(Introduction to Environmental Studies) B. Tech 3rd Semester

Land Resources

Unit 2

Natural Resources

Department: Chemistry
Subject: Environmental Studies (CHM2041)

Land resources

- Land is most simply defined as “the Solid portion of the Earth’s surface”.
- It is a significant natural resource which plays an important role in the development of human society.

Importance of land as resource

- Human civilization has taken shape on land
- Fulfill the basic need of human civilization such as food, cloth and shelter
- Used in agriculture
- Acts as the store of basic resources like groundwater, minerals, and fossil fuels

- Becomes a dump for solid and liquid waste
- Protect from high temperature of earth's core
- Provide habitat for most of the flora and fauna
- Even more Important, the top soil, just a few centimetres in thickness, supports all plant growth and is hence the life support system.

Soil Formation

- "Soil is the dynamic natural body capable of supporting a vegetative cover"
- Soil is largely composed of weathered rocks, along with water, oxygen and organic and inorganic materials or minerals.
- Fertile soil generally contain high amount of organic matter

Functions of Soil

- Significant role in nutrient cycles (carbon, Nitrogen etc.)
- Basis of agricultural production
- Store water and regulate water supply
- Regulate emission of trace gases
- Degrade pollutants and filter ground water
- Produce most of clay for brick making
- Provide a foundation for building (Used in construction)

Land Degradation

- The fertility of land supports the growth and productivity of natural vegetation and agricultural crops.
- A number of natural and man-made factors lower the quality of land. This is commonly referred to as land degradation.
- Land degradation is the temporary or permanent lowering of the productive capacity of land

Causes of land degradation

Natural Causes:

- **Heavy rains lead to the removal of topsoil making soil infertile and hence unsuitable for agriculture**
- **Natural disasters: Earthquake and floods can have considerable impact on land resources.**
- **High–speed winds: Winds of high intensity and storms are responsible for land degradation: soil erosion ,etc….**

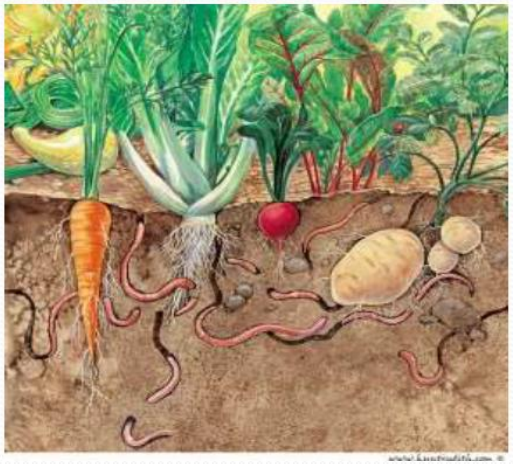
Highway washed away after a heavy rainfall

Anthropogenic Causes:

- **Mining:** generates a lot of waste that destroys vegetation and disrupts water circulation over large tracts, causes land degradation
- **Urbanization:** The growing urbanization all over the world is major cause of concern
- **Deforestation:** The indiscriminate and uncontrolled removal of trees have led to the destruction of forests.
- **Overgrazing:** lowers soil quality and leads to land degradation
- **Dams and Canals:** Construction of large dams and canals are also responsible for loss of vegetation leading to land degradation.
- **Fertilizers:** Most of the chemical fertilizers used in modern Agriculture affect the productivity of soil and leads to land degradation

Soil Erosion

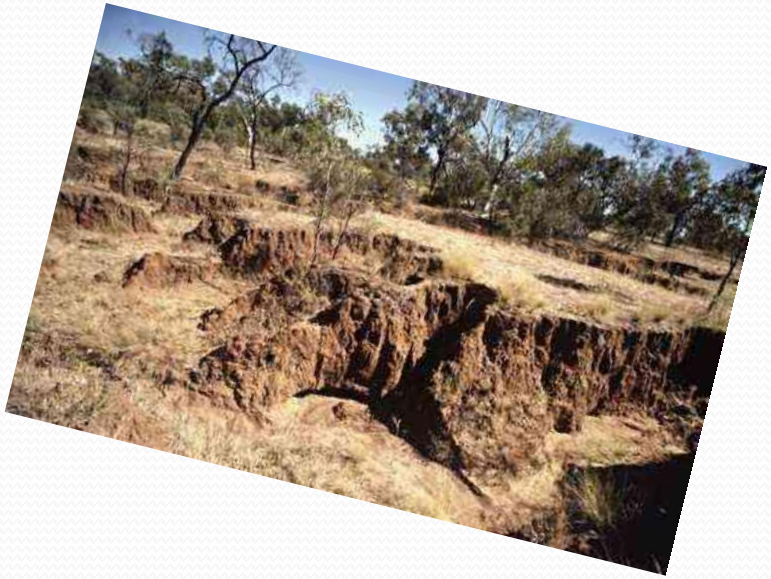
- Soil erosion is removal of fertile or top soil from its resting place by various physical agencies like wind and water.
- It can be defined as “the detachment and transport of the fertile layer of soil by water or air.”
- It is also known as the **creeping death of land.**


Causes of Soil Erosion

- Large scale deforestation
- Floods
- Overgrazing
- Large Violent Winds
- Improper agricultural techniques

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

Soil Conservation

It is extremely difficult for humans to control the natural factors of soil erosion.

(a) For Mild Slopes:

- **Reduced tillage (A cultivation operation whereby soil is disturbed as little as possible to produce a crop)**
- **Stubble mulching**

(b) For Gentle Slopes:

- **Contour bunding**
- **Vegetative bunds**
- **Contour cultivation**
- **Strip cropping**

(c) For Steeper Slopes:

- Terracing

(d) Other methods

- Afforestation on barren land
- Control of overgrazing
- Construction of small check dams
- Promotion of equitable use of water resources
- Prevention of excavation of rocks

Soil Conservation

Strip cropping

Contour bunding

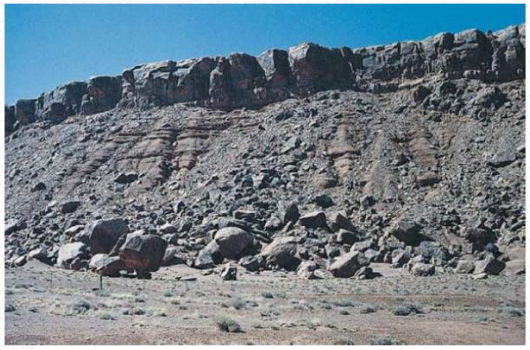
Construction of small check dams

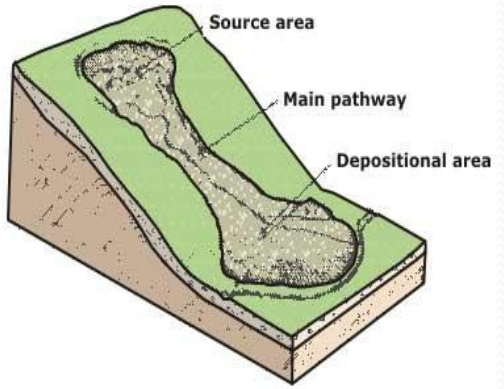
Afforestation

Terracing

LANDSLIDES

- A landslide, also known as a landslip, is a geological phenomenon that includes a wide range of ground movements, such as rock falls, deep failure of slopes and shallow debris flows
- A landslide is a downward or outward movement of soil, rock or vegetation, under the influence of gravity.
- Three distinct physical events occur during a landslide: the initial slope failure, the subsequent transport, and the final deposition of the slide material
- Various developmental activities like large dams reservoirs, construction of roads etc require large scale deforestation.
- Landslides can occur in offshore, coastal and onshore environments.
- The speed of the movement may range from very slow to rapid.





CAUSES OF LANDSLIDES

- Earthquakes
- Volcano eruptions
- Floods
- Ground water changes
- Rapid snow melt
- Quarrying

EFFECTS AND LOSSES DUE TO LANDSLIDES

A) **Direct Effects:**

- **Physical Damage**-Debris may block roads, supply lines (telecommunication, electricity, water, etc.) and waterways.
- **Causalities**- deaths and injuries to people and animals.

B) **Indirect Effects:**

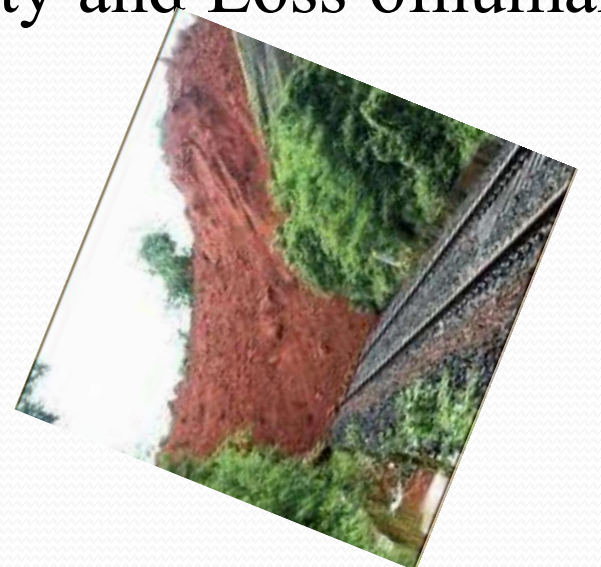
- **Influence of landslides in dam safety-** failure of the slopes bordering the reservoir, Flooding caused by movements of large masses of soil into the reservoir.
- **Landslides and flooding-** Debris flow can cause flooding by blocking valleys and stream channels, forcing large amounts of water to backup causing backup/ flash flood.

C) **Direct losses:**

- Loss of life, property, infrastructure and lifeline facilities, Resources, farmland and places of cultural importance.

D) **Indirect losses:**

- Loss in productivity of agricultural or forest lands, Reduced property values, Loss of revenue, Increased cost, Adverse effect on water quality and Loss ofhuman productivity,



How to Minimize Landslide Hazards

- Choose a safe location to build your home, away from steep slopes and places where landslides have occurred in the past.
- Prevent deforestation and vegetation removal.
- Avoid weakening the slope.

- Plant ground cover on slopes and build retaining walls.
- In mudflow areas, build channels or deflection walls to direct the flow around buildings.
- Awareness generation: Educate the public about signs that a landslide is imminent so that personal safety measures may be taken.
- Financial Mechanisms: Support the establishment of landslide insurance.
- Legal and Policy: legislation to direct a governmental or private program to reduce landslide losses should be strengthened

Desertification

Conversion of fertile land into an infertile desert land is called *desertification*.

Causes of Desertification

Natural Factors

- ❖ Very low rainfall
- ❖ Excessive evaporation
- ❖ Vast difference in diurnal temperature extremes
- ❖ High salinity of soils

Anthropogenic Factors

- •Continuous cutting of trees
- •Overgrazing
- •Over irrigation
- •Excessive ploughing
- •Excessive use of fertilizers

Effects of Desertification

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

Control of Desertification

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


Thank you!