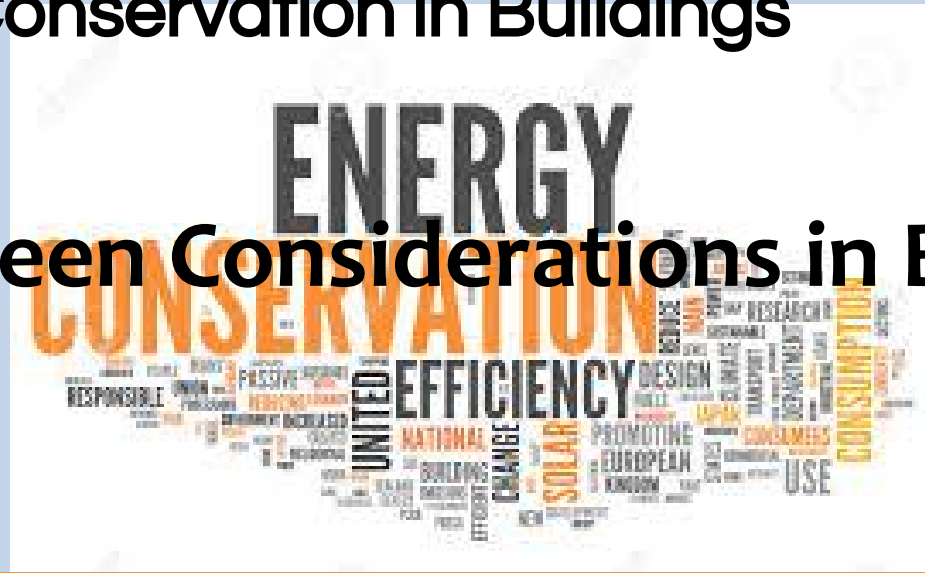


Green Building Techniques and Energy Conservation in Buildings

Green Considerations in Buildings



**Training Program on Energy Reforms
By APHRD
Extension Training Centre (ETC), BAPATLA**

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What is a Green Building?

A **Green Building**, is a sustainable building, which is an environmentally responsible and resource-efficient throughout its life-cycle from cradle to grave (siting, design, construction, operation, maintenance, renovation, and demolition)

Sustainable development is maintaining a delicate balance between the human need to improve lifestyles and feeling of well-being on one hand, and preserving natural resources and ecosystems, on which we & future generations depend

“ Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”-As per Brundtland Commission’s Report,1987





“Sustainable development is seen as a multidimensional process that links environmental protection with economically, socially and culturally sound development.”



Objectives of a Green building

- ❖ Efficient use of resources
- ❖ Reduction of negative impact on environment
- ❖ Optimal environmental and economic performance
- ❖ Occupant health and wellbeing
- ❖ Productivity

Benefits of Green Buildings



Considerations of a green building:

- ❖ Controlling of soil erosion and water table and air quality
- ❖ Reduction of pollution
- ❖ Limit disruption of natural resources
- ❖ Renewable technologies to reduce environmental impacts associated with fossil fuel energy use
- ❖ Control of ventilation and lighting systems to support good health, better productivity and a comfortable atmosphere
- ❖ Connection between indoor spaces and outdoor environment through the introduction of sunlight and views

GREEN BUILDING STRATEGIES

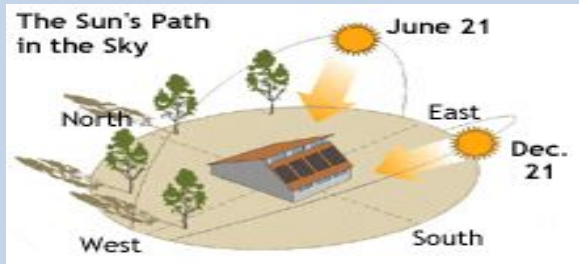
- Climate sensitive Design/Solar Passive Architecture
- Sustainable Building Materials
- Energy Efficient Lighting/HVAC
- Traditional Technologies/Materials



GREN BUILDING STRATEGIES

Solar passive Architecture

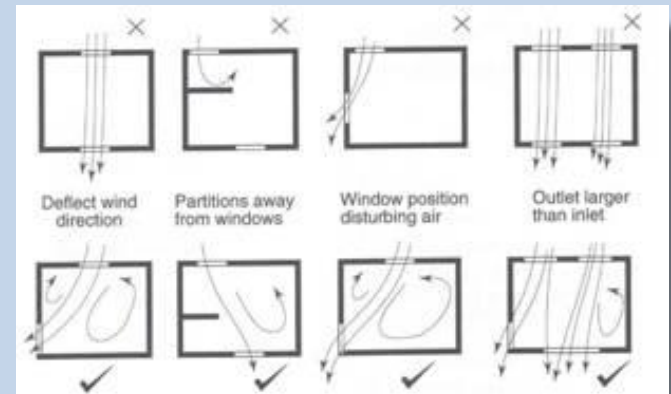
Orientation & Shape of the building



- Building needs to be oriented as per the local Climate
- The plan form of a building affects the airflow in & around a building and dictates heat gain or loss
- Thermal mass & Surface to volume ratio influences heat gain or loss

Fenestrations

- configuration of openings forms important aspects of climatic design.
- Appropriate ventilation with the help of shading devices gets fresh air and keeps the spaces comfortable
- Positioning and sizing of windows
- Window shading (fixed overhangs)

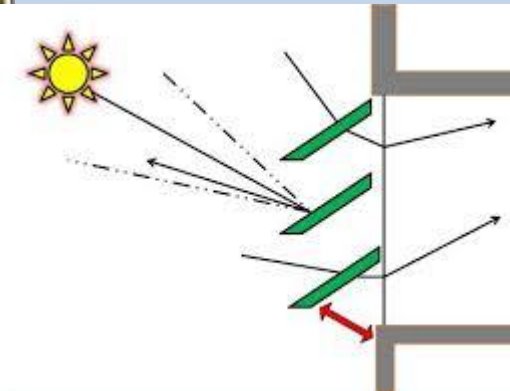


Passive Solar heating/cooling Techniques

- Passive and low energy design helps the building take advantage of the climate when it is advantageous, and protects the building from the climate when it is not.
- Passive cooling sources are the sky, the atmosphere, and the earth – all natural heat sinks.
- Principles of passive cooling are: shading, reflection, insulation, reduction of internal heat gains, ventilation, fans, and tightness of buildings.
- Heat reduction is best achieved by excluding unwanted heat rather than removing it later, often by air conditioning.

Green roofs

- Green roofs are simply vegetated roof covers constructed atop and across a roof deck. They sometimes are called eco roofs or sky gardens
- It reduce ambient air temperature, energy use, and utility costs;
 - help cleanse the air and water, extend the life of the roof
 - and improve aesthetics;



Exterior shading and controlling devices

ex: light shelves, overhangs, horizontal/vertical louvers, tracking devices

Sustainable Building materials

- Large amounts of energy is spent on the manufacturing of the materials and for their transport
- Less energy intensive materials should be selected
- Importance to vernacular/Local materials
- Alternative building materials with less embodied energy
- Ex: Roofing-Filler Slabs
- Terracing-Mud phuska
- Super structure-Ashlar Masonry with cement mortar
- Foundation-Fly ash bricks



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MATERIALS USED FOR GREEN BUILDING

- Less volatile organic compounds paints.
- Bamboo flooring.
- Woven wool for carpeting.
- Ecological concrete. (special admixture, dicalcium silicate: $2\text{CaO} \cdot \text{SiO}_2$, instead of cement).
- Paper insulation panels.



Energy Efficient Lighting

Following are few examples of energy saving opportunities with efficient lighting

- Installation of CFL,s in place of Incandescent lamps
- Use of energy efficient Fluorescent lamps in place of conventional CFL,s
- Installation of LED,s in place of CFL,s in offices/show rooms
- Installation of sensors
- Adding lighting controls and Occupancy controls(photo sensors) as per the usage
- Timers for the effective usage of appliances



With all this every building on an average has the potential to improve the energy efficiency by 25-30%

Water re use and recycling

Reduction of water consumption for landscape :

- Drought tolerant plants
- Drip irrigation, moisture-sensing irrigation technologies
- Recycled rainwater system
- Municipally-provided non-potable water source use
- Minimization of Water Usage
- Dual flush water closets & Ultra low-flow water closets and urinals
- Waterless Urinals
- Sensor-operated, Low-flow lavatories
- Rainwater collection reuse systems
- Gray water reuse systems



Traditional technologies for Sustainability

Untutored builders fit their work in the environment and topography.
They don't try to conquer nature" –Rudofsky

Traditional domestic architecture harmonizes with the local climate
ex. Traditional Kerala Houses

Use of Courtyards, massive walls in hot regions, sloped roofs, long chajjas in tropical areas had given comfortable living conditions



Energy management

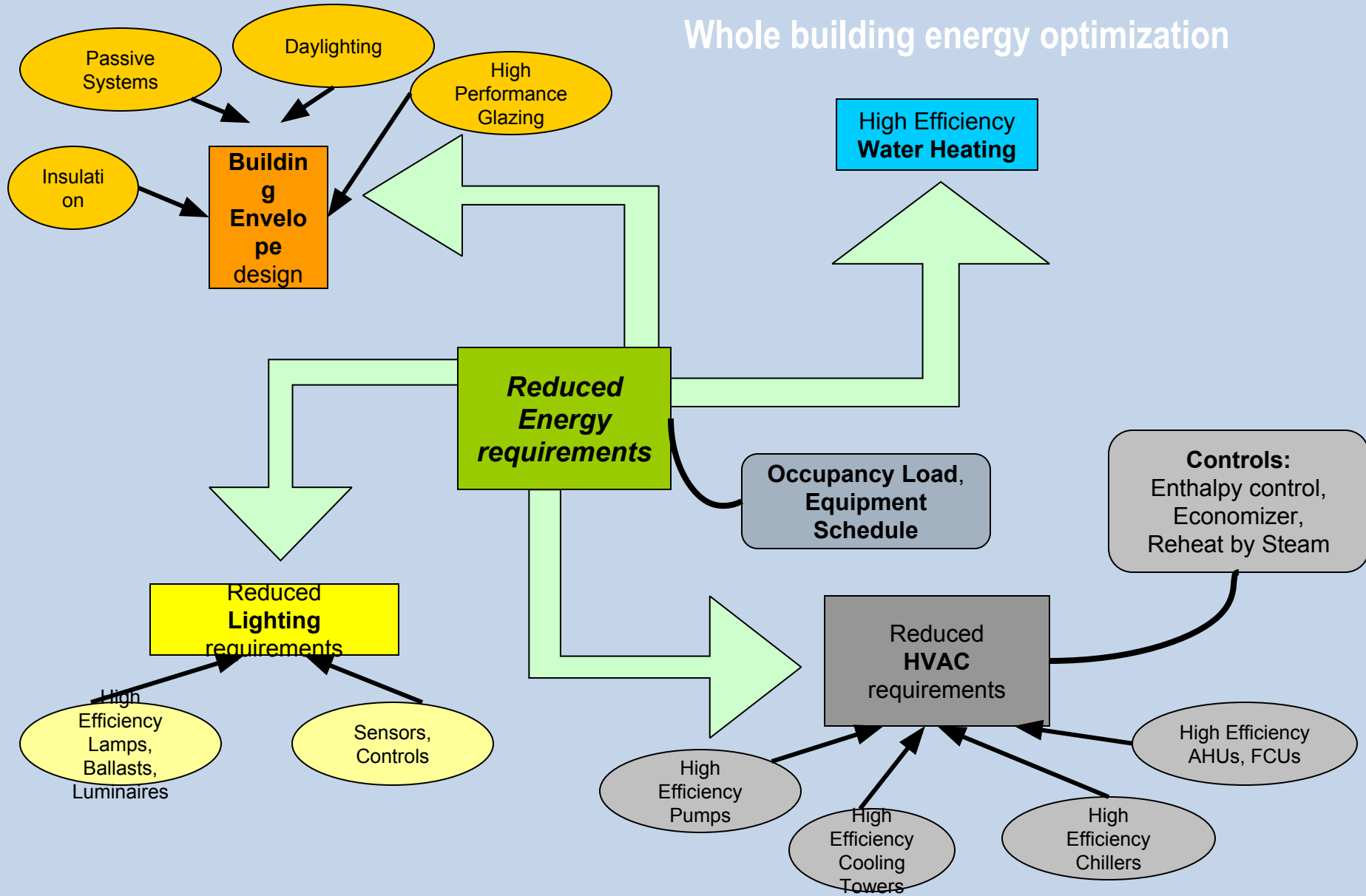
“The strategy of adjusting and optimizing energy, using systems and procedure so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems”

Objectives of Energy Management

- To achieve and maintain optimum energy procurement and utilization
- To minimize energy costs
- to reduce impacts on environment



Whole building energy optimization



**Architectural design/Site
planning**

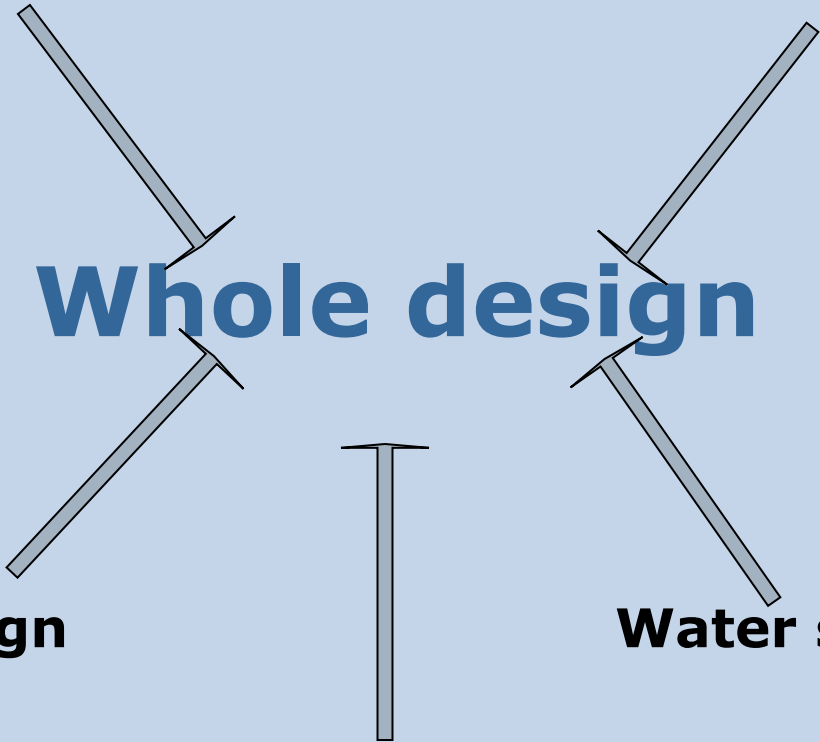
Lighting design

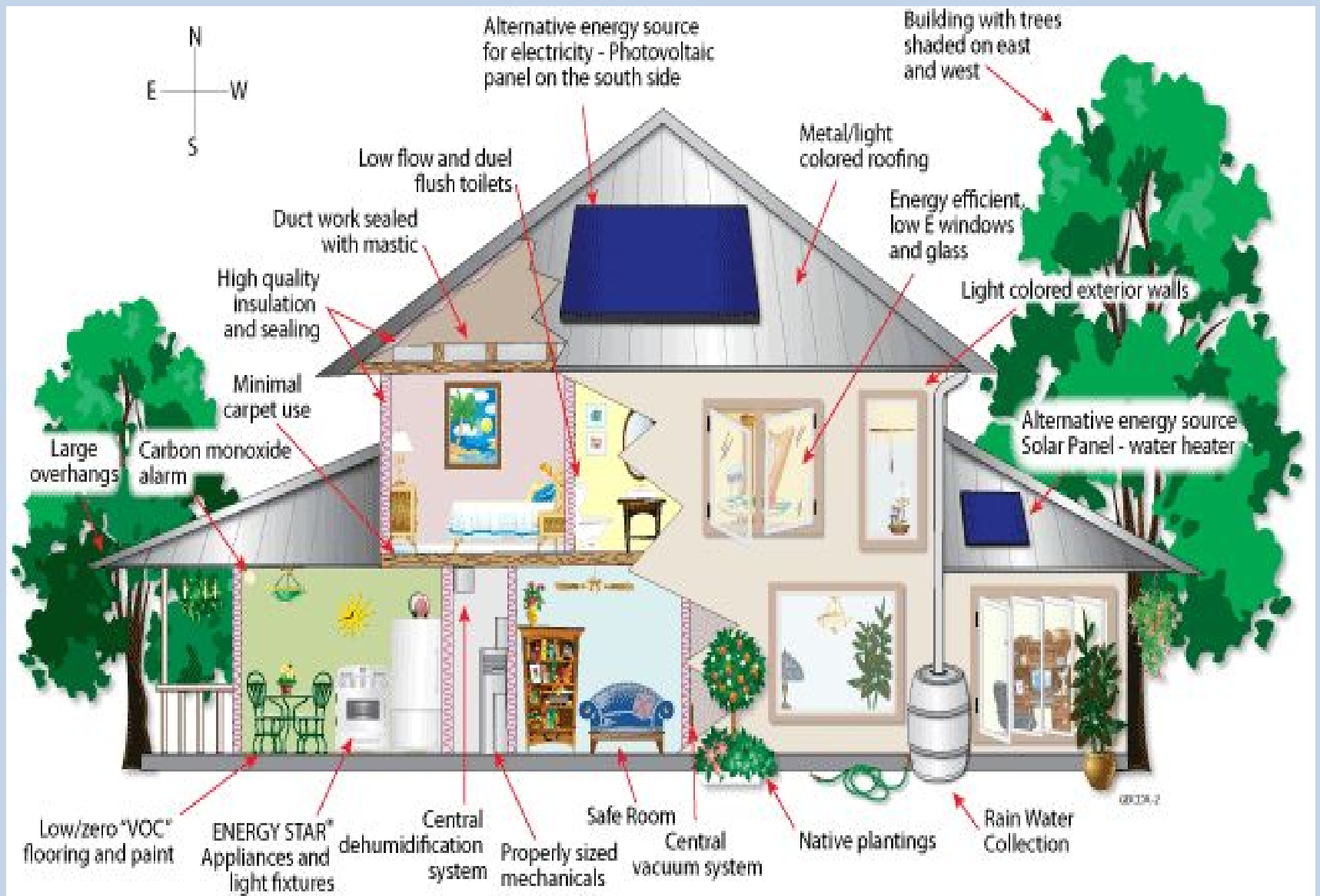
Whole design

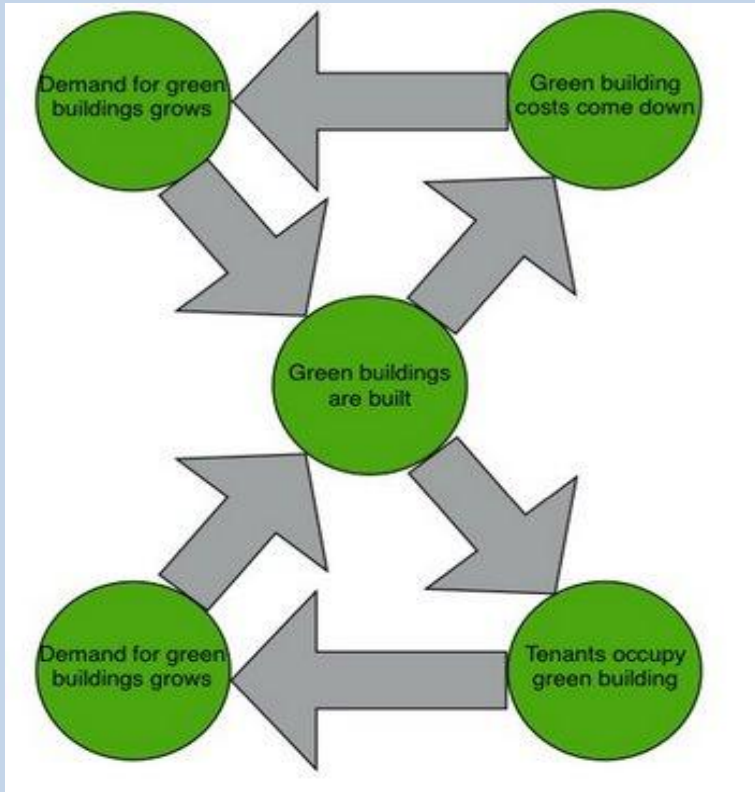
HVAC design

Water system design

**Energy management and
control design**







Green Building Cycle

THANK YOU