Deforestation is the purposeful clearing of forest by humans leading to the decrease of forest areas in the world.

Forests are important because they:

1. Manage quantity and quality of water supply
2. They replenish atmospheric oxygen and remove carbon dioxide from the atmosphere
3. They maintain nutrients in the soil
4. They are a habitat for flora and fauna
5. They are a habit for people
6. They provide a source for useful materials like timbre and oil palm

The causes of Deforestation are:

1. Agriculture
2. Logging
3. Construction of infrastructure
4. Urbanisation
5. Climate change

The impacts of deforestations are:

1. Environmental impact:
    a. Loss of biodiversity
    b. Loss of water catchment areas
    c. Enhanced greenhouse effect
    d. Increased risk of flooding, soil erosion, and sedimentation
2. Economic impact:
    a. Depletion of natural resources
3. Social impact:
    a. Loss of habitats of indigenous people

Impacts: forest fires and haze

- Deforestation, the large-scale deforestation, primarily for palm oil plantations, timber extractions, and other agricultural activities, is a major cause of forest fires. Forests are often cleared by cutting and burning vegetation, which can lead to uncontrolled fires that can easily spread to surrounding areas, especially during the dry season. Since Kalimantan has extensive peatlands, which are carbon-rich and highly flammable when drained and dried for agriculture, fires in peatlands are very difficult to extinguish

and can smoulder underground for long periods, releasing large amounts of smoke and carbon dioxide.

- These fires can lead to increased haze levels. The air quality index (AQI) and levels of particulate matter (PM2.5) often reach hazardous levels during fire seasons. In 2015, PM2.5 levels in some areas of Kalimantan exceeded 1000 micrograms per cubic metre, far above the world health organisation's guideline of 25 micrograms per cubic metre for a 24-hour period. Prolonged exposure to haze can lead to increased hospital admissions and premature deaths. Vulnerable populations, such as children, the elderly, and those with pre-existing health conditions, are at greater risk.
- The Indonesian government has implemented various policies to reduce deforestation and prevent fires, including a moratorium on new palm oil plantations and efforts to restore degraded peatlands.

Impact: soil erosion, sedimentation, and flooding

- Soil Erosion leads to the loss of the topsoil, which is the most fertile layer. This reduces soil fertility and agricultural productivity.
- Landslides also occur in hilly or mountainous areas, severe erosion can lead to landslides, which are hazardous to human settlements and infrastructure. Deforested areas in Kalimantan can experience soil erosion rates of up to 90 tons per hectare per year.
- In Peatland areas, deforestation can lead to the degradation of peat, cursing subsidence and further erosion. Peatlands, when drained and deforested, can erode at a rate of up to 20 cm per year.
- Sedimentation causes rivers to silt up, reducing their capacity to carry water. This can lead to more frequent and severe flooding.
- High levels of sediments in water bodies degrade water quality, affecting aquatic life and making the water unsuitable for human consumption and other uses. For example, the barrio river, one of the major rivers in Kalimantan, has seen sedimentation rates increase by more than threefold over the past few decades.
- In heavily deforested watersheds, sediment yields can reach over 500 tons per square kilometre per year, which is much higher than in undisturbed forested watersheds.
- Significant damage to homes, roads, and other infrastructure. In rural areas, agricultural lands are particularly vulnerable, leading to crop losses and food insecurity.
- Frequent and severe flooding leads to the displacement of communities, especially those living in low-lying or riverine areas.
- Health risks like outbreaks of waterborne diseases occur, as contaminated water sources and poor sanitation conditions are common flooded areas.

- The frequency and intensity of floods have increased over the past few decades, correlating with increased deforestation rates. For example, in 2021, severe flooding in south Kalimantan affected over 112,000 people and submerged thousands of homes.
- The 2021 floods caused damages amounting to over USD 100 million in South Kalimantan alone.

Impact: loss of biodiversity

- Kalimantan is home to over 15,000 plant species, more than 600 bird species, over 200 mammal species, and thousands of insect species, many of which are endemic to the region. Deforestation leads to the fragmentation of habitats, isolating populations of species and reducing genetic diversity, which is critical for species survival.
- One of the most critically endangered species in Kalimantan, the Bornean orangutan has seen its population decline by over 50% in the past 60 years. The international Union for Conservation of Nature (IUCN) estimates that there are fewer than 105,000 Bornean orangutans left in the wild.
- Several protected areas have been established for conservation efforts, including national parks like Tanjung Puting and Betun Kerihun, which are crucial for conserving biodiversity.

Impact: displacement of indigenous people

- The Dayak people are indigenous inhabitants of Borneo, including kalimantan. They practise a form of shifting cultivation and rely on the forest for hunting, gathering and medicinal plants. Many indigenous communities have customary land rights, but these rights are often not formally recognised by the Indonesian government, leading to conflicts when land is allocated for industrial use.
- Land conflicts related to palm oil plantations alone have affected thousands of indigenous families across Indonesia, including kalimantan. Forced evictions of the indigenous people happen to make way for industrial activities. These displaced people end up in urban areas, facing challenges such as unemployment, discrimination, and loss of cultural identity.
- The NGO and advocacy groups continue to support indigenous communities in the fight for land rights, providing legal assistance, raising awareness, and campaigning for policy changes.

Cloud Formation steps

1. Heat causes water to evaporate into water vapour

2. Warm air with water vapour rises
3. Air is cooled rapidly when it rises as temperature decreases with altitude
4. As air rises, temperature falls and relative humi
5. rises
6. When relative humidity reaches 100% at high altitude, air is saturated and excess water vapour changes back to water through condensation.
7. Water droplets condense on dust particles which act as condensation nuclei. Tiny water droplets form around the nuclei.
8. Water droplets collide with each other and merge into large water droplets
9. This form clouds

Describing temperature by using the mean of the temperature

- High temperature is more than 20 degrees.
- Low temperature is less than 10 degrees

Describing temperature consistency by using temperature range, maximum minus minimum of temperature

- Small range is less than 10 degrees
- Large range is more than 15 degrees
- Describe if its is hot or cold throughout the year
- Describe if its seasonal (is the middle finger)l or uniform temperature
- If it's a flat line, it is close to the equator and has even temperature all year around.
- If there's a large dip or bump, there is definite winter and summer season

Describing precipitation using total annual rainfall

- More than 1500mm total annual rainfall is high or very wet
- Less than 250mm total annual rainfall is low or very dry
- Distinct wet or dry period is not well distributed, not distinct is well distributed

tropics stuff

1. Height temperature (27 to 28 degrees celsius)
2. high rainfall (more than 2500mm)
3. high humidity (80%-90%)

relative humidity is the percentage of the actual amount of water vapour over the maximum amount of water vapour. Max water vapour is 100% saturation where no more evaporation takes place. As temperature increases, relative humidity decreases.

Weather is the current temperature of a particular time (short term) , climate is an average temperature of more than 30 years (long term)

Lower altitude has higher gravity, higher air density and air molecules are more condensed and solar radiation absorbed is higher = it is colder
high altitude has lower gravity, lower air density and air molecules are less condensed and solar radiation absorbed is lower = it is hotter

tropics:

- 90 degree angle of concentrated solar radiation, hence higher temperature

not tropics:

- acute angle of concentrated solar radiation, hence lower temperature

Convectional rain:

1. Ground heats up during the day, air above it becomes warmer than its surrounding and rises. The capacity to hold water vapour also increases.
2. The warm air rises, cools gradually and can no longer hold as much water vapour. Relative humidity of the parcel of air increases. When relative humidity reaches 100% at a certain altitude, the air will condense on condensation nuclei at dew point temperature.
3. Tiny water droplets condense around the dust particles in the air. The dust particles act as condensation nuclei. Tiny water droplets form around the nuclei. The water droplets collide with each other and merge into larger water droplets
4. Heavy water droplets fall to the ground as rain.

Relief rain:

1. The prevailing wind picks up moisture from the sea and pushes moist air up the windward side of the mountain.
2. As the parcel of air approaches a mountain, moist air is forced to rise up the windward side of the mountain.
3. The warm air rises, cools gradually and can no longer hold as much water vapour. Relative humidity of the parcel of air increases. When relative humidity reaches 100% at a certain altitude, the air will condense on condensation nuclei at dew point temperature.

4. Tiny water droplets condense around the dust particles in the air. The dust particles act as condensation nuclei. Tiny water droplets form around the nuclei. The water droplets collide with each other and merge into larger water droplets.
5. They fall as rain on the windward side where it then rises. The leeward side of the mountain has dry descending air, which is the rain shadow effect, as most moisture goes to the windward side.

Tropical rainforest

- The emergent layer is above 30 metres
    - The uppermost layer is 50-80 metres
    - It is formed by crowns of trees
    - They have tall, straight and smooth trunks with few branches
    - They have buttress roots provide additional support for trees
- The canopy layer is 20 metres to 30 metres
    - They grow closely together, they are dense
    - Their crowns interlock to form an almost continuous cover
    - It blocks 97% to 98% sunlight from reaching forest floor
    - It is a refuge for fauna and flora
- The underground layer is below 20 metres
    - It is dark because canopy layer blocks most sun rays
    - Vegetation is mostly parse
    - Only smaller plants, mosses, ferns lianas, and epiphytes live there
    - There is a thin layer of lead litter due to rapid decomposition caused by hot and wet environment

General characteristics of rainforests

1. Thick or dense
2. Luxurant or abundance
3. Evergreen trees
4. Rich biodiversity

Adaptation of plants

1. Broad leaves for photosynthesis
2. Waxy, leathery, hairy surface to minimise loss of moisture due to high temperature through transpiration
3. Drip tips to allow water to drop off easily to prevent fungi and bacterial growth
4. Colourful and strong smelling fruits and flowers to attract pollinators

Environmental functions of tropical rainforest

1. They provide for the survival of many organisms in the physical environment because of the ability to generate oxygen through photosynthesis
2. They absorb carbon dioxide for their own survival and growth.
3. They are able to produce oxygen all year sound as they are evergreen
4. They have an abundance of water and food source, that makes them suitable habitats
5. They are rich in biodiversity
6. The prevent soil erosion as the roots bind soil together, making it hard to erode

Environmental functions for people

1. It is a source of food
2. It is a source for raw material like metal and minerals
3. It is a habitat for indigenous people, who hunt and gather in the forest

The tropical rainforest is in the

1. Amazon (in the central and south america)
2. Congo (in the west and central Africa)
3. South-East Asia

Mangroves are:

1. Found along the coasts
2. In the tropics
3. In calm water conditions so the seedlings do not get washed away
4. In sheltered coastal environment where deposition and accumulation of fine sediments can occur
5. Where there's high water salinity, so there's a lack of competition.
6. The trees are evergreen
7. It has a lower diversity than tropical rainforest
8. They are halophytes, salt tolerant plants
9. They are not in shaded conditions so there's less competition for sunlight

Mangroves can be found in 3 zones.

1. Coastal zone

- It is nearest to sea, most flooded with saltwater at high tides
- Species in the coastal zone can tolerate high salinity and longer flooding
- Species have tube-like breathing roots

2. Middle zone
   - There is shorter periods of flooding by tide
   - Species have prop or stilt roots to anchor plants firmly to muddle soil
3. Inland zone
   - Trees have knee-like roots to provide support on soft soil
   - Species there are least salt-tolerant

Adaptations of mangrove plants

1. Leaves are evergreen, thick & leathery, broad, and has drip tips
2. Some leaves like Avicennia are salt secretors
3. Some leaves like Bruguiera, Rhizophora, and Sonneratia are ultrafiltrators. That means they store excess salt in old leaves about to be shed.
4. The flowers are colourful to attract pollinators
5. They have buoyant fruits that are dispersed by water
6. They have elongated fruits which germinate while on the parent tree, like the Rhizophora.

Mangroves can:

1. Filter pollutants, absorb excess nutrients and trap sediments. The dense mangrove root system traps sediments flowing down rivers. This stabilises the coastline from being eroded and destroyed by natural factors. By filtering out sediments, forests protect coral reefs and seagrass meadows from being smothered in sediments.
2. They provide a habitat for 341 threatened species around the world. WHen twigs and leaves decay, nutrients released become food for aquatic creatures living there to seek shelter and protection.
3. Mangroves are a carbon sink. More than 21 gigatons of carbon is being held within soil surrounding the mangrove roots globally
4. Mangroves are an important source of income, food and economic growth for more than 120 million people who live within 10km of mangrove. For example, rhizophora species are used as material for scaffold poles, firewood and charcoal.