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**Environmental systems and societies**  
**Standard level**  
**Paper 2**

Monday 11 November 2019 (morning)

Candidate session number

2 hours

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**Instructions to candidates**

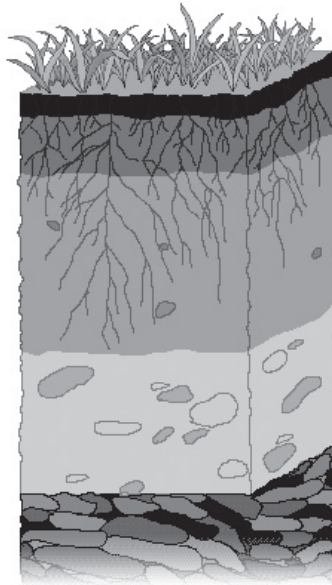
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer two questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[65 marks]**.



### Section A

Answer **all** questions. Answers must be written within the answer boxes provided.

**Figure 1: A typical soil profile**



[Source: adapted from WilsonBiggs/Hridith Sudev Nambiar/Wikimedia. File licensed under CC BY-SA 4.0; <https://creativecommons.org/licenses/by-sa/4.0/>]

1. (a) (i) State **one** transfer of matter occurring within the soil profile. [1]

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.....

(ii) State **one** transformation process occurring within the soil profile. [1]

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(iii) Identify **one** example of an output to the atmosphere from the soil system. [1]

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**(Question 1 continued)**

(b) Describe **two** characteristics of soil with high primary productivity. [2]

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(c) Outline **two** conservation methods that could be used to reduce soil erosion. [2]

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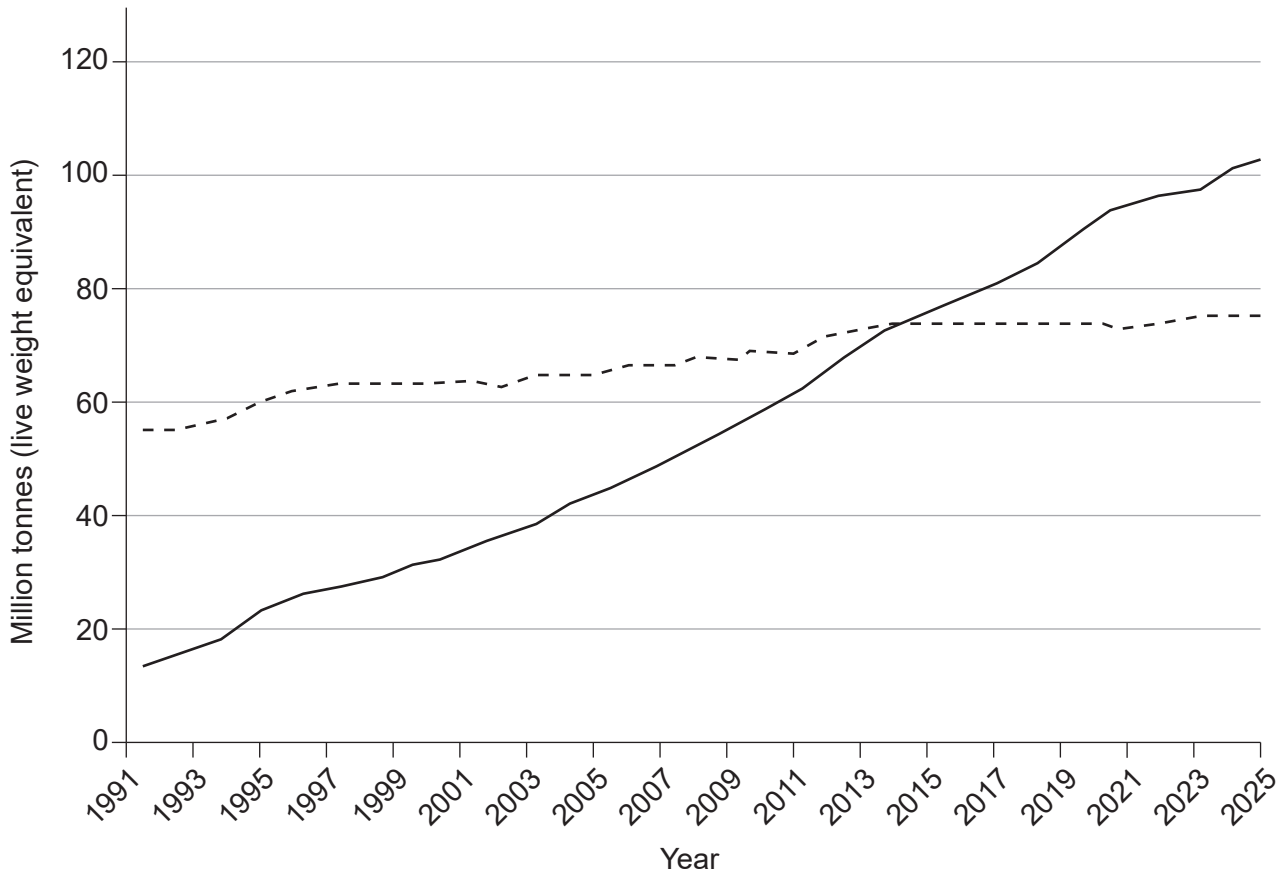
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**Figure 2: Global capture fisheries and aquaculture production from 1991 and projected to 2025**



**Key:**  
- - - - Capture fisheries for human consumption  
— Aquaculture for human consumption

[Source: Food and Agriculture Organization of the United Nations, 2016, FAO, *The State of World Fisheries and Aquaculture. Contributing to food security and nutrition for all*, <http://www.fao.org/3/a-i5555e.pdf>. Reproduced with permission.]

2. (a) Using **Figure 2**, identify **one** reason for the trend shown in the curve for:  
(i) aquaculture.

[1]

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**(Question 2 continued)**

(ii) capture fisheries.

[1]

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(b) Outline **two** negative environmental impacts of aquaculture.

[2]

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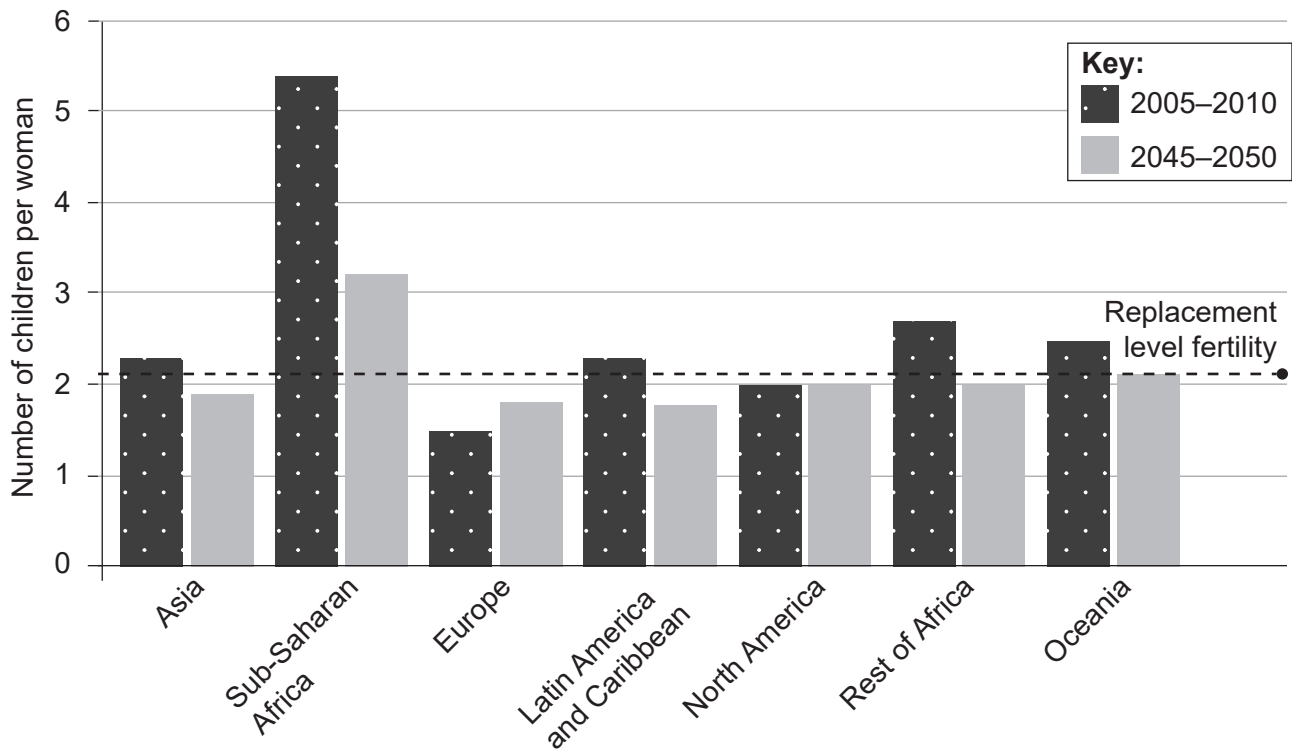
(c) Describe **two** strategies for the management of sustainable capture fisheries.

[2]

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Figure 3: Current and projected total fertility rates by region



[Source: adapted from World Resources Institute, <https://www.wri.org/blog/2013/12/global-food-challenge-explained-18-graphics>. File licensed under CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>)]

3. (a) Using **Figure 3** identify the region with the highest fertility rate in the period 2005–2010. [1]

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(b) Outline **two** possible reasons for the projected change in total fertility rate in Sub-Saharan Africa in the period 2045–2050. [2]

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**(Question 3 continued)**

(c) Identify **two** reasons for the projected increase in total fertility rate in Europe by the period 2045–2050.

[2]

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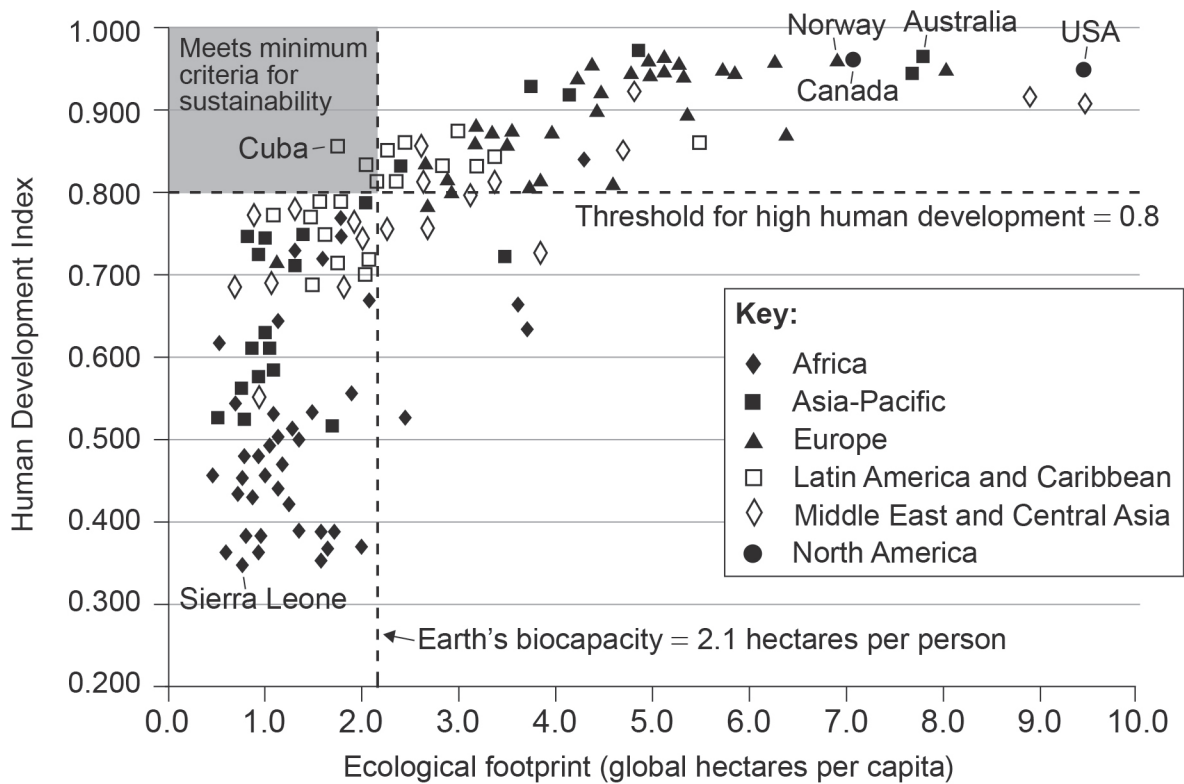
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Figure 4: A measure of the sustainability of individual countries from a comparison of their ecological footprint and their standard of living



[Source: adapted from Travelplanner/Wikimedia. File licensed under CC BY-SA 3.0 <https://creativecommons.org/licenses/by-sa/3.0/deed.en>. Data sourced from Global Footprint Network 2008 report (2005 data) and UN Human Development Index 2007/08]

The UN Human Development Index is a measure of the standard of living based on literacy, GDP per capita and life expectancy.

4. (a) Using **Figure 4**, identify the country that is above the threshold for high human development and below the Earth's biocapacity. [1]

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- (b) Outline the relationship between carrying capacity and ecological footprint. [2]

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**(Question 4 continued)**

- (c) To meet the minimum criteria for sustainability, a country needs to raise its human welfare above the threshold of high human development and have an ecological footprint below the Earth's biocapacity.

Evaluate **two** strategies a country can implement to achieve the minimum criteria for sustainability.

[4]

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### Section B

Answer **two** questions. Answers must be written within the answer boxes provided.

5. (a) Outline, using examples, the differences between primary and secondary pollution. [4]  
(b) Explain the causes and effects of acid deposition on natural ecosystems. [7]  
(c) To what extent is pollution impacting human food production systems? [9]
6. (a) Outline the factors that contribute to total biodiversity of an ecosystem. [4]  
(b) Explain how ecological techniques can be used to study the effects of human activities on the biodiversity of a named ecosystem. [7]  
(c) To what extent are strategies to promote the conservation of biodiversity successful? [9]
7. (a) Outline how energy drives the hydrological cycle. [4]  
(b) Explain, with the use of a system diagram, how human activities affect flows in the global water cycle. [7]  
(c) To what extent do the approaches and strategies of different environmental value systems improve access to fresh water? [9]
8. (a) Outline how the concept of sustainability can be applied to managing natural capital. [4]  
(b) Explain how environmental indicators are used to assess sustainability. [7]  
(c) To what extent does sustainability play a role in making decisions about energy and climate change policies at national and international levels? [9]



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