MCN-201:
SUSTAINABLE ENGINEERING

MODULE 2

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MODULE 2

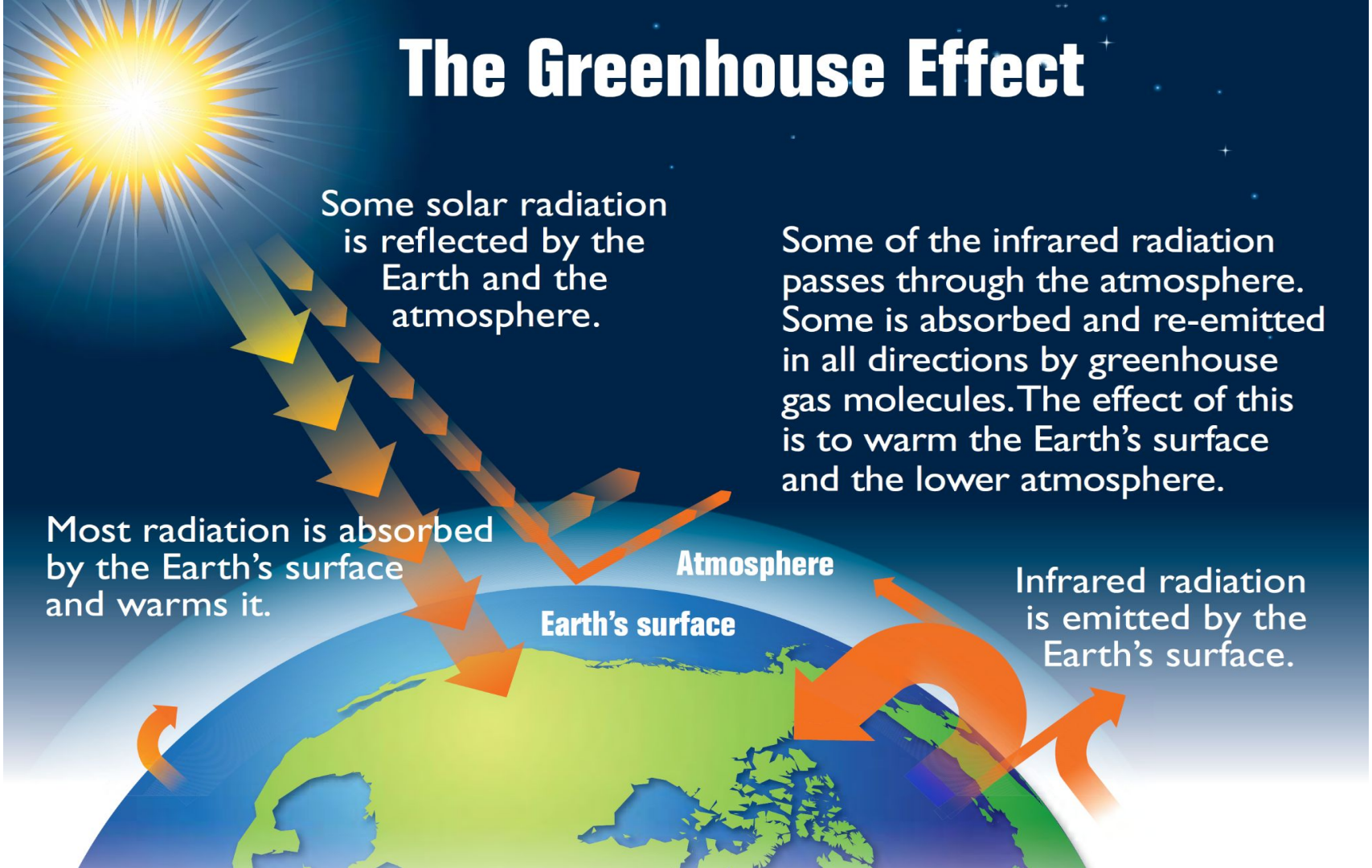
- Environmental Pollution: Air Pollution and its effects
- Water pollution and its sources,
- Zero waste concept and 3 R concepts in solid waste management
- Greenhouse effect
- Global warming
- Climate change
- Ozone layer depletion
- Carbon credits
- carbon trading and carbon footprint
- legal provisions for environmental protection.

4. Greenhouse effect

"The greenhouse effect is the process by which solar radiation is absorbed by greenhouse gases rather than reflected back into space. This insulates the earth's surface and keeps it from freezing."

- ➔ It is a natural phenomenon which refers to the rise in temperature of the earth due to the presence of certain greenhouse gases (GHG) in the atmosphere.
- ➔ GHG are water vapours, carbon dioxide, methane, nitrous oxide etc
- ➔ These gases are transparent to the incoming ultraviolet solar radiations but trap the outgoing infrared radiations, reflected back from the earth’s surface.
- ➔ If these gases were not present, the annual average temperature of the earth would be much lower (-18 0c) than they are now (15 0c).
- ➔ Excess amount of greenhouse gases will create excess hot conditions all over the earth.

The Greenhouse Effect



- ➔ Although the greenhouse effect is a naturally occurring phenomenon, it is possible that the effect could be intensified by the emission of greenhouse gases into the atmosphere as the result of human activity.
- ➔ From the beginning of the Industrial Revolution through the end of the 20th century, the amount of carbon dioxide in the atmosphere increased by roughly 30 percent and the amount of methane more than doubled.
- ➔ A number of scientists have predicted that human-related increases in atmospheric carbon dioxide and other greenhouse gases could lead by the end of the 21st century to an increase in the global average temperature of 3–4 °C (5.4–7.2 °F) relative to the 1986–2005 average.
- ➔ This **global warming** could alter Earth's climates and thereby produce new patterns and extremes of drought and rainfall and possibly disrupt food production in certain regions.

5. GLOBAL WARMING

- It is the increase of earth's average surface temperature due to the presence of too much greenhouse gases such as carbon dioxide, methane etc.
- The atmosphere holds on to too much heat, instead of letting it escape into space. This results in Global Warming.

Causes of Global Warming

- Burning of fossil fuels
- Refrigerants and air conditioners release CFC
- Deforestation - carbon dioxide intake is reduced when forests are cut down.
- Methane emission occurs due to anaerobic decomposition at huge landfills.
- Methane emission from livestock (animal farm)

Effects of Global Warming

- Rising Seas
- Changes in rainfall patterns
- Increased global temperature
- Melting of the ice
- Melting glaciers
- Widespread vanishing of animal populations
- Spread of disease
- Acidification of oceans

Measures to control Global Warming

- Promote renewable energy usage (solar energy, wind energy etc.)
- Depend more on public transport system to reduce the use of fossil fuels.
- Afforestation and reforestation
- Adopt 3R concept whenever possible.
- Reduce energy consumption at home, office etc.

6.Climate change

Climate change refers to changes caused by global warming in weather (temperature, untimely rain etc) and exists for an extended period of time.

Causes of climate change

1. Natural causes of climate change are :
    a. Continental Drift
    b. Variations in solar output
    c. Volcanoes
    d. Earth’s tilt
    e. Ocean Currents

2. Anthropogenic causes of climate change are :

a. Increase in usage of fossil fuels
b. Deforestation
c. Population growth
d. Urbanization
e. Industrial revolution

<u>Effects of climate change</u>

- Rising Seas
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7. OZONE LAYER DEPLETION

- ➔ Ozone layer is a deep layer in earth's atmosphere
- ➔ Ozone is a naturally occurring molecule containing three oxygen atom
- ➔ These ozone molecules form a gaseous layer in the Earth's upper atmosphere called stratosphere.
- ➔ This lower region of stratosphere containing relatively higher concentration of ozone is called Ozonosphere.
- ➔ The ozonosphere is found 15-35 km (9 to 22 miles) above the surface of the earth and it protects our planet from the harmful UV radiations.
- ➔ The ozone layer has the capability to absorb almost 97-99% of the harmful ultraviolet radiations that sun emits.
- ➔ UV rays produce long term devastating effects on human beings as well as plants and animals.
- ➔ Ozone depletion refers to the phenomenon of reductions in the amount of ozone in the stratosphere.

Man-made causes for Ozone layer depletion

- Main reason for the depletion of ozone layer is the excessive release of chlorine and bromine from man-made compounds like CFCS (chlorofluorocarbons), halons, methylbromide etc
- These –made compounds are classified as Ozone-Depleting Substances (ODS). Ozone- Depleting Substances (ODS) are not washed back in the form of rain on the earth and remains in the atmosphere for quite a long time. With so much stability, they are transported into the stratosphere. These gases are carried to the stratosphere layer of atmosphere.
- Ultraviolet radiations from the sun break them to release chlorine (from CFCs) and bromine (from methylbromide and halons).

Effects of Ozone layer depletion

- ★ Eye damage such as cataracts
- ★ Immune system damage
- ★ Reduction in phytoplankton (microscopic marine organisms that are food small fish, as well as whales)
- ★ Skin cancer
- ★ Damage to the DNA in various life-forms