

# Unit 1: An Introduction to Environment & Environmental Science

This chapter will help you understand:

- The meaning of the term 'environment'
- The importance of natural resources
- Multidisciplinary nature of environmental science
- Some major global environmental issues

## इकाई 1: पर्यावरण एवं पर्यावरण अध्ययन का एक परिचय

इस इकाई के अध्ययन के पश्चात आप जान पाएंगे:

- पर्यावरण का अर्थ
- प्राकृतिक संसाधनों का महत्व
- पर्यावरण अध्ययन की बहुआयामी प्रकृति
- कुछ महत्वपूर्ण वैश्विक पर्यावरणीय समस्याएं

## What is environment?

**Environment is made up of the word-** “ENVIRON” which literally means to encircle. Thus, environment means everything that surrounds us. It includes:

- A) All living things:** Animals, plants, forests, fungi, etc.
- B) All non-living things:** River, oceans, clouds, soil, rocks, minerals, air, water, buildings etc.
- C) Interactions with other living beings and with non-living things:** All living beings take and give something to this environment and also to other living organisms

## पर्यावरण क्या है?

पर्यावरण शब्द ‘परि’ एवं ‘आवरण’ शब्दों से मिलकर बना हुआ है जिसका अर्थ हमारे चारों ओर के आवरण से है। इसमें शामिल है:-

- अ) **समस्त सजीव:** जंतु, पौधे, वन, फंजाई इत्यादि
- ब) **समस्त निर्जीव पदार्थ:** नदी, सागर, बादल, मिट्टी, चट्टानें, वायु, पानी, वर्षा, भवन इत्यादि।
- स) **सजीव एवं निर्जीव पदार्थों के बीच अंतःक्रिया एवं अंतर्संबंध:** सभी सजीव आपस में तथा अपने अजैविक पर्यावरण के साथ किसी न किसी प्रकार से जुड़े होते हैं तथा परस्पर क्रिया करते रहते हैं।

## Some important points fundamental to environmental science and nature conservation

- Humans are an important part of environment
- Other organism (animals / plants/ microorganisms) are equally important and are also part of the same nature
- We as well as other organisms interact with nature or dependent on nature mainly for energy and nutrients i.e., food, which is needed for growth and development, and for maintaining good health, thus, humans and other living organisms are interdependent
- Having able to manipulate the environment by a variety of ways, humans have got a distinct place in the nature and at the same time has many responsibilities also.

पर्यावरण विज्ञान एवं जैवीय संरक्षण के आधार से संबंधित महत्वपूर्ण बातें

- मानव पर्यावरण का महत्वपूर्ण अंग
- अन्य जीवजंतु भी समान रूप से महत्वपूर्ण
- मानव के साथ साथ अन्य जीवजंतु भी पर्यावरण से ही अपनी विभिन्न आवश्यकताओं यथा ऊर्जा, पोषक तत्वों अर्थात भोजन, की पूर्ति अपने आस पास के वातावरण से ही करते हैं जिससे कि उनकी समुचित वृद्धि एवं शारिरिक विकास हो सके।
- मानव के बुद्धिमान प्राणि होने के कारण पर्यावरण के प्रति बहुत उत्तरदायित्व है।

## Interactions with environment

### Humans receive

Oxygen  
Food  
Clothes  
Wealth  
Health  
Home  
Natural wealth  
Natural resources  
Scenic beauty  
Mental peace

### Humans release

Carbon di- oxide  
Organic pollutants  
Inorganic pollutants  
Solid waste  
Loss of biodiversity  
Waste of water  
Weapons that pose  
danger to our own life  
Many more waste  
materials

## पर्यावरण के साथ अंतर्संबंध

मानव लेता है

आक्सीजन

भोजन

कपड़े

धन संपदा

घर

प्राकृतिक संपदा

प्राकृतिक सौंदर्य

मानसिक शांति

मानव देता है

कार्बन डाइ आक्साइड

कार्बनिक प्रदूषक

अकार्बनिक प्रदूषक

ठोस अपशिष्ट

जैव विविधता की हानि

अस्त्र शस्त्रों का निर्माण जिससे

मानव की ही हानि होगी

अनेकानेक अन्य अपशिष्ट पदार्थ

## Environmental science is the study of:

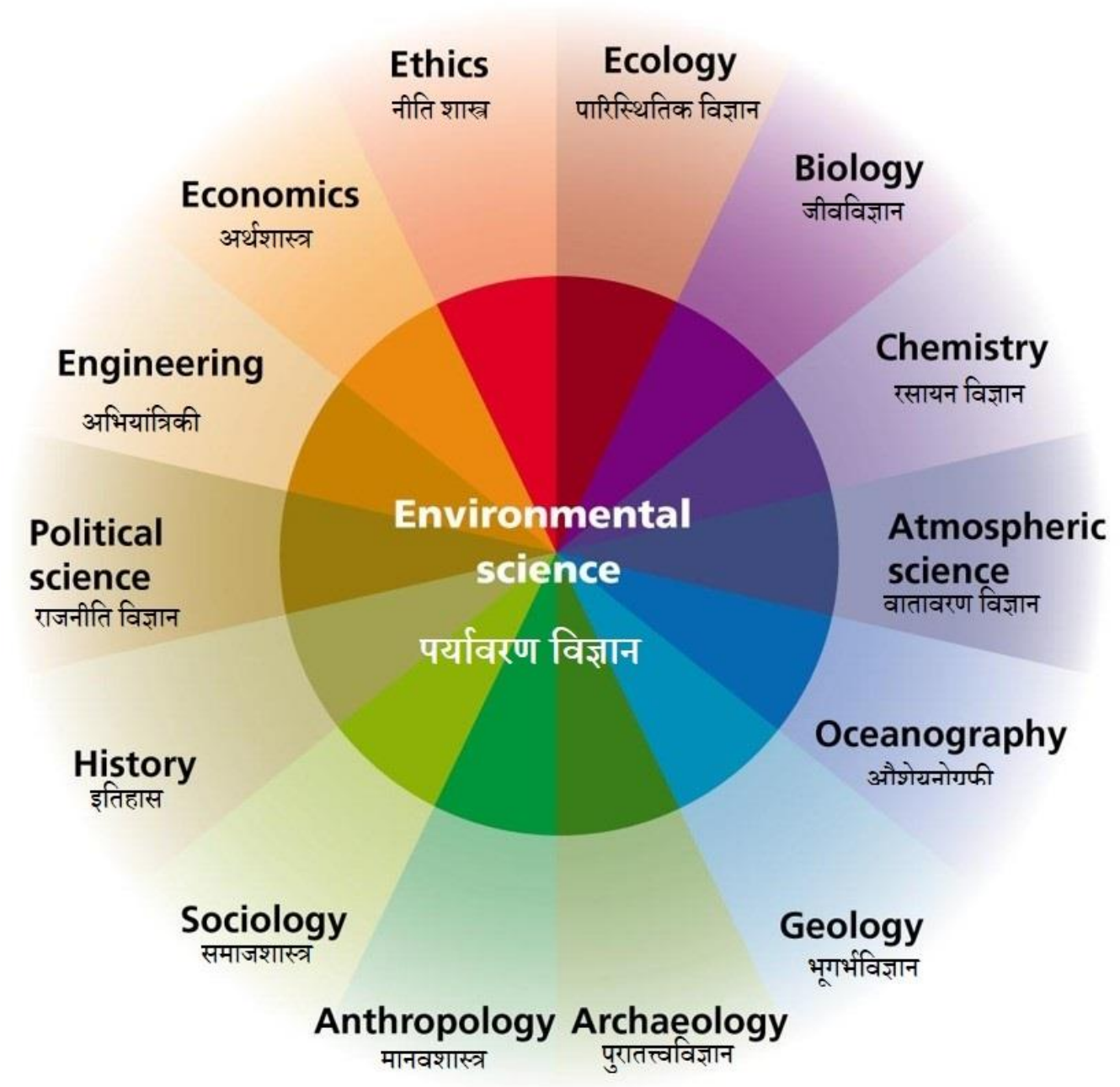
- Natural process
- Interrelationships
- Biodiversity
- Human impacts on environment and *vice versa*
- Various environmental issues and problems
- Finding solutions of various problems

## पर्यावरण विज्ञान में अध्ययन किया जाता है:

- प्राकृतिक क्रियाओं
- आपसी अंतर्संबंधों
- जैवविविधता का
- मानव के पर्यावरण एवं पर्यावरण का मानव पर प्रभावों का
- विभिन्न पर्यावरणीय मुद्दे एवं समस्याओं का
- समस्याओं का निदान

## Multi-disciplinary nature of Environmental Studies

पर्यावरण अध्ययन की  
बहुआयामी प्रकृति



# Important People & Organizations

- Charles Darwin
- John Muir
- Rachel Carson
- E.O. Wilson
- Salim Ali
- Indira Gandhi
- S.P. Godrej
- M.S. Swaminathan
- Madhav Gadgil
- M.C. Mehta
- Anil Agarwal
- Medha Patkar
- Sunderlal Bahuguna
- Gaura Devi

- **BHNS: Bombay Natural History Society**
- **WWF: World Wide Fund**
- **CSE: Centre for Science and Education**
- **CEE: Centre for Environment Education**
- **BVIEER: Bharti Vidyepeeth Institute of Environmental Education and Research**
- **SACON: Salim Ali Centre for Ornithology and Natural History**
- **WII: Wildlife Institute of India**
- **BSI: Botanical Survey of India**
- **ZSI: Zoological Survey of India**

# Unit 2. Natural Resources

The slide features a white background with a decorative graphic on the right side. This graphic consists of several overlapping, semi-transparent green shapes in various shades, ranging from light lime green to dark forest green. The shapes are primarily triangular and polygonal, creating a dynamic, layered effect that suggests natural elements like leaves or abstract terrain.



# What are natural resources?

- ▶ Environment is a source of variety of goods and services which are necessary for our day today life. These are called Natural resources
- ▶ Life on this planet earth depends on a variety of goods and services provided by the nature, which are known as Natural Resources.
- ▶ Any stock or reserve that can be drawn from nature is a Natural Resource

## Types of Natural Resources

### ► Renewable Natural Resources

Charcoal  
Water  
Soil  
Wildlife  
Sunlight  
Wind  
Solar Energy  
Tidal Energy

Timber

### ► Non-renewable resources

Fossil fuel/ mineral oil  
Coal  
Minerals

## प्राकृतिक संसाधनों के प्रकार

### • नव्यकरणीय प्राकृतिक संसाधन

काष्ठ  
चारकोल  
जल  
मृदा  
वन्यजीव  
सौर ऊर्जा  
पवन  
टाइडल ऊर्जा

### • Non-renewable resources

जीवाश्मीय इंधन / खनिज तेल  
कोयला  
खनिज तत्व

## Major Natural Resources

- ▶ Forest Resources
- ▶ Water Resources
- ▶ Mineral Resources
- ▶ Energy Resources
- ▶ Food Resources
- ▶ Land Resources

## मुख्य प्राकृतिक संसाधन

- वन संसाधन
- जल संसाधन
- खनिज संसाधन
- ऊर्जा संसाधन
- खाद्य संसाधन
- भूमि संसाधन



# Forest Resources

- ▶ Forests is green blanket covering the Earth
- ▶ Total land area of earth- 13 thousand million hactares of which 5.4 thousand million hactares (41%) are forests
- ▶ According to FAO annual global rates of deforestation was 9 million hactares (0.23% of toal forest cover) (1990)
- ▶ But the forest cover is depleting. Greatest losses have occurred in Tropical Asia, where one third of the forest is destroyed.
- ▶ Current Forest area of India: 21.35% (GSI 2015)

## वन संसाधन

- वन पृथ्वी की हरित चादर समान है।
- पृथ्वी के कुल क्षेत्रफल का 41 प्रतिशत भूभाग वनों से घिरा है।
- एफ.ए.ओ. के अनुसार वनों के निर्वनीकरण की दर 0.23 प्रतिशत अर्थात 90 लाख हेक्टेयर प्रतिवर्ष है। (1990)
- सार्वधिक वनों का हास उष्णीय एशिया भूभागों में हुआ है जहां अब तक एक तिहाई वनों का नाश हो चुका है।
- हमारे देश का वर्तमान में कुल वन क्षेत्रफल 21.35% है (GSI 2015)

## Forest Types of India (16 Types)

- ▶ Tropical wet evergreen forests
- ▶ Tropical semi evergreen forest
- ▶ Tropical moist deciduous forest
- ▶ Littoral Swamps
- ▶ Tropical dry deciduous forests
- ▶ Tropical thorn forests
- ▶ Tropical dry evergreen
- ▶ Subtropical broad leaved hill forests
- ▶ Subtropical pine forests
- ▶ Subtropical dry evergreen forests
- ▶ Montane wet temperate forest
- ▶ Himalayan moist temperate
- ▶ Himalayan dry temperate
- ▶ Sub alpine
- ▶ Alpine scrubs

## भारतवर्ष में वनों के प्रकार (16 प्रकार)

- उष्णकटिबंधीय आर्द्र सदाबहार वन
- उष्णकटिबंधीय अर्ध सदाबहार वन
- उष्णकटिबंधीय नम पर्णपाती जंगल
- Littoral Swamps
- उष्णकटिबंधीय शुष्क पर्णपाती वन
- उष्णकटिबंधीय कांटे वाले जंगल
- उष्णकटिबंधीय शुष्क सदाबहार
- उपोष्णकटिबंधीय चौड़े कटे हुए पहाड़ी जंगल
- उपोष्णकटिबंधीय देवदार के जंगल
- उपोष्णकटिबंधीय शुष्क सदाबहार वन
- मोंटाने गीले समशीतोष्ण वन
- हिमालयन नम शीतोष्ण
- हिमालयी शुष्क शीतोष्ण
- उप अल्पाइन वन
- अल्पाइन स्क्रब

# Benefits of Forests

## Commercial Uses

- Wood: timber
- Firewood
- Pulpwood
- Food items
- Gums, resins
- Fibres, canes, fodder
- Medicines and aromatic plants

## Ecological Uses

- Regulates water cycle
- Produces Oxygen
- Absorbs Pollutants
- Act as a sink of CO<sub>2</sub> (Reduce Global Warming)
- Driving Energy flow and Nutrient Cycling
- Habitat for wildlife
- Conservation of Soil

# वनों से होने वाले लाभ

## व्यवसायिक उपयोग

- इमानती लकड़ी
- जलावन
- पल्प
- खाद्य पदार्थ
- रेजिन एवं गम
- रेशे, बांस, एवं चारा
- औषधीय एवं एवं सुगंधित पौधे

## पारिस्थितिकीय लाभ

- जल चक्र का नियंत्रण
- आक्सीजन का उत्पादन
- प्रदूषकों का संशोधन
- CO<sub>2</sub> का संशोधन (वैश्विक ताप में कमी)
- ऊर्जा का प्रवाह एवं पोषक तत्वों का चक्रण
- वन्यजीवों हेतु आवास
- मदा संरक्षण

# Forest resources: Problems

- ▶ **Over – Exploitation:** Rapid & Excessive use of forest to meet human demands
- ▶ **Deforestation:** clearance or clearing is the removal of a forest or stand of trees where the land is thereafter converted to a non-forest use.

## वन संसाधन : समस्याएं

- ▶ **अत्यधिक दोहन :** मानवा आवश्यकताओं की पूर्ति हेतु वन संसाधनों का अत्यधिक दोहन
- ▶ **निर्वनीकरण:**

# Causes of Deforestation

- ▶ Fuel Requirement
- ▶ Raw material / timber for industries
- ▶ Shifting cultivation
- ▶ Development projects –dams
- ▶ Growing food needs
- ▶ Overgrazing
- ▶ Forest fires
- ▶ Mining activities
- ▶ Urbanisation, industrialization, and infrastructure development
- ▶ Heavy air pollution and tree's death
- ▶ Construction of dams and reservoirs

# निर्वनीकरण के कारण

- ▶ जलावन की आवश्यकता
- ▶ उद्योगों हेतु कच्चे माल की आवश्यकता हेतु
- ▶ इमारती लकड़ी
- ▶ स्थानान्तरी कृषि
- ▶ नदी घाटी परियोजनाओं का विकास
- ▶ बढ़ती हुई खाद्य आवश्यकताएं
- ▶ पशु चरान
- ▶ वनाग्नि
- ▶ खनन गतिविधियां
- ▶ शहरीकरण, औद्योगीकरण और बुनियादी ढाँचा विकास
- ▶ वायु प्रदूषण एवं पेड़ों का मरना
- ▶ बांधों एवं जलाशयों का निर्माण



# Consequences Deforestation

## निर्वनीकरण के परिणाम

- ▶ **Problem of climate change** (जलवायु परिवर्तन की समस्या)
- ▶ **Increased landslides (In hilly areas)** (पहाड़ी क्षेत्रों में भूस्खलन )
- ▶ **Floods in river** (नदियों में बाढ़ की समस्या)
- ▶ **Loss of nutrients, soil and water resources- Hydrological cycle affected**  
▶ (पोषक तत्वों का क्षरण, मृदा एवं जल की हानि )
- ▶ **Existence of Species is affected- Natural Habitat** (प्रजातियों के जीवन को खतरा)
- ▶ **Loss of Biodiversity** (जैवविविधता की हानि)
- ▶ **Soil erosion** (मृदा अपरदन )
- ▶ **Increase in frequency of man-wildlife conflicts** (मानव –वन्य जीव संघर्ष में वृद्धि)
- ▶ **Loss of natural and scenic beauty** (प्राकृतिक सुंदरता का हास)
- ▶ **Loss of gene pool** (जीन भंडार में हानि)

# Dams- Controversial Issue

Advantages	Disadvantages
Checks Floods, famine	Loss of Forest area
Generate Electricity	Large land under submergence
Reduce water & power shortage	Relocation of many tribal, communities, people, farmers.
Provide Irrigation water to low areas	Local Riots, abuse
Promote fisheries	Flash Floods
Employment	Seismic changes
	Siltation & Sedimentation Problem
	Micro-Climate Change
	Breeding of Vector & Spread of disease

**Society now moving towards construction of small dams or mini- hydal projects.**

# Water Resources

- ▶ Water is known as LIFE
- ▶ Nearly 80% of body composition
- ▶ Water is a chemical substance, a liquid at ambient conditions, often co-exists on earth with its solid state i.e ice, and gaseous state i.e water vapor or steam.
- ▶ Properties:
  - ▶ Universal solvent- so it can be nutrient carrier,
  - ▶ High surface tension- so it can rise easily at great heights,
  - ▶ Anomalous expansion- it freezes, it expands instead of contracting.

# Some Facts about water

- ▶ World oceans cover about 3/4<sup>th</sup> of earth's surface.
- ▶ Fresh water constitutes a very small proportion of this enormous quantity.
- ▶ About 2.7 % of the total water available on the earth is fresh water of which about 79 % lies frozen in polar regions and another 20% is present as ground water.
- ▶ The rest is available in lakes, rivers, atmosphere, moisture, soil and vegetation

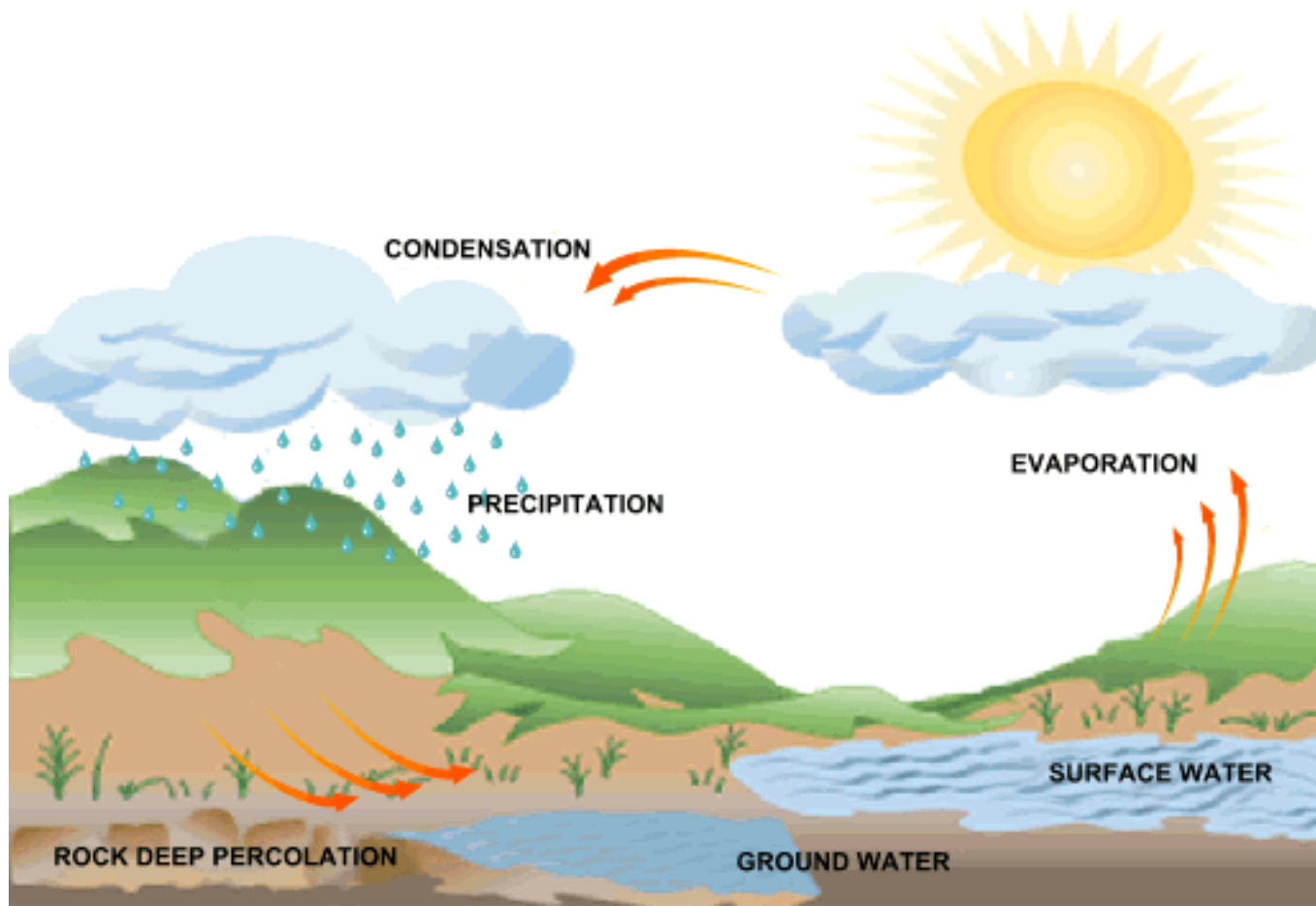
## Uses of water

- ▶ **Agriculture**
- ▶ Drinking
- ▶ Washing
- ▶ Transportation
- ▶ Chemical uses
- ▶ Fire Extinguish
- ▶ Recreation
- ▶ Water for Industry
- ▶ Food Processing
- ▶ Industrial Application

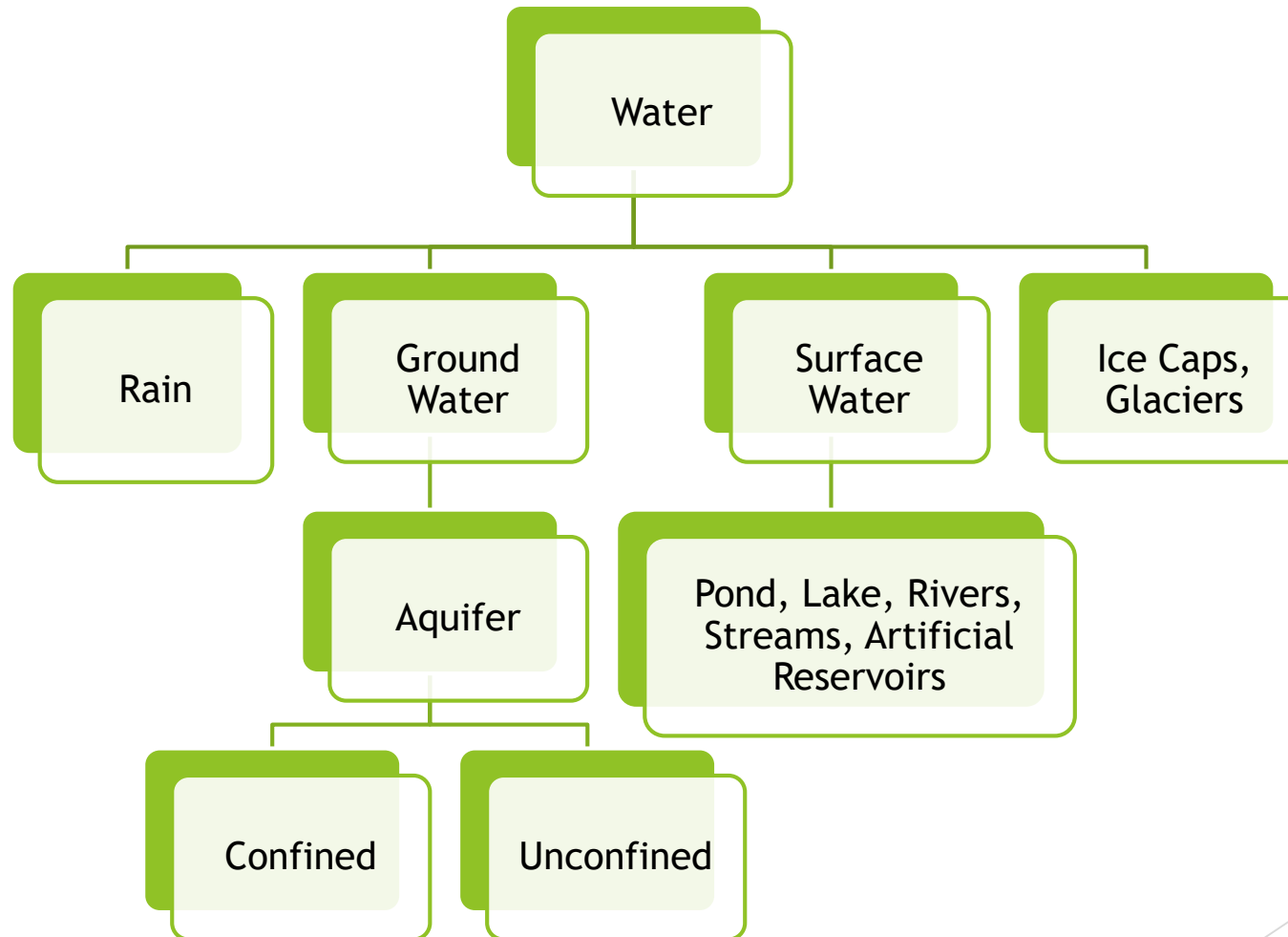
## जल के उपयोग

- कृषि हेतु
- पीने का पानी
- धोने को पानी
- यातायात
- रसायनिक उपयोग
- अग्नि शमन
- मनोरंजन हेतु
- औद्योगिक आवश्यकता
- खाद्य प्रसंस्करण हेतु
- औद्योगिक अनुप्रयोग

# Water on the earth is in motion- The Hydrological Cycle



# Sources of Water... जल के श्रोत

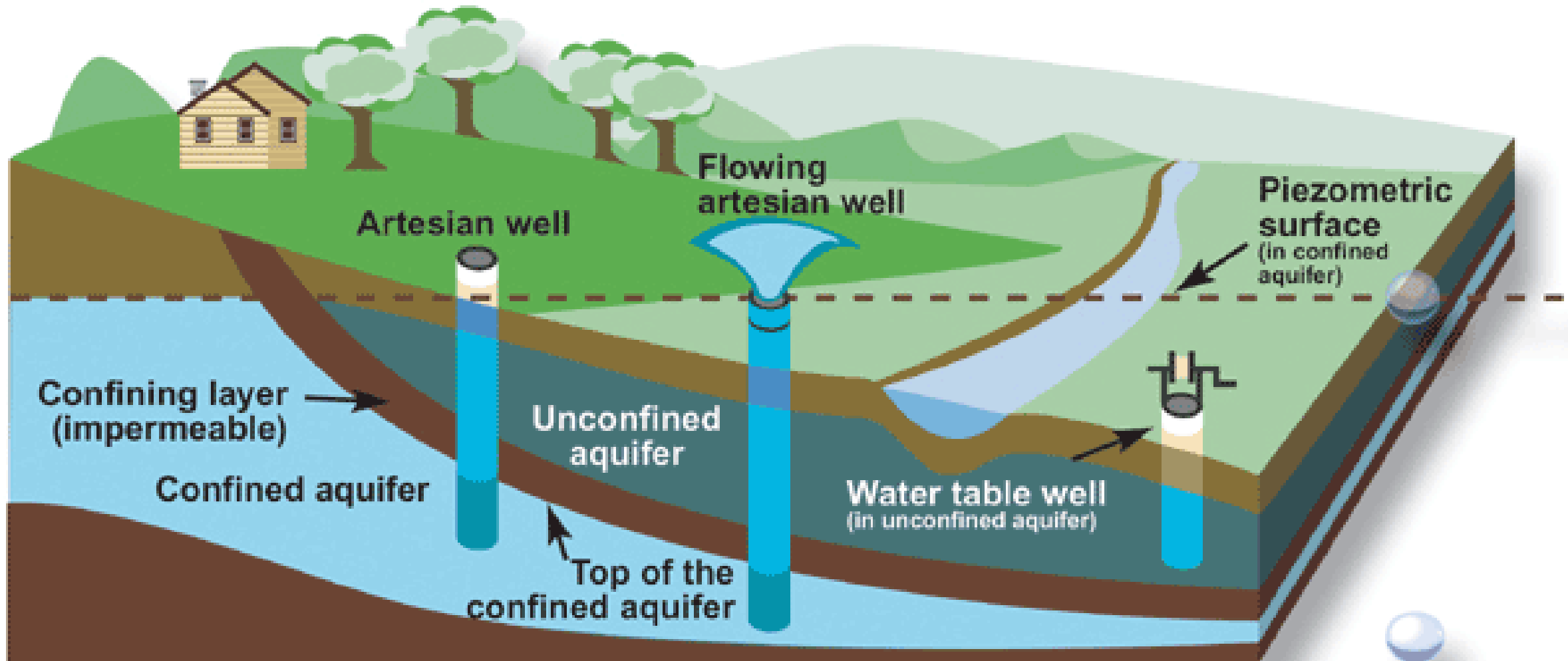


# Ground Water

- ▶ Water which percolates or infiltrates down in the ground
- ▶ Huge source of fresh water.
- ▶ Layer of sediment or rock that is highly permeable and contains water is an AQUIFER
  - ▶ Confined- Which are sandwiched between two impermeable layers of Rock/Sediments, Recharged where it intersects the land surface and
  - ▶ Unconfined aquifers- which are overlaid by permeable earth materials, recharged by water seeping down from surface.



# Aquifers and wells



# Effects of Excess Usage of Ground Water

- ▶ **Subsidence:** When groundwater withdrawal is more than its recharge rate, the sediments in the aquifer get compacted, a phenomenon known as “groundwater subsidence”.
- ▶ **Lower of Water Table:** Mining of water is done extensively in arid & semi-arid regions, which leads to lowering of water table.
- ▶ **Water Logging:** When irrigation is done with Brackish water, water table level increases leading to logging
- ▶ **Water Pollution:** Discharge and dumping of waste in water resources

# Floods: Causes and impacts

- ▶ Heavy Rainfall causes floods in low-lying areas coastal areas.
- ▶ Prolonged downpour cause overflow of rivers, lakes leading to floods.
- ▶ Anthropogenic Activities-
  - ▶ Deforestation
  - ▶ Overgrazing
  - ▶ Mining
  - ▶ Rapid industrialization.
- ▶ It is very regular feature in some North Eastern Parts of India & Bangladesh

# Droughts: causes and impacts

- ▶ When annual rainfall is below normal and less than evaporation, drought conditions are created.
- ▶ Meteorological Phenomenon
- ▶ Anthropogenic Causes: Grazing, deforestation, mining.
- ▶ Leads to desertification
- ▶ Proper crop plantation is a remedial measure.

# Conflicts over water

- Unequal distribution is the major cause
- ▶ Cauvery water dispute:
  - ▶ Cauvery River is contention between Karnataka & Tamil Nadu, and the problem is hundred years old.
  - ▶ The upstream is in Karnataka & downstream is in TN.
  - ▶ The TN people wants water-use regulated in Upstream, whereas the Karnataka people claims primacy over it.
  - ▶ June 2, 1990- Cauvery Water Dispute Tribunal was set up.
- ▶ Indus the water treaty-
  - ▶ established in 1960
  - ▶ The Jhelum ,Chenab & Indus itself given to Pakistan while The Sutlej, Ravi & Beas to India
- ▶ Sutlej-Yamuna link canal dispute
  - ▶ Issue between Punjab & Haryana

# Mineral Resources

- ▶ Minerals are naturally occurring, inorganic, crystalline solids having a definite chemical composition & characteristics properties.
- ▶ Composition of Mineral:
  - ▶ Silicon, oxygen, iron, magnesium, calcium, aluminium, etc.
  - ▶ Some common minerals like quartz, feldspar, biolite, dolomite, calcite, laterite, etc.

# Classification of minerals

- ▶ **Minerals classified based on their properties are of two types:**
  - ▶ **Metallic**
  - ▶ **Non-Metallic**
- ▶ **Minerals are also classified as :**
  - ▶ **Critical – Essential for economy of Nation**  
e.g. Iron, Aluminium, Gold, Copper, etc.
  - ▶ **Strategic – Essential for defence of Country**  
e.g. Manganese, Cobalt, Platinum, Chromium, etc.

# Uses- Metallic Minerals

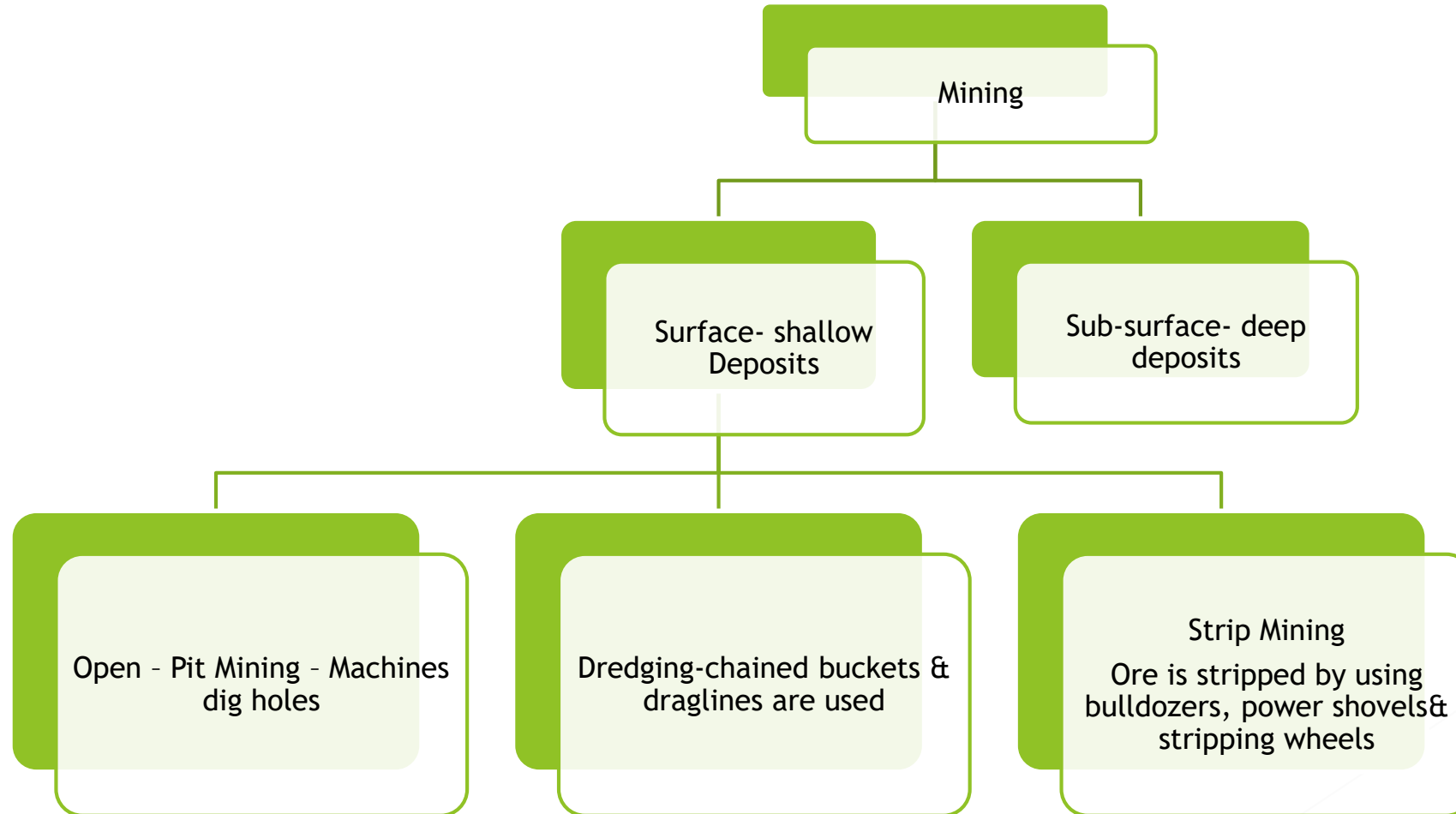
<b>Mineral</b>	<b>Uses</b>
<b>Aluminium</b>	<b>Packaging food items, transportation, utensils, electronics</b>
<b>Chromium</b>	<b>For making high strength steel alloys, textile/tanning ind.</b>
<b>Copper</b>	<b>Electric &amp; Electronic Goods, building, construction, vessels</b>
<b>Iron</b>	<b>Heavy machinery, steel production, transportation means</b>
<b>Lead</b>	<b>Gasoline, car batteries, paints, ammunition</b>
<b>Manganese</b>	<b>Making high strength, heat resistance steel alloys</b>
<b>Gold</b>	<b>Ornaments, medical use, use in aerospace</b>
<b>Silver</b>	<b>Jewellery, photography, electronics</b>
<b>Nickel</b>	<b>Batteries</b>
<b>Platinum</b>	<b>Automobiles, catalytic convertors, jewellery, medical use</b>



# Uses- Non-Metallic Minerals

<b>Mineral</b>	<b>Uses</b>
<b>Silicate</b>	<b>Sand &amp; gravel for construction, bricks, paving, etc</b>
<b>Limestone</b>	<b>Used for concrete, building stone, used in agriculture for neutralizing acid soils, used in cement industry.</b>
<b>Gypsum</b>	<b>Used in plaster wall-board, in agriculture</b>
<b>Potash, phosphorite</b>	<b>Used in fertilizers</b>
<b>Sulphur pyrites</b>	<b>Used in medicine, car battery, industry</b>

# Extraction: Mining and Quarrying



# Mining: Environmental Problem

- ▶ **Devegetation and defacing of landscape**
- ▶ **Subsidence of land**
- ▶ **Ground water contamination**
- ▶ **Air pollution**
- ▶ **Surface water pollution**
- ▶ **Occupational health hazards**