

# CHE 110: Environmental Studies

## Unit - 1

### INTRODUCTION TO ENVIRONMENTAL STUDIES

#### *Unit: 1\_Lecture: 4\_CHE110\_VK*



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# Land degradation



Any change in the condition of natural fertility of the land which reduces its productive potential. In other word

## ***Causes of Land degradation***

### **❑ Natural factors**

- Heavy rains
- High speed wind and storms
- Natural disasters like earthquakes ,floods, prolonged drought, etc.

### **❑ Anthropogenic factors:**

Biophysical environment is affected by a combination of human-induced processes

- Mining.
- Urbanization
- The indiscriminate and uncontrolled removal of trees
- Excess use of fertilizers
- industrial discharges
- Overgrazing, soil erosion ,etc..

- Soil erosion is removal of top soil from its resting place to another place
- It can be defined as “the detachment and transport of the fertile layer of soil by water or air.”
- It is also known as the creeping death of land.
- Resulting the loss of fertility of soil because it is the top soil layer which is fertile.

## Normal erosion or geologic erosion:

Gradual removal of top soil by natural processes which bring equilibrium between physical, biological and hydrological activities and maintain a natural balance between erosion and renewal.

## Accelerated erosion:

Anthropogenic (man-made) activities and the rate of erosion is much faster than the rate of formation of soil.

Overgrazing, deforestation and mining are some important activities.

# Climatic Factor of Soil Erosion



## ❑ Water induced soil erosion

**Sheet erosion:** Uniform removal of a thin layer of soil from a large surface area due to run-off water



**Rill erosion:** Rapidly running water due to heavy rainfall produces finger-shaped grooves or rills over the area.



**Gully erosion:** Due to very heavy rainfall, deeper cavities or gullies are formed in the shape of U or V. It's more prominent type of soil erosion





## ❑ Water induced soil erosion

**Slip erosion:** Mainly found on slopes of hills and mountains due to heavy rainfall

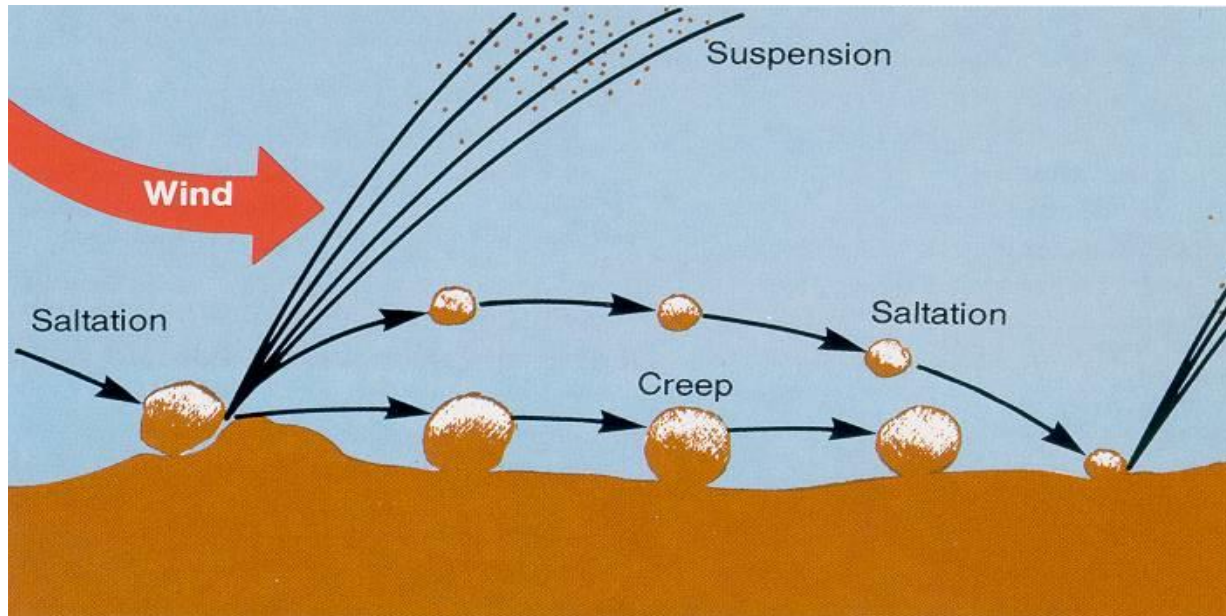


**Stream bank erosion:** In heavy raining session the fast running stream take a turn in another direction, cut the soil and make a cave in the banks



## ❑ Wind Induced Soil erosion:

- ✓ **Suspension:** Fine soil particles ( $<1$  mm diameter) which are suspended in the air are kicked up and taken away to distant places.
- ✓ **Saltation:** Light soil particles ( $>1$  mm and  $< 2$  mm in diameter) move up in vertical direction due to power of stormy wind.
- ✓ **Surface creep:** Larger particles (5-10 mm diameter) creep over the soil surface along with wind.



- ❑ Excessive grazing, mining and deforestation
- ❑ The top soil is disturbed or rendered devoid of vegetation cover.
- ❑ The land is directly exposed to the action of various physical forces.
  - Deforestation is the permanent destruction or removal of forests in order to make the land available for other uses
- ❑ Thereafter converted land would not be usable for forestation.
- ❑ Uncovering of land from forest the top soil available for erosion



# Effects of Soil Erosion

- ✓ Decrease in productivity of land
- ✓ Desertification of land
- ✓ Reduction in the agricultural land at the banks of rivers
- ✓ Deposition of soil in river beds and canals causing diversion of their natural flow and hence leading to disasters





# Methods of Controlling Soil Erosion



**Reduce Tillage.** Tillage is the agricultural preparation of soil by mechanical agitation of various types, such as digging, overturning.

- **Contour farming** is the farming practice of planting across a slope following its elevation contour lines
- **Strip farming** is defined as alternating crop rows between heavy-rooted plants and loosely-rooted plants to minimize erosion.
- **Terrace cultivation** is method of growing crops on sides of hills or mountains by planting on graduated terraces built into the slope.



- **Alley Cropping:** Crops are planted between rows of trees



- **Wind Beaks or shelterbelts:** Trees are planted in long rows along with the cultivated land boundaries



- *Forest* is a biotic community with a predominance of trees
- it is an important renewable resource.
- Forests restore oxygen in our atmosphere through photosynthesis and
- Forests also provide solvents, medicines, fuels, and many other products that are important for our health and comfort.
- India is rich in forest resources with a great diversity of flora and fauna.





# Benefits



- ✓ Forests help in minimizing natural hazards.
- ✓ They help in reducing soil erosion and siltation of downstream water bodies.
- ✓ They help in reducing desertification and land degradation.
- ✓ They help in maintaining biodiversity by providing habitat to wild animals.
- ✓ They help in regulating hydrological cycle.
- ✓ They help in regulating the gases in atmosphere.



## ❑ Benefits of Forests

### **Protective Function**

Forest Provide protection against Soil erosion, Droughts, floods, noise, radiations

### **Productive Function**

Forest Provide various products like, gum resins, medicines, Katha, honey, pulp, bamboo, timber, and fruits

### **Regulative Function**

The Forest regulates the level of Oxygen and carbon dioxide in atmosphere. The forests also help in regulating temperature conditions

### **Accessory Function**

Forest provides aesthetics, habitat to various flora and fauna besides that it also has an recreational



# Desertification/ Desertization



- A process of land degradation in arid, semi-arid and sub-humid areas due to various factors including climatic variations and human activities.
- Due to that the biological productivity of dry lands (arid and semiarid lands) has been reduced.
- Desertification, in short, is when land that was originally of another type of biome
- Desertification is characterized by de-vegetation and loss of vegetal over, depletion of groundwater, salinization and severe soil erosion.
- **Causes of Desertification**
  - ✓ Denuding of forest land
  - ✓ lacking of vegetation which hold back the surface run-off, water drains off quickly before it can soak into the soil to sustain the plants or to refill the groundwater.
  - ✓ This increases soil erosion, loss of fertility and loss of water.

# Effects of Desertification

- ✓ Rapid soil erosion
- ✓ Poor soil quality
- ✓ Unfavorable climate
- ✓ Low water table, salty and hard water
- ✓ Huge economic losses



<https://www.youtube.com/watch?v=qNTOq1uEObc>

- ✓ Promoting large-scale plantation of trees
- ✓ Changing agricultural practices and promoting dry land farming
- ✓ Development of pasture lands (suitable for Grazing) and control of overgrazing
- ✓ Promoting equitable use of water resources
- ✓ Development of water catchment areas

- ☐ **The desertification is increasing significantly in Bhuj in northern Gujarat**
- ☐ **Over usages of ground water for last 20 years.**
- ☐ **Water tables going down by 3 m/ year.**

# Causes and impacts due to mining



- ✓ Minerals are the natural resources which play an important role in the economic development of the country.
- ✓ But the extraction and mining of these natural resources leads to some adverse effect on our environment as well.
- ✓ It leads to the emission of dust, suspended particle and gases which cause air pollution.
- ✓ Release of harmful trace element e.g., CO, Pb, Cd etc. leads to the contamination of surface water.
- ✓ Underground water is contaminated due to seepage and infiltration of leached drainage.
- ✓ Mining leads to the degradation of soil quality, fertility and makes it toxic.
- ✓ Natural vegetation get adversely effected due to leached trace element
- ✓ The major consequences is deforestation which results in loss of flora and fauna.
- ✓ Affect the ecosystem and its stability as many species are killed due to toxicity
- ✓ Mining results in wastage of land as it neither remain suitable for agricultural purposes.
- ✓ Mining directly results in the loss of landscape and beauty of surrounding.