



19BSS22

**Environmental
Science &
Engineering**

Topics in EVS

UNIT I ECOSYSTEMS AND BIODIVERSITY

UNIT II NATURAL RESOURCES

UNIT III ENVIRONMENTAL POLLUTION

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

UNIT - I

Ecosystem

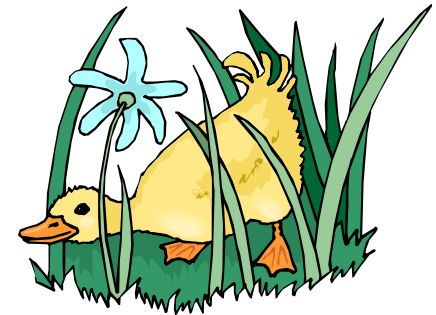
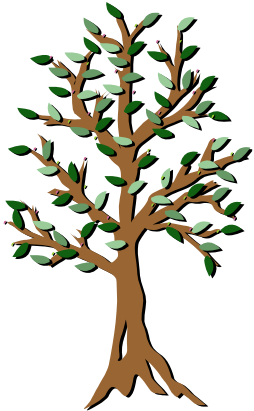
Scope or Objectives of EVSE

- To know about environment
- To get an awareness
- To get motivation
- To get an inspiration
- To get good social status
- To take active participation
- To develop skills

ENVIRONMENT



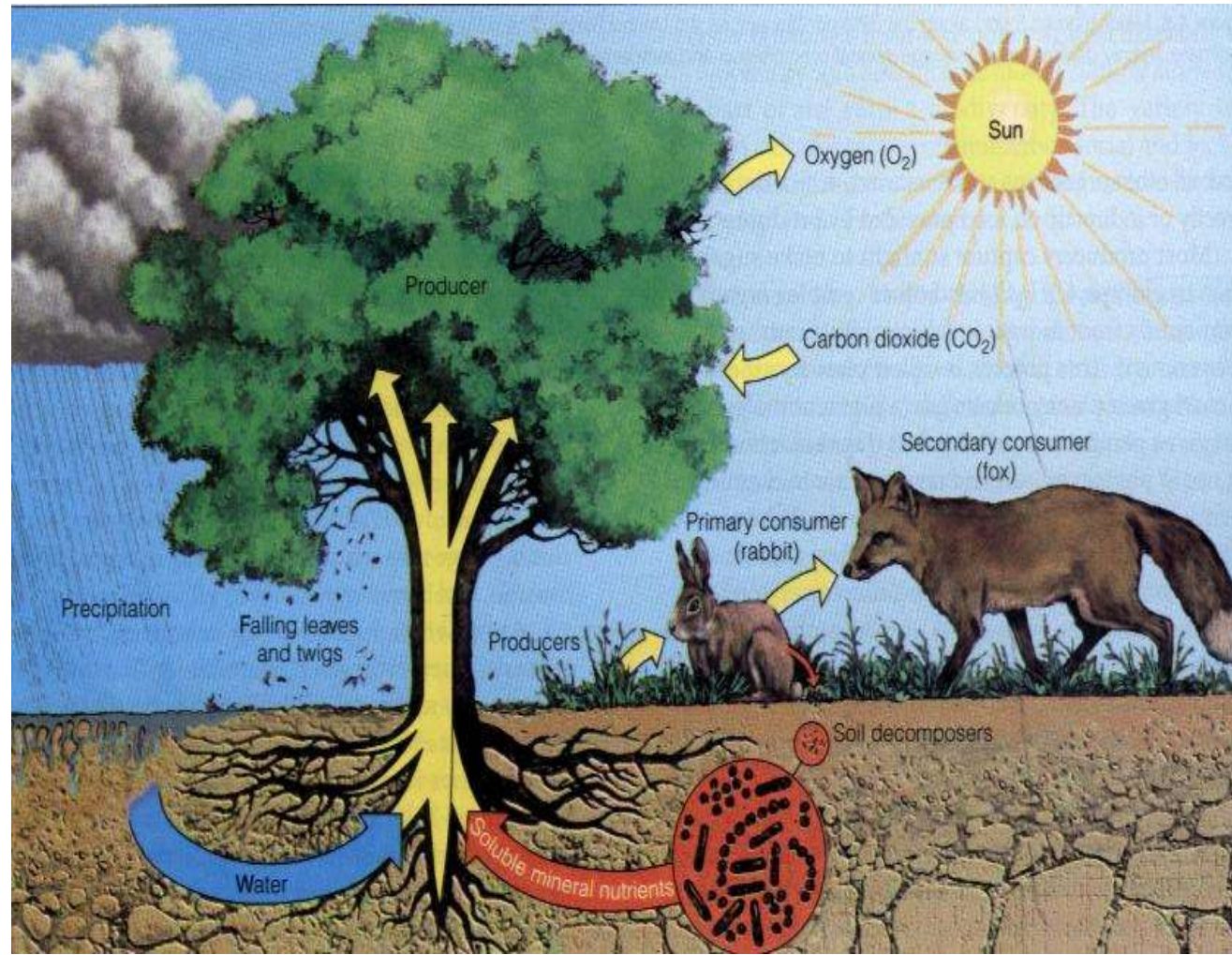
The living and nonliving things that surround a living thing make up its **environment**.



What do living things get from their environments?

Many living things share their environments and its resources.

1. Food
2. Water
3. Oxygen
4. Space



Classification of Living and Nonliving things

Living Things or biotic

Fish

Water lily

Plants

Animals

People

Non Living Things or abiotic

Air

Rocks

Cave

Soil

water

1. Environment

Environment is defined as, *“the sum of total of all living and non - living things around us influencing one another.”*

2. Environmental Science

Environmental science is the *study of the environment, its biotic (ie., biological) and abiotic (ie., non biological) components and their interrelationship.*

3. Environmental Engineering

Environmental engineering is *the application of engineering principles to the protection and enhancement of quality of the environment and to the enhancement and protection of public health and welfare.*

4. Environmental Studies (or) Environmental Education

Environmental studies are *the process of educating the people for preserving quality environment.*

Types of Environment

**Natural
Environment**

**Man made or
Artificial Environment**



ECO SYSTEM

- An *ecosystem* is made up of all the living and nonliving things in an *environment*.

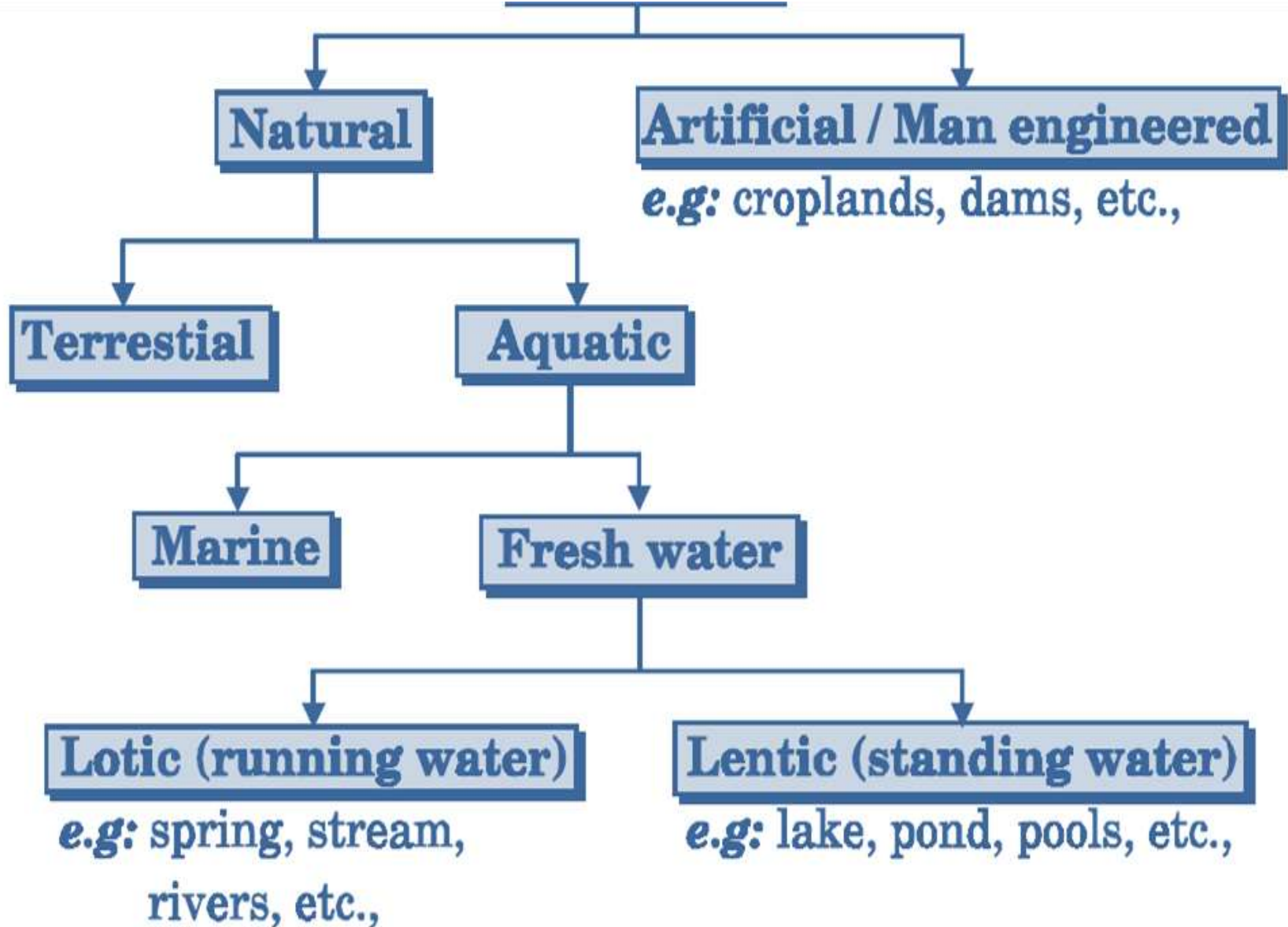


Biome (Small Ecosystem)

A kind of organisms which can live in a particular ecosystem depends on their physical and metabolic adaptations to the environment of that place.



TYPE OF ECOSYSTEM



1. Terrestrial ecosystem

- This ecosystem is related to land and types of vegetation.

*Ex: Grassland ecosystem,
forest ecosystem,
desert ecosystem, etc.,*



Forest Ecosystems



Deserts Ecosystem



2. Aquatic ecosystem

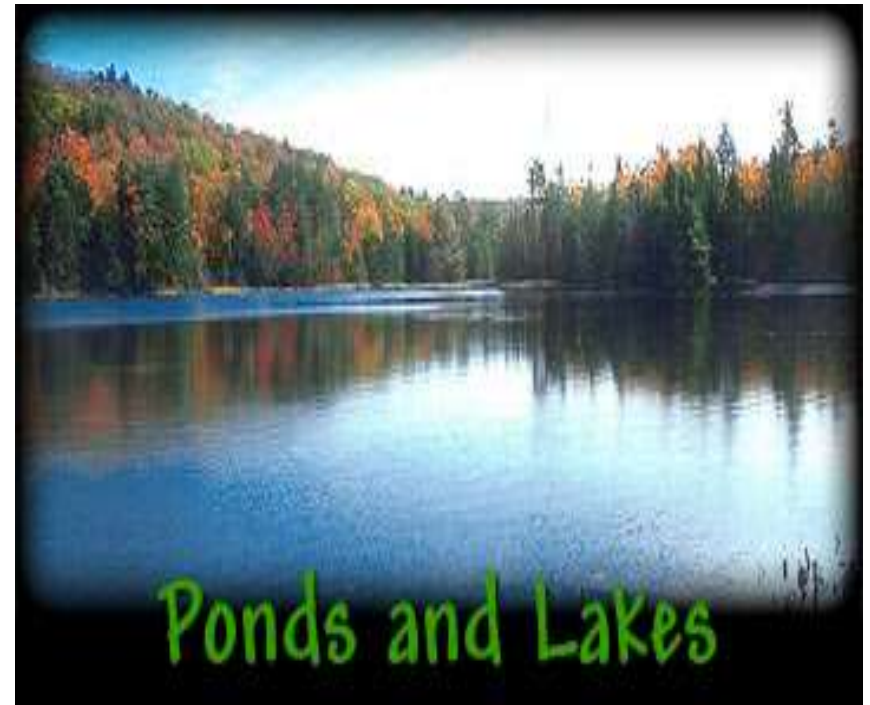
This ecosystem is related to water, it is further sub classified into two types based on salt content.

(i) Fresh water ecosystem.

(a) Running water ecosystems.



(b) Standing water ecosystems.



(ii) Marine ecosystem



2. Man-made (or) Artificial ecosystems

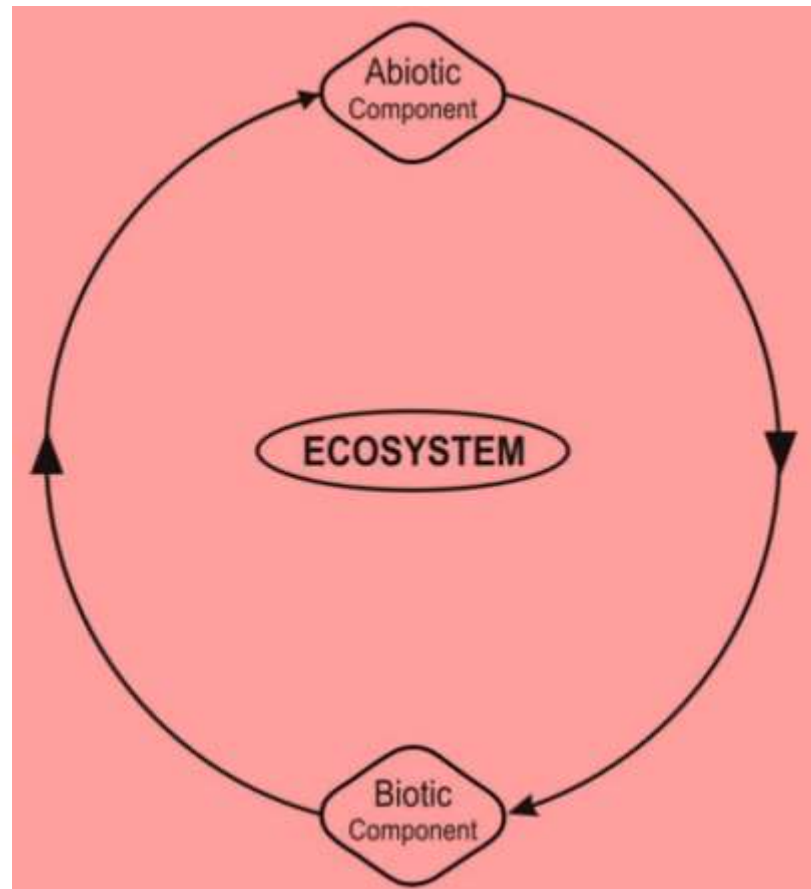
Artificial ecosystem is operated (or) maintained by man himself.

Example *Croplands, gardens.*



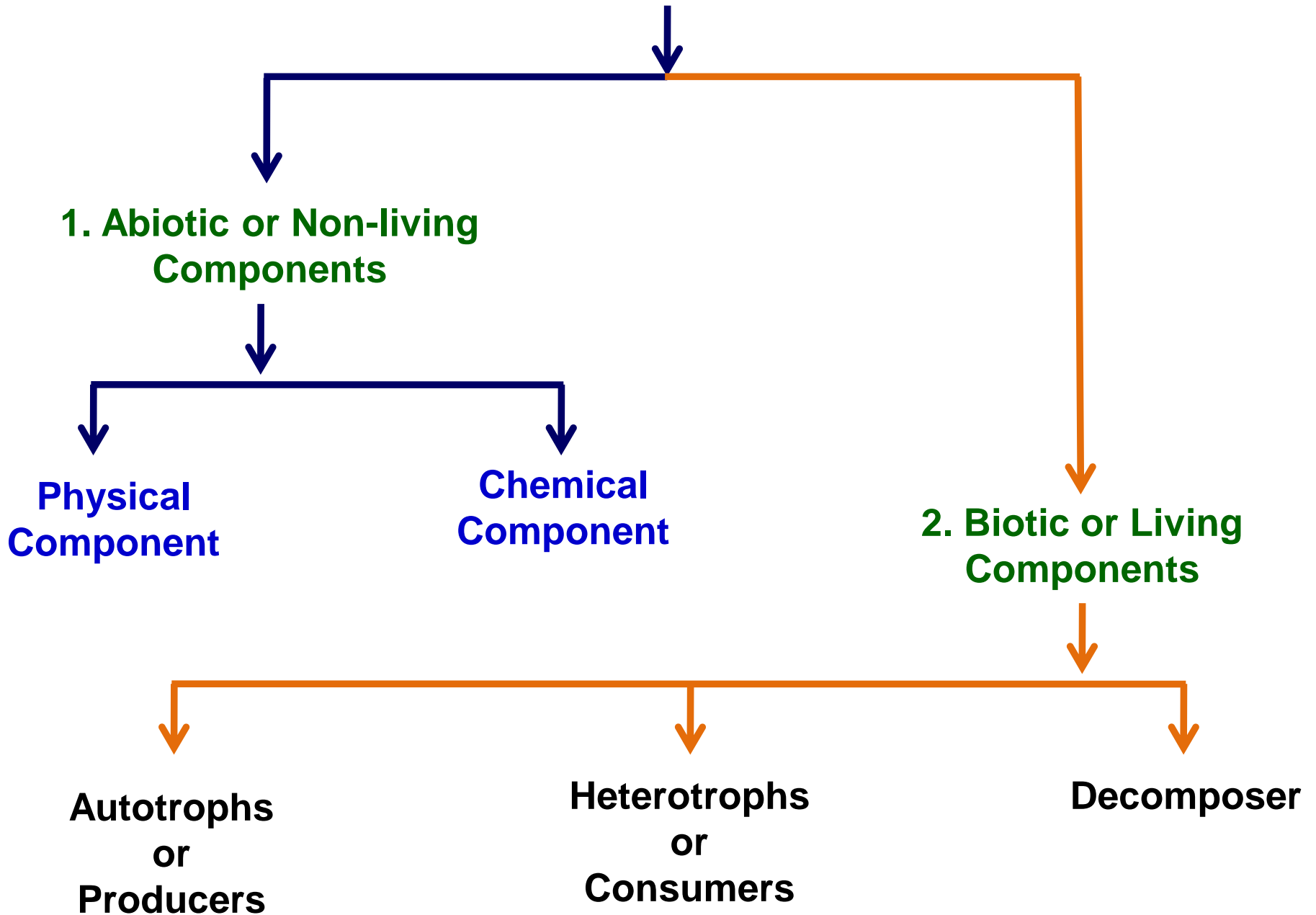
STRUCTURE (OR) COMPONENTS OF AN ECOSYSTEM

- ❖ An ecosystem has two major components
 1. Abiotic (non-living) components.
 2. Biotic (living) components.





COMPONENTS OF AN ECOSYSTEM



Abiotic (non-living) components

➤ **Non-living components (physical and chemical) of an ecosystem collectively form a community called abiotic components**

Examples *Climate, soil, water, air, energy, nutrients, etc.,*

1. Physical components: It is useful for the growth and maintenance of its member.

Air, water, soil, sunlight, etc.,

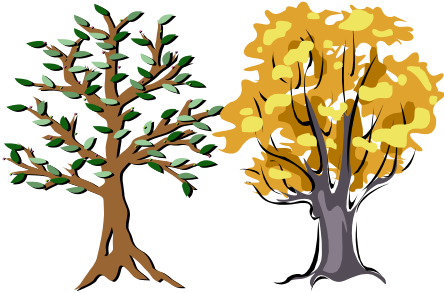
2. Chemical Components: It is the sources of essential nutrients.

(i) Organic substances: Protein, lipids, carbohydrates, etc.,

(ii) Inorganic substances: All micro (Al, Co, Zn, Cu) and macro elements (C, H, O, P, N, P, K) and few other elements.

2. Biotic (Living) components

**Autotrophs
or
Producers**



**Heterotrophs
or
Consumers**

Decomposer



**Primary Consumers
or
Herbivores**



**Secondary Consumers
or
Carnivores**



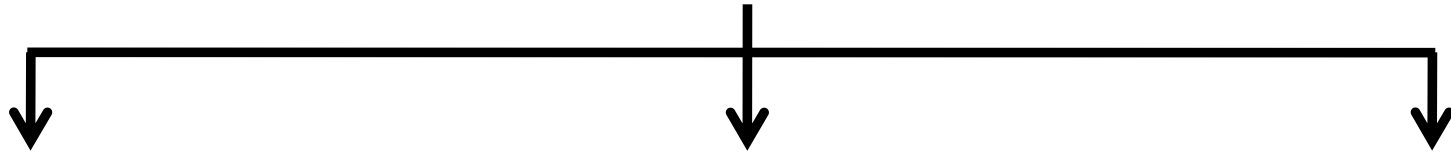
**Tertiary Consumers
or
Omnivores**



FUNCTIONS OF AN ECOSYSTEM

To understand clearly the nature of ecosystem, its functioning should be thoroughly understood.

Types of Functions



Primary Function

Manufacture of Food through photosynthesis

Secondary Function

Distributing energy in the form of food to all consumers

Tertiary Function

All living system die @ particular stage & it bodies will decompose

➤ **Functioning of an ecosystem may be understood by studying the following terms.**

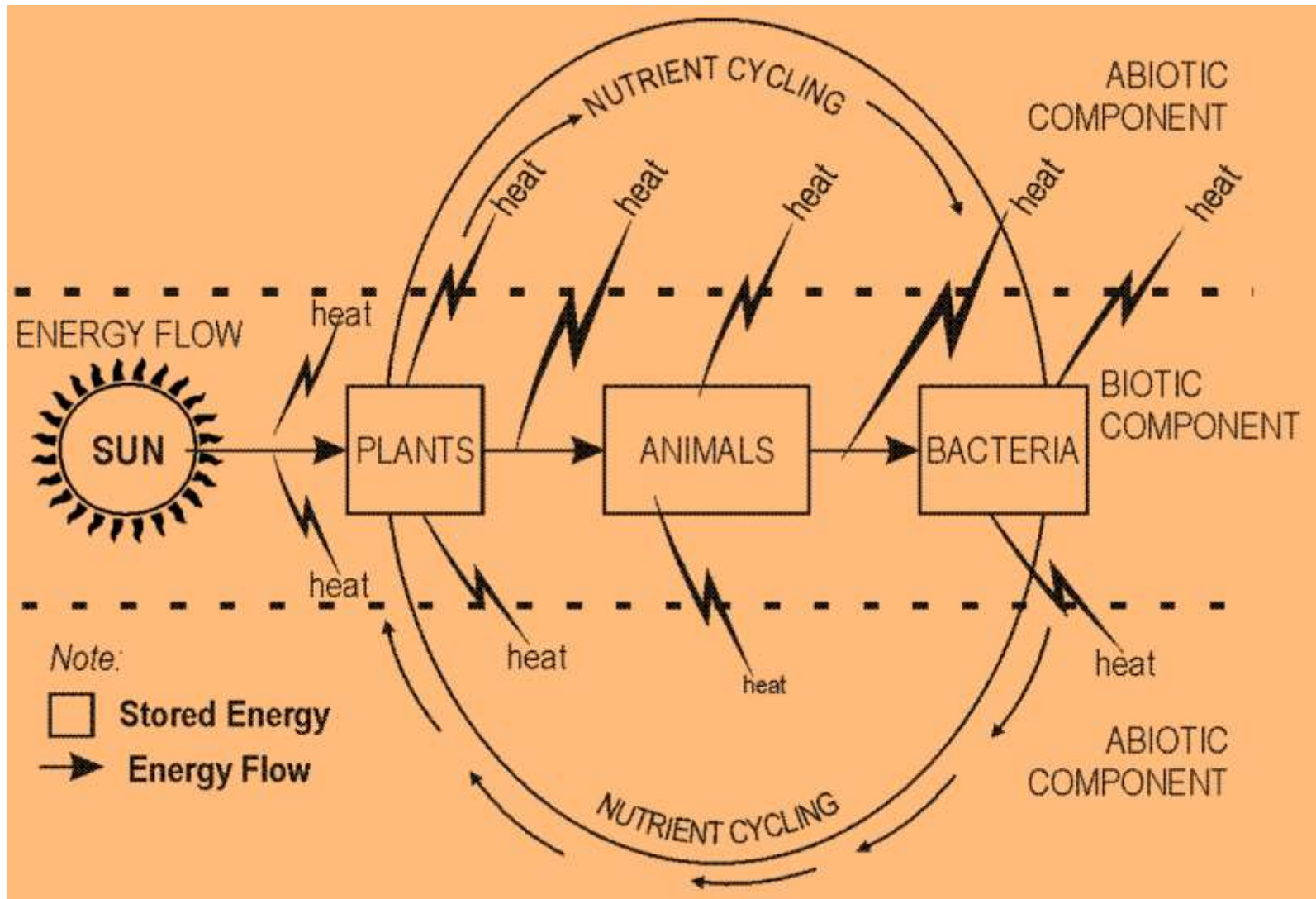
(a) Energy and material flow.

(b) Food chains.

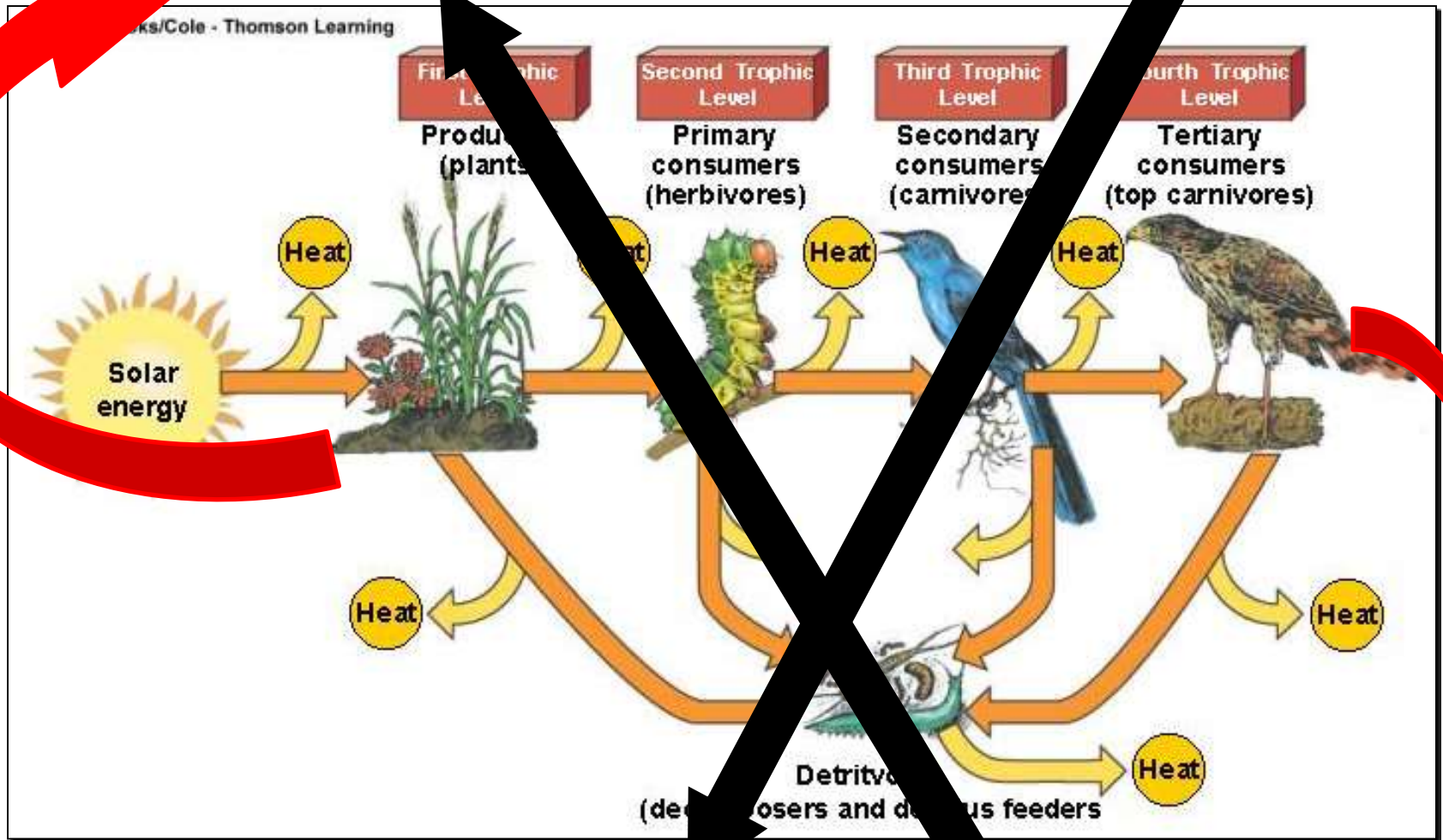
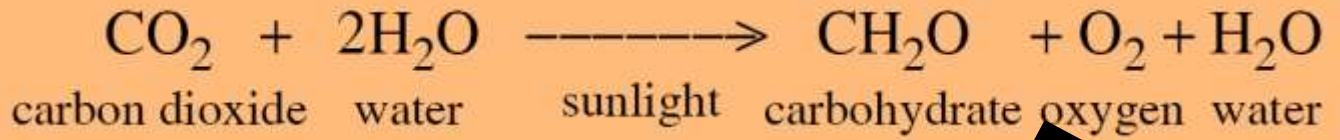
(c) Food webs.

(d) Food pyramids.

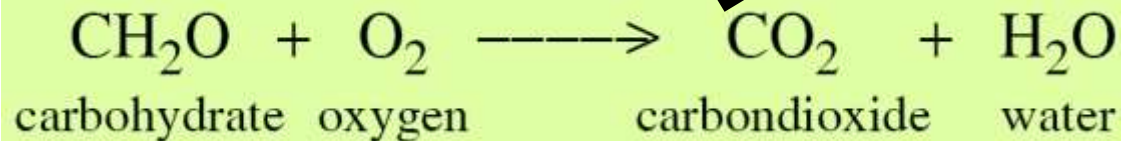
(a) ENERGY AND MATERIAL FLOW IN AN ECOSYSTEM



Photosynthetic equation



Respiration equation



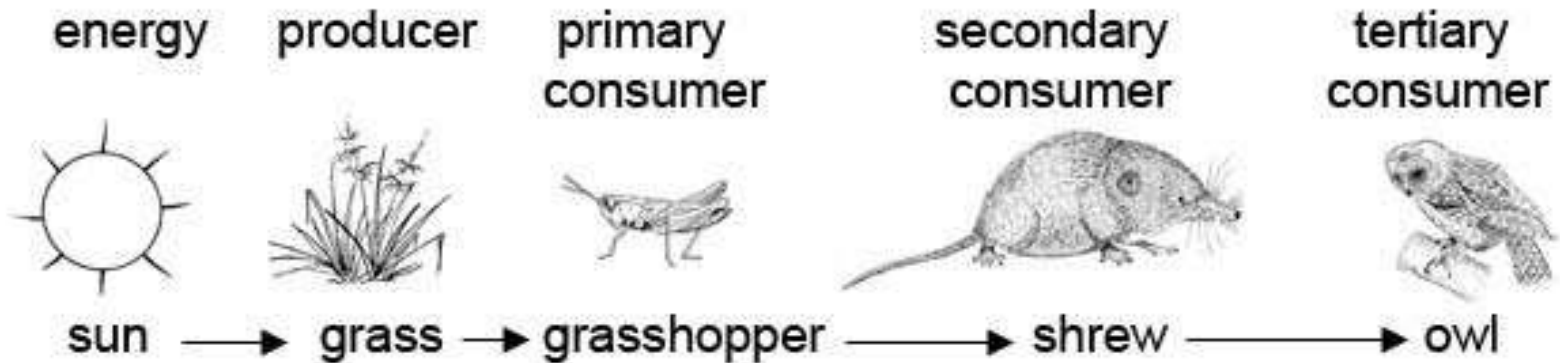
(B) FOOD CHAINS.

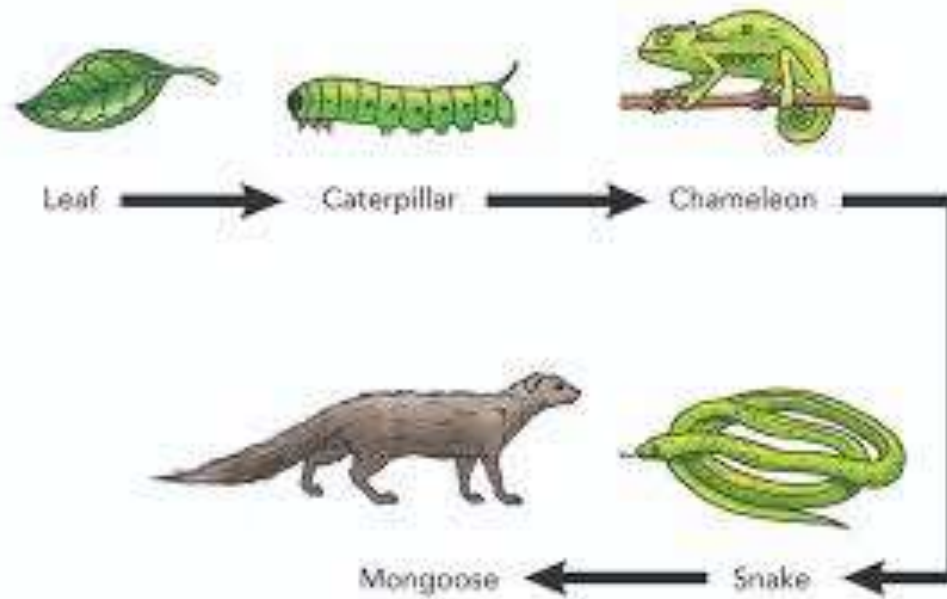
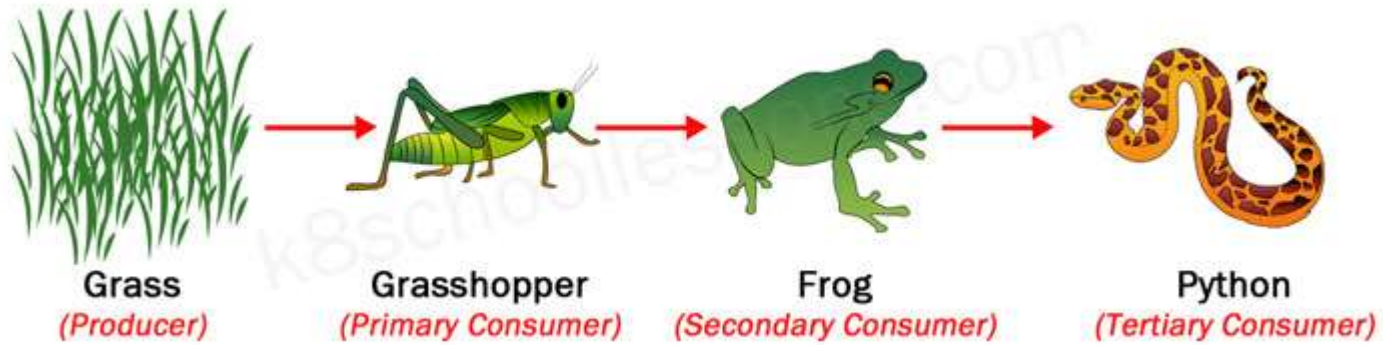
The particular pathway of nutrient and energy movement depends on which organism feeds on another

or

A sequence of being eating and eaten animals are called food chain.

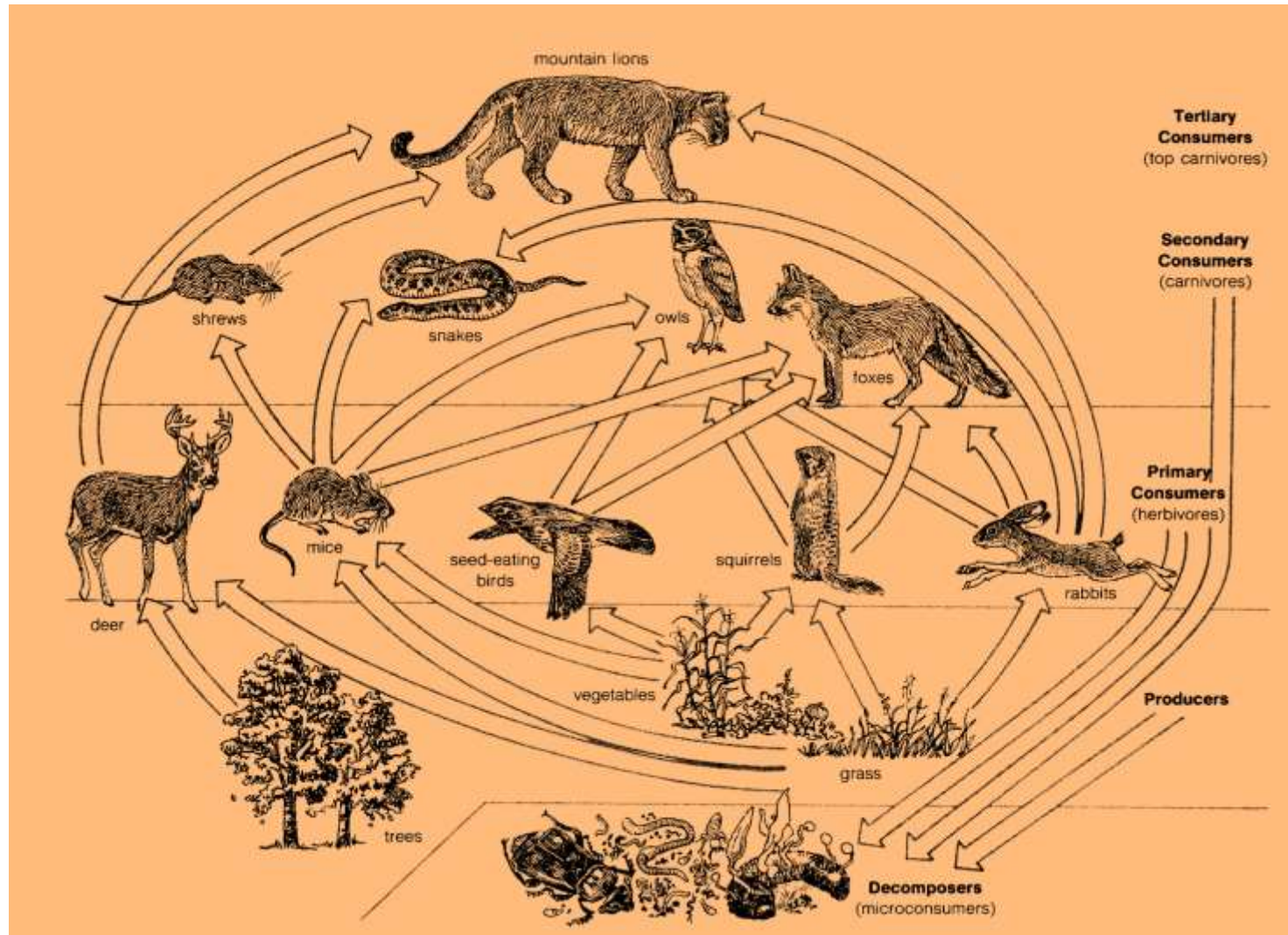
Autotrophs--->Herbivores--->Carnivores--->Omnivores

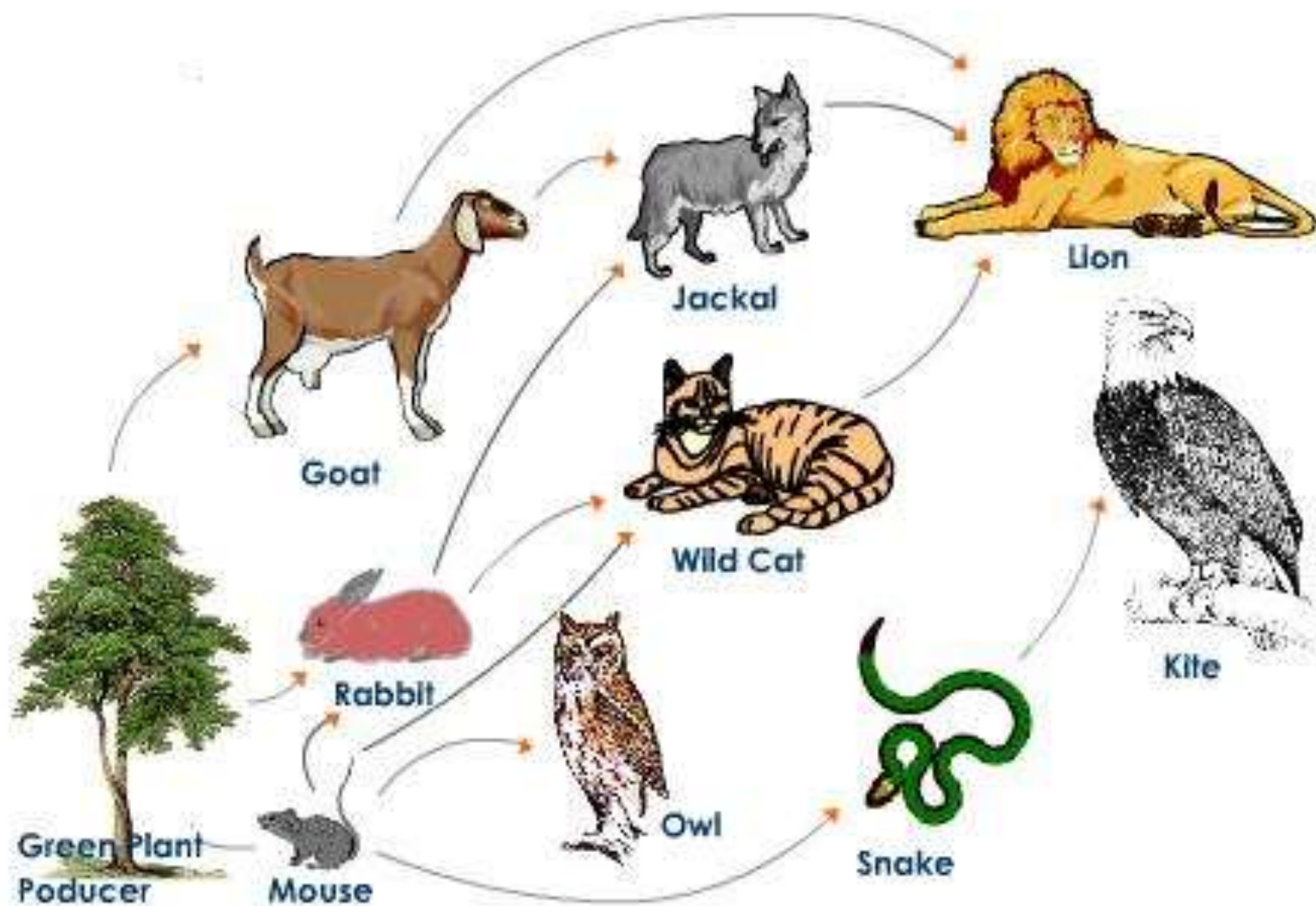




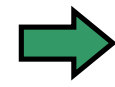
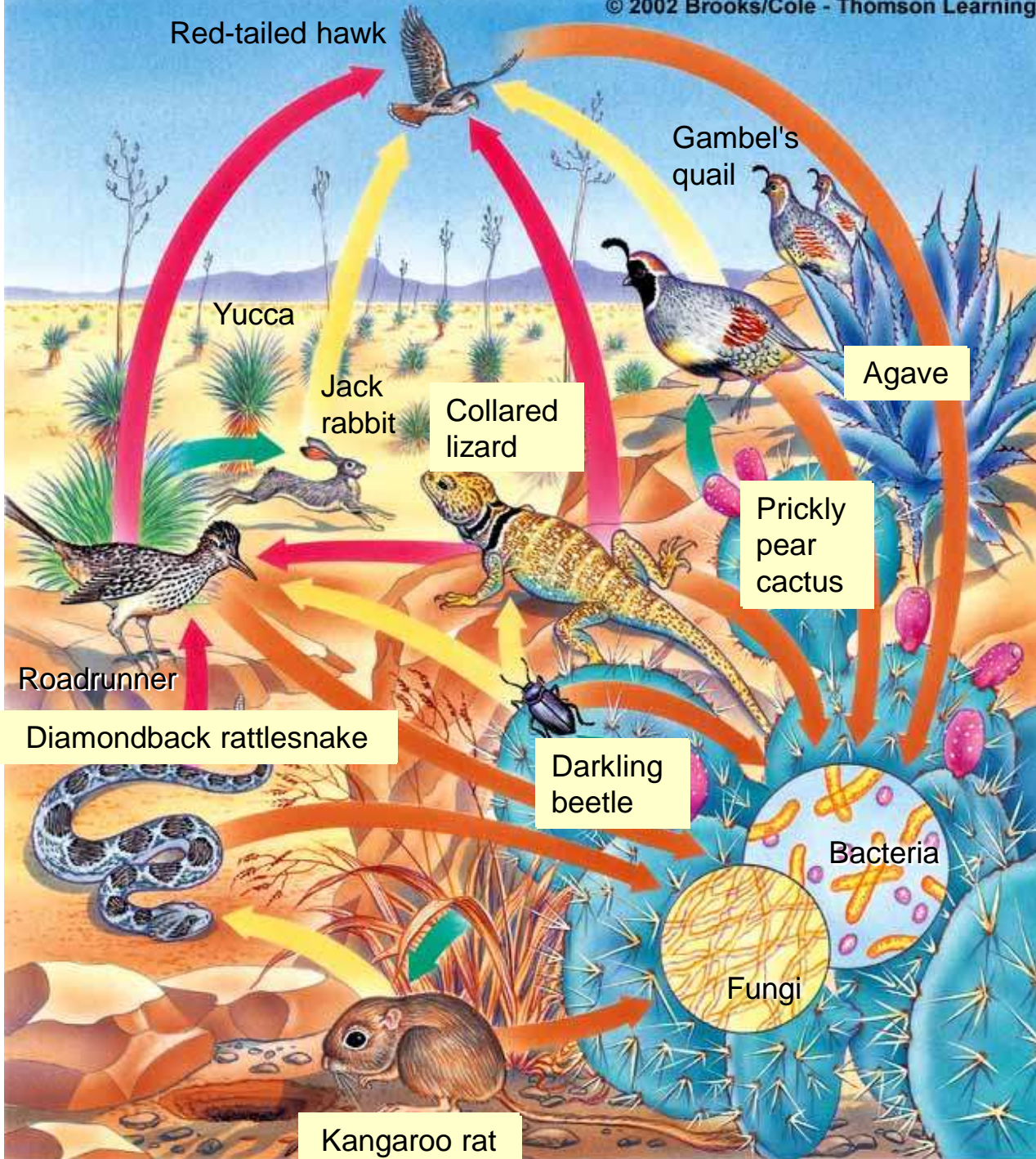
(B) FOOD CHAINS.

Interlocking patterns of more than two food chain are called food web.

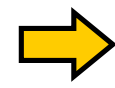




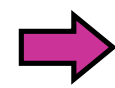
Food Web in a Forest



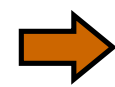
Producer to primary consumer



Primary to secondary consumer



Secondary to higher-level consumer



All producers and consumers to decomposers

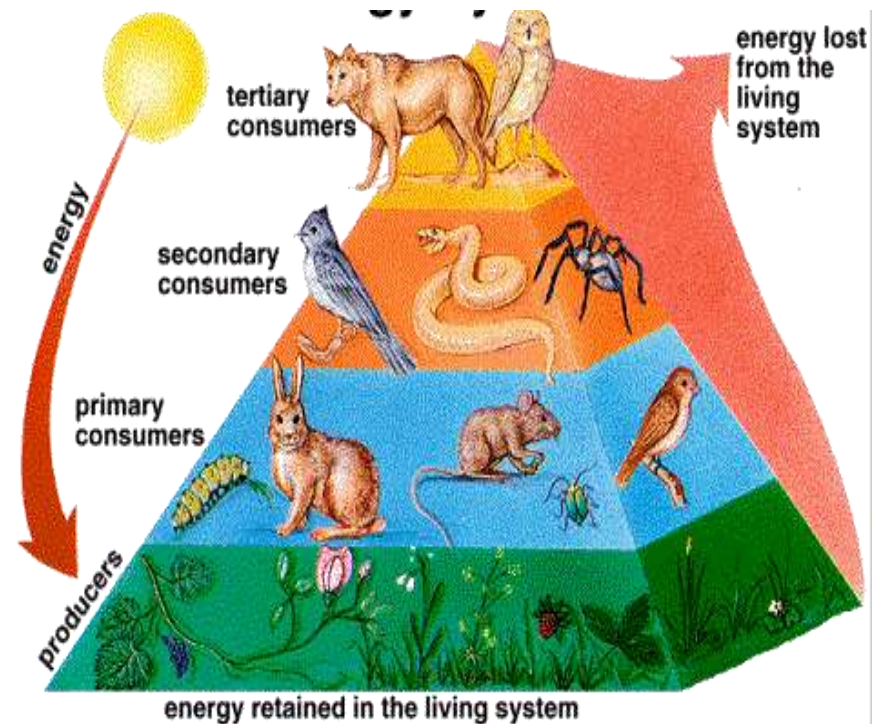
(d) FOOD PYRAMID or ECOLOGICAL PYRAMID.

It is the graphical representation of various trophic levels in an ecosystem.

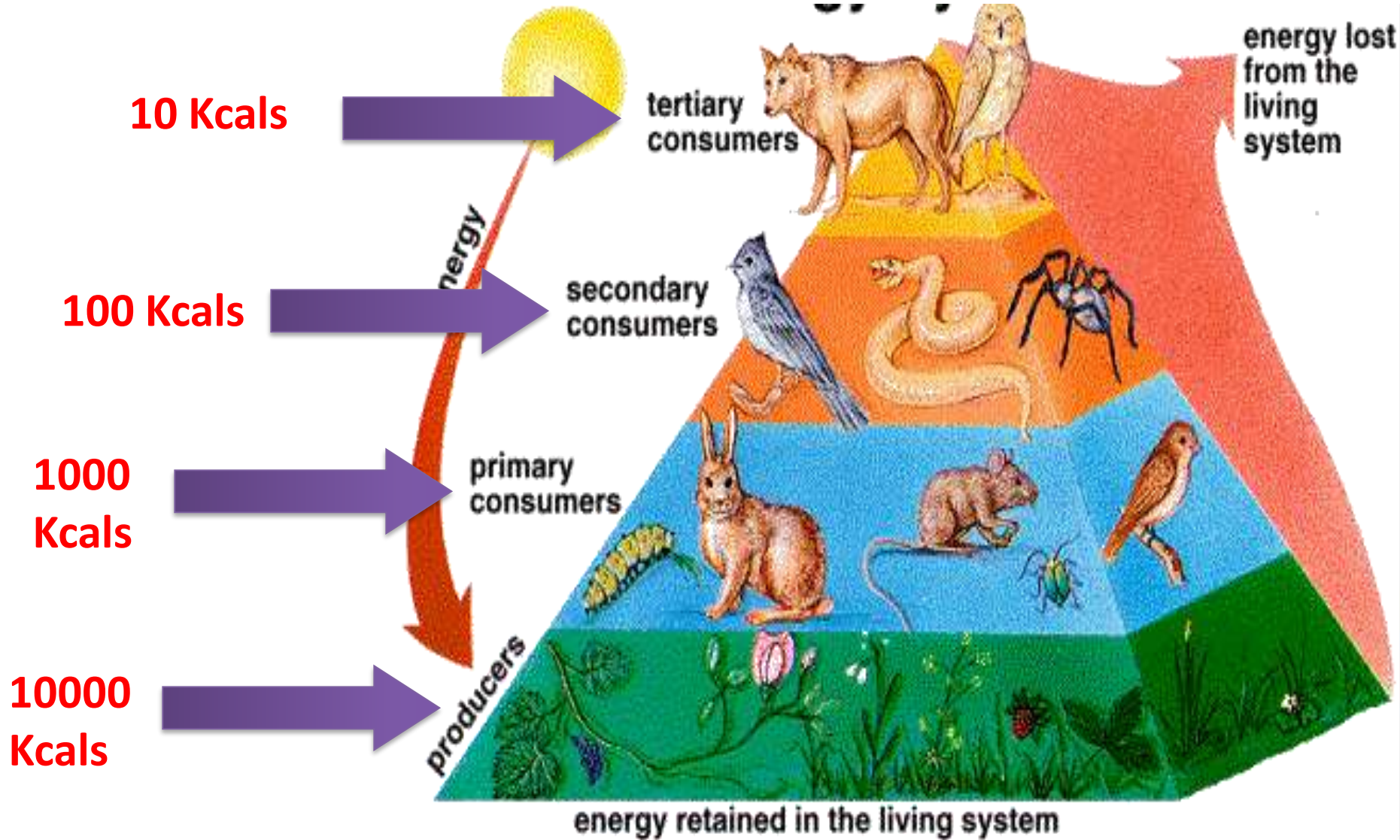
1. Pyramids of Energy

2. Pyramids of Numbers

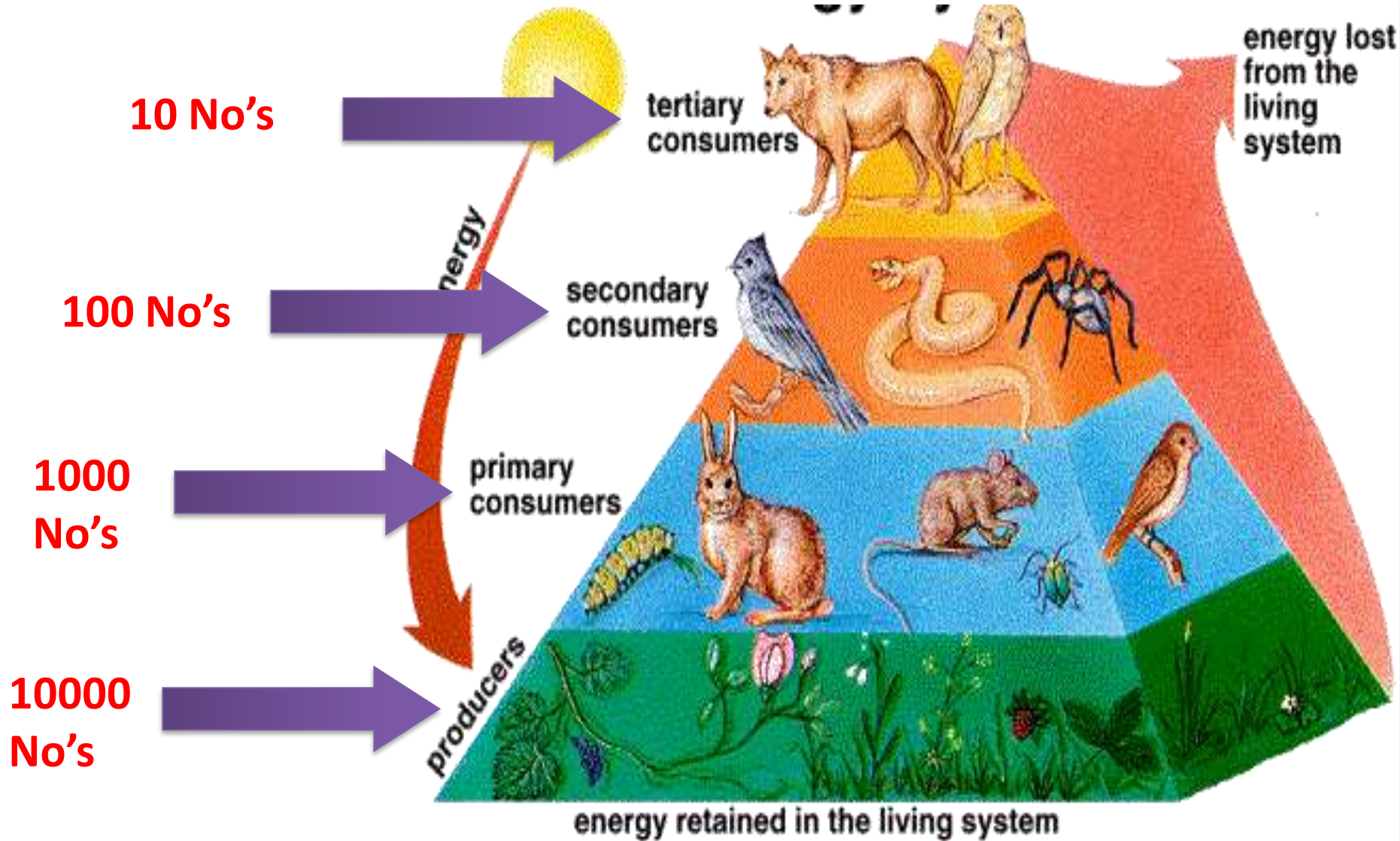
3. Pyramids of Biomass



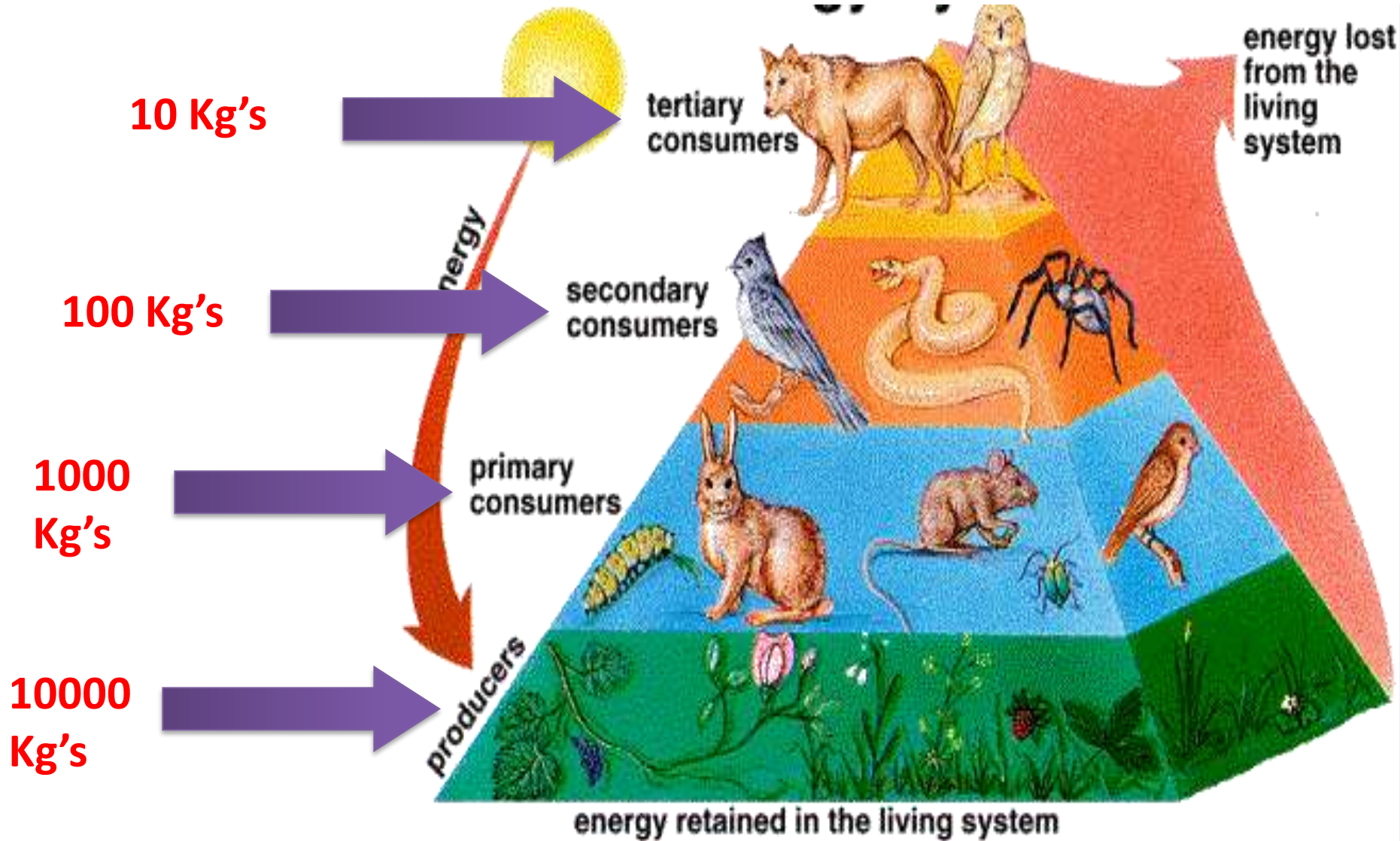
Pyramids of Energy



Pyramids of Numbers



Pyramids of Biomass



ECOLOGICAL SUCCESSION

Thus the progressive replacement of one community by another till the development of stable community in a particular area is called ecological succession.

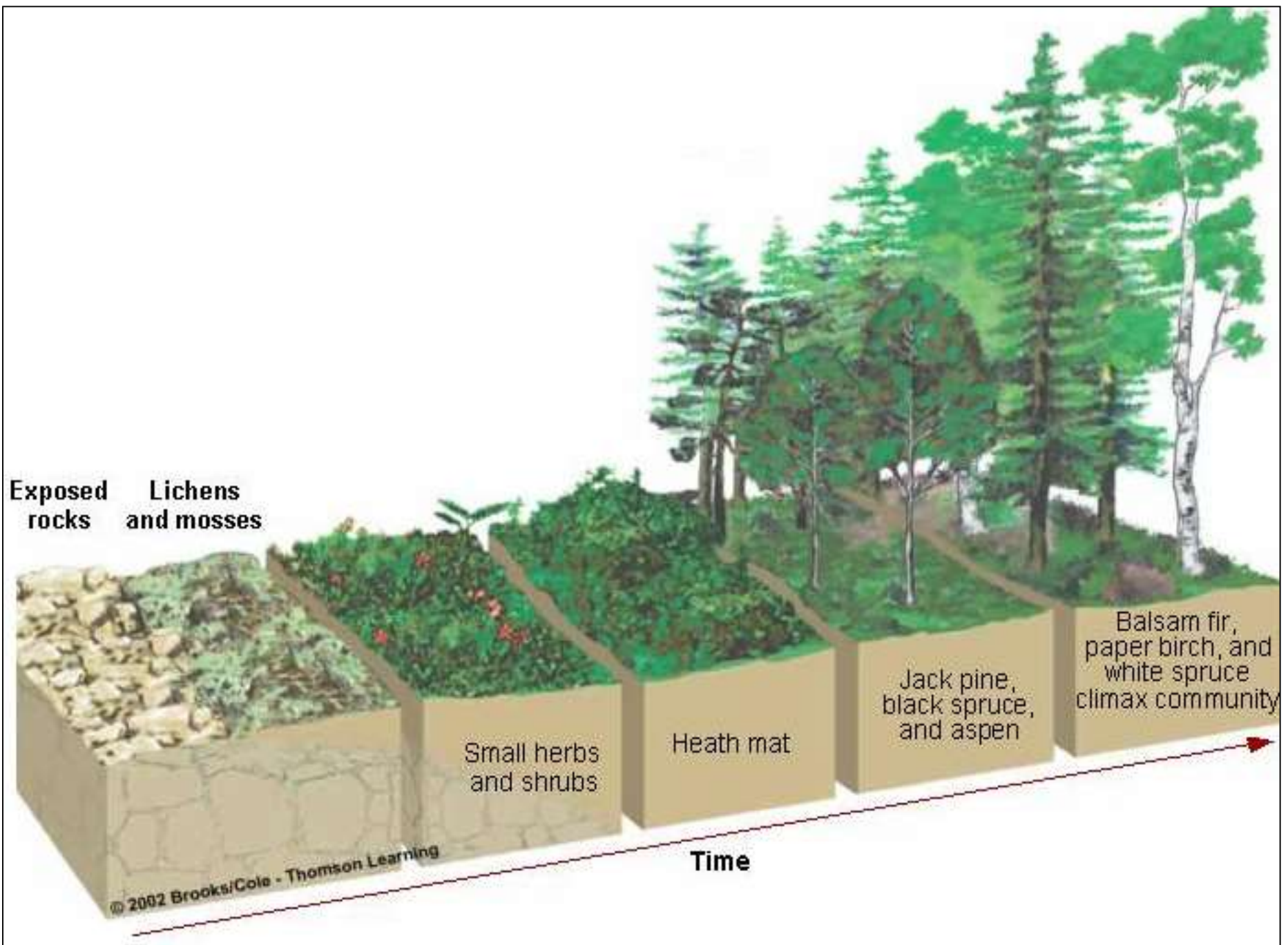
Stages of ecological succession

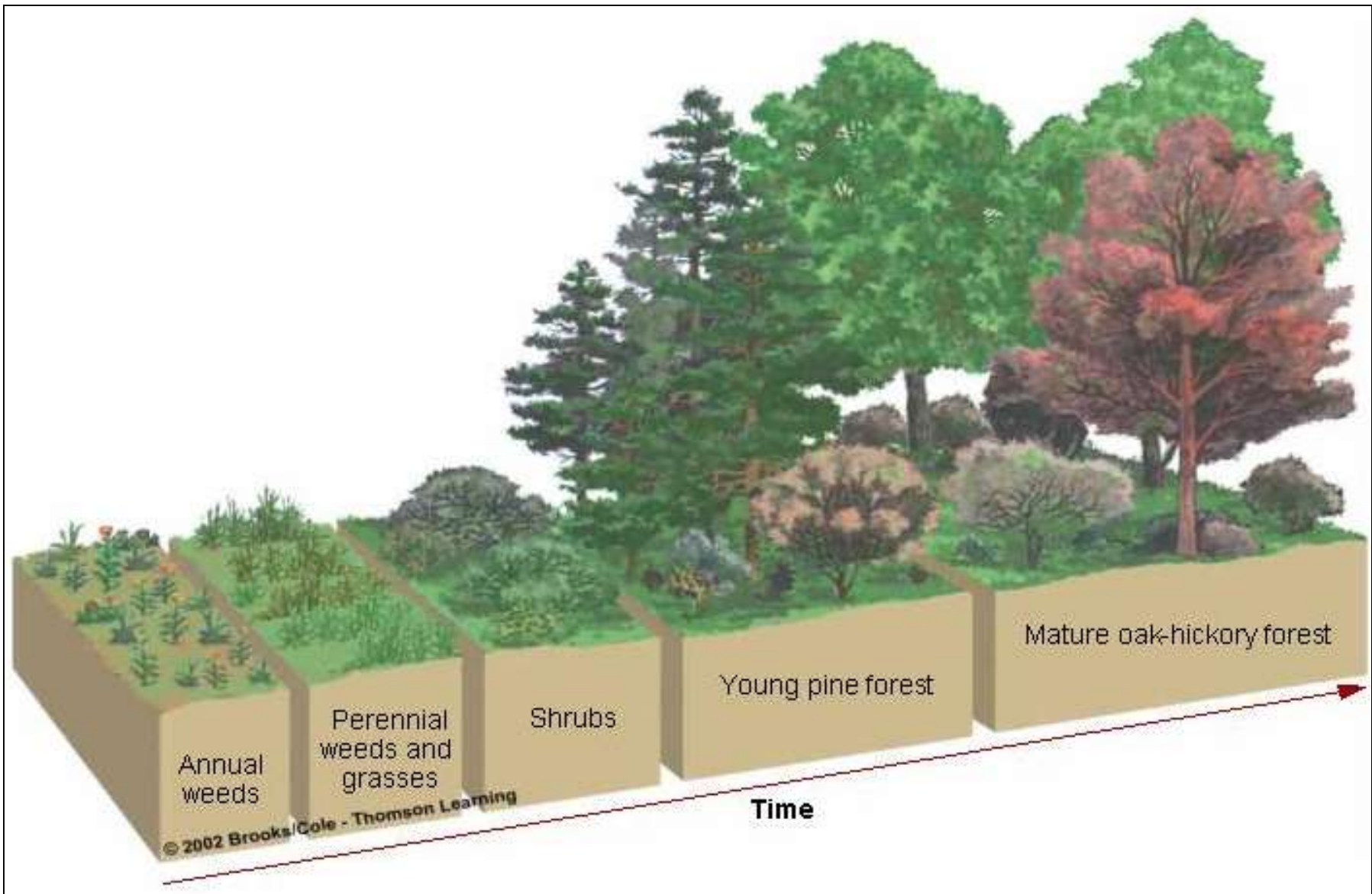
1. Pioneer community

- ❖ First group of organism, which establish their community in the area is called 'Pioneer' Community.

2. Seres (or) Seral stage

- ❖ Various developmental stages of a community is called 'seres'.





Process of Ecological Succession

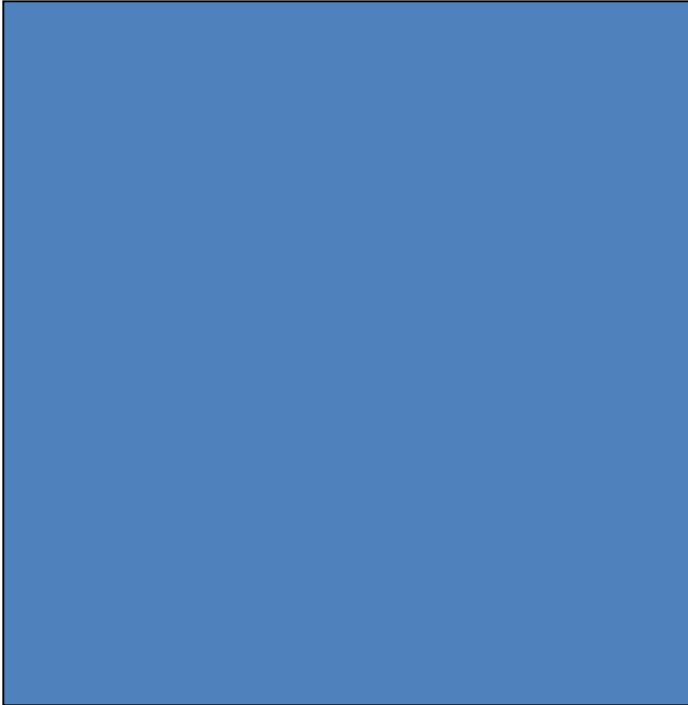
- 1. Nudation:** It is the development of a bare area without any life form.
- 2. Invasion:** It is the establishment of one or more species on a bare area through migration followed by establishment.
 - (a) Migration: Migration of seeds is brought about by wind, water or birds.*
 - (b) Establishment: The seeds then germinate and grow on the land and establishes their pioneer communities.*
- 3. Competition:** As the number of individual species grows, there is a competition with the same species and between different species for space, water and nutrients.

4. **Reaction:** The living organisms, take water, nutrients and grow and modify the environment is known as reaction. This modification becomes unsuitable for the existing species and favour some new species, which replace the existing species. This leads to seral communities.

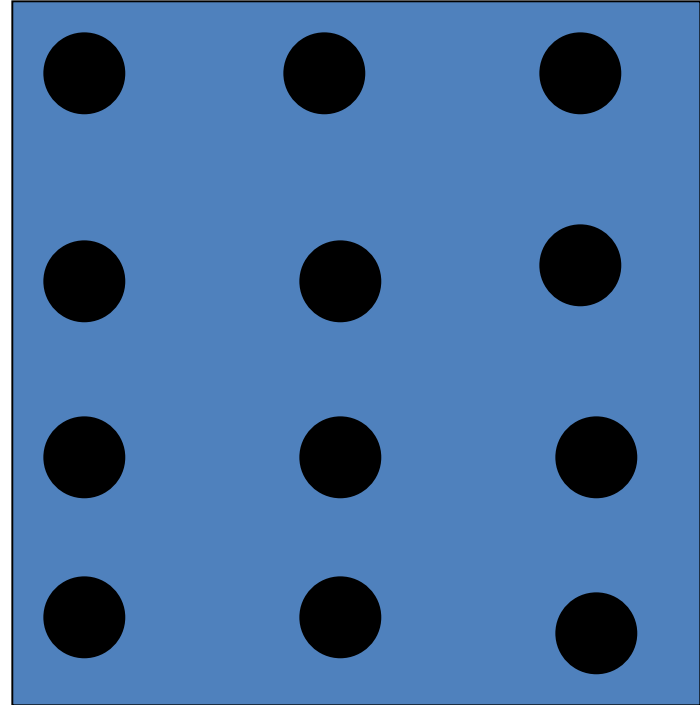
5. **Stabilizations:** It leads to stable community, which is in equilibrium with the environment.

Bio diversity

Which do you like better?

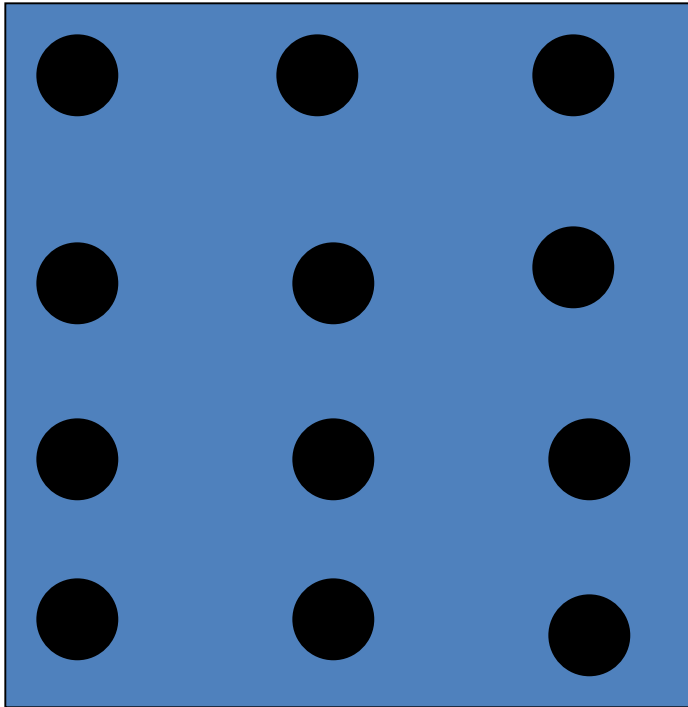


A

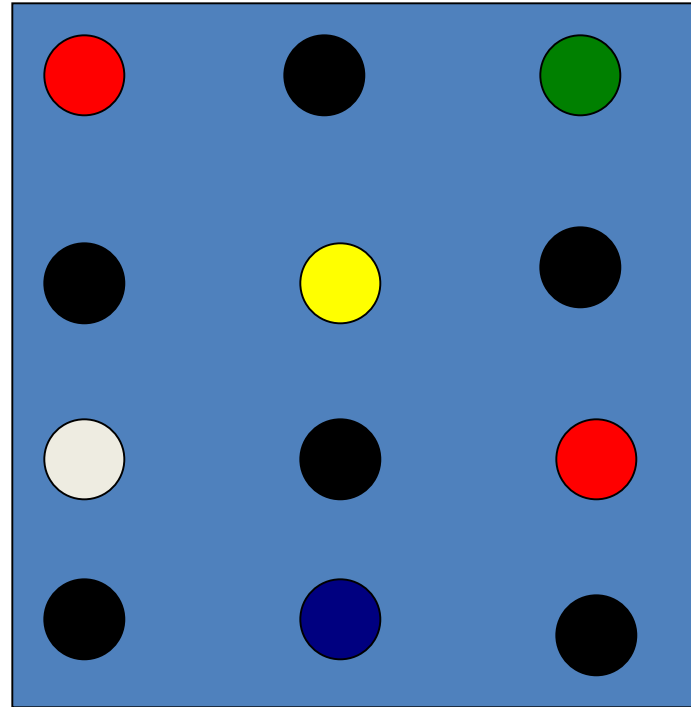


B

Which do you like better?

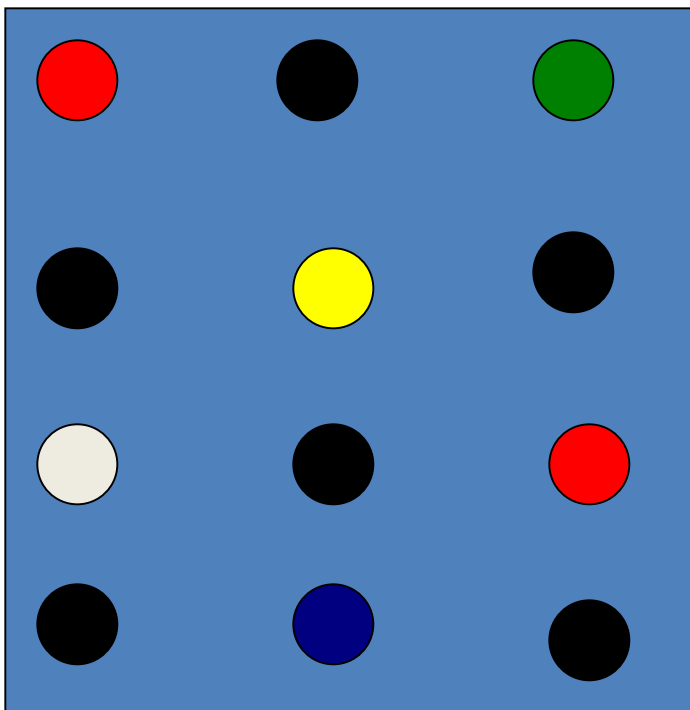


A

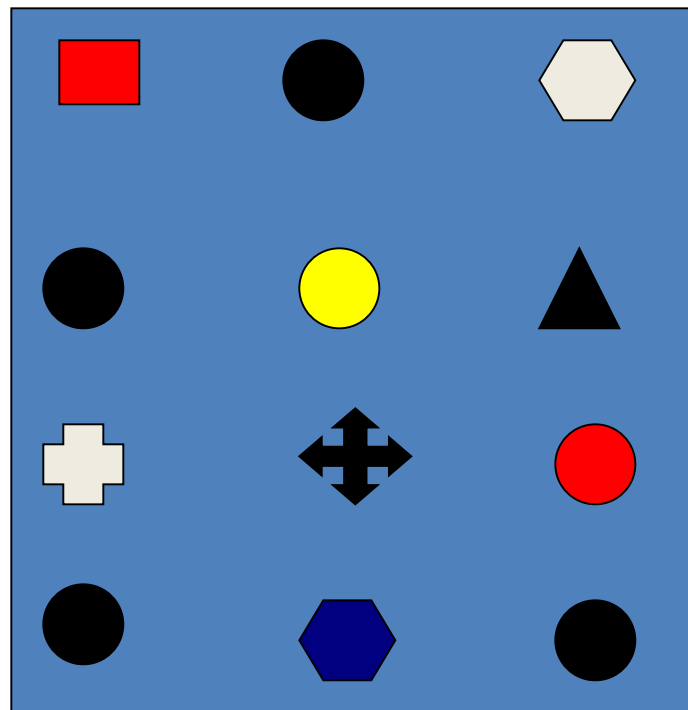


B

Which do you like better?

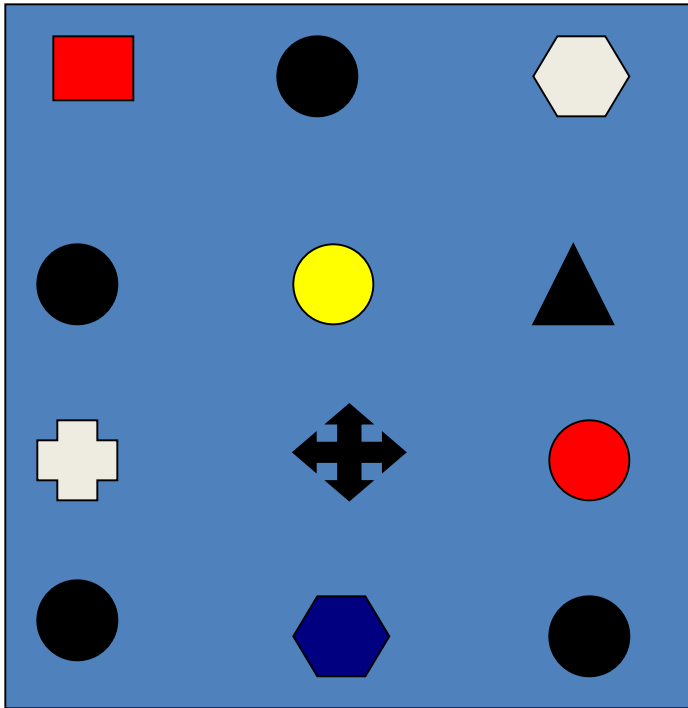


A

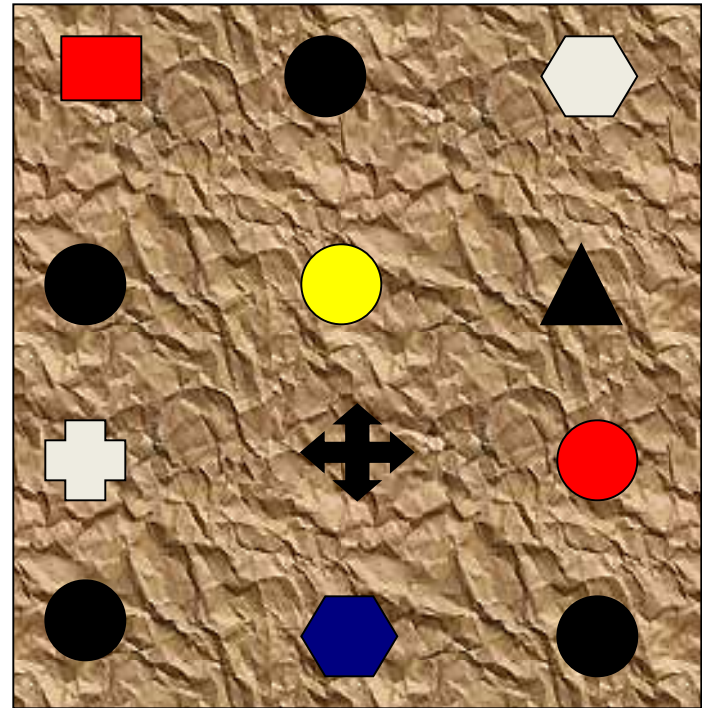


B

Which do you like better?

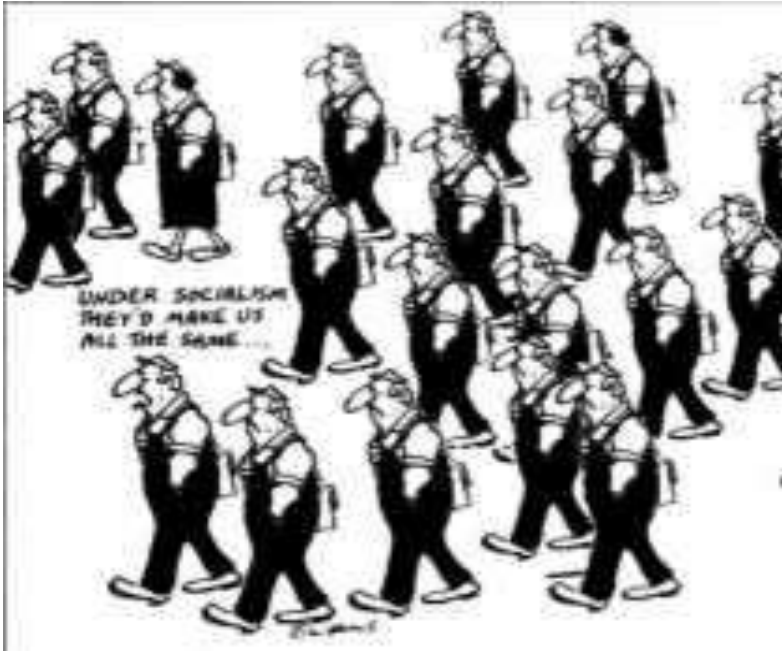


A



B

Which do you like better?



A



B

Which do you like better?



A



B

**What do you think biodiversity
means?**

Biodiversity

What does “Bio” mean?

Bio =

Life

Biodiversity

What does “Diversity” mean?

Diversity = Variety

There are 3 components of biodiversity

1. Gene Level of Biodiversity

Chihuahuas, beagles, and rottweilers are all the same species — but they're not the same because there is variety in their genes.



Chihuahua



Beagle



Rottweilers

2. Species Level of Biodiversity

For example, monkeys, dragonflies, and meadow beauties are all different species.



Hoary Bat



Iwi



Kahuli

3 Ecosystems Level of Biodiversity

Each one is different, with its own set of species living in it.



Desert



Tropical Rain Forest



Tiaga

What do we get from biodiversity?

- **Oxygen**
- **Food**
- **Clean Water**
- **Medicine**
- **Aesthetics**
- **Ideas**



VALUE OF BIODIVERSITY

- Biosphere is a life supporting system to the human beings. It is the combination of different organisms. Each organisms in the biosphere has its own significance.

1. Consumptive use value
2. Productive use values
3. Social Values
4. Ethical values (or) Existence value
5. Aesthetic value
6. Optional values

1. Consumptive use value

These are direct use values, where the biodiversity products are harvested and **consumed directly**.

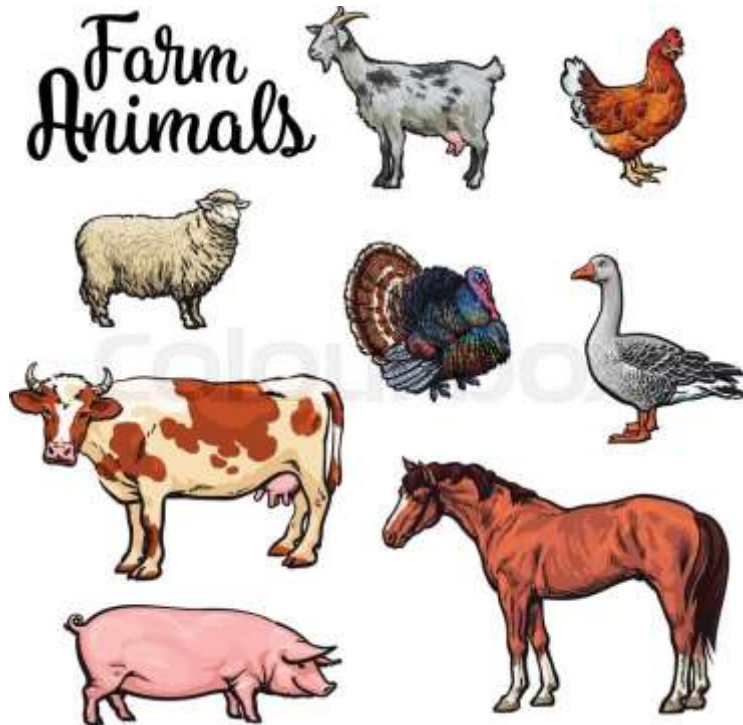
Ex. Food, drug, fuel, etc.,



2. Productive use values

Biodiversity products have obtained a **commercial value**. These products are **marketed and sold**

Ex. Animal Products, Plant Products, etc.,



3. Social Values

These values are associated with the **social life, religion and spiritual aspects** of the people.

Ex. Holly Animals & Holly Plants



4. Ethical values (or) Existence value

It involves ethical issues like **all life must be have rights to live on Earth.**

Ex. Kangaroo, Zebra or Giraffe



5. Aesthetic value

These values are associated with the **Joy, reduced stress, Enthusiasm and Happiness** of the people.

Ex. Eco-tourism



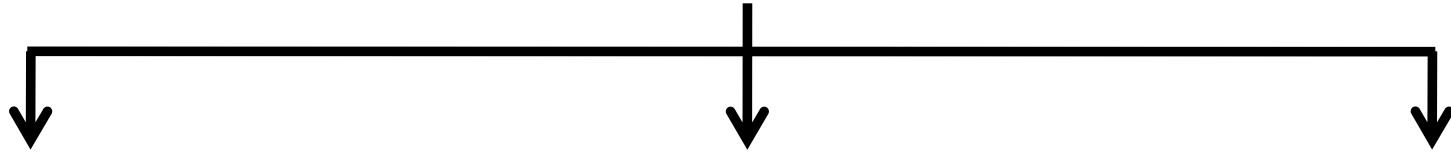
6. Optional values

The optional values are the potentials of biodiversity that are **presently unknown and need to be known.**

Ex. The growing biotechnology field is searching a species for causing the diseases of cancer and AIDS.

THREATS TO BIODIVERSITY

Any disturbance in an natural ecosystem tend to reduce its biodiversity.



1. Habitat Loss

- a) *Deforestation*
- b) *Destruction of wetlands*
- c) *Habitat fragmentation*
- d) *Raw material*
- e) *Production of drugs*
- f) *Illegal trade*
- g) *Developmental activities*

2. Poaching of Wild animals

- a) Human population
- b) Commercial activities

3. Man – Wild life Conflicts

CONSERVATION OF BIODIVERSITY

Conservation is defined as, *the management of biosphere so that it will yield the greatest sustainable benefit to present generation while maintaining its potential to meet the needs of future generation.*

- ❖ There are two types of biodiversity conservation.
 1. In - situ conservation (within habitat)
 2. Ex - situ conservation (outside habitat)

1. In - situ conservation

In - situ conservation involves protection of fauna and flora within its natural habitat, where the species normally occurs is called in - situ conservation.

1. Biosphere Reserves

2. National Park

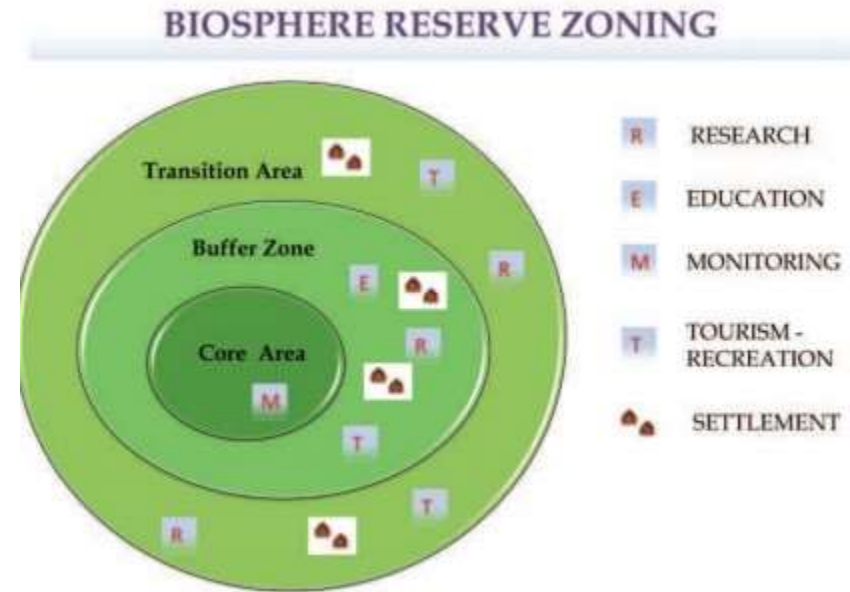
3. Wildlife Sanctuaries

4. Gene Sanctuary

5. Other projects for conservation of animals

1. Biosphere Reserves

- Biosphere reserves cover large area.
- 5000 sq. km.
- It is used to protect species for long time.
- It serves as site of tourism.
- useful for educational and research.



Mixed deciduous forest of Nokrek Biosphere Reserve, Meghalaya

Photo: Dr. H.S. Debnath

Some important Biosphere Reserves in India

Name of Biosphere	State
Nanda Devi	U.P
Nokrek	Meghalaya
Manas	Assam
Sunderbans	West Bengal
Gulf of Mannar	Tamil Nadu
Nilgiri	Karnataka, Kerala, Tamil Nadu
Great Nicobars and Similipal	Orissa





2. National Park

- ❖ A national park is an area dedicated for the conservation of wildlife along with its environment.
- ❖ It is usually a small reserves covering an area of about 100 to 500 sq. kms.
- ❖ It is used for enjoyment through tourism.



Some important National parks in India

Name of National Park	State	Important Wildlife
Kaziranga	Assam	One horned Rhino
Gir National Park	Gujarat	Indian Lion
Bandipur	Karnataka	Elephant
Dachigam	J & KJ & K	Hangul
Corbett	U.P	Tiger
Kanha	M.P	Tiger
Periyar	Kerala	Tiger, Elephant
Dudwa	U.P	Tiger
Sariska	Rajasthan	Tiger
Ranthambore	Rajasthan	Tiger





3. Wildlife Sanctuaries

- ❖ A wildlife sanctuary is an area, which is reserved for the conservation of animals only. At present, there are 492 wildlife sanctuaries in our country.
- ❖ Killing, hunting, shooting, or capturing of wildlife is prohibited except under the control of higher authority.



Some Important Wildlife Sanctuaries in India

Name of Sanctuary	State	Major Wild Life
Hazaribagh Sanctuary	Bihar	Tiger, Leopard
Ghana Bird Sanctuary	Rajasthan	300 species of birds
Sultanpur Bird Sanctuary	Haryana	Migratory birds
Abohar Wildlife Sanctuary	Punjab	Black buck
Nal Sarovar Bird Sanctuary	Gujarat	Water birds
Mudumalai Wildlife Sanctuary	Tamil Nadu	Tiger, Elephant, Leopard
Vedanthangal Bird Sanctuary	Tamil Nadu	Water birds
Wild Ass Sanctuary	Gujarat	Wild ass, Wolf, Chinkara
Jaldapara Wildlife Sanctuary	W.Bengal	Rhinoceros, Elephant, Tiger



4. Gene Sanctuary

- ❑ A gene sanctuary is an area, where the plants are conserved.
- ❑ In Northern India, two gene sanctuaries are found available.
 - (a) One gene sanctuary for citrus (Lemon family)
 - (b) One gene sanctuary for pitcher plant (an insect eating plant).

sanctuary for citrus



grapefruit



lime



orange



tangerine



lemon



pomelo



citron



oroblanco



kumquat



pitcher plant



5. Other projects for conservation of animals

□ For the protection and conservation of certain animals, some special projects are framed in our country.

1. *Project Tiger;*
2. *Gir Lion project;*
3. *Crocodile Breeding project;*
4. *Project Elephant, etc.,*

Advantages (or) merits of In-situ Conservation

- 1. It is very cheap and convenient method.**
- 2. The species gets adjusted to the natural disasters likedrought, floods, forest fires.**

Disadvantages (or) Limitations of In-situ Conservation

- 1. A large surface area of the earth is required to preserve the biodiversity.**
- 2. Maintenance of the habitats is not proper, due to shortage of staff and pollution.**

2 Ex-situ conservation.

➤ *Ex-situ conservation involves protection of fauna and flora outside the natural habitats.*

1. National Bureau of Plant Genetic Resources (NBPGR)

- ❖ It is located in New Delhi.
- ❖ Preserve agricultural and horticultural crops.

2. National Bureau of Animal Genetic Resources (NBAGR)

- ❖ It is located at Karnal, Haryana.
- ❖ It preserves the semen of bovine animals.

3. National Facility for Plant Tissue Culture Repository (NFPTCR)

Advantages (or) merits of Ex-situ Conservation

- 1. Survival of endangered species is increasing due to special care and attention.**
- 2. In captive breeding, animals are assured food, water, shelter and also security and hence longer life span.**
- 3. It is carried out in cases of endangered species, which do not have any chances of survival, in the world.**

Disadvantages (or) Limitations of Ex-situ Conservation

- 1. It is expensive method.**
- 2. The freedom of wildlife is lost.**
- 3. The animals cannot survive in natural environment.**
- 4. It can be adopted only for few selected species.**

ENDANGERED AND ENDEMIC SPECIES

➤ According to International Union of Conservation of Nature and Natural Resources (IUCN) the species are classified into various types.

1. Extinct Species.
2. Endangered Species.
3. Vulnerable Species.
4. Rare Species.

1. Extinct species

A species is said to be extinct, when it is no longer found in the world.



2. Endangered Species

A species is said to be endangered, when its **number has been reduced to a critical level**. Unless it is **protected and onserverved**, it is in immediate danger of extinction.



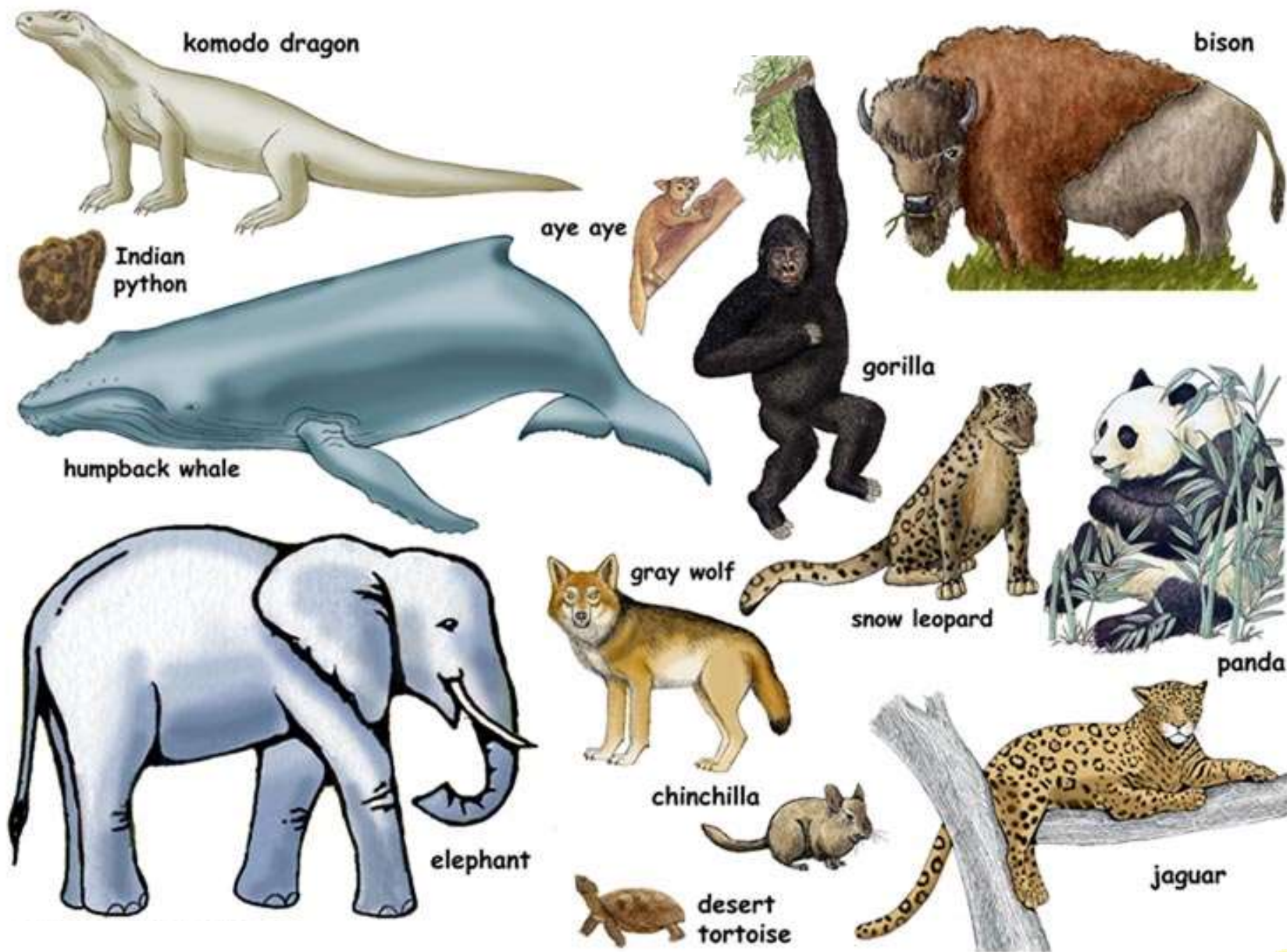
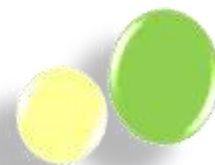


Fig. 3.2 Some endangered species



Vulnerable Species

A species is said to be Vulnerable when **its population is facing continuous decline** due to habitat destruction or over exploitation.

Such a species is still abundant.



Cola bear



Mountain Deer



Five color parrot



White Crow



Multi color Snake

4. Rare Species

A species is said to be rare, when it is **localized within restricted area** (or) they are thinly scattered over a more extensive area.

Such species are not endangered or vulnerable.



Bengal Tiger



White Peacock

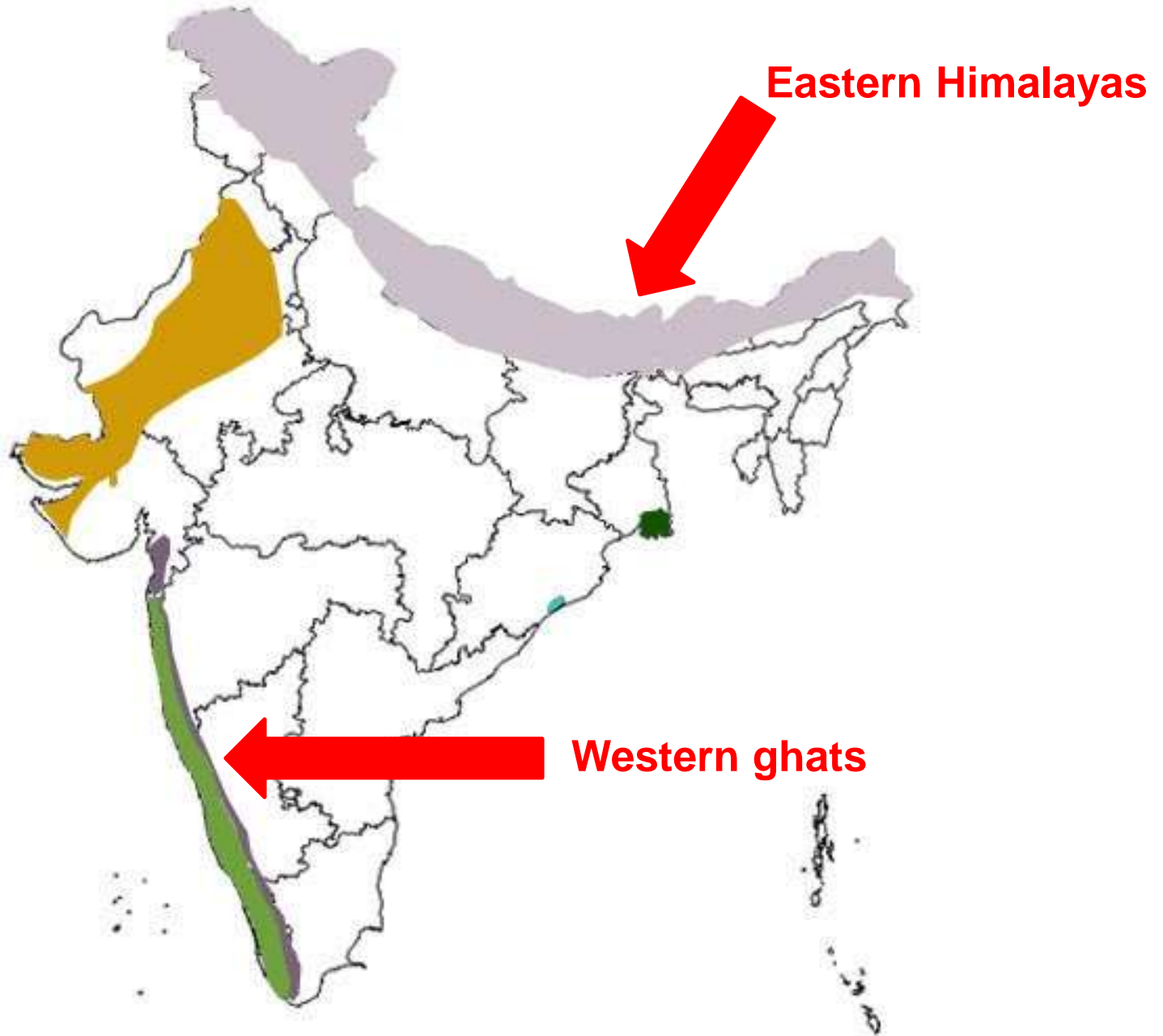
Hot Spot of Biodiversity

Hot spots are the geographic areas which possess high endemic species.

Criteria for recognizing hot spots

1. The richness of the endemic species is the primary criterion for recognizing hot spots.
2. The hot spots should have a significant percentage of specialized species.
3. The site is under threat.
4. It should contain important gene pools of plants of potentially useful plants.

Hot spots of biodiversity in India



Eastern Himalayas

- Geographically these area comprises **Nepal, Bhutan and neighboring states of Northern India.**
- There are **35,000** plant species found in the Himalayas, of which **30% are endemic.**
 - (a) **63% mammals are from Eastern Himalayas, and**
 - (b) **60% of the Indian Birds are from North East.**

Western ghats

- ❖ The area comprises **Maharashtra, Karnataka, Tamilnadu and Kerela.**
- ❖ Nearly 1500 endemic, dicotyledone plant species are found from Western ghats. **62% amphibians and 50% lizards** are endemic in western Ghats.

That's All



Timber

UNIT - II

NATURAL RESOURCES



5.1

TYPES OF NATURAL RESOURCES

➤ Natural resources are the sources which are useful to man or can be transformed into a useful product. Natural resources are classified into two types.

1. Renewable resources.
2. Non-renewable resources.

5.1.1 Renewable resources

■ *Resources that are capable of being regenerated by ecological processes within a reasonable time period are called renewable resources.* They have the potential to renew themselves.



Exempl → *Soil, water, air, wildlife, natural vegetation.*

eS ■ The renewable resources are further sub classified into two types.

1. Continuous resources

- These resources are continuously renewed.

Exempl → *Solar energy, wind, tidal energy.*

2. Extrinsic resources

- These resources are prone to breakdown or degradation, yet are available continuously if well managed.

Exempl → *Human skills, institutions, management abilities.*

eS





5.1.2 Non-renewable resources

■ *Resources that are not capable of being regenerated by ecological processes are called non-renewable resources.*

Exampl → *Minerals, coal, oil, natural gas, ground water.*



5.2 FOREST RESOURCES

➤ Forests are one of the most important renewable natural resources on this earth. About one-third of the world's land surface is covered with forest.

- 
- 
- Forests are an important components of our environment and economy. Besides economy, forests provide fuel wood, coal, furniture, checks air pollution, soil erosion, saves the hill-slopes from landslides.

5.2.1 Type of forests

- According to the type of vegetation, forests are classified into three major types.

1. Evergreen forests.
 2. Deciduous forests.
 3. Coniferous forests.
- 
- 

1. Evergreen forests



➤ Evergreen forests are generally found in the equatorial regions, where the temperature and rainfall is very high. Due to heavy rainfall throughout the year these forests are evergreen.

Examp ➔ *The silent valley in Kerala.*

Important trees: Teak, mahogany, rosewood.

2. Deciduous forests

- These forests are of two types
 - (a) Tropical deciduous forests.
 - (b) Temperature deciduous forests.



(a) **Tropical deciduous forests:** These forests are generally found in the tropical monsoon. As these forests receive only seasonal rainfall, they shed their leaves during the summer season.

■ ***Important trees:*** Teak, sandalwood, pillaimarudhu.

(b) **Temperature deciduous forests:** Due to severe winter with heavy snowfall the trees shed their leaves just before the winter season.

3. Coniferous forests

■ The snow slides down the sloping sides of the trees. The needle type leaves preserve the moisture.



■ ***Important trees:*** Pine tree, spruce tree.





5.3

FUNCTIONS OF FORESTS

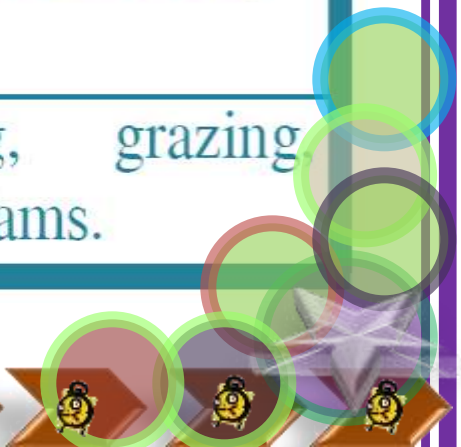



1. Forests perform very important functions both to humans and nature.
 2. They are habitats to millions of plants, animals and wildlife.
 3. They recycle rainwater and remove pollutants from air.
 4. They control water quality and quantity.
 5. They moderate temperature and weather and help to maintain humidity.
 6. They influence soil conditions and prevent soil erosion and perform watershed functions.
 7. They promote tourism and contribute aesthetic beauty.
- 
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5.4

USES (or) BENEFITS OF FORESTS

5.4.1 *Commercial uses*

- Man depends heavily on a larger number of plant and animal products from forests for his daily needs.
- They provide us a large number of commercial goods.





Name of the products	Uses
1. Forests supply wood	used as fuel.
2. Forests supply wood for various industries	used as raw materials as pulp, paper, board, timber etc.,
3. Forests supply minor forest products	give products like gums, resins, dyes, etc.,
4. Many plants	these are utilized in preparing medicines and drugs.
5. Forest produces variety of animal products	gives honey, ivory, hides etc.,
6. Many forest lands are used for	used for mining, grazing recreation and for dams.

5.4.2 Ecological Uses

■ Though a typical tree produces very good commercial goods, it also provides the following environmental services.

1. **Production of oxygen:** During photosynthesis trees produce oxygen which is essential for life on earth.
2. **Reducing global warming:** The main greenhouse gas carbondioxide (CO_2) is absorbed by the trees (forests).

■ Trees (forests) absorb the main green house gas, carbondioxide (CO_2), which is a raw material for photosynthesis. Thus the problem of global warming, caused by green house gas CO_2 , is reduced.

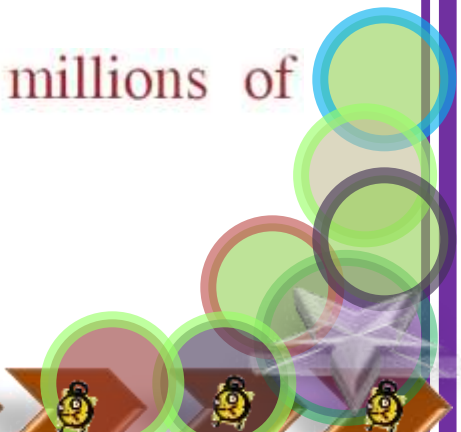



3. Soil conservation: Roots of trees (forests) bind the soil tightly and prevent soil erosion. They also act as wind breaks.

4. Regulation of hydrological cycle: Watersheds in forest act like giant sponges, which absorb rainfall, slow down the runoff and slowly release the water for recharge of springs.

5. Pollution moderators: Forests can absorb many toxic gases and noises and help in preventing air and noise pollution.

6. Wildlife habitat: Forests are the homes of millions of wild animals and plants.



5.4.3 Aesthetic value

➤ Forests also have aesthetic value and serve as gene reserve of important species.

Example

1. Tribals utilize bamboo and wild grass for erecting the huts to reside and for making other products like mats, baskets, cots, etc., used in their daily lives.
2. There are variety of daily plants whose fruits, leaves, seeds, roots are used as food by tribals and poor people who live nearer to the forest range.
3. Many kinds of alcoholic drinks and medicines are derived from forest plants.
4. Aromatic oils and other oils, used for lighting and cooking, are also obtained from forests.

5.4.4 *Touristic Value*

■ Ecotourism provides a growing income for those who have facilitated it. Several countries are now attracting the tourists.

5.5 OVER EXPLOITATION OF FOREST

■ Due to over population the materials supplied by the forest like food, medicine, shelter, wood and fuel are not sufficient to meet the people's demand. Hence exploitation of forest materials is going on increasing day by day.

■ With growing civilization, the demand for raw materials like timber, pulp, minerals, fuel wood, etc., increases resulting in large scale logging, mining, road building and cleaning of forests.

Reason for over exploitation in India

➤ It has been estimated that in India the minimum area of forests required to maintain good ecological balance is about 33% of total area. But, at present it is only about 22%. So over exploitation of forest materials occur.

Causes of over exploitation

➤ Over exploitation of forest wealth in developing countries occurs in the following ways.

- (a) Increasing agricultural production.
- (b) Increasing industrial activities.
- (c) Increase in demand of wood resources.

Effects (or) Consequences of Over exploitation

1. Over-exploitation of the forest resources led to migration of the farmers.
2. Environmental damage caused by over-exploitation is heavy.
3. The tropical forests are destroyed at very fast rate.
4. Countless plant species and animals are endangered.
5. Marine populations will go into extinction.
6. Dumping of wastes into land, water and air has become a severe problem.

5.6

DEFORESTATION

Definition

■ *Deforestation is the process of removal of (or) elimination of forest resources due to many natural (or) man-made activities. In general deforestation means destruction of forests.*

Deforestation in India

■ Deforestation is a continuous process. In India about 1.3 hectares of forest land has been lost. The percapita availability of forest in India is 0.08 hectares per person, which is much lower than the world average of 0.8 hectares.

■ The presence of wasteland is a sign of deforestation of India.

5.6.1 Causes of Deforestation

1. Developmental Projects

- Development projects cause deforestation in two ways.
 - (i) Through submergence of forest area underwater.
 - (ii) Destruction of forest area.

Example

Bigdams, hydroelectric projects, road construction etc.,

- S**
- Hence, there is a need to discourage the undertaking of any development works in the forest area.

2. Mining operations

● Mining have a serious impact on forest areas. Mining operation reduces the forest area.

Example → *Mica, coal, manganese, limestone, etc.,*

S Raw materials for industries

● Wood is the important raw material for so many purposes.

Example → *For making boxes, furnitures, plywood, match-boxes, pulp, etc.,*

S ● Every year in India, the demand for wood is increased continuously.

4. Fuel requirements

● In India both rural and tribal population depend on the forest for meeting their daily need of fuel wood, which leads to the pressure on forest, ultimately to deforestation.

5. Shifting cultivation

● Replacement of natural forest ecosystem for monospecific tree plantation can lead to disappearance of number of plant and animal species.

Example

S

India is the richest nation with more than 15,000 species of plants, many of which is endangered due to deforestation.

6. Forest fires

● Forest fire is one of the major causes for deforestation. Due to human interruption and rise in ambient temperature, forest fire is happening often nowadays. Thus, due to forest fire thousands of forest area gets destroyed.

5.6.2 Consequences (or) ill effects (or) impact of deforestation on the environment

■ Since many people are dependent on forest resources, deforestation will have the following social, economic and ecological effects.





1. Global warming

➤ Cutting and burning of forest trees increases the CO₂ content in the atmosphere, which in turn changes the global climatic pattern, rising sea levels and depletion of the protective ozone layer.

2. Loss of genetic diversity

➤ Destruction of our forest destroys the greatest storehouse of genetic diversity on earth, which provides new food and medicines for the entire world.





3. Soil erosion

➤ Deforestation also causes soil erosion, landslides, floods, drought. Natural vegetation acts as a natural barrier to reduce the wind velocity, this in turn reduces soil erosion. 6000 million tons of soil get eroded every year in India.

4. Loss of biodiversity

➤ Most of the species are very sensitive to any disturbance and changes. When the plants no longer exist, animals that depend on them for food and habitat become extinct.

5. Loss of food grains

➤ As a result of soil erosion, the countries lose the food grains.



6. Unemployment problems







● The people living around forest areas lose their livelihood.

7. Flood and Landslides

● Frequent floods, landslides in hilly areas and wind speed are heavy.

5.6.3 Preventive measures (or) avoid of deforestation (or) methods of conservation of forests

● Conservation of forest includes planting of new trees and protecting the existing ones. Followings are the methods of conservation of forests.

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2. Use of wood for fuel should be discouraged.
 3. Forest pests can be controlled by spraying pesticides by using aeroplanes.
 4. Forest fire must be controlled by modern techniques.
 5. Over grazing by cattle must be controlled.
 6. Steps should be taken by the government to discourage the migration of people into the islands from mainland.
 7. Education and awareness programmes must be conducted.
 8. Strict implementation of law of Forest Conservation Act.

5.7

CASE STUDIES

5.7.1 Deforestation in the Himalaya region

➤ Deforestation in Himalaya region, involves clearing of natural forests and plantation of monocultures like eucalyptus, camadulensis, etc.,. Due to this, nutrient cycling has become poor and the soil is losing their fertility. Thus the entire west Khasihill, Himalayas, Ladakh, Garhwal are now facing the serious problems of deforestation.



5.7.2 *Disappearing Tea gardens in Chhota Nagpur*

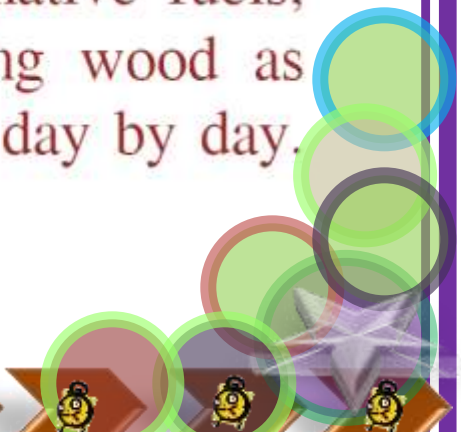

● Deforestation activities in the hilly region of Chhota Nagpur declines the rainfall to such an extent that tea-gardens are disappeared from the region.



5.8

TIMBER EXTRACTION

■ Due to population growth and lack of alternative fuels, people living near by forest area are mostly using wood as fuel. Hence, wood (timber) extraction is increasing day by day.









Uses of timber

1. Timber is used as raw materials for various wood based industries like pulp and paper, composite wood, furniture, etc.,
2. Timber is also used for various developmental activities like railways, boats, road construction etc.,

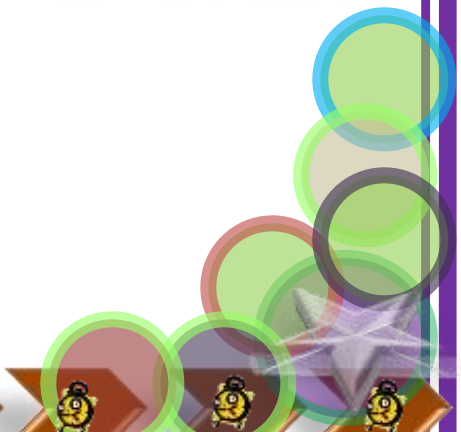
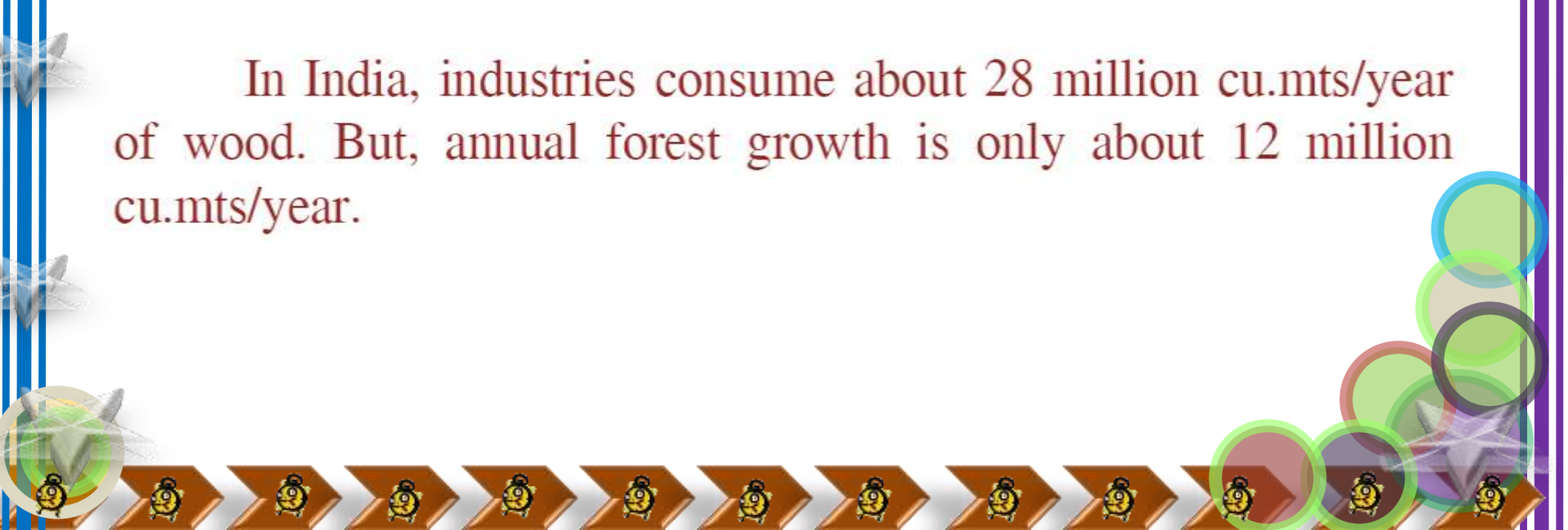
5.8.1 Consequences (or) effects of timber extraction

1. Large scale timber extraction causes deforestation.
 2. Timber extraction leads to soil erosion, loss of fertility, landslides and loss of biodiversity.
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3. Timber extraction also leads to loss of tribal culture and extinction of tribal people.
 4. Timber extraction reduces thickness of forest.

Indian scenario

In India, industries consume about 28 million cu.mts/year of wood. But, annual forest growth is only about 12 million cu.mts/year.



5.9

MINING

➤ Mining is the process of extracting mineral resources and fossil fuels like coal from the earth. These deposits are found in the forest region and any operation of mining will naturally affect the forest. Mining operation requires removal of vegetation along with underlying soil mantle.

5.9.1 *Types of mining*

1. **Surface mining**

● It involves mining of minerals from the shallow deposits.

2. **Underground mining**

● It involves mining of minerals from deep deposits.

5.9.2 Steps involved in mining

- Mining operation involves the following five steps

STEP 1

exploration (investigation and searching of minerals)

STEP 2

development

STEP 3

exploitation (extraction of minerals)

STEP 4

ore processing (separation of ore)




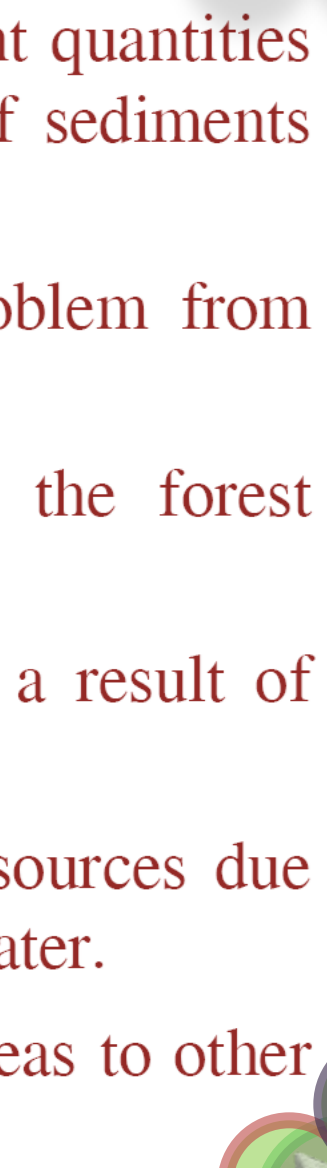
STEP 5

extraction and purification of minerals.

■ The extent of damage by underground mining to the forest resources is significantly less than that of surface mining. Hence, surface mining is adopted for mineral extraction, which needs enormous amount of land area for its operation and management.

5.9.3 *Effects of mining (or) Impacts of mining*

1. Mining activity not only destroys trees, but also pollutes soil, water and air with heavy metal toxins that are almost impossible to remove.
2. Destruction of natural habitat at the mine and waste disposal sites.
3. Due to continuous removal of minerals, forest covers, trenches are formed on the ground, leading to water logged area, which inturn contaminates the ground water.
4. During mining operations, vibrations are developed, which leads to earthquake.

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5. When materials are disturbed in significant quantities during mining process, large quantities of sediments are transported by water erosion.
 6. Noise pollution is the another major problem from mining operations.
 7. Mining reduces the shape and size of the forest areas.
 8. Sometimes landslides may also occur as a result of continuous mining in forest area.
 9. Pollution of surface and ground water resources due to the discharge of waste minerals in water.
 10. Migration of tribal people from mining areas to other areas for searching land and food.



5.10

DAMS AND THEIR EFFECTS ON FORESTS AND TRIBAL PEOPLE

● Dams are the massive artificial structures built across the river to create a reservoir in order to store water for many beneficial purposes. However, these dams are also responsible for the destruction of vast areas of forest and displacement of local people.

Indian Scenario

● India has more than 1600 large dams.




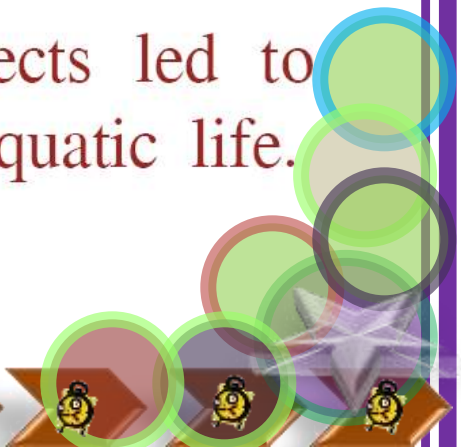
State	Number of dams
Maharashtra	more than 600 dams
Gujarat	more than 250 dams
Madhya Pradesh	more than 130 dams


➤ Tehri dam is the highest built across the river Bhagirathi in the state of Uttaranchal.





5.10.1 *Effects of dam on forest*

1. Thousands of hectares of forest have been cleared for executing river valley projects.
 2. In addition to the dam construction, the forest is also cleared for residential accommodation, office buildings, storing materials, laying roads, etc.,
 3. Hydroelectric projects also have led to widespread loss of forest in recent years.
 4. Construction of dams under these projects led to killing of wild animals and destroying aquatic life.
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5. Hydroelectric projects provide opportunities for the spread of water borne diseases.
 6. The big river valley projects also cause water logging which leads to salinity and inturn reduces the fertility of the land.

Example

1. *Narmada Sagar project:* It has submerged 3.5 lakh hectares of forest comprising teak and bamboo trees.

2. *Tehri dam:* It has submerged 1000 hectares of forest affecting about 430 species of plants.



5.10.2 *Effects of dam on tribal people*

1. The greatest social cost of big dam is the widespread displacement of tribal people, such a biodiversity cannot be tolerated.
2. Displacement and cultural change affects the tribal people both mentally and physically. They do not accommodate the modern food habits and life styles.
3. Tribal people are ill-treated by the modern society.
4. Many of the displaced people were not recognized and resettled or compensated.
5. Tribal people and their culture cannot be questioned and destroyed.
6. Generally, the body conditions of tribal people (lived in forest) will not suit with the new areas and hence they will be affected by many diseases.

5.11

WATER RESOURCES

● Water is an important component of all the living beings. Nearly 80% of earth's surface is covered with water. All organisms are made up of mostly by water.

**Examp
le**

1. *A tree is made up of 60% by weight of water.*
2. *Animals are made up of 50-65% of water.*

Forms of water: Water exists in three phases, solid, liquid and gas. It is circulated in accordance with the hydrological cycle.

5.11.1 Hydrological cycle

■ Hydrological cycle involves the following steps.

1. Evaporation.
2. Condensation and precipitation.
3. Transpiration and respiration.

1. Evaporation

■ Heat energy from the sun constantly causes evaporation from all the water surfaces. Oceans, rivers, streams, lakes, ponds and the surfaces of terrestrial organisms lose water due to evaporation. The energy, from the sun, also drives the weather systems, which move the clouds (water vapour) from one place to another.

2. Condensation and precipitation

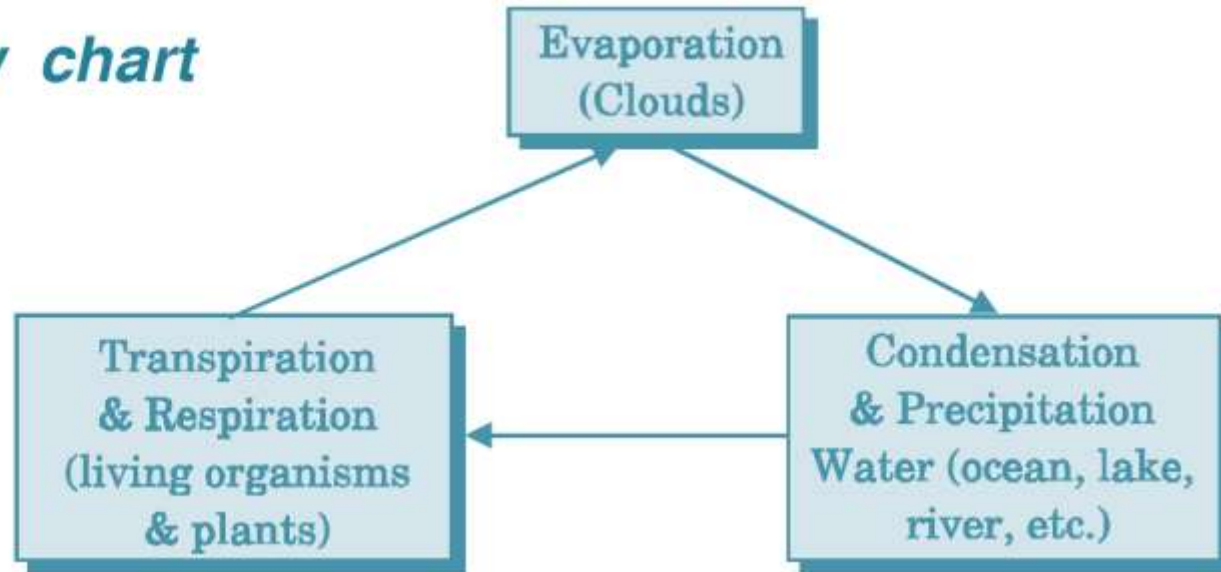
- Precipitation (rain fall) occurs due to the condensation of water from a gaseous state in the atmosphere and falls to earth. Once water condenses, it is pulled into the ground by gravity.
- Gravity continues to operate either pulling the water underground (ground water) or across the surface (surface run-off). In both the cases gravity continues to pull the water lower and lower until it reaches the oceans.

3. Transpiration and respiration

● Organisms play an important role in the water cycle. We know that most of the organisms contain significant amount of water ($\approx 90\%$ of their body weight). Plants use the soil water for photosynthesis and to transport materials within them. Much of the water, they absorb through their roots, is lost to the atmosphere from the leaves. This process is known as **transpiration**. In both animals and plants, the break down of sugars to produce energy (known as **respiration**) with the liberation of by products carbon dioxide and water.

● *Thus, the process of evaporation, condensation and transpiration is called hydrological cycle.*

Flow chart



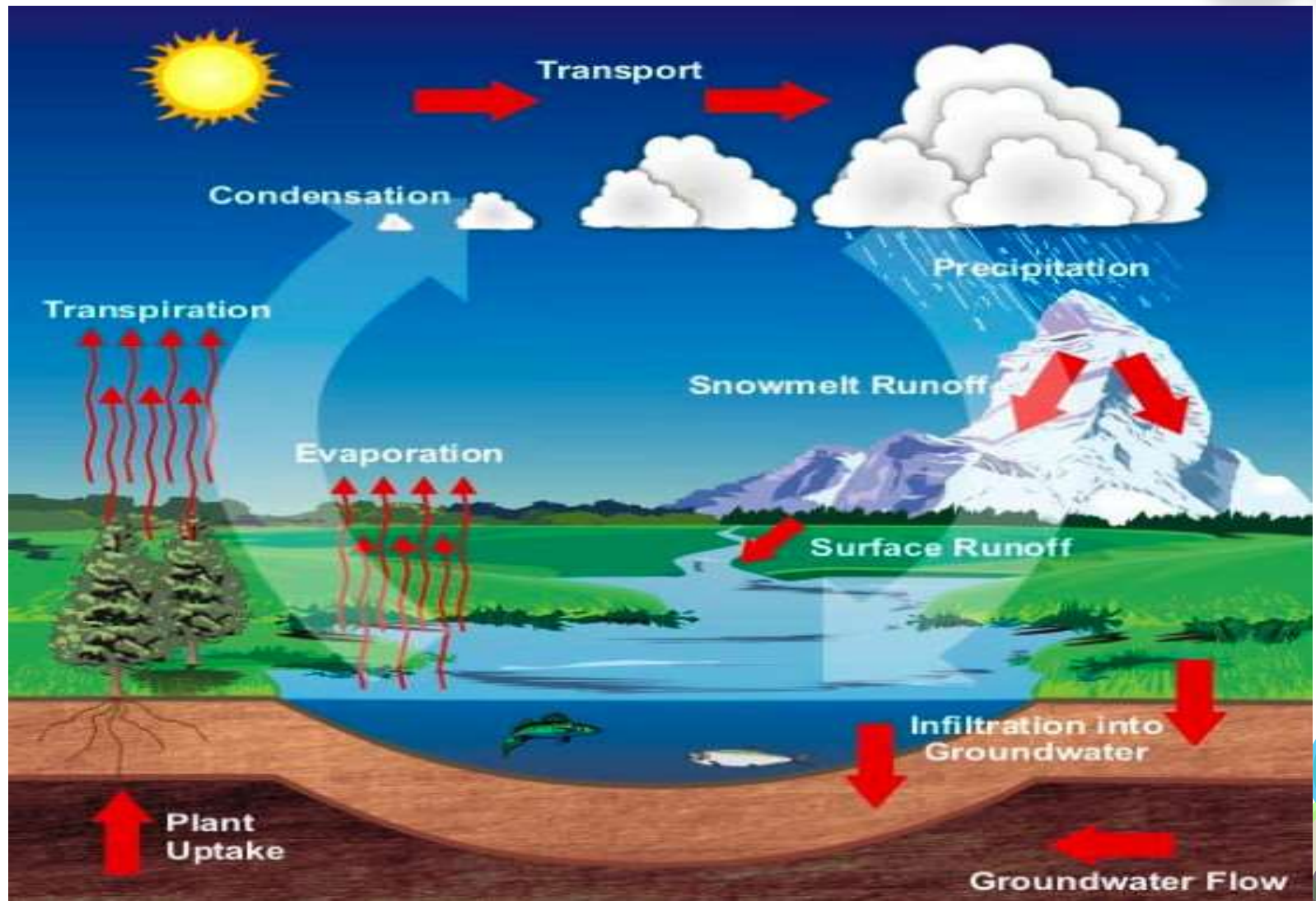




Fig. 5.1 The Water Cycle



5.11.2 *Distribution of water resources*

- About 97.4% by volume of water is found in oceans and is too salty and cannot be used for drinking, irrigation, industrial purposes. Of the remaining 2.6% of fresh water, most of which is locked up in ice or in deep ground water.
 - Thus only about 0.014% of the earth's total volume of water is easily available to us as usable ground water.
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5.11.3 *Types of Fresh Water Resources*

● Fresh water resources may be broadly classified into two types.

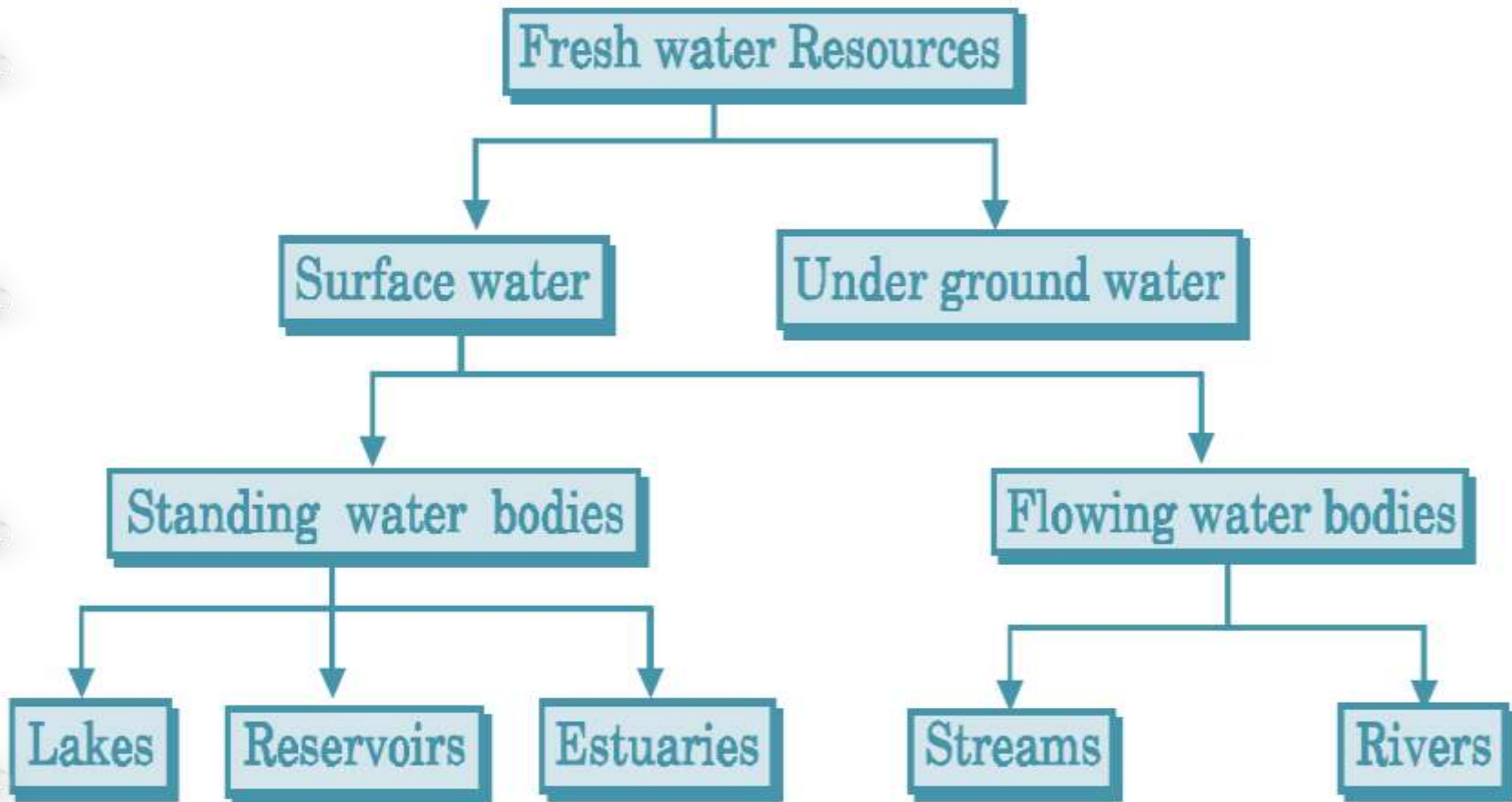
1. Surface water.

(a) Standing water bodies: Lakes, reservoirs, estuaries.

(b) Flowing water bodies: Streams, rivers.

2. Under ground water.

Flow chart



5.11.4 Uses of water-Different Types

- The water is used mainly for two types of uses.

1. Consumptive Use

- Here water is completely utilised and it is not reused.

Example → *In domestic application, industry and irrigation.*

S

2. Non-Consumptive use

- Here water is not completely utilised and it is reused.

Example → *Hydropower plant.*

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3. Other important uses of water

1. Water is mainly used for domestic purposes like drinking, cooking, bathing and washing etc.,
2. Water is also used for commercial purposes like hotels, theatres, educational institutions, offices, etc.,
3. Another important use of water is for irrigation, like agriculture. Almost 60-70% of the fresh water is used for irrigation.
4. 20-30% of the total fresh water is used for so many industrial operations like refineries, iron and steel, paper and pulp industries.
5. Water is very essential for the sustenance of all the living organisms.
6. Water also plays a key role in sculpting the earth's surface, moderating climate and diluting pollutants.

5.12

OVER-UTILIZATION OF WATER (SURFACE AND GROUND WATER)

■ The rapid increase in population and industrial growth have increased the demand for water resources. Due to increase of ground water usage, the annual extraction of ground water is in far excess than the natural recharge.

5.12.1 Effects on over-utilization of water (or) Consequences of overdrawing of ground water

1. Decrease of Ground Water

■ Due to increased usage of ground water, the ground water level decreases.

Reason

- Other reasons for decrease of ground water are
 - (a) The erratic and inadequate rainfall results in reduction in storage of water in reservoirs.
 - (b) The building construction activities are sealing the permeable soil zone, reducing the area for percolation of rain water and increase in surface runoff.

2. Ground subsidence

➤ When the ground water withdrawal is more than its recharge rate, the sediments in the aquifer get compacted, which results in sinking of overlaying land surface. This process is known as ground subsidence.





Problems

1. Structural damage in buildings.
2. Fracture in pipes.
3. Reversing the flow of canals and tidal flooding.

3. Lowering of water table

➤ Over utilization of ground water in arid and semi-arid regions for agriculture disturbs the state of equilibrium of the reservoir (disturb the hydrological cycle) in the region. This causes following problems.

Problems

1. Lowering of water table.
 2. Decreased pressure in the aquifers and changes in the speed and direction of water flow.
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4. Intrusion of salt water

■ In coastal area, over-exploitation of ground water would lead to rapid intrusion of salt water from the sea.

Problem

■ Water cannot be used for drinking and agriculture.

5. Earthquake and landslides

■ Over-utilization of ground water leads to decrease in water level, which cause earthquake, landslides and famine.



6. Drying up of wells

➤ As a result of over utilization of ground water, the level of ground water getting depleted at much faster rates than they can be regenerated. This leads to drying up of dug wells as well as bore wells.

7. Pollution of water



➤ When ground water level near the agricultural land decreases, water, containing the nitrogen as nitrate fertilizer, percolates rapidly into the ground and pollute the ground water.



Problem: Water becomes unsuitable for potable use by infants, when nitrate concentration exceeds 45 mgs / lit.



■ Dams are built across the river in order to store water for irrigation, hydroelectric power generation and flood control. Most of the dams are built to serve for more than one purpose called “multi purpose dams”. These dams are called as the Temples of modern India by the country’s first Prime Minister, Jawaharlal Nehru.

5.13.1 Benefits of constructing dams

1. Dams are built to control flood and store flood water.
 2. Sometimes dams are used for diverting part or all of the water from river into a channel.
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3. Dams are used mainly for drinking and agricultural purposes.
 4. Dams are built for generating electricity.
 5. Dams are used for recreational purposes.
 6. Navigation and fishery can be developed in the dam areas.

5.13.2 Problems of constructing dams

■ Problems of dams can be studied in the following two titles.

1. Upstream problems

- (a) Displacement of tribal people.
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- (b) Loss of non-forest land.
 - (c) Loss of forests, flora and fauna.
 - (d) Landslips, sedimentation and siltation occurs.
 - (e) Stagnation and waterlogging around reservoirs retards plant growth.
 - (f) Breeding of vectors and spread of vector-borne diseases.
 - (g) Reservoir induced seismicity (RIS) causes earthquakes.
 - (e) Navigation and aquaculture activities can be developed in the dam area.
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2. Down stream problems

- (a) Water logging and salinity due to over irrigation.
- (b) Reduced water flow and silt deposition in rivers.
- (c) Salt water intrusion at river mouth.
- (d) Since the sediments carrying nutrients get deposited in the reservoir, the fertility of the land along the river gets reduced.
- (e) Sometimes, due to structural defects the dam may collapse suddenly and destroy many living organisms.
- (f) Salt water intrusion at river mouth.

Environmental Science & Engineering



Why???????

- **To know about environment**
- **To get an awareness**
- **To get motivation**
- **To get an inspiration**
- **To get good social status**
- **To take active participation**
- **To develop skills**



UNIT - III

ENVIRONMENTAL POLLUTION

INTRODUCTION

- Environmental pollution may be defined as, “*the unfavorable alteration of our surroundings*”. It changes the quality of air, water and land which interferes with the health of humans and other life on earth.
- Pollution are of different kinds depending on the nature of pollutant generated from different sources.

Example

Industry, automobiles, thermal power plants, farming, nuclear reactors, generate different types of pollutants causing pollution to air, water bodies and land.

Types of Pollutants

- 1. Biodegradable pollutants - decompose rapidly by natural processes.**
- 2. Non-degradable pollutants - do not decompose or decompose slowly in the environment.**

Classification of Pollution

Different kinds of pollution that affects the environment are,

(i) Air Pollution

(v) Noise Pollution

(ii) Water Pollution

(vi) Thermal Pollution and

(iii) Soil Pollution

(vii) Nuclear hazards.

(iv) Marine Pollution

AIR POLLUTION

- ❖ Air pollution may be defined as, “the presence of one or more contaminants like dust, smoke, mist and odour in the atmosphere which are injurious to human beings, plants and animals.”

CAUSES

- ❖ Rapid industrialization, fast urbanization,
- ❖ rapid growth in population,
- ❖ drastic increase in vehicles on the roads and other activities of human beings have disturbed the balance of natural atmosphere.

CHEMICAL COMPOSITION OF ATMOSPHERIC AIR

Constituents	%
Nitrogen	78
Oxygen	21
Argon (Ar)	< 1
CO ₂	0.037
Water vapour	Remaining
O ₂ , He, NH ₃	Trace amount

INDIAN AMBIENT AIR QUALITY STANDARDS

Category	Area	Concentration in ug/m ³			
		SPM	SO ₂	NO _x	CO
A	Industrial and mixed use	500	120	120	5,000
B	Residential and rural	200	80	80	2,000
C	Sensitive (hill stations, tourist resorts, monuments)	100	30	30	1,000

Sources of Air Pollution

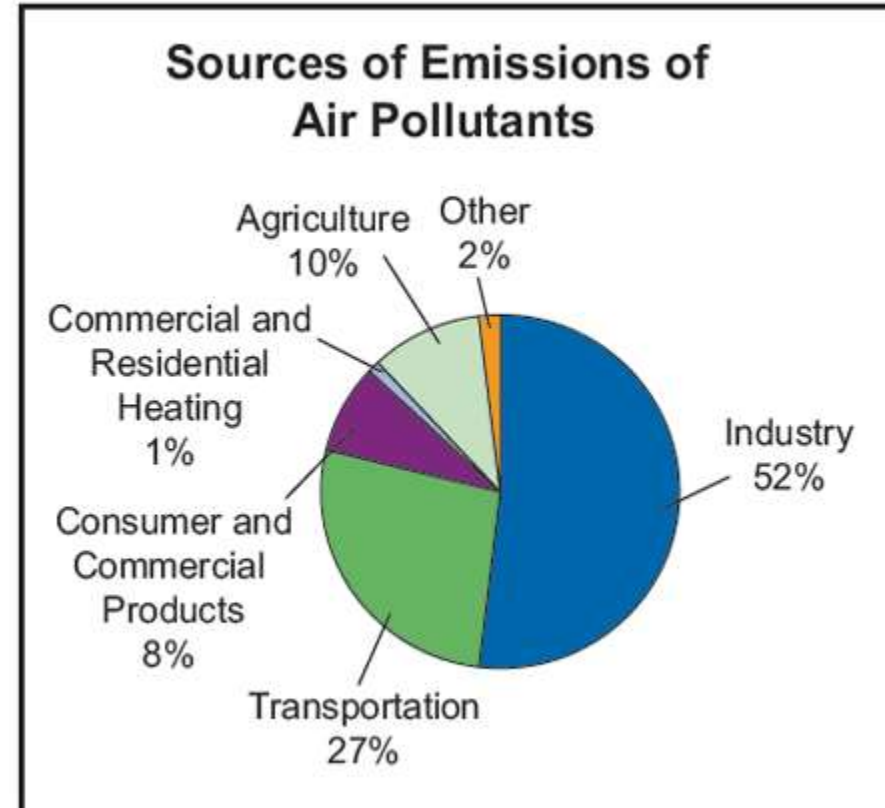
➤ Sources of air pollution are of two types

1. Natural sources

Volcanic eruptions, forest fires, biological decay, pollen grains, marshes, radioactive materials etc.

2. Man-made (anthropogenic) activities

Thermal power plants, vehicular emissions, fossil fuel burning, agricultural activities etc.,



Classification of Air Pollutants

➤ Depending upon the form (origin) of pollutants present in the environment, they are classified as

1. Primary air pollutants

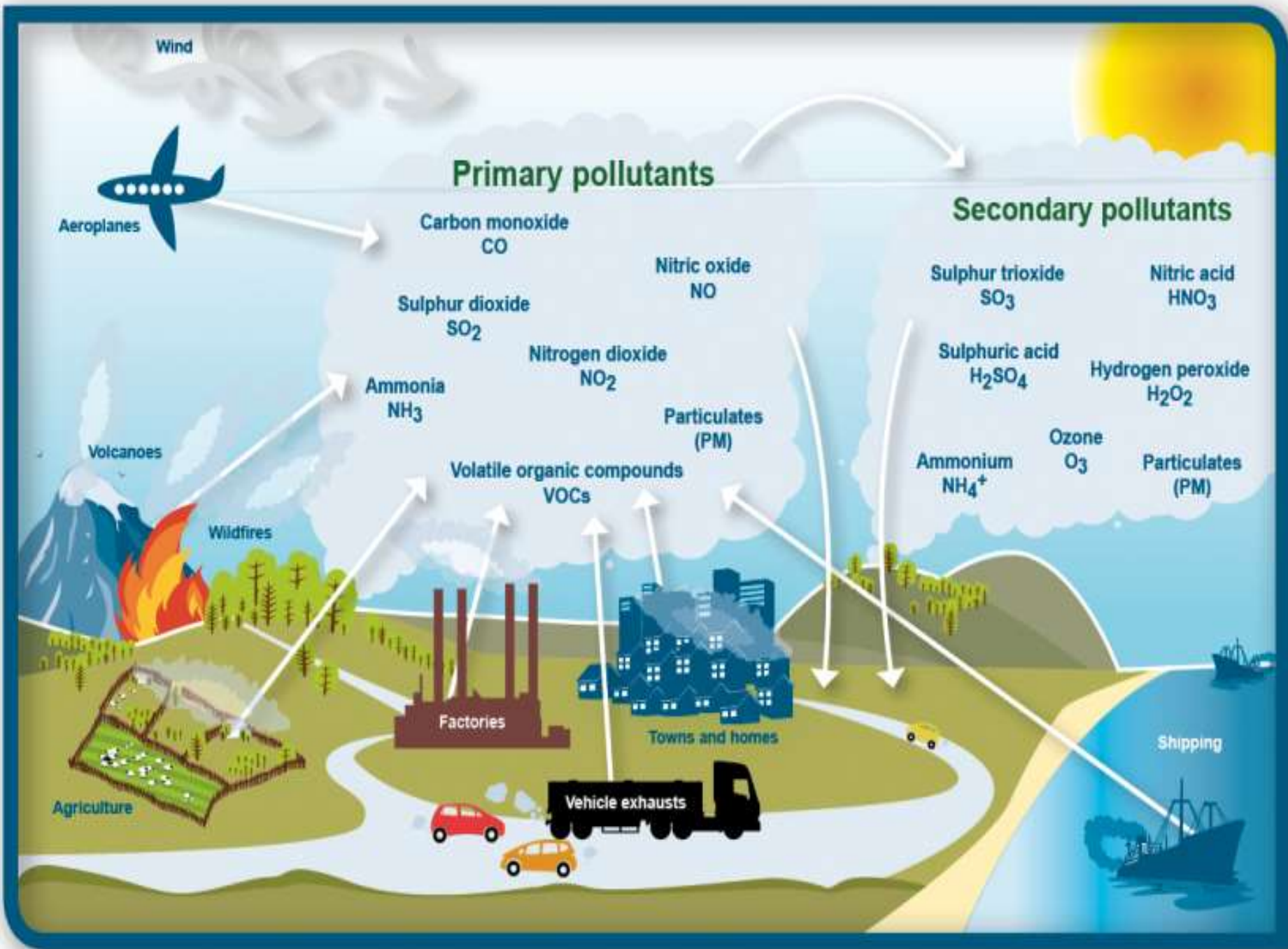
➤ Primary air pollutants are those emitted directly in the atmosphere in harmful form.

Ex. CO, NO, SO₂, etc.,

2. Secondary air pollutants

➤ Some of the primary air pollutants may react with one another or with the basic components of air to form new pollutants. They are called as secondary air pollutants.





Common air pollutants sources and their effects

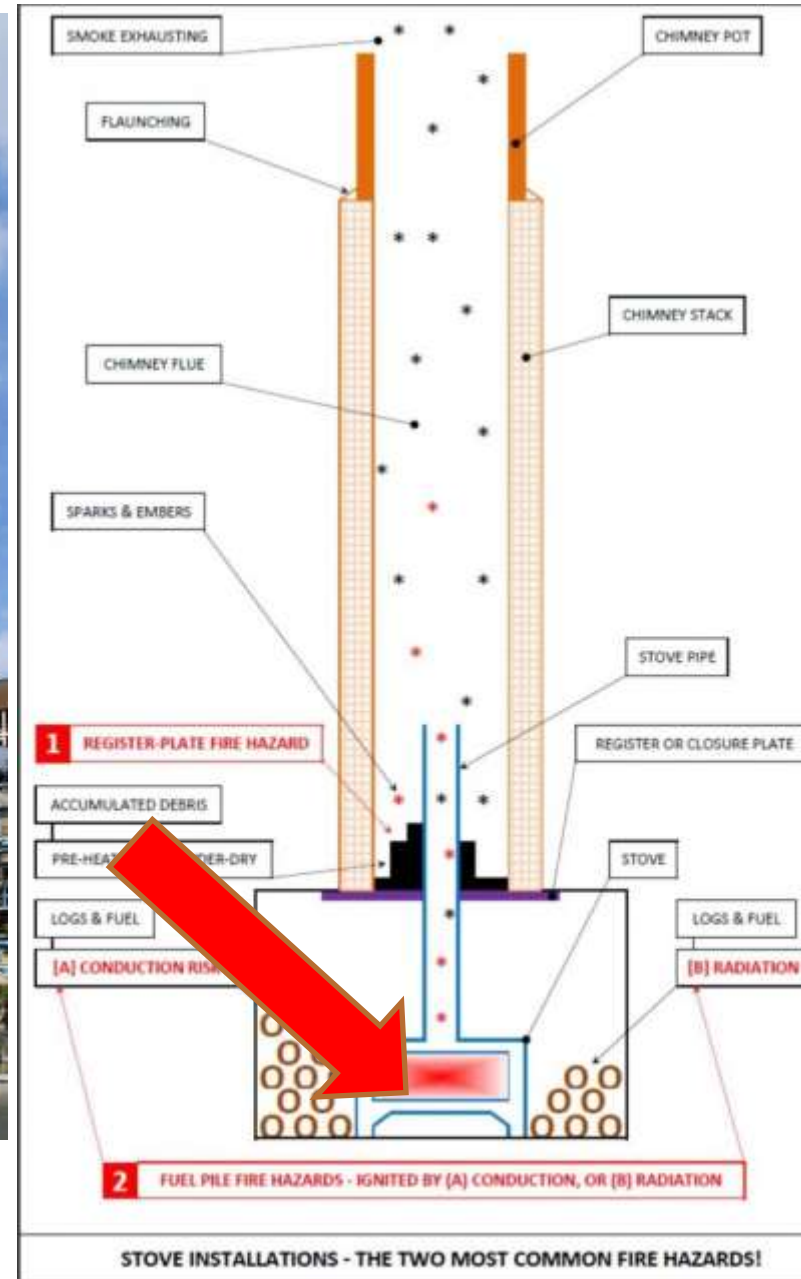
Gases	Formation	Health effect	Environmental effects
CO	$2C + O_2 \longrightarrow 2CO$	headaches and anemia	globe temperature
NO ₂	NO ₂ + Moisture (H ₂ O) \longrightarrow HNO ₃	Lung irritation and damage	Acid rain
SO ₂	SO ₂ + Moisture (H ₂ O) \longrightarrow H ₂ SO ₄	Breathing problems	Acid rain
SPM	variety of particles and droplets can be suspended in atmosphere	lung damage, bronchitis, asthma, cancer	damage trees, soils and aquatic life
O ₃	Highly reactive irritating gas with an unpleasant odour		Moderates the climate
Hydrocarbons	Hydrocarbons get accumulated due to the decay of vegetable matter	Carcinogenic	they react to form secondary pollutants

I. Source control

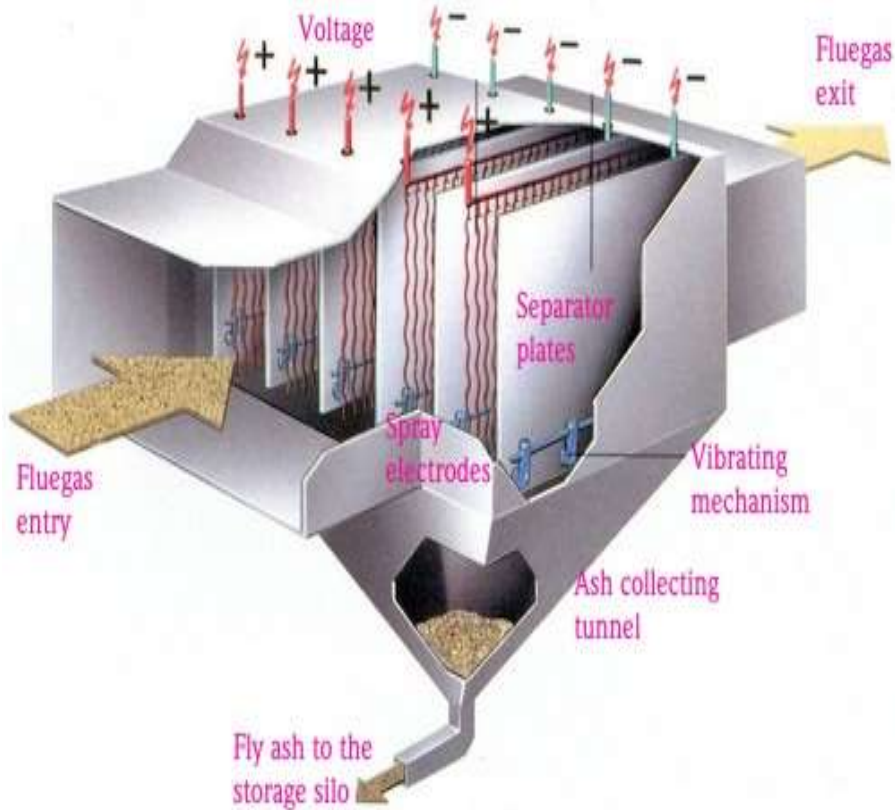
- 1. Use only unleaded petrol.**
- 2. Use petroleum fuels that have low ash content.**
- 3. Reduce the number of private vehicles on the road.**
- 4. Ensure that houses, schools, restaurants and places where children play are not located on busy streets.**
- 5. Plant trees**
- 6. Industries and waste disposal sites should be situated out side of town**
- 7. Use catalytic converters**

II. Control measures in industrial centers

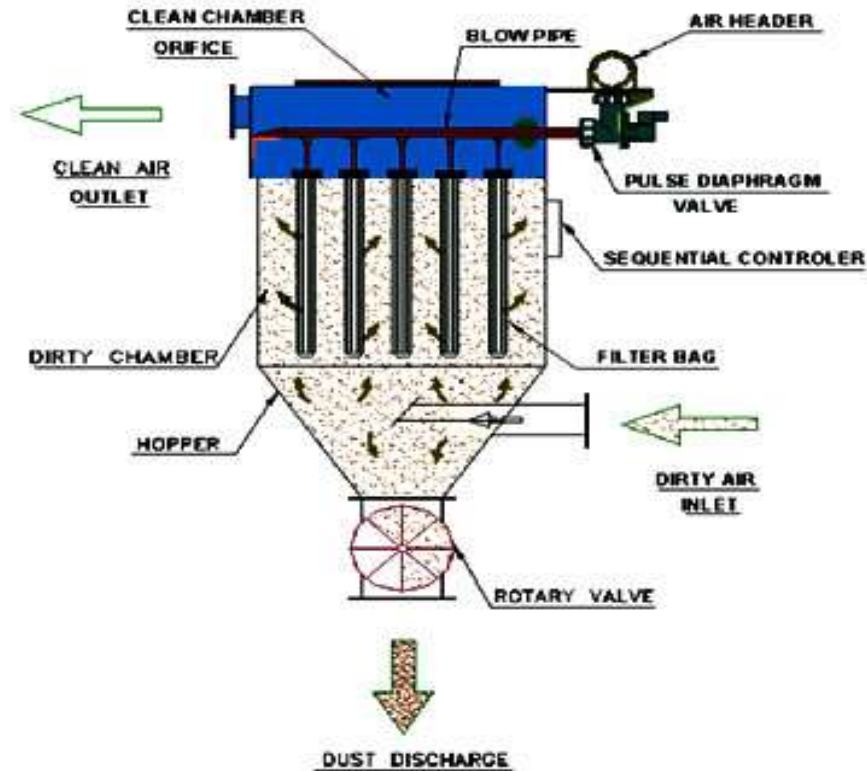
- 1. The emission rates should be restricted to permissible levels.**
- 2. Use of air pollution control equipments.**
- 3. Continuous monitoring of the atmosphere for the pollutants.**



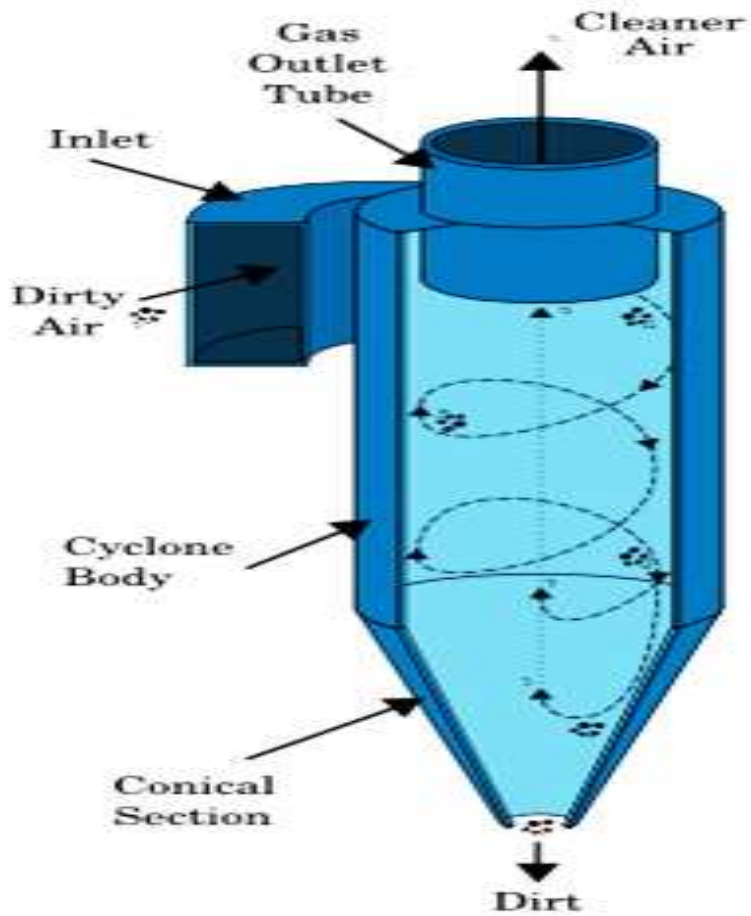
Control Measures of air pollution



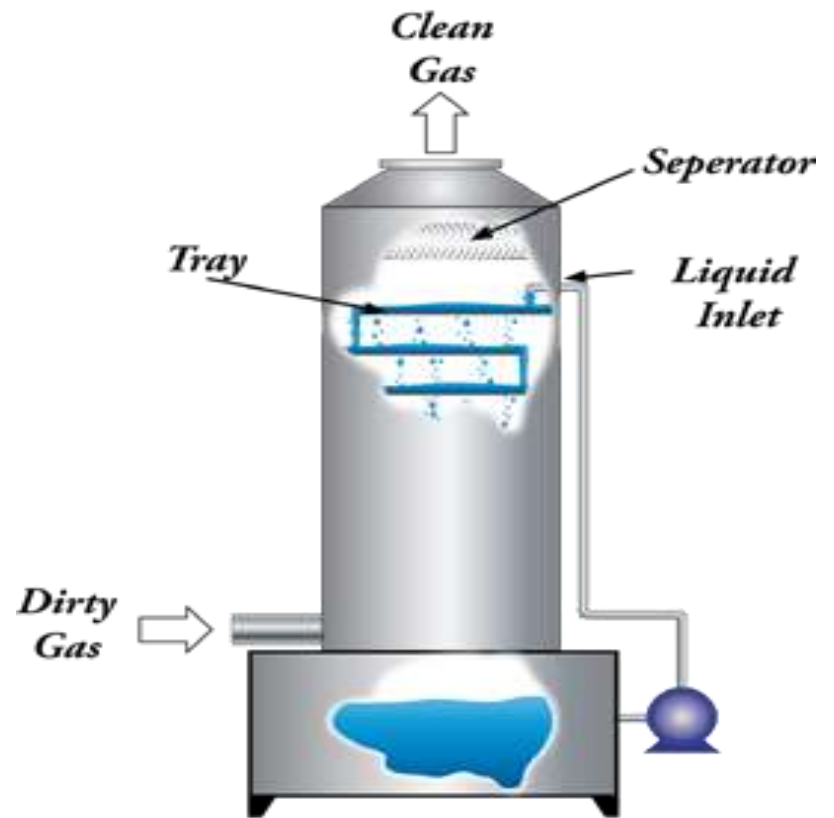
Electrostatic Precipitator



Baghouse Filter



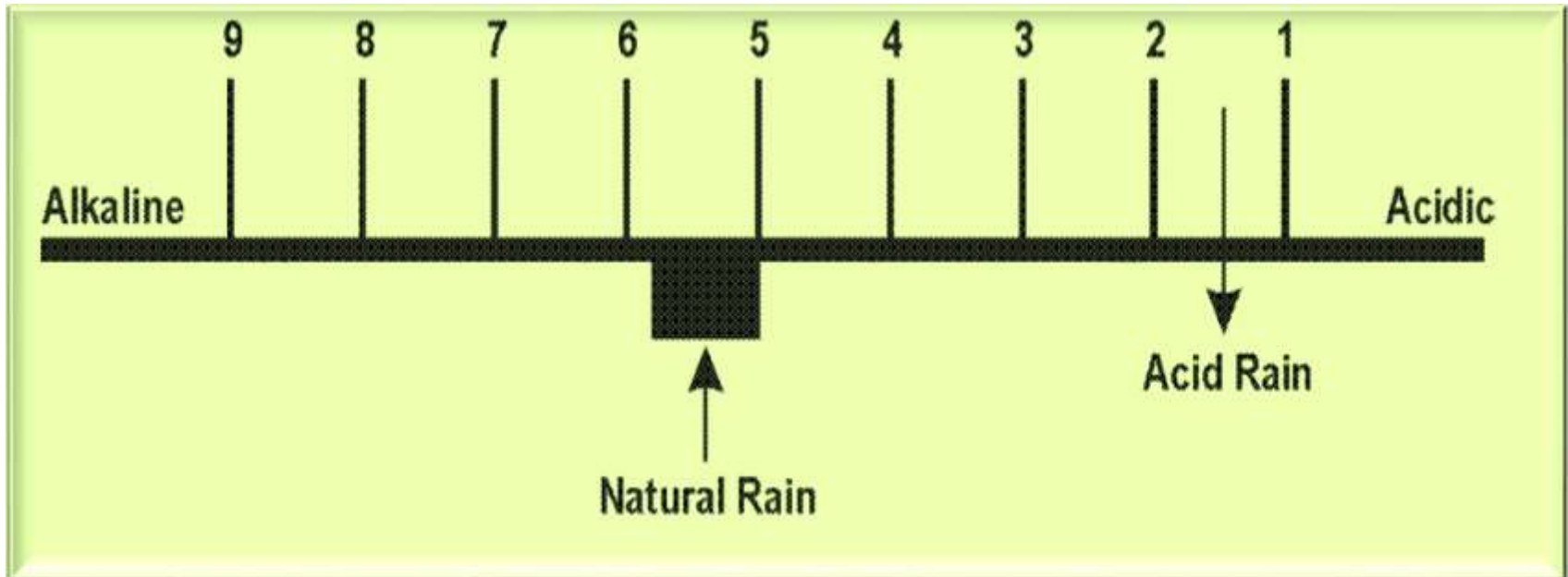
Cyclone Separator



Wet Scrubber

Acid Rain (or) Acid Precipitation

Because of the presence of SO_2 and NO_2 gases as pollutants in the atmosphere, the pH of the rain water is further lowered. This type of precipitation of water is called acid rain (or) acid deposition.



The pH scale

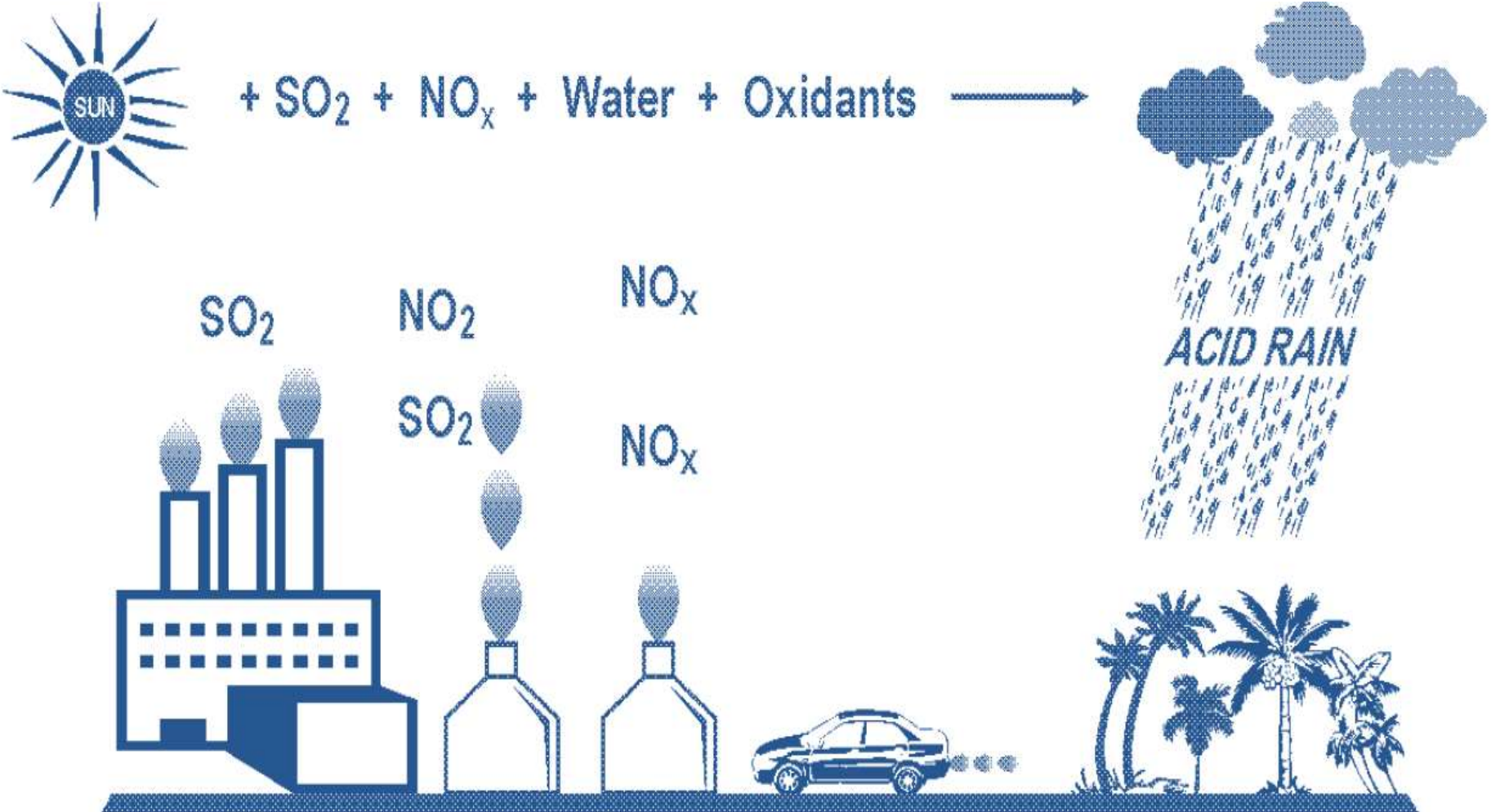
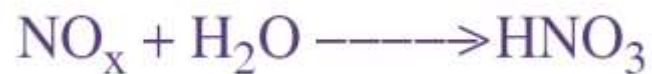
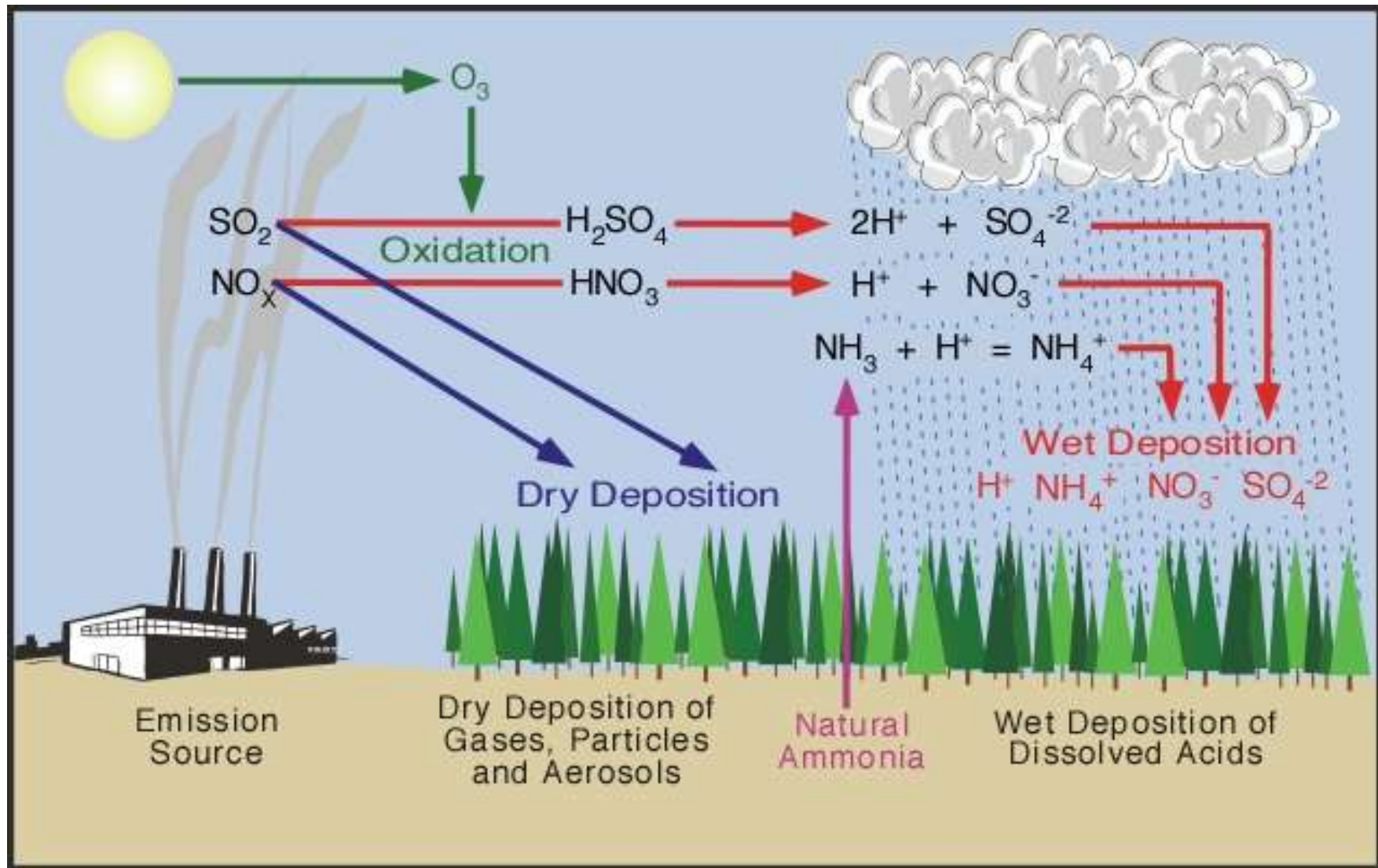


Fig. 4.3 Formation of acid rain





Effects (impacts) of Acid Rain

I. Effects of acid rain on human beings

1. Acidic rain can destroy life
2. It also causes asthma and bronchitis

II. Effects of acid rain on buildings

1. The Taj Mahal in Agra suffering at present due to H_2SO_4 acid.
2. Acid rain corrodes houses, monuments, statues, bridges and fences.
3. Acid rain contribute to the corrosion of metals.
4. leading to increased maintenance costs.

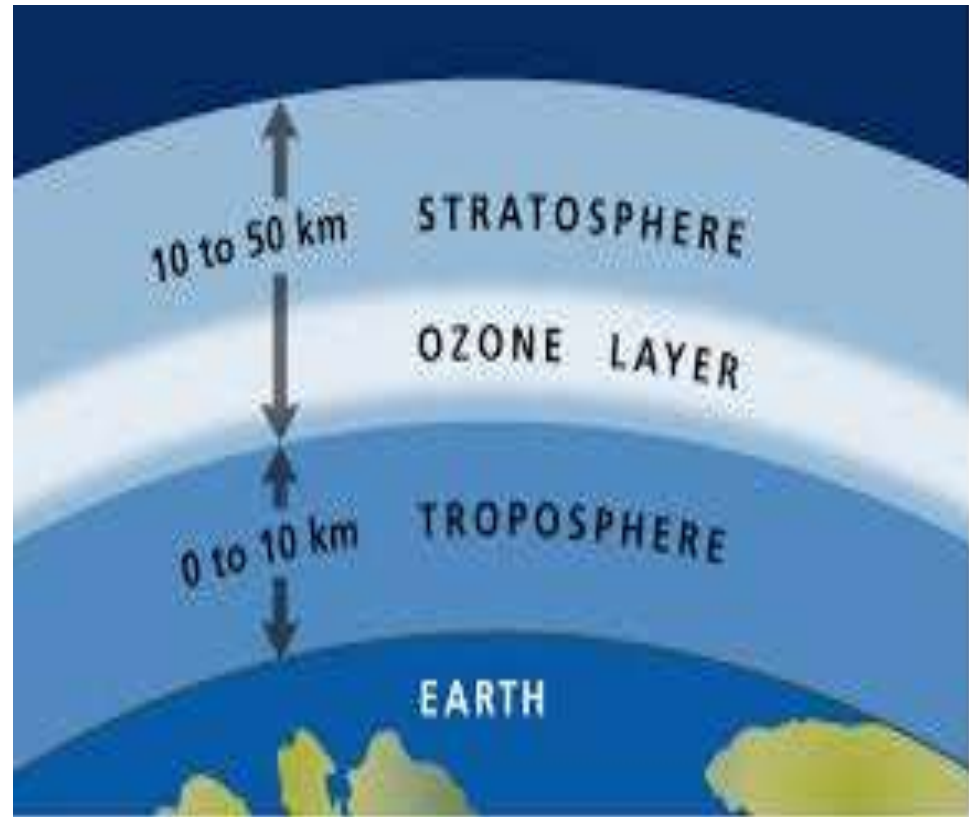
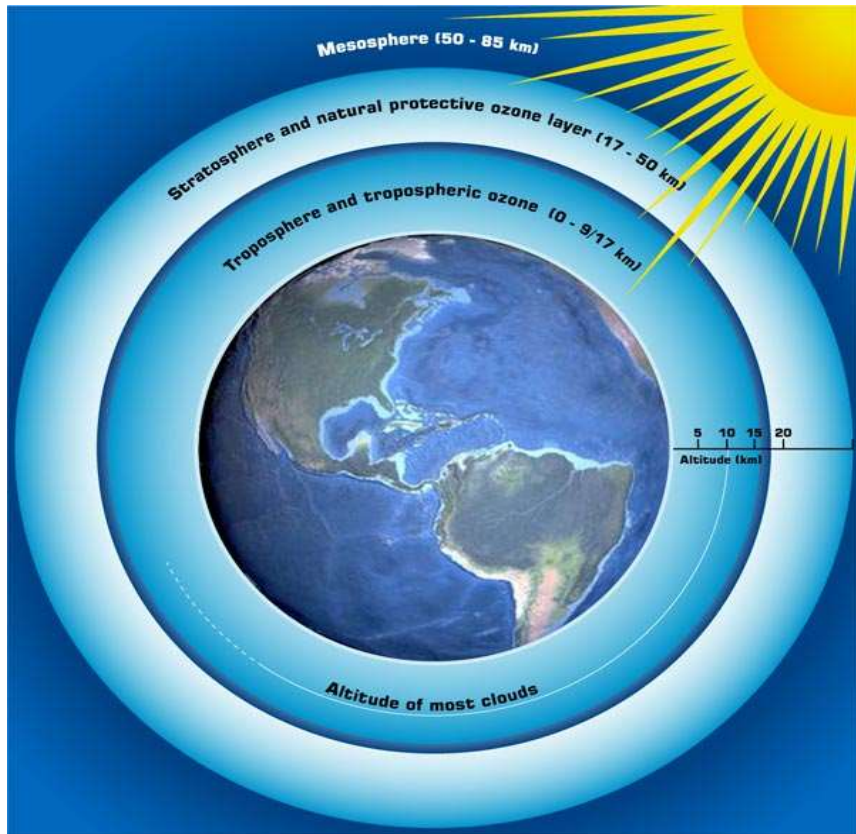


III. Effects of acid rain on terrestrial and lake ecosystem

- ❖ Terrestrial vegetation reduces rate of photosynthesis and growth
- ❖ Acid rain severely retards the growth of crops
- ❖ It causes a significant reduction in fish population
- ❖ The activity of the bacteria and other microscopic animals is reduced in acidic water



Ozone Layer Depletion (Ozone hole)



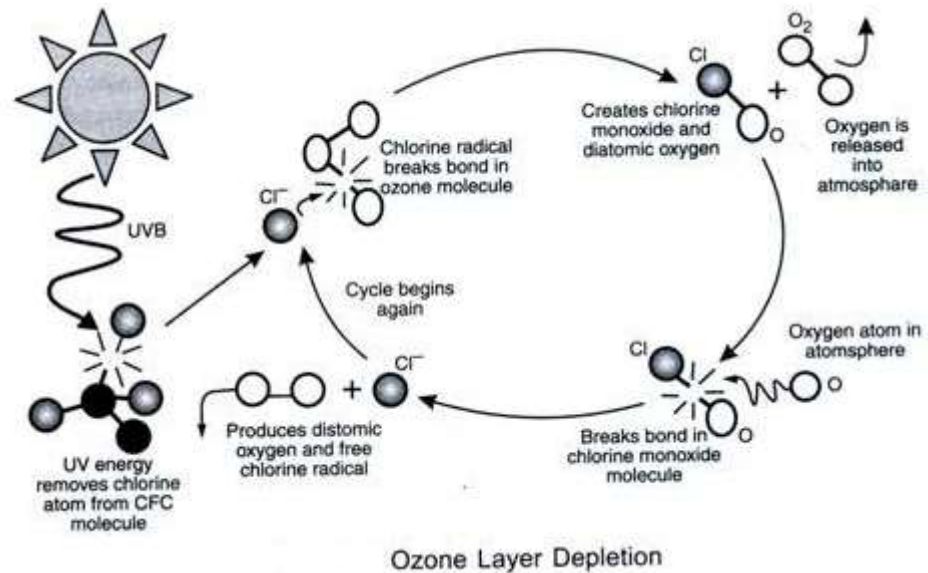
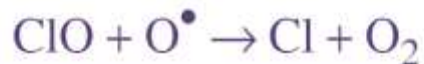
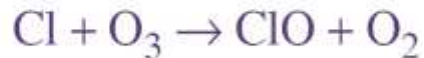
Importance of ozone layer

- It protects us from the damaging ultraviolet radiation of the sun.
- Certain parts of the ozone layer are becoming thinner and ozone 'holes' have developed
- The ozone layer hole is allow that more UV radiation reaches the earth's surface
- UV radiation affects DNA molecules, causing damage to the outer surface of plants and animals

Mechanism of Ozone layer depletion (or) Formation (or) Causes of ozone hole

In 1970, it was found that the ozone layer was attacked by chlorofluoro carbons (CFCs) which are released into atmosphere by refrigeration units, air conditioning systems, aerosol sprays and cleaning solvents. Chlorofluoro carbons release chlorine which breaks ozone into oxygen.

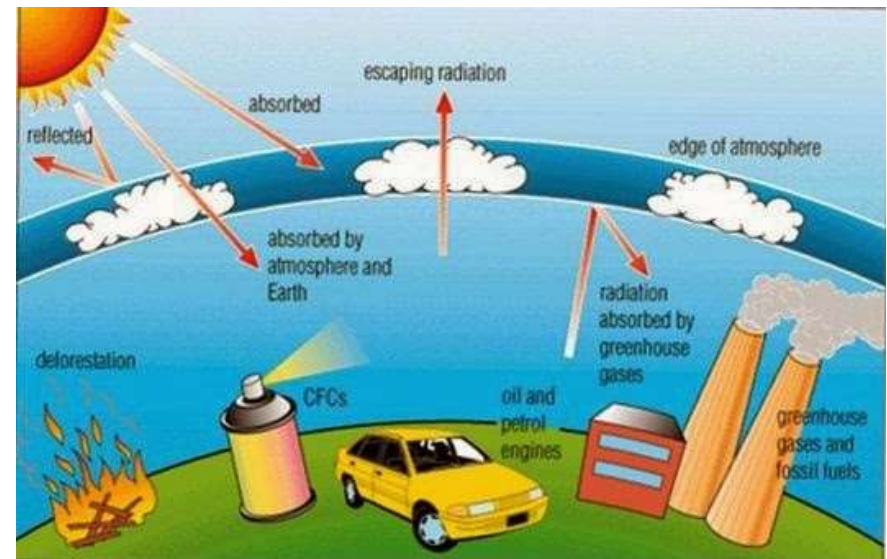
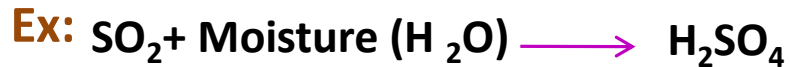
The following reactions will then occur



1% loss of ozone results in a 2% increase in UV rays reaching the earth's surface.

Ozone Depleting Substances

1. Chloro Fluoro Carbon (CFC)
2. Hydro Chloro Fluoro Carbon (HCFC)
3. Bromo Fluoro Carbons (BFC)
4. Other Chemicals



Effect (or) Environmental impact (or) consequences of Ozone Layer Depletion

I. Effect on human health

- ❖ Skin cancer
- ❖ Melanine skin cancer
- ❖ Cataract
- ❖ Can suppress the immune responses

ii. Effect on aquatic system

- ❖ Affect Phytoplankton
- ❖ Affect the aquatic forms such as fish, larval crabs

III. Effect on Materials - Degradation of paints, plastics and other polymeric material will result in economic loss

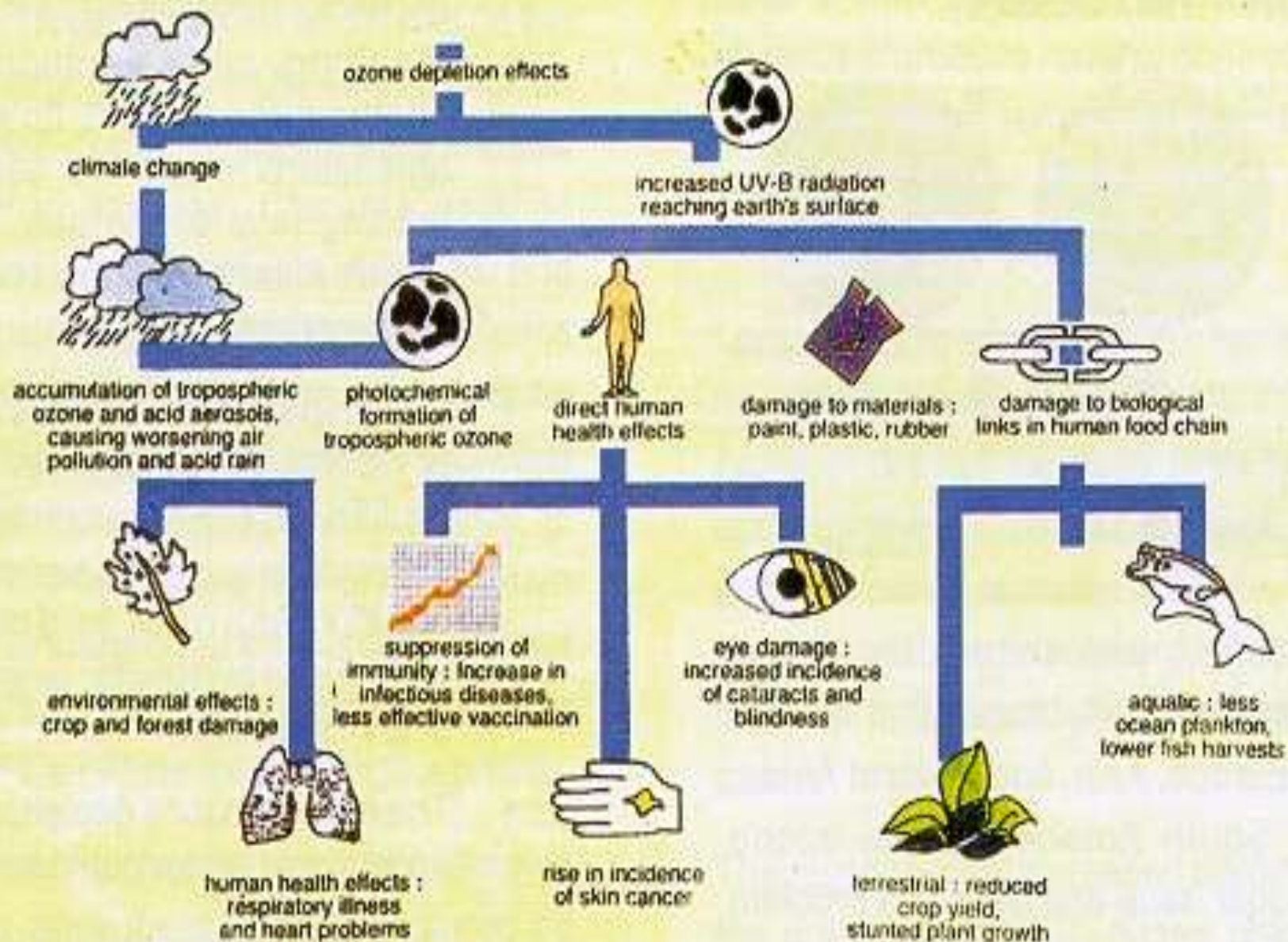
IV. Effect on Climate – Global warming

Measurement of Ozone (Dobson Unit)

The amount of atmospheric ozone is measured by 'Dobson spectrometer' and is expressed in Dobson units (DU)

- ❖ In temperate latitude its concentration is 350 DU.
- ❖ In tropics its concentration is 250 DU.
- ❖ In subpolar region its concentration is 450 DU.

ENVIRONMENTAL EFFECTS OF OZONE DEPLETION



WATER POLLUTION

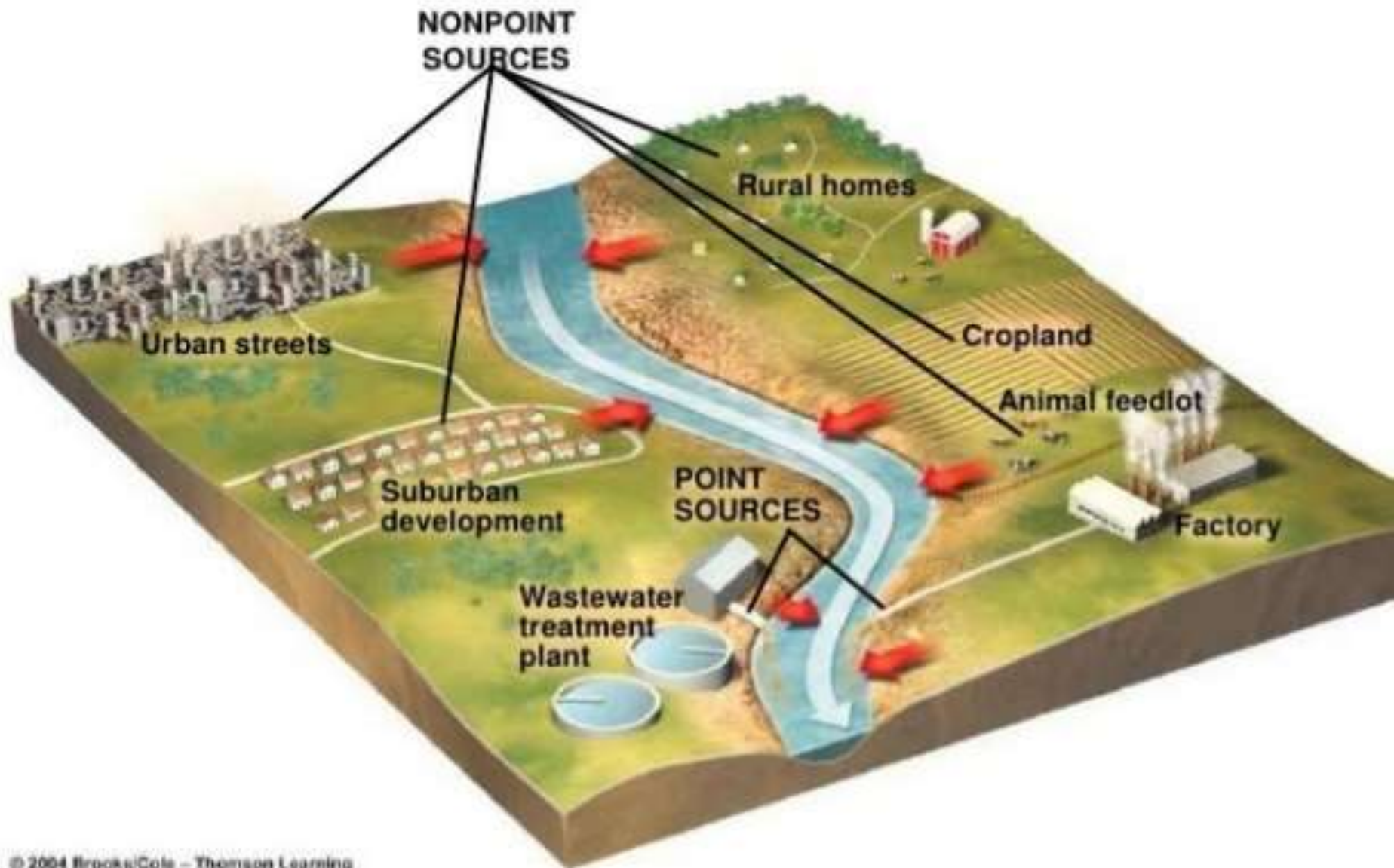
Water pollution may be defined as, “the alteration in physical, chemical and biological characteristics of water which may cause harmful effects on humans and aquatic life.”

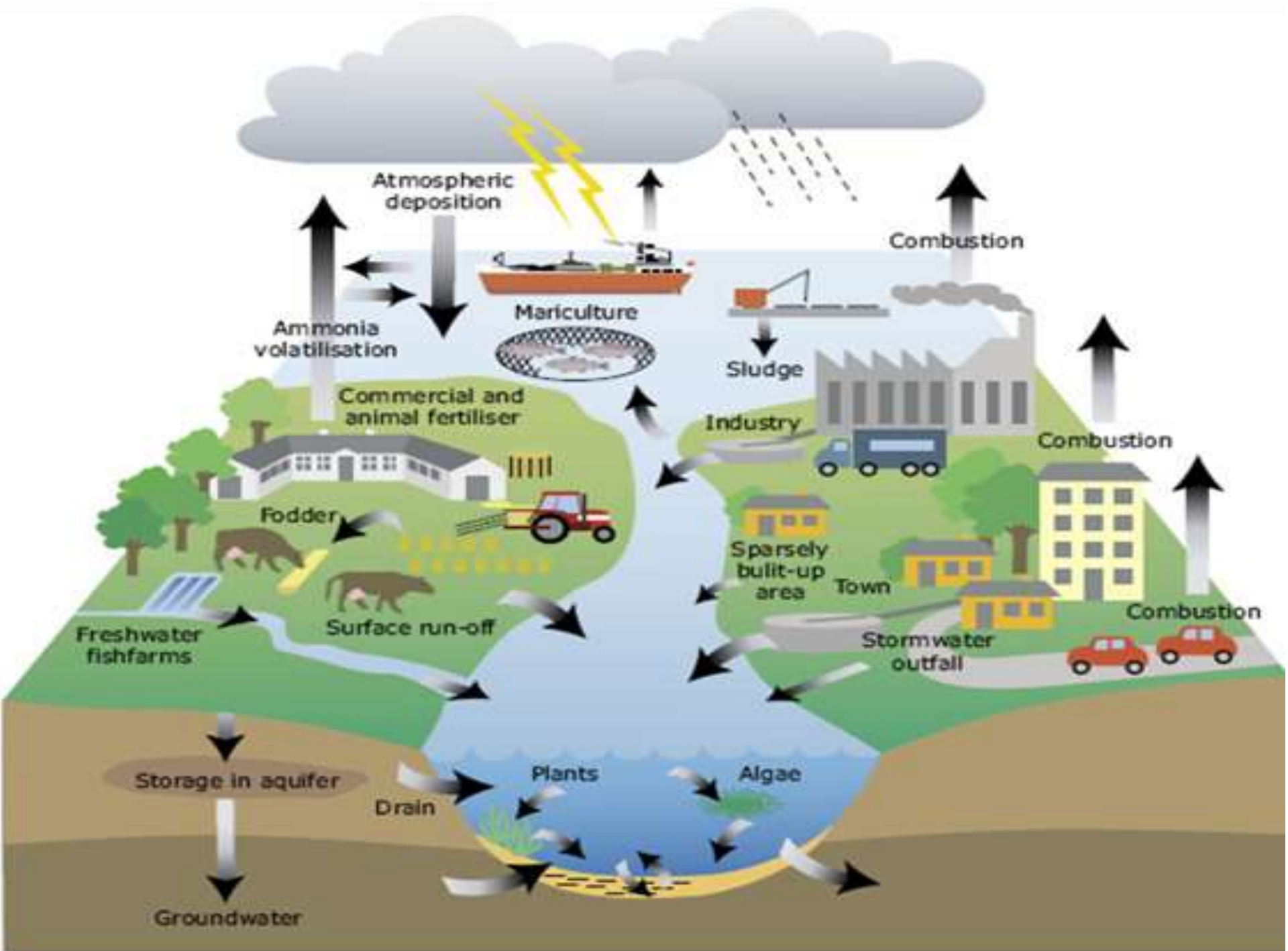
Types, effects and sources (causes) of water pollution

Agents	Examples	Sources	Effects
Infectious Agents	Bacteria, viruses, protozoa	Human and animals wastes	Variety of diseases
Dissolved oxygen	DO varies from 8-15 mg/lit	animal manure, plant debris	fish and other forms of aquatic life to die
Inorganic chemicals	Acids, Pb, As, Se	Surface runoff, industrial effluents	skin cancers, Damage the nervous system, liver and kidneys
Organic Chemicals	Oil, gasoline, plastics, pesticide	Industrial effluents, household cleansers	nervous system damage and some cancers

Agents	Examples	Sources	Effects
Plant Nutrients	<i>NO₃⁻, PO₄³⁻ and NH₄⁺ ions</i>	Sewage, manure, and agricultural fertilizers	growth of algae and other aquatic plants
Sediments	<i>Soil, silt,</i>	Human activities	Disrupt aquatic food webs
Human Sources	Land erosion	Human activities	Disrupt aquatic food webs
Radioactive Materials	<i>Radioactive isotopes of I, Rn, U, Ce, and Th</i>	Nuclear power plants, mining and processing	Genetic mutations, birth defects, and certain cancers
Heat	<i>Excessive heat</i>	Water cooling of electric power plants	Lowers DO levels and affect aquatic organisms
Point Sources	discharged pollutants through pipes, ditches	<i>Includes factories, sewage treatment plants</i>	Pollute water
Non-point Sources	Location of which cannot be easily identified	Rain water run off	Pollute water

Sources of water pollution





Characteristics (or) Testing of waste water

Parameter	Definition	Significance
Dissolved oxygen (DO)	DO is the amount of oxygen dissolved in a given quantity of water at a particular pressure and temperature	<ul style="list-style-type: none">i) DO is important for aquatic lifeii) A minimum level of DO 4 mg/lit
Biochemical Oxygen Demand (BOD)	BOD is the amount of oxygen required for the biological decomposition of organic matter present in the water	<ul style="list-style-type: none">i. It is an important amount of organic matter present in the river waterii. BOD depends on the amount and type of organic matter present in river water
Chemical Oxygen Demand (COD)	COD is the amount of oxygen required for chemical oxidation of organic matter using some oxidising agent like $K_2Cr_2O_7$ and $KMnO_4$	<ul style="list-style-type: none">i. It is carried out to determine the pollutional strength of river water

Control measures (methods) of water pollution

1. The administration of water pollution control should be in the hands of State or Central Government.
2. Scientific techniques are necessary to be adopted for the environmental control of catchment areas of rivers, ponds or streams.
3. The industrial plants should be based on **recycling operations**, because it will not only stop the discharge of industrial wastes into natural water sources but by products can be extracted from the wastes.
4. Plants, **trees and forests** control pollution and they acts as natural air conditioners.
5. The national goal should be “Conservation of Forests” and campaign should be “Plant more trees”
6. Domestic sewage may be used for **irrigation**
7. Public awareness for water pollution control on **radios, TVs etc.,**
8. Suitable **laws, standards** and practices should be framed
9. Basic and applied **research in public health engineering** should be encouraged

SAVE WATER



**THE WORLD
IS IN
YOUR HANDS**

SOIL POLLUTION

Soil pollution is defined as, “the contamination of soil by human and natural activities which may cause harmful effects on living beings.”

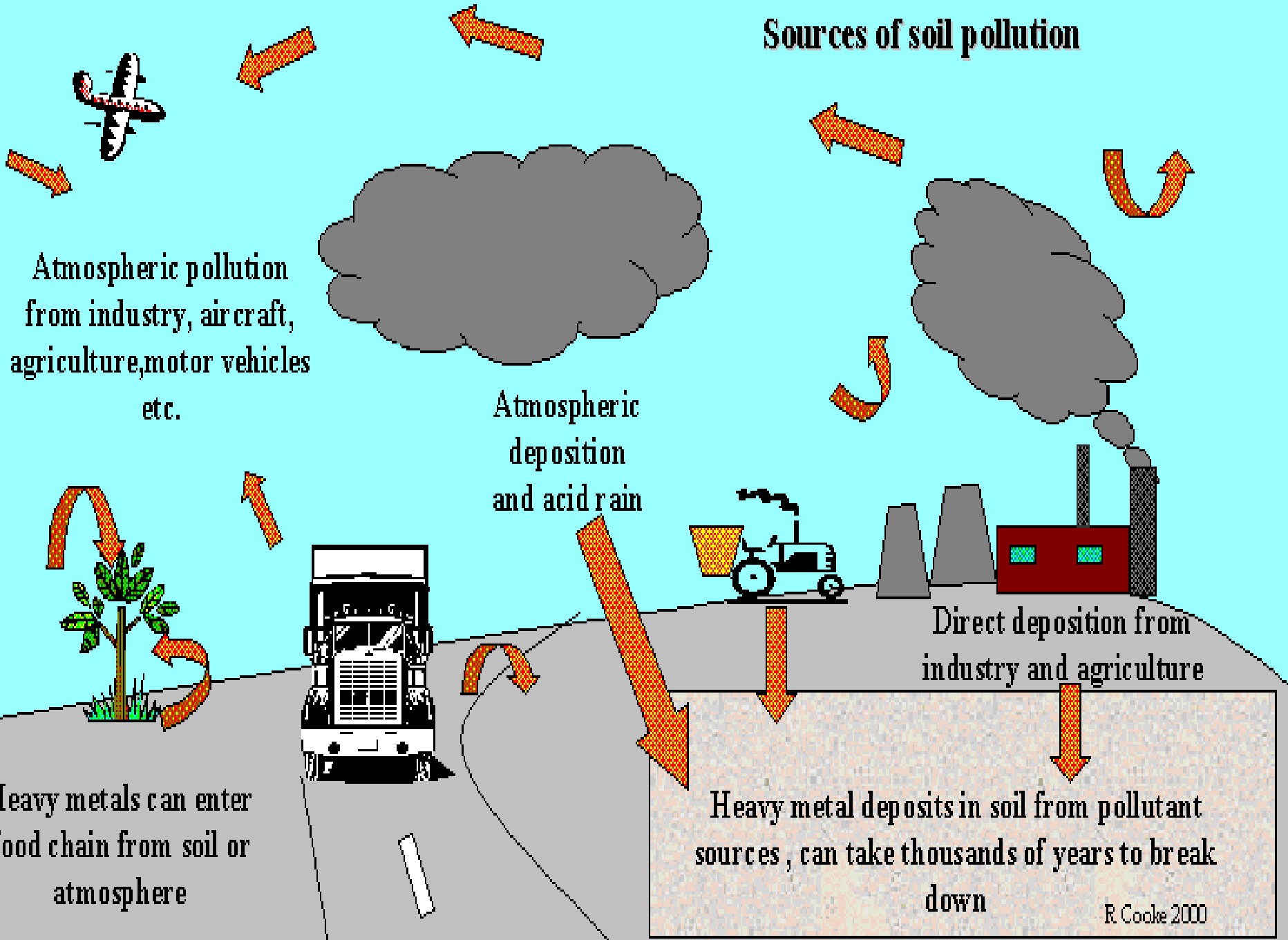
Composition of soil

Components	%
Mineral matter (inorganic)	45
Organic matter	5
Soil water	25
Soil air	25

Types, effects and sources (causes) of soil pollution

Name of the sources	Example for the Source	Effects
Industrial wastes	paper mills, oil refineries, sugar factories, tanneries, textiles, steel, distilleries, fertilizers, pesticides, drugs, glass, cement, petroleum and engineering industries etc.,	❖ Alter the chemical and biological properties of soil ❖ disturb the biochemical process
Urban wastes	Garbage, materials like plastics, glasses, metallic cans, paper, rubbers, street fuel residues, leaves, containers, vehicles	❖ its more dangerous than industrial wastes
Agricultural practices	fertilizers, pesticides, herbicides, weedicides	❖ chemicals can enter into human food chain
Radioactive pollutants	Radio nuclides of Ra, Th, U, isotopes of K-40 and C-14	❖ All these radio nuclides deposited on the soil emit gamma radiations
Biological agents	faulty sanitation, municipal garbage, waste water and wrong methods of agricultural practices	❖ It induced heavy soil pollution

Sources of soil pollution



Atmospheric pollution from industry, aircraft, agriculture, motor vehicles etc.

Atmospheric deposition and acid rain

Direct deposition from industry and agriculture

Heavy metal deposits in soil from pollutant sources, can take thousands of years to break down

Heavy metals can enter food chain from soil or atmosphere

Major physico-chemical characteristics of untreated wastes of Organic chemical industries in Soil

S.No	Industry	Physico-chemical characteristics
1.	Pulp and paper	Suspended solids, high or low pH, colour, fibres, BOD, COD, high temperature, fibres.
2.	Rubber industry	Chlorides, suspended and dissolved solids, variable pH and high BOD.
3.	Oil refineries	Acids, alkalis, phenols, resinous materials and petroleum oils.
4.	Antibiotics	Toxic organics and high acidity or alkalinity.
5.	Synthetic drugs	High suspended and dissolved organic matter including vitamins.
6.	Distillery	Very high COD, low p ^H , high organic matter, high suspended and dissolved solids containing nitrogen, high potassium.
7.	Organic chemical industry	Toxic compounds, phenols, high acidity, alkalinity.

Major physico-chemical characteristics of untreated wastes of Inorganic chemical industries in Soil

S.No	Industry	Physico-chemical characteristics
1.	Thermal Power Plants	Heat, heavy metals, dissolved solids and inorganic compounds.
2.	Steel Mills	Acids, phenols, low p ^H , alkali, limestone, oils, fine suspended solids, iron salts, ores and coke.
3.	Cotton Industry	Sodium, organic matter, colour, high p ^H and fibres.
4.	Metal Plating	Metallics, toxic cyanides, cadmium, chromium, zinc, copper, aluminium and low p ^H .
5.	Iron Foundry	Coal, clay, suspended solids and iron.
6.	Pesticides	Aromatic compounds high organic matter.
7.	Acids	Low p ^H and organic content.
8.	Tanneries	Ca, Cr, high salt content, colour, dissolved and suspended matter.
9.	Explosives	Alcohol, metals, TNT and organic acids.

Control measures of soil pollution

1. Population growth
2. Decrease of the available farm land due to urbanization.
3. Control of soil erosion
4. Proper dumping of unwanted materials
5. Use of natural fertilizers – Ex: *animals dung*
6. Proper Hygienic condition
7. Public Awareness – Ex: Mass media
8. *Ban on toxic chemicals* – Ex: Ban pesticides like DDT, BHC
9. *Reuse and recycling of wastes* – Ex: *plastics*

SOLID WASTE MANAGEMENT (OR) SOIL WASTE MANAGEMENT (OR) WASTE SHED MANAGEMENT

Why should we.....

Rapid population growth and urbanization in developing countries have led to the generations of enormous quantities of solid wastes and consequential environmental degradation.

- ❖ An estimated **7.6 million tonnes** of municipal solid waste is produced per day in developing countries.
- ❖ These wastes are creating considerable nuisance and environmental problems.
- ❖ These are potential risks to health and to the environment from.
- ❖ Hence management of solid waste become very important.

Types and sources of solid wastes

Urban (or) Municipal wastes



Industrial wastes



Hazardous wastes



Urban (or) Municipal wastes

Sources of wastes	Place of wastes	Example of wastes
Domestic wastes	thrown out from the homes	<i>Food waste, cloth, waste paper, glass bottles, polythene bags, waste metals</i>
Commercial wastes	wastes coming out from the shops, markets, hotels, offices, institutions	Waste paper, packing material, cans, bottle, polythene bags
Construction wastes	It includes the wastes of construction materials.	<i>Wood, concrete, debris</i>
Biomedical wastes	waste organic materials	<i>Anatomical wastes, infectious wastes</i>

Characteristics
wastes

Bio-degradable wastes - can be degraded by micro organisms

Non - Biodegradable wastes - cannot be degraded by micro organisms

Source and Characteristics of Industrial Wastes

The main sources of industrial wastes are chemical industries, metal and mineral processing industries.

Examples

- 1. Nuclear power plants:* It generates radioactive wastes.
- 2. Thermal power plants:* It produces fly ash
- 3. Chemical industries:* It produces large quantities of hazardous and toxic materials.
- 4. Other industries:* metals, rubber, plastic, paper, glass, wood, oils, paints, dyes, etc.,

Hazardous wastes

Hazardous wastes are the wastes, that pose a substantial danger immediately or over a period of time to human, plant or animal life

Sources of wastes	Place of wastes	Effects of wastes
Toxic wastes	<i>Acute toxicity</i>	immediate effect on humans or animals causing death
	<i>Chronic toxicity</i>	long-term effect slowly causing irreparable harm to the exposed persons
Reactive wastes	These wastes react vigorously with air, water, heat and generate toxic gases	Produce cancers
Corrosive wastes	Chemical reaction & industries	destroy materials and living tissues
Infectious wastes	<i>Used bandages, human tissue from surgery, hypodermic needles</i>	It causes infection to others
Heavy metals	Industries	Genetic problems



Process of Solid Waste Management (or) Process of preventing solid waste generation in urban areas (or) Waste Shed Management

Solid waste management includes, the waste generation, mode of collection, transportation, segregation of wastes and disposal techniques.

Two important steps of solid waste (waste shed) management

I) Reduce, Reuse and Recycle (3R)

Reduce the usage of raw materials

Reuse of waste materials

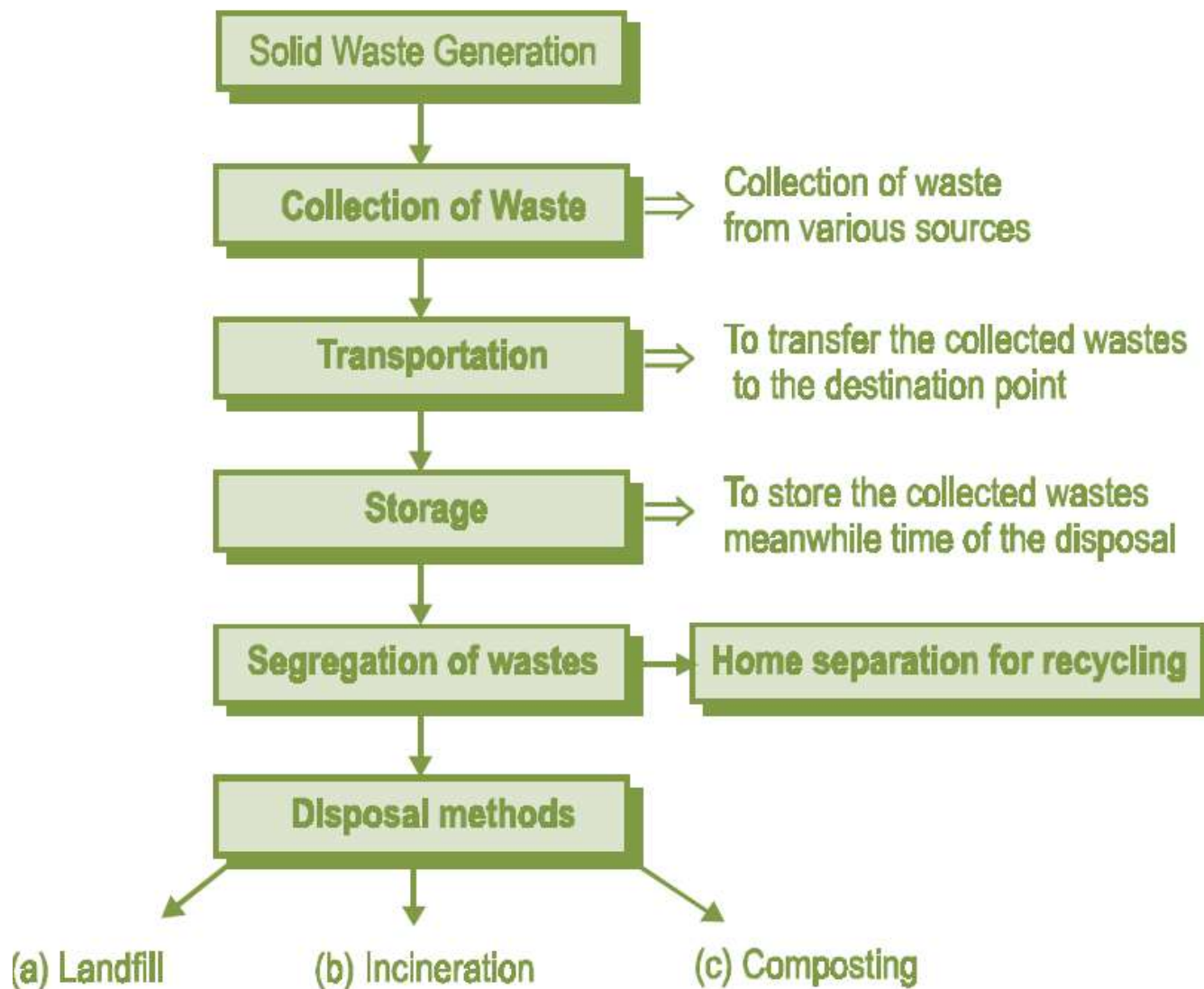
Recycling of materials

II) Discarding wastes

It involving various steps



Various steps involving in Discarding wastes



Various steps involving in Discarding wastes



1. Generations



2. Collection



3. Transportation

6. Disposal



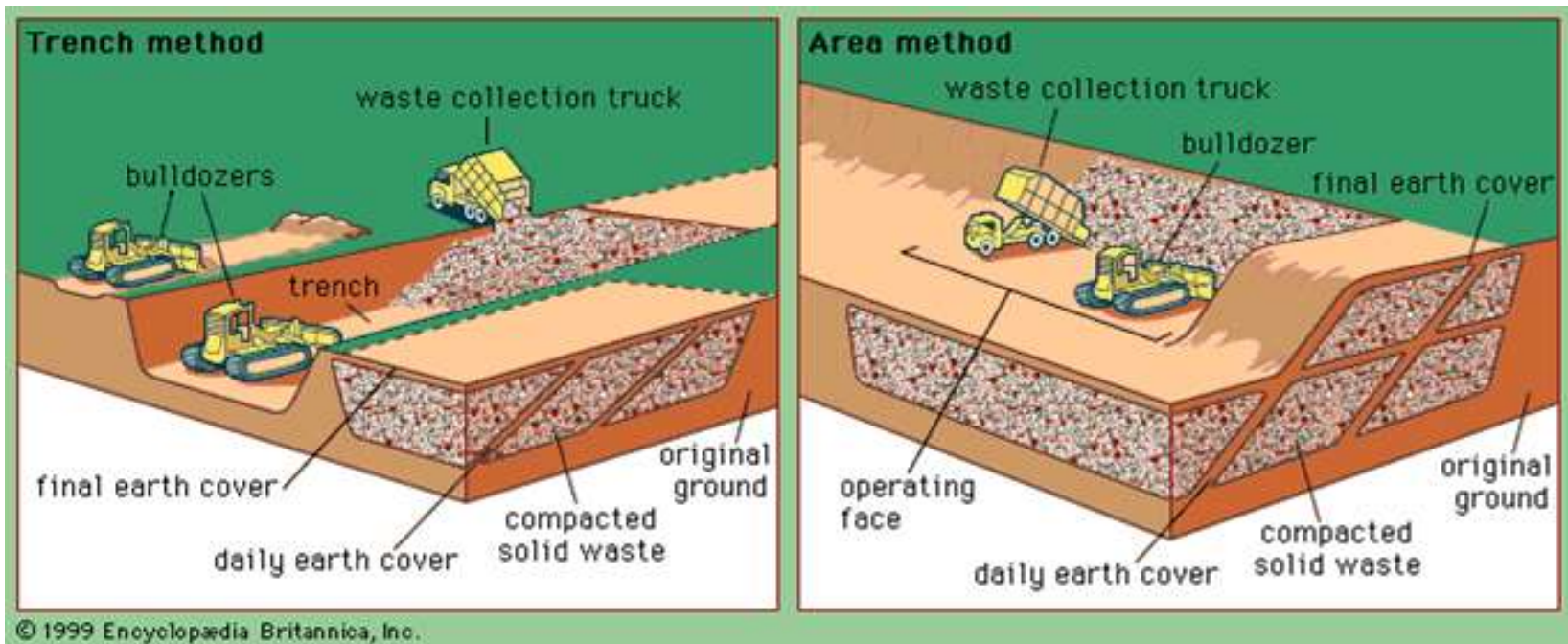
5. Segregation



4. Storage

1. Landfill

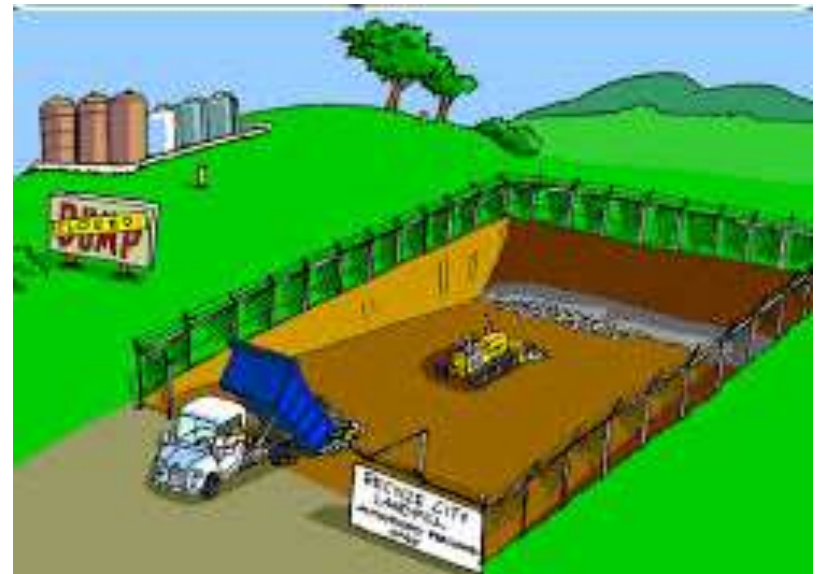
- Solid wastes are placed in sanitary landfill system in alternate layers of **80cm thick** refuse,
- covered with selected **earth fill of 20cm** thickness.
- After two or three years, solid waste volume **shrinks by 25-30%**
- After the land is used for parks , roads and small buildings.





Advantages

1. It is simple and economical
2. Segregation not required
3. Land filled areas can be reclaimed and used for other purposes.
4. Natural resources are returned to soil and recycled.

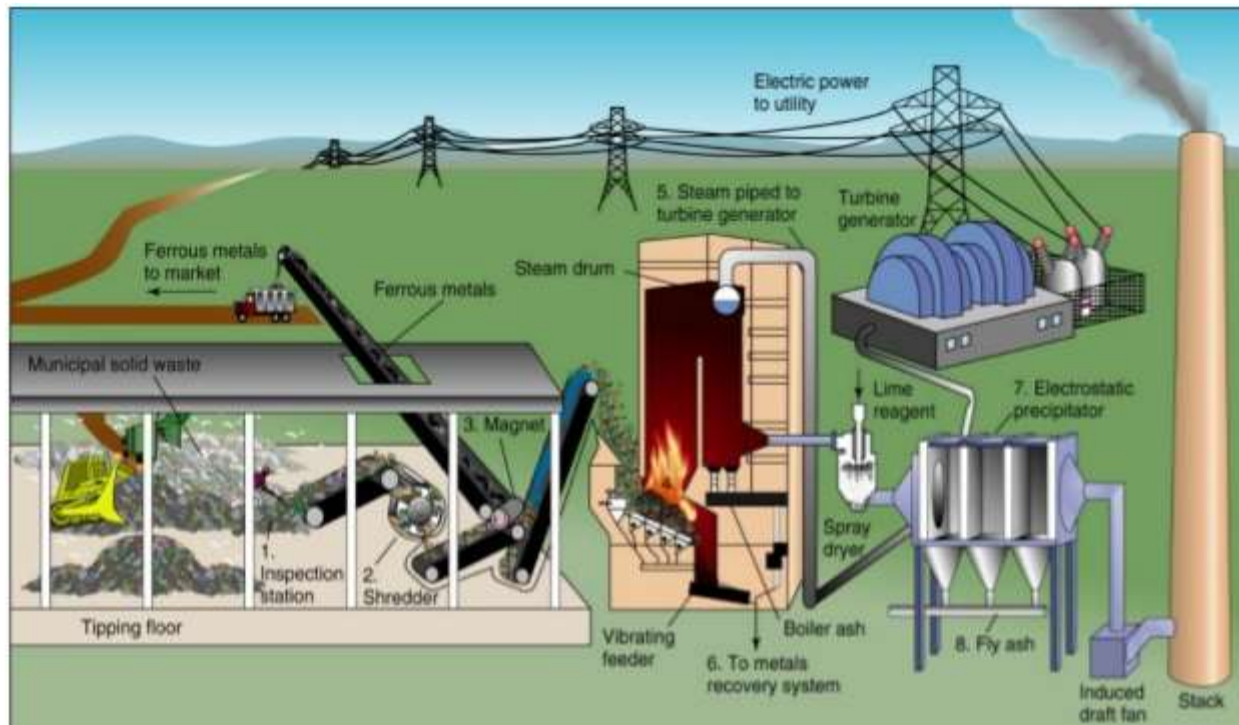


Disadvantages

1. A large area is required.
2. Transportation cost is heavy.
3. Bad odors, if land fills are not properly managed.
4. The land filled areas will be the sources of mosquitoes
5. Causes fire hazard due to the formation of methane in wet weather.

2. Incineration

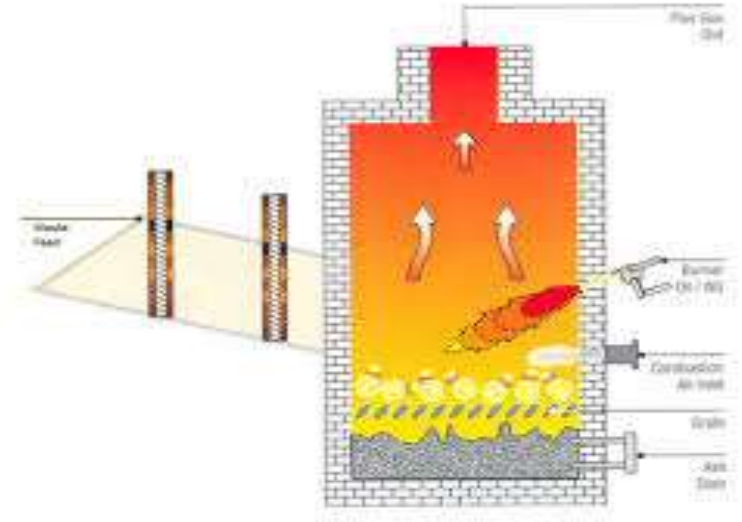
- ❖ In this method the municipal solid **wastes are burnt in a furnace** called incinerator.
- ❖ The combustible substances separated before feeding to incinerators.
- ❖ The heat produced in the incinerator during the burning used in the form of **steam power** for generation of electricity.
- ❖ Incinerate about **100 to 150 tones** per hour.
- ❖ The temperature normally maintained in a combustion chamber is about 700°C and may be increased to about 1000°C when electricity is to be generated.





Advantages

1. The residue is only 20-25% of original weight.
2. It requires very little space.
3. Cost of transportation is not high.
4. An incinerator plant of 300 tones per day capacity can generate 3MW of power.

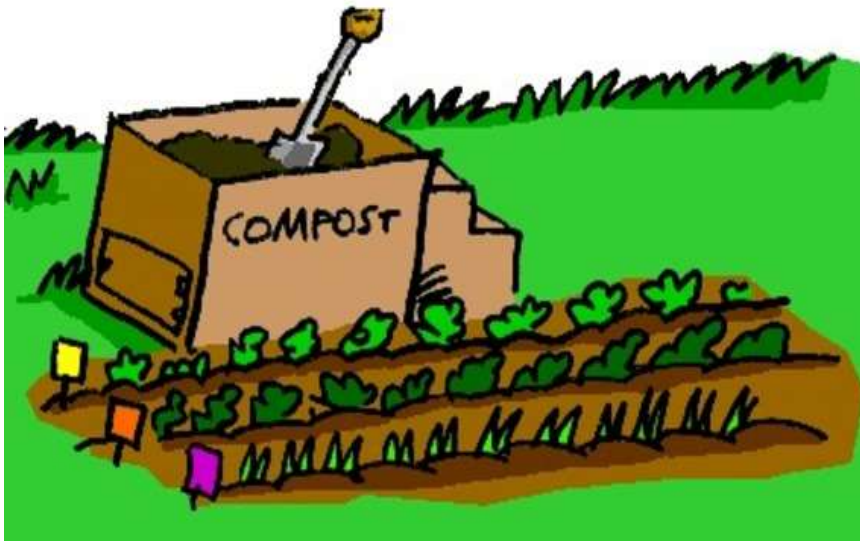


Disadvantages

1. Its capital and operating cost is high.
2. Needs skilled personnel.
3. Formation of smoke, dust and ashes needs further disposal, due to which air pollution may be caused.

3. Composting

- It is another popular method practiced in many cities in our country
- In this method, bulk organic waste is converted into a fertilising manure by biological action
- Within 2 to 3 days biological action starts
- The organic matters are being destroyed by actinomycetes
- Temperature of the compost by about 75°C
- Powdery brown coloured odourless mass known as humus
- It has a fertilizing value which can be used for agricultural field.





Advantages

1. When the manure is added to soil,
2. Large solid wastes can also be treated by this method
3. Low cost of disposing of wastes.
4. Recycling - occurs

Disadvantages

1. The non-consumables have to be disposed separately
2. Use of compost has not yet caught up with farmers and hence no assured market

MARINE POLLUTION

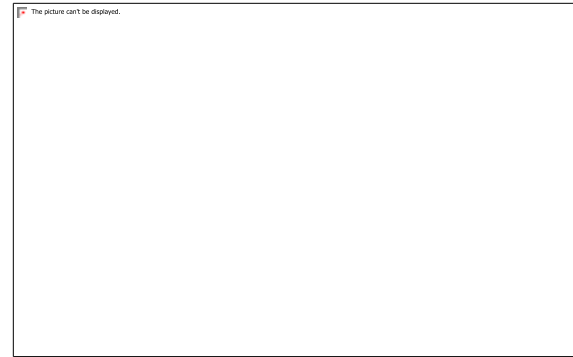
Marine pollution is defined as, “the discharge of waste substances into the sea resulting in harm to living resources, hazards to human health, hindrance to fishery and impairment of quality for use of sea water.”

About half of the world population live nearer to coastal lines and derive many benefits from the coastal zones and oceans.



Coral reefs

Coral reefs are underwater structures made from calcium carbonate secreted by corals. Corals are colonies of tiny living animals found in marine waters containing few nutrients.



The coral reefs have been valued at 47 thousands US dollars per square meter of shoreline for their protection function alone.

Benefits (or) importance of coral reefs

The coral reefs which are the most productive eco-systems offer many benefits to people.

1. Reefs support more than one millions species.
2. They provide feeding, breeding and nursery areas to fish and shell fish.
3. They offer medicines.
4. They act as buffer to ocean waves and protect coastal lines from storms and so on.







Factors affecting coral reefs

The coral reefs are threatened by

1. The sediment from deforestation carried by the runoffs.
2. The agricultural and industrial chemicals reaching through river discharges.
3. The boat anchors and the careless divers.
4. Rising ocean temperatures, ocean acidification.

Sources (causes) of marine pollution

Name	Sources	Effects
Dumping the Wastes	dumping of untreated wastes rivers ultimately ends up in the seas	Many living system distrubed
Oil pollution of Marine Water	damage to water is imposed by petroleum and its products	inhibits the growth of plankton

Effects of Marine pollution

1. organic pollutants cause more damage in eggshell and tissue damage of egg
2. About 50,000 to 2,50,000 birds are killed every year by oil
3. Oil spilling in sea water causes hypothermia in birds
4. Inhibits the growth of plankton
5. Food chain and consumption of affect fish by man may cause cancer



Control Measures of Marine Pollution

1. Plans for conserving marine biodiversity
2. People should be educated about marine ecosystems
3. Local communities must be involved in protecting and managing their coastal resources
4. Social and economic incentives must be offered for conserving and sustainable use of marine resources
5. The urban growth near the coasts should be regulated

Methods of removal of oil

1. Physical Methods

- (i) Skimming the oil off the surface with a suction device appears to be the simplest method.
- (ii) The floating oil can be absorbed using a suitable absorbing material like polyurethane foam.

2. Chemical Methods

- (i) Dispersion.
- (ii) Emulsification.
- (iii) Using chemical additives.

NOISE POLLUTION

Noise pollution is defined as, "the unwanted, unpleasant or disagreeable sound that causes discomfort for all living beings."





Unit of Noise (Decibel)

The sound intensity is measured in decibel (dB), which is one tenth of the longest unit Bel. One dB is equal to the faintest sound, a human ear can hear.

- ❖ Normal conversation sound ranges from 35 dB to 60 dB.
- ❖ Impairment of hearing takes place due to exposure to noise of 80 dB or more.
- ❖ Noise above 140 dB becomes painful.

Types and sources (causes) of noise

1. Industrial noise.
2. Transport noise.
3. Neighbourhood noise.



Effects of noise pollution

1. Noise Pollution affects human health, **mental distress, heart attacks** etc.
2. It causes **nervous breakdown, tension** etc.
3. The most immediate effect of noise is the **impairment of hearing**
4. The blood is also thickened by excessive noises
5. Impairment of night vision

Control measures of noise pollution

1. **Source Control** - source modification such as acoustic treatment to machine surface, design changes, limiting the operational timings
2. **Transmission Path Intervention** - source inside a sound insulating enclosure
3. **Receptor control** - protection of the receiver by altering the work schedule
4. **Oiling** - Proper oiling will reduce the noise on machines



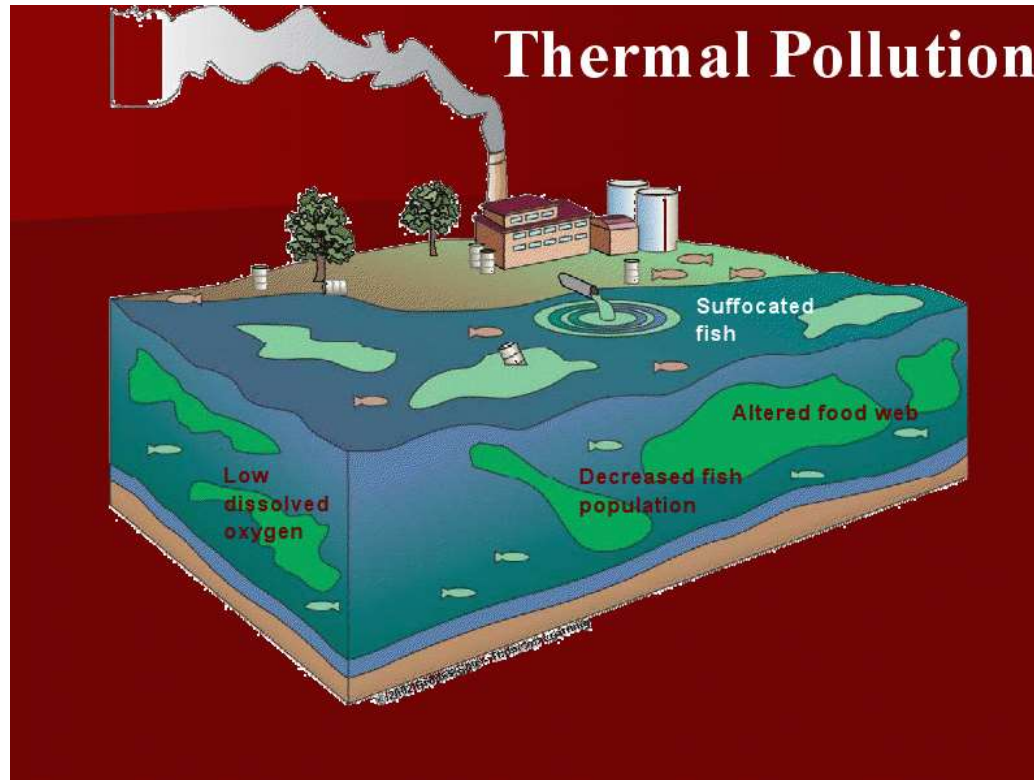
Stop!

Noise

[ABUSE!]

THERMAL POLLUTION

Thermal pollution is defined as the addition of excess of undesirable heat to water that makes it harmful to man, animal or aquatic life or otherwise causes significant departures from the normal activities of aquatic communities in water.



Sources (causes) of Thermal pollution

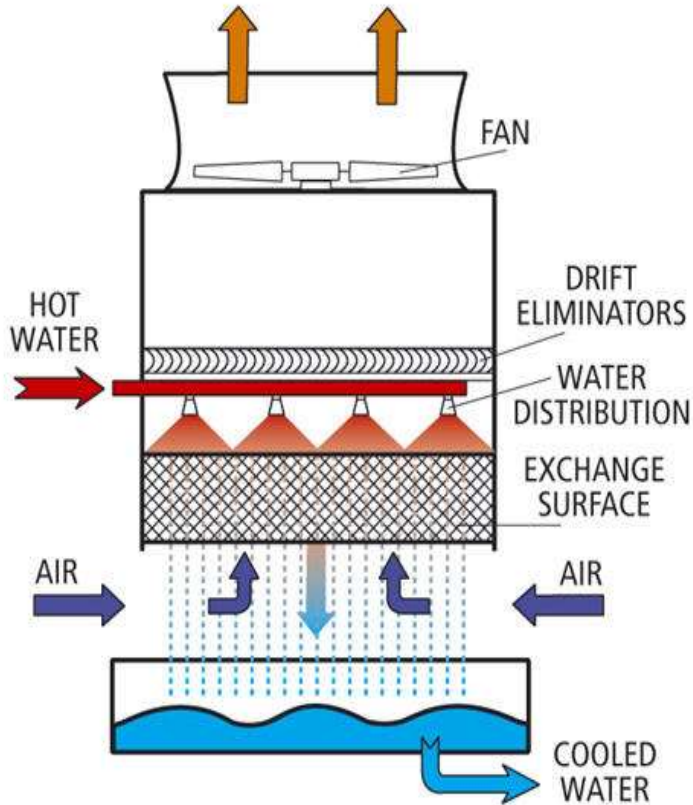
- 1. Nuclear power plants.**
- 2. Coal-fired power plants.**
- 3. Industrial effluents.**
- 4. Domestic sewage.**
- 5. Hydro-electric power.**

Effects of Thermal pollution

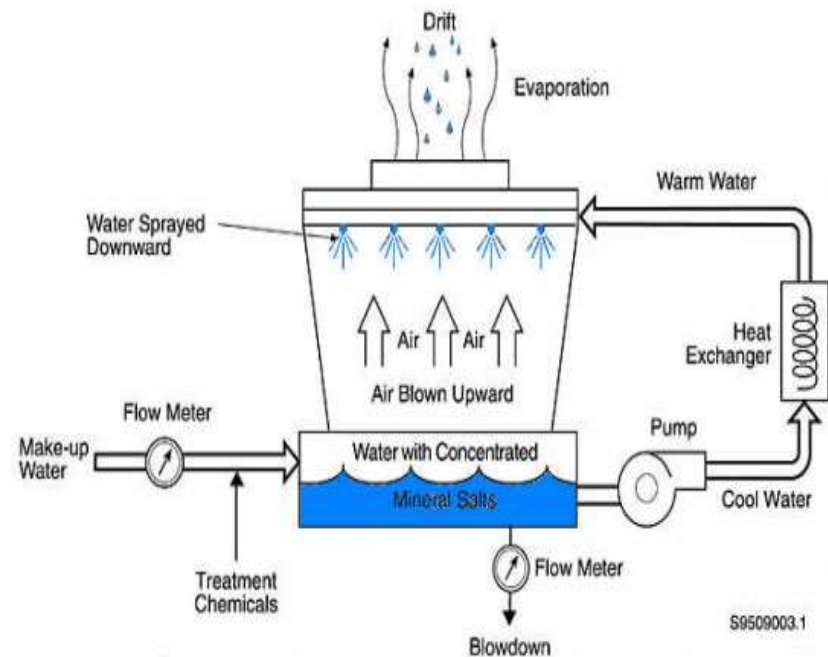
- 1. Reduction in dissolved oxygen**
- 2. Increase in Toxicity**
- 3. Interference with biological activities**
- 4. Interference with reproduction**
- 5. Direct mortality**

Control measures of Thermal pollution

1. Cooling Towers

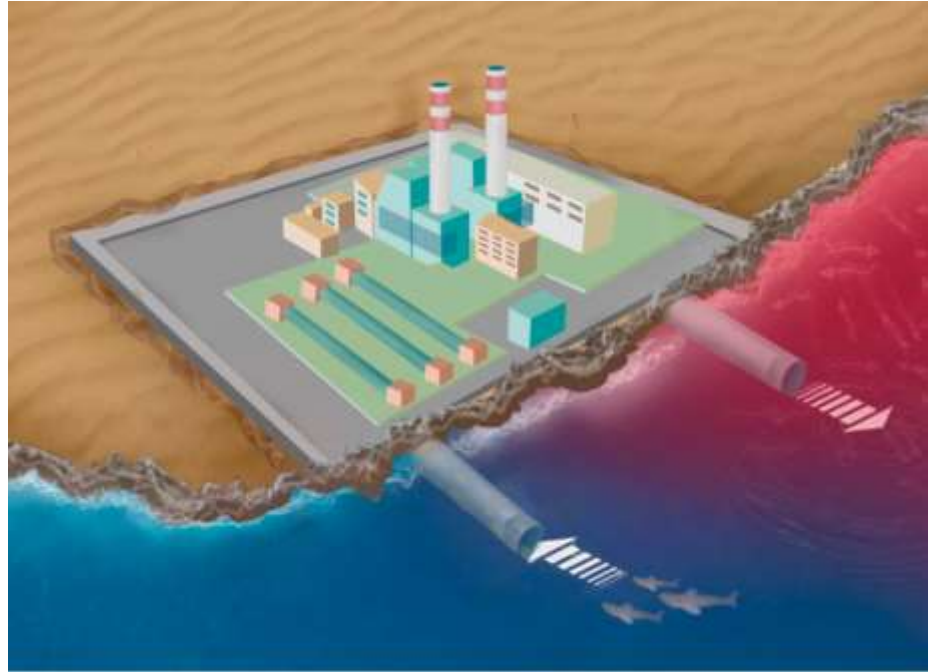


Wet cooling tower

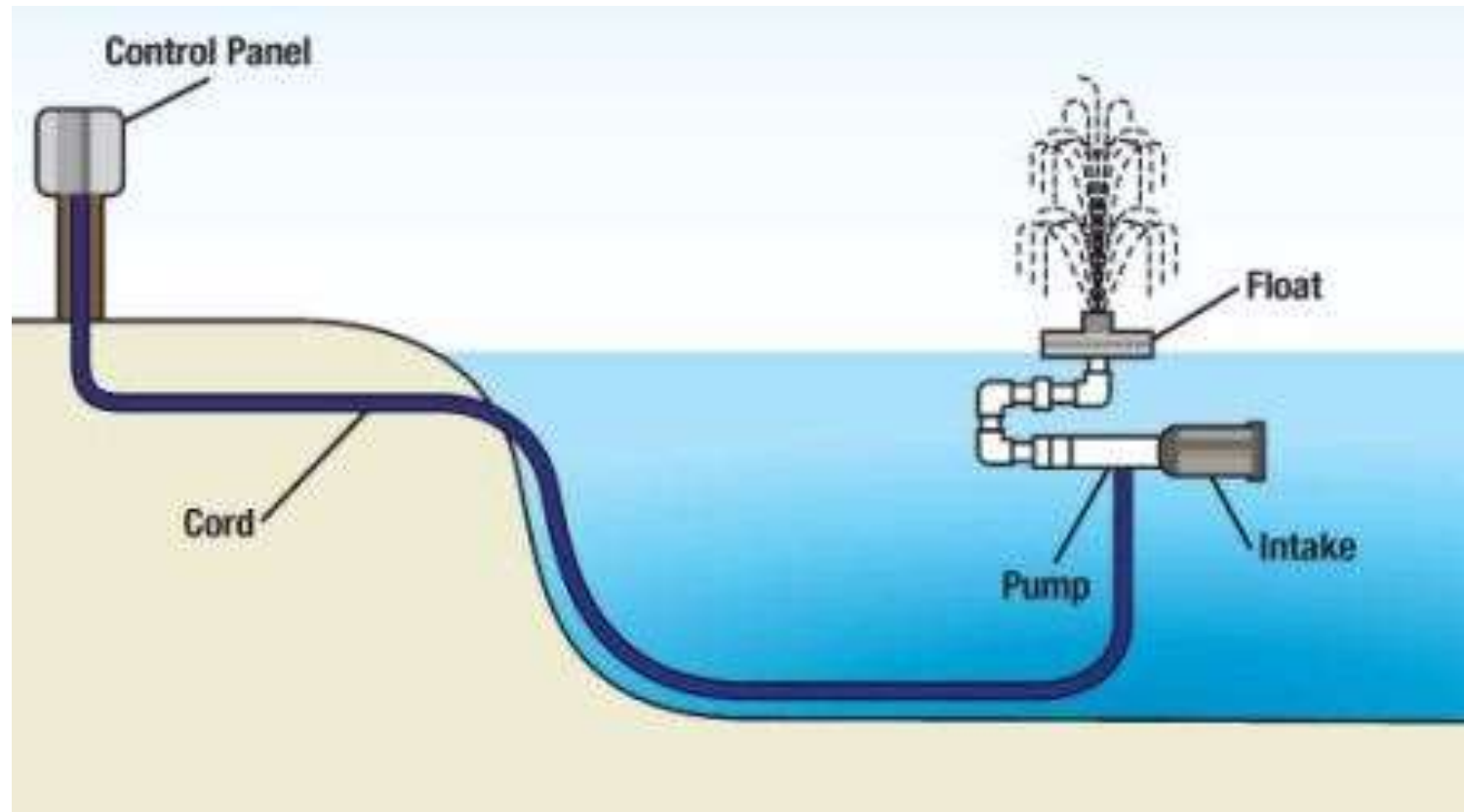


Dry cooling tower

2. Cooling ponds



3. Spray Ponds



NUCLEAR HAZARDS (POLLUTION)

(Radio Active pollution)

Radiation hazard in the environment comes from ultraviolet, visible, cosmic rays and microwave radiation which produce genetic mutations in man.



Sources of Nuclear Hazards

1. Natural sources

- (a) The very important natural source is space, which emit cosmic rays.
- (b) Soil, rocks, air, water, food, radioactive radon-222 etc., also contain one or more radioactive substances.

2. Man-made sources

Man-made sources are nuclear power plants, X-rays, nuclear accidents, nuclear bombs, diagnostic kits, etc., where radioactive substances are used.

Effects of Nuclear pollution

- Radioactive radiation affects the cells in the body
- Affects the function of glands and organs.
- People suffer from blood cancer and bone cancer
- Radioactive pollution can cause genetic disorders
- Exposure of the brain and central nervous system causes death within hours or days
- Impair in eye sight
- Internal bleeding and blood vessel damage





Control measures of Nuclear pollution

- 1. Nuclear devices should never be exploded in air.**
- 2. In nuclear reactors use closed-cycle coolant system**
- 3. Decrease the radioactive emissions**
- 4. Production of radioisotopes should be minimized**
- 5. Fission reactions should be minimized**
- 6. Extreme care should be exercised**

Disposal of Radioactive wastes (Nuclear Hazards)

Types	Examples	Methods
High level wastes (HLW)	<i>Spent nuclear fuel</i>	<ul style="list-style-type: none">i. cooled and stored for several decadesii. converting them into inert ceramics and then buried deep into earth
Medium level wastes (MLW)	<i>Filters, reactor components, etc.,</i>	<ul style="list-style-type: none">i. MLW are solidified and are mixed with concrete in steel drumsii. being buried in deep mines or deep sea
Low level wastes (LLW)	<i>Solids or liquids contaminated with traces of radioactivity</i>	disposed off in steel drums in concrete-lined trenches

Role and responsibility of Individual participation in environmental protection

1. Plant more trees.
2. Help more in pollution prevention than pollution control.
3. Use water, energy and other resources efficiently.
4. Purchase recyclable, recycled and environmentally safe products.
5. Use CFC free refrigerators.
6. Use natural gas than coal.
7. Reduce deforestation.
8. Increase use of renewable resources.
9. Remove NO_x from motor vehicular exhaust.
10. Use of eco-friendly products.
11. Use rechargeable batteries.
12. Use organic manure instead of commercial inorganic fertilizers.
13. Slow population growth.

Role of Women in Environmental Protection

1. In rural areas, women plant trees and grass, grow vegetables.
2. In urban areas, they go shopping using cloth bags.
3. Women refuse to use disposal products.
4. Women choose green products instead.
5. They refuse to eat the meat.
6. Women bring the concept of environmental protection into families.

The Bhopal Gas Tragedy

- ❖ The world's worst industrial accident occurred in Bhopal city
- ❖ @ M.P. on the night of 3rd December 1984
- ❖ It happened at Union Carbide India Ltd, who manufactures some carbonate pesticides, using methyl isocyanate (MIC)
- ❖ The reactor got exploded, due to failure of its cooling system and 40 tons of MIC leaked into the atmosphere

Effect

- (i) MIC is a toxic gas, lower concentrations of which affects lungs and eyes and causes irritation in the skin.
- (ii) Higher amounts of MIC, remove oxygen from the lungs and can cause death.

Effects in Bhopal



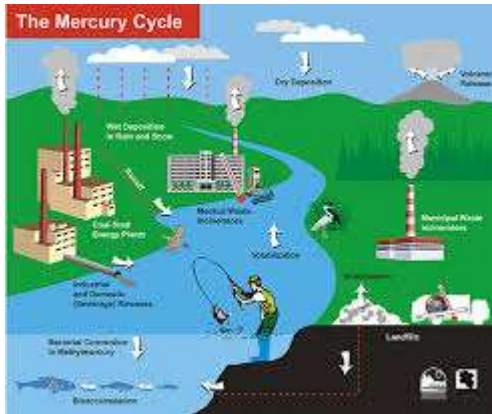
- a) spread over 40 sq. km area
- b) 5000 persons were killed
- c) 65,000 people suffered from severe eye, respiratory, neuromuscular, gastrointestinal disorders
- d) 1000 persons became blind

The Miniamatta Epidemic (1953)

(marine pollution)

- 1. Miniamatta is a small coastal village in Japan**
- 2. The Chisso Chemical Company, which produces PVC**
- 3. The industry released its effluent into Miniamatta sea**
- 4. The effluent containing Hg ions is converted into methyl mercury, which is highly toxic**
- 5. The marine organisms like phytoplankton and zoo-planktons easily absorb the toxic methyl mercury compound**
- 6. These organisms are consumed by small fishes and finally the large fishes are consumed by human beings**
- 7. Thus the poisonous chemical (methyl mercury) enter into the body of human beings through food chain**

Effect



(a) Loss of vision and hearing.

(b) Loss of muscular co-ordination and severe headache.

(c) Nervous disorders.

**We Were Born to help
the World, Not to
Destroy it, Then Why
we are Destroying
the Environment?**





That's all...

Social Issues and Environment



Unit - IV

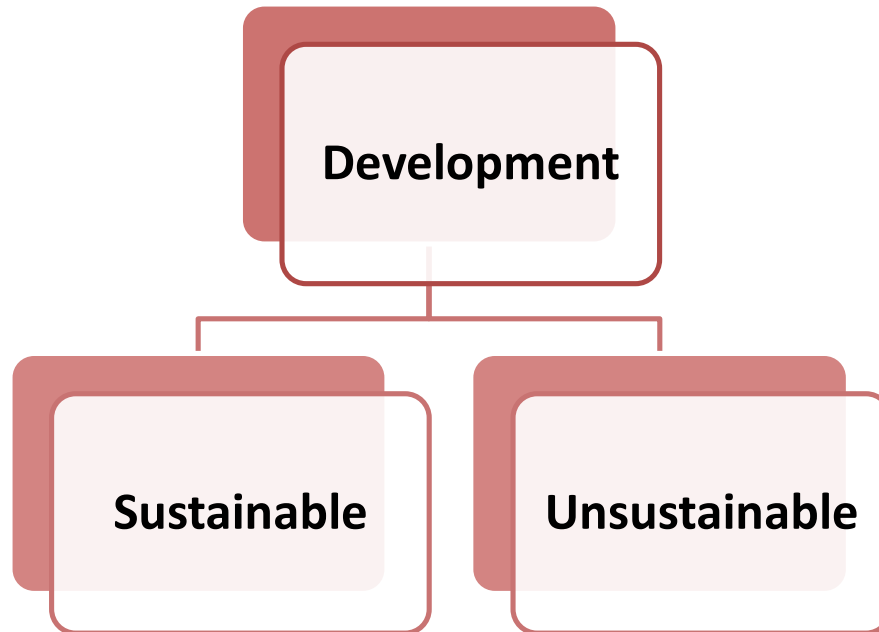
Social Issues and Environment

Social Issues

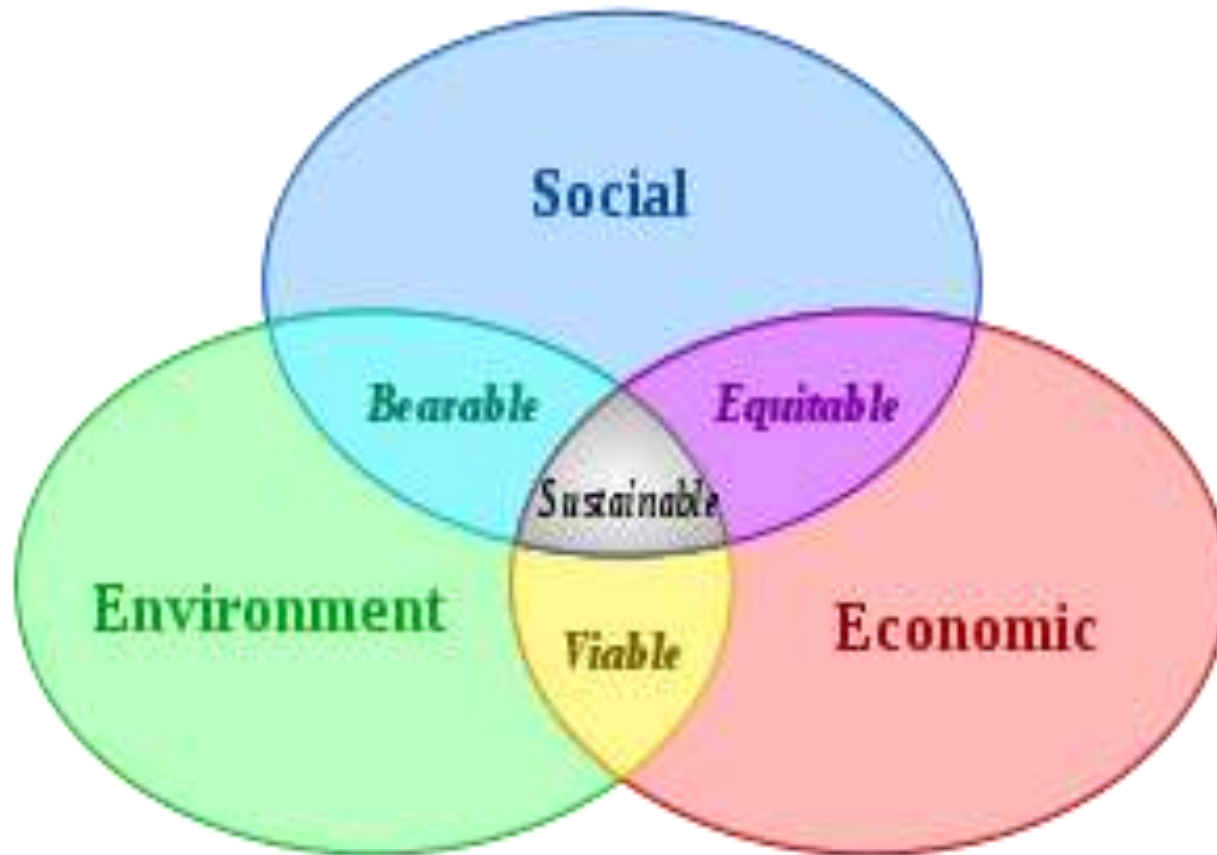
- Sustainable development
- Urban problems related to Energy
- Water conservation
- Resettlement and Rehabilitation issues
- Climate Change
- Global Warming
- Acid Rain and Ozone layer Depletion
- Nuclear Accidents and Holocaust
- Environmental protection act

Sustainable development

- We live in a natural as well as social world
- Development cannot be of only the rich
- Development means only high living standards.



From Unsustainable to Sustainable



Key aspects of Sustainable development

- **Inter- generational equity**
 - ❖ Hand over a safe, healthy and resourceful environment to our future generations
- **Intra-generational equity**
 - ❖ Minimize gap between and within nations
 - ❖ Support economic growth of poorer countries
 - ❖ Provide technological help

Key aspects of Sustainable development

- Using appropriate technology: concept of “**Design with nature**”
- **3-R approach**: Reduce, Reuse, Recycle
- Promoting environmental **awareness** and education
- Use of **Renewable** resources
- Improving quality of life
- Population control

Urbanization

Urbanization is the movement of human population from rural areas to urban areas for the want of better education, Communication, health, employment, etc.,



Urban problems related to energy

- Cities are the main centers of economic growth, trade, education, employment
- Now 50% population lives in Urban areas
- Urban sprawl
- Difficult to accommodate
- Uncontrollable and unplanned growth
- Densely populated, consume more resources, **NEED MORE ENERGY**

Water Conservation



The process of conserving or saving water for future utilization is known as water conservation.

Methods

- 1. Rain water harvesting**
- 2. Water Shed management**



Water your yard and outdoor plants early or late in the day to reduce evaporation.

Use a shut-off nozzle on your hose.



Use plants that require less water.



Mulch around plants to hold water in the soil.

Get an Energy Star labeled washing machine.



Wash only full loads.

Use a low flow showerhead.



Take shorter showers — five minutes or less is best.

Turn off the water while soaping hands and brushing teeth.



Turn off sink faucet while scrubbing dishes and pots.



Install new toilets that use less than 1.6 gallons per flush.



Put faucet aerators on sink faucets.

Use a broom, not a hose, to clean driveways and walkways.



The new way—
conservation



Rain Water Harvesting

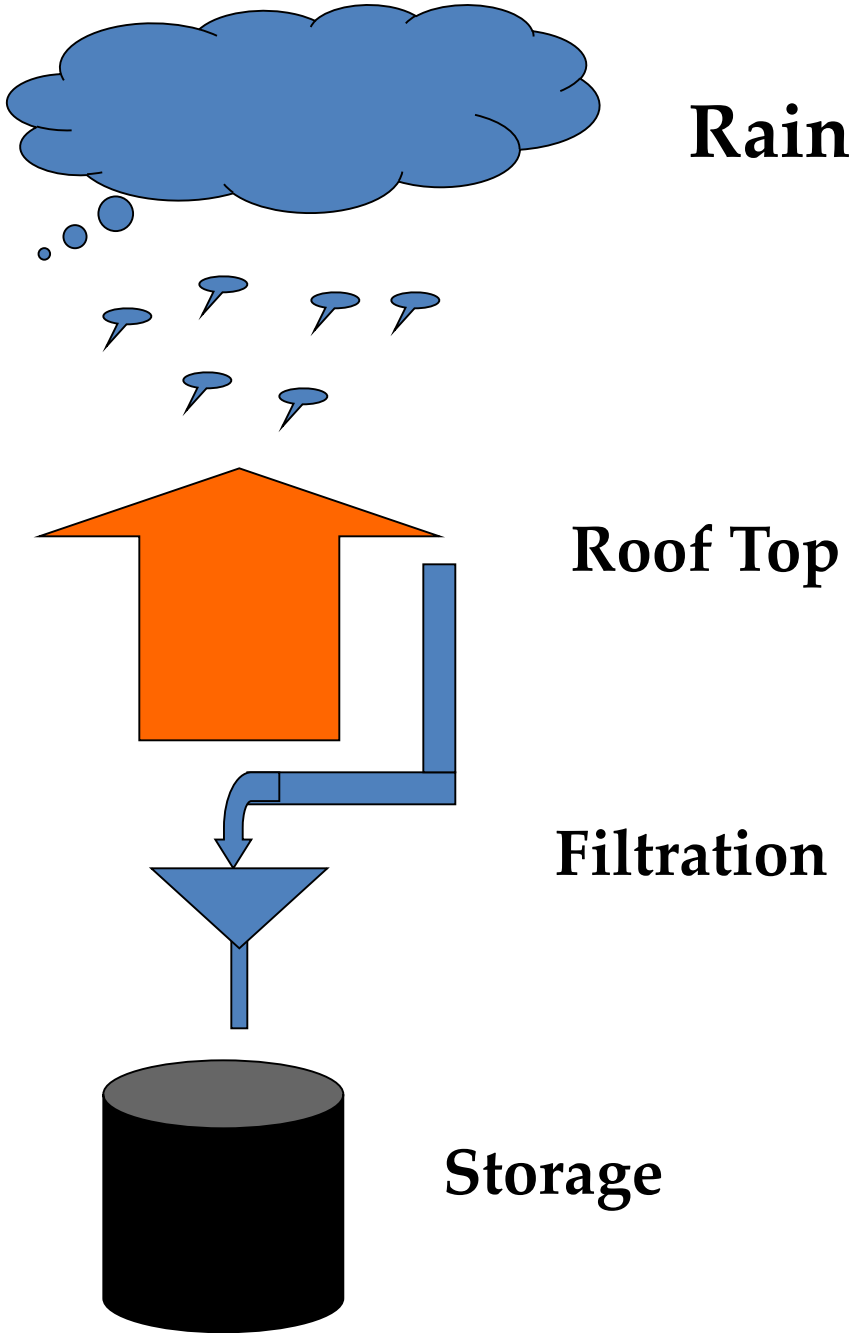
It is a technique of capturing and storing of rainwater for future utilization

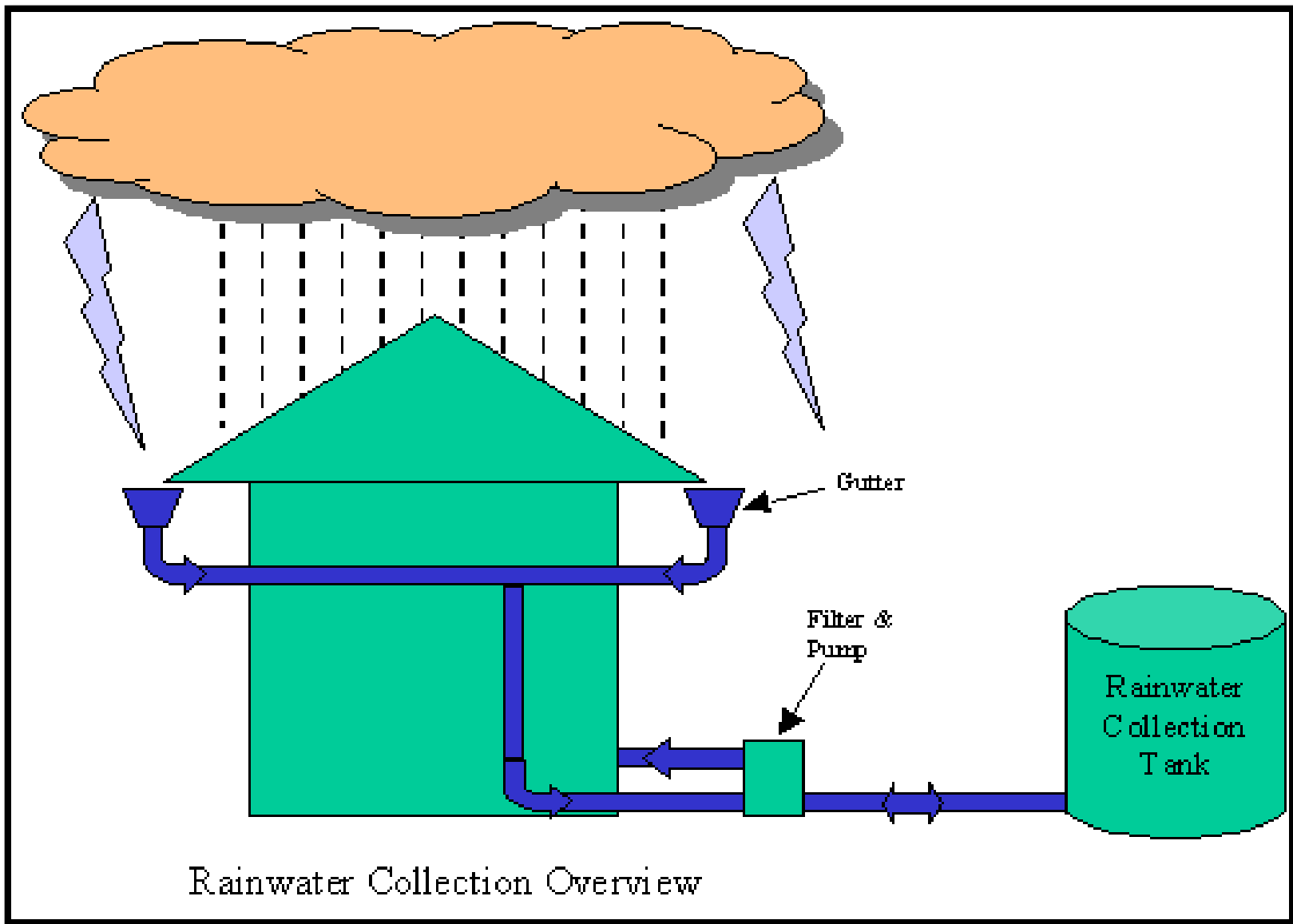


Rain Water Harvesting - Objectives

- To reduce run-off loss.
- To avoid flooding of roads.
- To meet the increasing demands of water.
- To raise the water table by recharging ground water.
- To reduce ground water contamination.
- To supplement the ground water supplies during lean seasons.
- To reduce water conflicts.

RAIN WATER HARVESTING



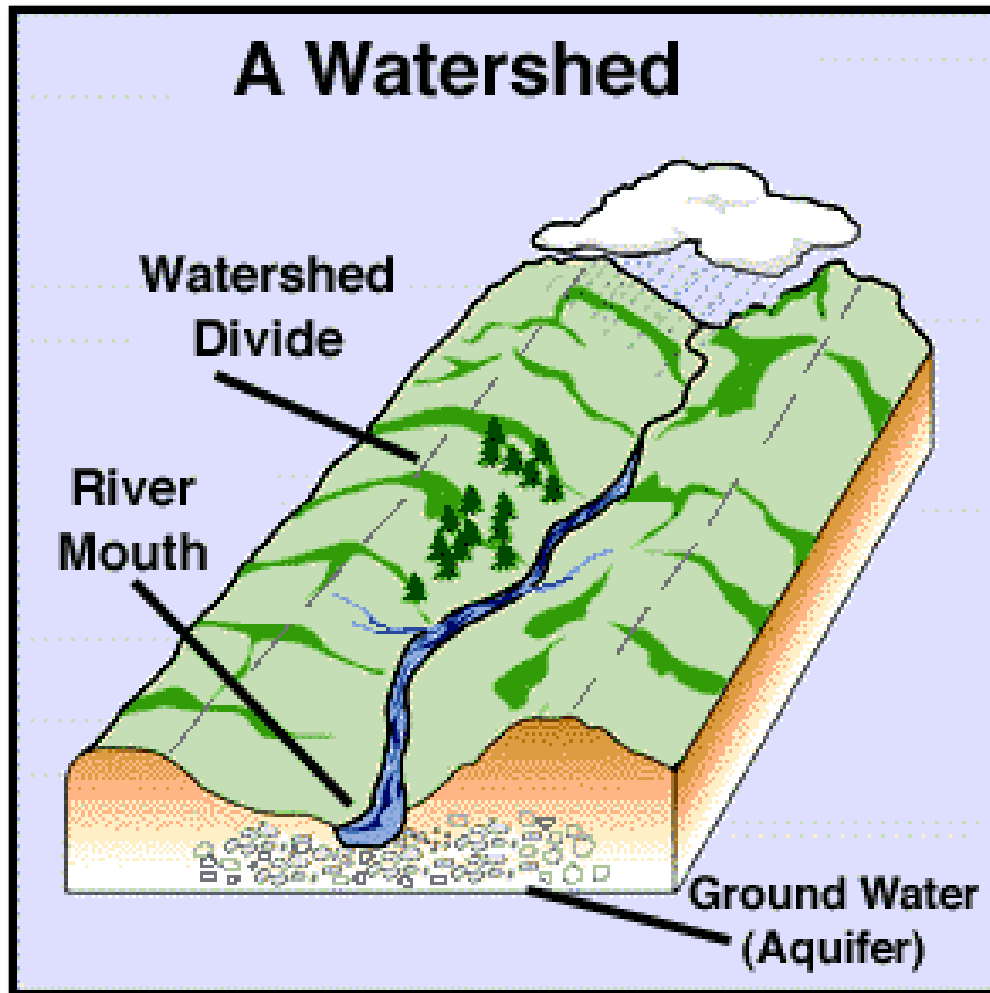


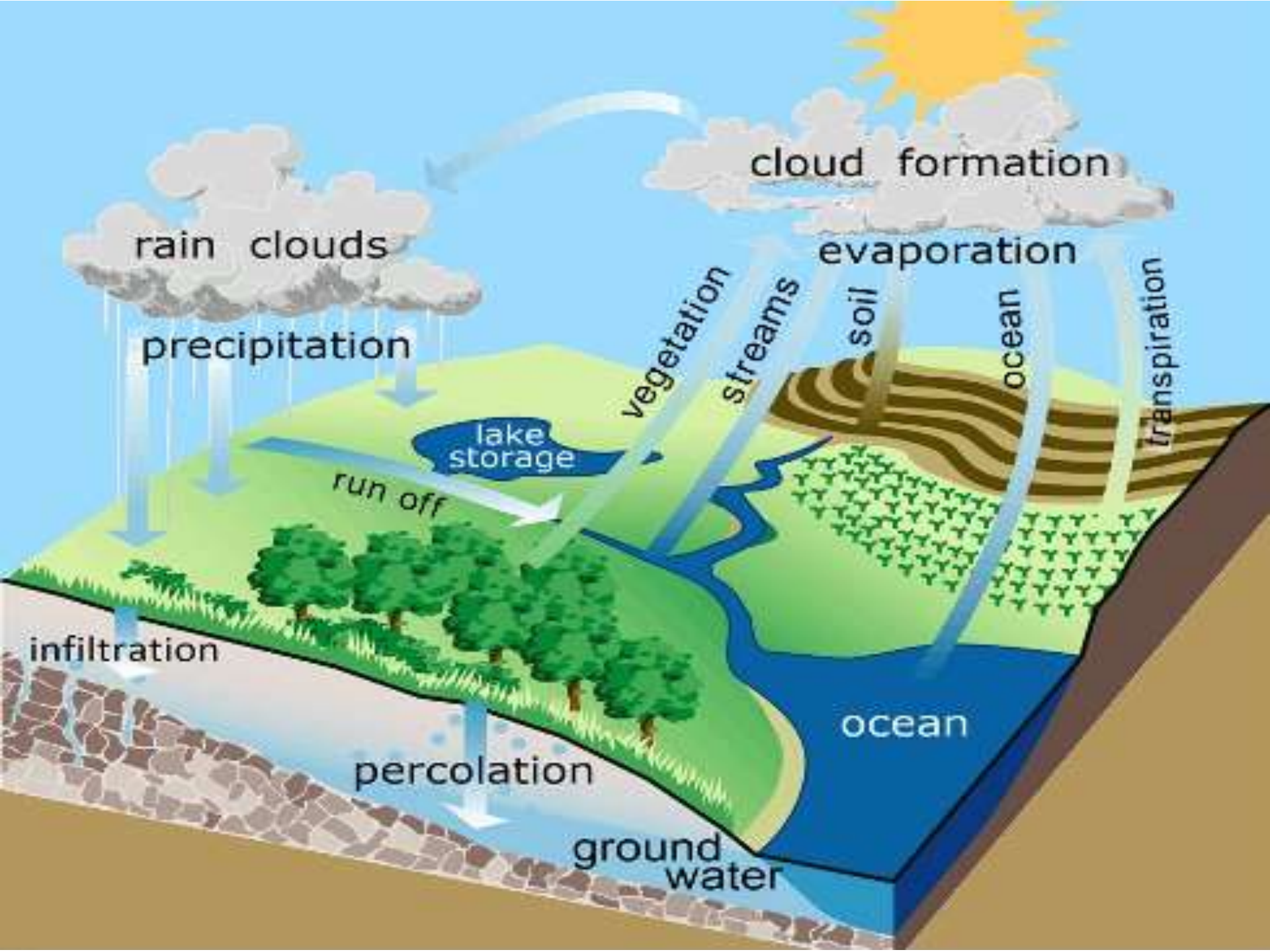
Example of Small level Rain Water harvesting in villages in India



WATER SHED MANAGEMENT

The management of rainfall and resultant runoff is called water shed management.





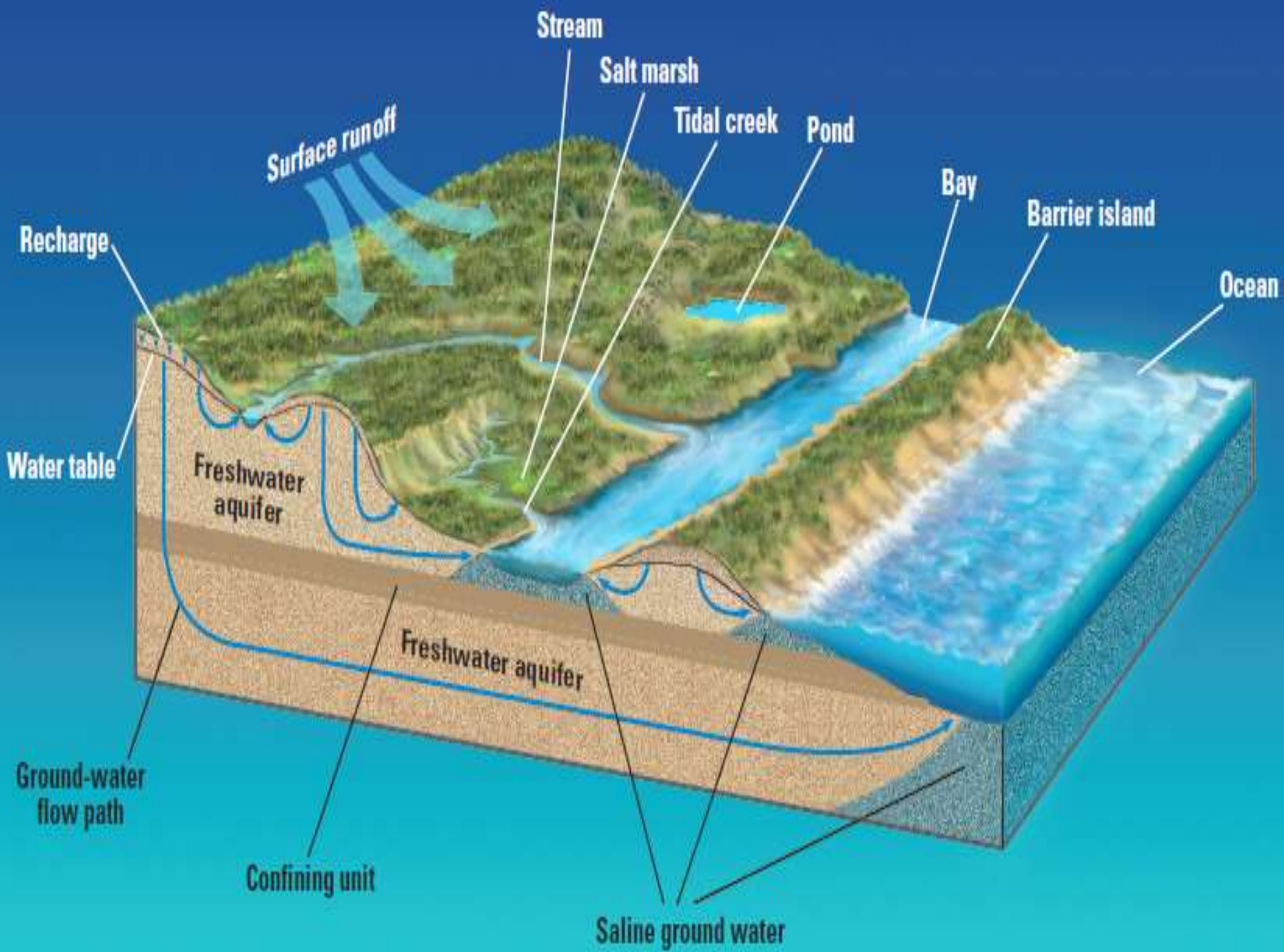
Watershed Management - Objectives

- To minimizing **soil erosion**.
- To manage **domestic water supply, irrigation, hydropower** generation...
- To minimize the risk of **floods, droughts** and land slides.
- To develop rural areas.
- To raise the **ground water level**.
- To generate **employment**.
- To promote **forest**.

Watershed Management - Techniques

- Trenches (Pits)
- Earthen dam
- Farm Pond
- Underground barriers (Dykes)





Watershed Management Practices

- Water harvesting.
- Afforestation and agro-forestry.
- Reducing soil erosion and run-off losses.
- Scientific mining and quarrying.
- Public participation.

Resettlement and Rehabilitation



Resettlement – Simple relocation of human population

Rehabilitation – making the system work again

Causes

❖ Developmental activity

Ex: Construction of Dams

❖ Due to disaster

Ex: Flood, Drought, Earthquake

❖ Due to Conservation initiatives

Ex: National parks, reserve forest



UNITED STATES REFUGEE RESETTLEMENT PROCESS

SUB-SAHARAN AFRICA

English



UNHCR Identification and Referral



RSC Africa Interviews



USCIS Interviews



Approval



Denial



Medical Examinations



Cultural Orientation



Travel to the United States



United States Reception

In the U.S., you will find



School for children Freedom from Persecution

In the U.S., you must



Work Hard Learn English

CO-ORDINATION OF SERVICES

A COORDINATED, INDIVIDUALLY TAILORED, WRAP-AROUND PACKAGE OF SUPPORT MUST BE IN PLACE. THIS IS CRUCIAL TO MEETING THE MULTIPLE AND COMPLEX NEEDS OF VULNERABLE YOUNG PEOPLE.



EFFECTIVE RESETTLEMENT

A PROCESS THAT ENABLES A SHIFT IN A YOUNG PERSON'S IDENTITY, MOVING THEM AWAY FROM CRIME TOWARDS A POSITIVE FUTURE



60%

HAVE COMMUNICATION PROBLEMS



RELEASE ON TEMPORARY LICENCE

61% GIRLS **33% BOYS**



IN CUSTODY HAVE PREVIOUSLY BEEN IN CARE

91%

HAVE EXPERIENCED ABUSE OR LOSS



NEGATIVE INFLUENCES



CAN SET YOU BACK

MAY INVOLVE RELAPSE

AS WELL AS PROGRESS



Beyond
YOUTH CUSTODY

CONTINUOUS SERVICE FOCUSED ON RESETTLEMENT

THERE MUST BE A CONTINUOUS SERVICE BETWEEN CUSTODY AND THE COMMUNITY WITH SENTENCE PLANNING FOCUSED ON RESETTLEMENT THROUGHOUT.



PLANNING FOR RELEASE



INDIVIDUALLY TAILORED

SEAMLESS SENTENCE



WE APPROACH YOUNG PEOPLE ON THEIR LEVEL, SHOWING THEM THAT WE CAN RELATE TO THEM...

THIS GENERATES A LEVEL OF MUTUAL RESPECT, SOMETHING MANY YOUNG PEOPLE HAVE NEVER EXPERIENCED BEFORE



HE CAME INTO PRISON TO TALK ABOUT MY OPTIONS AND HE CARED

ENGAGING THE YOUNG PERSON FOR POSITIVE CHANGE

EFFECTIVE ENGAGEMENT AND HIGH QUALITY TRUSTED RELATIONSHIPS ARE KEY TO ENHANCE A YOUNG PERSON'S MOTIVATION TO MAKE POSITIVE CHOICES AND BUILD RESILIENCE TO NEGATIVE INFLUENCING FACTORS.



Rehabilitation- issues

- Right to housing a basic human right
- Government acquires land for various reasons
- Already poor tribals most affected.
- Loss of land, food, home, jobs, property assets, social isolation
- Cash compensation not enough, tribals are unaware so might be a case of cheating.
- Communal settlement does not happen.

Rehabilitation policies

- 100% restoring of all asserts.
- Rehabilitation work should be started before the commencement of project.
- Rehabilitated only minimum distance.
- We should obey social justice.

Environmental Ethics

It is the issues, principles and guidelines relating to human interaction with their environment



Environmental Ethics



Recognize plant
and animal
rights.

Realize the
intrinsic worth of
nature.



Environmental Ethical Guidelines

- You should **love and honour** the earth.
- You should **celebrate** the seasons.
- You should hold yourself above other living things and have **no right kill**.
- You should be **grateful to the plants and animals** which nourish you by giving you food.
- You should **not waste your resources** on destructive weapons.
- You should **not steal** from future generations their right to live in a clean and safe planet by polluting it.
- You should consume the **material goods** in moderate amounts so that all may share the earth's precious treasure of resources.

Climate change

- Climate is average weather of an area
- Control temperature, evaporation rate, seasons, moisture content.
- Conditions if prevail for 30 years...its said to be the climate of an area



GLOBAL WARMING

- Overall increase in temperature by a few degrees.
- It happens when greenhouse gases (CO₂, water vapor, NO₂ etc) trap heat and light from the sun in the earth's atmosphere, which increases the temperature.
- This hurts many people, animals, and plants.
- Many cannot take the change, so they die.







Green House Effect

- The greenhouse effect is **heating the Earth's surface** and atmosphere.
- It results from the fact that certain atmospheric gases, such as **carbon dioxide, *water vapor*, and methane.**
- Without the greenhouse effect life on this planet would probably not exist as the average temperature of the Earth would be a chilly **-18° Celsius, rather than the present 15° Celsius.**
- Enhanced green house effect : CO₂, CH₄, NO₂, CFC's

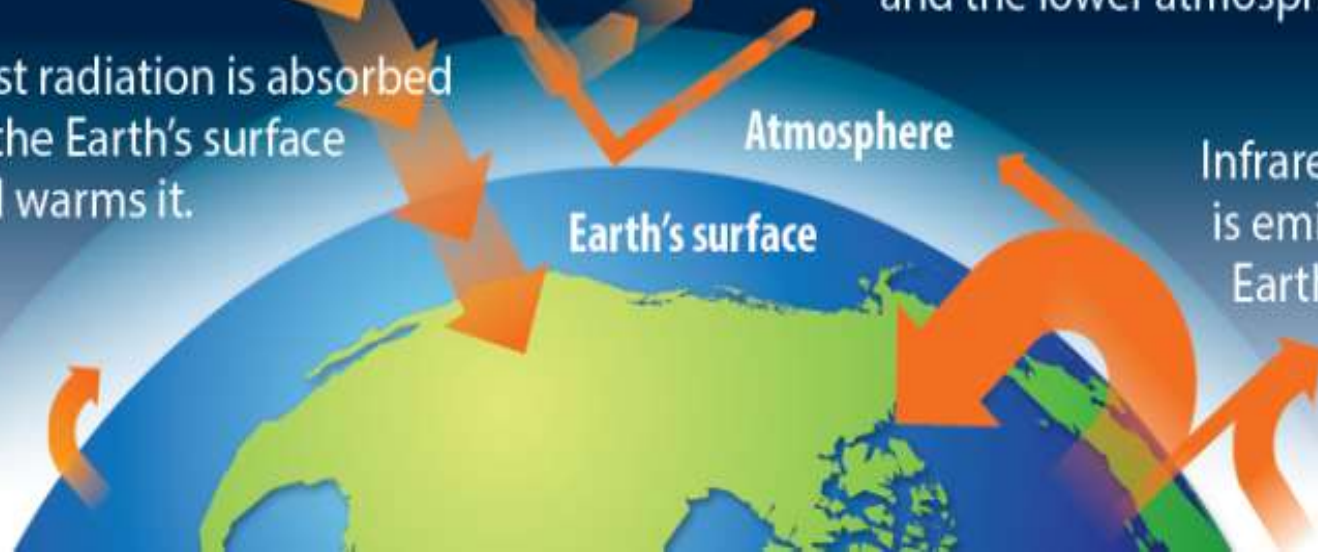
The Greenhouse Effect

Some solar radiation is reflected by the Earth and the atmosphere.

Some of the infrared radiation passes through the atmosphere. Some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.

Most radiation is absorbed by the Earth's surface and warms it.

Infrared radiation is emitted by the Earth's surface.

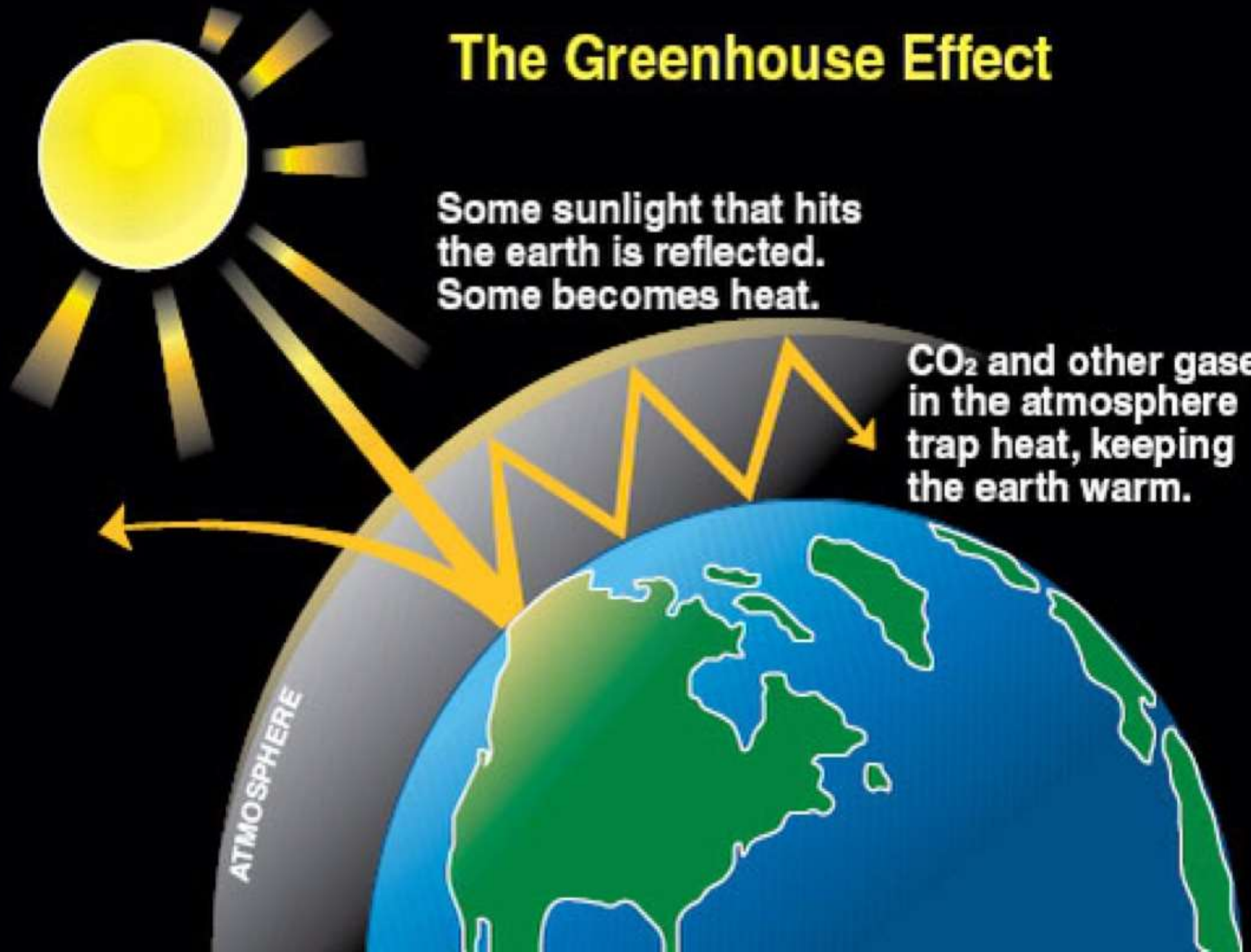


The Greenhouse Effect

Some sunlight that hits the earth is reflected. Some becomes heat.

CO₂ and other gases in the atmosphere trap heat, keeping the earth warm.

ATMOSPHERE



Effects

- Change in Wind current patterns
- Ocean currents will change
- Hydrological cycle will intensify
- Sea level rise: submergence of areas.
- Changed agricultural production
- Cases of flood, droughts, cyclones on a rise.



Solution

- Renewable energy
- Biofuels
- Afforestation
- Reduce the current rate of CFCs use
- Trap methane for fuel
- Potential of algae in Carbon dioxide utilization
- Sustainable agriculture

Nuclear Accidents

- Nuclear test
- Nuclear plant accidents
- Improper disposal of nuclear wastes
- Accident during transport
- Core melt down

Nuclear test



Nuclear plant accidents



Improper disposal of nuclear wastes



Accident during transport



Core melt down



Nuclear Holocaust

It is the destruction of biodiversity or living system by nuclear equipment or bomb.



Nuclear Winter







ENVIRONMENTAL LEGISLATION LAWS

- India first country to have made provisions for environment protection in its constitution
- After Stockholm Conference , 1972
- Many laws and rules have been made
- **Article 48- A** : *The state shall endeavour to protect and improve the environment and to safeguard forests and wildlife of the country.*
- **Article 51 A (g)**: - *It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures*

ACTS

- **Water (Prevention and Control of Pollution) Act, 1974**
- **Forest (Conservation)Act, 1980**
- **Air (Prevention and Control of Pollution) Act, 1981**
- **The Environment (Protection) Act, 1986**

Water (Prevention and Control of Pollution) Act, 1974

- **This act aim to protect water from all kind of pollution.**
- **It establishment of state & central boards.**
- **This act give empowerment to the board.**
- **Any contravention of the guidelines give penal action ranging from 3 to 6 months of prison.**
- **This act is not clear about definition of pollutants.**

Air (Prevention and Control of Pollution) Act, 1981

- ❖ To prevent and control air pollution.
- ❖ To maintain the quality of air.
- ❖ The central board may laydown the standards for the quality of air.
- ❖ Operation of an industrial unit is prohibited in heavily polluted areas.
- ❖ Violation of laws punishable one.

Forest (Conservation)Act, 1980

- ❖ It protect and conserve the forest.
- ❖ To ensure legal use of forest products.
- ❖ Forest land cannot be use for non forest purposes.
- ❖ Any illegal hunting or poaching of animals and trees in the forest is offence.
- ❖ based on the offence that person get punishment.

The Environment (Protection) Act, 1986

- ❖ It is protect and improvement of the environment.
- ❖ It prevent all kinds of pollution.
- ❖ The Govt. has authority to close any industry if the violation occurs.
- ❖ Contravenes is occurs it could be punishable.
- ❖ Punishment is 3 to 5 years prison.

NGO's

- ❖ It is non governmental organization.
- ❖ It is protect and improvement of the environment.



Role of NGO's in India

- ❖ Mahila Mandals - Create awareness about women education.
- ❖ Centre for Science & Environment (CSE) – permissible limits of pesticides in cola drinks.
- ❖ World Wide Fund for nature (WWF) – Environment protection and health.

Public Awareness

- ❖ To create awareness among the people.
- ❖ To organize meetings, GD on development of our environment.
- ❖ To focus on current environment problems.
- ❖ To learn to live simple & eco-friendly manner.
- ❖ To eliminate poverty through provide employment.

Methods of Public Awareness

- ❖ Environ. awareness in schools & Colleges – through education.
- ❖ Through Mass media – TV, Radio, FM, FB
- ❖ Through Acting - Cinema, Dramas, Videos
- ❖ Through News papers – Magazines, periodicals
- ❖ Voluntary organization - NSS, NCC, YRC
- ❖ Arranging Competition – Paper presentation, Painting, Story writing etc.,

That's All





The Human Population and its Impact

Chapter 6
and
Chapter 23-4

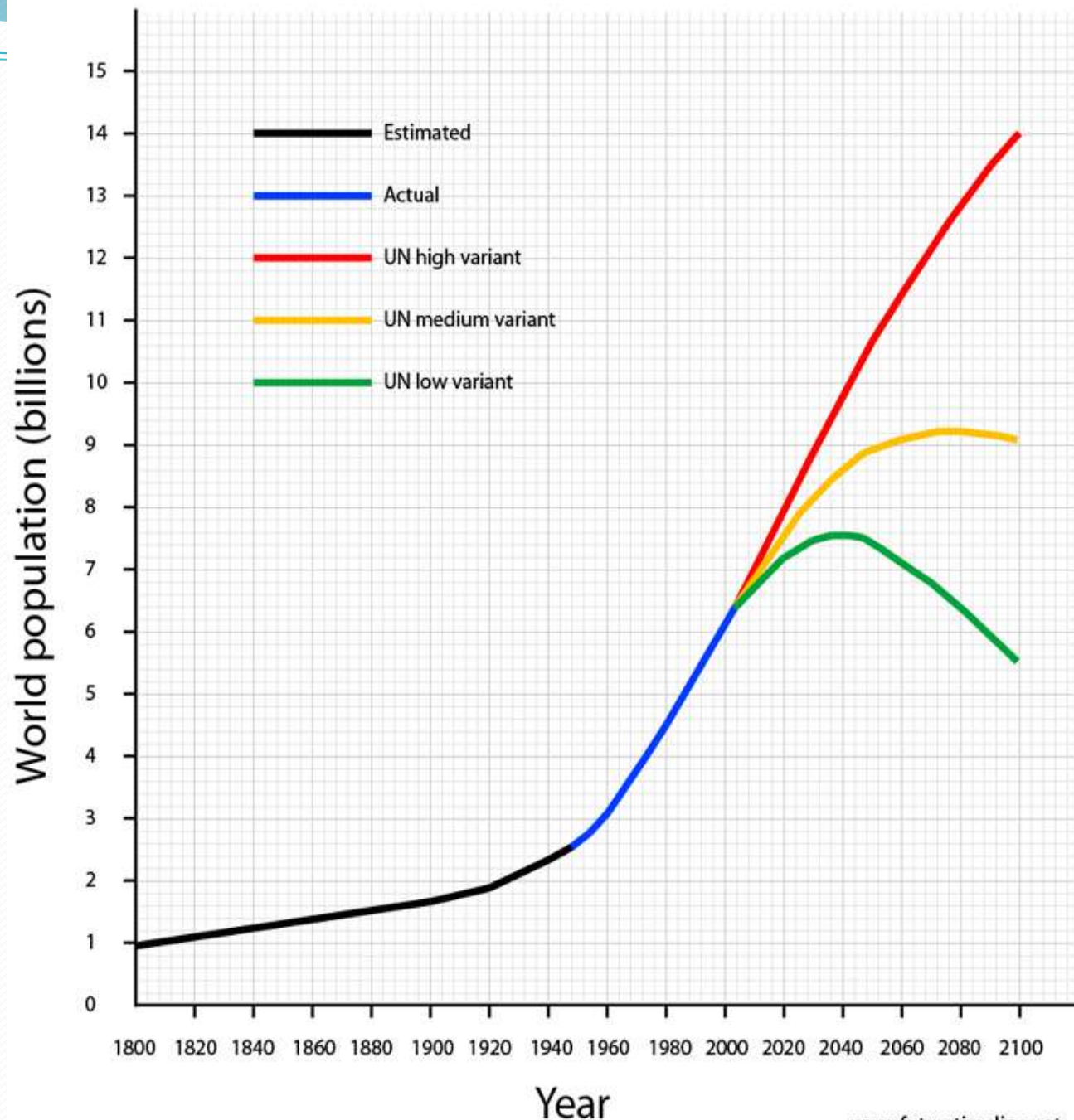
The Human Population Over Time

The time it takes our population to double has decreased sharply.

It only has taken about 12 years to go from 6-7 billion people.

We are projected to hit 9 billion near the year 2050.

Estimates say stabilization around 2100. (10.5 billion)



Human Population Over Time

- What's your number?

<http://www.bbc.co.uk/news/world-15391515>

Population Clock (census)

<http://www.census.gov/popclock/>

- Population growth video

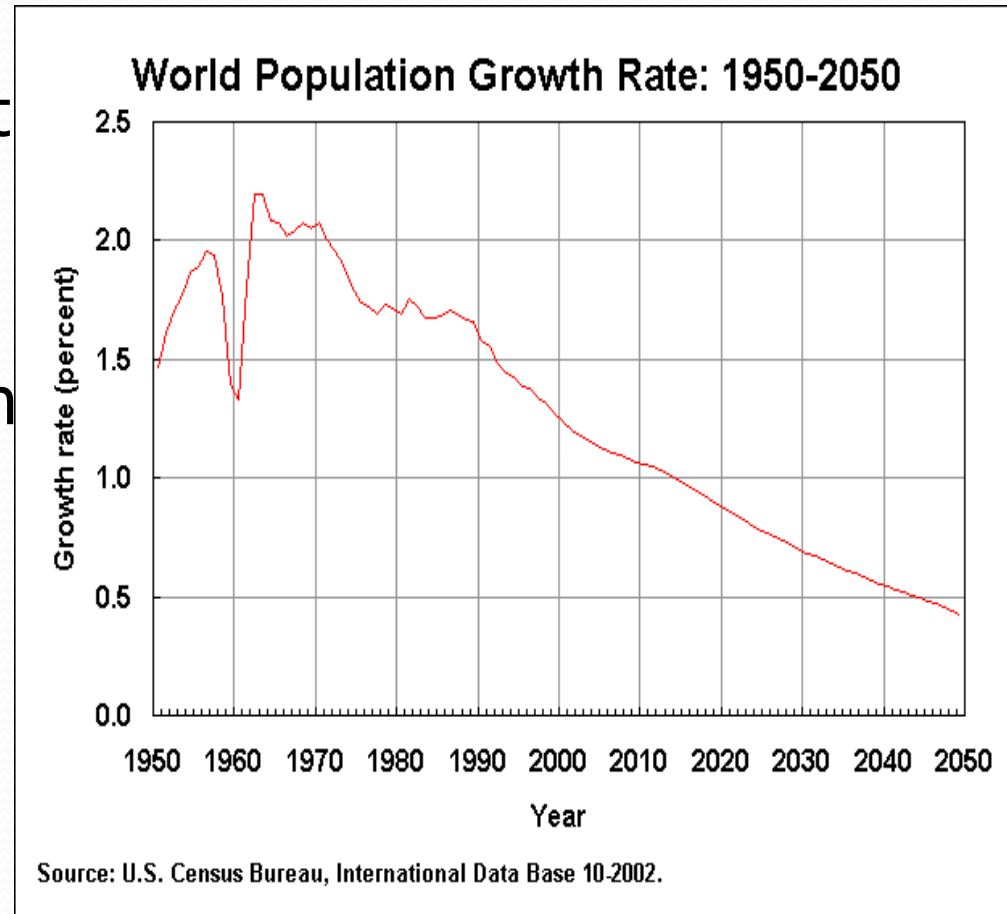
<https://www.youtube.com/watch?v=khFjdmp9sZk>

Why our population has grown so quickly....

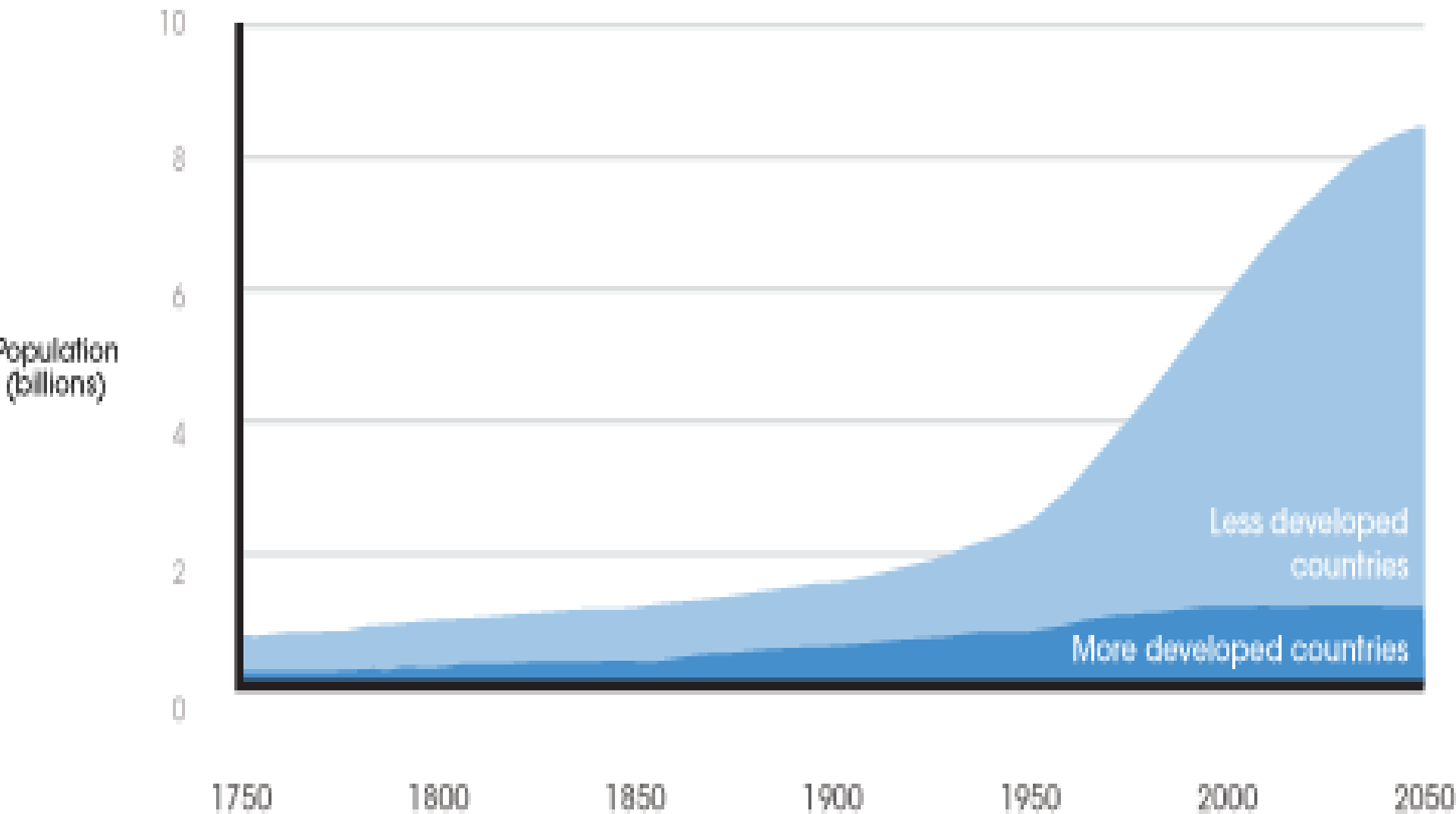
- Humans have the ability to expand into all climate zones and habitats
- Modern agriculture has allowed us to produce food very efficiently and in large quantities
- Death rates decreased because of improved sanitation and healthcare (biggest influence)
- The current global population growth rate is around 1.3% per year (and slowing). Most of this growth happens in developing countries.
 - If growth rate is slowing...why is our population still growing?

- Overall, the world population is growing at a rate of about 1.7 percent; if this rate continues, the population will double in 41 years.

- Population growth rate peaked in the 1960s at about 2%



Projected World Population



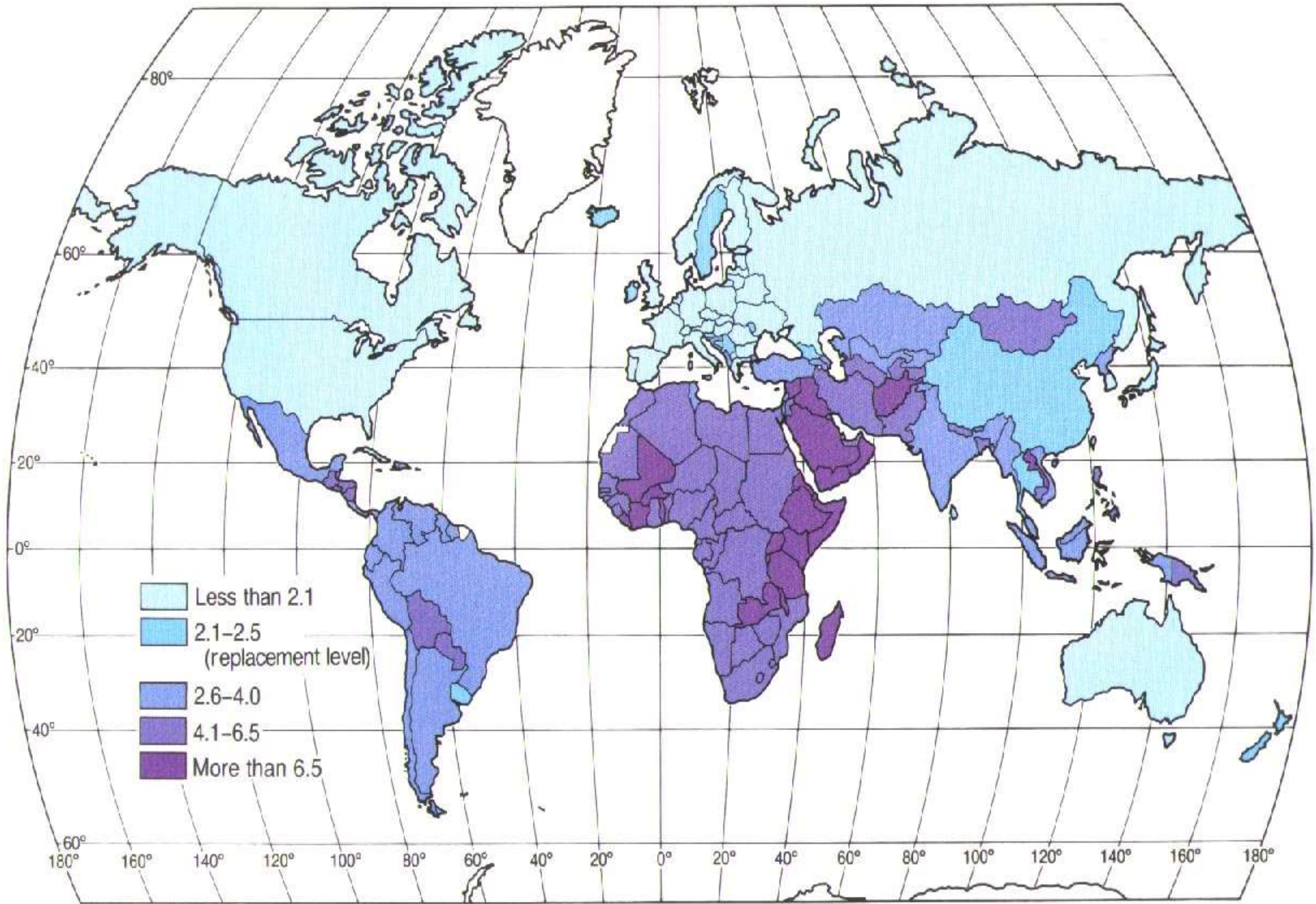
Source: UN, *World Population Prospects: The 2006 Revision*

Carrying Capacity

- Under ideal conditions populations will grow exponentially until limiting factors cause growth to slow.
- Carrying Capacity: maximum number of individuals an ecosystem can support
 - Determined by limiting factors
 - Carrying capacity for humans on earth is highly debated.
 - Innovation and technology
 - Rules other populations follow don't apply to us
- Cultural carrying capacity: the maximum number of people who could live in reasonable freedom and comfort indefinitely without decreasing the ability of the earth to sustain future generations.
 - What standard of living are we willing to accept?

Factors Affecting Growth

- When inputs into a system are larger than the outputs the system will grow
- Births, Deaths, Immigration and Emigration
 - Crude birth rate: births per 1000
 - Crude death rate: deaths per 1000
- Fertility Rates
 - Replacement level fertility (number to replace the parents)
 - Average 2.1-2.5 (babies dying before reproductive years)
 - Gauges changes in population size
 - Total fertility (estimate of average number of children born to women)
 - Lower in developed countries
 - US about 2.1
 - On average declining worldwide
 - China 1.5 TFR (one child policy)



21 Total Fertility Rates
Figure 4.5

Source: Data from Population Reference Bureau.
Jerome Fellmann, Arthur Getis, and Judith Getis, *Human Geography: Landscapes of Human Activities*, 4th ed. Copyright © 1995 Wm. C. Brown Publishers, Dubuque, Iowa. All Rights Reserved.

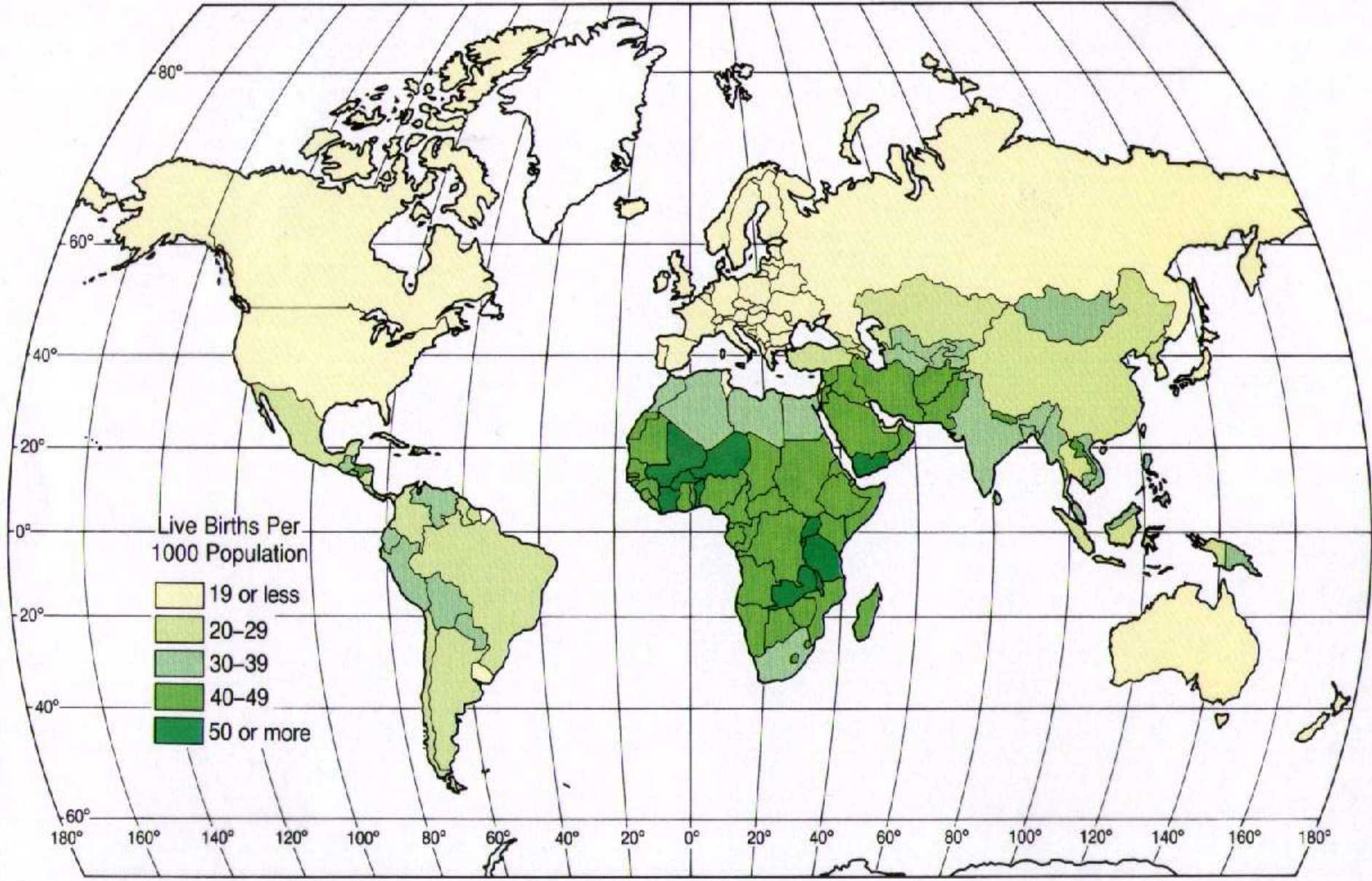


- What factors affect birth and fertility rates?

- Labor force
- Cost of raising and educating children
- Urbanization
- Infant deaths
- Education for women
- Marrying age
- Access to contraceptives

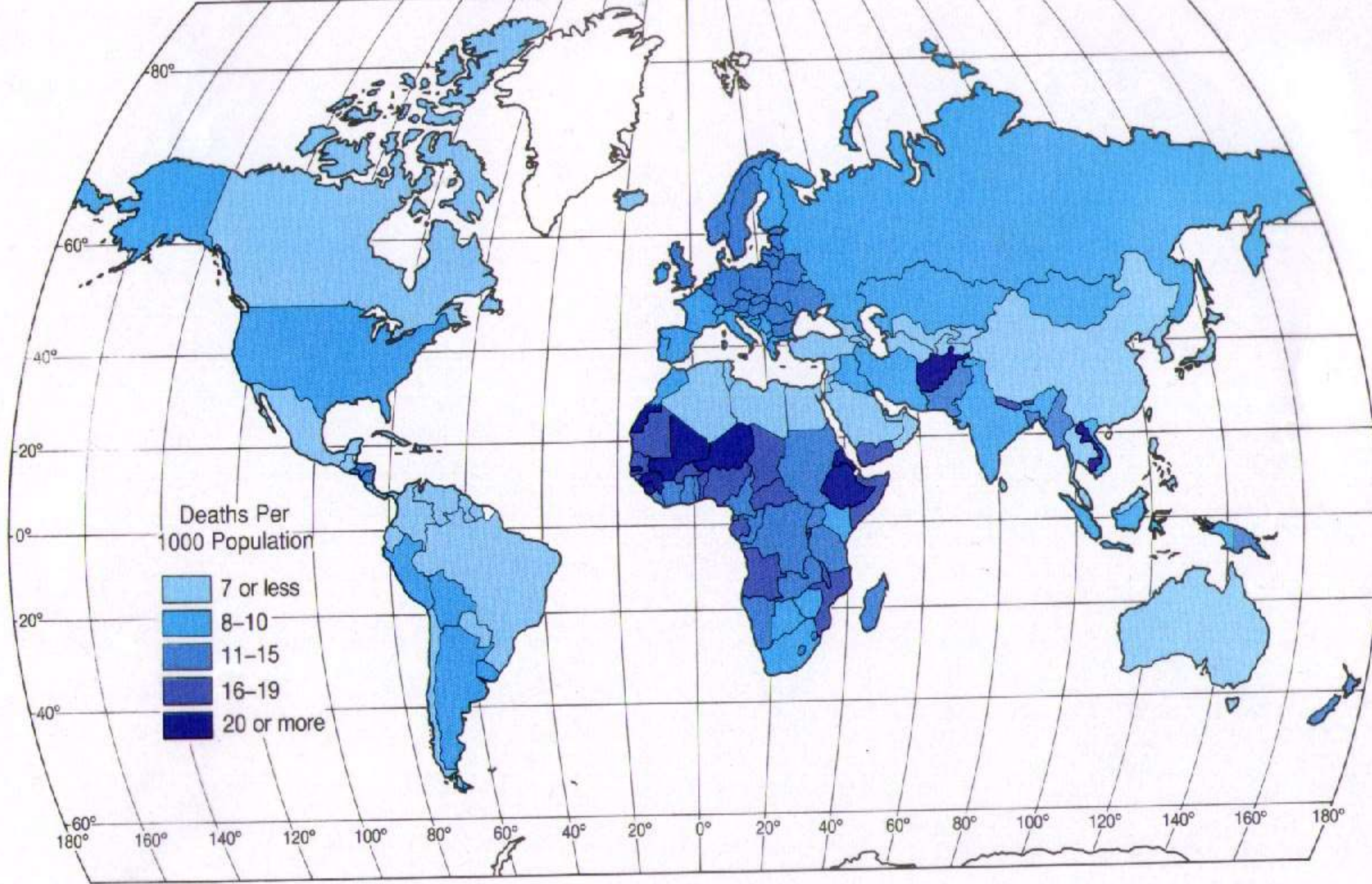
- What factors affect death rates?

- Access to nutrition, medical care, clean water
- Community support for elders
- Increased life expectancy
 - Usually higher for women
- Decrease in infant mortality



20 Crude Birth Rates
Figure 4.3

Source: Data from Population Reference Bureau.
 Jerome Fallmann, Arthur Getis, and Judith Getis. *Human Geography: Landscapes of Human Activities*, 4th ed. Copyright © 1995 Wm. C. Brown Publishers, Dubuque, Iowa. All Rights Reserved.

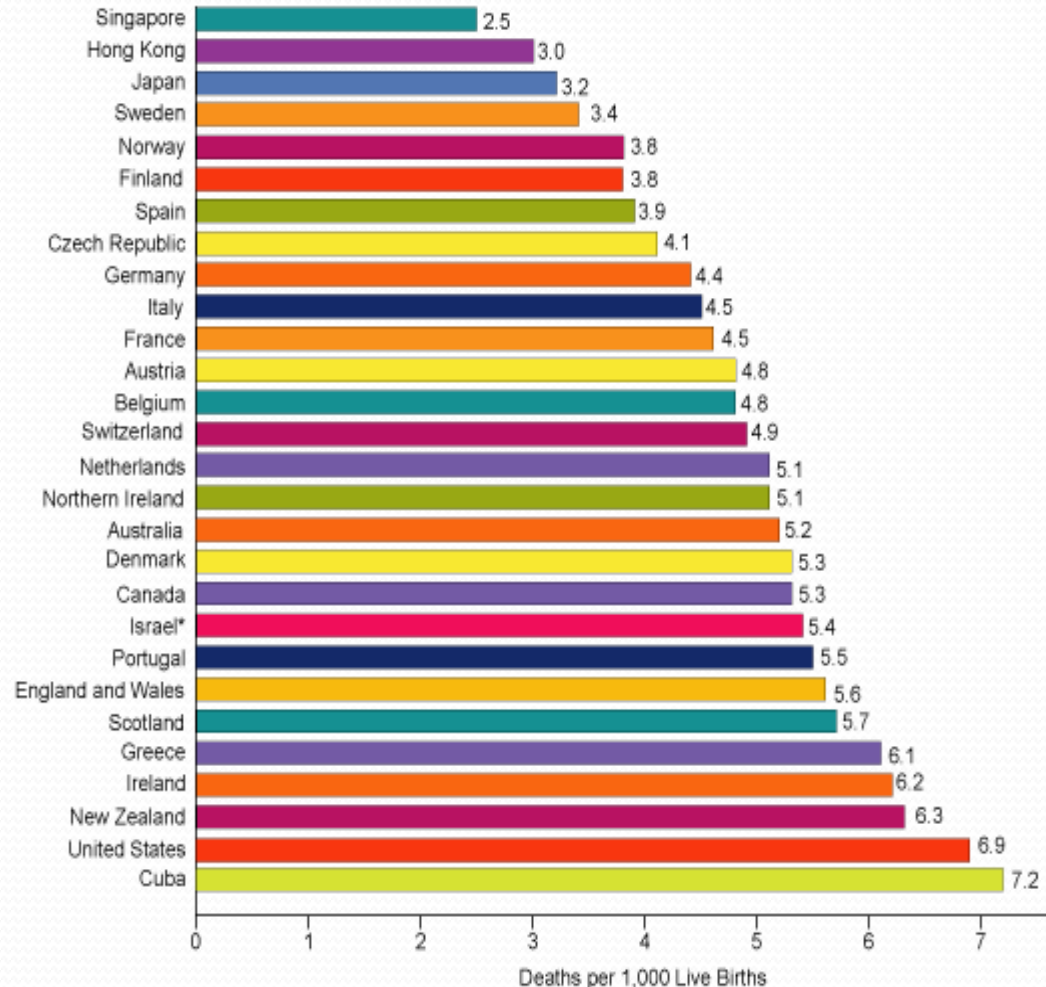


Infant Mortality

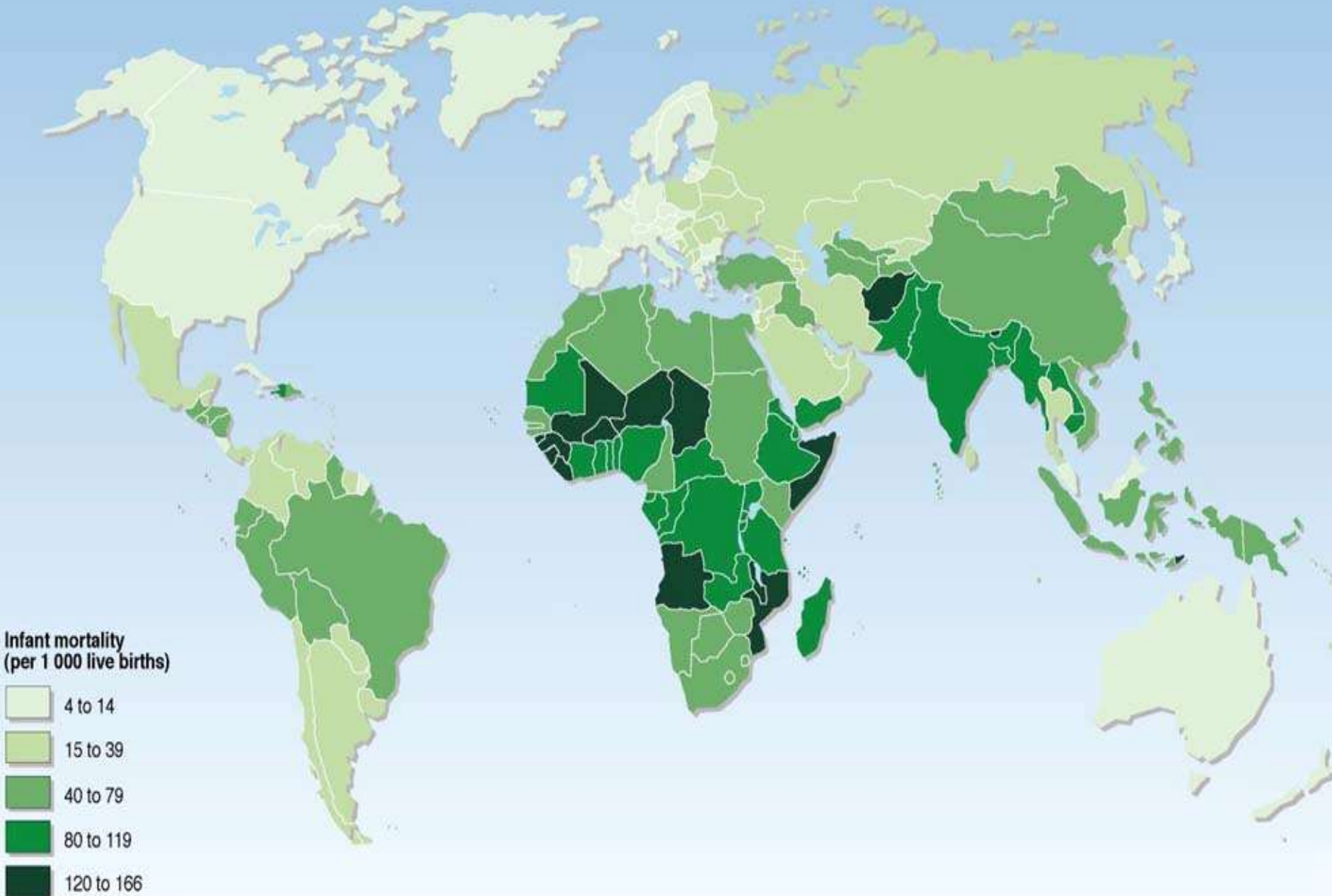
- Good measure of a nation's quality of life
- Measured as number of infant deaths per 1000 births
 - World average is 46
- 40 countries have a lower IMR than the US. Why?
 - Inadequate prenatal care, drug addiction, teenage pregnancies, socioeconomic variances

Comparison of International Infant Mortality Rates: 2000

Source (II.2): Centers for Disease Control and Prevention, National Center for Health Statistics



* Includes data for East Jerusalem and Israeli residents in certain other territories under occupation by Israel military for since June 1967.



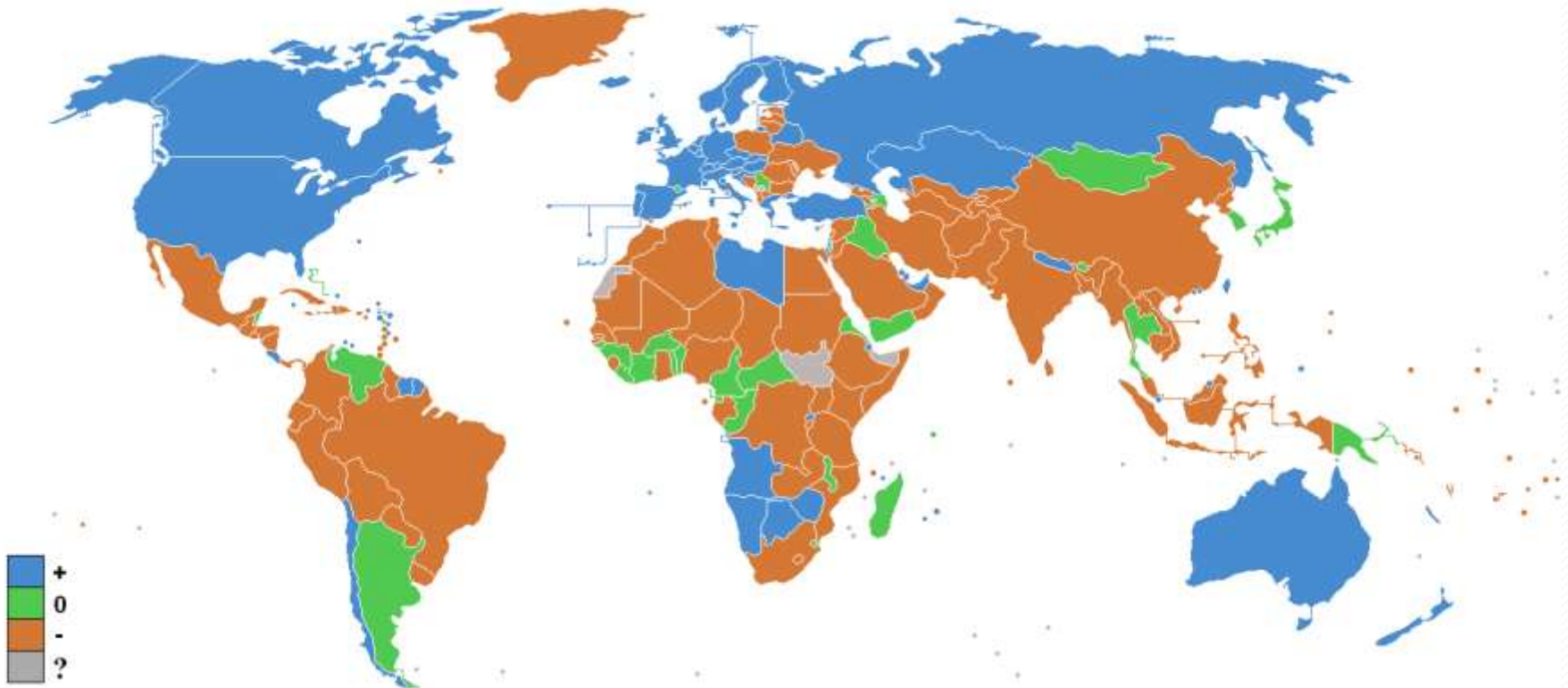
Infant mortality (per 1 000 live births)

- 4 to 14
- 15 to 39
- 40 to 79
- 80 to 119
- 120 to 166

Source : United Nations, 1995.

• Factors affecting Migration (immigration and emigration)

- Net Migration Rate: difference between immigration and emigration per 1000 people in a given year (only effects individual countries)
 - Better jobs and economic improvement
 - Religious, ethnic, or political conflicts
 - Lack of access to basic needs (food, water, etc.)
 - Environmental refugees



Exponential Growth Calculations

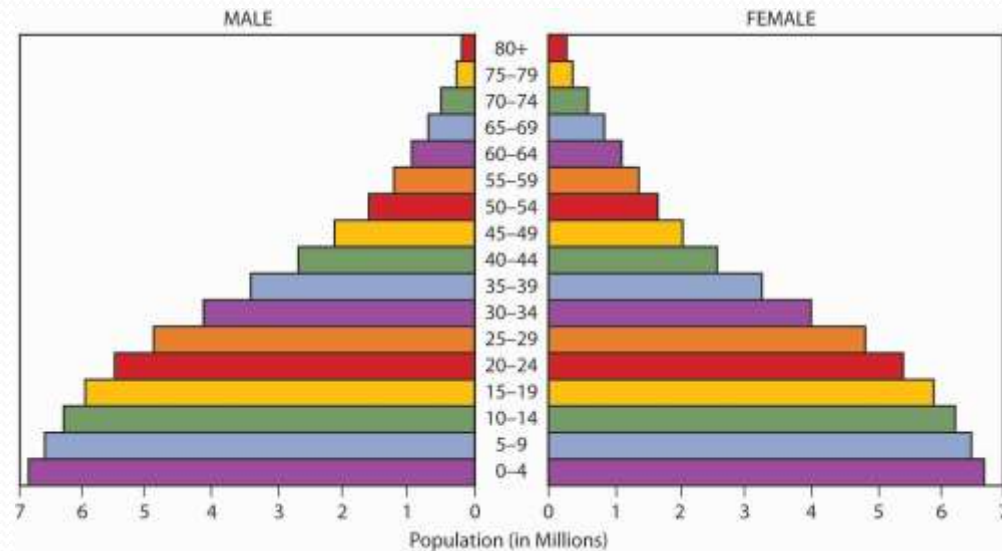
- Calculating and Predicting Rates of Growth—The Rule of 70
 - With populations that are growing exponentially we can use the rule of 70 to predict rates of growth and population doubling times.
 - ****Assumes growth rate is constant. Estimate only.****
 - Doubling time (dt) = $70 / \% \text{ growth rate}$
 - or
 - $\% \text{ growth rate} = 70 / dt$

Practice Problems

- If the starting population of 5 rabbits grows at 2% each year, how long will it take the population to double?
- If the doubling time for a population is 7 years what is the growth rate over this time period?

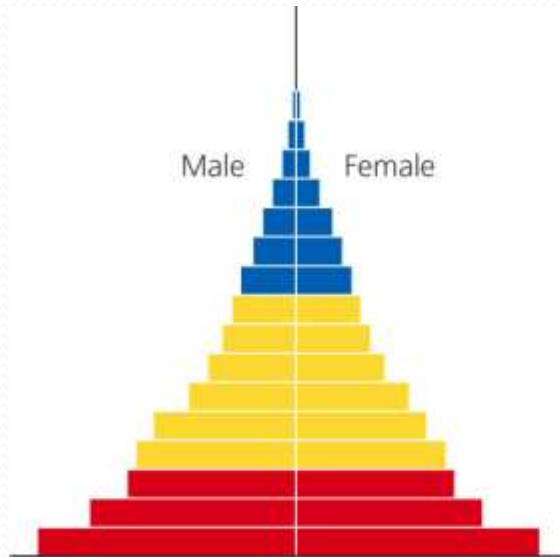
Population Pyramids

- Graph (histogram) that allows us to see the population growth within a country broken down by age groups and gender
 - horizontal axis: gender
 - male: left-hand female: right-hand
 - absolute number of people or %
 - vertical axis: age
 - 5-year or 10-year age groups
- Ages categorized as...
 - Pre-reproductive: ages 0-14
 - Reproductive: ages 15-44
 - Post-reproductive: ages 44+



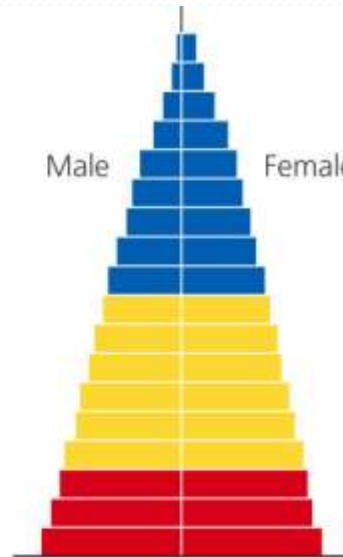
Population Pyramids

- We classify our pyramids based on the shape they take.
 - Rapidly Growing: large amounts of people in the pre-reproductive and reproductive years
 - Very large bottom of the pyramid
 - Growing Slowly: more individuals in the pre-reproductive and reproductive years
 - Bottom of pyramid is slightly larger than the rest
 - Stable (zero population growth): population is evenly distributed throughout age groups
 - Pyramid is relatively even top to bottom
 - Declining (negative growth): more individuals in the post-reproductive age groups
 - Bottom of pyramid is smaller than the top



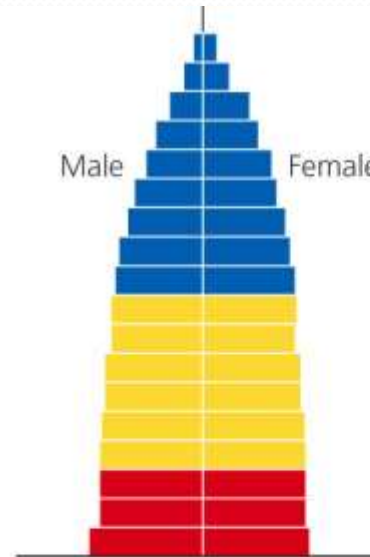
Expanding Rapidly

Guatemala
Nigeria
Saudi Arabia



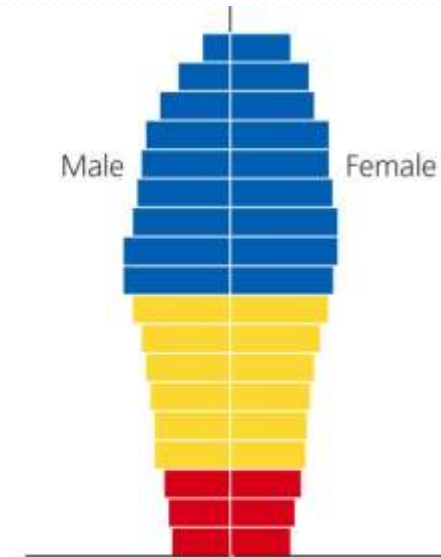
Expanding Slowly

United States
Australia
China



Stable

Japan
Italy
Greece



Declining

Germany
Bulgaria
Russia

■ Prereproductive ages 0–14

■ Reproductive ages 15–44

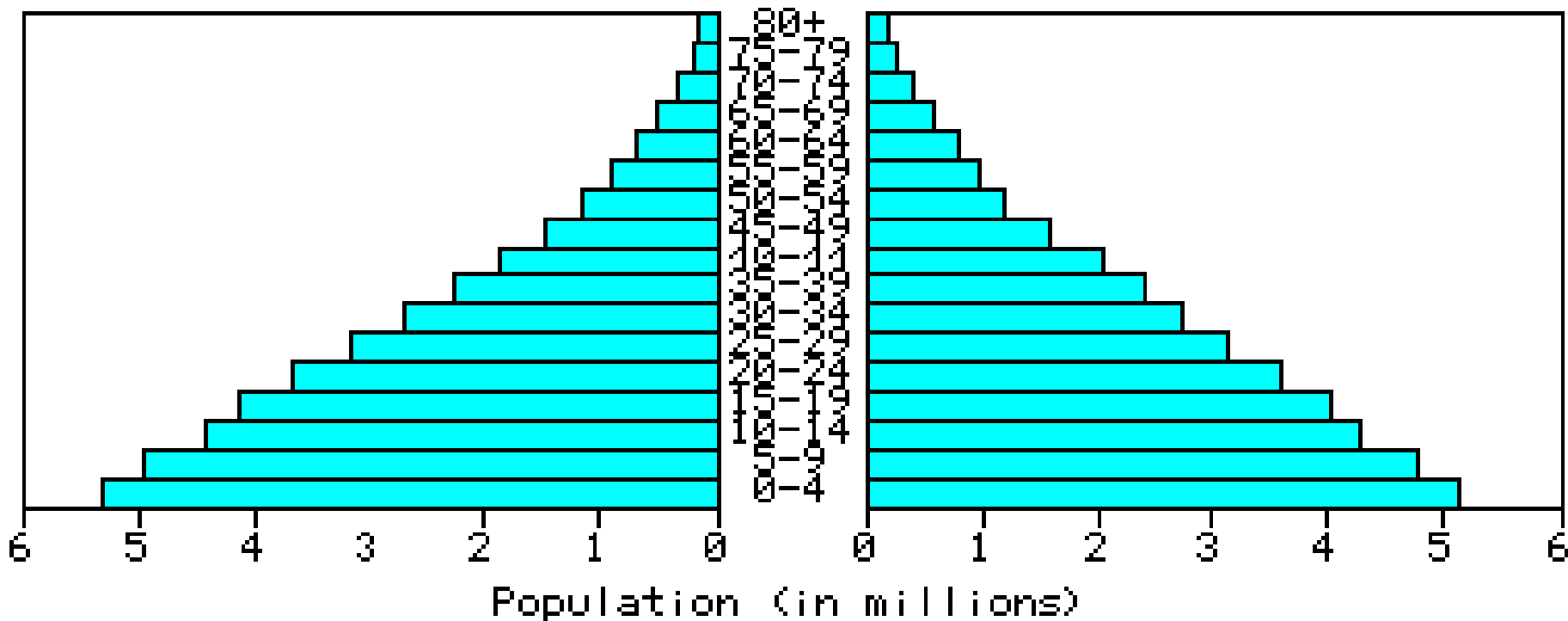
■ Postreproductive ages 45–85+

Rapid Growth

Philippines: 1997

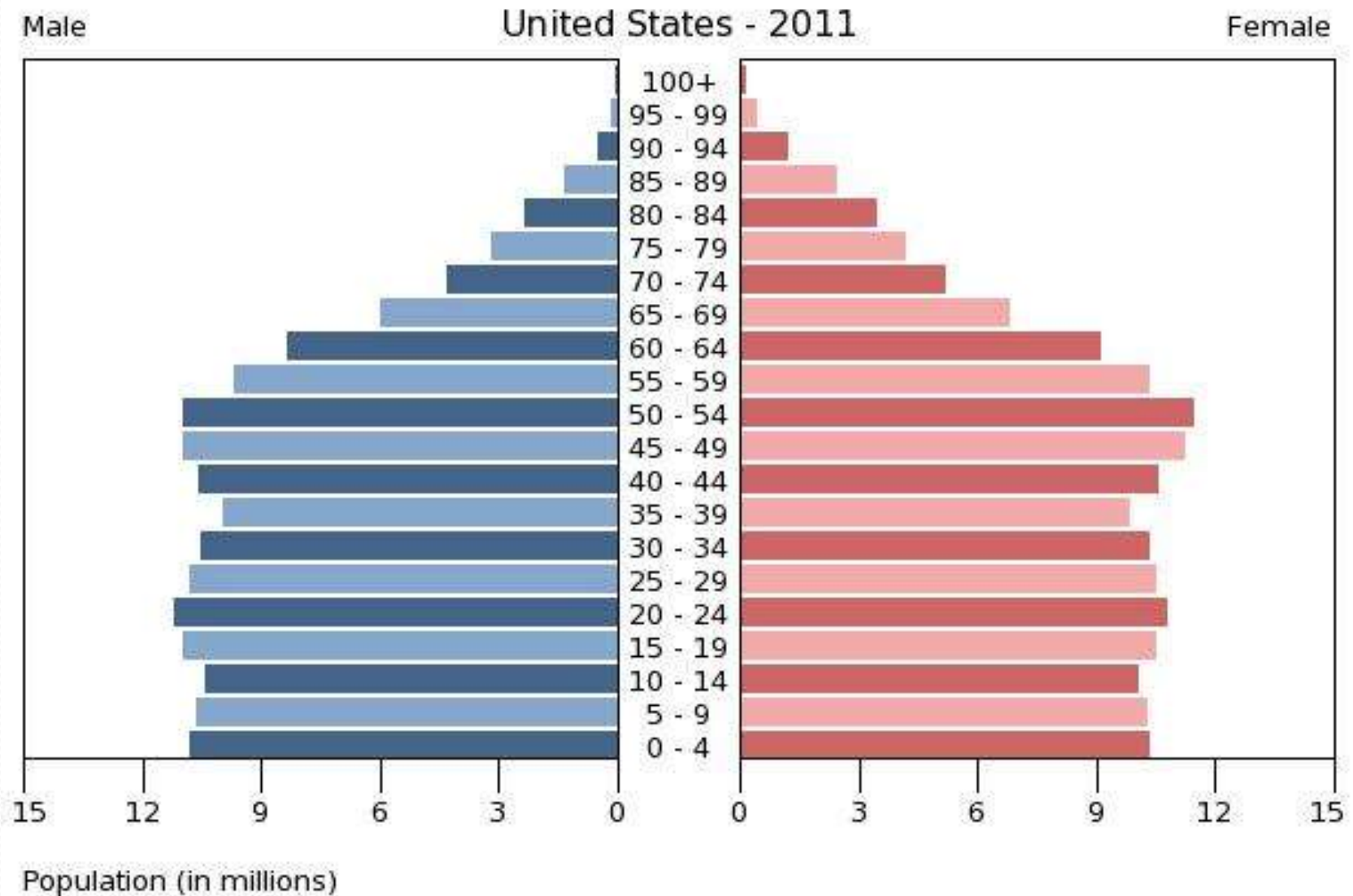
MALE

FEMALE

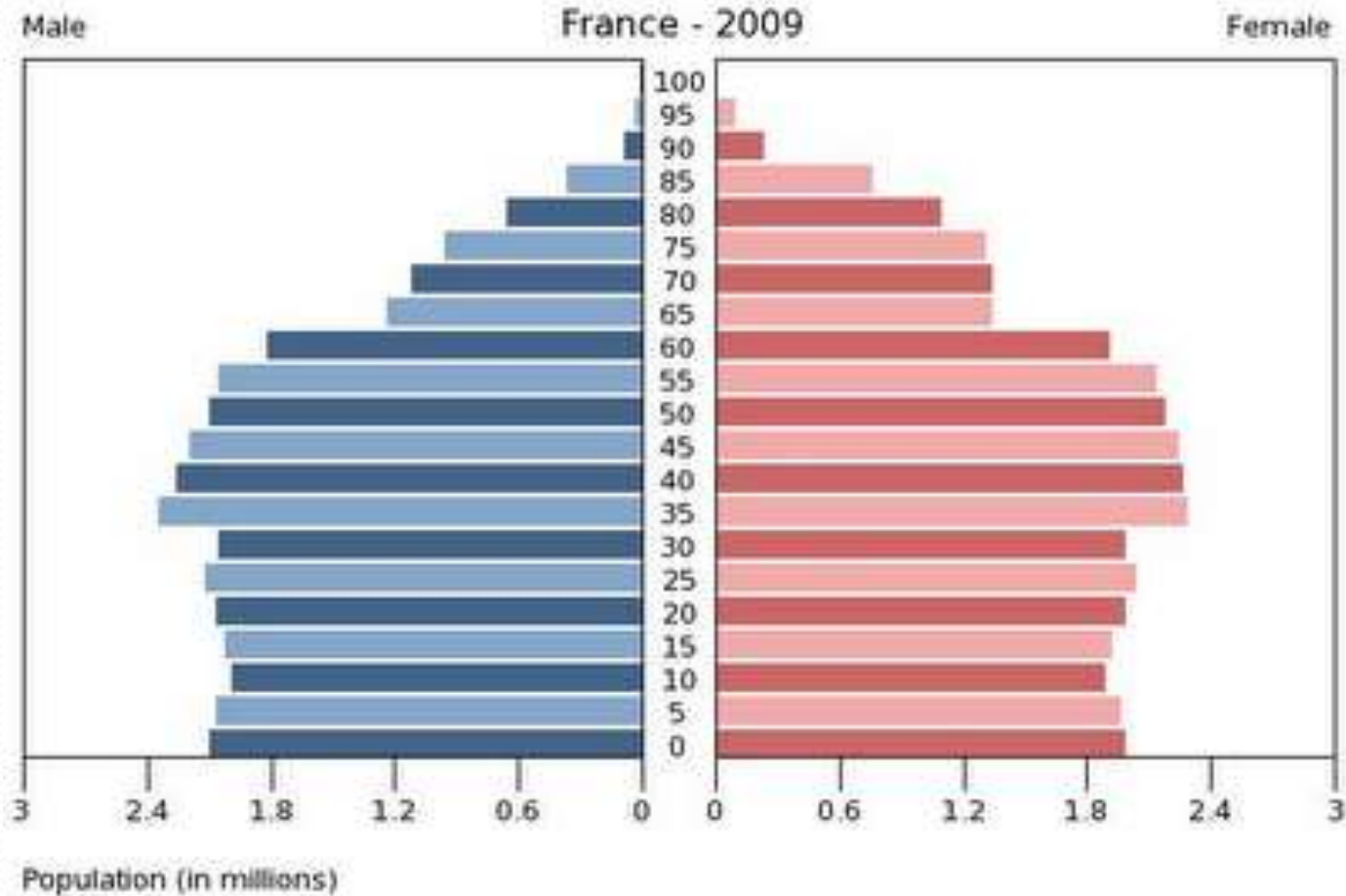


Source: U.S. Census Bureau, International Data Base.

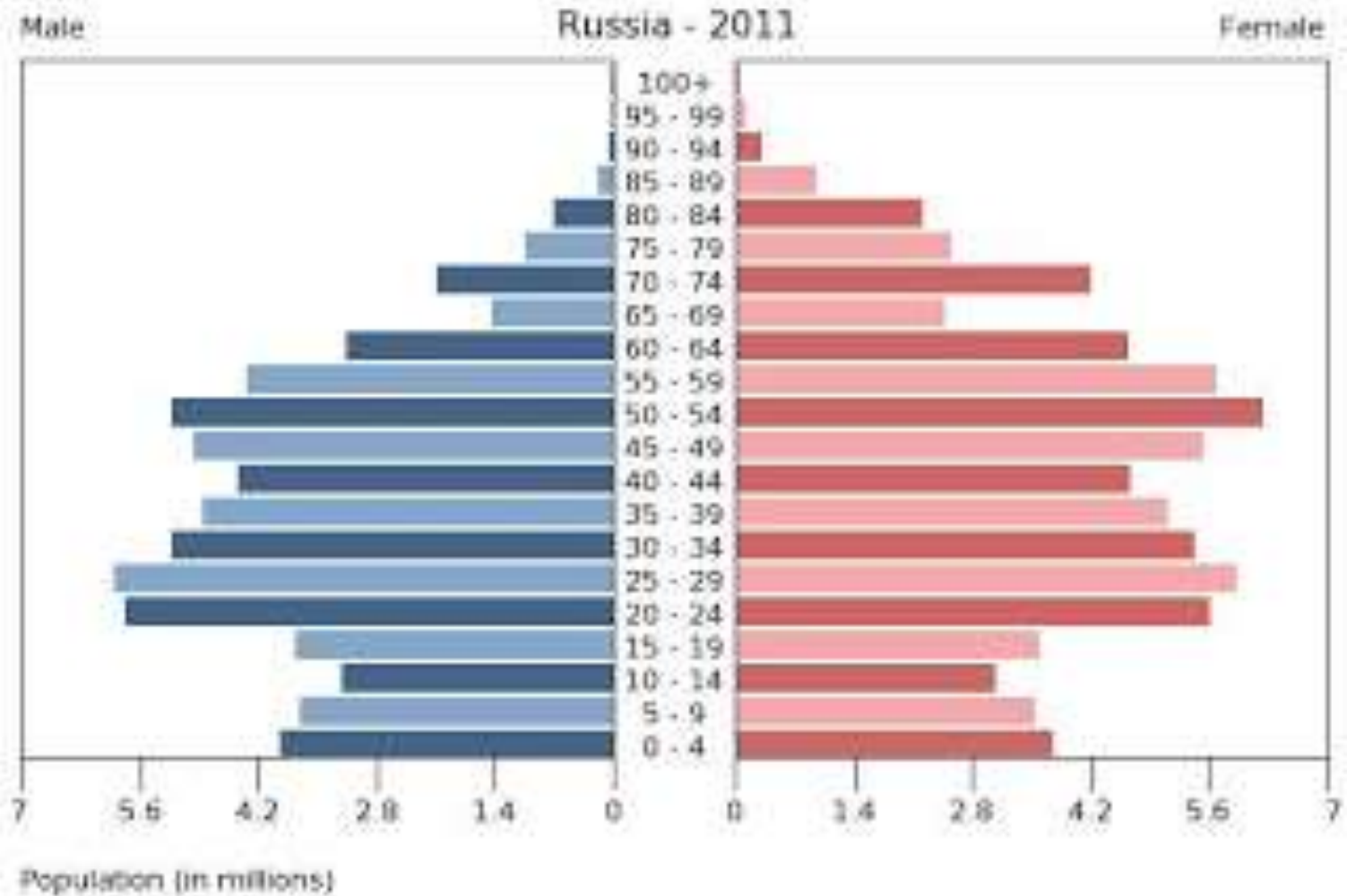
Expanding Slowly



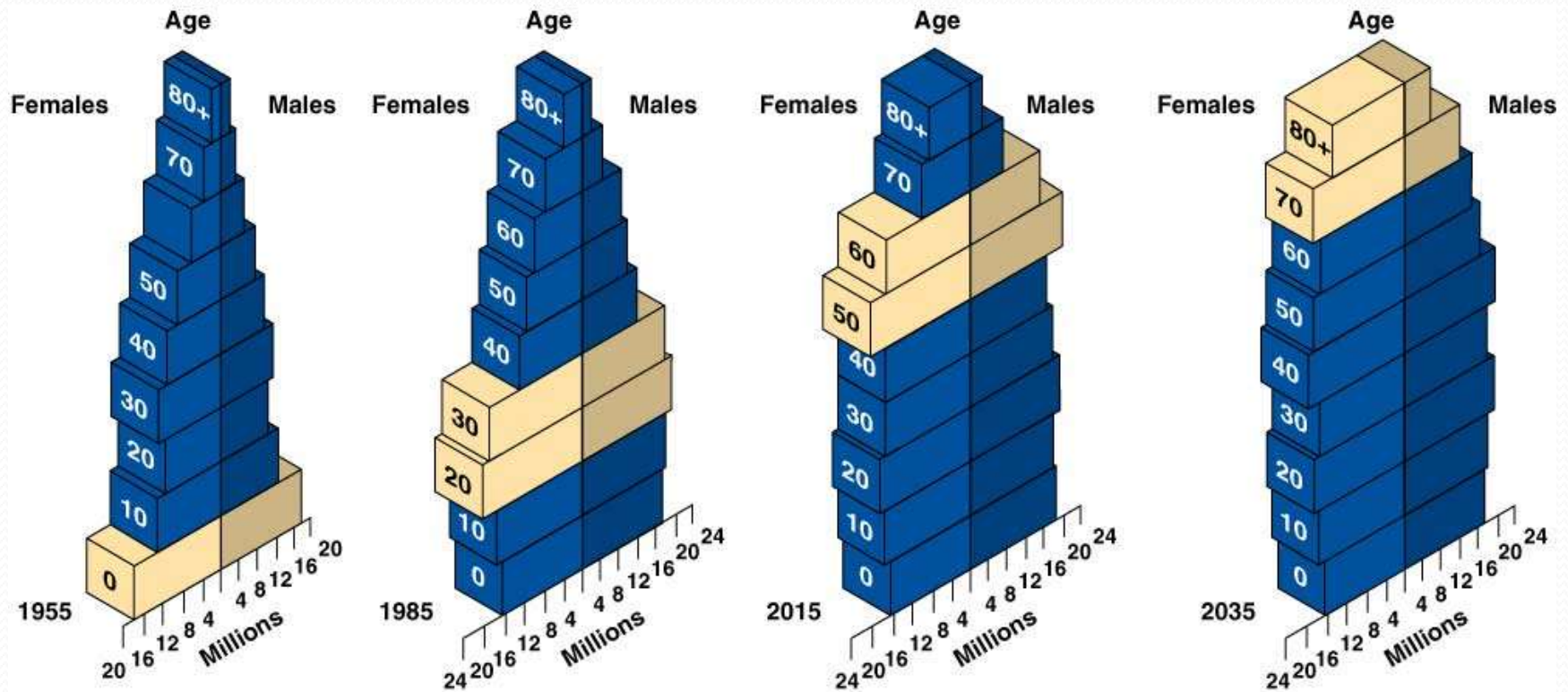
Stable—Zero Population Growth



Declining

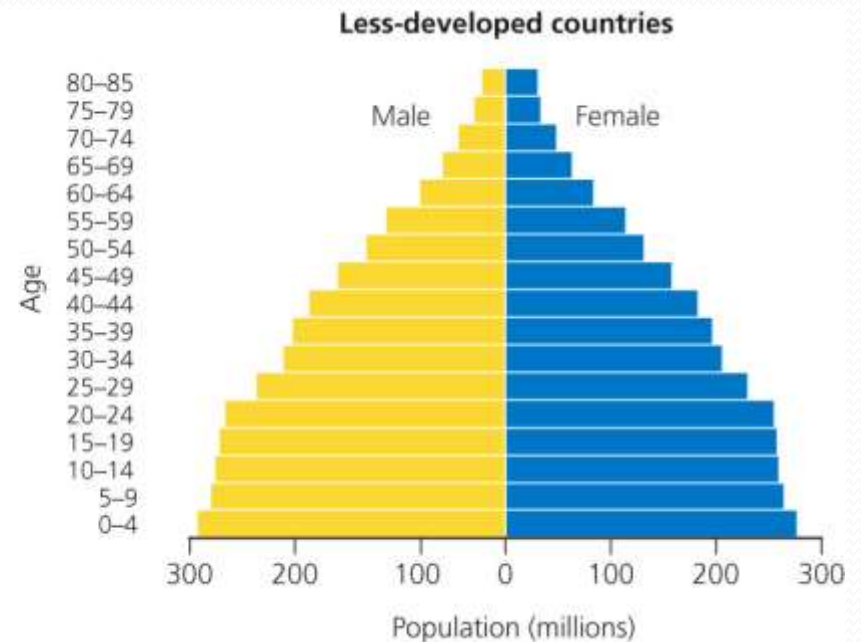
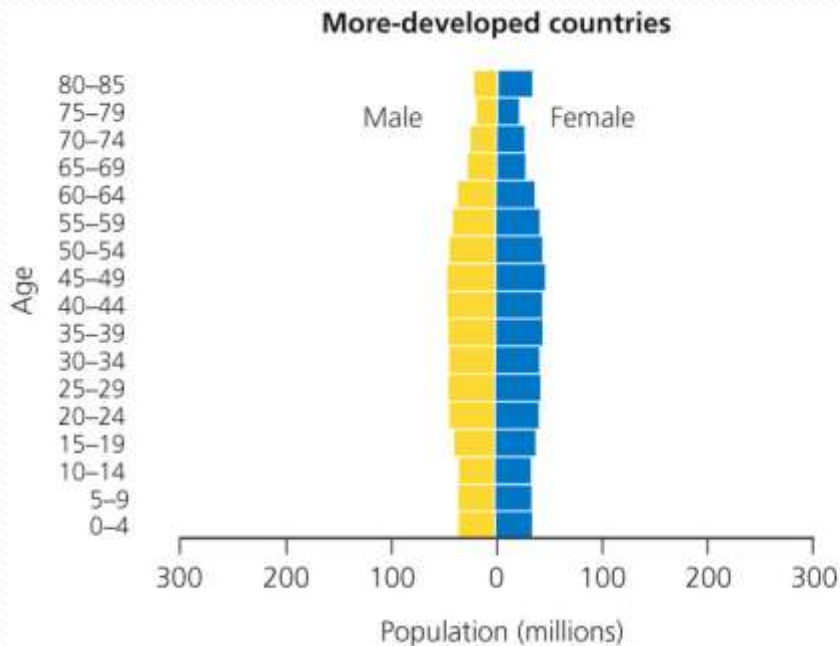


The US Baby Boom.



Population Pyramids

- We also see differences based on economics. Is the country developed or developing?
- Allows us to project future growth based on age structure.

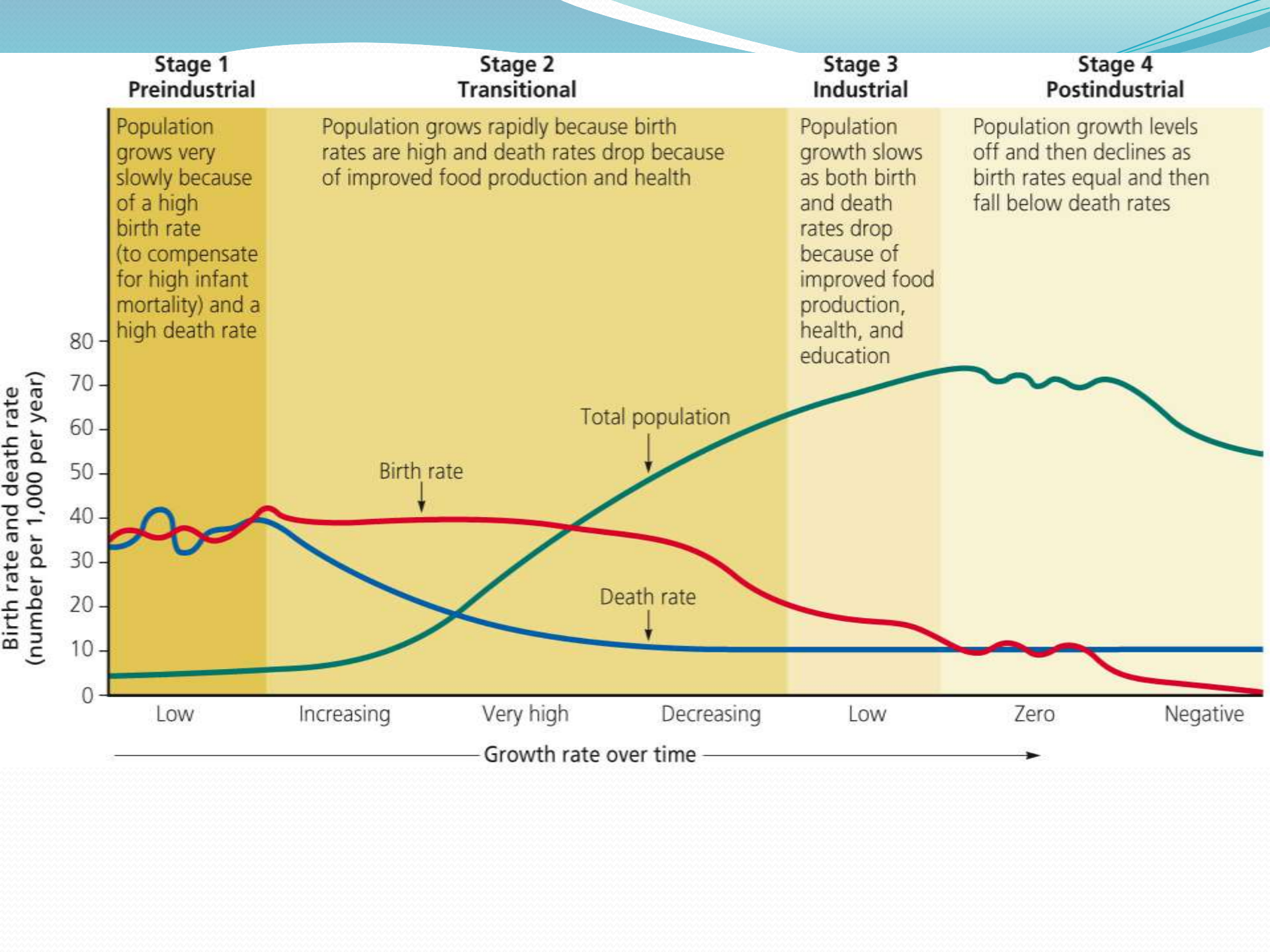


World Population Pyramid

- Using the data for the total population of the world (from 2010), construct an age structure pyramid. We will use this as a reference for other countries we discuss.
 - You will first need to convert the numbers into percentages for both males and females.
 - Divide the number in each category by the total population.
- When finished with world pyramid, grab individual country pyramid and answer comparison questions.

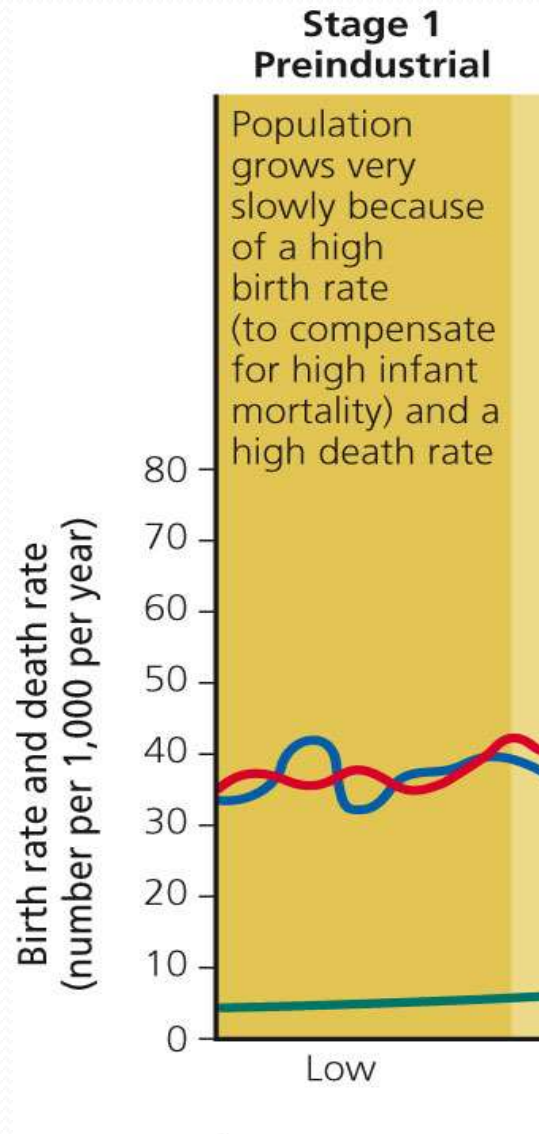
Demographic Transition

- Movement of a nation from high population growth to low population as it develops economically (from subsistence economy to affluence).
 - Traced through graphs of a population change over time (birth rates and death rates)
 - Illustrates how countries will influence the environment as they transition
 - most countries will go through this transition in the next few decades due to technological and economic development
- Transition as a result of five stages
 - Stage 1—Birth and death rates are both high
 - Stage 2—Death rates fall; birth rates remain high; growth rate rises
 - Stage 3—Birth rates fall as standard of living rises; growth rate falls
 - Stage 4 and 5—Growth rate continues to fall to zero or to a negative rate



Stage 1

- high birth rates, high (at time erratic) death rates, low growth rates, low total population
- stage for much of human history, traditional societies
- practically no country today

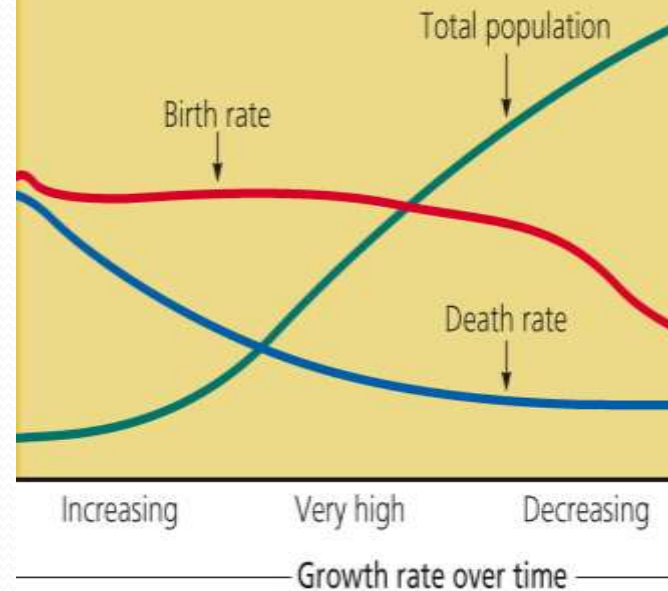


Stage 2

- high birth rates, declining death rates, rising growth rates
- improvements in sanitation (water) and medicine
- “developing countries”
- much of Africa today, some countries of Asia (Afghanistan, Nepal, etc.)

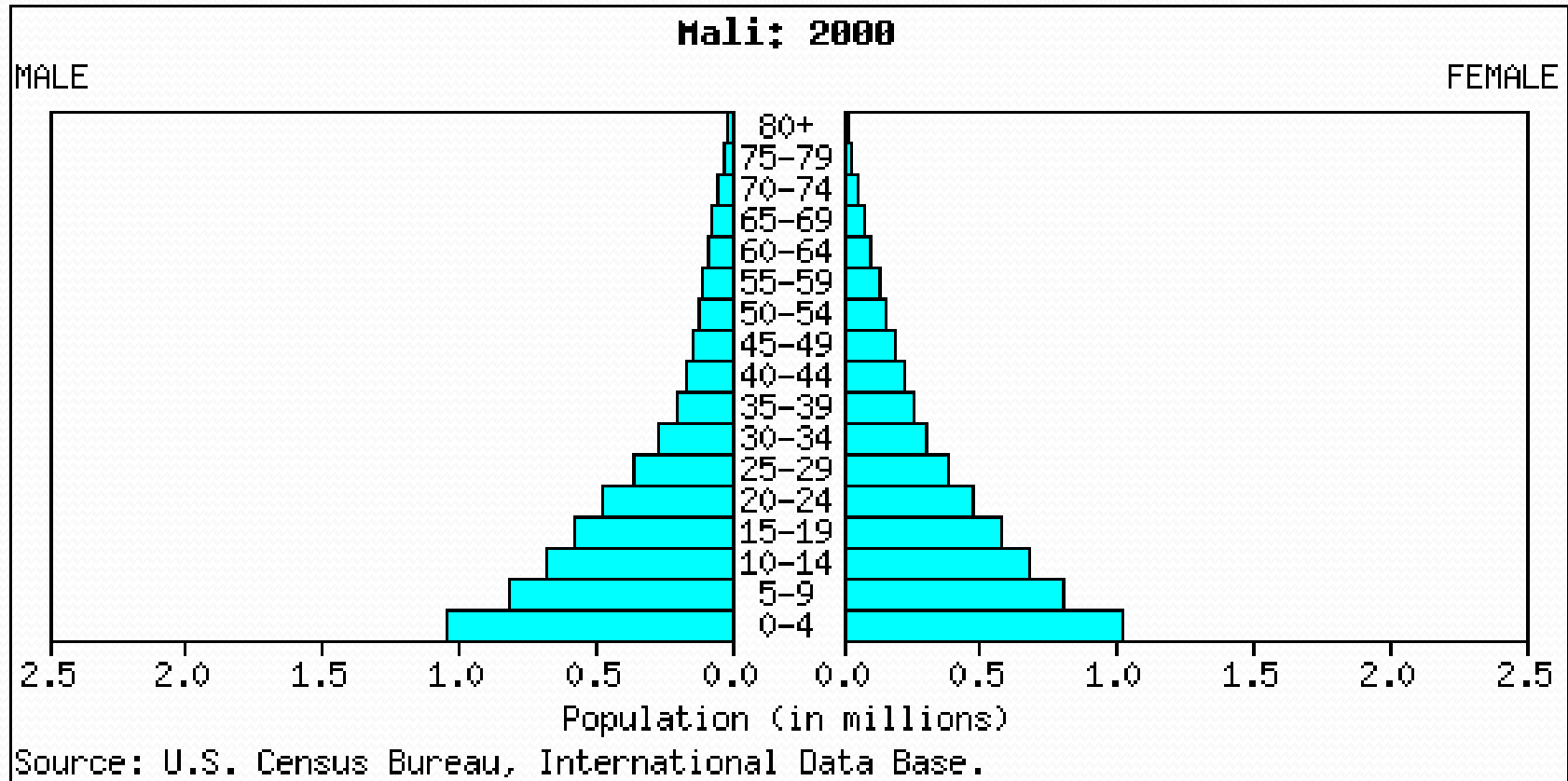
Stage 2 Transitional

Population grows rapidly because birth rates are high and death rates drop because of improved food production and health



Population Pyramid and Demographic Transition

- **Stage 2: wide base**
- stage 3: wide middle
- stage 4: slender
- stage 5: narrow base

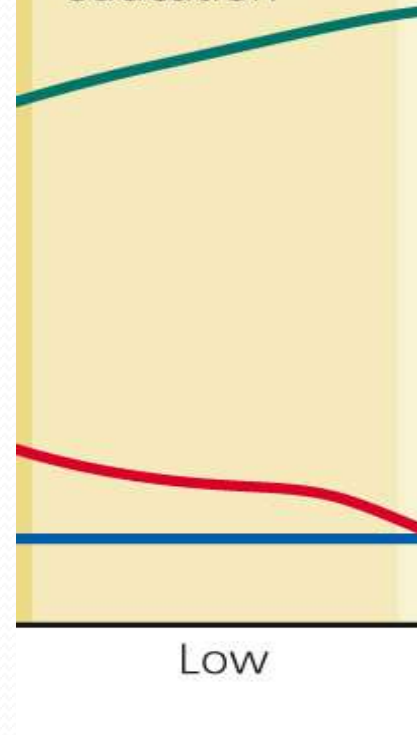


Stage 3

- continued decline of death rates, declining birth rates, growth rates decline from high to lower levels
- “moderately developed countries”
- economic change: urbanization (incentive to have fewer children)
- Mexico today

Stage 3 Industrial

Population growth slows as both birth and death rates drop because of improved food production, health, and education

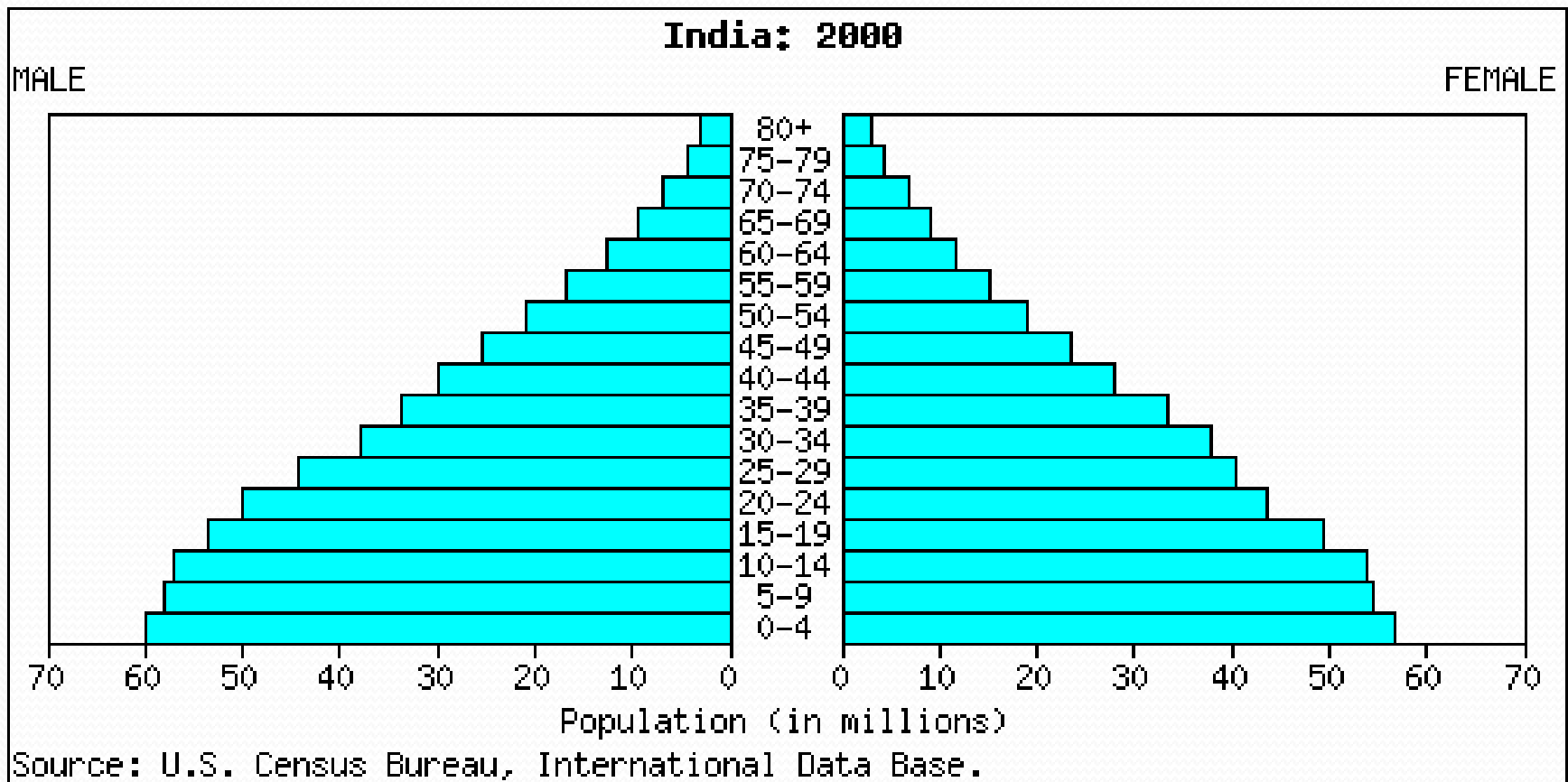


Population Pyramid and Demographic Transition

- Stage 2: wide base

- **stage 3: wide middle**

- stage 4: slender
- stage 5: narrow base

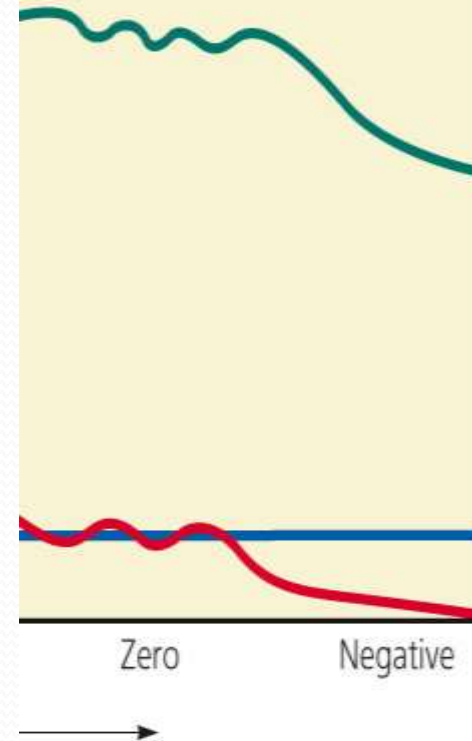


Stage 4 & 5

- Stage 4: low birth rates, low death rates, low growth rates
 - United States today
- Stage 5: low birth rates, rising death rates, declining growth rates (if birth rates drop below death rates: negative growth rates)
 - several countries of Europe today (Austria)

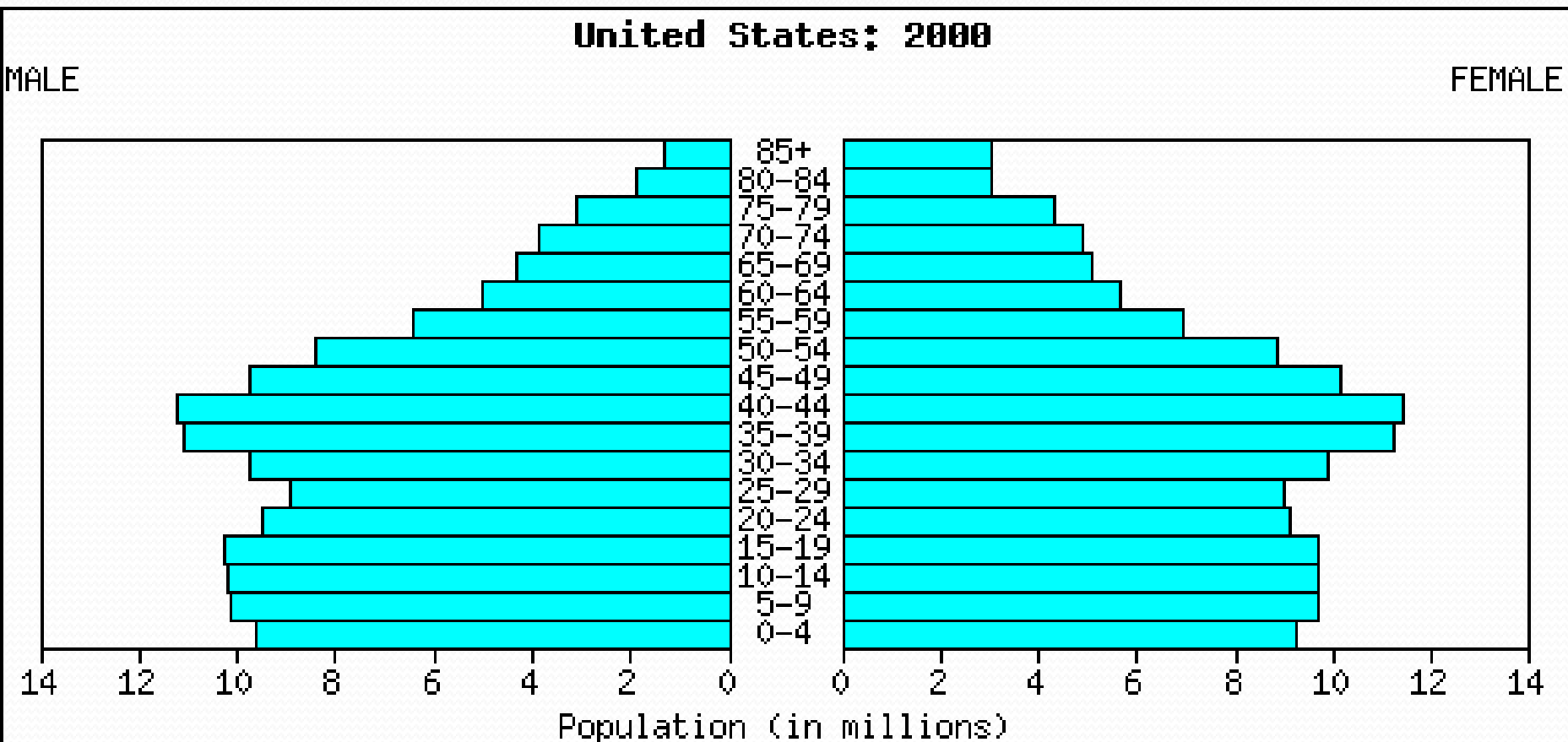
Stage 4 Postindustrial

Population growth levels off and then declines as birth rates equal and then fall below death rates



Population Pyramid and Demographic Transition

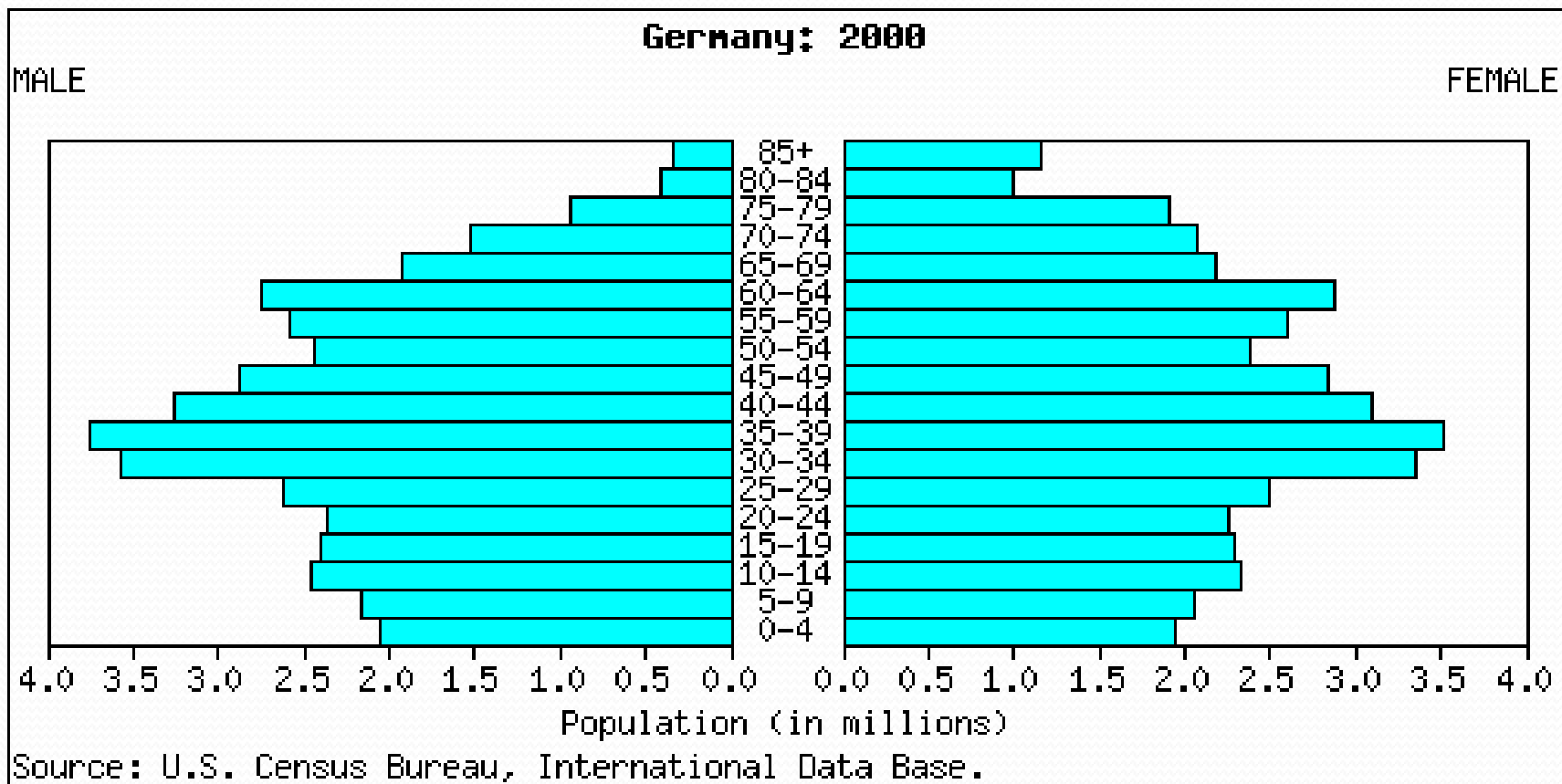
- Stage 2: wide base
- stage 3: wide middle
- **stage 4: slender**
- stage 5: narrow base



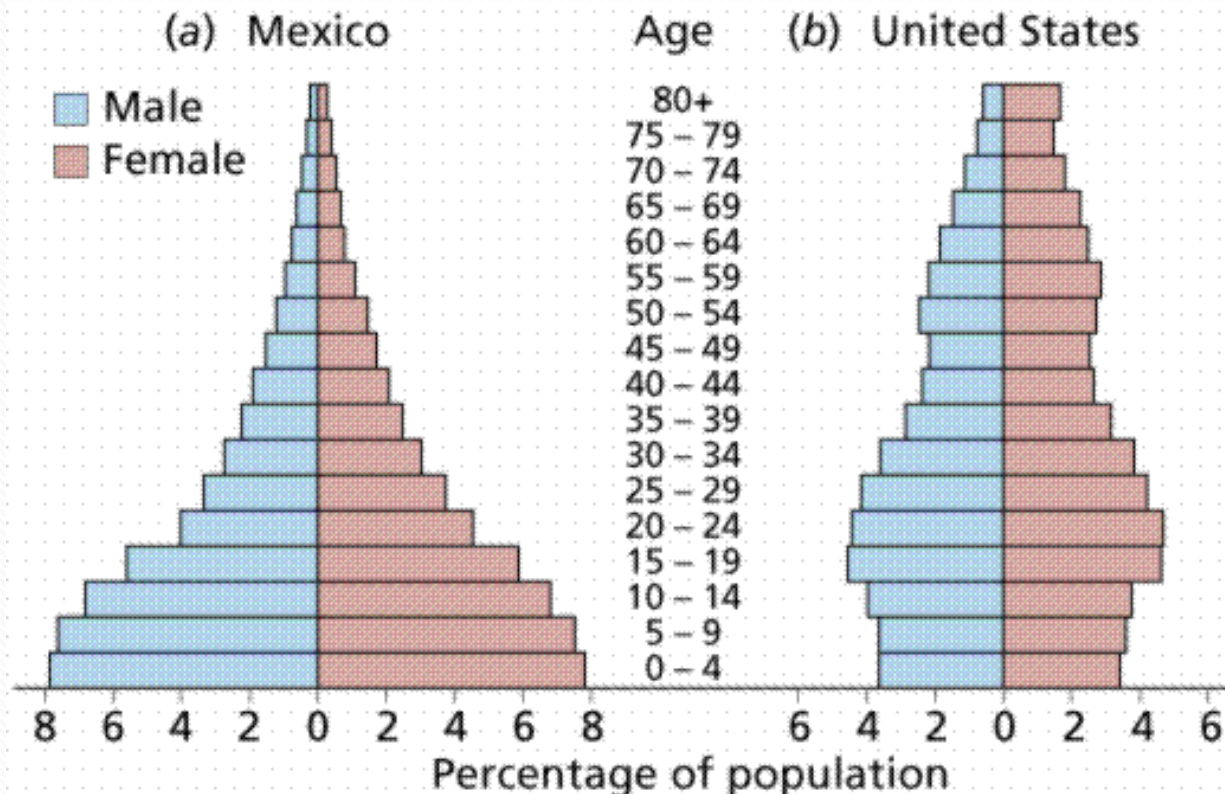
Source: U.S. Census Bureau, International Data Base.

Population Pyramid and Demographic Transition

- Stage 2: wide base
- stage 3: wide middle
- stage 4: slender
- **stage 5: narrow base**



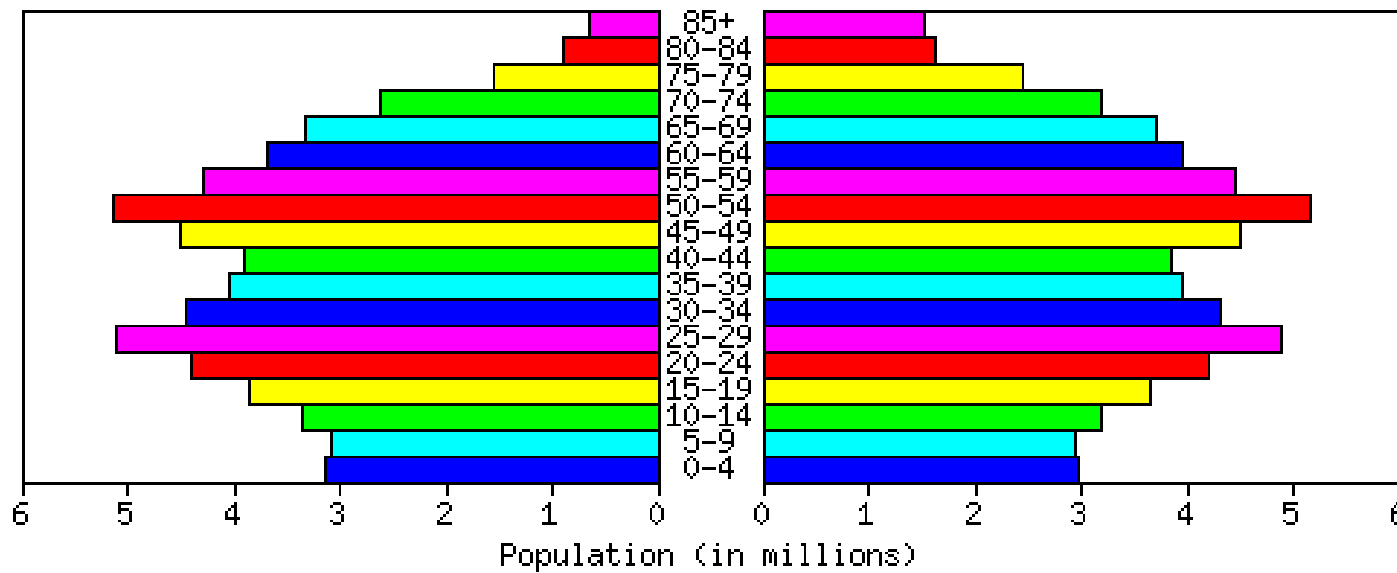
- by comparing age structure diagrams between countries it is possible to infer social changes that occurred within the country and predict future population changes



Japan: 2000

MALE

FEMALE

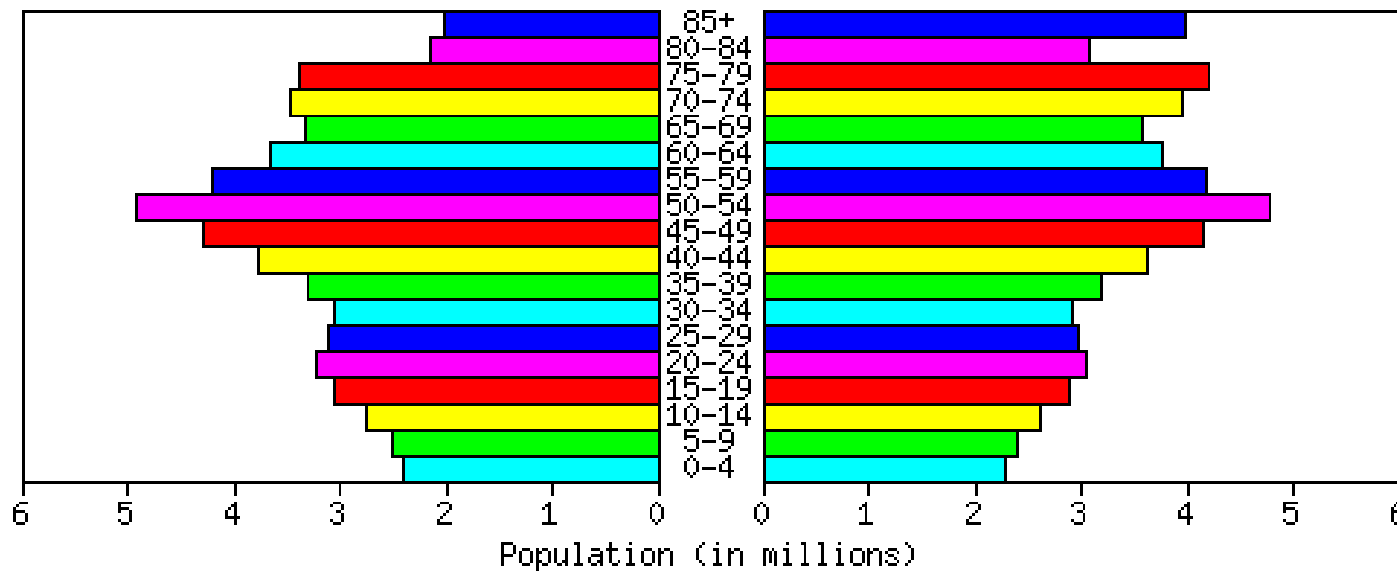


Source: U.S. Census Bureau, International Data Base.

Japan: 2025

MALE

FEMALE



Source: U.S. Census Bureau, International Data Base.

Male

Qatar - 2012

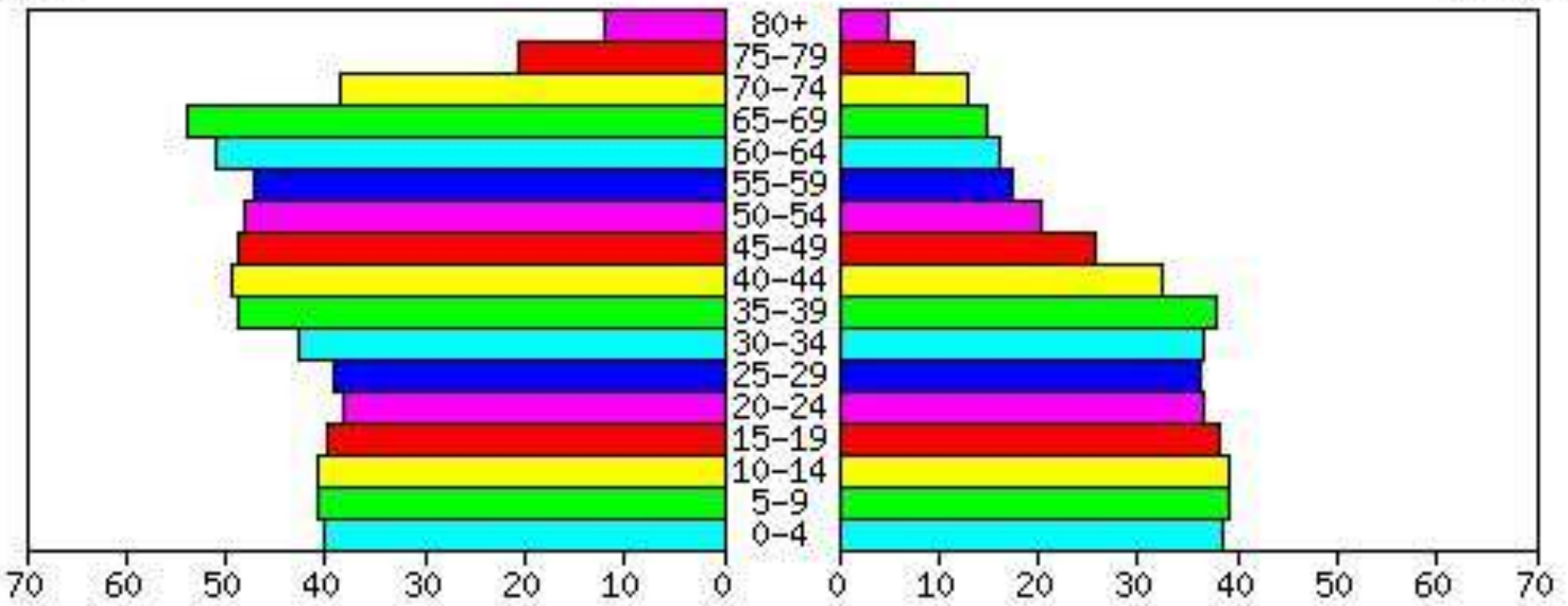
Female

	100+	
	95 - 99	
	90 - 94	

Qatar: 2025

MALE

FEMALE



Population (in thousands)

Source: U.S. Census Bureau, International Data Base.

Population (in thousands)

Age Group

Population (in thousands)

Solutions for slowing population growth

- economic development
 - reduction of poverty
 - Education
- family planning
 - reproductive health care
- empowering women

economic solutions—get people out of poverty.

- “failing states”- rapid population growth, extreme poverty and environmental degradation leads to the government no longer ensuring the personal security of their people and they can’t provide basic services. Leads to people perpetually trapped in poverty.
 - civil war and terrorism are common
 - low income, less developed
 - lack of skilled workers, financial capital
 - stuck in stage 2 of transition
- ex. Somalia, Haiti

empowering women

- women will have fewer children if they are educated, can control their own fertility, and earn an income of their own
 - Microloans for skilled trades (weaving, sewing, etc.) to earn income
- in many societies women have fewer rights and educational and economic opportunities
 - patriarchal societies (sons valued)--India
 - women account for 66% of all hours worked but only 10% of income earned (worldwide)

family planning

- helps couples choose how many children to have and when to have them
 - educating men and women
- birth spacing, birth control, health care for women and infants
 - the older a woman is when she has her first child will decrease the total number of children
- reduces number of pregnancies and abortions (major decrease in TFR)
- lack of access to services hinders efforts

Problems with a growing population

- “graying of a population” (Japan)
 - Characteristic of highly developed countries
 - Women choosing not to have children..pursue career instead
 - who will care for the elders?
 - income to provide for social services
 - economic impacts (smaller workforce)
 - some countries providing incentives to have more children (Europe)
- may be balanced out with a large number of immigrants

Impacts

- Developed and Developing countries have different impacts
 - most of the world lives in developing countries, but developed countries consume more resources
 - ecological footprints and wealth gap
 - Affluence
- Measure Impact using IPAT equation
 - $\text{Impact} = \text{population} \times \text{affluence} \times \text{technology}$
- As a population grows resources need to be available to meet the needs of the people
 - land use (housing and agriculture)
 - Sanitation and health care
 - Access to clean water