

Biome Casestudy: Tropical Rainforest of Amazon basin, Brazil

What is a Biome?

- Biomes are unique regions of the world where the climate controls what type of soil is formed there, animals live there and plants grow there
- Tropical Rainforest – A forest of tall trees found in a region of a year-round warmth
- Average precipitation (rainfall) : 1250mm-6600mm
- Home to greatest variety of living things in the world – huge biodiversity
- Many fruits, vegetables, nuts, drinks, oils, flavourings and other foods come from rainforests

Aspect One: Climate

Temperature

- Rarely above 34C or below 20C – average of 27C
- Small temperature range
- Highest temperatures between June and December due to thermal equator
- Thermal Equator: a belt encircling the earth, defined by the set of locations having the highest mean annual temperature

Humidity

- Average humidity is between 77% and 88%

Precipitation

- Every afternoon – heavy convectional rainfall (1250 to 6600mm per year)

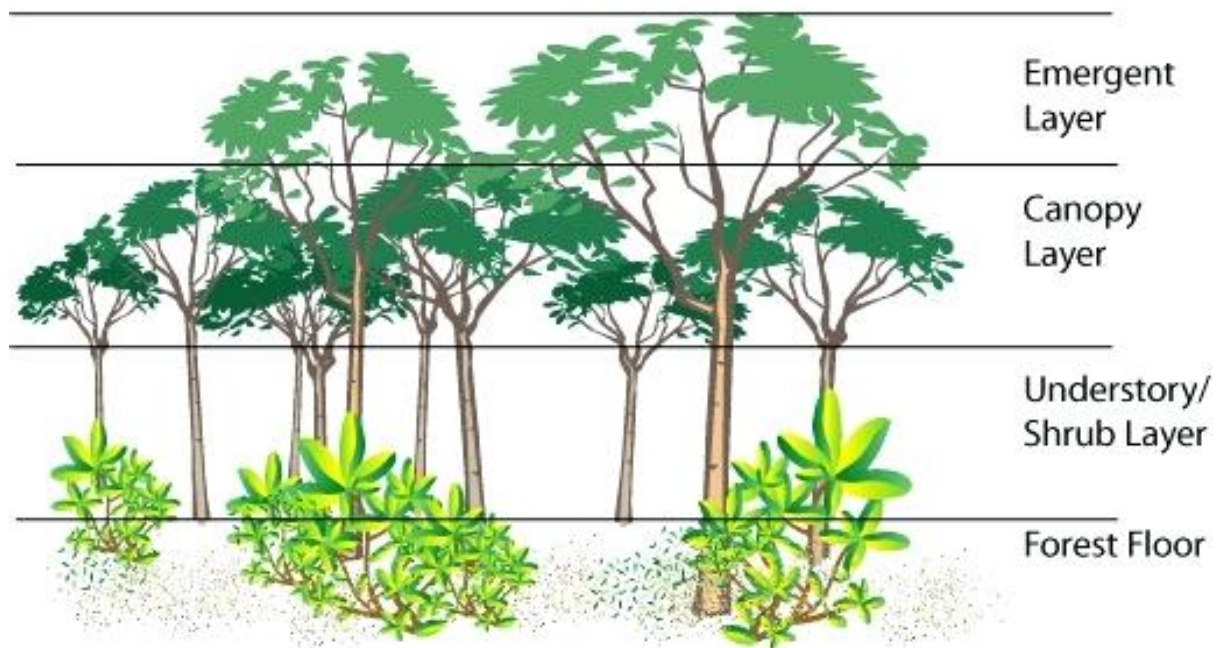
Aspect Two: Vegetation

- Huge variety
- The 3 largest rainforests (South America, Africa, Asia) has a different plant group and animal species

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- However, the plant species look very similar and sometimes may only be distinguished by their flowers
- Typical trees include: teak, mahogany, palm oil and brazil nut trees
- There are 4 distinct layers of vegetation: **forest floor, understory, canopy, emergent layer**

Rainforest Structure



Forest Floor

- Teeming with animal life, especially insects and spiders
- Largest animals generally live here: gorillas, anteaters, wild boars, tapirs and jaguars
- Indigenous people also live here e.g Yanomami of Brazil
- Receives less than 1% of the light that strikes the top of the rainforest
- Few plants can grow here, so relatively easy to walk through
- Top soil is thin and of poor quality
- A lot of leaf litter falls on the ground where it is quickly broken down by termites, earthworms and fungi
- The heat and humidity further help to break down the litter

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- This organic matter (humus) is then quickly absorbed by the trees' shallow roots

Understory

- Also a dark environment, located under the canopy
- Limited plant growth due to lack of light
- Short, leafy, mostly non-flowering shrubs, small trees, ferns and vines (lianas) that have all adapted to filtered light and poor soil
- Animals – insects, spiders, snakes, lizards and small mammals that live on and in tree bark
- Some birds live and nest within tree hollows
- Some larger animals, like jaguars, spend a lot of time on branches looking for prey

Canopy

- The upper parts of trees which grow below the emergent layer
- 20-40 metres above ground
- Leafy environment, full of life : insects, spiders, birds (toucan), mammals (monkey), reptiles and amphibians
- Plants include: snake like vines, and epiphytes (air plants) like mosses, lichens and orchids which grow on trees

Emergent Layer

- The tops of the tallest trees – 40 to 80 metres
- Contains birds like the scarlet macaw, insects and many other creatures
- Trees are spaced far apart with umbrella shaped outlines
- As they are exposed to drying winds, they tend to have small, pointed leaves
- These giant trees have straight, smooth trunks with few branches
- Shallow root system with buttresses that can spread out to a distance of 9 metres

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Plant Adaptations to the Rainforest

- Many adaptations have been made by rainforest plants to their environment
- May be grouped under 3 headings: leaves, roots and trunks and parasitic plants

Leaves

- Many plants have drip tips and grooved leaves to help them shed water quickly, so they don't get weighed down and break
- Some leaves have oily coatings to repel water
- To absorb as much sunlight as possible in the dark shrub layer (forest floor) leaves are very large

Roots and Trunks

- Many emergent trees grow very fast in order to capture the light
- They may have buttress or stilt roots for extra support in the shallow, wet soils of the rainforest
- Trees have straight trunks that do not branch until a height of 30 metres or more because there is no need to grow branches below the canopy where there is little light
- The majority of trees have smooth, thin barks because there is no need to protect them from water loss and freezing temperatures
- It also makes it difficult for plant parasites to get a hold on trunks
- Many plants in the upper region of the rainforest have aerial (air) roots (epiphytes)
- The roots use the moisture of the air
- Their sponge like layers gather water and soak it up later for use
- Plants like orchids and ferns have these types of root systems
- They grow high in the canopy and the roots never reach the ground

Parasitic Plants

- P.P's live off the nutrients supplies by their host plant or they might use them for support
- Good examples are vines and lianas

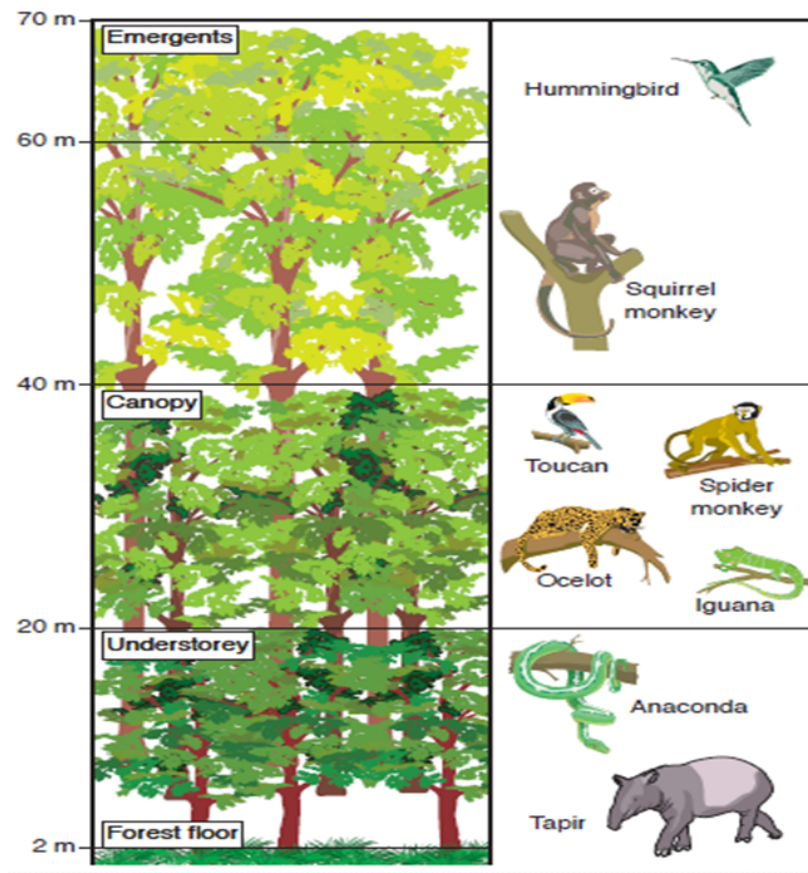
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- Lianas have adapted to the dark conditions on the forest floor by 'catching' a tree and taking a lift to the light
- Lianas start off as small shrubs that grow on the forest floor
- To reach the sunlight in the upper canopy, they send out tiny shoots to grab sapling trees
- The liana and the young tree grow towards the canopy together
- The vines can grow from one tree to another and may make up 40% of the canopy leaves

- Starngler vines use trees as support and grow thicker and thicker as they reach the canopy, strangling their host tree which eventually dies
- Over 2,500 species of vines or lianas grow in the rainforest

- Fibres from T.R.F are used in rugs, mattresses, ropes, strings, fabrics etc.

- T.R.F oils, gums, resins are found in: insecticides, rubber products, fuel, paint, varnish, cosmetics, soaps, shampoos, perfumes, disinfectants and detergents



Aspect Three: Animals

- Estimated that a typical patch of rainforest measuring just $6km^2$ contains as many as:
 - 1,500 species of flowering plant
 - 750 species of tree

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- 400 species of bird
- 150 species of butterfly
- 100 species of reptile
- 60 species of amphibian
- Can contain more than 100 different species of animal in each hectare
- The south american rainforest, particularly around the Amazon Basin, contains a wider variety of plant and animal life than any other biome in the world
- Many varieties of monkeys in the rainforest
- Different areas of the same rainforest may have different species
- Insects make up the largest single group of animals that live in T.R.F
- They include: butterflies, mosquitoes, ants, etc.

Animal Adaptations

- Camouflage/colour
 - Looking like a leaf is very effective in T.R.F
 - Forest floor scattered with dead leaves, so easy to blend in and hard to be seen from above
 - Moths and tree frogs use this method
 - Other animals such as the jaguar have spotted coats to blend in to the shaded forest
 - Animals also use colour to warn predators that they are poisonous
 - Some of the brightly coloured animals are just bluffing
 - The poison arrow frog is certainly poisonous
 - It comes in many different colours from sky blue to black and green
 - Sloths are covered with a greenish layer of algae which camouflages their fur in their tree living (**arboreal**: living in trees) environment
 - They are very slow moving, making them harder to spot

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- Body structure
 - Flying foxes have developed flaps of skin between the front and back legs to allow them to jump between trees and glide for longer distances than they would normally be able to leap
 - Having a tail that can wrap around a tree branch (prehensile tail) is another useful adaptation seen in animals such as lemurs
- Animal – plant associations
 - Animals and plants have a close relationship in the rainforest
 - Animals depend on plants for a home and food
 - Plants depend on animals to fertilise and disperse seeds
 - For example, the Ceiba tree is covered in vivid red flowers that attract many insects and hummingbirds, who drink the nectar, collect pollen and fertilise the tree
 - Some species of frog live only on one species of tree

Aspect Four: Soils

- The latasol is the zonal soil associated with the T.R.F Biome
- Very poor in nutrients due to constant leaching
- As a result, the rainforest has a very short nutrient cycle
- Nutrients are mainly found in living plants and layers of decomposing leaf litter on the surface (O horizon) decomposers such as insects, bacteria etc. make quick work of converting dead plant and animal matter into nutrients
- Plants absorb these nutrients the moment they are released
- 99% of nutrients are held in the root mats of the forest floor
- When a rainforest is cut down or burned, the nutrients are removed from the ecosystem
- The soil in the destroyed rainforest can only be used for a very short time before it becomes completely depleted of all its nutrients

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- The leaves of the trees protect the soil from intense stripping by interception of the powerful raindrops

Leaving Cert Exam Questions on Biomes

2018

Describe the specific climatic and soil characteristics experienced in one biome that you have studied and examine the impact of these specific climatic and soil characteristics on the development of vegetation in this biome

2017

Examine how each of the following activities impact on biomes:

- The felling of tropical rain forests
- Intensive agriculture practices industrial development

2016

Examine the characteristics of one biome that you have studied, with reference to any three of the following:

- Climate
- Soils
- Flora
- Fauna

2015

Examine with reference to one biome that you have studied, how plants and animals have adapted to specific climate and soil conditions

2014

Biomes are altered by human activity. Discuss

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2013

With reference to one biome that you have studied, account for the type of climate experienced in the biome and explain how climate impacts on soils and vegetation within the biome

2012

Explain how any three of the activities listed below can impact on biomes

- Early settlement and the clearing of forests
- The felling of tropical rain forests
- Intensive agricultural practices
- Industrial development

2011

The developemnt of economic activities can alter biomes. Discuss this statement with reference to appropriate examples that you have studied

Examine the charachteristics of any one biome that you have studied under three of the following headings:

- Climate
- Soils
- Flora
- Fauna

2010

Examine the influences of climate on the charachteristics of one biome that you have studied

2009

Assess how biomes have been altered by human activity

2008

Examine two ways in which human activities have altered the natural charachteristics of a biome you have studied

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Describe and explain the main characteristics of one biome that you have studied

2007

Describe how plant and animal life adapt to soil and climatic conditions in a biome which you have studied

2006

Examine the main characteristics of a biome that you have studied

Asses the impact of human activity of a biome that you have studied