MCN-201:
SUSTAINABLE ENGINEERING

Module 5

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Sustainability practices:

- Basic concept of sustainable habitat
- Methods for increasing energy efficiency in buildings
- Green Engineering
- Sustainable Urbanisation
- Sustainable cities
- Sustainable transport.

1. Basic concept of sustainable habitat

sustain = Maintain
Habitat = Natural home for one or more species.

- A sustainable habitat is an **ecosystem** that produces food and shelter for people and other organisms, **without resource depletion** and in such a way that no external waste is produced.
- Thus the habitat can **continue into the future** without **external inputs** of resources.
- Such a sustainable habitat may evolve naturally or be produced under the influence of man.

- A sustainable ecosystem is the achievement of a **balance** between **economic and social development** of the human ecosystem along with environmental protection, housing, basic services, social infrastructure and transportation.
- A stable habitat is necessary to ensure that **one species' waste becomes another species' energy or food source.**
- It involves preserving ecological balance based on a **symbiotic perspective on urban development** while **developing urban extensions of existing towns**.

For maintaining our natural habitat(Earth),

we should:-

1. Promote energy efficiency
2. Promote the use of eco-friendly fuels. (e.g. LPG,CNG, etc.)
3. Better manage municipal solid waste
4. Better manage the sewage disposal system
5. Promote public transport

PROMOTE ECO-FRIENDLY FUELS

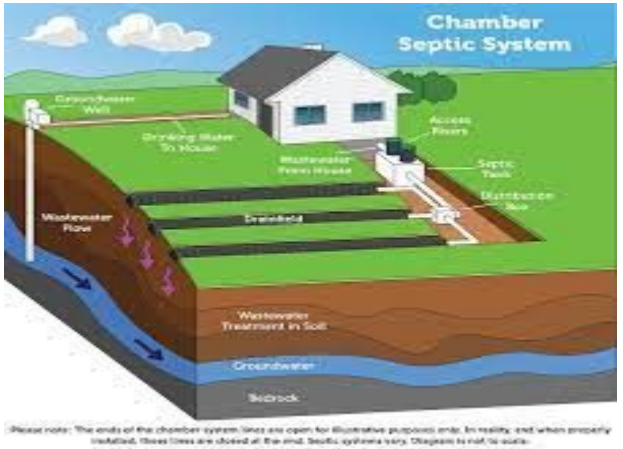
- Eco-Friendly fuels include LPG and CNG

- These fuels emit a smaller amount of carbon monoxide (CO) per joule.
- They are considered to burn cleanly. Therefore, the use of such fuels help reduce air pollution. This helps in sustaining our habitat.

- Use Biofuels like biodiesel

BETTER SEWAGE DISPOSAL SYSTEM

- A proper sewage disposal system helps in sustaining our habitat.
- The sewage is disposed off into a nearby river.
- The river thus gets polluted and the marine life, depleted. This leads to loss in biodiversity.
- Loss in biodiversity destroys man's habitat and ultimately man himself.



BETTER PUBLIC TRANSPORT

- Using public transport reduces the carbon emissions in the environment.
- Many people travel together in the modes of public transport(i.e. bus, trains, etc.).
- If a condition arises that all the people travelling by bus use their own vehicles instead, the carbon emissions will be higher.

2. Methods for increasing energy efficiency in buildings

- Keeping energy consumption down is one of the biggest challenges that facilities managers face. The need for reduced energy waste is not only driven by economic factors, but by an increased focus on sustainability. By optimizing the energy usage in your buildings, you can improve your bottom line and dramatically reduce your carbon footprint.

A. Reduce the Need for Heating and Ventilation

- Based on research from the US Department of Energy, heating, ventilation and air conditioning (HVAC) represent **a total of 35% of total building energy**. Luckily, there are several measures you can take to reduce energy consumption in these areas.
- The first step is to get **control of the temperature in your buildings**. Unless you know when and where the air conditioning should be on, it will be impossible to optimize energy usage. Once you have control of the temperature in your facilities, you can start taking action. Key opportunities include:

- **Replacing old windows** with energy-conserving windows. Energy conserving glass reduces heat loss through windows while allowing more heat from the sun to enter the building.

- Using **high-efficiency heat pumps** that can eliminate the use of refrigerants. This is a long-term investment, but one that pays off. It's also a far more sustainable option than a regular heat pump. Using high-efficiency heat pumps instead leads to a more favorable bottom line and fewer greenhouse gas emissions.

- **Ensuring proper insulation in the building**. A building should be insulated continuously around the thermal boundary. The insulating material should have a suitable thermal resistance for the climate zone where the facility is located. According to recent studies, the use of the most efficient wall, window, and HVAC equipment could reduce commercial cooling by 78%.

B. Optimize your Light Sources

- Lighting is the second most energy-consuming source in facilities. While lighting represents approximately **11% of the energy usage in American buildings**, this percentage will vary from country to country.
- Some countries, for example, **Australia**, are further ahead in adapting LED lighting as a standard. According to research from Statista, the global LED lighting market is on track to grow almost 30% between 2020 and 2023.
- And with good reason: **replacing your lighting with LED lighting** can reduce your energy use by up to **75%** compared to incandescent lighting.

C. Use Smart Technology to Optimize Energy Usage

★ Today, there are numerous technology solutions that can help you continuously measure and optimize your energy consumption.

★ One of the key research opportunities that the US Department of Energy has identified is utilizing **“low cost, easy to install, energy harvesting sensors and controls”.**

Every action can make a difference! **By reducing the need for HVAC, optimizing your light sources and using smart technology,** you will increase your energy efficiency in no time.