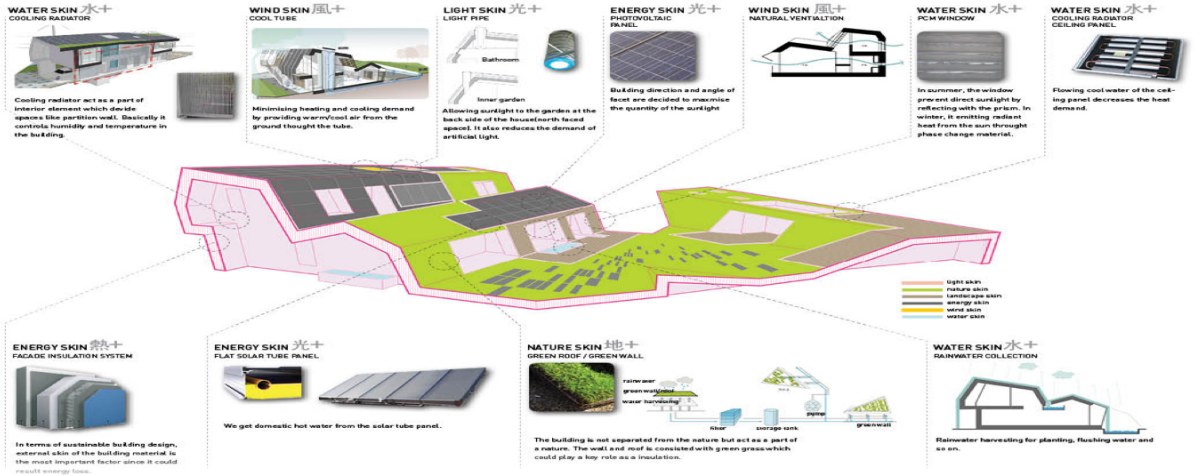
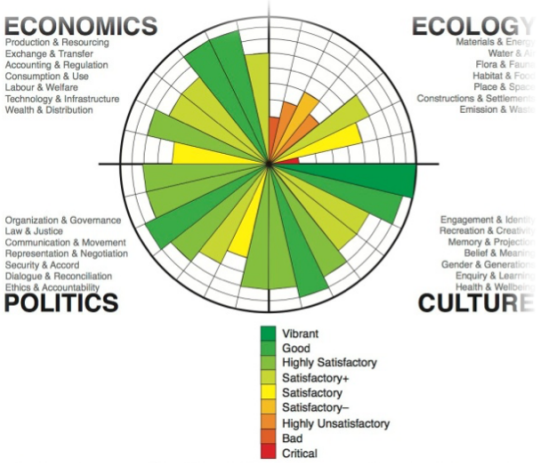
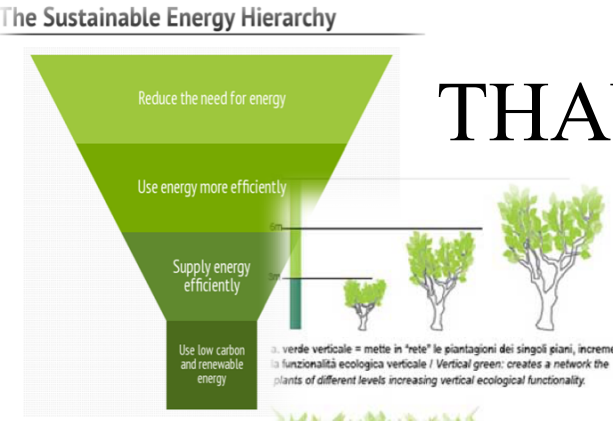


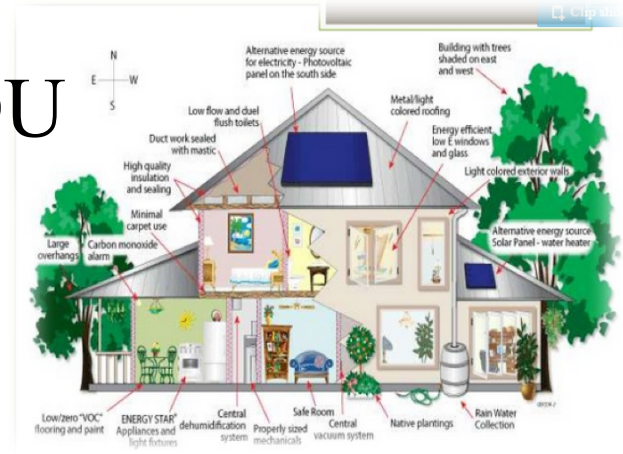


CIRCLES OF SUSTAINABILITY



GREENMATCH

THANKYOU



Form + Function

It must not only function well, it must be designed well.
Does the customer like how it appears?

Design for people not for prestige.

What is Industrial Design?

The art and science of improving the aesthetics, ergonomics, functionality, and/or usability of a product (hardware).

Industrial Design(ID)

Hardware

Form

Style

Materials

Aesthetics


Max Watts 325
KitchenAid
Stir 2 4 6 8 10
ARTISAN

~90% of design is created for 10% of the world
Whereas only 10% of design is created for 90% of the world.

Design as human centered.
Design as God’s hands.
Design as sustainable and necessary.

one laptop per child

http://www.nytimes.com/2007/05/29/science/29cheap.html