



VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)
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522508
Department of Civil Engineering

Green Buildings

UNIT-II

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- Renewable Energy sources that can be used in Green Buildings – Conventional and Non Conventional Energy, Solar energy, Passive Solar Heating, Passive Solar collection, Wind and other renewables. A passive solar strategy, Photovoltaics, Rainwater Harvesting Climate and Energy, Macro and Microclimate. Indian Examples.

Renewable Energy sources that can be used in Green Buildings

- **Climate change phenomena is very likely to produced by green house gases (GHGs) excess in the atmosphere.**
- **Approximately two thirds of current GHG emissions are produced by energy related fossil fuel combustion**
- **An option to mitigate those emission is to transform current energy systems to sustainable energy systems.**
- **Renewable energy: Energy that comes from the sources which are continuous replenished such as sun light, wind, rain, tides, waves and geo thermal energy.**
- **There are many sources of renewable energy, but all of them, except geothermal energy, are more or less directly related to the sun; the main source of clean and sustainable energy for the earth.**



Biomass energy



Hydro energy



Wind energy



Geothermal energy



Solar energy



Tidal energy

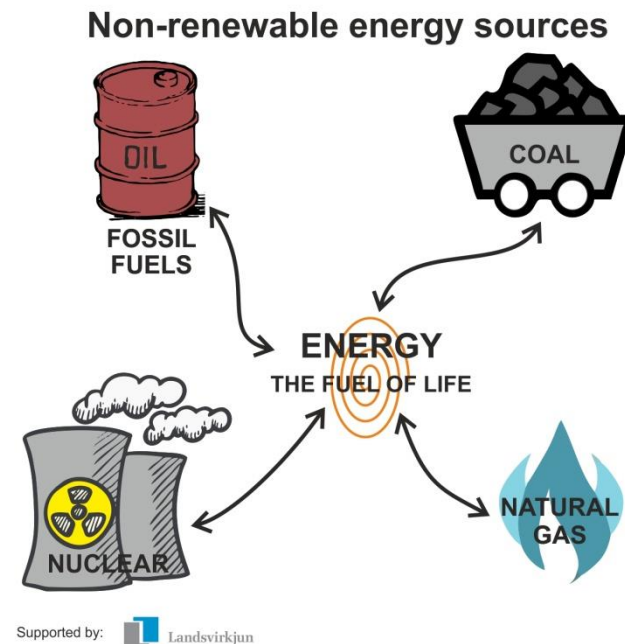
Renewable Energy Scenario in India

- Government created the **DEPARTMENT OF NON-CONVENTIONAL ENERGY SOURCES (DNES)** in **1982**
- In 1992a full fledged Ministry of Non- Conventional Energy Sources was established under the overall charge of the Prime Minister.
- The range of its activities cover
 1. Promotion of renewable energy technologies
 2. Create an environment conducive to promote renewable energy technologies
 3. Create an environment conducive for their commercialization
 4. Renewable energy resource assessment
 5. Research and development
 6. Demonstration
 7. Production of biogas units, solar thermal devices, solar photovoltaic's, cookstoves, wind energy and small hydropower units

CONVENTIONAL SOURCE OF ENERGY

- The conventional sources of energy are generally non-renewable sources of energy, which are being used since a long time.
- These sources of energy are being used extensively in such a way that their known reserves have been depleted to a great extent.
- At the same time it is becoming increasingly difficult to discover and exploit their new deposits.
- It is envisaged that known deposits of petroleum in our country will get exhausted by the few decades and coal reserves are expected to last for another hundred years.
- The coal, petroleum, natural gas and electricity are conventional sources of energy.

- Conventional sources of energy are not abundant, present in limited quantity, e.g. coal, petroleum, natural gas.
- conventional source have been in use for a long time.
- conventional source aren't refill continuously. They are formed over a million years.
- Conventional source are called non-renewable fuel sources of energy.
- Conventional source are mostly used industrial and commercial purposes.



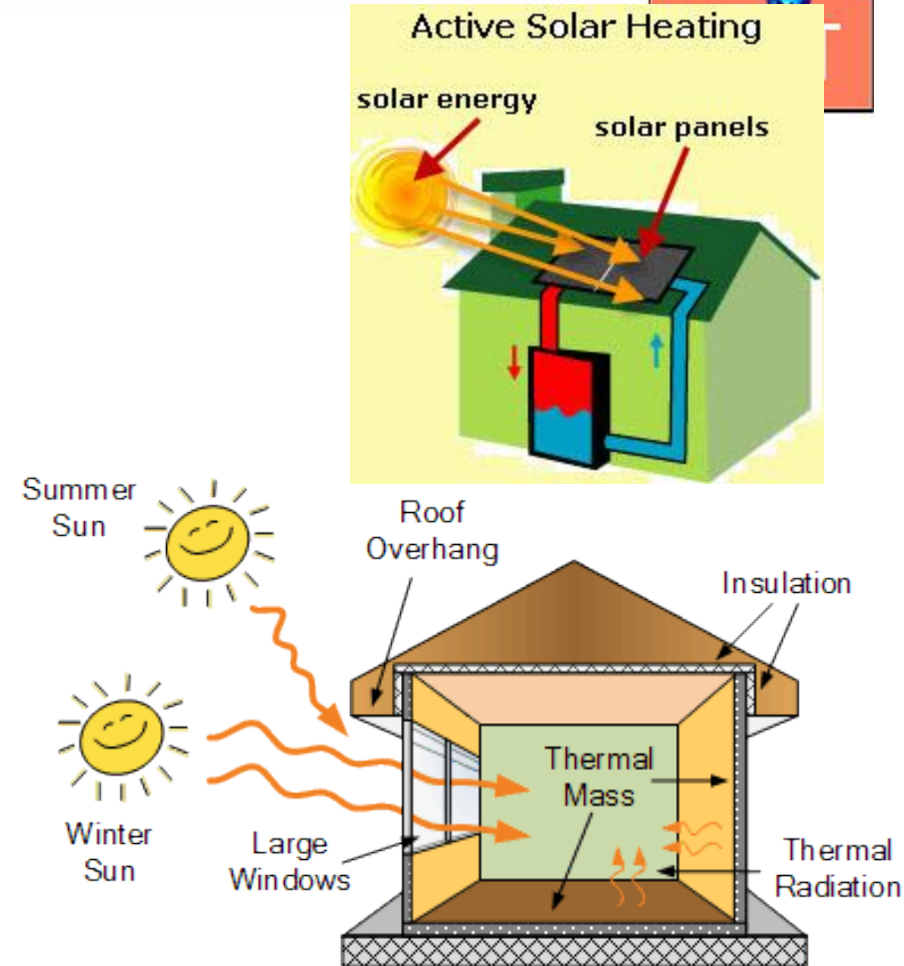
NON-CONVENTIONAL SOURCE OF ENERGY

- Energy generated by using wind, tides, solar geothermal heat and biomass including farm and animal waste as well as human excreta is known as non-conventional energy.
- All these sources are renewable or inexhaustible and do not cause environment pollution.
- More over they do not require heavy expenditure.
- Non-conventional sources of energy are abundant in nature, e.g. solar energy, wind energy, tidal energy, bio-gas from biomass etc.
 - They are inexhaustible.
 - Generally, these are pollution-free.
 - Low expenditure required.
 - Less expensive due to local use and easy maintenance.

Solar energy

- **Solar energy** is radiant light and heat from the Sun that is harnessed using a range of technologies such as solar power to generate electricity, solar thermal energy (including solar water heating), and solar architecture.
- **Solar architecture** is an architectural approach that takes in account the Sun to harness clean and renewable solar power.
- It is related to the fields of optics, thermics, electronics and materials science.
- Both active and passive solar housing skills are involved in solar architecture.

- Active solar techniques include the use of photovoltaic systems, concentrated solar power, and solar water heating to harness the energy.
- Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air.



Active Solar Design

- **Active solar systems use external sources of energy or use conventional energy source to operate**
- **It usually requires expensive external equipment**
- **Requires a lot of maintenance**
- **Its efficiency depends on the type of equipment used**
- **Active solar systems typically work on mechanical system**
- **Lots of moving parts- higher failure rates**
- **Allows controlled and efficient gathering and distribution of energy**

Passive solar Design

- **A passive solar system does not involve mechanical devices or the use of conventional energy sources to operate**
- **It's usually cheaper than an active system**
- **Requires little or almost no maintenance**
- **It's efficiency depends on the weather**
- **Passive solar heating uses a phenomenon that happens naturally**
- **No moving parts and works 24hours per day**
- **Less control in gathering and distribution of energy**

Passive Design



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graph TD; A[Passive Design] --> B[Passive Cooling]; A --> C[Passive Heating]; A --> D[Passive Lighting];
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Passive
Cooling

Passive
Heating

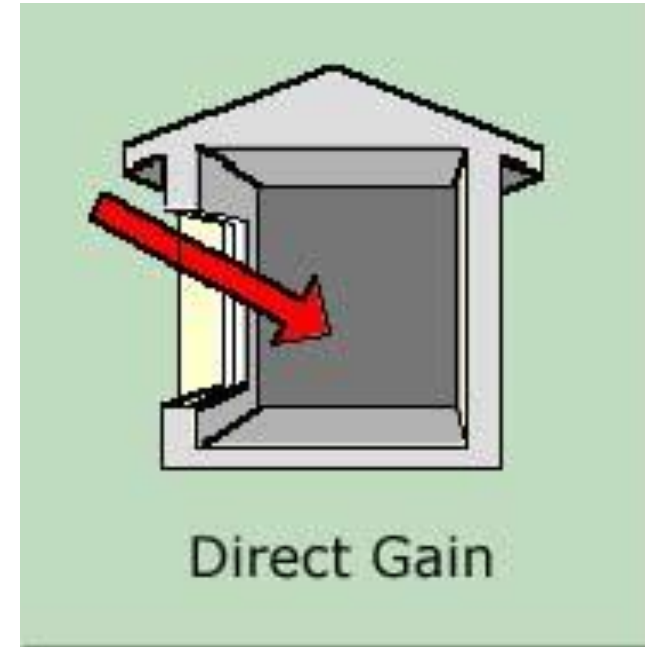
Passive
Lighting

Passive Solar Heating

- Passive heating is the spontaneous warming effect resulting from the absorption of solar radiation wherein solar energy is exploited to induce heat flow from the affected surface to indoor air, as well as promote heat storage within the building structure.
- In the climatic zones requiring indoor space heating, it may be explored to use the following strategies:

a) Direct gain method:

- Controlled sun may be permitted into the habitable spaces through an opening to directly heat the floor, walls or other internal components and objects, which, in turn, heat the air within the room.
 - Some examples of building materials that enable direct solar gain by acting as thermal storage mass are concrete, bricks, stone and water.
 - The high thermal mass is usually located in the internal or external walls, floors or other built- in structures that receive sun directly.



b) Indirect gain:

- A thermal storage wall may be placed between the glazing and habitable space which prevents solar radiation from directly entering the living space.
- The solar energy incident on wall is absorbed by the wall and then indirectly transmitted to the habitable space over a longer time.

