THE LIVING WORLD
Desertification

read

quiz

The Big Picture

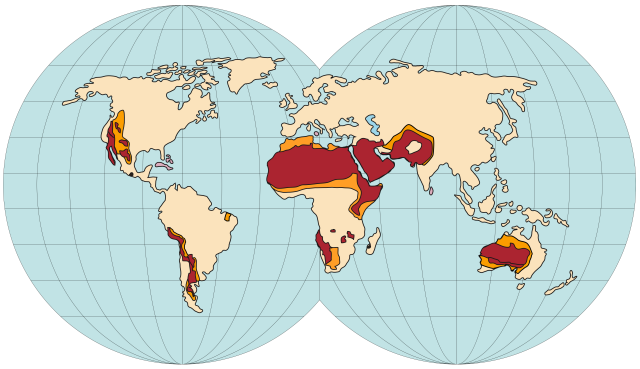
ecosystems

rainforests

The Living World

cold environments or *hot deserts**

Location



Desert
Risk of desertification

About

Deserts are increasing in size daily due to desertification. Desertification is the process of land turning into desert. Areas on the edge of hot deserts are especially at risk.

Causes of Desertification

Climate Change – hotter and drier conditions are increasing the risk of land turning to desert.

Population growth – Increasing population raises the demand for food leading to vegetation destruction and soil erosion.

Removal of fuelwood – Deforestation leave the soil exposed and vulnerable to erosion.

Overgrazing – The soil becomes bare as the result of vegetation being removed by grazing animals.

Over-cultivation – Farming is becoming more intensive which means the land has less chance to recover causing it to become infertile.

Soil erosion – Exposed soil is baked in the sun. When it rains it washes over the surface removing topsoil exposing infertile sub-soil.

Reducing the Risk

Water and soil management

Addresses the problem of intense rainfall events washing away loose soil and causing soil erosion e.g. bunds in the Sahel. It also involves water storage and controlling surface flow.

Appropriate technology

The use of technology or techniques that can be easily used or replaced by local people. Examples include bunds and planting pits (zai).

Tree planting

Effective in reducing soil erosion. Roots bind the soil and canopies act like umbrellas. The Great Green Wall is a plan to plant trees across the southern edge of the Sahara desert.

Key Terms

Bunds – Low rock walls that follow contours, designed to disrupt surface flow.

Desertification – Land turning to desert over time.

Great Green Wall – A plant to plant trees in the Sahel to reduce desertification.

Over-cultivation – Exhausting the soil by over-cropping the land.

Overgrazing – Grazing too many livestock for too long on the land.

Soil erosion – Removal of topsoil faster than it can be replaced.

THE LIVING WORLD
Ecosystems

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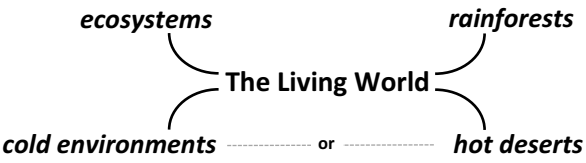
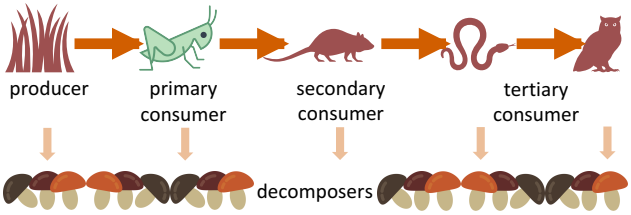
The Big Picture



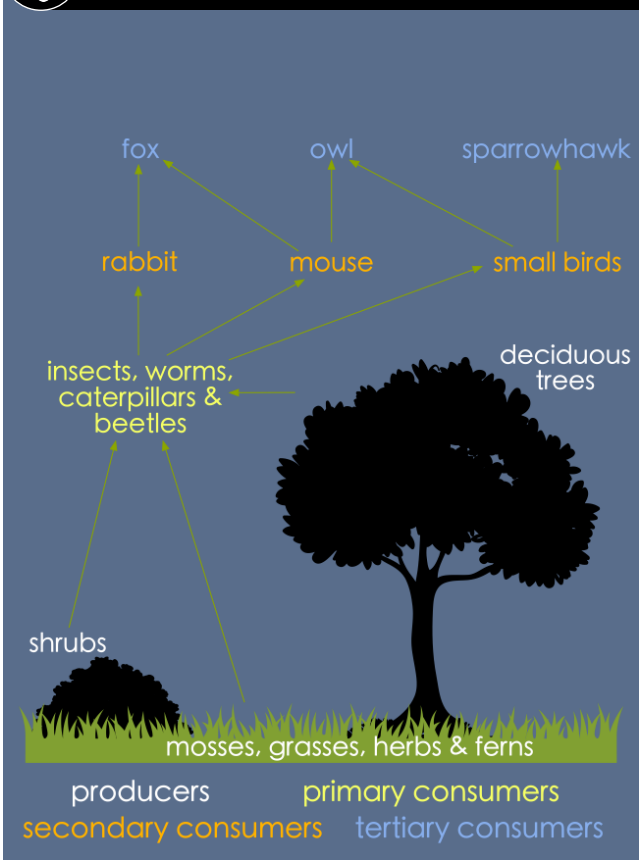
Food Chain



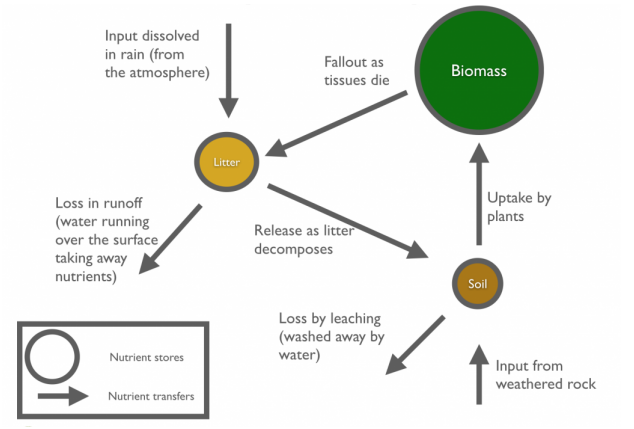
Key Terms

- ***Abiotic*** – The non-living elements of an ecosystem e.g. climate, soil and water.
- **Biotic** – Organisms found in an ecosystem e.g. plants, insects & animals.
- **Ecosystem** – a community of plants and animals sharing an environment with non-living things.
- **Producer** – A type of organism produce their own food usually by photosynthesis.
- **Consumer** – Organisms that consume other organisms to obtain their energy.
- **Decomposer** – Organisms that break down dead plants and animals.
- **Food chain** – The flow of energy from producer to tertiary consumer.
- **Food web** – A diagram showing lots of food chains and how they overlap.
- **Nutrient cycle** – The transfer of nutrients through an ecosystem.

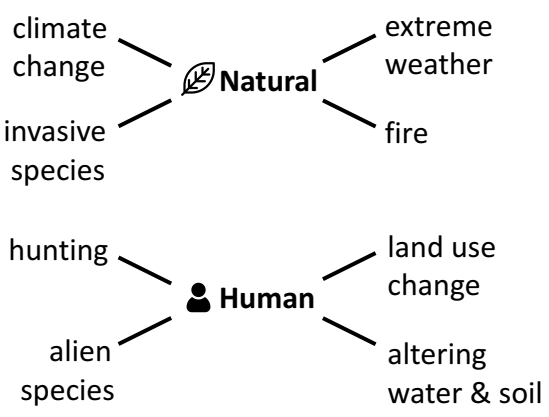
Food Web



The Nutrient Cycle



Ecosystem Change



THE LIVING WORLD
Hot Deserts

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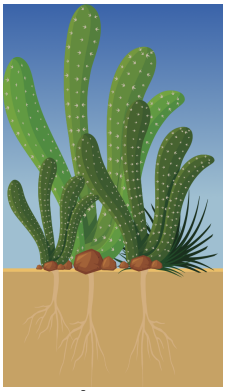
The Big Picture

The Living World
- ecosystems
- rainforests
- cold environments or hot deserts*

Key Terms

- **Appropriate technology** – Technology suited to the needs, skills, knowledge and wealth of local people.
- **Biodiversity** – The variety of life in the world or a particular habitat.
- **Desertification** – The process by which land becomes drier and degraded.
- **Hot desert** – areas with high average temperatures and very low precipitation.
- **Mineral extraction** – The removal of solid mineral resources from the earth.
- **Over cultivation** – Exhausting the soil by over-cropping the land.
- **Over grazing** – Grazing too many livestock for too long on the land, so it is unable to recover its vegetation.

Adaptations



Reduced number of stomata to reduce water loss by transpiration.

Needles instead of leaves, reducing loss by evapotranspiration.

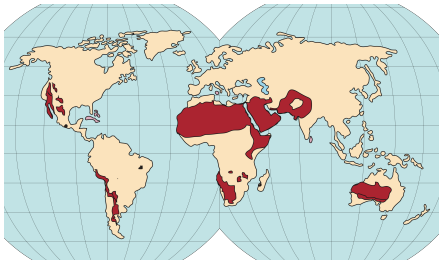
Large capacity to store water in fleshy stems.

Large, network of roots absorb water rapidly after rainfall.

Camels

- humps store fat which a camel can break down into water and energy.
- broad, flat, leathery feet to spread their weight and provide protection from hot sand.

Location



Around the Tropics of Cancer and Capricorn

Between 15° and 30° north or south of the equator

Characteristics

Climate – Arid (rainfall <250mm/year, summer temperatures >40°C and high pressure.

Water – Short supply, downpours when it rains, high evaporation rates.

Soil – Sandy or stony and dry. Very little organic matter and generally not very fertile.

Biotic – Low level of biodiversity. Many plants and animals have adapted to conditions.

People – Sparsely vegetated desert fringes = livestock farming.

Interdependence

Interdependence includes:

- complex food webs
- sustainable coexistence of people, plants and animals in fragile semi-arid environments
- adaptations of plants and animals to soil and climate characteristics
- potential damage to the ecosystem inflicted by overgrazing etc.

Biodiversity

Rich in small pockets near water.

biodiversity
- Threatened by humans.
- Low rainfall = low biodiversity.
- Generally low.
- Fragile to changes.

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THE LIVING WORLD
Western Desert

quiz

The Big Picture

ecosystems — *rainforests*

The Living World

cold environments — or — *hot deserts**

Location

Located in the Southwest of the USA

It extends across several states including California, New Mexico and Arizona.

About

The Western Desert extends over 200,000 square kilometres. The Western Desert comprises three deserts, the Sonoran Desert, the Mojave Desert and the Chihuahuan Desert. Population density is low except for major cities such as Las Vegas and Phoenix.

Opportunities

Mineral resources – Many minerals are extracted from the ground including coal, rare elements used in manufacturing, copper (Sonoran desert) and uranium (Grand Canyon).

Energy – In the Sonoran Desert, enough solar energy is being produced to power 100,000 homes. A dam on Lake Mead generates HEP. Oil is extracted in Arizona.

Tourism – Many tourists visit natural attractions such as the Grand Canyon. Lake Mead is popular for water sports. Las Vegas attracts over 31 million visitors every year.

Farming – Most farming is commercial. In the Coachella Valley water is extracted from aquifers to grow crops. Irrigation canals used for large-scale agriculture.

Challenges

Water – Precipitation levels in the Western Desert are very low at around 55mm per year. The Hoover Dam was constructed on the Colorado River for drinking water and irrigation.

Inaccessibility – Access in the Western Desert is limited to major cities such as Chicago and Las Vegas. Major routes such as Route 66 provide links to major urban areas.

Temperature – Temperatures can exceed 49°C in the Western Desert which makes it very challenging to for people, such as farmers, to work outside. High temperatures lead to rapid evaporation and a shortage of water.

Key Terms

Ecotourism – Travel that conserves the environment and benefits locals.

Inaccessibility – Very difficult to travel or impossible to travel to or reach.

Irrigation – Applying controlled amounts of water to crops.

Non-renewable energy – Energy from sources that will run out e.g. oil.

Population density – a measurement of the number of people in an area.

Renewable energy – Energy from sources that will eventually run out e.g. solar.

THE LIVING WORLD

Malaysia Rainforest Case Study

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The Big Picture

ecosystems — *rainforests** — **The Living World** — *cold environments* — or — *hot deserts*

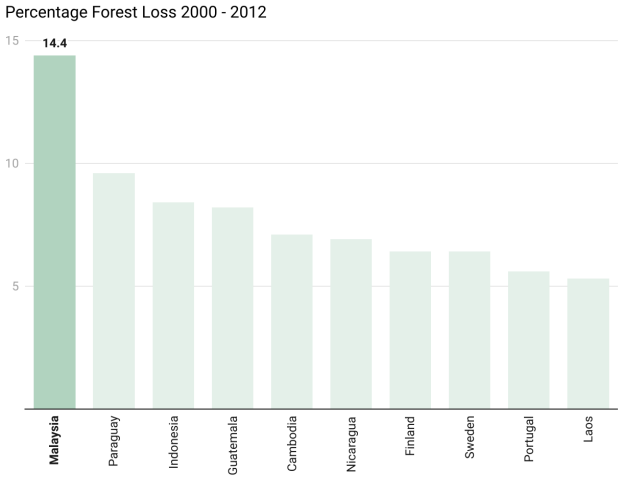
Background

- Malaysia is in southeast Asia.

- At 192,838 km², the Malaysian rainforest is the 24th largest in the world.

Deforestation Rates

- Between 2000 and 2012 Malaysia had the highest deforestation rate in the world (by % area), losing 14.4% of its forest cover.



- The rate of deforestation fluctuated between 2012 and 2015.
- It steadily declined between 2016 and 2020.
- Between 2001 and 2021 17% of rainforest cover was lost.

Causes of Deforestation

Agriculture – Malaysia is the second-largest producer of palm oil in the world.

Logging – Hard wood (mahogany & teak) valued for furniture. Small trees pulped/charcoal.

Road building – Increased accessibility encourages development e.g. in Sarawak.

Mineral extraction – Bauxite mined in Peninsular Malaysia. Oil and Gas in Borneo.

Energy development – High rainfall creates ideal conditions for HEP e.g. Bakun Dam, Sarawak.

Settlement and population growth – Trans-migration Policy – 15000 ha rainforest cleared.

Impacts of Deforestation

Economic Development

- Raw materials used by processing industries increasing the value of exported products.
- Commercial farming and mining generate employment and tax income.
- Cheap, renewable energy = development.
- Loss of biodiversity affects tourism.
- Long-term economic losses due to forests being destroyed and rivers polluted.

Social Impacts

- Education, health care and social conditions are improved from tax revenue.
- Decline in indigenous tribes e.g. Orang Asli.

Environmental Impact

- Exposed land increases soil erosion
- Decline in biodiversity

Climate Change

- Local environment becomes hotter and drier.
- Reduction in carbon sink due to deforestation.

Sustainable Management

International hardwood agreements

Ecotourism — **Debt reduction**

Strategies

Conservation and education — **Selective logging and replanting**

THE LIVING WORLD
Rainforests

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The Big Picture

Key Terms

Biome – Areas of the planet with a similar climate and landscape, where similar animals and plants live.

Biodiversity – The variety of life in the world or a particular habitat.

Commercial farming – Farming to sell produce for a profit.

Debt reduction – National debt relief in return for protecting rainforests.

Deforestation – The chopping down and removal of trees.

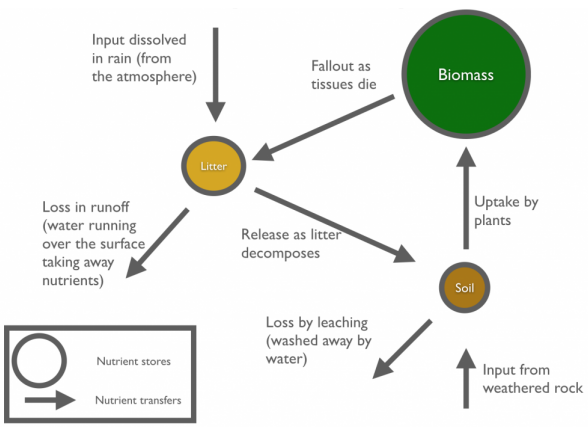
Ecotourism – Responsible travel to natural areas that conserves the environment and benefits locals.

Logging – Cutting down trees and selling the timber.

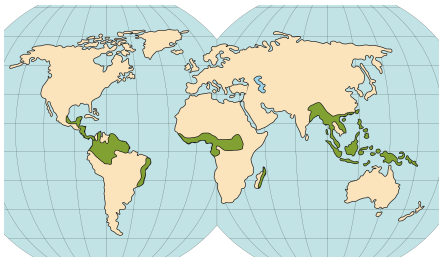
Soil erosion – Removal of topsoil faster than it can be replaced.

Sustainability – Progress meting todays needs with affecting future generations.

The Nutrient Cycle



Location



10°N and 10°S of the Equator

South America (Amazon), the DRC (Africa), Indonesia & Malaysia (Asia)

Characteristics

Climate - High temperatures (27°C) and high rainfall (2000mm +)

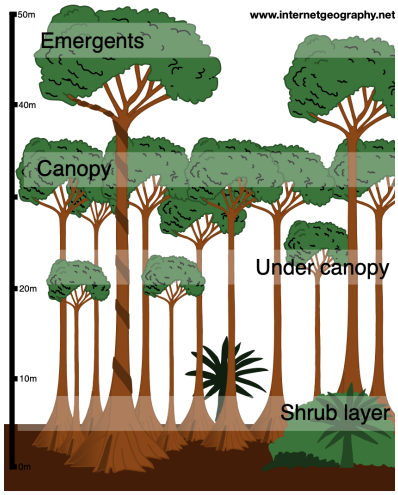
Water – Distinct wet season lasting several months. Leaching during this time.

Soil – Not very fertile. Nutrients concentrated in the topsoil & quickly absorbed.

Biotic – Highest biodiversity in the world. Thousands of species of plants and animals.

People – Traditional tribes live sustainably. Exploitation for $$ gain by non-indigenous.

Adaptations



Emergents and lianas grow to reach the sunlight.

Buttress roots anchor the trees in the shallow soil.

Smooth bark to deter epiphytes.

Plants have thick, waxy leaves & drip tips to channel water.

Poison Dart Frog - bright colours deter predators.

Sloths - long, sharp claws that help them cling onto branches.

Spider Monkey - prehensile tail to be able to grasp the branches of trees.

Jaguars - large claws, which enable them to climb small trees and catch their prey.

THE LIVING WORLD
Rainforests

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The Big Picture

ecosystems — *rainforests** — **The Living World** — *cold environments* — or — *hot deserts*

Value

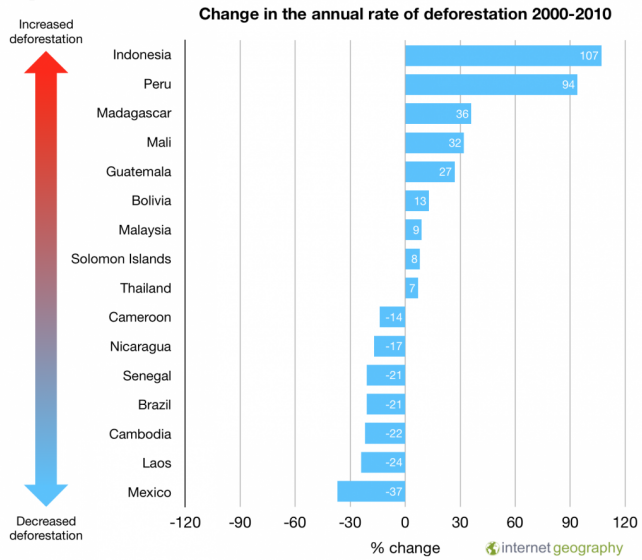
Services

- **Carbon sink**
- **Water and nutrient cycling**
- **Protection against soil erosion**
- **Wildlife habitats**
- **Biodiversity**
- **Employment opportunities**

Goods

- **Native food crops (fruit and nuts)**
- **Wild meat and fish**
- **Building materials (timber)**
- **Energy from hydro electric power**
- **Water**
- **Medicines**

Deforestation Rates



Causes of Deforestation

Logging – Hard wood (mahogany & teak) valued for furniture. Small trees pulped/charcoal.

Road building – Increased accessibility encourages development e.g. Trans-Amazonian.

Mineral extraction – Minerals (gold, bauxite, and copper) mined extensively.

Energy development – High rainfall creates ideal conditions for HEP.

Settlement and population growth – Settlements developed to service developments.

Impacts of Deforestation

Economic Development

- Commercial farming and mining generate employment and tax income
- Education, health care and social conditions are improved from tax revenue.
- Raw materials used by processing industries increasing the value of exported products.
- Cheap, renewable energy = development.
- Long-term economic losses due to forests being destroyed and rivers polluted.
- Loss of biodiversity affects tourism.

Soil Erosion

- Exposed land increases soil vulnerability to soil erosion reducing fertility.

Climate Change

- Local environment becomes hotter and drier.
- Reduction in carbon sink due to deforestation.
- Burning trees releases carbon dioxide.

Sustainable Management