

Centre Number						Candidate Number				
Surname										
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 2010

Environmental Studies

ENVS4

Unit 4 Biological Resources and Sustainability

Tuesday 22 June 2010 9.00 am to 11.00 am

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.

ENVS4



J U N 1 0 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.

Complete the table.

Term	Definition
Vegetative propagation	
Limiting factors in food production	
Agricultural diversification	Increase in the variety of activities on farms
Energy subsidy	
By-catch	
Sustainability	

(5 marks)

5

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2 Agricultural intensification has led to a decline in UK biodiversity. A field trial was carried out into the effects of pesticide concentration on crop yield.

- Five fields were sampled.
- A different concentration of pesticide was applied in each field.
- Crop yields were calculated at harvest.
- Invertebrates were sampled.

2 (a) Suggest **four** ways in which the field trial could have been standardised to ensure a fair test.

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(2 marks)

2 (b) The table below shows some results from the investigation.

Field number	Pesticide concentration in liquid spray/mg l ⁻¹	Invertebrate species diversity index	Crop yield/ t ha ⁻¹
1	0	6.14	17.3
2	100	4.21	21.2
3	150	3.67	23.5
4	200	3.23	27.3
5	250	2.11	24.7



2 (b) (i) Suggest an explanation for the trend of crop yields shown in the table.

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(2 marks)

2 (b) (ii) Explain why invertebrate survival was assessed using a diversity index rather than species number.

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(1 mark)

2 (c) Invertebrate diversity can be increased by planting native hedgerows as field boundaries.

Describe a practical procedure that could be used to assess how the distance from the hedgerow affects the invertebrate diversity.

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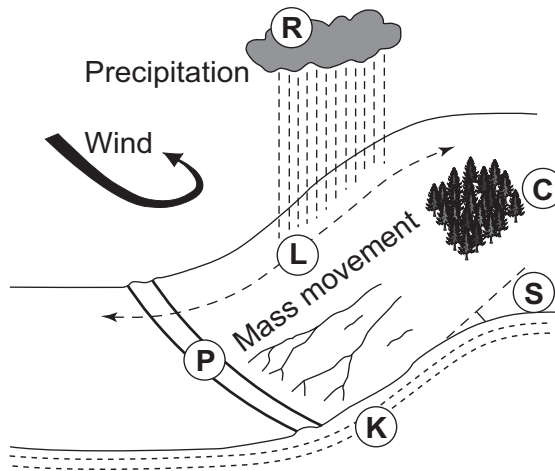


3 The diagram shows the Universal Soil Loss Equation (USLE) which can be used to predict the amount of erosion that will take place in an area.

$$A = R \times K \times L \times S \times C \times P$$

Key

- A predicted soil loss
- R rainfall erosivity
- K soil erodibility
- L slope length
- S slope gradient
- C vegetation cover
- P erosion control practice



3 (a) Explain how slope gradient affects soil erodibility.

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(2 marks)

3 (b) Explain how soil biota may reduce erosion rates.

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(3 marks)



3 (c) An investigation was carried out into the effects of slope angle and vegetation cover on rainsplash erosion.

Suggest how the slope angle and vegetation cover data should have been collected.

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4 (a) Table 1 shows net primary productivity (NPP) rates for open ocean and continental shelf ecosystems.

Table 1

Ecosystem	NPP / gm ⁻² y ⁻¹
Open ocean	2–400
Continental shelf	600–1000

Explain the differences in marine productivity shown in the table.

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(2 marks)

4 (b) The effects of fishing intensity on wild stocks is a controversial issue.

Suggest why maximum sustainable yield, shown by the following equation, is difficult to calculate accurately.

C = R + G – M

where:

R biomass of young fish added to stock

G biomass added by growth

C biomass caught by fishing boats

M biomass lost through natural death

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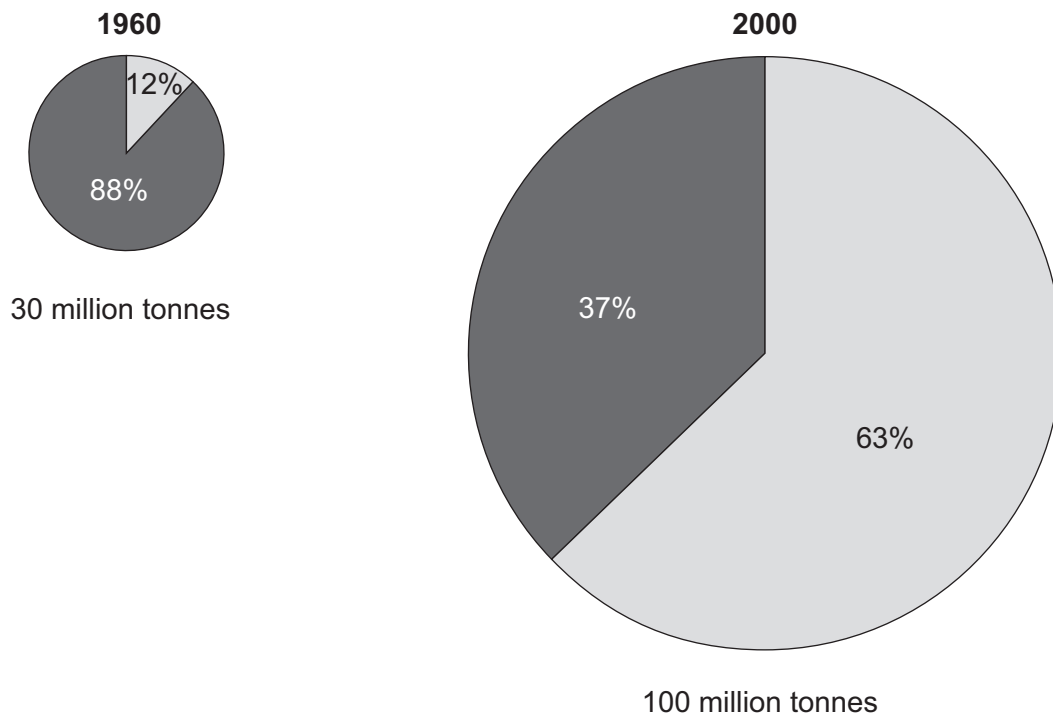


4 (c) **Table 2** shows estimated annual biological losses of crops to diseases, weeds and other pests in selected regions. The graphs show data on the world consumption of pesticides, including herbicides, insecticides and fungicides.

Table 2

Region	Percentage losses due to:		
	Diseases	Weeds	Other pests
Worldwide	12	10	14
Europe	13	7	5
North and Central America	11	8	9
Africa	13	16	13
Asia	11	11	21

Share of world pesticide consumption



Key

- More Economically Developed Countries (MEDC)
- Less Economically Developed Countries (LEDC)



Suggest why pests cause more crop losses in LEDCs despite the greater use of pesticides.

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5 (a) Concerns over continuing tropical deforestation are growing.

Suggest **four** likely impacts of deforestation on microclimate.

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(2 marks)

5 (b) Suggest how the exploitation of timber could be made more sustainable.

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(5 marks)



5 (c) Scientists in the UK have asked the Forestry Commission for permission to plant genetically modified poplar trees on its land for an investigation into biofuels. The genetically altered trees would produce less lignin in the wood, increasing ethanol yields by 40% compared with natural poplars.

Explain why some scientists argue that this method of replacing fossil fuels is unsustainable.

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(3 marks)

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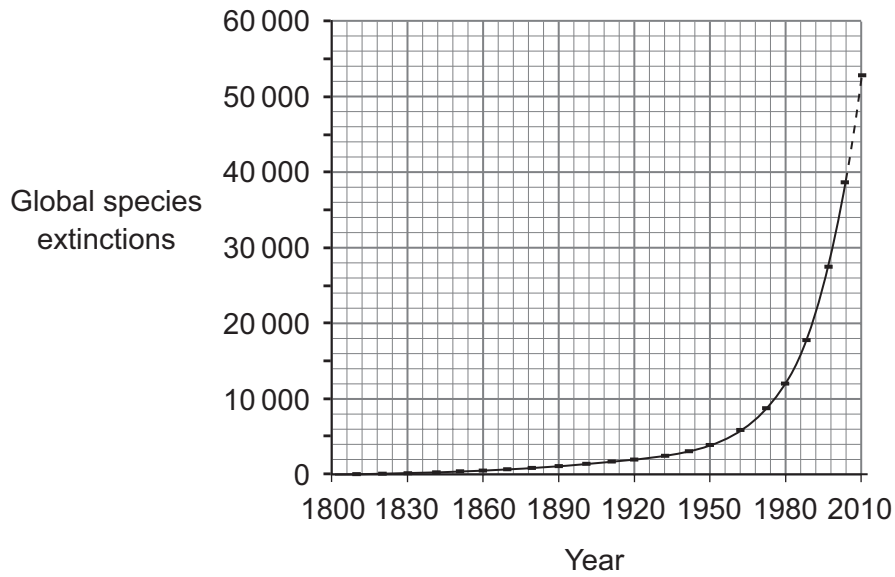
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6 (a) Graph A shows global species extinctions since 1800.

Graph A



Outline the consequences for future food production of the current trend in global species extinctions.

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(3 marks)

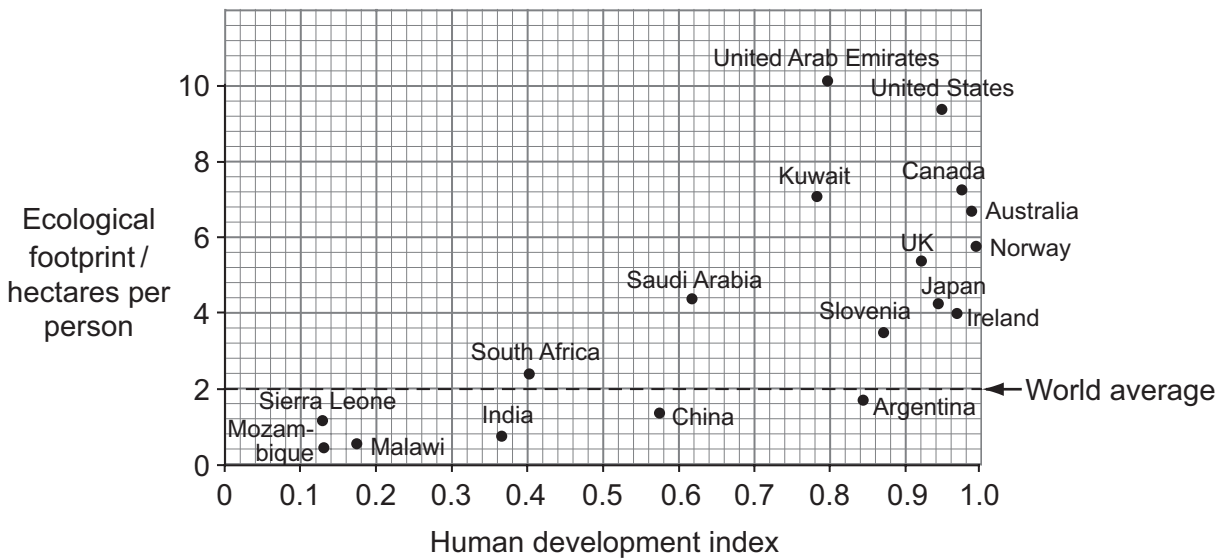


6 (b) **Graph B** shows the size of the ecological footprint and the human development index for selected countries.

A country'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 absorb the carbon dioxide released by its burning of fossil fuels. The size of each footprint depends on the size of the country's population and per capita resource consumption.

The human development index is a measure of a country's level of economic development based on a number of socio-economic criteria such as life expectancy and food intake.

Graph B



Summarise the data in the graph.

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(2 marks)

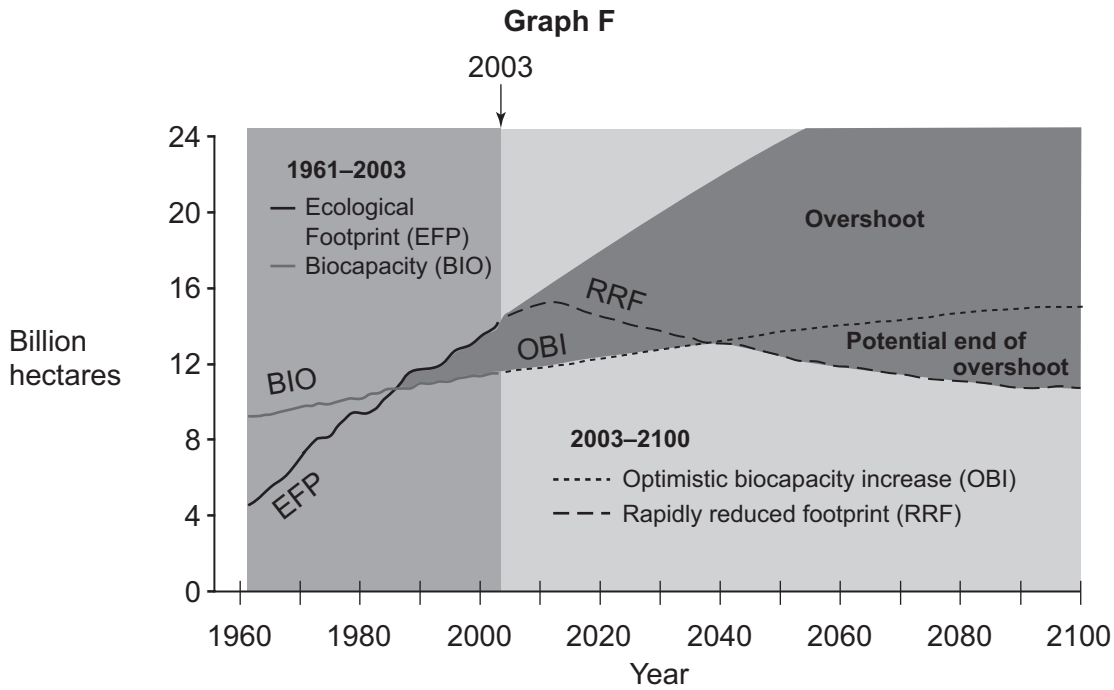
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6 (d) An assessment of the global ecological footprint and biocapacity was made in 2003. **Graph F** shows the trends up to 2003 and predictions for the future.

Global overshoot will occur when the population demands resources at a faster rate than the planet can supply them.



Source of Graphs C–F: adapted from Living Planet Report 2008, published by WWF, all rights reserved.

Outline the strategies that the human population could employ to reduce global overshoot.

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