ENVIRONMENTAL SCIENCE

ENVIRONMENTAL SCIENCE

Course code:AHSB07

I. B.Tech IV semester

Regulation: IARE R-18)

BY

Dr. V.Anitha Rani, Dr. Venkateshwar Rao

Professor

Mr. B Raju, Mr. M Praveen, Ms. T Mallika Ms. M Malathi, Mr. G Mahesh Kumar

Assistant Professor

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

DUNDIGAL, HYDERABAD - 500043

CO's	Course outcomes
CO1	Discover knowledge in ecological perspective and value of environment.
CO2	Understand the significance of various natural resources and its management.
CO3	Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.
CO4	Categorize different types of pollutions and their control measures. Discover effective methods of waste management. Analyze global environmental problems and come out with best possible solutions.
CO5	Understand environmental laws and sustainable development.

MODULE- I
ENVIRONMENT AND ECOSYSTEMS

CLOs	Course Learning Outcome
CLO1	Summarize about environment and its importance and Discuss environment and importance of ecosystems.
CLO2	Provides the information regarding ecosystem and applicability. Acquire knowledge of how all the animals are competing with their food requirements and also understand the various trophic levels in the food chain.
CLO3	Describe the flow of energy through the various components of ecosystem. Examine the importance a of nutrients and flow of nutrients in ecosystem.
CLO4	Summarize about the toxicity of heavy metals on the biotic and a biotic components.

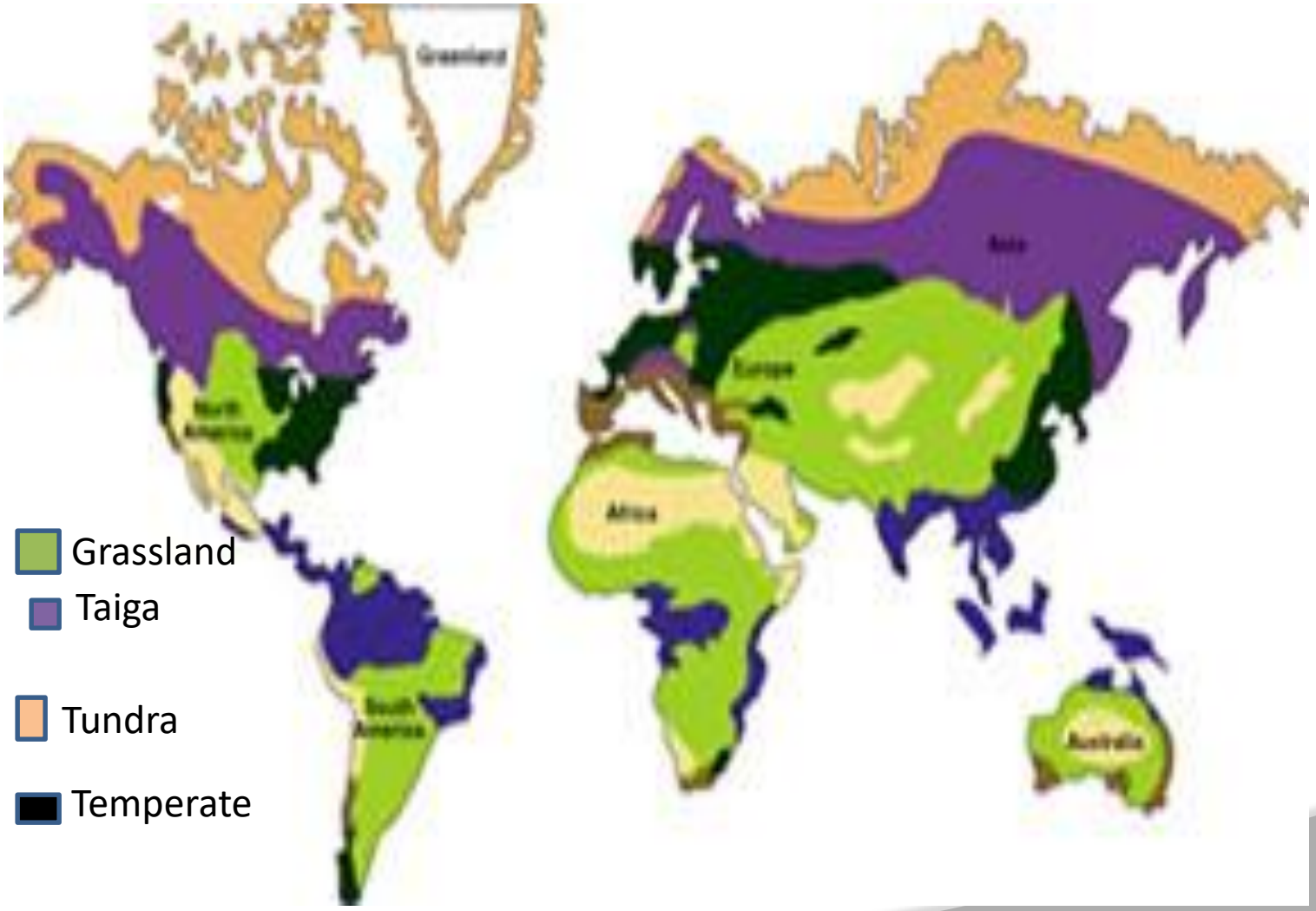
Ecology and Ecosystem

- Ecology is the study of relationships between living things and between living things and their environment.
- Ecosystem is a system of living things that interact with each other and with the physical world.
- A Biome is a collection of related ecosystems.

Main Ecosystems

- Tundra
- Desert
- Rain Forest
- Ocean
- Chaparral
- Taiga
- Grassland
- Temperate Forrest

Ecosystems



Ecosystems

- An ecosystem can be as large as the Sahara Desert, or as small as a puddle!!!

- Ecosystems are more than just the organisms they contain. Geography, weather, climate and geologic factors also influence the interactions within an ecosystem.

Abiotic Factors

- Are nonliving physical factors of an environment.
- Abiotoic Factors include amount of water and oxygen, temperature, amount of sunlight and water pressure.

Biotic Factors

Are the living, physical factors of an environment.

Examples of Biotic Factors are parasitism, disease and predation.

Balance

- Ecosystems will fail if they do not remain in balance.
- No community can carry more organisms than its food, water and shelter can accommodate.

Ecosystems

System = regularly interacting and interdependent components forming a unified whole

Ecosystem = an ecological system;

A community and its physical environment treated together as a functional system

ECOSYSTEMS

an ecosystem is composed of the organisms and physical environment of a specified area.

SIZE: micro to MACRO

ENERGY FLOW IN ECOSYSTEMS

an ecosystem is composed of the organisms and physical environment of a specified area.

All organisms require energy, for growth, maintenance, reproduction, locomotion etc.

Hence, for all organisms there must be:

- A source of energy
- A loss of usable energy

Autotrophs

Autotrophs (=self-nourishing) are called primary producers.

► Photoautotrophs fix energy from the sun and store it in complex organic compounds

►(= green plants, algae, some bacteria)

Chemoautotrophs (chemosynthesizers) are bacteria

► that oxidize reduced inorganic substances

►(typically sulfur and ammonia compounds)

► and produce complex organic compounds.

Chemosynthesis near hydrothermal vents

Chemoautotrophs

Heterotrophs

Heterotrophs (=other-nourishing) cannot produce their own food directly from sunlight+ inorganic compounds. They require energy previously stored in complex molecules.

- consumers
- decomposers

The Laws of Thermodynamics

Energy flow is a one-directional process.

► FIRST LAW of THERMODYNAMICS:

► Energy can be converted from one form to another, but cannot be created or destroyed.

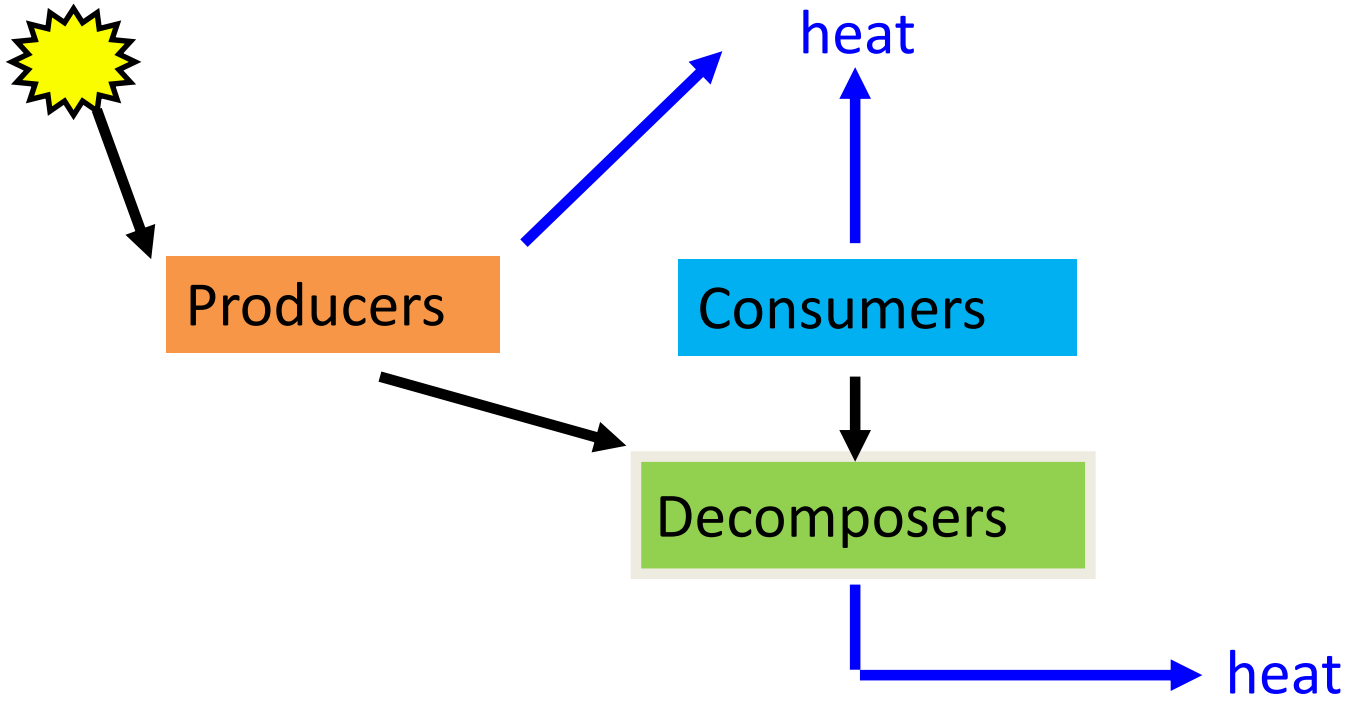
SECOND LAW of THERMODYNAMICS

► Transformations of energy always result in some loss or dissipation of energy

r

► In energy exchanges in a closed system, the potential energy of the final state will be less than that of the initial state

Energy flow



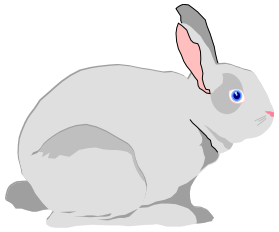
This pattern of energy flow among different organisms is the TROPHIC STRUCTURE of an ecosystem.

Alternate Terminology

Producers = plants etc. that capture energy from the sun

- Herbivores = plant-eaters
- Carnivores = animal-eaters
- Specialized herbivores:
- Granivores--seed-eaters
- Frugivores--fruit-eaters

Carnivore



Herbivore

Producer

Carnivores

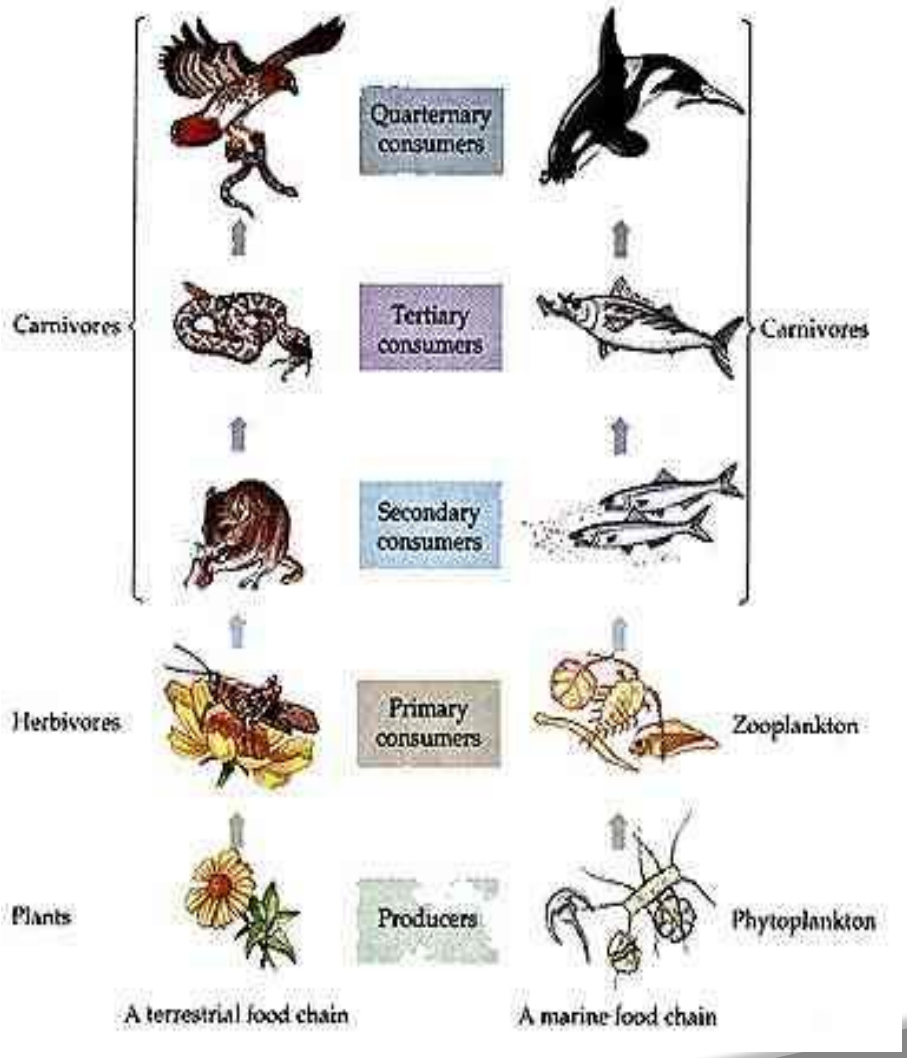
Carnivores can be further divided into groups:

quaternary carnivore (top)

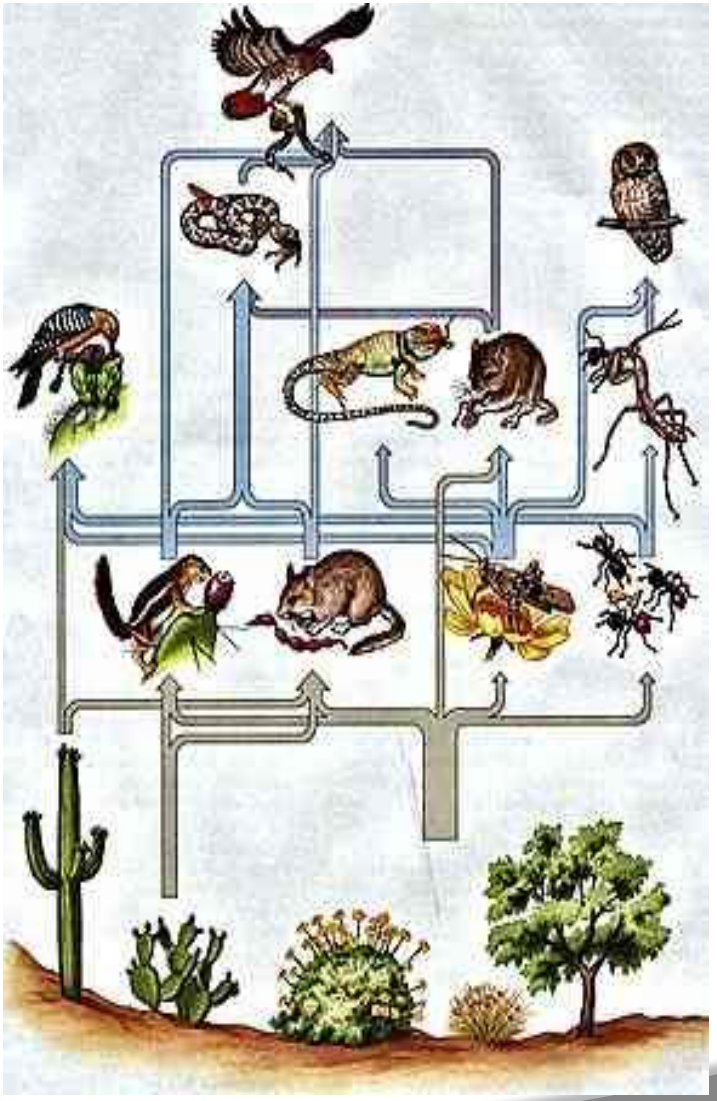
- tertiary carnivore
- secondary carnivore
- primary carnivore

- The last carnivore in a chain, which is not usually eaten by any other carnivore, is often referred to as the top carnivore.

Food chains

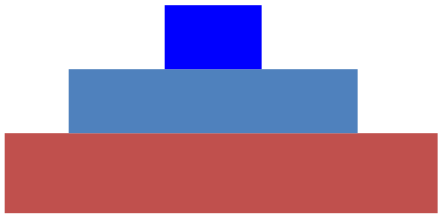

Quarternary consumers
Tertiary consumers
Secondary consumers
Primary consumers
Producers
Carnivores
Carnivores
Herbivores
Plants
Zooplankton
Phytoplankton
A terrestrial food chain
A marine food chain

Food Web



Pyramid of energy

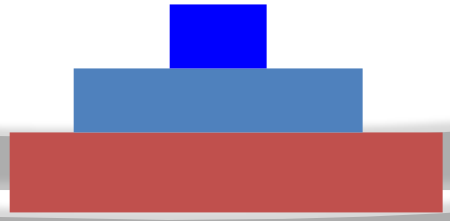
- A pyramid of energy depicts the energy flow, or productivity, of each trophic level.
- Due to the Laws of Thermodynamics, each higher level must be smaller than lower levels, due to loss of some energy as heat (via respiration) within each level.



Pyramid of numbers

- A pyramid of numbers indicates the number of individuals in each trophic level.

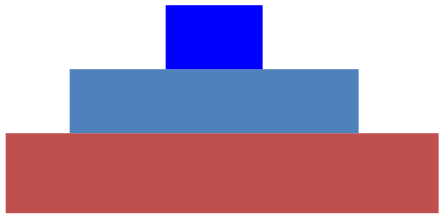
- ► Since the size of individuals may vary widely and may not indicate the productivity of that individual, pyramids of numbers say little or nothing about the amount of energy moving through the ecosystem.



# of carnivores
# of herbivores
# of producers

Pyramid of yearly biomass production

If the biomass produced by a trophic level is summed over a year (or the appropriate complete cycle period), then the pyramid of total biomass produced must resemble the pyramid of energy flow, since biomass can be equated to energy.



carnivores
herbivores
producers

MODULE- II
NATURAL RESOURCES

CLOs	Course Learning Outcome
CLO5	Distinguish about different types of natural resources and their applicability and illustrate the utility of renewable resources efficiency.
CLO6	Describe the impact of over utilization of underground and surface water. Discuss the disaster manage mental plans.
CLO7	Describe the benefits and property of dams. Illustrate the uses of mineral resources.
CLO8	Enumerate the applications of the solar energy and wind energy in modern days.

Introduction

- Natural resources occur naturally within environments
- Natural resource is often characterized by amounts of biodiversity and geo diversity existent in various ecosystems.
- Any material which is part of earth and satisfy human need and add value is called as resource. Example: rocks, minerals, soil, rivers, plants & animal.
- Human is a resource because developing his skill, he can develop other resource by adding value to the physical material .

Introduction

- Economic value- Production of things from natural resources
- Legal value- Clean air, Fresh water, Healthy animal and human beings
- Aesthetic value- Beauty of village, roads, ponds and their agricultural fields

Introduction

Biotic : Resources which are living in nature. Example: Forests ,Animals etc.

- A biotic : Resources which are non-living in nature. Example: Air ,Water etc.
-
- OTHERS Renewable : Resources which can be replenished easily. Example: Sunlight

Hardness of Water

Water is a very good solvent and even called as the universal solvent. Most of the inorganic salts are soluble in water. The water that has calcium and magnesium salts dissolved in it causes hardness of water. Water passes through rocks and flows on the ground. A soap is a sodium salt of higher fatty acid such as stearic acid ($C_{17}H_{35}COOH$). Soap in the absence of Ca^{2+} and Mg^{2+} gives lather with water easily, but in the presence of Ca^{2+} and Mg^{2+} reacts with them and forms insoluble soap that appears as precipitate (formation of scum).

Reaction

$$\underset{\text{(soap)}}{2C_{17}H_{35}COONa} + Ca^{2+}/Mg^{2+} \rightarrow \underset{\text{(insoluble scum)}}{(Mg^{2+}/Ca^{2+})(C_{17}H_{35}COO)_2} + 2Na^{+}$$

FOREST

- In Ahirori, there are no forest but some villagers have planted Mango, Eucalyptus, Popular, Sagaun etc in their own field for commercial purpose.
- For this some local level traders support him for growing such trees in their own land for commercial purpose only.
- Uttar Pradesh Forest Corporation also plants Shrubs plant in public land every year but people can care of it because they don't aware for natural resources in their future.

SOLAR LIGHT

- **In Ahirori, The Solar street lights are being setup which is under " 13th Vitta Yojaya" in year 12-13.**
- **There are some private companies who have entered into the solar light business where they collect larteins in morning and charge them in their grid station and dispatch in evening to each household.**
- **They only have to pay minimal cost of Rs 100 per month. So this model saves environment and even money burns in buying kerosene oil for lightening.**

Soil / Land Resources

- In the area of study the soil was found very productive as availability of water is excellent.
- The pulses grown there are good in quality and quantity wise.
- The agricultural land is large than other lands like grassing land & fallow land.
- Soils are getting polluted day by day by excess use of fertilizer and pesticides.

Water Resources

- In the natural resources, Ahirori is very rich in water resources like Wells, Canal, Ponds, Mini Lake, Rivers etc.
- Generally wells are private property there but Canal, Ponds, Rivers and Mini Lake are public property.
- Department of Water management, Department of Irrigation Uttar Pradesh are major institutions, who manage the water resources.

ANIMALS

- Animals are major resource of livelihood after agriculture.
- In the wild animals, Nilgai and Jackal is a most populated animal who's affected negatively to farmers.
- The quality and population of pet animal are increasing day by day for only commercial propose.
- Fodders are getting polluted day by day by excess use of fertilizer and pesticides. This is directly impacting to animals.

Resource: www.google.co.in

Uses of Natural Resources

Natural Resources	Uses
Air (Wind)	Required for all living things for breathing, Use to produce wind energy.
Animals / Plants	Provide food, cloth, shelter, medicine. Used as mode of transport. Animal dung can be used as fuel/fertilizer.
Soil	Used as the primary nutrient source for plants. It is the habitat of many organisms.
Solar Light	Provide light, energy and help to plants for making their foods
Wood / Tree	Used as construction material. Used to make utensils, furniture and sporting equipments.
Water	Used in household, agriculture and transportation.

Major problems with Natural Resource conservation

Low awareness for conservation of natural resources.

Exploitation of living natural resources for economic gain.

Values and knowledge about the species and ecosystem inadequately known.

Unplanned urbanization and uncontrolled industrialization.

FLOOD

MANAGEMENT

CLOs	Course Learning Outcome
CLO9	Illustrate the definition and importance of biodiversity. Acquire the genetic diversity, species and ecosystem diversity.
CLO10	Describe the ecological values and consumptive use of ecosystem. Recall India is mega diversity nation. Discuss the hot spot center in and around.
CLO11	Analyze the information regarding different causes for loss of biodiversity. Analyze various reasons for conflict of species. Illustrate different methods to protect the biodiversity. Correlate national biodiversity act.

MODULE- III
BIODIVERSITY

BIODIVERSITY

- What does “Bio” means?
- Bio = 

- What does “Diversity” means?
- Diversity = Variety

Types of biodiversity

- Diversity of Species



- Diversity of Ecosystem



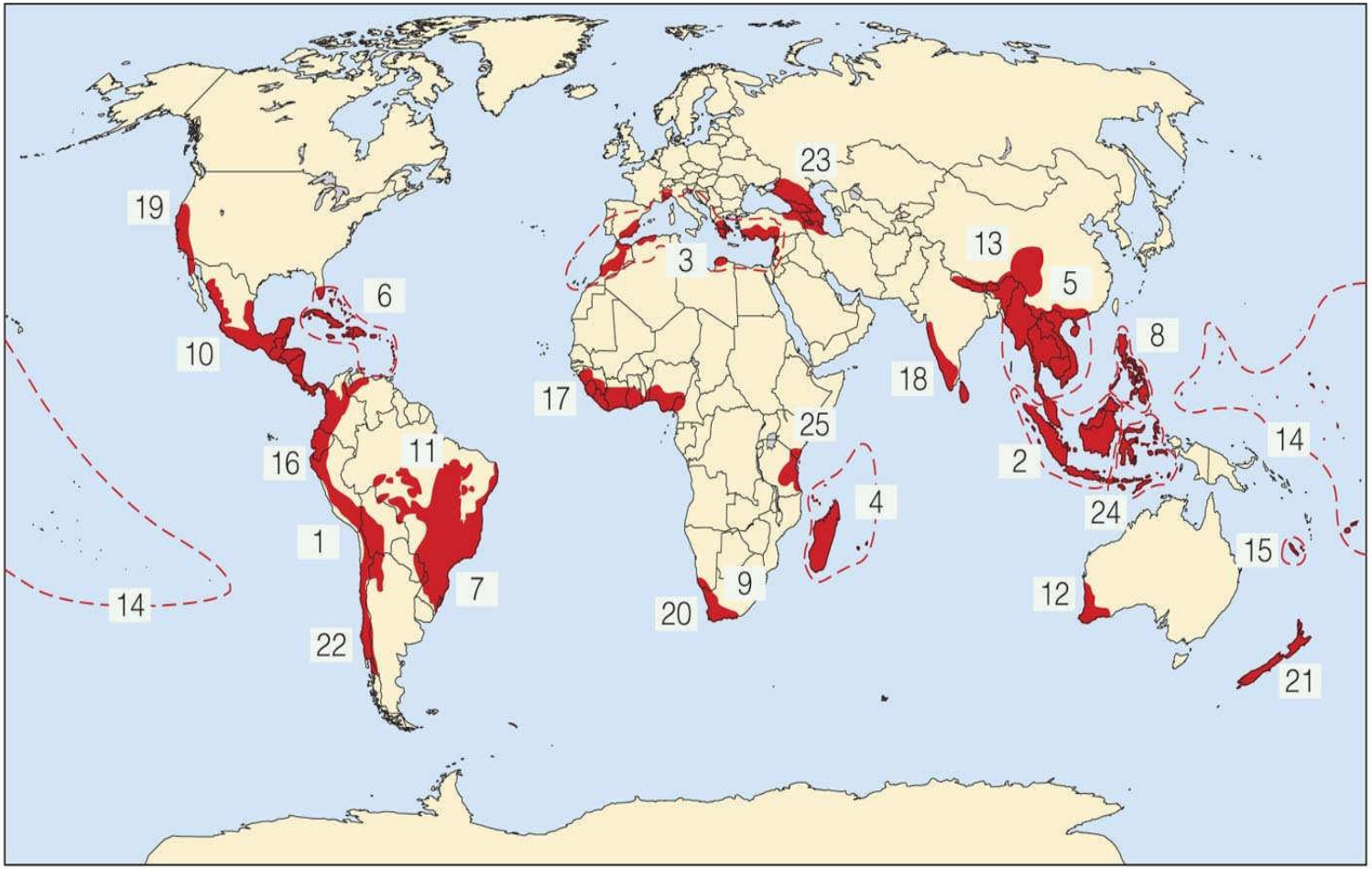
- Diversity of Genes


Benefits Of Biodiversity

- Consumptive value:
- Food/Drink
- Fuel
- Medicine
- Better crop varieties
- Industrial Material
- Productive use
- Social use

- **Ethical use**
- **Aesthetic use**
- **Intrinsic value**

Distribution Of Biodiversity



Distribution Of Biodiversity

Flora and fauna diversity depends on-
Climate
Altitude
Soils
Presence of other species
Most of the biodiversity concentrated in Tropical region.

BIODIVERSITY HOTSPOTS:
A region with high biodiversity with most of spices being Endemic.
India have two Biodiversity Hotspots- East Himalayan Region and Western Ghat.

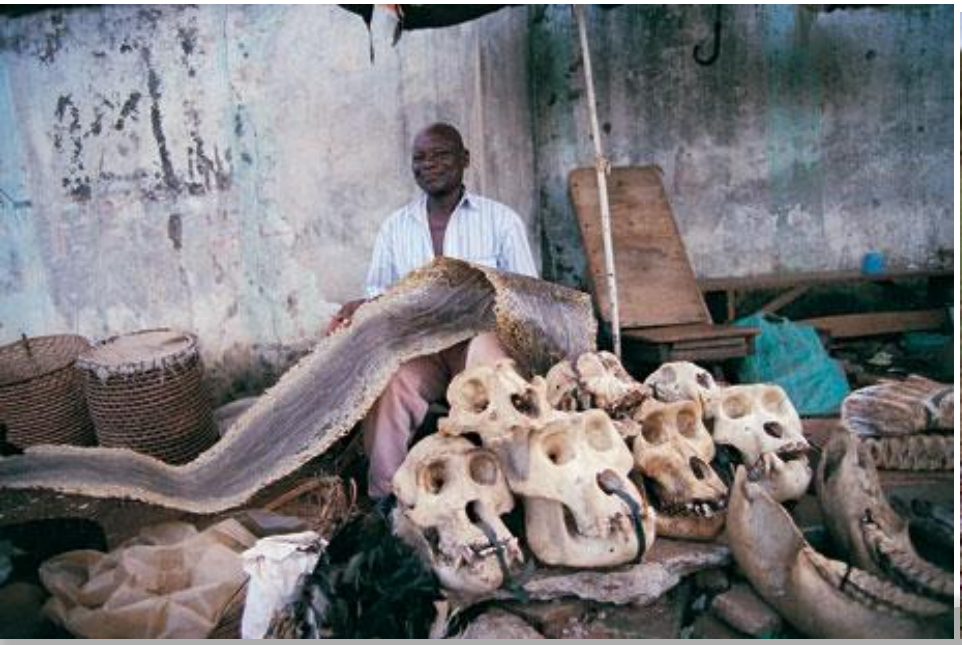
THREATS TO BIODIVERSITY

Habitat Loss

- Wild Life
- poaching
- Man-Wildlife
- Conflicts

Poaching of Wild Life

Elephant Tusk



Man-Wild Life Conflicts


STOP

CONSERVATION OF BIODIVERSITY

► In situ conservation

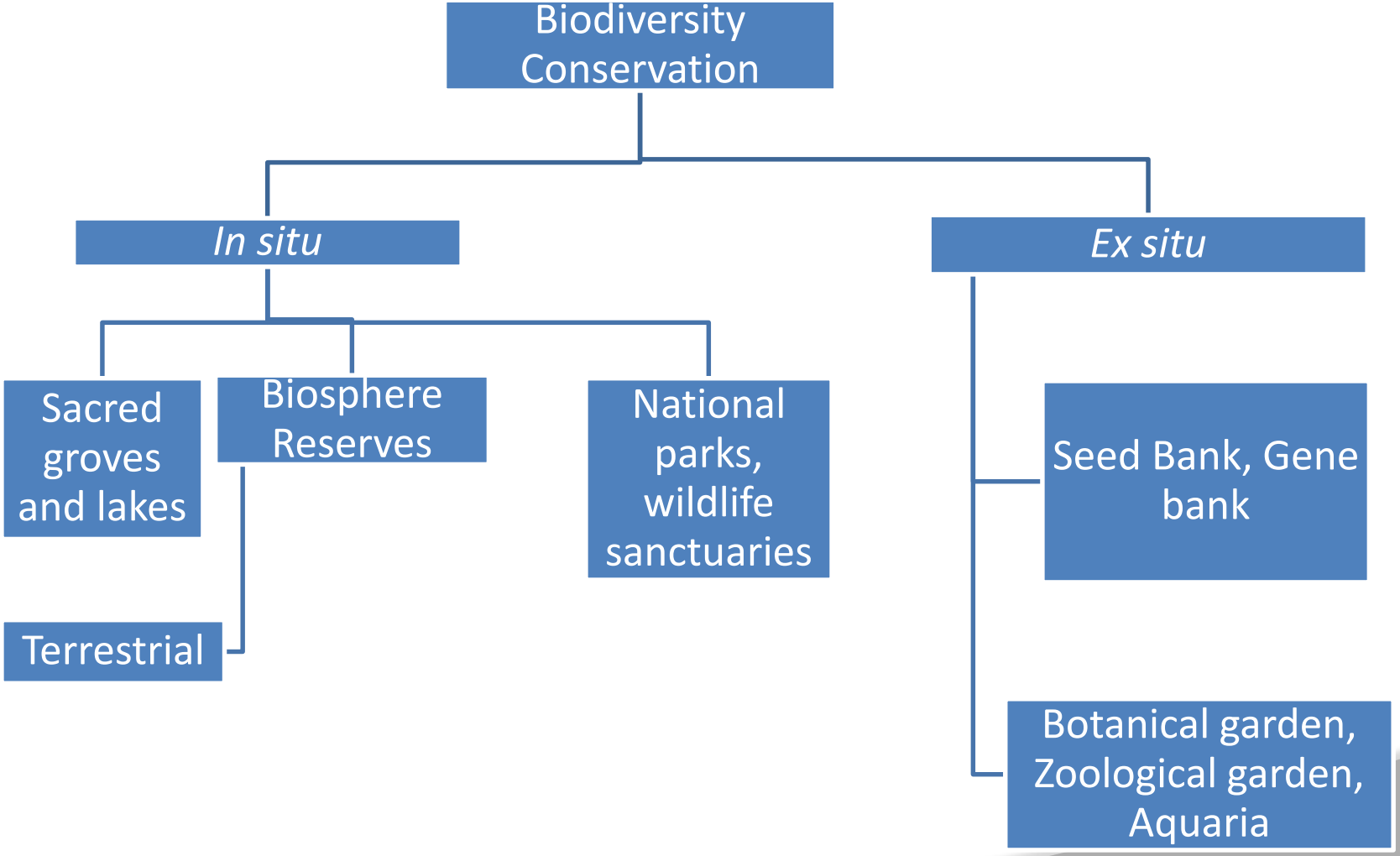
Protected areas (National Parks and Sanctuaries)

Biosphere Reserves

Sacred Forest and Sacred Lakes

► Ex situ conservation

Seed Bank, Gene Bank, Pollen Bank, DNA Bank


Biodiversity Conservation
In situ
Ex situ
Sacred groves and lakes
Biosphere Reserves
National parks, wildlife sanctuaries
Terrestrial
Seed Bank, Gene bank
Botanical garden, Zoological garden, Aquaria

National parks and wild life Sancturies in India

Kanha National Park

Gir National Park

Corbett National Park

Kaziranga National Park

Ranthambore National Park


TAMIL NADU
FOREST DEPT
INDIRA GANDHI WILDLIFE SANCTUARY
AND
NATIONAL PARK
WELCOMES YOU
WILD LIFE AREA
DRIVE SLOWLY AND SAFELY
DO NOT TEASE OR GO NEAR ANIMALS
DO NOT THROW PLASTIC BAGS CONTAINERS
DO NOT PARK YOUR VEHICLES

Feel Wild Adventure in Your Life

Top 10 Wildlife Sanctuaries in India

Wildlife Sanctuary is a natural shelter for wild species, which provide protection to wild animals from hunting ground & hunting spider.

For more information visit here - >

http://www.india-wildlifetours.com

Ex-Situ Conservation

ZOO

Gene Bank

Conserving cowpea

Botanical Gardens

Conservation of seeds

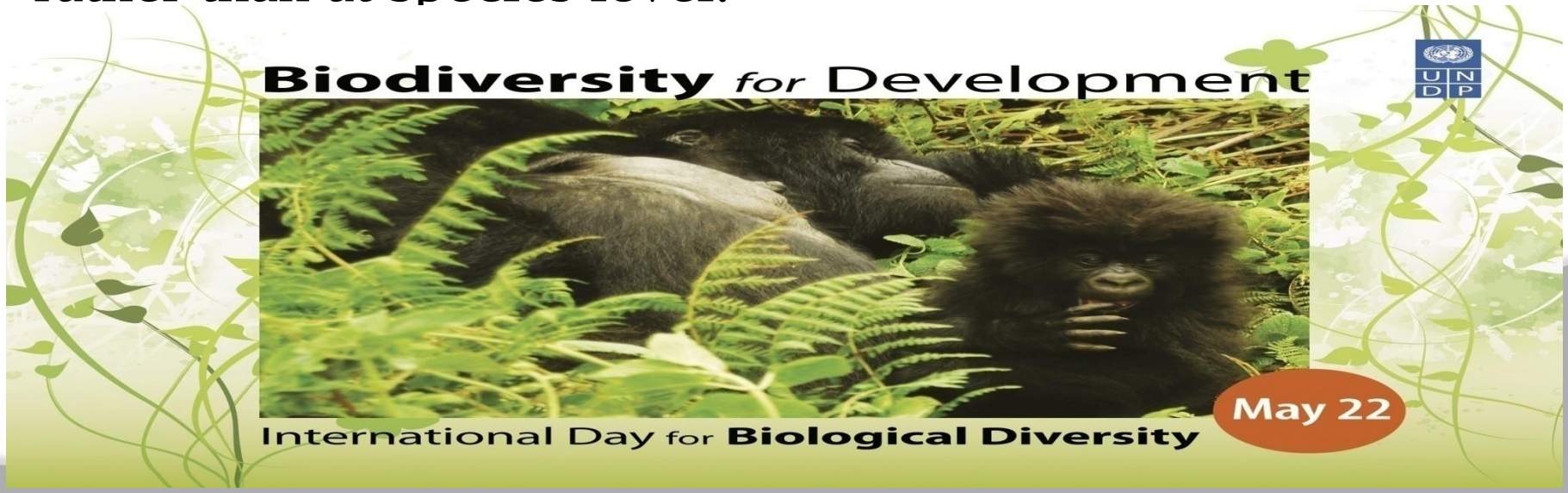
Food Resources

Fodder Resources

Timber forest Products

Non-Timber Forest Products

Biodiversity is our life. If the Biodiversity got lost at this rate then in near future, the survival of human being will be threatened. So, it is our moral duty to conserve Biodiversity as well our Environment. Long-term maintenance of species and their management requires co-operative efforts across entire landscapes. Biodiversity should be dealt with at scale of habitats or ecosystems rather than at species level.

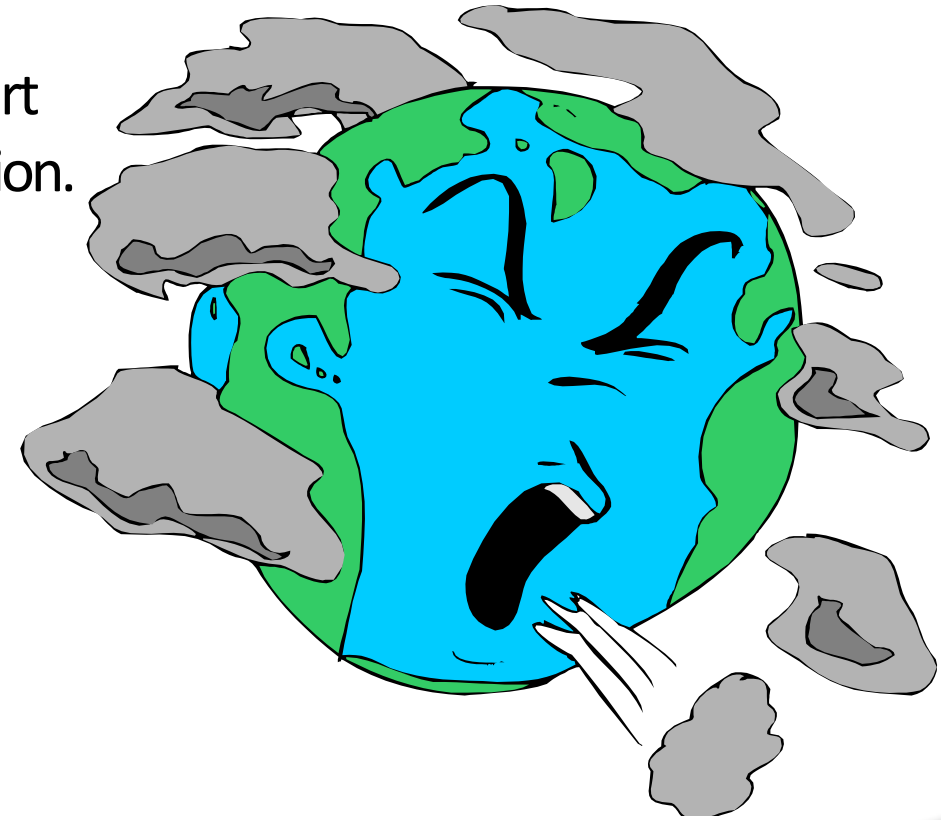


CLOs	Course Learning Outcome
CLO12	Explain the meaning of environmental pollution and classification. Analyze the important pollutants in air pollutants.
CLO13	Enumerate the sources types and effects of water pollution. Correlate the sources types and effects of soil pollution. Analyze the noise quality and permissible levels
CLO14	Describe the various methods commonly employed for the disposal of solid waste.
CLO15	Identify To understand the recent trends in e-waste management practices.
CLO16	Understand concept of climate change and impacts.
CLO17	Summarize the remedial measures of ozone depletion.

MODULE- IV
ENVIRONMENTAL POLLUTION, POLLUTION CONTROL TECHNOLOGIES AND GLOBAL ENVIRONMENTAL PROBLEMS

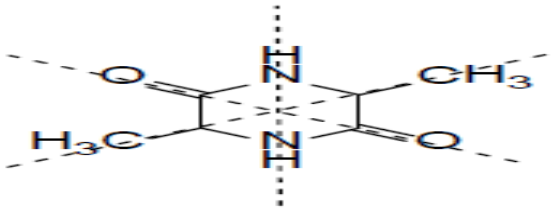
AIR POLLUTION

Any visible or invisible particle or gas found in the air that is not part of the original, normal composition.

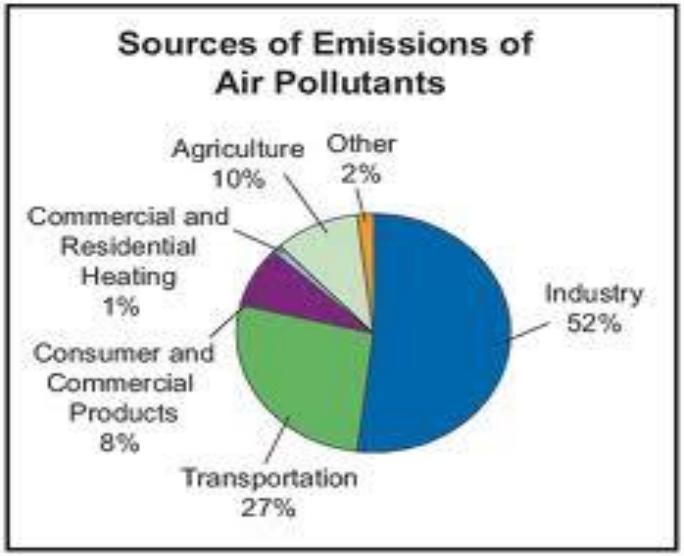


Classification Of Air Pollutants

The center of symmetry is a point in space such that if a line is drawn from any part (atom) of the molecule to that point and extended an equal distance beyond it, an analogous part (atom) will be encountered. Thus the molecule 3,6-dimethylpiperazine- 2,5-dione has centre of symmetry (sometimes referred to as centre of inversion) running through the centre of the molecule.



SOURCES OF AIR POLLUTION

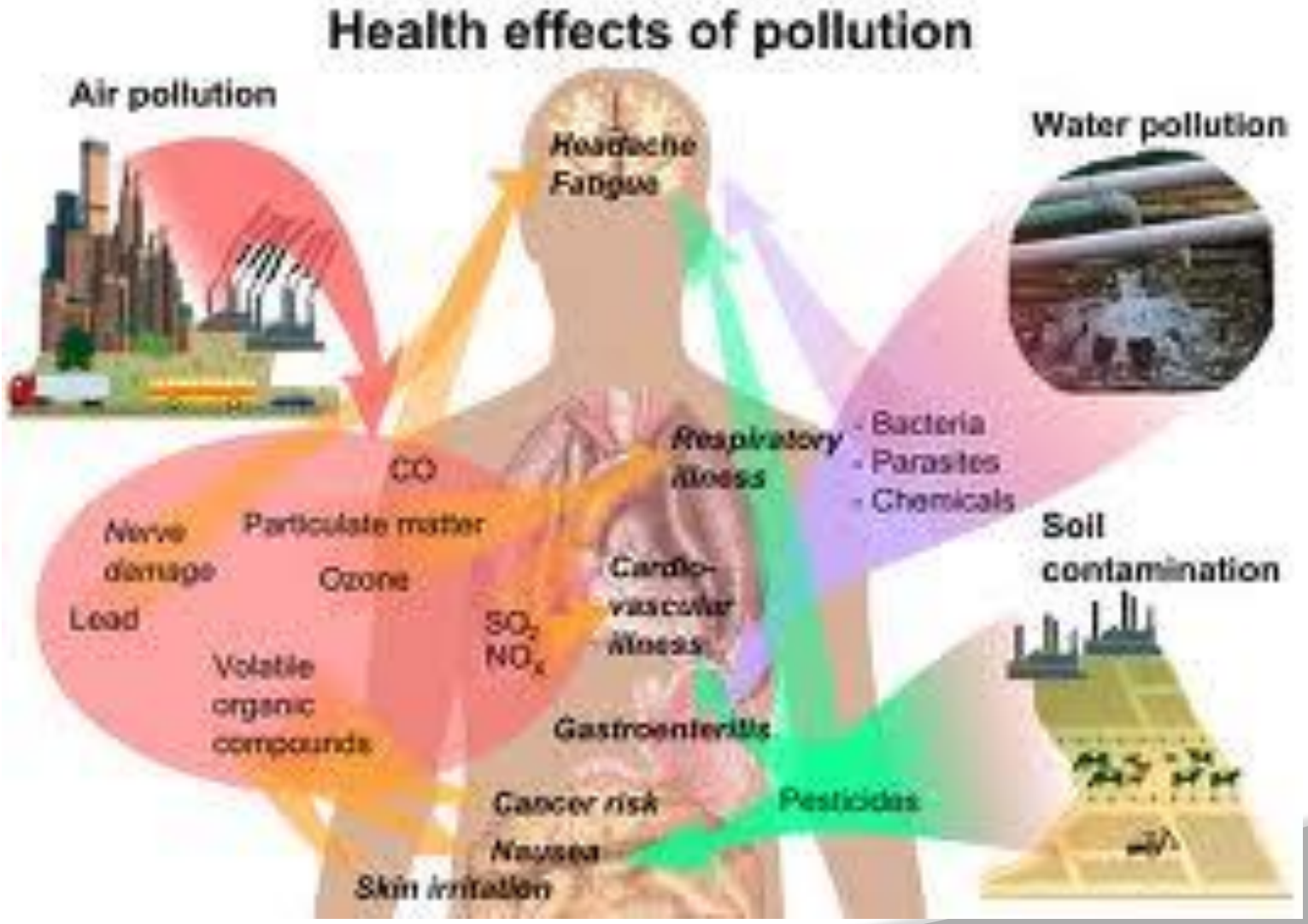

Sources of Emissions of Air Pollutants
Agriculture 10%
Other 2%
Commercial and Residential Heating 1%
Industry 52%
Consumer and Commercial Products 8%
Transportation 27%

Carbon Monoxide

colorless, odorless produced when carbon does not burn in fossil fuels

present in car exhaust headaches, fatigue, and impaired

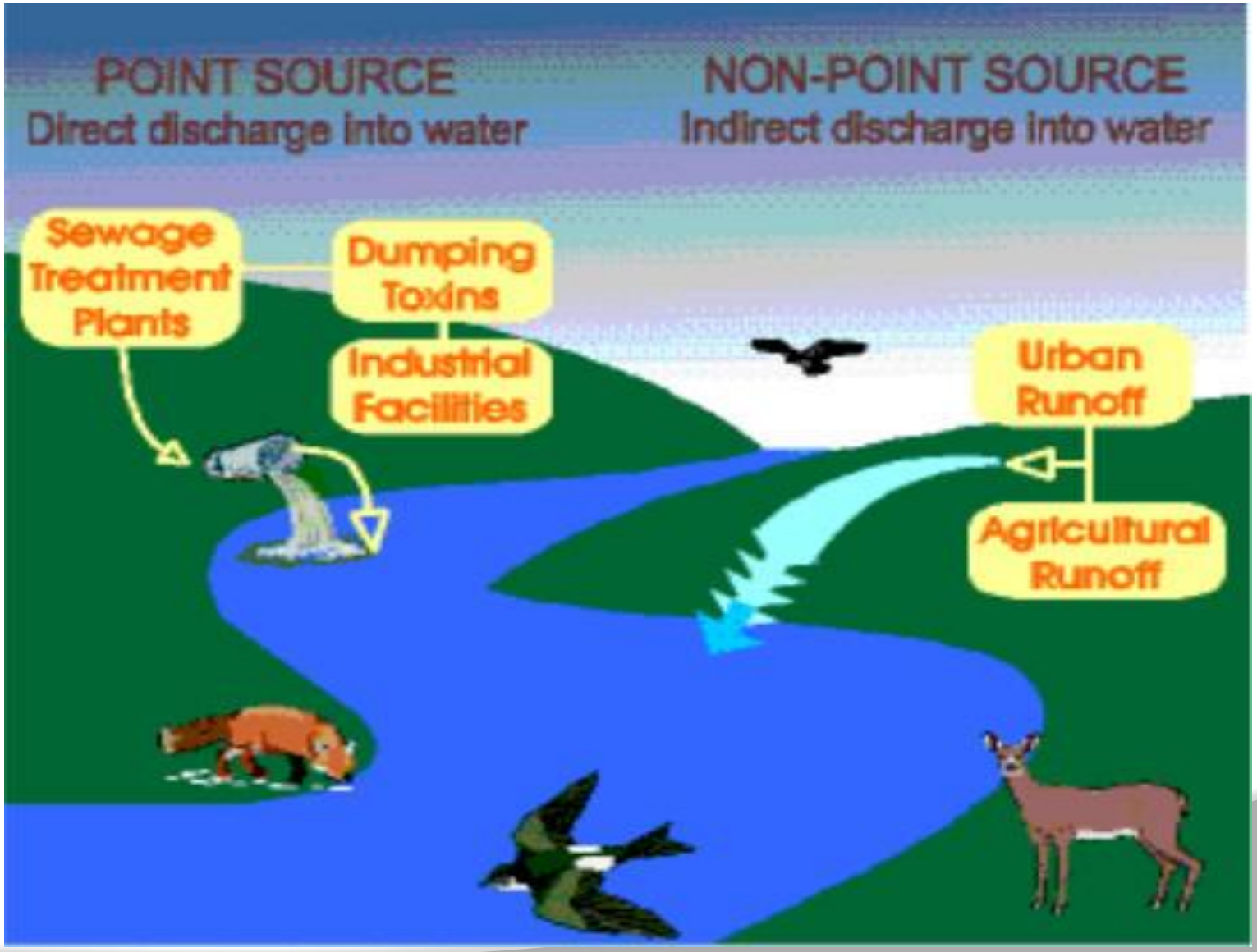
Pollution


Health effects of pollution
Air pollution
Water pollution
Soil contamination
Headache
Fatigue
Respiratory illness
- Bacteria
- Parasites
- Chemicals
CO
Particulate matter
Nerve damage
Ozone
Lead
SO_2
NO_x
Volatile organic compounds
Cardio-vascular illness
Gastroenteritis
Cancer risk
Nausea
Skin irritation
Pesticides

Water Pollution

Water Pollution occurs when energy and other materials are released into the water, contaminating the quality of it for other users.

Sources Of Pollutants



- Marine Dumping
- Industrial Waste
- Sewage, mainly from households

- Nuclear waste
- Oil pollution
- Underground storage leaks

- Toxic water
- Thermal heating
- Our sources of water

- Diseases caused by:
  - Drinking contaminated water
  - Swimming in polluted water
  - Contact with chemically polluted water

- 200 turtles in Australia's surround waters die each year

- Birds and mammals become coated with oil

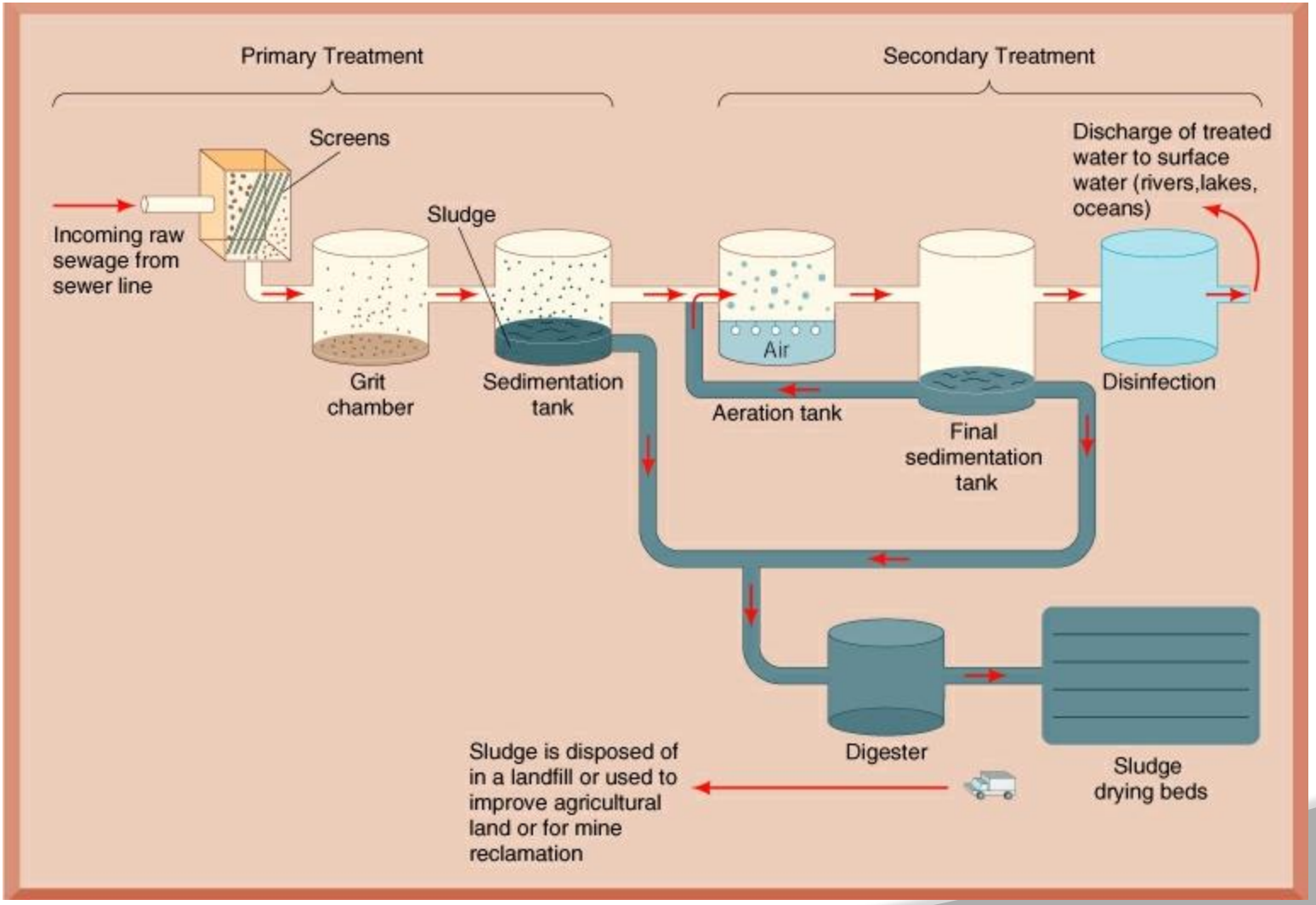
WASTE WATER TREATMENT METHODS

ETP – (EFFLUENT TREATMENT PLANT) ETP is designed to treat industrial effluents

STP - (SEWAGE TREATMENT PLANTS) STP is designed to treat the municipal waste water.

CETP - (COMMON EFFLUENT TREATMENT PLANTS) is designed to treat all type of industrial effluents

Sewage Treatment plant



Noise Pollution

In modern life no one can escape from noise. Noise pollution is very dangerous. Many health problems can be caused by noise pollution such as annoyance, hypertension, hearing loss, tinnitus, high stress levels, sleep disturbance, aggression, etc. in the following article there are causes, effects and solutions to control the noise pollution.

Displeasing sound that interrupts the balance of human or animal life is known as “Noise pollution.” Noise word comes from Latin word nauseas means seasickness. Noise pollution is mainly from trains, aircrafts, loud music, transport vehicles and construction work. It has harmful effects on the physiological and psychological health of human beings. Noise pollution is measured in decibels.

Noise Pollution

Noise pollution at home is caused by using music systems and television sets with high volumes. Instead of using these appliances with the high volume, it is better to keep it at a moderate level. To wear ear protection while working in noisy conditions is an effective way to manage noise. Vehicles and factory machines need to be maintained properly and checked from time to time. Lack of maintenance will not only increase noise levels, but also decrease the efficiency of these machines.

Greenhouse Effect

Rise in Earth's temperature

By certain atmospheric gases

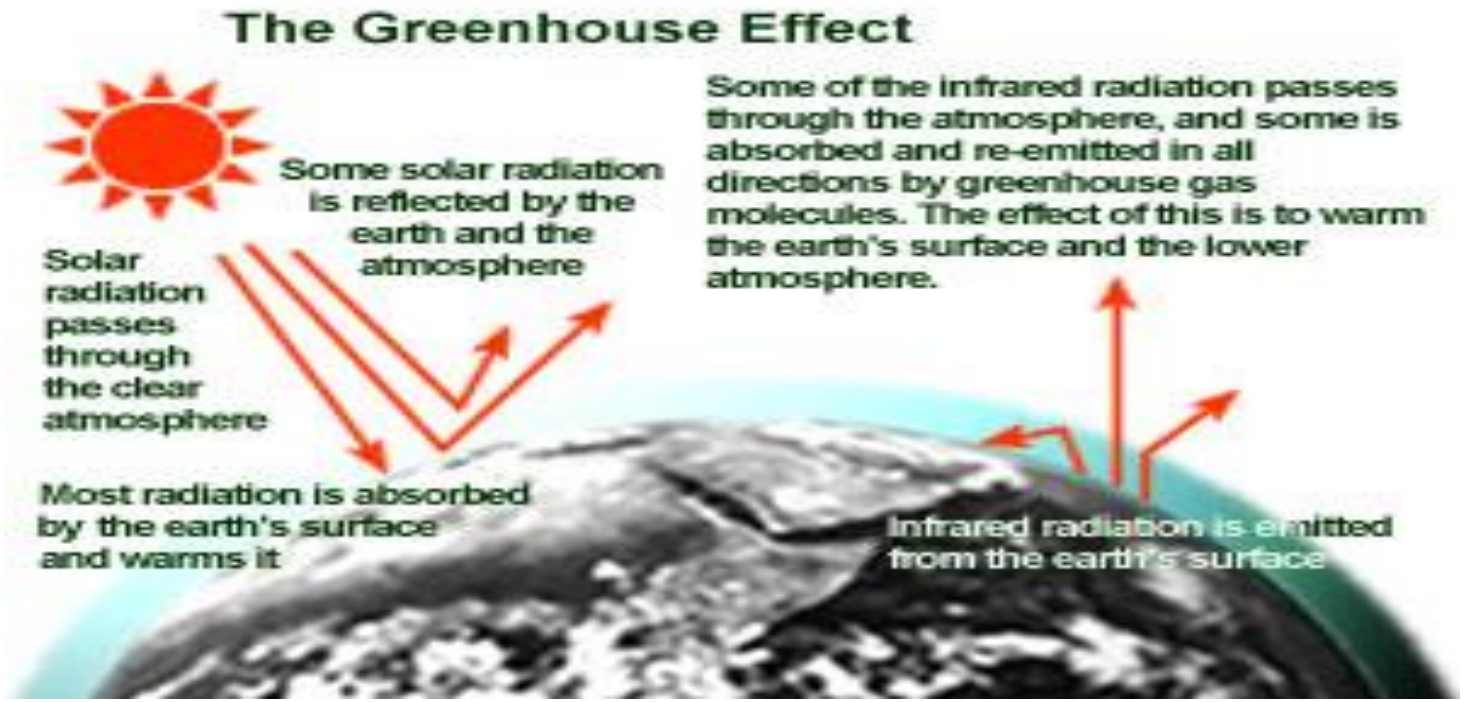
That trap the Sun's energy

Water vapor (H_2O)

Carbon dioxide (CO_2)

Nitrous oxide (N_2O)

Methane (CH_4)



Sun's energy passes through atmosphere

26% is reflected or scattered

19% absorbed by clouds, gases, and particles

4% reflected to space by surface

51% reaches the surface

Climate Change

Greenhouse gases increase through human activity

Deforestation

Use of fertilizers

Burning of organic matter

Burning of fossil fuels

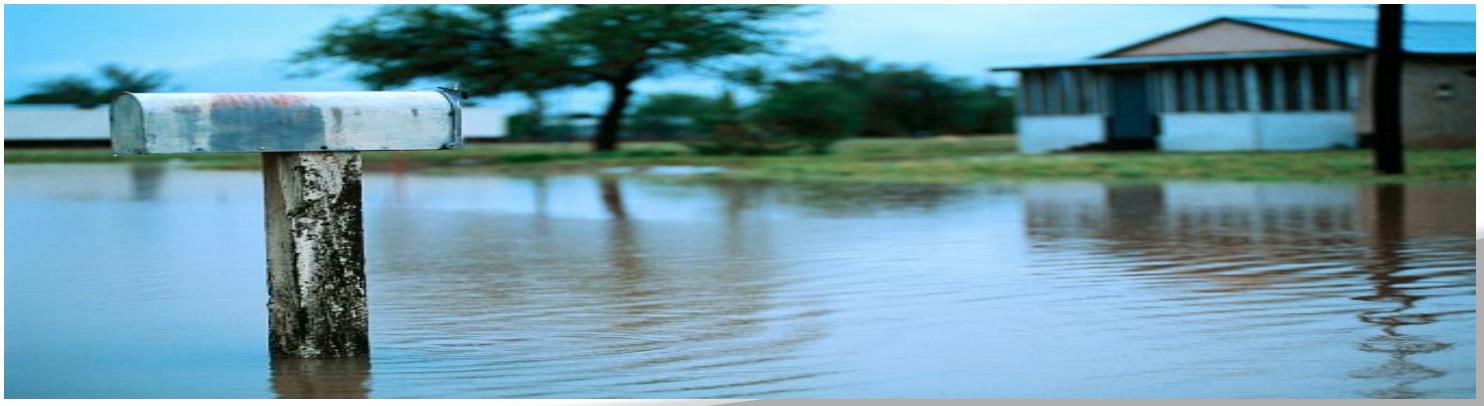
Climate changes

Changes in wildlife adaptations and cycles

Melting of polar ice caps

Increase in sea level

Flooding in coastal areas



International Conventions / Protocols

Discussion to evolve strategies to environmental issues .

All Heads of nations or the Representatives meet

at a common platform to sign agreement

Such meetings are called international agreements, protocols, conventions

A Protocol is generally a treaty or agreement

Earth Summit, 1992

UNCED – United nation's conference on environment and development

Took place on june 3-14,1992 in Riode Janerio, brazil

The Earth Summit Focused on:

Development and protection of Environment.

Global action plan for Sustainable Development

Substantial increase in new funding from developed countries to aid in the Sustainable Development

Kyoto Protocol Dec 11,1997

UNFCCC – united nations frame work convention on climate change

This Protocol subject to legal binding to cut green house emissions by mininimum 5%.

The important component of Kyoto Protocol are as follows:

Clean Development Mechanism (CDM) - To keep overall global emissions with the limits.

Emission Trading- If a developing countries reduces green house gas emission in excess of the required amount.

Joint Implementation - It establishments in 2 countries cannot meet the emission targets as set by the Kyoto protocol.

CLOs	Course Learning Outcome
CLO18	Evolve strategies to environmental issues. Describe the role of government and legal aspects in environmental protection
CLO19	Discuss the silent features of the hazardous waste management rules. Understand the importance of EIA for developmental activities
CLO20	State the aim and objectives of sustainable development. Enumerate population and its explosion.
CLO21	State the aim and objectives of sustainable development. Acquire knowledge of environmental education. Summarize the environmental ethics and objectives of green buildings

MODULE- V
ENVIRONMENTAL LEGISLATIONS AND SUSTAINABLE DEVELOPMENT

Environment Impact Assessment

What is EIA?

Environmental Impact Assessment (EIA) is a process which ensures that all environmental matters are taken into account quite early in the project at planning process itself.

It takes into consideration not only technical and economic considerations but also, traditional aspects like impact on local people, biodiversity etc.

Environment Impact Assessment

Why EIA?

EIA is intended to prevent or minimize potentially adverse environmental impacts and enhance the overall quality of a project.

The main benefits and advantages of EIA are:

Lower project costs in the long-term

Increased project acceptance Improved project design nucleophile comes in, then the leaving group leaves

Environment Impact Assessment

Which type of projects under go EIA?

Agriculture

Construction (Road networks, Malls, Townships, Dam etc)

Industries

Electrical projects

Waste disposal

Any developmental projects around Protected Areas / Nature Preserves

Clean Development Mechanism CDM projects

Towards Sustainable Future

Any thing that we take from the physical landscape to make other things that we need or want for our lives, eg

Drink

Food

Shelter

Fuel/Power

Manufactured goods

But, using resources can lead to a lot of waste

Towards Sustainable Future

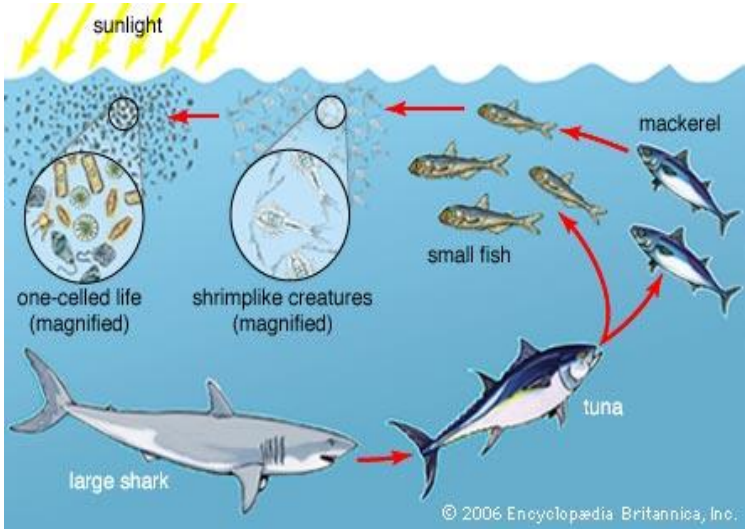
Coal, oil and gas are Fossil Fuels.

We dig up coal and drill for oil.

We then burn the coal and oil (and gas) to generate electricity

Towards Sustainable Future

What do you think will be the impact of these types of fishing on the resources of the sea?



Towards Sustainable Future

Sustainable development

Development means making life better, eg, to have a better standard of living and an improved quality of life

► Sustainable Development means making sure that the things we do, the goods we buy and the lifestyle we have today will not harm the environment for us, for people in other places and for future generations Looking at levels of consumption and waste thinking about our careful use of the Earth's resources Realizing that we are each responsible for our actions, and that what we do can have a huge effect on other people, and places

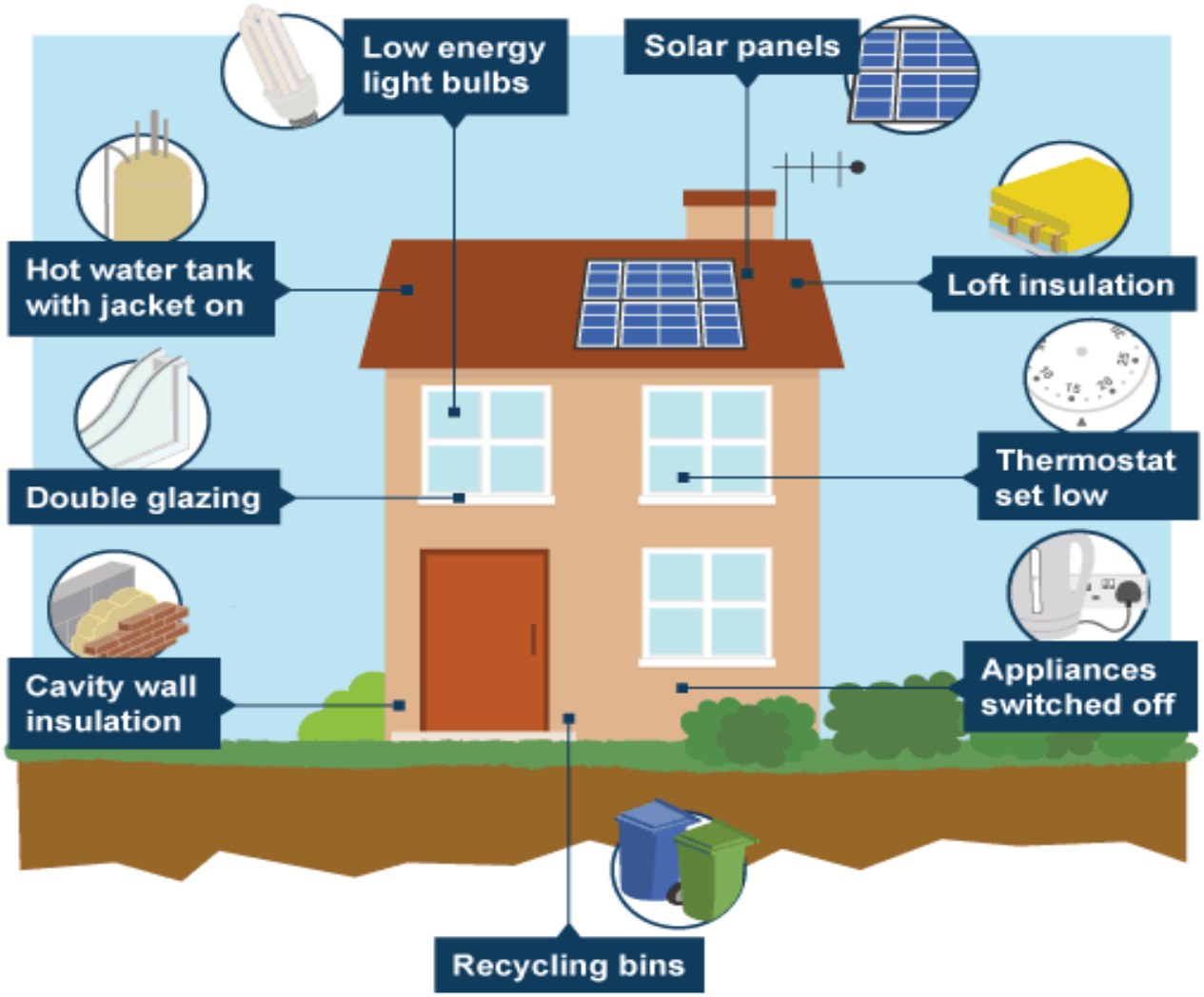
Consumerism

Over-Exploitation of Resources

The attack of the overexploitation of resources responsible for changes in rainfall patterns.

Environmental Education

Urban Sprawl


Low energy light bulbs
Solar panels
Hot water tank with jacket on
Loft insulation
Double glazing
Thermostat set low
Cavity wall insulation
Appliances switched off
Recycling bins

Green Building


Thank you