

The Tropical Rainforest Ecosystem: Teachers' Notes

This programme explores the functioning of the rainforest ecosystem, including concepts such as food webs, the nutrient cycle, and how the rainforest ecosystem functions.

This programme focuses mostly upon the Amazon within Ecuador, but of course applies to rainforests almost anywhere in South America. It covers some of the unique features of rainforests, their distribution globally, and the reasons why they are located within specific geographical regions of the world. It explores how food webs function within the ecosystem, and the essential part played by soils in maintaining the health of the ecosystem. The nutrient cycle and its component parts and processes are explained, together with the ways in which the unique structure of rainforests has enabled a huge biodiversity to develop around it.

Teachers' notes

There is one **Teachers' Guidance Sheet**, providing guidance and background information about using video resources in classrooms.

The basis of the programme and follow-up exercises here are that students should:

- **know** about the nature of rainforests, their component parts, and their structure and function;
- **understand** how food webs function within rainforests, together with the essential role played by the nutrient cycle in maintaining rainforests.
- develop **skills** in analysing visual evidence.

There are seven **Student Resource Pages**. Each is designed to develop student knowledge and understanding of rainforest threats. These range from knowing basic locations and terms (Resource Page 1), to searching questions that probe student understanding (Resource Page 2). Later Resource Pages develop students' application of knowledge and their geographical skills (Resource Pages 4, 5, 6 and 7).

Contents

A Teachers' Guidance:

Teachers' Guidance Using this film for active learning

- This consists of ideas to help students learn effectively while watching the programme.

B Resource Pages:

Student Resource Page 1 Knowing the key words

- Knowing the key words from the programme
- Similar terms, different definitions!

Student Resource Page 2 Understanding the programme

- Questions to follow up each part of the programme

Student Resource Page 3 Framework for making notes from the programme

A framework for student notes on the programme

Student Resource Page 4 Understanding the rainforest food web

- Two activities, designed to help students understand food webs and food chains and trophic levels

Student Resource Page 5 Understanding the rainforest water cycle

- An activity to help students understand how the rainforest maintains its own water cycle.

Student Resource Page 6 Understanding the structure of rainforests

- A photo activity to help understand the layers of rainforests.

Student Resource Page 7 Understanding the nutrient cycle

- An activity to help students understand the component parts of the nutrient cycle in rainforests.

Teachers Guidance

Using this film for active learning

Watching a TV programme can often be interpreted by students as a passive experience. Jane Ferretti (2009) has followed Margaret Roberts' research (1986) on the attention given to narration rather than pictures on a video. Asked to make notes, students usually make notes on what is **said** and not what they **see**. Yet, the purpose of TV programmes is for students to be able to see places which they may be unlikely to visit. The strategies below are designed to help students to engage with the programme to help make sense.

1 Describing

- Select scenes (e.g. of the rainforest structure) and ask students to describe in detail – e.g. '10 words to describe what the rainforest is like in each layer'.
- Ask students to describe a scene and devise a script (e.g. for scenes showing the development of soils). This is especially effective if done without sound.
- Reverse the process; ask students to predict what pictures are being shown, and details about these, by listening to the narration but with the screen picture turned off. This could be done for scenes showing the layers in the rainforest.

2 Understanding

- Before a clip, (e.g. on soils and the nutrient cycle) give students specific things to look for. This is especially effective if you ask the class to think about the rainforest and changes when deforestation occurs – 'What's the impact likely to be on soils?' 'What do you think makes these soils fertile?' 'How could these soils change over time if the forest were cleared?'
- Freeze-frame scenes and discuss students' understanding of what is being shown. This is useful for sketching features of a rainforest (e.g. different layers).
- Give students comprehension questions – but beware that they may be listening to the narration, with eyes down, rather than watching the picture. If you choose this strategy, watch the class carefully to ensure that they are watching, and give them time afterwards to make any notes that you want.

3 Listening

- Give students key words to listen out for, and then identify their meaning.
- Ask students to identify key words or phrases, and define these, based on the narration. Some ideas for these are given in **Student Resource Page 1**.

4 Creative follow-up

- **Information Gap.** You need two rooms for this. Half the class watches part of the programme without sound, while the other hears sound but without pictures. Each discusses what they think will be in the script (one group), and shown as pictures (second group). Students return to class, pair up, discuss the situation and characters, and put together sounds and pictures. The teacher then shows the complete programme. This is a good strategy for a) describing rainforests, and b) explaining processes such as the nutrient cycle.
- **Fractured scenes.** Write parts of the dialogue (included in this DVD) on strips of paper; place these in random order in envelopes, and ask students to re-sequence. Or, distribute strips randomly among students, and ask them to describe the scene in which their script occurs.

Further reading

- Ferretti, Jane (2009) 'Effective use of visual resources in the classroom' in 'Teaching Geography', Autumn 2009

- Roberts, Margaret (1986) 'Using video' in 'The Geography Teachers' Handbook', Geographical Association

Student Resource Page 1 Knowing the key words

A Key words

Explain the meaning of these terms which are used in the programme:

- | | |
|-------------------------|------------------------------|
| 1. Abiotic | 19. Hygrometer |
| 2. Aseasonal | 20. Leaching |
| 3. Biodiversity | 21. Lianas |
| 4. Biodiversity hotspot | 22. Litter layer |
| 5. Biomass | 23. Mycorrhizal fungi |
| 6. Biotic | 24. Net primary productivity |
| 7. Buttress roots | 25. Nutrient cycle. |
| 8. Canopy layer | 26. Nutrients |
| 9. Chlorophyll | 27. Photosynthesis |
| 10. Consumers | 28. Predators |
| 11. Decomposers | 29. Primary forests |
| 12. Deforestation | 30. Primary Producers |
| 13. Detrivores | 31. Rainforest |
| 14. Drip tips | 32. Shrub layer |
| 15. Emergent layer | 33. Stratification |
| 16. Epiphytes | 34. Symbiotic relationships |
| 17. Food web | 35. Tertiary consumer |
| 18. Forest canopy | |

B Similar terms, different definitions!

Many similar sounding terms have different meanings. Others are about the same thing, but with subtle changes of meaning.

In pairs, distinguish between these terms:

- Biodiversity and biodiversity hotspot
- Decomposers and detrivores
- Emergent layer and Canopy layer
- Primary forest and forest
- Producers and primary producers
- Epiphytes and lianas
- Food webs and symbiotic relationships
- Biomass and Net primary productivity.

Student Resource Page 2 Understanding the programme

1. What are rainforests like?

- a) Explain how the biodiversity of the rainforest can be useful in creating medicines for people.
- b) Explain why the red-tailed boa is top of the food chain in this area of rainforest.
- c) Explain using examples how, in a food web, one change to the web affects another.
- d) Why, if an area of rainforest is cleared, is it likely to take 700 years before it regrows fully?

2. Where and why do rainforests grow?

- a) How does photosynthesis work? Use these words: chlorophyll, leaves, sunlight, carbon compounds.
- b) Why is net primary productivity highest in the northern hemisphere between April and August, whereas in the southern hemisphere it's between October and February?
- c) Why is there very little variation in temperature in equatorial regions between one month and another?
- d) Why is the word 'seasonal' more meaningful about rainfall than about temperature in equatorial regions?
- e) Explain how rainforests regulate their own water cycle.
- f) Rainforests often get between 3,000 and 4,000mm rainfall annually. Use your atlas to find out how this compares with your home area.

3. Soils and the Nutrient Cycle

- a) How do forests help to 'create their own soils in which to grow'?
- b) Why are rainforests 'the best soil-makers of them all'?
- c) Why do rainforest plants and trees shed their leaves all year round?
- d) Why is the litter layer an extremely important part of the forest ecosystem?
- e) How do nutrients actually get into the soil from the litter layer?
- f) What is a 'clay lick' and why are animals attracted to it?
- g) Why does leaching represent a loss from the nutrient cycle?
- h) Why do tropical rainforest soils soon become infertile after deforestation?
- i) How does the nutrient cycle help to restore nutrients to the soil?

4. Structure and adaptation in Tropical Rainforests

- a) Why do rainforest leaves often have i) pointed drip tips, ii) smooth bark?
- b) Why do most rainforest trees have i) buttress roots? ii) vast root networks? iii) root networks which spread and rarely go deep?
- c) How have rainforest trees formed a symbiotic relationship with Mycorrhizal fungi living in the ground?
- d) Why do the shoots of lianas use claws, hooks and suckers to latch onto trees?
- e) Why can lianas then climb rapidly?
- f) How and why does the strangler fig eventually kill off its host tree?
- g) How do epiphytes survive without roots in the soil?

Student Resource Page 3 Framework for making notes

Section	Notes from pictures	Notes from spoken word
1 What are rainforests like?		
2 Where and why do rainforests grow?		
3 Soils and the Nutrient Cycle		
4 Structure and adaptation in Tropical Rainforests		

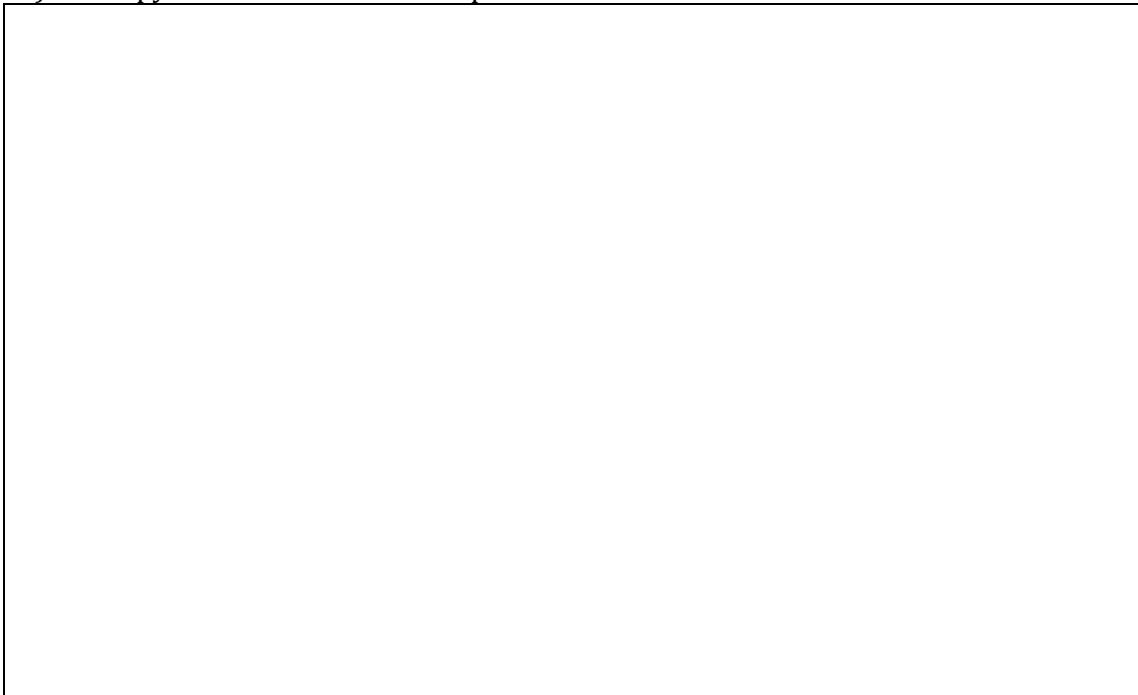
Student Resource Page 4 Understanding the rainforest food web

Take each of the species from the programme below, and create two diagrams:

a) a food web



b) a food pyramid to show different producer and consumer levels



Species list:

Red-tailed boa

Lizards

Insects

Black mantled tamarins (species of monkey)

Fungi

Monkeys

Smaller birds

Smokey jungle frog

Squirrel monkeys

Bacteria

Student Resource Page 5 Understanding the rainforest water cycle

The image below comes from Shadia Duery, International Fellowship Manager at World Forest Institute. It shows different ways in which the water and nutrient cycles operate in rainforests.

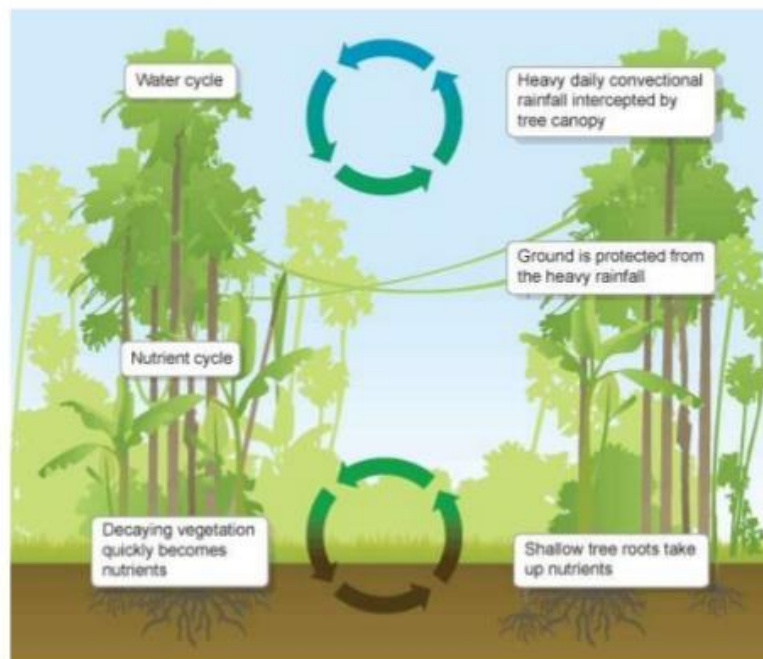
The following ten processes show how the water cycle operates in the rainforest, but have been mixed up.

- a) Clouds form
- b) Droplets merge to form rain
- c) Evaporation from ground surfaces
- d) Evapotranspiration
- e) Pores in the leaves
- f) Temperature cools water vapour in atmosphere
- g) Transpiration
- h) Water droplets
- i) Water vapour condenses
- j) Water vapour given off




Activity

1. Place the processes into a sequence to show how the rainforest creates its own water cycle.
2. Write each process on to the diagram, and link them together using arrows, so that your diagram shows how one process leads to another.
3. Explain how the cycle you have produced would change if the trees were cut down.

Tropical Rainforest Water and Nutrient Cycles



Student Resource 6 Understanding the structure of rainforests

 <p>Top canopy (emergents)</p>	
 <p>Middle (or main) canopy</p>	
 <p>Lower tree canopy (understorey)</p>	



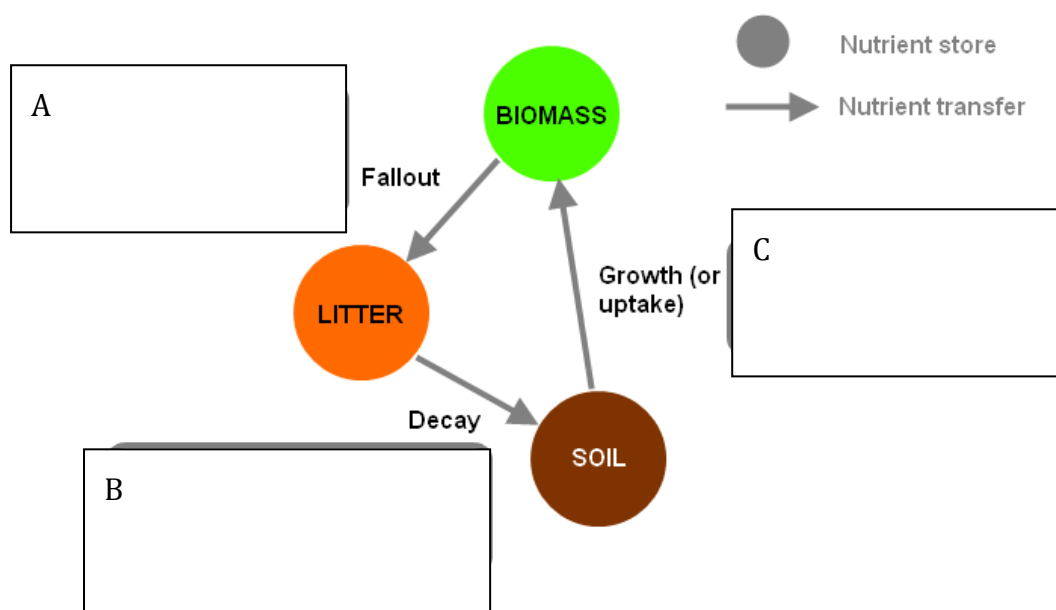
Study the four photos above. They show the four different layers in the structure of the rainforest.

Place each of the following descriptions next to a photo by writing it in the spaces provided.

- Buttress roots are common here
- Crossing the layers are creepers such as lianas
- From ground level to 10m up is the shrub layer.
- Less than 3% of the light striking the trees above gets to the forest floor
- Most of the mature trees are here
- The highest canopy is not a continuous cover
- The lower tree canopy extends up to about 20m.
- The main canopy extends from 20 to 40 metres in height
- There's relatively little undergrowth here
- These plants have to be tolerant to shade and are usually slow growing
- These two layers are sometimes called the under-storey.
- This layer is also called the emergent layer
- Trees here can be over 50 metres high

Student Resource Page 7 Understanding the nutrient cycle

Soil health – or soil fertility – is maintained by the **nutrient cycle** shown below. It is usually known as Gersmehl's nutrient cycle, after the person who developed the idea.



1. Explain the ways in which Biomass, Litter and Soil are linked in the diagram.

2. Explain how the following process occur:

- Fallout

- Decay

- Growth (or uptake)

3. The following phrases belong on boxes A, B, and C in the diagram. Decide which belongs where, and complete the boxes.

- Litter decomposes, returning nutrients to the soil
- Plants take up nutrients as they grow
- Dead plant matter fall to become known as 'leaf litter' on the ground

4. Explain a) how deforestation could break this nutrient cycle, b) why rainforest soils become infertile very quickly.

a)

b)

Tropical Rainforests - Threats and Challenges: Teachers' Notes

This programme is concerned with threats to the Amazon rainforests, which are based in a small area of Ecuador.

This programme focuses mostly upon the Amazon within Ecuador, but also refers to rainforests in Brazil, where the sheer size of the country and the threats to the Amazon are on a different scale. It covers the value of the rainforest regions of the world, both ecologically, and in terms of the goods and services that rainforests provide. It explores the threats to rainforests created by oil and mineral exploration and exploitation, as well as some of the threats caused by plantations and monoculture.

Teachers' notes

There is one **Teachers' Guidance Sheets**, providing guidance and background information about using video resources in classrooms

The basis of the programme and follow-up exercises here are that students should:

- **know** about the nature of rainforests, their environmental value and some of the services and goods that they provide;
- **understand** how different threats can impact upon rainforests, ranging from highly destructive (e.g. oil and mineral exploitation) to more benign but with the potential for greater long-term development and rainforest destruction (e.g. eco-road building);
- develop **skills** in analysing visual evidence.

There are seven Student Resource Pages. These range from knowing basic locations and terms (Resource Pages 1 and 2), to searching questions that probe student understanding (Resource Page 3). Later Resource Pages develop student abilities in applying what they know (Resource Page 7) and using geographical skills (Resource Pages 4-6).

Contents

A Teachers' Guidance:

Teachers' Guidance Using this film for active learning

- This consists of ideas to help students learn effectively while watching the programme.

B Resource Pages:

Student Resource Page 1 Getting to know the Amazon rainforest

- A map showing the key features of the Amazon Basin within Latin America, and activity.

Student Resource Page 2 Knowing the key terms used in the programme

- Knowing the key terms exercise
- Odd one out

Student Resource Page 3 Understanding the programme

- Questions to follow up each part of the programme

Student Resource Page 4 Framework for making notes from the programme

- A framework for student notes on the programme

Student Resource Page 5 Understanding the rate of deforestation in Brazil

- A data activity to aid students' understanding of maths and statistics

Student Resource Page 6 Understanding the rate of deforestation in Brazil

- A satellite image activity about the rate of deforestation in one part of the Amazon Basin.

Student Resource Page 7 What are the greatest threats to the Amazon?

- An diamond ranking activity to help students assess the most important factors behind the deforestation of rainforest regions

Teachers Guidance Using this film for active learning

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1 **Describing**

- Select scenes (e.g. of the rainforest environment) and ask students to describe in detail – e.g. '20 words to describe what the rainforest is like'.
- Ask students to describe a scene and devise a script (e.g. for scenes showing the impacts of the oil pumps). This is especially effective if done without sound.
- Reverse the process; ask students to predict what pictures are being shown, and details about these, by listening to the narration but with the screen picture turned off. This could be done for scenes showing the waterfall diagram.

2 **Understanding**

- Before a clip, (e.g. deforestation) give students specific things to look for. This is especially effective if you ask the class to think about the rainforest and changes when deforestation occurs – 'what's the impact likely to be on soils?', 'do you think the environment will improve for people? For animals?', 'how might this stretch of forest change over time if this road is extended?'
- Give students comprehension questions – but beware that they may be listening to the narration, with eyes down, rather than watching the picture. If you choose this strategy, watch the class carefully to ensure that they are watching, and give them time afterwards to make any notes that you want.

3 **Listening**

- Give students key words to listen out for, and then identify their meaning.
- Ask students to identify key words or phrases, and define these, based on the narration. Some ideas for these are given in **Student Resource Pages 2 and 3**.

4 **Creative follow-up**

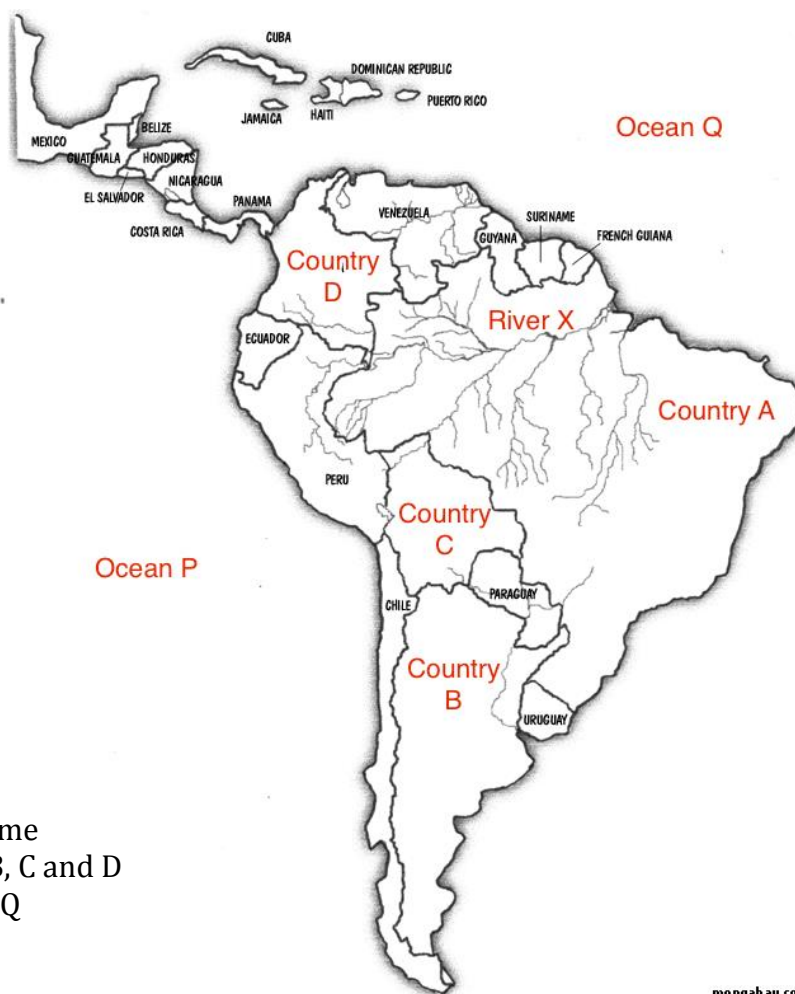
- **Information Gap.** You need two rooms for this. Half the class watches part of the programme without sound, while the other hears sound but without pictures. Each discusses what they think will be in the script (one group), and shown as pictures (second group). Students return to class, pair up, discuss the situation and characters, and put together sounds and pictures. The teacher then shows the complete programme. This is a good strategy for a) describing rainforests, and b) explaining the impacts of deforestation.
- **Fractured scenes.** Write parts of the dialogue (included in this film) on strips of paper; place these in random order in envelopes, and ask students to re-sequence. Or, distribute strips randomly among students, and ask them to describe the scene in which their script occurs.

Further reading

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- Roberts, Margaret (1986) 'Using video' in 'The Geography Teachers' Handbook', Geographical Association

Student Resource Page 1 Getting to know the Amazon rainforest

Figure 1 Map showing Latin America



1. Using an atlas, name
 - a) countries A, B, C and D
 - b) oceans P and Q
 - c) river X.
2. Use your atlas to draw a scale on this map to show 1000km.
3.
 - a) Using your atlas, shade on the map the area of the Amazon rainforest.
 - b) Using your scale, estimate the a) width, b) length of the Amazon rainforest in km
 - c) Using these figures, calculate the area of the Amazon rainforest in km².
4. Using Google Maps or similar application to find and mark on your map:
 - a) Find Héctor's House. Use the following co-ordinates; Latitude 0°26'36.73"S, and longitude 76°49'12.21"W
 - b) Find the oil well north east of Héctor's house (Latitude 0°25'49.01"S, longitude 76°47'42.11"W)
5. Use the polygon tool in Google Maps to work out how much land was cleared to create this well. If you haven't used this before, there's an online tutorial at <https://www.youtube.com/watch?v=40Ybn-BXWFA>
 - a) Identify other wells and oil infrastructure, particularly west of Coca (Latitude 0°27'14.58" S, longitude 76° 59'40.90" W)
 - b) Identify and estimate the extent of deforestation around Héctor's house.

Student Resource Page 2 Knowing the key terms used in the programme

A Key words

Explain the meaning of these terms which are used in the programme:

- | | |
|-------------------------|----------------------------|
| 36. Acculturation | 50. Infertile soil |
| 37. Agribusiness | 51. Logging |
| 38. Biodiversity | 52. Monoculture |
| 39. Cash crop | 53. Native lands |
| 40. Cattle ranching | 54. Oil palm |
| 41. Colonists | 55. Oil terminal |
| 42. Commercial loggers | 56. Petro-dollars |
| 43. Contaminate | 57. Plantations |
| 44. Crude oil | 58. Pollution |
| 45. Deforestation | 59. Primary forest |
| 46. Export | 60. Rainforest |
| 47. Extractive industry | 61. Renewable resources |
| 48. Forest intact | 62. Slash and burn |
| 49. Indigenous people | 63. Symbiotic relationship |

B Odd one out

In pairs, discuss the following groups of terms. In each case, identify the odd one out, and explain what makes it so:

- a) Native lands, Agribusiness, Cash crop
- b) Oil Palm, Logging, Plantation
- c) Primary forest, Colonists, Indigenous People
- d) Rainforest, Symbiotic relationship, Infertile soil
- e) Infertile soil, Rainforest, Biodiversity
- f) Export, Commercial logging, Renewable resources
- g) Slash and burn, Monoculture, Cattle ranching
- h) Indigenous people, Slash and burn, Colonists
- i) Oil palm, Oil terminal, Petro-dollars
- j) Acculturation, Native lands, Forest intact

Student Resource Page 3 Understanding the programme

1 Why are rainforests cut down?

- a) What's the difference between:
 - indigenous people and colonists
 - intact rainforest and deforestation
 - cattle ranching and plantations?
- b) In which country is most of this programme set?

2 The Value of the Rainforest

- a) What is meant by the term 'value of the rainforest'?
- b) What's the difference between 'goods' and 'services' provided by the rainforest?
- c) Give three examples of each of a) goods, and b) services provided by the Amazon rainforest.
- d) Complete the following statement by selecting the correct answers:

The UK is home to about 10 000 / 40 000 / 70 000 / 100 000 species compared to the Amazon where it's estimated there are more than 20 000 / 100 000 / 250 000 / 2.5 million species.

- e) What is meant by the phrase: 'biodiversity plays a vital role in indigenous culture and identity' of people in the Amazon?
- f) Why is it important as far as possible to take note of and record every species in the Amazon rainforest?
- g) In what ways does the Amazon rainforest affect the climate a) locally, b) globally?
- h) Explain how the Amazon rainforest helps to slow the rate of climate change.

3. The Impacts of Oil Extraction?

- a) In what ways is the area close to Hector's home already showing evidence of mineral extraction?
- b) Explain why Héctor feels that the discovery of oil 'devastated (our) communities and decimated huge areas of their extraordinary forest home'.
- c) How and why is Héctor campaigning to stop oil production in the Amazon?
- d) What does Héctor mean by his 'toxic tours' for tourists?
- e) In what ways is the oil industry damaging the rainforest environment?
- f) Explain the meaning of the term 'dead river', and how this has happened.
- g) Explain the full impact of the oil industry on the rainforest in terms of a) getting the oil, b) transporting the oil across the Amazon, and c) exporting the oil overseas.
- h) What does Héctor mean when he says 'When you talk about oil, you can say it was the umbilical cord to the destruction of the Amazon'?

4. The Impacts of Roads

- a) Why until the 1960s did indigenous people have little contact with outsiders?
- b) What does Héctor mean when he says that, after the 1960s, people from outside started to use forest resources in a more 'extractivist' way?
- c) Explain the a) short-term, and b) long-term damage done to the rainforest by commercial logging.
- d) Why have many colonists been poor, landless workers from other parts of Ecuador?
- e) Explain how the traditional way of farming known as 'slash and burn' worked. In what ways was it sustainable?
- f) Explain how forest clearance has led to poorer soils.
- g) Explain how the loss of forest has meant a loss of culture for some groups

5. The Impacts of Plantations

- a) Why are monoculture and biodiversity contradictory terms?
- b) Why are pesticides and other chemicals used more on plantations and rarely in traditional agriculture in the rainforest?
- c) What are the social problems associated with using pesticides?

6. Threats to the Amazon – Benefits and Impacts

- a) Why has the boom in products from the rainforest only benefitted a minority of Ecuador's 16 million people?
- b) Explain why the oil producing areas are the poorest states in Ecuador.
"The benefits of development often come at the expense of deforestation".

Student Resource Page 4 Framework for making notes on the programme

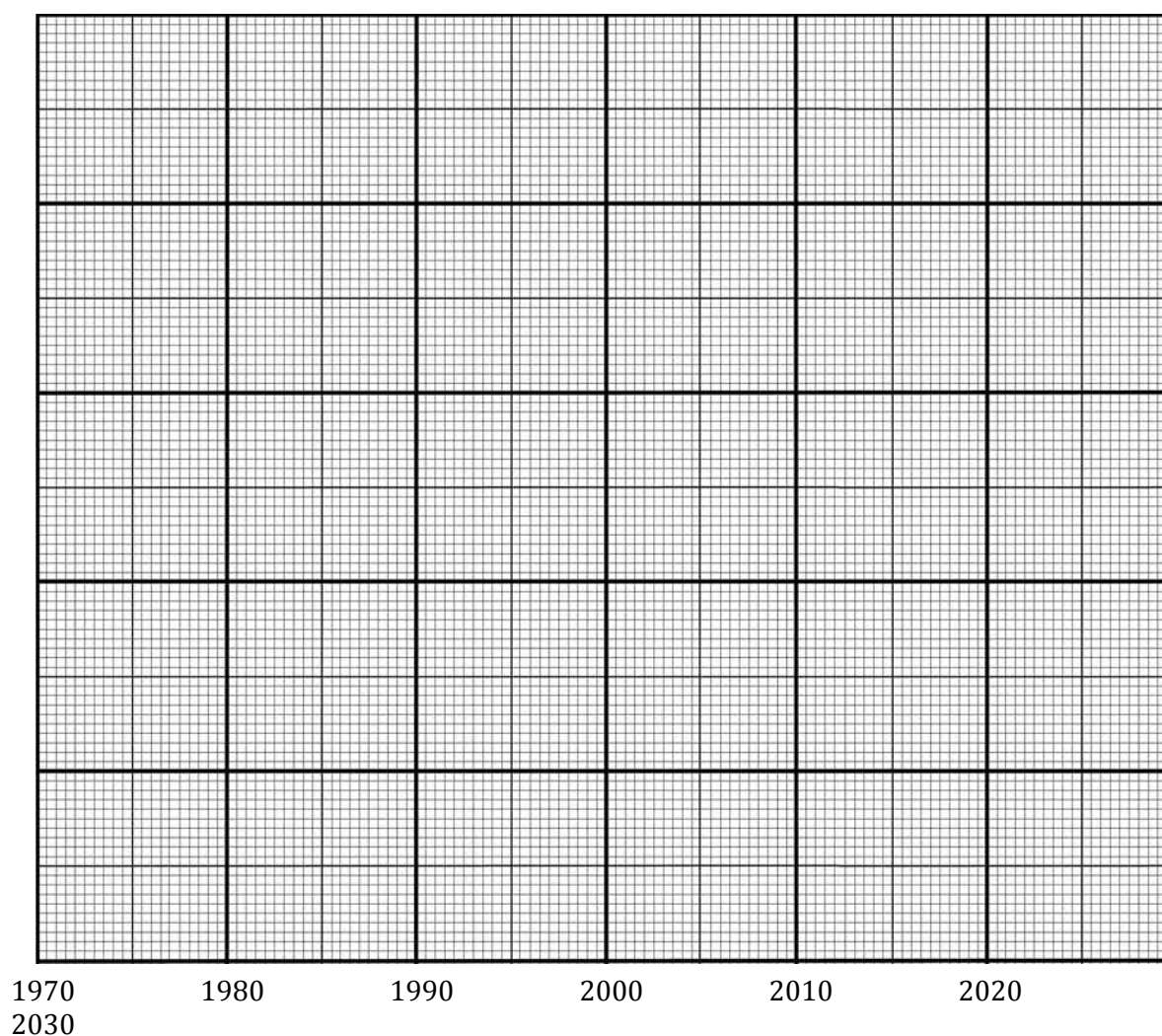
Section	Notes from pictures	Notes from spoken word
1 Introduction		
2 The Value of the Rainforest		
3 Threats to the Amazon – Oil and mineral extraction?		
4 Threats to the Amazon – building roads?		
5 Threats to the Amazon – plantations		
6 Threats to the Amazon – Benefits and Impacts		

Student Resource Page 5 Understanding the rate of deforestation in Brazil

Year	Est. remaining forest in the Brazilian Amazon (km ²)	Annual forest loss (km ²)	% of 1970 cover remaining	Total forest loss since 1970 (km ²)
1977	3,955,870	21,130	96.5%	144,130
1987	3,744,570	21,130	91.3%	355,430
1992	3,667,204	13,786	89.4%	432,796
1997	3,576,965	13,227	87.2%	523,035
2002	3,484,538	21,651	85.0%	615,719
2007	3,387,381	11,651	82.6%	713,837
2012	3,347,799	4,571	81.7%	752,201
2015	3,331,065	5,831	81.2%	768,935

Figure 5 Forest loss in the Brazilian Amazon 1977-2015

1. Draw a scale on the vertical column to show all forest loss in the Brazilian Amazon in km². Extend the scale to 1 million.
2. a) Using the graph paper below, plot the total forest loss in the Brazilian Amazon in km² since 1970. Remember 1970 should be '0'.
b) Annotate the graph to show i) the period of fastest rate of forest loss, Individual Investigation) the slowest rate of loss.
3. Using the graph, estimate a) how much more forest will have been lost by 2030 if the current rate of loss is maintained, b) how much forest might have been lost in total by 2030 if the fastest rates of loss had been maintained.



Years

Student Resource Page 6 Understanding the rate of deforestation in Brazil

Created by NASA, this pair of images shows changing land use around Rondonia in Brazil over 37 years, between 1975 and 2012. It clearly shows the impact of changing road networks across the Amazon region.



Rondonia 1975



Rondonia 2012

Study the photos carefully. Before beginning this activity, be clear that you can spot the following:

- a) areas which are rainforest – these are shown in dark green
- b) areas which have been cleared of forest – these are shown in lighter colours.
- c) The main highway which was built across Rondonia in the 1970s and 1980s.

showing economic, social and environmental impacts of deforestation in the Amazon – then highlight positive and negative – and a summary exercise

Activity

- 1 Locate the area of the rainforest on Google Earth. Its latitude is 10° 3' 35.94"S and longitude is 63°34'21.75"W.
- 2
 - a Using the scale, estimate the area of forest cleared in square kilometres.
 - b Compare the size of area cleared to the size of the UK (250 000 km²).
- 3
 - a Describe the pattern of forest clearance in relation to the road.
 - b Outline the likely reasons for building the road through the Amazon.
- 4 Having watched the programme, form small groups and discuss
 - a) the potential benefits for settlers of farming a recently cleared plots of land,
 - b) the potential social and environmental problems that could result.

Student Resource Page 7 What are the greatest threats to the Amazon?

Several threats to the Amazon are shown in this programme. In this exercise:

1. work in groups of 2-3 to rank these nine threats in a 'diamond ranking'.
This allows you to group some threats to make ranking them easier.
2. present your findings to the class and compare rankings overall.
3. write a summary of 500 words using the title above to explain your ranking.

Nine threats to the Amazon

- a) Population increase
- b) Traditional economic activities e.g. farming using 'slash and burn'
- c) Commercial logging
- d) Oil exploration
- e) Deforestation for cattle ranching
- f) Road building
- g) Giving land for farming to poor landless labourers
- h) Oil palm plantations
- i) Mining or quarrying for minerals

1

2

3

4

5

6

7

8

9

The Tropical Rainforest: Sustainable Management: Teachers' Notes

This programme is concerned with the ways in which future management of the rainforests could adapt more sustainably to the demands placed upon them by people.

This programme focuses mostly upon the Amazon within Ecuador, but of course applies to rainforests almost anywhere in South America. It covers some of the reasons rainforests matter both globally and at local scales. It then explores some of the ways in which more sustainable development options are being applied across Ecuador, including conservation and education, the part played by international agreements in conservation, the role of eco-tourism in providing alternative economic futures, and the impacts of agriculture and logging on the rainforest environment.

Teachers' notes

There is one **Teachers' Guidance Sheets**, providing guidance and background information about using video resources in the classroom

The basis of the programme and follow-up exercises here are that students should:

- **know** about the nature of rainforests, their environmental value and some of the threats that they face;
- **understand** how different forms of development can impact upon rainforests, ranging from destructive (e.g. oil exploration and logging) to more sustainable (e.g. eco-tourism and sustainable farming methods);
- develop **skills** in analysing visual evidence.

There are **seven** Student Resource Pages. Each is designed to meet the requirements of the new GCSEs by developing student knowledge and understanding of rainforest threats. These range from knowing basic locations and terms (Resource Pages 1 and 2) terms, to searching questions that probe student understanding (Resource Page 3). Later Resource Pages develop students' geographical skills (Resource Page 4) and applying what they know (Resource Pages 5, 6 and 7).

Contents

A Teachers' Guidance:

Teachers' Guidance Using this film for active learning

- This consists of ideas to help students learn effectively while watching the programme.

B Resource Pages:

Student Resource Page 1 Getting to know Ecuador

- A map showing the key features of the Amazon Basin within Latin America, and activity.

Student Resource Page 2 Knowing key terms

- Knowing the key terms from the programme
- Remembering the names!

Student Resource Page 3 Understanding the programme

- Questions to follow up each part of the programme

Student Resource Page 4 Framework for making notes from the programme

- A framework for student notes on the programme

Student Resource Page 5 Assessing the impacts of economic activities on rainforests

- A photo activity to help students understand some of the impacts of economic activities on the future sustainability of rainforests.

Student Resource Page 6 More or less sustainable?

- An analytical activity to help understand the complexities of factors which affect sustainability.

Student Resource Page 7 Why is the future of the Amazon uncertain?

- A discussion activity to help students evaluate their own viewpoints about the future sustainability of rainforests

Teachers Guidance Using this film for active learning

Watching a TV programme can often be interpreted by students as a passive experience. Jane Ferretti (2009) has followed Margaret Roberts' research (1986) on the attention given to narration rather than pictures in a film. Asked to make notes, students usually make notes on what is **said** and not what they **see**. Yet, the purpose of TV programmes is for students to be able to see places which they may be unlikely to visit. The strategies below are designed to help students to engage with the programme to help make sense.

1 Describing

- Select scenes (e.g. of the rainforest environment) and ask students to describe in detail – e.g. '20 words to describe what the rainforest is like'.
- Ask students to describe a scene and devise a script. This is especially effective if done without sound.
- Reverse the process; ask students to predict what pictures are being shown, and details about these, by listening to the narration but with the screen picture turned off. This could be done for scenes showing the eco-lodge.

2 Understanding

- Before a clip, (e.g. deforestation) give students specific things to look for. This is especially effective if you ask the class to think about the rainforest and changes when deforestation occurs – 'what's the impact likely to be on soils?', 'do you think the environment will improve for people? For animals?', 'how might this stretch of forest change over time if cattle farming like this is extended?'
- Freeze-frame scenes and discuss students' understanding of what is being shown. This is useful for sketching features of a rainforest (e.g. different plants).
- Give students comprehension questions – but beware that they may be listening to the narration, with eyes down, rather than watching the picture. If you choose this strategy, watch the class carefully to ensure that they are watching, and give them time afterwards to make any notes that you want.

3 Listening

- Give students key words to listen out for, and then identify their meaning.
- Ask students to identify key words or phrases, and define these, based on the narration. Some ideas for these are given in **Student Resource Pages 2 and 3**.

4 Creative follow-up

- **Information Gap.** You need two rooms for this. Half the class watches part of the programme without sound, while the other hears sound but without pictures. Each discusses what they think will be in the script (one group), and shown as pictures (second group). Students return to class, pair up, discuss the situation and characters, and put together sounds and pictures. The teacher then shows the complete programme. This is a good strategy for a) describing rainforests, and b) explaining the impacts of deforestation.
- **Fractured scenes.** Write parts of the dialogue (included in this film) on strips of paper; place these in random order in envelopes, and ask students to re-sequence. Or, distribute strips randomly among students, and ask them to describe the scene in which their script occurs.

Further reading

- Ferretti, Jane (2009) 'Effective use of visual resources in the classroom' in 'Teaching Geography', Autumn 2009
- Roberts, Margaret (1986) 'Using video' in 'The Geography Teachers' Handbook', Geographical Association

Student Resource Page 1 Getting to know Ecuador

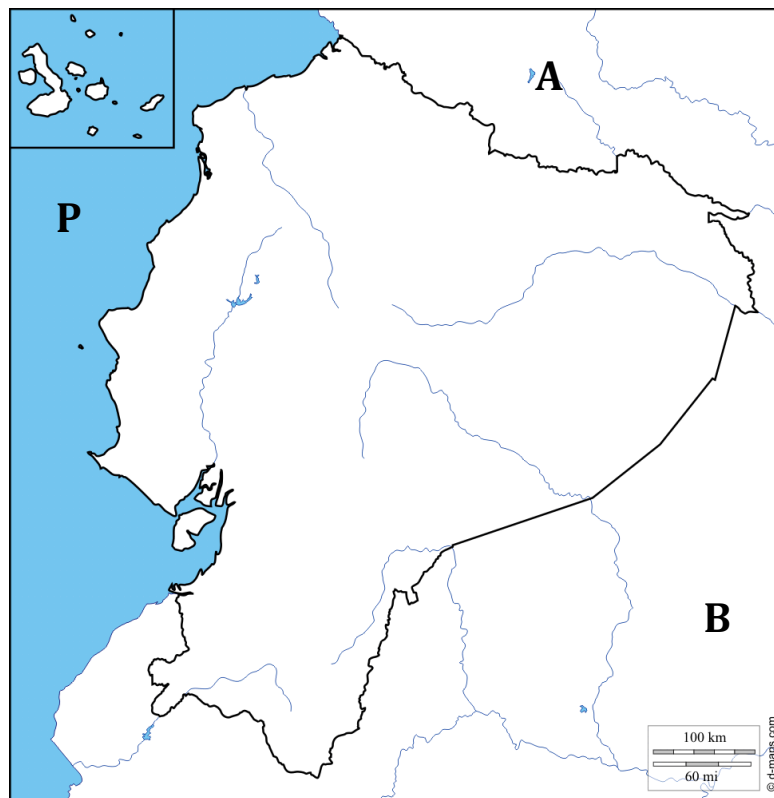


Figure 1 Outline map of Ecuador

1. Using an atlas, locate on the outline map and name:
 - d) neighbouring countries A and B
 - e) land over 1000 metres above sea level – and name this mountain range!
 - f) ocean P
 - g) the capital city, Quito, and second largest city, Guayaquil.
 - h) which of the rivers shown is a tributary of the Amazon
2. Using your atlas, shade on the map and label the area of the Amazon rainforest.
3. Using Google Maps or similar application to locate and mark on your map:
 - c) Héctor's House. Use the following co-ordinates; Latitude $0^{\circ}26'36.73''\text{S}$, and longitude $76^{\circ}49'12.21''\text{W}$
 - d) The Limoncocha National Park, Yasuni National Park, the Fruta Del Norte gold mine, and Yachana Lodge (the eco-tourist facility shown in the programme).
6. Use Google Maps to identify rainforest in the east of Ecuador which has been cleared. In pairs, estimate the proportion of land which has been cleared of rainforest.

Student Resource Page 2 Knowing the key words

A Key words

Explain the meaning of these terms which are used in the programme:

- | | |
|----------------------------------------------|-----------------------------------------|
| 64. Biodiversity | 81. Neo-colonial environmentalism |
| 65. Black market | 82. NGO (Non-Governmental Organisation) |
| 66. Cattle ranching | 83. Organic waste |
| 67. Certified sustainably produced hardwoods | 84. Poaching |
| 68. Commercial logging | 85. Predator |
| 69. Conservation | 86. Primate species |
| 70. Deforestation | 87. Rainforests |
| 71. Diversify | 88. RAMSAR sites |
| 72. Eco-tourist dollars | 89. Rehabilitation |
| 73. Eco-tourism | 90. Resources |
| 74. Exploitation | 91. Slash and burn |
| 75. Illegal logging | 92. Soil nutrients |
| 76. Indigenous people | 93. Subsistence farmers |
| 77. Infertile soil | 94. Sustainable management |
| 78. Microcredit schemes | 95. Sustainable sources of timber |
| 79. Mineral resources | 96. Wetland |
| 80. National Park | |

B Remembering the names!

In Column A below are names of places or features which occur in the programme. Below the table are place descriptions. Match each description to its correct place in Column B.

A Name or feature	B Description
Ecuador	
Amazon	
Limoncocha National Park	
Yasuni National Park	
Yachana Lodge	
Fruta Del Norte	
Yachana Foundation	

Descriptions:

- The location of the gold mine
- The name of the country in which this programme was filmed
- The National Park in which conservation was taking place e.g. of squirrel monkeys
- The name of the eco-tourism destination
- The National Park where large oil reserves have been discovered
- The NGO where sustainable farming methods were filmed
- The river from which Ecuador's rainforest gets its name

Student Resource Page 3 Understanding the programme

1. Why do rainforests matter?

- e) Why are rainforests so important i) to people, ii) to the environment?
- f) Why is it significant that most rainforests are located in rapidly developing or newly industrialised countries?
- g) What is meant by the phrase *'there's always tension between the need to conserve ecosystems and the need to sell resources.'*?

2. Conservation and Education

- g) Why is animal rescue and rehabilitation so important in the Amazon?
- h) What is significant about the monkey 'translocation programme'?
- i) Why are rehabilitation programmes i) normally funded by private individuals or NGOs like the World Wildlife Fund (and not governments), ii) usually small scale?
- j) Why are most wetlands likely to be areas of high biodiversity?
- k) How do the creation of reserves create economic advantages?
- l) Why is protecting biodiversity an economic as well as an environmental policy?
- m) Why do reserves such as Limoncocha need policing?

3. International Agreements

- a) Why do trees in tropical rainforests process more CO₂ than European forests?
- b) Why do some of the world's wealthiest countries and institutions like the EU give international aid or loans in return for agreements to stop deforestation?
- c) Explain why Yasuni National Park has been described as *'the most biodiverse location on the planet'*.
- d) What's radical about the Ecuadorian government's plan for Yasuni and its oil reserves?
- e) How successful has this government plan for Yasuni been?
- f) What's the link between this plan and the later decision to exploit other mineral resources in the Amazon?
- g) What does the decision to exploit minerals have to do with increasing debts of the Ecuadorian government?
- h) Why does Rafael Correa – President of Ecuador – feel this about environmental movements:

It is putting us in the role of guardians of the rainforest so that they can enjoy it on their vacations, so that they can contaminate the environment whilst our rainforest purifies it and we're dying of hunger. We're nobody's fools – everyone is responsible for looking after the planet.

4. Ecotourism

- h) Explain what is meant by the following statement about tourism: *'unless it's managed carefully, tourism can have dramatic impacts on the environment.'*
- i) Explain four ways in which the accommodation at Yachana differs from traditional mass tourism.
- j) Outline two **economic** benefits of the eco-lodge at Yachana.
- k) Why does Alfonso think his job at Yachana is of great benefit to him?
- l) Outline three ways in which tourism is managed at Yachana so that there is minimal damage from tourists.
- m) Explain how tourists to Yachana engage with local people and culture, as well as seeing unique environments.
- n) Outline three benefits for the local community at Yachana from the income from the eco-lodge.

- o) Compare the environmental impacts of oil on the rainforest and its communities with those created by eco-tourism.

5. Agriculture and Logging

- a) Explain why i) tropical rainforest soils become infertile after a short time, ii) 'slash and burn' was traditionally a sustainable method of farming in rainforest areas.
- b) Explain how 'banana circles' work and why they are a sustainable way of farming rainforests.
- c) How have international agreements affected commercial logging and why?
- d) How do microcredit schemes work? What are their advantages?

Student Resource Page 4 Framework for making notes

Section	Notes from pictures	Notes from spoken word
1 Why do rainforests matter?		
2 Conservation and Education		
3 International Agreements		
4 Eco-tourism		
5 Agriculture and Logging		

Student Resource 5 Assessing the impacts of economic activities on rainforests

	Activity
	Activity
	Activity
	Activity

Study the four photos above. They show four economic activities in the rainforest in Ecuador:

- cattle ranching,
- the Eco-lodge
- growing bananas in circles,
- commercial logging,

but not in that order.

1. Match each economic activity to a photo by writing its name in the space provided.

2. In pairs, carry out the following

- In Column A below, score each of the four economic activities in the photos for their **economic** benefits that they bring to the local people. Use a score between 1 (has no benefits) and 10 (has many benefits).
- In Column B, score each of the four economic activities in the photos for their social benefits that they bring to the local people (i.e. their effects on people and traditional culture). Use a score between 1 (causes big problems) to 10 (brings great advantages).
- In Column C, score each of the four economic activities in the photos for their impacts on the local environment. Use a score between 1 (causes major environmental destruction) to 10 (has many benefits for or maintains the quality of the environment)

Activity	Column A Economic	Column B Social	Column C Environmental	Total score out of 30
Eco-lodge				
Cattle ranching				
Banana circles				
Logging				

3. Add up the total scores.

- Which economic activity has a) the greatest economic, b) social, c) environmental, and d) overall benefit?
- Write a 400-word report on 'Recommendations for future economic activities in the rainforest'. In it, explain how your scores show that some economic activities bring more benefits than others.

Student Resource Page 6 More or less sustainable?

- For each of the following factors that could affect the future sustainability of rainforests in Column A, complete the following table as follows:
 - In **Column B**, say whether the factor makes a sustainable future for the rainforests of Ecuador **more** or **less likely**;
 - In **Column C**, explain why this is so.
- When you have finished this, work with a partner to rank the **most sustainable** down to **least sustainable** factors which affect the future sustainability of rainforests.

Column A	Column B	Column C
Ecuador increases its overseas debts		
New deposits of gold are discovered		
World timber prices fall rapidly		
The global price of bananas doubles		
Ecuador's population increases rapidly		
Demand for beef worldwide leads to an increase in price		
The price of oil doubles		
Air fares increase by 50% between Ecuador and the USA, UK, the EU and Australia		
Ecuador's government bans further oil exploration		
Ecuador signs a global agreement to extend the number of RAMSAR sites		
There are major street protests by poor landless labourers who demand land of their own		

Student Resource Page 7 Why is the future of rainforests uncertain?

How should the world deal with depleting rainforests? Rising demand makes conventional energy more expensive, so that there are reasons to develop the oil beneath the world's rainforests, as in the Amazon. Similarly, there are large deposits of metals across the world's rainforest regions. Yet the preservation of rainforests is not just about the preservation of species, or of cuddly-looking animals, but has implications in terms of arresting climate change, and the value of the goods and services that it provides. What should be done?

Stage 1 Preparing for the discussion

For this lesson, you will need to prepare as follows:

- Five A4 cards or sheets of paper; these should read 'Strongly agree', 'Generally agree', 'Not sure or No Opinion', 'Generally disagree' and 'Strongly Disagree'.
- A small amount of blu-tak to enable these to be stuck on to the classroom walls.
- Classroom; create space for students to move about by moving tables to the sides.

Stage 2 Discussing the issues

- Blu-tak the five cards to the wall, from 'Strongly agree' to 'Strongly Disagree'.
- Explain to students that you are going to read out statements, one by one, and that you will allow about 3-5 minutes to discuss each one. Each time they hear a statement, they should go and stand beneath the card that most clearly describes how they feel about it – e.g. 'Generally agree'.
- Once there, they should justify why they are there, and listen to others do the same.
- If at any time they change their opinion, they can move to another position.
- Read out the statements from the list below. Add your own if you are feeling inventive or other issues have occurred in class.

Stage 3 De-briefing and Concluding

- Debrief students towards the end of the lesson about the views expressed. How far should the search for resources be allowed to dominate the future of rainforests? Should the world be seeking to preserve species? What untapped medicines or foods lie within the secrets of the rainforest?
- To conclude, ask each person to write about 500 words 'Are economic development and the preservation of rainforests compatible?'

Statements

1. Continued exploration of the rainforests for resources such as oil is realistically the only way in which the world will have enough resources for the foreseeable future
2. If clearing rainforests gives us cheap resources for the next 2-3 decades, let's go for it
3. We do not have the right to take whatever the rainforests offer, regardless of consequences
4. There are so many species within the rainforest that it doesn't matter if we lose a few more
5. We should be leaving rainforests as they are now in order to combat climate change

6. Instead of plundering more rainforests for resources, we should be researching alternatives
7. I'm happy to live in a world without rainforests.