Knowledge collection Page 2

Figure 1 – Text – Distribution of tropical rainforests

1. Tropical rainforests cover 6 % of the earth's surface.

Figure 1 – Map - Distribution of tropical rainforests

2. Rainforests are mostly located in 3 continents Africa, Asia and South America .
3. Rainforests are distributed around the Equator between the Tropic of Cancer and Tropic of Capricorn
4. The largest area of tropical rainforest is the Amazon rainforest, located in South America .
5. One city located in the Amazon rainforest is called Manaus.

Figure 1 – Text – The tropical rainforest climate

6. The climate of the rainforest is hot and wet all year round with no real annual temperature differences. There is very high annual rainfall. High humidity levels make it ideal for the growth of vegetation.
7. Micro-organisms are vital to nutrient cycling because they rapidly decompose biomass in the hot wet and humid conditions.

Application question 1

Use Figure 1 to explain the distribution of the world's tropical rainforests [4 marks]

The tropical rainforests are located in a band around the equator between the tropics of cancer and Capricorn. The three continents with the majority of rainforest are South America, Africa and Asia.

The hot sun at the equator provides plenty of sunlight for photosynthesis, and evaporates large amounts of water, which condenses into heavy daily rainfall.

This hot wet and humid all year round climate creates ideal growing conditions for a huge variety of vegetation and trees.

Figure 1 – Data – The tropical rainforest climate

8. The highest temperature is 29 °C in the months of August, September and October
9. The annual temperature range is 2 °C which is very small.
10. The highest rainfall is in the month of March with 300 mm. Total annual rainfall is very high at over 2000 mm.

Application Question 2

Use Figure 1 to describe the features of the climate of Manaus in Brazil [4 marks]

Manaus has a hot wet climate all year round with a maximum temperature of 29°C in August, September and October.

The annual temperature range is very small at only 2 °C.

Annual rainfall is very high and over 2000mm.

It is wettest between December to April with each month receiving over 200mm of rainfall. March is the wettest month at 300mm. It is slightly drier between the months of June to September.

Figure 1 – Text – The tropical rainforest ecosystem

11. Hot, moist weather gives ideal growing conditions for plants so they grow rapidly .
12. Minerals are added to the soil by the rapid decomposition of biomass
13. Minerals are quickly absorbed by plants or washed out (leached) by rainfall so the actual soil is poor in nutrients.
14. Most energy in the nutrient cycle is stored in the plants (biomass) .
15. The tropical rainforest has a vertical structure with 4 layers.
16. Rainforests have the highest biodiversity of any ecosystem with 60 % of the worlds species .
17. In the Amazon there are over 15 million species of plants and animals
18. In the Amazon there are over half of the world's flowering plants
19. One hectare of land contains 1500 species of fish 2000 bird species, and 30 000 species of insect.
20. All the plant and animal life forms a complex food web.

Application Question 3

Use Figure 1 and your own knowledge to outline reasons for the high levels of biodiversity in the Amazon rainforest [4 marks]

There are extremely high levels of biodiversity in the rainforest because the hot, wet and humid climate provides an all year round growing season meaning a huge variety of species of plants grow.

For example the Amazon contains over half the worlds flowering plants.

This huge variety of producers provides the habitat and food source for a huge range of consumers, and supports a very complex food web.

60% of the world's species ae found in the tropical rainforests. In the Amazon one hectare of land contains 1500 species of fish, 2000 bird species and 30 000 insect species.

Application question 4

Explain the inter-dependence of climate, vegetation and soils in the tropical rainforest ecosystem

[6 marks]

The climate, vegetation and soils are very closely linked, with the vegetation highly dependent on climate and soils to grow.

The hot, wet and humid all year round climate at the equator create the perfect conditions for a huge variety of species of vegetation to photosynthesise and grow, creating habitats for many other species of animals. Some of the trees can reach 50m tall.

When this biomass dies it falls to the ground and forms the litter layer, which is rapidly decomposed in the hot, humid conditions by a wide variety of micro-organisms, fungi and other decomposers that thrive in the humid climatic conditions. This creates nutrients in the soil layer.

Nutrients in the soil are then rapidly re-absorbed by the roots of the wide variety of trees and plants, which allows them to remain healthy and grow. This is called the nutrient cycle.

Any nutrients not quickly absorbed are lost from the soil by rapid leaching in the very wet climatic conditions.

Knowledge collection Page 3

Figure 1 text – The structure of the rainforest

1. Large trees that break through the general levels of the rainforest are called emergents. They grow over 30 m high.
2. The canopy layer is made up of the tops of most trees . It protects the ground from heavy rainfall and reduces sunlight to areas below.
3. The next layer down is called the understory . Plants here need to grow with limited sunlight.
4. The ground layer is largely made up of decomposed material. It is hot and humid. There are scattered plants and fungi used as a food source by insects .

Application question 5

Using Figure 1 explain the structure of the rainforest [6 marks]

The rainforest has a vertical structure with 4 different layers.

The top layer of emergent trees are extremely tall reaching over 30 meters. This is because the all year round growing season with plenty of rainfall and sunlight allows them to grow rapidly. They are tall to get maximum sunlight for photosynthesis.

The next layer called the canopy is made up of the tops of most trees. Most of the growth is at the top of the tree because this is where the trees can access sunlight to photosynthesise.

The trunks are often branchless because below the canopy in the understory much of the sunlight is blocked out. Here you find trees and shrubs adapted to lower light levels. They often have big leaves to maximise photosynthesise.

The Ground layer has little vegetation because it is too dark to photosynthesise. Fungi are found here because they gain energy from decomposing dead biomass and do not require sunlight.

Figure 1 text – The importance of tropical rainforests

5. Rainforests are a vital part of the global carbon balance. They are a carbon sink and a climate regulator. They also help to reduce the local risk of erosion and flooding .
6. They provide a wide range of local foods and industrial products including fibres , resins , dyes and rubber ,
7. They are home to over 1000 indigenous tribes who live sustainably within the forest.

Figure 1 – Text – Tropical rainforests – the World's medicine cabinet

8. The rainforest is important for worldwide health .
9. 120 prescription drugs come from rainforest plants.
10. 25 % of western drugs are derived from rainforest ingredients.
11. Two thirds of cancer fighting drugs come from the rainforest.
12. Bat saliva helps prevent heart attacks .
13. Leech saliva dissolves blood clots.
14. Wild yams used in birth control pills
15. The cocoa plant provides a local anaesthetic .

Application Question 6

Using Figure 1, explain the value of the rainforest to people and the environment [6 marks]

The rainforest is a valuable resource for people and the environment.

On a global scale they are natures medicine cabinet. 25% of all Western drugs have a rainforest ingredient. For example 2/3rd's of all cancer fighting drugs come from rainforests and bat saliva helps prevent heart attacks. This is vital for global health and saves millions of lives each year.

On a local scale rainforests provide a range of resources like resins, dyes and rubber which can be collected and sold by local people, providing income and jobs for local people, improving their standard of living and boosting local economies. They also support the existence of indigenous tribes who live sustainably in the forest.

Rainforests are also vital to the global environment as they are a carbon sink, absorbing carbon dioxide and producing oxygen. This reduces greenhouse gases in the atmosphere helping to slow down the negative effects of climate change.

They are also a habitat to over half the world's species, supporting a huge range of bio-diversity on the planet.

Knowledge collection Page 4

Forest loss Graph – Deforestation of Tropical rainforests

1. Between 2001 and 13 there were 5 years when deforestation of the Brazilian Amazon exceeded 2 000 000 hectares. Brazilian deforestation peaked in the year 2004 and since then there has been an overall but fluctuating decline. In 2013 deforestation was at 125 000 hectares.
2. Deforestation of the Non- Brazilian Amazon is lower than the Brazilian Amazon but is slowly increasing . It has been under 500 000 hectares in all but 5 years.

Annual deforestation rates Graph - Deforestation of Tropical rainforests

1. The country with the greatest increase in rates of deforestation since 2005 is Indonesis in the continent of Asia . Two other Asian countries with increasing rates are Malaysia with 9% increase and Thailand with 7 % increase.
2. The biggest rate of increase in deforestation in the South American Amazon is in Peru with 94 % . Two other South American countries with increasing rates are Guatemala and Bolivia .
3. The South American country with the most rapidly decreasing rate of deforestation is Brazil with -21 %, followed by Nicaragua with -17 %

Application question 6

Using Figure 2, compare rates of deforestation in the Brazilian and non-Brazilian Amazon [4 marks]

Rates of deforestation in the Brazilian Amazon are much higher than the non-Brazilian Amazon with rates above 100 000 hectares per year between 2001 and 13 and above 200 000 hectares between 2002 and 2006.

However rates are fluctuating but falling, for example Brazil has seen a 21% decrease between 2005 and 2010.

In the non-Brazilian Amazon deforestation rates only exceed 50 000 hectares in 5 years and never exceed 100 000. However rates are slowly increasing, for example Peru with a 94% increase and Bolivia a 17% increase between 2005 and 10.

Figure 2 Text – We are destroying rainforests so quickly they may be gone in 100 years

1. At current rates the worlds rainforests will be gone in 100 years.
2. Cutting down trees for wood and other uses is called logging .
3. Four other agricultural activities responsible for most rainforest clearance are cattle grazing ,soya farming , palm oil and rubber plantations .
4. Every year an area the size of England and Wales is destroyed.
5. Deforestation adds to climate change because trees are a carbon sink . They absorb carbon dioxide a greenhouse gas and convert it to wood. Less trees means more carbon dioxide in the atmosphere.
6. At the Paris agreement in 2015 all countries agreed to reduce carbon emissions.
7. The 50 countries with rainforest agreed to reduce illegal forestry and restore millions of acres of forest by 2030.
8. These countries are poor so will need financial and technical support from the HICs because they rely on exploiting their forests to improve living standards for their people.
9. Germany , Norway and the UK have promised 1 billion $, and the World bank will match this figure.
10. Part of the money will benefit indigenous people who are the traditional protectors of the forest.

Knowledge collection Page 5

Figure 2 Text – The main threat to tropical rainforests is illegal activity

1. 50% of deforestation is from illegal activities such as logging , mining and agriculture.
2. These activities do not benefit local people or the Government because illegal activities pay no tax .
3. Environmental laws are not followed so rainforest destruction is huge.
4. Large areas of forest are destroyed to get the most valuable trees . This is called clear felling.
5. Land and rivers are poisoned due to chemicals from illegal mining .
6. Government backed schemes are better because they respect the environment and local people. Money earned is used to improve living conditions.

Application question 7

To what extent does the conservation of the world's rainforest require international cooperation?

[6 marks]

Conserving the world's rainforests needs a large amount of international cooperation.

This is because many of the 50 countries with rainforest are extremely poor and need to use the rainforest to provide resources to improve living conditions in their countries. In order to stop rainforest destruction, richer HIC's need to provide financial and technical support to these countries to help them use their rainforests in a sustainable way, and also to replant areas that have been destroyed.

For example the UK, Germany and Norway have promised $1 billion and the world bank another $1 billion. Without this money there is no encouragement or support for these countries to stop deforestation.

However individual countries could also reduce deforestation on their own by cracking down on illegal activities in their own countries. Activities like mining and logging accounts for over 50% of all deforestation.

They should do this because illegal forestry offers no benefits for the governments or local people as no jobs are created or tax payed. Government backed schemes could then use the rainforest more sustainably e.g. eco-tourism to improve living conditions.

Overall, both international cooperation and national action are needed.

Figure 2 Map and graphs - The main threat to tropical rainforests is illegal activity

1. All the data on the map and graphs is for deforestation between the years 2000 and 2012 .
2. The country with by far the greatest total forest loss is Brazil with 30.6 million hectares.
3. Total deforestation in South America is 33.4 million hectares compared to 20.2 million in Asia.
4. In all countries deforestation due to commercial agriculture accounts for over 75 % of total deforestation. The highest percentage is in Brazil with 90 %.
5. Over ¾ of the commercial agriculture is illegal in Brazil , Bolivia and Indonesia . In Malaysia nearly half of agriculture is illegal with 43 %
6. Over 75 % of all agricultural products are exported to other countries apart from Beef in Brazil which is mostly sold in the country. Malaysia is the highest exporting over 90 %
7. Agricultural products that are mostly exported are Soy , Palm Oil and Pulp .
8. In Asia the main agricultural export is Oil Palm whereas in South America it is Soy .

Application question 8

Using figure 2 compare the causes of deforestation in Asia and South America [4 marks]

In both Asia and South America most deforestation is due to commercial agriculture, with all countries in both continents at or above 75% for this. The highest is Brazil with 90%.

In South America this is mostly Soy farming, with some beef in Brazil. In comparison, in Asia both Malaysia and Indonesia mostly grow oil palm or pulp.

In both continents illegal deforestation is a huge problem and is 79% or above in all countries apart from Malaysia where it is 43%.

In all countries 75% or more of the agricultural products are exported apart from Beef in Brazil where only 17% is exported

Knowledge collection Page 6 – Road development in the Peruvian Amazon

Figure 3 Text

1. The Human development index is an indicator made up of GDP per capita , years in schooling and life expectancy .
2. According to the HDI Peru is a middle income country, ranking 77 out of 187. Middle income countries are also known as NEE's .
3. The percentage of people living below the poverty line is 30 % and 50 % are considered poor.
4. In rural areas food insecurity is a major problem.
5. People in the capital Lima can expect to live 20 years longer than those in rural areas.
6. People in rural areas lack basic facilities e.g. 69 % access to clean water compared to 91% in cities, and 53 % access to sanitation compared to 82 % in cities.
7. Rural people also lack modern technology e.g. internet access in the country is only 40 %.

Application question 9

Using Figure 3 and your own knowledge, to what extent is there a development gap in Peru? [6 marks]

There is a large development gap in Peru. Overall Peru is a middle income country ranked 77/187 on the human development index. On average GNI is $11 295. However this does not show the big inequality in levels of development between urban and rural areas of Peru.

In urban areas services are mostly good with 91% access to clean water and 82% access to sanitation. This is much lower in rural areas with 69% and 52% for the same services. Also people tend to be less poor in urban areas. For the country as a whole 30% are considered poor but in rural areas this reaches 50%.

People in rural areas also suffer from food insecurity and live in villages that lack basic facilities and no modern technology. (internet access for the country is only 40%)

This means there is a big gap in quality of life and standard of living between urban and rural areas which means people in cities like the capital Lima have a much higher level of development, therefore tend to live 20 years longer on average.

Knowledge collection Page 7

Figure 3 Text – Road developments – an important part of the development process.

1. The Peruvian Government plan to construct new roads in the Amazon.
2. The roads will connect major settlements and allow development in rural Peru.
3. Roads will create trade corridors and boost the tourism industry.
4. This type of tourism is known as eco tourism.
5. The roads will however pass through protected reserves and National parks.
6. Supporters say environmental damage will be kept to a minimum.
7. Conservationists are worried about the environment and indigenous people.

Figure 3 – White text box – Road development in the Peruvian Amazon

1. New roads will put a quarter of a million hectares of rainforest at risk.
2. Roads will travel through two indigenous reserves and one National Park.
3. Studies show that when roads are built in the forest a band of land 10 km wide is lost as it encourages other activities . In the Amazon rainforest most deforestation occurs near roads or navigable rivers.
4. This will negatively effect habitats and local communities .
5. Conservationists and locals believe that more environmentally friendly methods could be used to earn money e.g. eco-tourism.

Figure 3 Yellow box (left) – Road building, the engine of progress and enabler of destruction

1. Peru has the second largest share of Amazon rainforest.
2. Peru is one of the most forested countries in the world.
3. Nearly half a million people rely on the forest for their survival .
4. Positively, new roads open up opportunities for trade , industrial development and tourism .
5. Negatively this may lead to destroying habitats as land is cleared for cattle ranching, soy plantations and mining .

Figure 3 Yellow box (right) – Roads will help to drive rural areas of Peru out of poverty

1. Developing mining may help cut poverty by 50 % by 2021. In 2016 over 40 % of rural dwellers were living in poverty.
2. Roads will connect rural areas bringing thousands of jobs in agriculture and mining.
3. It will also increase export earnings giving the government opportunities to invest in social improvements.

Application question 10

Do you think the proposed road development in Peru should go ahead?

Yes No

Use evidence from the resource booklet and your own knowledge to explain your view [9 marks + 3 SPAG]

I think that the proposed road development should go ahead.

I think this because new roads in the Peruvian rainforest will open up the area to economic development from trade, industry and tourism. This will happen because trade corridors will be opened with other countries , such as Brazil and settlements in the rainforest will be properly connected to the rest of the country, improving their accessibility.

At present 40% of people in rural areas in Peru live in poverty with very poor services. Only 69% have access to water and 53% have access to sanitation. There are also a lack of jobs and opportunities for people. This means many are very poor and lack even basic necessities. Many people suffer from food insecurity. This means you are likely to die 20 years younger in rural areas than the capital Lima.

New roads would encourage new industries in to the area, creating jobs and wealth, improving people's standard of living and quality of life. Extra tax to the Government from industries could also be used to invest in better services like water, and sanitation, improving the health of rural populations.

There is an argument that new roads will encourage destructive industries like mining, or monoculture from growing crops like Soy. Some people believe that new roads create a development corridor 10km wide along roads, which could lead to the destruction of a quarter of a million hectares of rainforest, destroying habitats and reducing bio-diversity. This would also threaten indigenous tribes who live in the rainforest.

However if new development is carefully planned, sustainable industries such as eco-tourism could be developed. This would create jobs and wealth but at the same time protect the rainforest, as this is the resource tourists want to come and see. There are also many rainforest resources such as fibres, dyes and rubber that can be harvested and sold without destroying the forest.

The Peruvian Government could also focus on developing their pharmaceutical industry, discovering new medicines and cures in the rainforest that would improve global health but at the same time generate huge wealth for the country.

Finally they could focus on sustainable forestry, where only a few valuable trees are logged and the remainder of the forest protected. Any damaged areas could be re-planted and would regenerate.

These methods would encourage economic development and improve people's lives but at the same time conserve the rainforest for the future.

Overall, if carefully planned, new roads could improve many people/s lives without causing the destruction of the rainforest.