

## What is an Ecosystem?

An ecosystem is a system in which organisms interact with each other and with their environment.

### Ecosystem's Components

**Abiotic** These are **non-living**, such as air, water, heat and rock.

**Biotic** These are **living**, such as plants, insects, and animals.

**Flora** **Plant life** occurring in a particular region or time.

**Fauna** **Animal life** of any particular region or time.

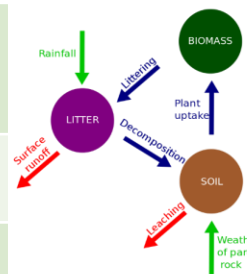


### Food Web and Chains

Simple **food chains** are useful in explaining the basic principles behind ecosystems. They show only one species at a particular trophic level. **Food webs** however consists of a network of many food chains interconnected together.

### Nutrient cycle

Plants take in **nutrients** to build into new organic matter. Nutrients are taken up when animals eat plants and then returned to the soil when animals die and the body is broken down by **decomposers**.

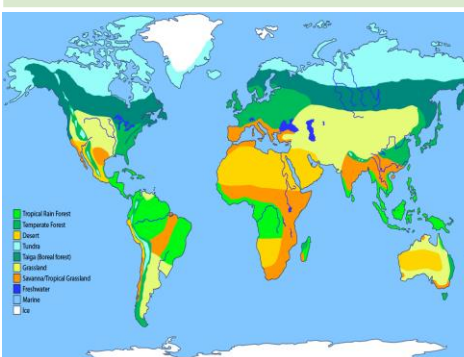


**Litter** This is the **surface layer** of vegetation, which over time breaks down to become **humus**.

**Biomass** The total **mass of living organisms** per unit area.

### Biomes

A biome is a **large geographical area of distinctive plant and animal groups**, which are adapted to that particular environment. The climate and geography of a region determines what type of biome can exist in that region.



Coniferous forest
Deciduous forest
Tropical rainforests
Tundra
Temperate grasslands
Tropical grasslands
Hot deserts.

The **most productive biomes** – which have the greatest biomass- grow in climates that are **hot and wet**.

## Biome's climate and plants

Biome	Location	Temperature	Rainfall	Flora	Fauna
<b>Tropical rainforest</b>	Centred along the Equator.	Hot all year (25-30°C)	Very high (over 2000mm/year)	Tall trees forming a canopy; wide variety of species.	Greatest range of different animal species. Most live in canopy layer
<b>Tropical grasslands</b>	Between latitudes 5°- 30° north & south of Equator.	Warm all year (20-30°C)	Wet + dry season (500-1500mm/year)	Grasslands with widely spaced trees.	Large hoofed herbivores and carnivores dominate.
<b>Hot desert</b>	Found along the tropics of Cancer and Capricorn.	Hot by day (over 30°C) Cold by night	Very low (below 300mm/year)	Lack of plants and few species; adapted to drought.	Many animals are small and nocturnal: except for the camel.
<b>Temperate forest</b>	Between latitudes 40°- 60° north of Equator.	Warm summers + mild winters (5-20°C)	Variable rainfall (500-1500m /year)	Mainly deciduous trees; a variety of species.	Animals adapt to colder and warmer climates. Some migrate.
<b>Tundra</b>	Far Latitudes of 65° north and south of Equator	Cold winter + cool summers (below 10°C)	Low rainfall (below 500mm/ year)	Small plants grow close to the ground and only in summer.	Low number of species. Most animals found along coast.
<b>Coral Reefs</b>	Found within 30° north – south of Equator in tropical waters.	Warm water all year round with temperatures of 18°C	Wet + dry seasons. Rainfall varies greatly due to location.	Small range of plant life which includes algae and sea grasses that shelters reef animals.	Dominated by polyps and a diverse range of fish species.

## Unit 1b



# The Living World

### Tropical Rainforest Biome

Tropical rainforest cover about **2 per cent** of the Earth's surface yet they are home to **over half of the world's plant and animals**.

### Interdependence in the rainforest

A rainforest works through **interdependence**. This is where the plants and animals **depend on each other** for survival. If one component changes, there can be **serious knock-up effects** for the entire ecosystem.



### Distribution of Tropical Rainforests

Tropical rainforests are **centred along the Equator** between the Tropic of Cancer and Capricorn. Rainforests can be found in South America, central Africa and South-East Asia. **The Amazon** is the world's largest rainforest and takes up the majority of northern South America, encompassing countries such as Brazil and Peru.

### Rainforest nutrient cycle

The **hot, damp conditions** on the forest floor allow for the **rapid decomposition** of dead plant material. This provides plentiful nutrients that are easily absorbed by plant roots. However, as these nutrients are in high demand from the many fast-growing plants, they do not remain in the soil for long and stay close to the surface. If vegetation is removed, the soils quickly become **infertile**.

### Climate of Tropical Rainforests

- Evening temperatures rarely fall below **22°C**.
- Due to the **presence of clouds**, temperatures rarely rise above **32°C**.
- Most afternoons have heavy showers.
- At night with no clouds insulating, temperature drops.

### Example: A freshwater pond ecosystem



Freshwater ponds provide a variety of habitats for plants, insects and animals. You need to learn an example of a producer, consumer and also an example of a food chain and food web.

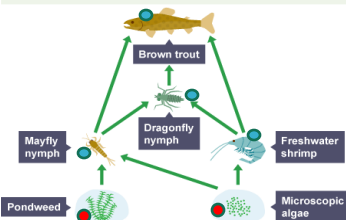
### Components & Interrelationships

Within an ecosystem there are often complex interrelationships (links) between **biotic** (e.g. plants and animals) and **abiotic** features (e.g. soil, climate and light)

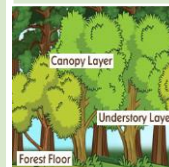
- Producers** (e.g. plants) convert energy from the sun by photosynthesis into carbohydrates for growth
- Consumers** get their energy from eating producers and/or other consumers

Finally dead plant and animal matter is broken down by **decomposers** (e.g. bacteria and fungi) to add nutrients to the soil.

### Simple food web for a pond ecosystem



These complex interrelationships can be found in this simple food web above.



### Canopy

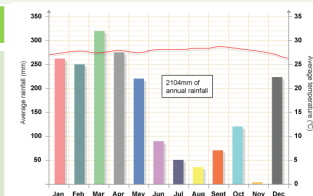
80% of life is found here as it receives **most of the sunlight and rainfall**.

### U-Canopy

Consists of trees that reach **20 metres high**.

### Shrub Layer

Lowest layer with **small trees** that have adapted to living in the **shade**.





## Tropical Rainforests: Case Study Malaysia









Malaysia is a LIC country in south-east Asia. 67% of Malaysia is a tropical rainforest with 18% of it not being interfered with. However, Malaysia has the fastest rate of deforestation compared to anywhere in the world

Adaptations to the rainforest		Rainforest inhabitants
<b>Orangutans</b>	Large arms to swing & support in the tree canopy.	Many tribes have developed sustainable ways of survival. The rainforest provides inhabitants with... <ul style="list-style-type: none"> <li>• <b>Food</b> through hunting and gathering.</li> <li>• <b>Natural medicines</b> from forest plants.</li> <li>• <b>Homes and boats</b> from forest wood.</li> </ul>
<b>Drip Tips</b>	Allows heavy rain to <b>run off leaves easily</b> .	
<b>Lianas &amp; Vines</b>	Climbs trees to reach sunlight at canopy.	


### Issues related to biodiversity

Why are there high rates of biodiversity?	What are the causes of deforestation?
<ul style="list-style-type: none"> <li>• <b>Warm and wet climate</b> encourages a wide range of vegetation to grow.</li> <li>• There is <b>rapid recycling of nutrients</b> to speed plant growth.</li> <li>• Most of the rainforest is <b>untouched</b>.</li> </ul>	<p><b>Logging</b> </p> <ul style="list-style-type: none"> <li>• Most widely reported cause of destructions to biodiversity.</li> <li>• Timber is harvested to create <b>commercial items</b> such as furniture and paper.</li> <li>• <b>Violent confrontation</b> between indigenous tribes and logging companies.</li> </ul> <p><b>Agriculture</b> </p> <ul style="list-style-type: none"> <li>• Large scale <b>'slash and burn'</b> of land for ranches and palm oil.</li> <li>• Increases <b>carbon emission</b>.</li> <li>• <b>River siltation and soil erosion</b> increasing due to the large areas of <b>exposed land</b>.</li> <li>• Increase in <b>palm oil</b> is making the <b>soil infertile</b>.</li> </ul>

Main issues with biodiversity decline	Mineral Extraction	Tourism
<ul style="list-style-type: none"> <li>• <b>Keystone species</b> (a species that are important of other species) are extremely important in the rainforest ecosystem. Humans are threatening these vital components.</li> <li>• <b>Decline in species</b> could cause tribes being unable to survive.</li> <li>• <b>Plants &amp; animals</b> may become extinct.</li> <li>• Key medical <b>plants</b> may become <b>extinct</b>.</li> </ul>	<p></p> <ul style="list-style-type: none"> <li>• <b>Precious metals</b> are found in the rainforest.</li> <li>• Areas <b>mined</b> can experience <b>soil and water contamination</b>.</li> <li>• <b>Indigenous people</b> are becoming <b>displaced</b> from their land due to roads being built to transport products.</li> </ul>	<p></p> <ul style="list-style-type: none"> <li>• <b>Mass tourism</b> is resulting in the building of hotels in extremely <b>vulnerable areas</b>.</li> <li>• Lead to <b>negative relationship</b> between the government and indigenous tribes</li> <li>• Tourism has <b>exposed animals</b> to human <b>diseases</b>.</li> </ul>

Impacts of deforestation	Energy Development	Road Building
<p><b>Economic development</b> </p> <ul style="list-style-type: none"> <li>+ Mining, farming and logging creates employment and tax income for government.</li> <li>+ Products such as palm oil provide valuable income for countries.</li> <li>- <b>The loss of biodiversity will reduce tourism.</b></li> </ul> <p><b>Soil erosion</b> </p> <ul style="list-style-type: none"> <li>- Once the land is <b>exposed by deforestation</b>, the soil is more <b>vulnerable to rain</b>.</li> <li>- With <b>no roots to bind soil together</b>, soil can easily <b>wash away</b>.</li> </ul>	<p></p> <ul style="list-style-type: none"> <li>• The <b>high rainfall</b> creates ideal conditions for <b>hydro-electric power (HEP)</b>.</li> <li>• The <b>Bakun Dam</b> in Malaysia is key for creating energy in this developing country, however, both people and environment have suffered.</li> </ul>	<p></p> <ul style="list-style-type: none"> <li>• <b>Roads</b> are needed to bring supplies and <b>provide access</b> to new mining areas, settlements and energy projects.</li> <li>• In Malaysia, logging companies use an <b>extensive network of roads</b> for heavy machinery and to transport wood.</li> </ul>

### Sustainability for the Rainforest


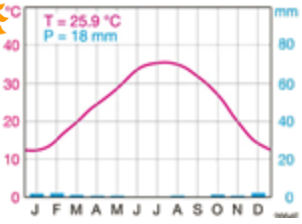
Climate Change	Possible strategies include:
<p></p> <ul style="list-style-type: none"> <li>-When rainforests are cut down, the climate becomes <b>drier</b>.</li> <li>-Trees are <b>carbon 'sinks'</b>. With greater deforestation comes more greenhouse emissions in the atmosphere.</li> <li>-When trees are burnt, they <b>release more carbon in the atmosphere</b>. This will enhance the <b>greenhouse effect</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Agro-forestry</b> - Growing trees and crops at the same time. It prevents soil erosion and the crops benefit from the nutrients.</li> <li>• <b>Selective logging</b> - Trees are only felled when they reach a particular height.</li> <li>• <b>Education</b> - Ensuring those people understand the consequences of deforestation</li> <li>• <b>Afforestation</b> - If trees are cut down, they are replaced.</li> <li>• <b>Forest reserves</b> - Areas protected from exploitation.</li> <li>• <b>Ecotourism</b> - tourism that promotes the environments &amp; conservation</li> </ul>

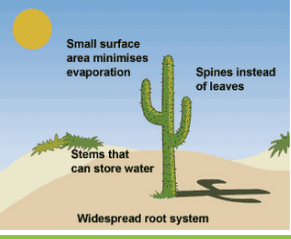
## Hot Desert: Case Study Thar Desert – India/Pakistan



The Thar Desert is located on the border between India and Pakistan in Southern Asia. With India soon becoming the most populated country in the world in the next five years. With this, more people will plan to live in the desert.

Distribution of the world's hot deserts	Major characteristics of hot deserts
<p>Most of the world's hot deserts are found in the <b>subtropics</b> between <b>20 degrees and 30 degrees north &amp; south</b> of the Equator. The <b>Tropics of Cancer and Capricorn</b> run through most of the world's major deserts.</p> 	<ul style="list-style-type: none"> <li>• <b>Aridity</b> – hot deserts are extremely dry, with annual rainfall below <b>250 mm</b>.</li> <li>• <b>Heat</b> – hot deserts rise over <b>40 degrees</b>.</li> <li>• <b>Landscapes</b> – Some places have dunes, but most are <b>rocky with thorny bushes</b>.</li> </ul>

Hot Deserts inhabitants	Climate of Hot Deserts
<ul style="list-style-type: none"> <li>- People often live in large <b>open tents to keep cool</b>.</li> <li>- Food is often <b>cooked slowly</b> in the <b>warm sandy soil</b>.</li> <li>- <b>Head scarves</b> are worn by men to provide <b>protection from the Sun</b>.</li> </ul>	<p></p> <ul style="list-style-type: none"> <li>• <b>Very little rainfall</b> with less than <b>250 mm per year</b>.</li> <li>• It might only <b>rain once every two to three years</b>.</li> <li>• Temperate are <b>hot in the day</b> (45 °C) but are <b>cold at night</b> due to little cloud cover (5 °C).</li> <li>• In winter, deserts can sometimes receive occasional frost and snow.</li> </ul> 

Adaptations to the desert	Desert Interdependence
<p></p> <p>Small surface area minimises evaporation</p> <p>Spines instead of leaves</p> <p>Stems that can store water</p> <p>Widespread root system</p>	<p>Different parts of the hot desert ecosystem are <b>closely linked together and depend on each other</b>, especially in a such a harsh environment.</p>

Opportunities and challenges in the Hot desert	
Opportunities	Challenges
<ul style="list-style-type: none"> <li>• There are <b>valuable minerals</b> for industries and <b>construction</b>.</li> <li>• <b>Energy resources</b> such as coal and oil can be found in the Thar desert.</li> <li>• <b>Great opportunities</b> for renewable energy such as solar power at Bhali.</li> <li>• Thar desert has attracted <b>tourists</b>, especially during <b>festivals</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>The extreme heat makes it difficult to work outside for very long</b>.</li> <li>• <b>High evaporation rates</b> from irrigation canals and farmland.</li> <li>• <b>Water supplies are limited</b>, creating problems for the increasing number of people moving into area.</li> <li>• <b>Access through the desert is tricky</b> as roads are difficult to build and maintain.</li> </ul>

Causes of Desertification		Strategies to reduce Desertification
<p><b>Desertification means the turning of semi-arid areas (or drylands) into deserts.</b></p>	<p><b>Climate Change</b> Reduce rainfall and rising temperatures have meant less water for plants.</p>	<ul style="list-style-type: none"> <li>• <b>Water management</b> - growing crops that don't need much water.</li> <li>• <b>Tree Planting</b> - trees can act as windbreakers to protect the soil from wind and soil erosion.</li> <li>• <b>Soil Management</b> - leaving areas of land to rest and recover lost nutrients.</li> <li>• <b>Technology</b> – using less expensive, sustainable materials for people to maintain. i.e. sand fences, terraces to stabilise soil and solar cookers to reduce deforestation.</li> </ul>
<p><b>Fuel Wood</b> People rely on wood for fuel. This removal of trees causes the soil to be exposed.</p>	<p><b>Overgrazing</b> Too many animals mean plants are eaten faster than they can grow back. Causing soil erosion.</p>	
<p><b>Over-Cultivation</b> If crops are grown in the same areas too often, nutrients in the soil will be used up causing soil erosion.</p>	<p><b>Population Growth</b> A growing population puts pressure on the land leading to more deforestation, overgrazing and over-cultivation.</p>	