IBO

IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

ECOSYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 2

Thursday 12 May 2005 (morning)

1 hour 45 minutes

Candidate session number

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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer two questions from Section B. Write your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

SECTION A

*Candidates must answer **all** questions in the spaces provided.*

1.   The data in table 1 shows the ecological footprints for people in various countries of the world. A five hectare footprint would mean that five hectares of biologically productive space (including land and sea) are in constant production to support the average individual of that country.

   Available capacity is the total amount of biologically productive space for each country. If the footprint exceeds the biologically productive area of the country, the country has an ecological deficit.

Table 1

	Population in 1997	Ecological footprint / hectares person^{-1}	Available capacity / hectares person^{-1}	Ecological difference (deficit if negative) / hectares person^{-1}
Australia	18 550 000	9.0	14.0	5.0
Ethiopia	58 414 000	0.7	0.5	-0.3
Germany	81 845 000	5.3	1.9	-3.4
India	790 230 000	0.8	0.5	-0.3
Indonesia	203 631 000	1.4	2.6	1.2
Japan	125 672 000	4.3	0.9	
Norway	4 375 000	6.2	6.3	0.1
Russian Federation	146 381 000	6.0	3.7	-2.3
Singapore	2 899 000	7.2	0.1	-7.1
United States	268 189 000		6.7	-3.6
United Kingdom	58 587 000	5.2	1.7	-3.5
Venezuela	22 777 000	3.8	2.7	-1.1
WORLD	**5 892 480 000**	**2.8**	**2.1**	**-0.7**

[Source: The Earth Council, *Ranking the Ecological Impact of Nations,* http://www.ecouncil.ac.cr/rio/focus/report/english/footprint/ranking.htm]

   (a)   (i)   Calculate the ecological deficit for Japan.   *[1]*

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   (ii)   Calculate the ecological footprint of a person in the United States.   *[1]*

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(Question 1 continued)

    (iii) If the Earth's resources were equally shared, there would be a total of 2.1 hectares of space available for each person. State how many countries in table 1 have an available capacity greater than 2.1 hectares. *[1]*

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    (iv) Suggest why Indonesia is not in ecological deficit despite the fact that its population is so large. *[2]*

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  (b) Gross Domestic Product (GDP) is a measure of the economic wealth of a country divided by the number of people in that country. Table 2 shows the GDP for various countries.

Table 2

Country	GDP per person in 1999 / US$
Australia	21 300
Ethiopia	560
Germany	22 100
India	1720
Indonesia	2830
Japan	23 100
Norway	24 700
Russian Federation	4000
Singapore	23 300
United States	31 500
United Kingdom	21 200
Venezuela	8 500

[Source: based on data from the 1999 *CIA World Factbook,* http://www.photius.com/wfb1999/rankings/gdp_per_capita_0.html]

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Turn over

(Question 1 continued)

    (i)   Complete table 3, using the data from tables 1 and 2 to rank the countries according to the size of their ecological footprints and GDP. *[2]*

Table 3

Rank	Size of ecological footprint (country with largest footprint first)	GDP (country with highest GDP first)
1		United States
2	Australia	Norway
3		Singapore
4		
5	Russian Federation	
6	Germany	
7	United Kingdom	
8		
9		
10		Indonesia
11	India	
12		Ethiopia

    (ii)   State what relationship (if any) your ranking in table 3 shows between ecological footprint and GDP. *[1]*

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    (iii)   Explain how it is possible for some countries, such as Singapore, to have such a high GDP despite the fact that they have so little biologically productive space. *[2]*

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(Question 1 continued)

(c) (i) Using data from table 1 only, state whether or not the current global use of resources is sustainable. Justify your answer.   *[2]*

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(ii) Describe **two** ways in which a country might be able to descrease its ecological footprint through technological development.   *[4]*

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(iii) Compare the attitudes of an ecocentrist and a technocentrist towards ecological deficit.   *[4]*

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SECTION B

*Answer **two** questions. Write your answers on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.*

Each essay is marked out of [20] of which [2] are for clarity of expression, structure and development of ideas:

> *[0]   Quality of expression, structure and development is poor.*
> *[1]   Quality of expression, structure and development is limited.*
> *[2]   Quality of expression is clear, structure is good and ideas are well developed.*

2.   "...loss of biological diversity around the world, from a multitude of causes, is *correlated* with decreasing productivity, increasing fragility in systems and increasing exposure of farming families to uncertainty, poverty and hunger. Reversing these trends will require a huge effort to understand the ecological, economic and social problems, while at the same time educating people from all walks of life – producer, consumer, scientist, policy maker and farmer."
[Food and Agriculture Organization (FAO)].

(a)   With reference to examples of specific ecosystems you have studied, outline the factors which can lead to a loss in biodiversity.   *[6]*

(b)   Describe and explain the relationship between biodiversity and "increasing fragility" in ecosystems.   *[5]*

(c)   Evaluate the importance of educating "people from all walks of life" in reversing the loss of biodiversity.   *[7]*

Expression of ideas [2]

3.   "...there is constant interchange of .. various kinds within each system, not only between the organisms but between the organic and inorganic. These *ecosystems*, as we may call them, are of .. various kinds and sizes." Tansley (1935)

(a)   Compare the characteristics of ecosystems and social systems.   *[5]*

(b)   Describe how populations of individual species interact within an ecosystem, using named examples to support your answer.   *[6]*

(c)   Explain the relationship between climate and net primary productivity in two contrasting biomes you have studied.   *[7]*

Expression of ideas [2]

4. "...we can no longer afford to ignore the dependency of the economy and social progress on the environmental resource base. It is the content of economic growth, with natural resources factored in, that counts in the long term, not just the yield in products and currency. A country that levels its forest, drains its aquifers, and washes its topsoil downriver without measuring the cost is a country traveling blind." Edward Wilson (2002)

    (a)   With reference to the statement above, outline what is meant by the terms "natural capital", "natural income" and "sustainability". *[5]*

    (b)   Describe and explain how societies are using water and soil resources unsustainably. *[13]*

Expression of ideas [2]

5.   (a)   Identify the causes of stratospheric ozone depletion and photochemical smog. *[6]*

    (b)   Explain why some atmospheric pollution issues are regional in effect whereas others are global. *[4]*

    (c)   Describe and evaluate pollution management strategies for **either** global warming **or** acid deposition. *[8]*

Expression of ideas [2]