

Chapter three

Energy End Use, Option Assessment, and Tradeoff Analysis

OUTLINE

- ▶ What are green buildings or Eco-buildings?
- ▶ Electric Industry Restructuring
- ▶ Domestic Energy Efficiency Improvement
- ▶ Future Road Transport Options
- ▶ Impact of energy uses on ecosystems
- ▶ Research into renewable energy sources
- ▶ Energy Policy and Options

ECO-BUILDINGS OR GREEN BUILDING

► Green buildings are the ones that are good to the environment in addition to being resource efficient throughout their life cycle.

► Advantages:

1) The construction costs are the same as a standard building and sometime they cost a little bit more as they require special materials to be built.

2) Efficiency

A) Water efficiency:

► Green buildings don't know the meaning of "wasted", they recycle rain water and grey water and use them for toilet flushing for instance.

B) Energy Efficiency

► It saves energy more than those built out of bricks.

► They only depend on all renewable energy resources such solar power, hydro-power and wind power which are used for heat and electricity and help improve the indoor air quality.

C) Material Efficiency:

► Green buildings are built from natural, non-toxic and recycled materials that don't cost much and Eco-friendly such as bamboo, straw, recycled metal or concrete..etc.

Disadvantages:

1- Location:

Since these buildings depend on sun for energy, they need to be located in position that will have the best sun exposure.

2- Availability:

The materials to build such buildings can be hard to find especially in urban areas.

3- No air cooling features:

These buildings run on heat to generate power, so they are not designed for hot areas as they do not have any ventilation systems, so air conditioners will be required which will make these buildings anything but Eco-friendly.

Eco-buildings

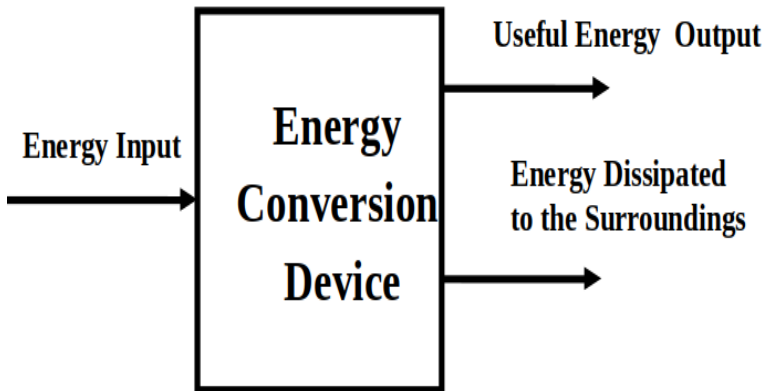
► Eco or green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources.
 - Protecting occupant health and improving employee productivity.
 - Reducing waste, pollution and environmental degradation.
 - Green building practices aim to reduce the environmental impact of buildings, and do not build in sprawl (spreading in disordered fashion)
- Domestic Energy Efficiency Improvement:

- Energy efficiency mean “doing more with less through smarter technologies”.
- It means getting more energy service per unit of energy consumed.

Example: Installing fluorescent lights reduces the amount of energy required to attain the same level of illumination compared to using traditional incandescent light bulbs.

Energy Efficiency

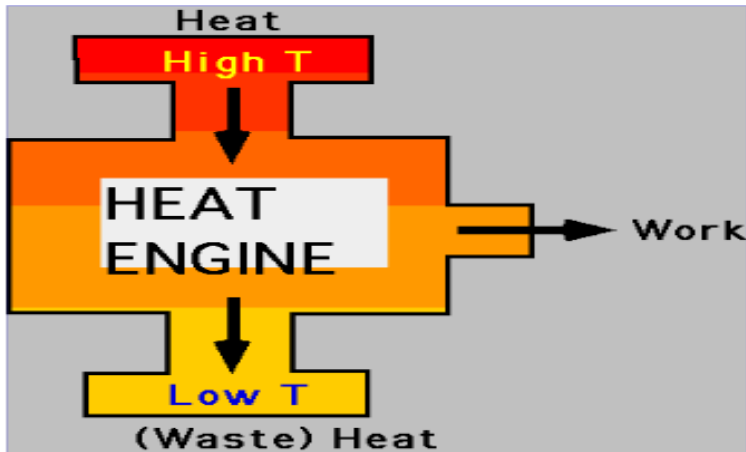


$$\text{Efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

Heat Engine

A heat engine is any device which converts heat energy into mechanical energy.

Accounts for 50 percent of our energy conversion devices.



Carnot Efficiency

- ▶ Maximum efficiency that can be obtained for a heat engine .

$$\eta(Carnot) = (1 - \frac{T_{cold}}{T_{hot}})$$

- ▶ Temperature is in degree Kelvin.
- ▶ Smart design techniques and high efficiency building components are the key to maximizing energy efficiency.

Electric Industry Restructuring:

- ▶ It is possible to restructure the electric industry and simultaneously move toward a sustainable energy system, by including policies that explicitly (clearly) constrain markets.
- ▶ Restructuring should include specific provisions for commercialization of renewable generating technologies and for diversity of the electric system resource mix.
- ▶ This could include funding for renewables in a system benefits charge and/or a renewables portfolio standard.
- ▶ Energy efficiency programs should be continued, delivered by regulated electricity distribution companies and others, and funded through a system benefits charge.

Future Road Transport Option

- ▶ Transportation accounts for just over a quarter of the total global demand for energy.
- ▶ It is fast growing use of global energy and a petroleum dependency which causes global warming.
- ▶ One way to reduce the dependence of the transportation sector on petroleum-based fuels is to switch from the use of internal combustion engines fueled by petroleum.
- ▶ We need the future cars to be less contribution for environmental pollution (i.e GHG) emissions associated with vehicles with the following options:
 - ✓ Increasing the efficiency of converting the fuel energy to work, by improving drive train efficiency and recapturing energy losses;
 - ✓ Changing to a less carbon-intensive fuel; and
 - ✓ Reducing emissions of non-CO₂ GHGs from vehicle exhaust and climate controls.

Impact of energy uses on ecosystems

► Energy consumption is the major source of GHG emissions, that cause climate change, and the building sector is a major energy consumer.

► The exponential increase of energy consumption, since the beginning of the industrial revolution, has produced significant changes in the global environment.

► Among which is the increase of the average concentration of carbon dioxide in the atmosphere from 280 ppm in 1750 to more than 390 ppm in 2011.

► Other significant environmental effects of energy consumption are:

✓ the several ecological problems caused by acid rain, which has threatened (in danger) in the past the ecosystems of several lakes and rivers;

✓ lead contamination of the atmosphere;

✓ nuclear waste, which is produced by the more than 430 nuclear power plants in continuous operation worldwide.

- ✓ Some of the consequences of global climate change are:
- ✓ Melting of the polar ice caps
- ✓ Sea level rise
- ✓ Regional climate change

Remedial Actions for Global Warming

- ✓ Reduction of energy consumption per capital
- ✓ Sequestration of CO_2 at the production sites, that is at the power plants, and subsequent storage.
- ✓ Substitution of coal with nuclear fuel for the production of electricity.
- ✓ Reforestation
- ✓ Higher use of renewable energy sources.

Energy policy and options

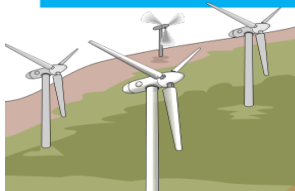
► The goal of any energy policy, whether it is regional, national, or multinational is to provide a reasonable balance between energy demand and energy supply in all economic sectors.

► The following are the energy policy and options:

1. Reducing the gap between energy demand and supply.
2. Improving energy efficiency and conservation.
3. Achieving the optimal (best) energy mix.
4. Diversifying sources of energy supply.
5. Investing in energy infrastructure development.
6. Shifting to alternative and renewable sources of energy.
7. Encouraging innovation and competition through research and development.
8. Reducing vulnerability to energy price fluctuations.
9. Achieving good energy sector governance.

- ▶ The general objectives of the energy policy by the Government of the Ethiopia (GoE) are:
 - ✓ To ensure a reliable supply of energy at the right time and at affordable prices, particularly to support the country's agricultural and industrial development strategies adopted by the GoE.
 - ✓ To ensure and encourage a gradual shift from the use of traditional energy sources to modern energy sources.
 - ✓ To set general guidelines and strategies for the development and supply of energy resources;
 - ✓ To increase energy utilization efficiency and reduce energy wastage; and,
 - ✓ To ensure that the development and utilization of energy is benign to the environment.

Thank you



END OF THIS CLASS SESSION

