

Natural Resources

Part II

WATER RESOURCES

- Water claims to be an important resource.
- An important use of water in our country is for irrigation.
- Besides, water is also required in large amounts for industrial and domestic consumption

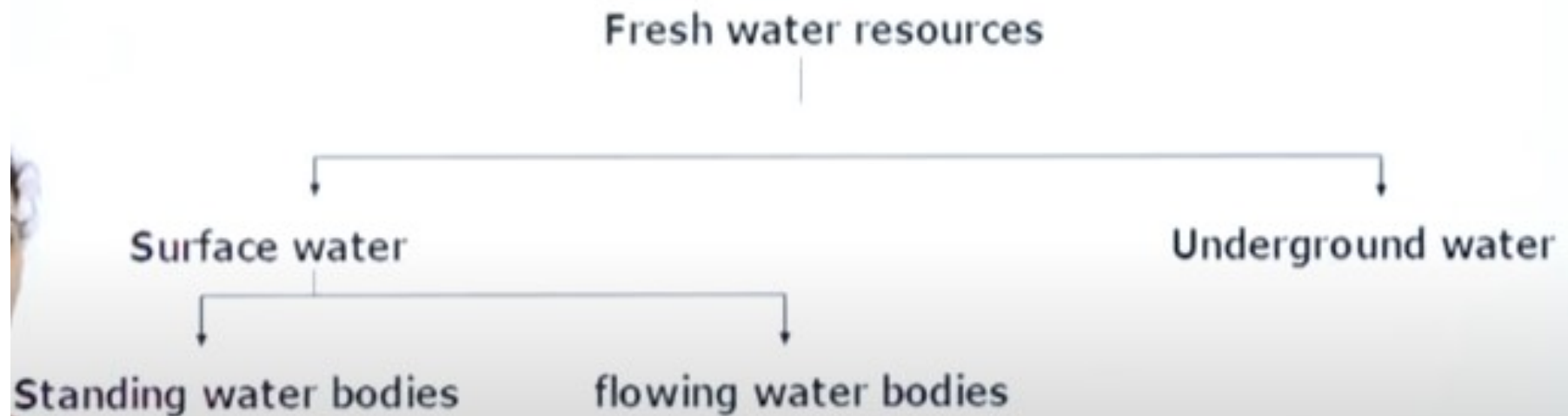


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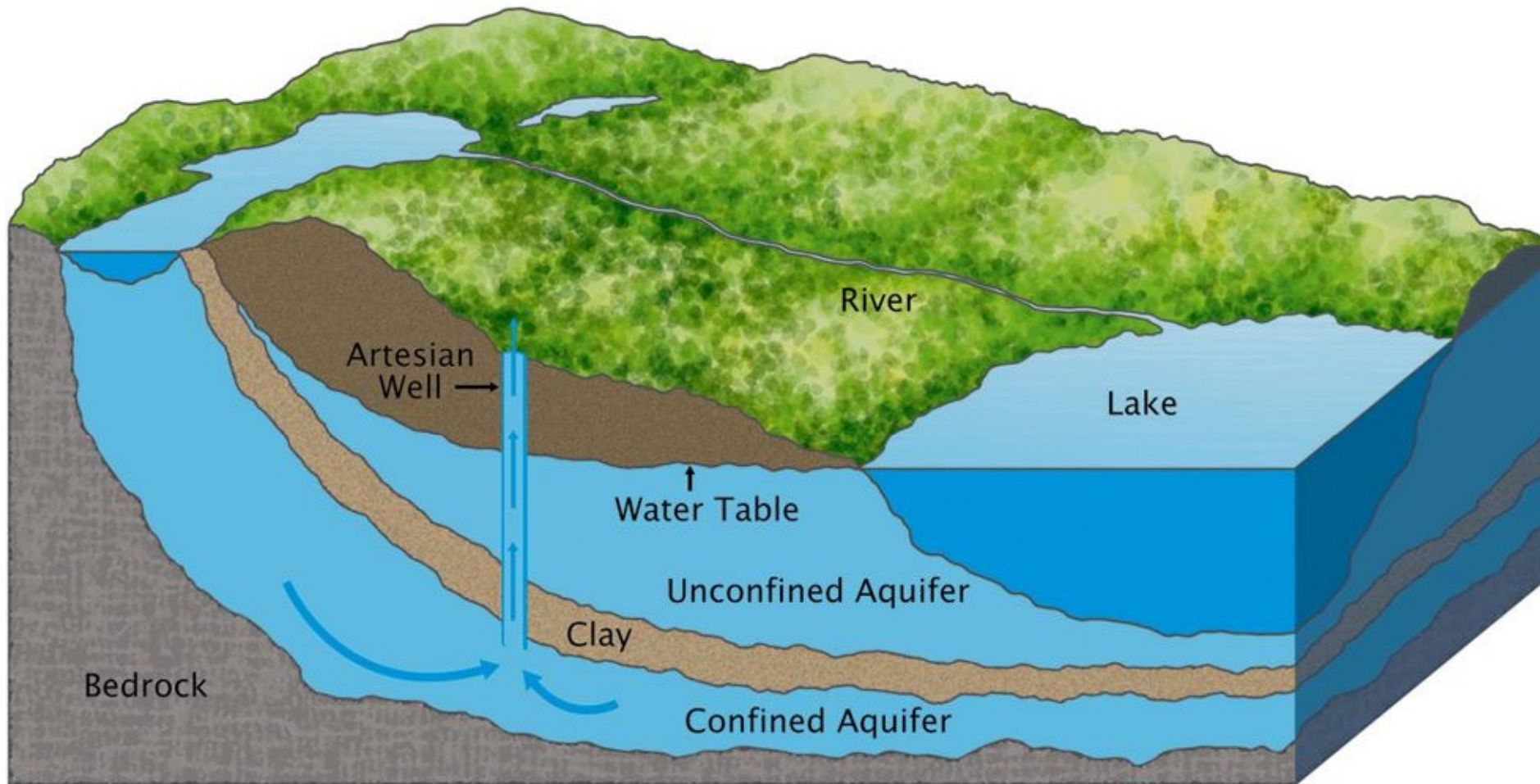
- Is essential for all forms of life.
- Many uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually, all of these human uses, require fresh water.
- No plant or animal species can survive without water. If water in our body drops by 1% we feel thirst, if it drops by 10% we face death



DISTRIBUTION OF WATER RESOURCES



Aquifer



Layers of highly permeable rock that can store water is called an aquifer. Layers of sand and gravel are good aquifers. Clay and crystalline rocks are not good aquifers.

EFFECTS OF OVER UTILIZATION OF WATER



Decrease of ground water:

- Increased usage decreases the ground water.
- Insufficient rain fall
- Building construction activities sealing the permeability of the soil.

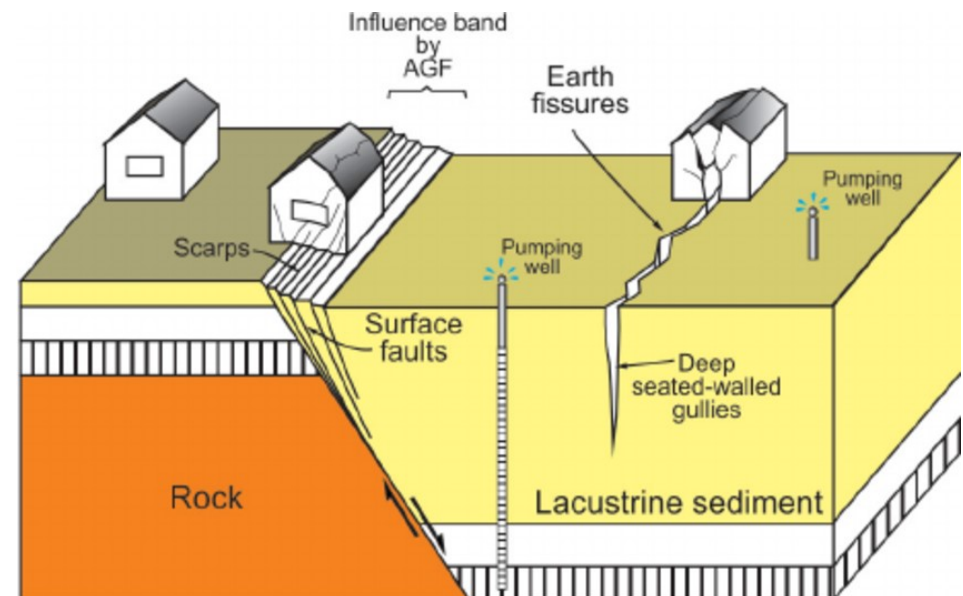
EFFECTS OF OVER UTILIZATION OF WATER

Ground subsidence

If ground water withdrawal is greater than its recharge rate, then the sediments in the aquifers get compacted. As a result shrinkage of land surface takes place.

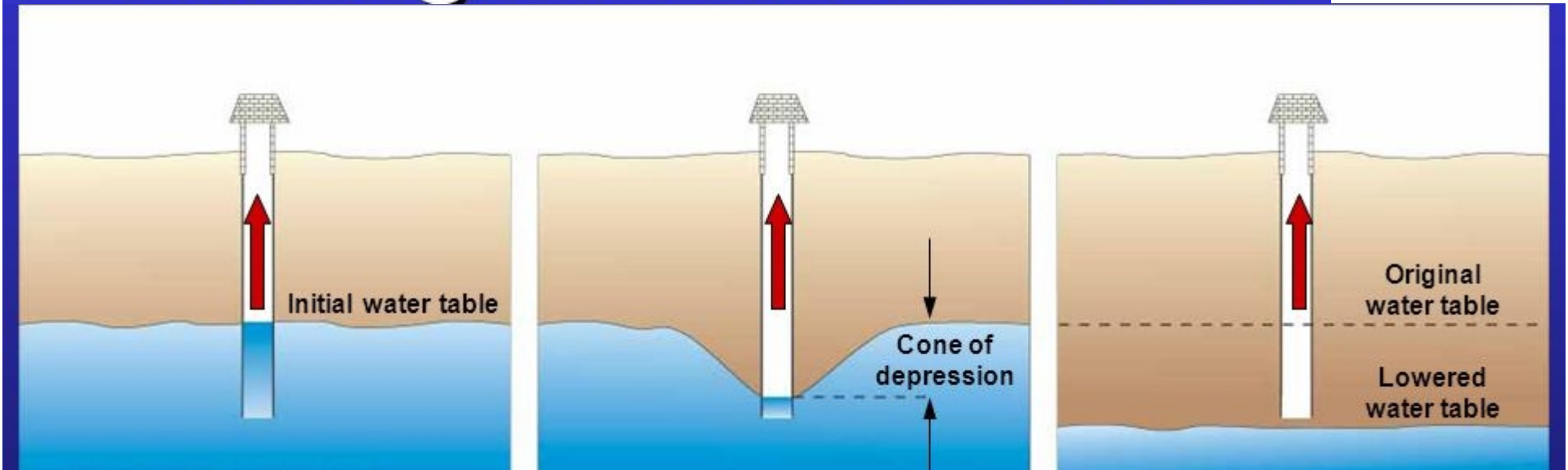
Problems:

- Structural damages to the buildings
- Fracture in pipes.
- Reversing the flow of canals.



Effects of Over Utilization of Water

Lowering the Water Table



Lowering of water table: Over utilization of ground water in arid and semi arid regions for agriculture disturbs the state of equilibrium of the hydrological cycle.

- Problem:
- Lowering of water table
 - Decrease the number of aquifers
 - Change the speed and direction of water.

Effects of Over Utilization of Water



Intrusion of salt water: In coastal area over exploitation of ground water leads to the intrusion of salt water from sea. Therefore that water cannot be used for drinking and agriculture.

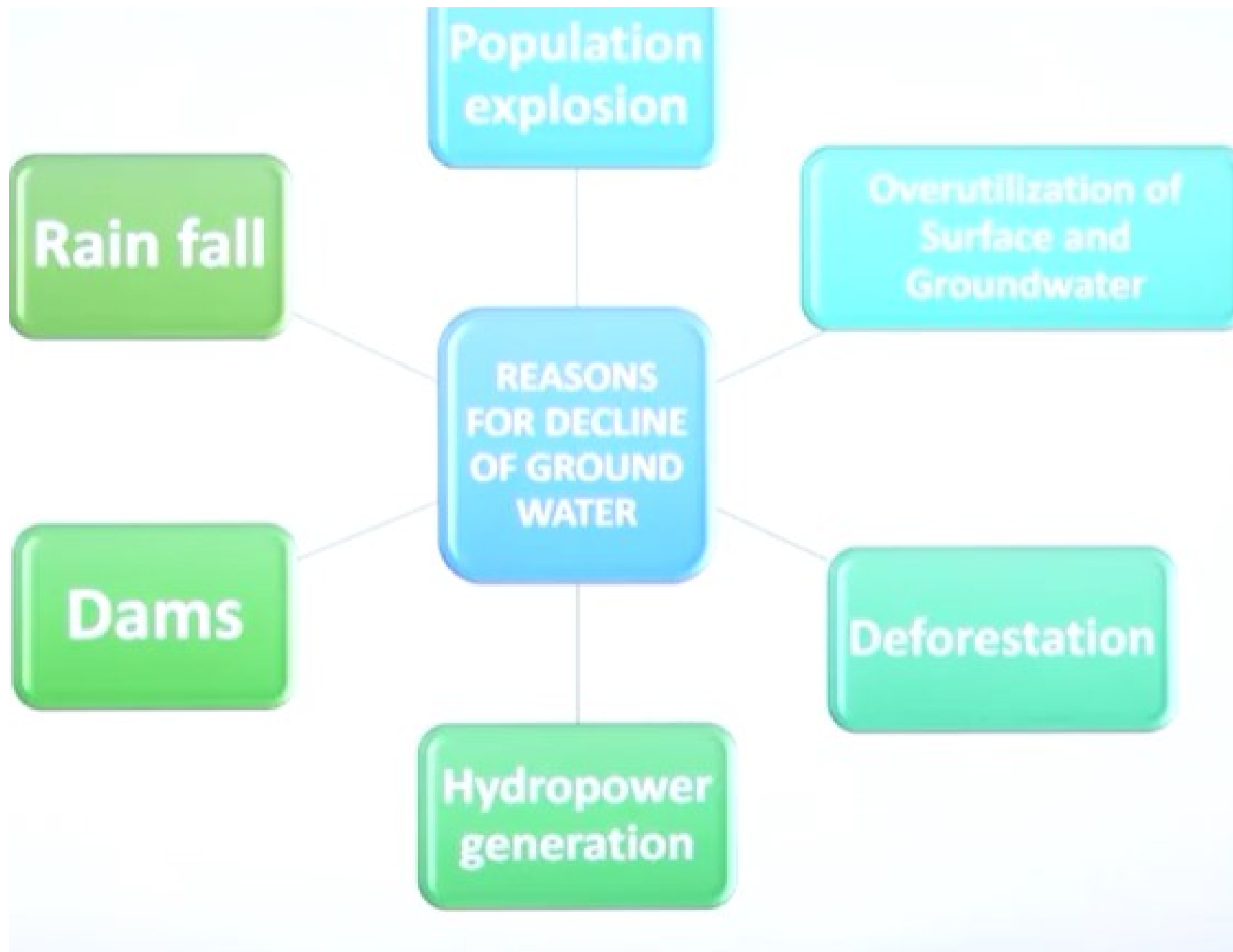
Effects of Over Utilization of Water

Over utilization of water causes earthquakes, landslides and famines.

Drying up of wells: Due to over utilization, ground water level decreases much faster than can be regenerated. It leads to drying up of dug well and bore wells.

Pollution of water: Near the agricultural land ground water decreases therefore water containing nitrogen enters into the ground and pollute the ground water.
Problem: Water which contains excess nitrate content is not suitable for drinking.





Population explosion

Overutilization of Surface and Groundwater

Rain fall

REASONS FOR DECLINE OF GROUND WATER

Deforestation

Dams

Hydropower generation

Reasons for decline in groundwater

Population explosion: World population is > 6 billion and will continue to increase significantly during the next few decades - Enormous demands on the world's limited freshwater supply. The total annual freshwater withdrawals today are estimated at 3800 cubic kilometers, twice as much as just 50 years ago (World Commission on Dams, 2000).



Reasons for decline in groundwater

Overutilization of Surface and Groundwater: Occurs at various levels. Use of more water than really needed by human beings. Many agriculturists use more water than necessary to grow crops.

Deforestation:

Reasons for decline in groundwater

Hydropower generation: Large amount of water is used for generating power which otherwise used for human needs.

Dams - for Agriculture and Power Generation

Rain fall: The erratic and inadequate rainfall results in reduction in storage in subsurface reservoirs. The building construction activities are sealing the permeable zone, reducing the area for percolation of rainwater into subsurface and increase in surface runoff.

Flood

It is an over flow of water. It happens when the magnitude of flow of water exceeds the carrying capacity of the channel within its bank.



CAUSES OF FLOOD

1. Heavy rainfall, melting of snow and sudden release of water from dams. (Flash floods)
2. Reduction in the carrying capacity of the channel.
3. Deforestation, mining and over grazing increase the runoff from rains and the level of flood raises.

Effect of Flood

- Water spreads in surrounding area and submerges them
- Cultivated land gets affected
- Extinction of civilization



FLOOD MANAGEMENT

1. Floods can be controlled by dams.
2. Channel management control flood.
3. Flood hazards reduced by forecasting or flood warning.
4. Flood may also be reduced by reduction of run off by increasing infiltration through appropriate afforestation in the catchment area.

Drought

Drought is nothing but scarcity of water, which occurs due to

- Inadequate rain fall
- Late arrival of rain fall
- Excessive withdrawal of ground water.
- Lack of water for the needs of agriculture, livestock, industry or human population may be termed as a drought. Drought causes serious damages to plants, animals and human life.



Causes of drought

1. When annual rain fall is below normal and less than evaporation, drought is created.
2. High population.
3. Intensive cropping pattern

Ex: Maharashtra - There has been no recovery from drought for the last 30 years due to over exploitation of water by sugarcane crop.

Effects of drought

1. Drought causes hunger, malnutrition, and scarcity of drinking water and also changes the quality of water
2. Drought causes widespread crop failure leading to acute shortage of food and adversely affects human and livestock population
3. Worst situation of drought causes desertification
4. Raw materials of agro-based industries are critically affected during drought time , hence industrial and commercial growth decreases.
5. Drought increases degradation of natural resources
6. Drought causes large migration of people and urbanization

Drought Management

Indigenous knowledge is essential

Rainwater harvesting system

Construction of reservoirs to improve ground water level

Modern irrigation technology (drip irrigation) very useful to conserve water

Afforestation activities also improve the potential of water in drought area

Crop mixing and dry farming are suitable methods which minimize the risk of crop failures in dry areas

WATER CONFLICTS



Conflict through use: Unequal distribution of water led to interstate and international disputes.

National conflicts

- Sharing of cauvery water between Karnataka and TamilNadu.
- Sharing of Krishna water between Karnataka and Andrapradesh
- Siruvani – TamilNadu and Kerala

International conflicts

Indus – India and Pakistan & Colorado river – Mexico and USA

LAND RESOURCES

LAND RESOURCES

- Land is a naturally occurring finite resource.
- It provides the base for survival of living beings.
- It holds everything that constitutes terrestrial ecosystems.
- Increased demand on land in modern times due to the rise in human population and resultant activities has resulted in degradation of land quality and quantity, decline in crop production, and competition for land.



LAND DEGRADATION

It can be defined as any change in the land that reduces its condition or quality and hence its productivity or productive potential. It occurs whenever the natural balances in the landscape are changed by human activity, through misuse or overuse.

The major land degradation problems are:

- Wind erosion
- Water erosion including mass movement of hill slopes
- Dry land salinity
- Irrigation-induced salinity
- Soil surface scalding
- Water logging
- Soil acidity
- Soil structure decline
- Soil fertility decline or nutrient loss
- Vegetation decline and degradation, such as weed infestation and lack of it
- Tree regeneration
- Loss of flora and fauna and hence of biodiversity

CAUSES FOR LAND DEGRADATION





DEFORESTATION

Forest soils contain much organic matter. When a forest is cleared, the trees are burnt, which leads to an immediate loss in organic matter. Cutting forest for fuel wood is another form of deforestation.

OVER GRAZING

When insufficient amounts of grass litter are left for the soil, the soil organisms die and the soil loses fertility.

INDUSTRIALIZATION

Industries and mining operations can pollute soils



AGRICULTURE

Over irrigating farmland leads to salinization, as the evaporation of water brings the salts to the surface of the soil on which crops cannot grow. Over irrigation also creates water logging of the top soil, so that crop roots are affected and the crop deteriorates. The use of more and more chemical fertilizers poisons the soil and eventually the land becomes unproductive.



EROSION

When the grasses are removed the soil becomes loose and gets eroded by the action of wind and rain fall.

Deforestation thus leads to rapid soil erosion. Soil is washed into streams and is transported into rivers and finally lost to the sea.

The process is more evident in areas where deforestation has led to erosion on steep hill slopes as in the Himalayas and in the Western Ghats.

These areas are called 'ecologically sensitive areas' or ESAs.



FACTORS AFFECTING SOIL EROSION

There are mainly three factors that will be affecting erosion

- Natural factors
- Sudden climate change
- Human-induced factors

FACTORS AFFECTING SOIL EROSION

Natural factors

1. **Heavy rains on weak soil:** Rain drops loosen soil particles and water transports them down hill.
2. **Vegetation depleted by drought:** Rain drops are free to hit the soil, causing erosion during rainfall. Winds blow away the fine particles during droughts.
3. **Steep slopes:** Gravity pulls harder: water flows faster, soil creeps, slips or slumps downhill

FACTORS AFFECTING SOIL EROSION

Sudden climate change:

1. **Rain fall:** Erosion increases unexpectedly rapidly as rainstorms become more severe.
2. **Drought:** Water dries up and the soil becomes a play ball of winds. A sudden rain causes enormous damage.
3. **Changing winds:** Areas previously sheltered, become exposed.



FACTORS AFFECTING SOIL EROSION

Human-induced factors:

1. **Change of land:** The land loses its cover, then its soil biota, porosity and moisture.
2. **Intensive farming:** The plough, excessive fertilizer and irrigation damage the land, often permanently.
3. **Housing development:** Soil is barred; massive earthworks to landscape the subdivision; soil is on the loose.
4. **Road construction:** Roads are cut; massive earth works, leaving scars behind. Not enough attention is paid to rainwater flow and maintenance of road sides

DESERTIFICATION



It is the process by which an area becomes even more barren, less capable of retaining vegetation and progresses towards becoming a desert. This is often a cause of long term disasters. Deforestation, overgrazing etc. bring about changes in rainfall, temperature, wind velocity etc. and also lead to soil erosion . Such changes then lead to desertification of the area.

THANK YOU

Acknowledgements:

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