

Centre Number						Candidate Number				
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Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	



General Certificate of Education  
Advanced Level Examination  
June 2011

# Environmental Studies

# ENVS4

## Unit 4 Biological Resources and Sustainability

Friday 10 June 2011 1.30 pm to 3.30 pm

**You will need no other materials.**  
You may use a calculator.

### Time allowed

- 2 hours

### Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.  
Two of these marks are for the Quality of Written Communication.
- You will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.
- Question 7 should be answered in continuous prose.  
Quality of Written Communication will be assessed in this answer.



J U N 1 1 E N V S 4 0 1

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ANSWER IN THE SPACES PROVIDED**



Answer **all** questions in the spaces provided.

- 1** The table lists some terms used in the management of biological resources and sustainability.

Complete the table.

Term	Definition
Maximum sustainable yield	The maximum allowable harvest that will not change the ability of the resource to supply that harvest indefinitely
Pollution	
Overpopulation	
Agroecosystem	
Monoculture	
Crossbreeding	

(5 marks)

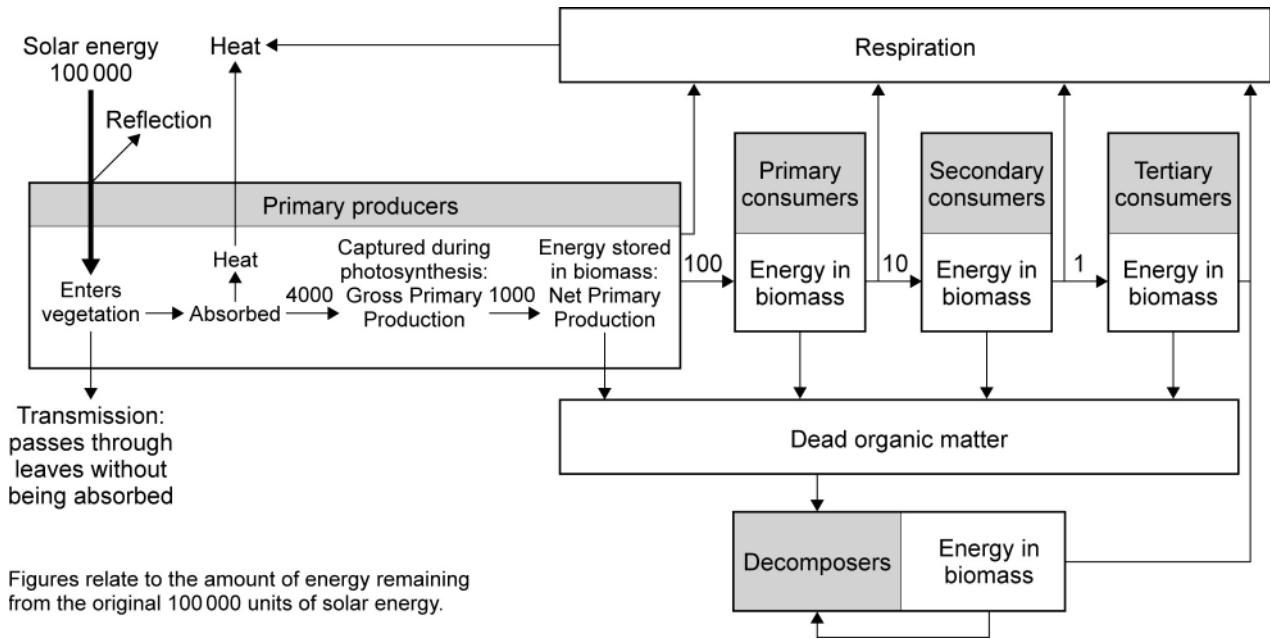
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2 (a) The diagram shows the passage of energy through a food chain.



Figures relate to the amount of energy remaining from the original 100 000 units of solar energy.

2 (a) (i) What percentage of the incoming solar energy is available to herbivores?

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 (1 mark)

2 (a) (ii) What percentage of the energy stored as net primary production is available to humans as secondary consumers?

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 (1 mark)

2 (b) How may limiting factors be controlled in agricultural systems to increase food production?

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 (2 marks)



**2 (c)** Explain when livestock production might be a more effective use of land than crop production.

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(2 marks)

**2 (d)** Describe how you would investigate the distribution of weeds in a field.

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(4 marks)

<b>10</b>

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- 3 (a)** The table shows the percentage of cropland devoted to export cash crops and per capita food energy intake for selected Less Economically Developed Countries in Africa (LEDCs).

Country	Proportion of crop land devoted to export cash crops /%	Mean food energy intake / kJ per capita per day
Cameroon	36	9.5
Ghana	33	10.1
Ivory Coast	29	11.0
Kenya	39	8.8
Nigeria	35	11.3
Uganda	34	9.9

- 3 (a) (i)** Identify the country that does not fit the general trend and explain your choice.

Country .....

Explanation .....

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(1 mark)

- 3 (a) (ii)** The governments of some LEDCs encourage subsistence farmers to convert to export cash crops, such as groundnuts or coffee, to reduce their country's national debt. Outline the disadvantages of this strategy.

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(3 marks)



3 (b) Figure 1 shows a coffee plantation.

Figure 1



Source of photograph: Getty Images

Outline the advantages of monocultures to farmers.

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(3 marks)

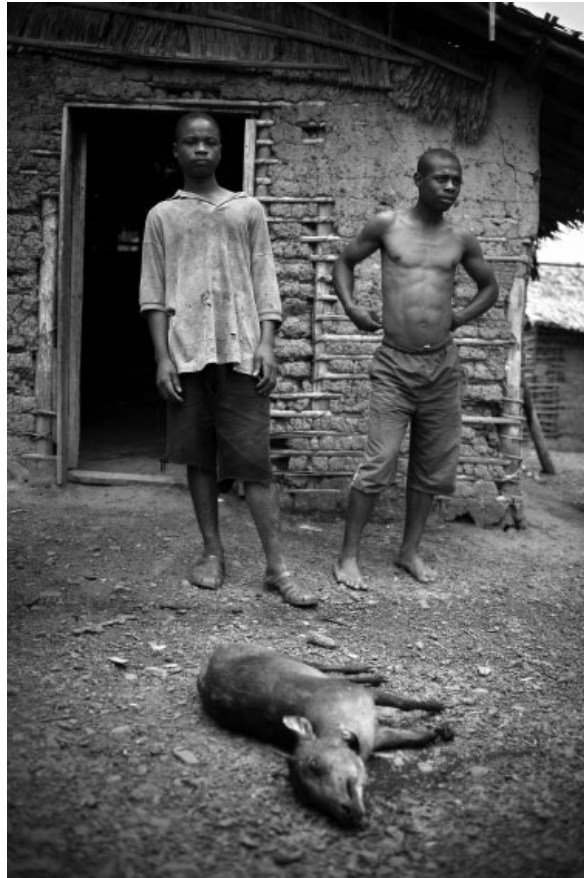
Question 3 continues on the next page

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3 (c) **Figure 2** shows hunters with 'bush meat'.  
Impoverished subsistence farmers may resort to hunting wild game or *bush meat*.

**Figure 2**



Source of photograph: Getty Images

Suggest the environmental impacts of *bush meat* hunting.

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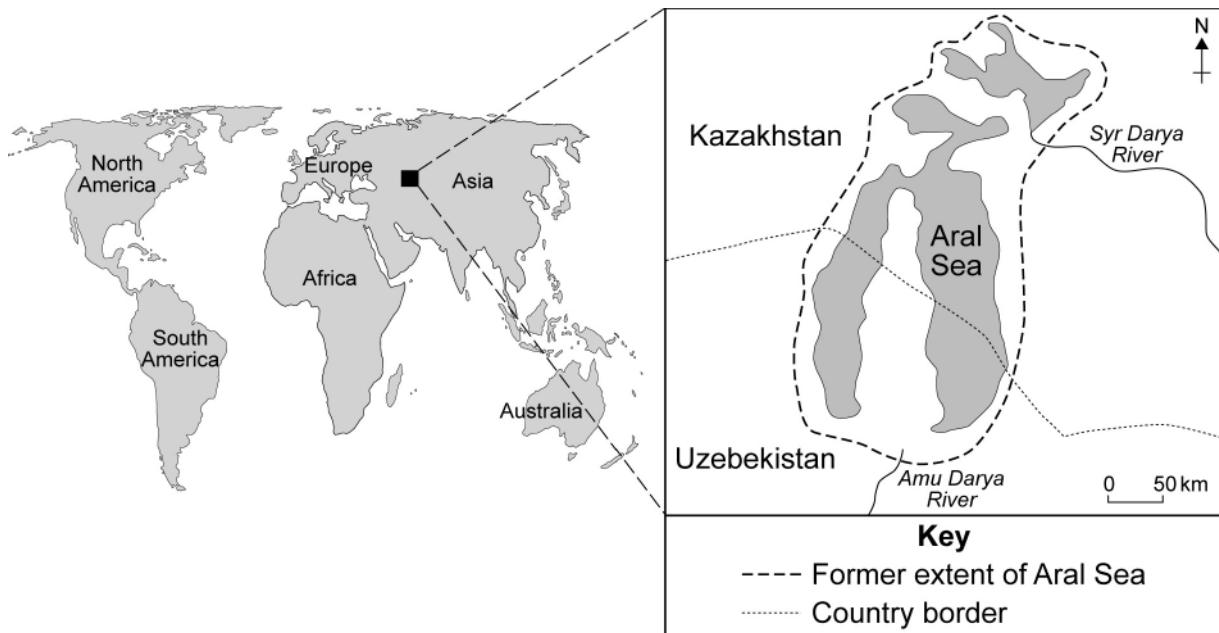
(3 marks)

10





- 4 The maps and photograph show the Aral Sea. Since 1970, the surface area of the Aral Sea has decreased by 74%, whilst its volume has been reduced by 90%. This was caused by the abstraction of water from its feeder rivers to irrigate 7.9 million hectares of wheat and cotton farmland.



Source: [www.worldatlas.com](http://www.worldatlas.com)

### The Aral Sea

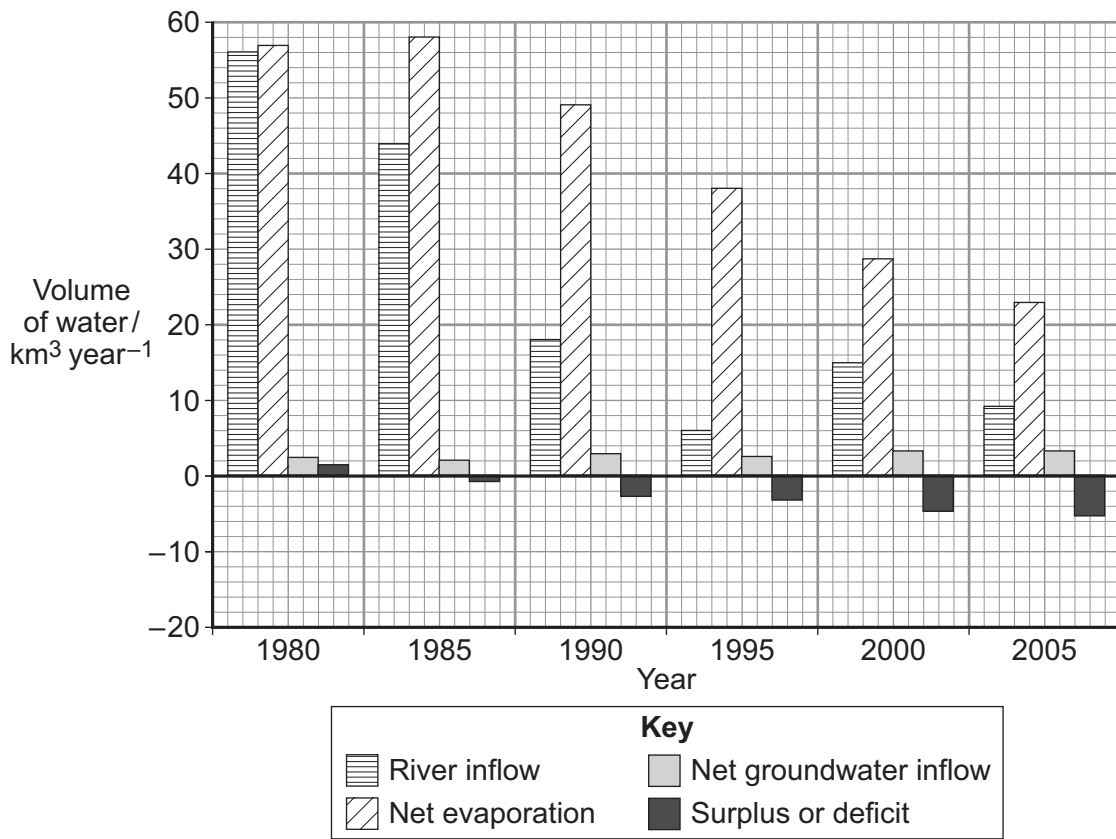


Source of photograph: Getty Images

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4 (a) The graph shows the water budget of the Aral Sea.



Using the information in the graph, explain why the Aral Sea's water deficit is increasing despite falling evaporation rates.

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(2 marks)



**4 (b)** Suggest the likely impacts of the Aral Sea's falling water level on the local human population.

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*(4 marks)*

**4 (c)** Outline how an afforestation programme within the Aral Sea catchment area may reduce soil erosion.

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*(4 marks)*

<b>10</b>

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- 5 The table shows a range of food production systems and their energy ratios.

Food production system	Energy ratio
Extensive beef rearing	1.8
Coastal shell fishing	1.0
Intensive cereal growing	0.3
Salmon farming	0.25
Broiler poultry rearing	0.1
Commercial fishing	0.07 – 0.035
Prawn fishing	0.02

- 5 (a) (i) Explain the term *energy ratio*.

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(1 mark)

- 5 (a) (ii) Explain why coastal shell fishing achieves a higher energy ratio than salmon farming.

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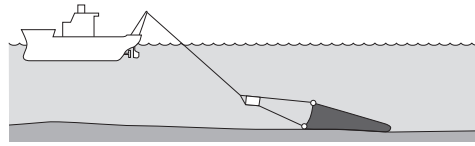
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(2 marks)

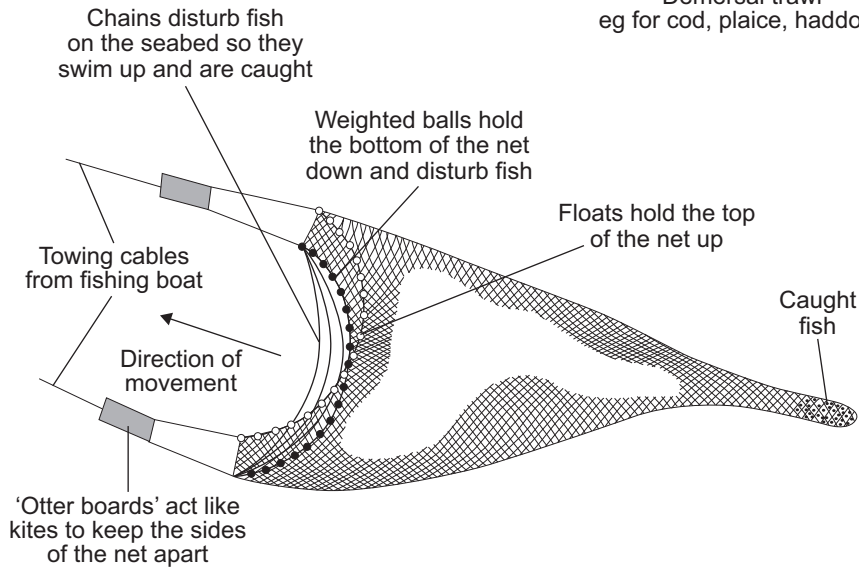


5 (b) The diagrams show the features of demersal trawling and longlining.

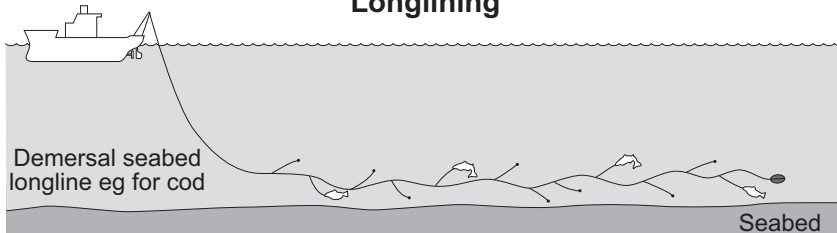
**Demersal trawling**



Demersal trawl  
eg for cod, plaice, haddock



**Longlining**



Explain why longlining is a more sustainable form of fishing than demersal trawling.

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(3 marks)

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**5 (c)** As part of a study into the sustainability of fisheries, scientists monitored live by-catch from purse seine nets. Fish populations were estimated using the catch-mark-release-recapture method.

Outline **four** assumptions made by the scientists when using this method.

- 1.....
- 2.....
- 3.....
- 4.....

(2 marks)

**5 (d)** Suggest how commercial fisheries may reduce by-catch.

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(2 marks)

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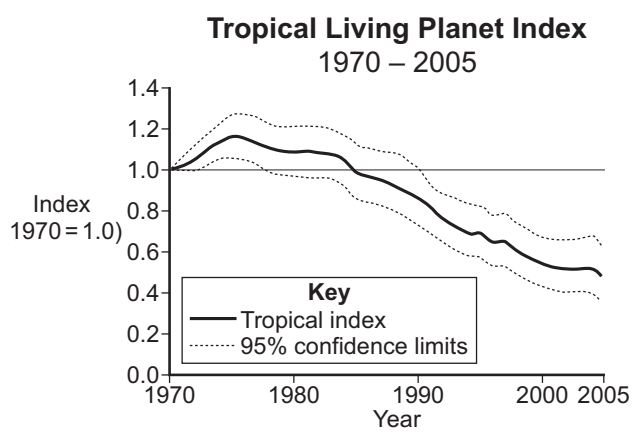
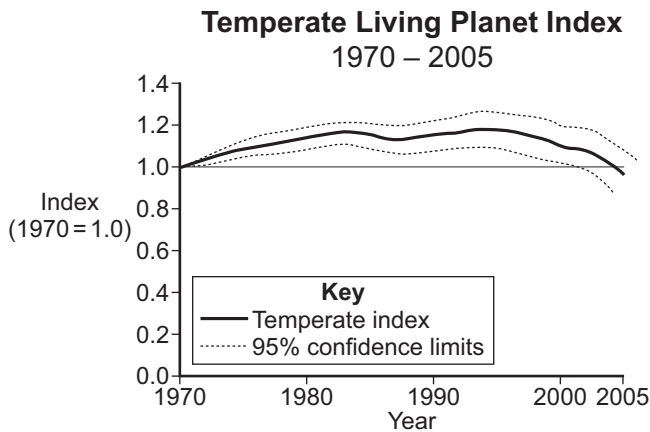


**6** Figures 3 and 4 show the Living Planet Index (LPI) for Temperate and Tropical regions, between 1970 and 2005.

LPI is an index of population change based on 1686 species of mammal, bird, reptile, amphibian and fish. The changes in the population of each species have been averaged and shown relative to 1970, which is given a value of 1.0.

**Figure 3**

**Figure 4**



Source: Figures 3, 4, 5 and 6 reproduced by kind permission of WWF International

**6 (a) (i)** Explain why the graphs include confidence limits.

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 (1 mark)

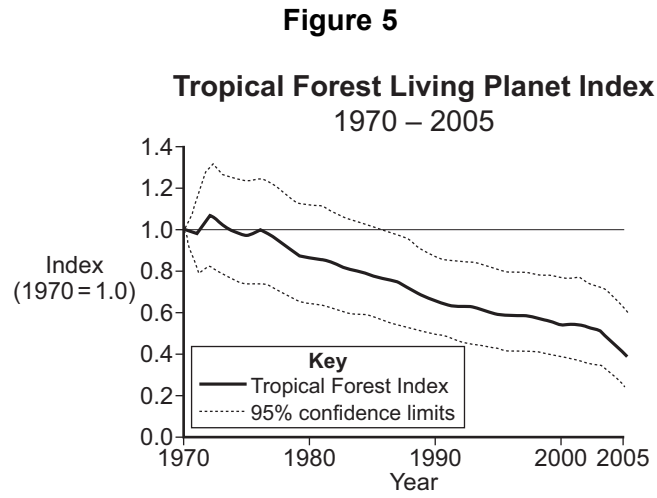
**6 (a) (ii)** Suggest why the Tropical LPI has declined more than the Temperate LPI in this time period.

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 (3 marks)





6 (b) Within the tropics, different habitats have experienced varying rates of decline. **Figure 5** shows the Tropical Forest LPI.



Suggest the consequences for global sustainability of the trend shown in the graph.

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(4 marks)

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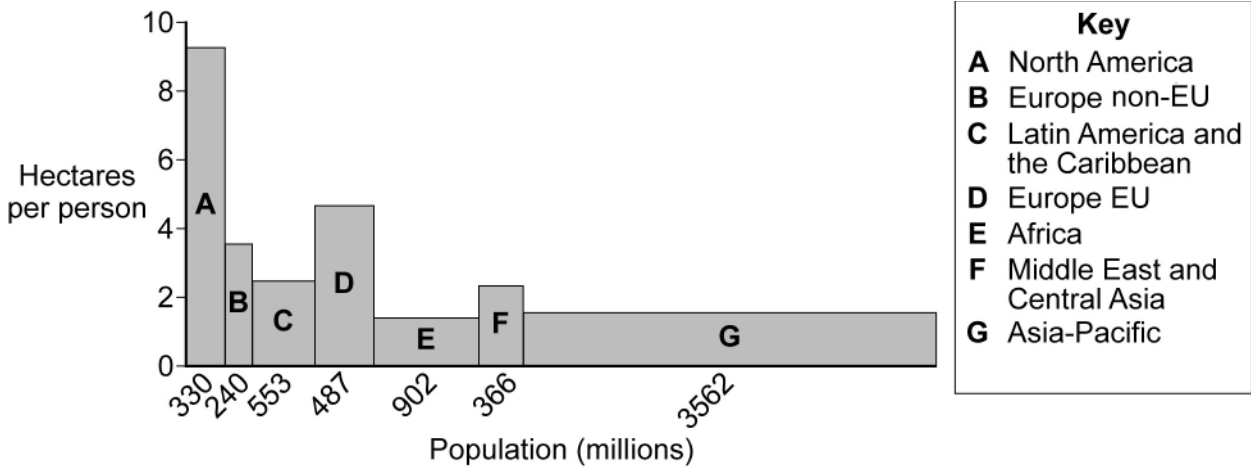
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6 (c) Figure 6 shows the Ecological Footprint of selected regions in 2005.

A region's Ecological Footprint is a measure of the area of the Earth needed to provide resources, such as food, fibre, timber and housing, and to deal with the wastes produced.

**Figure 6**  
**Ecological Footprint by region, 2005**



Outline the strategies that regions such as North America and Europe EU may use to reduce their *Ecological Footprint*.

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(7 marks)

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**7** Write an essay on **one** of the following topics. Credit will be given for your understanding of the relationship between different areas of the subject, also for the organisation and presentation of the essay and for grammar, punctuation and spelling.

**EITHER**

**7 (a)** Discuss the environmental and social impacts of agriculture. (20 marks)

**OR**

**7 (b)** Discuss the role of forests as a resource for the human population. (20 marks)

**OR**

**7 (c)** Discuss the manipulation of species for human consumption in food production systems. (20 marks)

Write the number of the question you have chosen in the box below.

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Dotted lines for writing.

(20 marks)

20

END OF QUESTIONS



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