**Living World 1: TRF**

**Paper 1 Question 2: (updated Aug 2020)**

Changes to a hedge ecosystem: everything in a ecosystem is linked either directly or indirectly. If one thing changes it will effect other aspects, food and/or habitat eg

- Hot dry summer → Less plant growth → Fewer berries for birds in winter → Number of sparrows fall → Lees food for sparrowshawks → number of sparrowshawks falls

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**Tropical Rainforests Forest Ecosystem**

**Where:** Between 0° (the equator) and 30° N & S, between tropics of Cancer & Capricorn. Central America, North & East South America, Central Africa & SE Asia

**Climate:** Hot & wet all year 27°+, 2000mm rain+ due to overhead sun concentrated on this area all year round

**Soil:** Latasol soil. Nutrients at surface as decay is very fast in hot/wet climate. High rainfall washes nutrients away & huge uptake by the trees

**Characteristics:** Lush & dense vegetation in 4 layers:

1) **Emergent layer**, approx. 40m, above canopy, fast growing, branches at the very top eg Capoc
2) **Canopy layer**, continuous layer of approx. 30m
3) **Undercanopy**, trees approx 10-20m
4) **Shrub layer**: approx. 10m, very little light

**Adaptations:** plants need to adapt to high rainfall, & competition for light & shallow soil

- **Plants**
  - Thick **waxy leaves** with drip tips to channel off water to prevent damage
  - Large **butterress roots** to support tall trunks
  - **Epiphytes** eg lianas that climb other trees to reach sunlight
  - Roots shallow and wide to obtain nutrients at soil surface
  - Ground dwellers e.g. **Anteaters** with long tongues to suck out termites in termite mounds
  - Camouflage e.g. Jaguars + ability to swim in **floods**
  - Poisonous and bright colours e.g. Dart frog to detract predators
  - Canopy dwellers—**Spider monkey** with long arms and prehensile tail to swing through the **canopy**, sharp claws for removing bark for sap.

**Case Study of a Tropical Rainforest & deforestation in Malaysia**

**DEFORESTATION IN MALAYSIA**

- **Deforestation:** cutting down trees on a large scale
- Malaysia is a country in South East Asia.
- 67% of land there is covered in rainforest
- Orang-utans are losing their natural habitats as rainforest is cut down
- **Deforestation** means the land can be used for other enterprises eg commercial farming or palm oil production. The rate of deforestation in Malaysia is the fastest in the whole world. Between 2000 and 2013, the total area of forest lost was larger than Denmark

**THRAT TO MALAYSIA’S RAINFORESTS**

**Logging:**
- The timber is highly valuable.
- Malaysia became the world’s largest exporter of tropical wood in the 1980s. **Clear felling** (where all trees are chopped down in one area) was common – leading to the total destruction of forest habitats. Clear felling has recently been replaced by **selective logging** (see management pg 14)

**Road building:**
- Trees need to be cleared to build roads to provide access to new mining areas, settlements and energy projects. Logging required road construction to bring in the machinery and take away the timber.

**Energy Development:**
- In 2011 the Bakun Dam in Sarawak started to generate electricity. It is Asia’s highest dam (205m) outside China. The dam supplies energy for the industrialised Peninsular Malaysia. The dam’s reservoir flooded over 700km² of land. Several dams are planned to be built to boost Malaysia’s energy supplies

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**Ecosystem**

<table>
<thead>
<tr>
<th>The living and non-living components of an environment and the interrelationships that exist between them</th>
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**Producers**

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<tr>
<th>An organism that uses sunlight to produce food eg grass</th>
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**Consumers**

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<tr>
<th>An organism that gets its energy by eating other organisms. Eg rabbit, fox</th>
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**Decomposers**

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<th>An organism that gets its energy by breaking down dead material (producers or consumers). Eg bacteria, fungi</th>
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**Food Chain**

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<th>A linear diagram showing what eats what</th>
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**Food web**

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<th>Lots of food chains showing how they interlink</th>
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**Herbivore**

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<th>Consumer that only eats producers eg rabbits</th>
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**Carnivore**

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<th>Consumer that eats other consumers eg fox</th>
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**Omnivore**

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<tr>
<th>Consumer that eats other consumers and producers eg pigs</th>
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THREATS TO MALAYSIA'S RAINFORESTS

Mineral Extraction:
- Trees must be removed to access the mineral underground.
- More trees are cleared to build roads to the mines.
- Mainly tin and smelting (heating the ore to extract the metal).
- Drilling for oil and gas has recently started in Borneo.

Population Pressure:
- Poorer urban people were encouraged to move to the rural areas, away from the rapidly growing cities (transmigration policy). Around 15,000 ha of forest was felled for the settlers to build homes & farms.

Commercial Farming:
- Malaysia is the largest exporter of palm oil — large areas of land have been cleared of trees and converted to palm oil plantations.

Subsistence Farming (shifting cultivation):
- Traditionally, local communities would hunt & gather food from the forest & grow crops in small patches of cleared land (from burning). This was sustainable as the areas were small & the forest would re-establish once they moved on. But together with the other threats now adds to the problem.

IMPACTS OF DEFORESTATION

Soil Erosion:
- Roots of trees and plants bind soil together.
- Deforestation means soil is left exposed and is then easily washed away and can cause landslides eg Karak Highway in 2015.

Flooding:
- Risk is increased as less water is absorbed by the roots & stops interception by leaves. Eg Betram Valley in 2013 with loss of 3 lives.

Loss of Biodiversity:
- 14.4% of Malaysia’s rainforest was lost between 2000-2012 (area size of Denmark).
- Destroys an ecosystem and therefore their inhabitants eg Malaysian Sunbear.

Contribution to Climate Change:
- Trees give off moisture during transpiration (deforestation) reduces the moisture in the air causing a drier climate.
- The process of evaporation uses up heat and cools the air -- so if the trees are cut down the temperature will rise.

NATIONAL SUSTAINABLE MANAGEMENT OF DEFORESTATION

1. National Parks Rainforests can be protected from deforestation in conservation areas such as National Parks, which are then used for education, scientific research and tourism. In Malaysia, land use surveys carried out in the 1960's have enabled the government to identify Permanent Forest estates.

2. Ecotourism Ecotourism is sustainable as it is small scale so few areas are cleared. It is staffed by local people so they do not need to make money from deforestation. Accommodation is made from forest materials so it is in keeping with the surrounding. It educates visitors about the wonders of the rainforest. Therefore, it helps increase the need to keep the forests (ie no forests = no tourism).

3. Selective logging Clear felling (cutting all the trees in an area) is quick & easy but very destructive & wasteful. Selective logging is more sustainable as only the trees needed are removed; it only takes mature trees, leaving the young to grow and the high seed bearing trees so forest has more chance to regenerate. Oxen can be used to drag the tree out, reducing need for road construction & the use of large, damaging machinery.

INTERNATIONAL SUSTAINABLE MANAGEMENT OF DEFORESTATION

1. Debt Reduction LIC’s that have borrowed money have been using methods like farming, mining, logging to repay the debt which usually result in deforestation. Some countries have reduced this by debt-for-nature swapping. If debts don’t have to be paid back or so quickly less forest will have to be chopped down to cover the debt so the forests & their ecosystems will last longer e.g. Banco du Brasil now offers reduced interest loans for framers & ranchers who comply with national laws.

2. Forest Stewardship Council (FSC) is an international organization that promotes sustainable forestry. It aims to educate manufacturers & consumers about the need to use wood from sustainable sources. Products that are sourced from sustainable forests will have the FSC label enabling consumers to make better choices. This will help reduce unsustainable logging & increase sustainable management techniques.

3. Carbon Sinks are protected areas of Tropical Rainforest e.g. The Gola Rainforest, which was made a National Park in 2008, where the trees are left to absorb CO2 which would otherwise have add to climate change.

IMPACTS OF DEFORESTATION

Economic Development Gains (opportunities)
- Development of land for mining, farming, logging etc. create jobs and has the multiplier effect.
- Companies will pay taxes which can be used for development of public services.

Economic Development Losses: (challenges)
- Pollution of water sources and an increasingly dry climate may result in water shortages.
- Fires can cause harmful pollution and burn out of control.
- Higher temps could lead to less farm production.
- Plants with medical benefits may become extinct.
- Tourism numbers to rainforests could decrease.