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Environmental systems and societies
Higher level
Paper 2

4 May 2026

Zone A morning | **Zone B** morning | **Zone C** morning

Session number

2 hours 30 minutes

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Instructions to students

- 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 **[80 marks]**.



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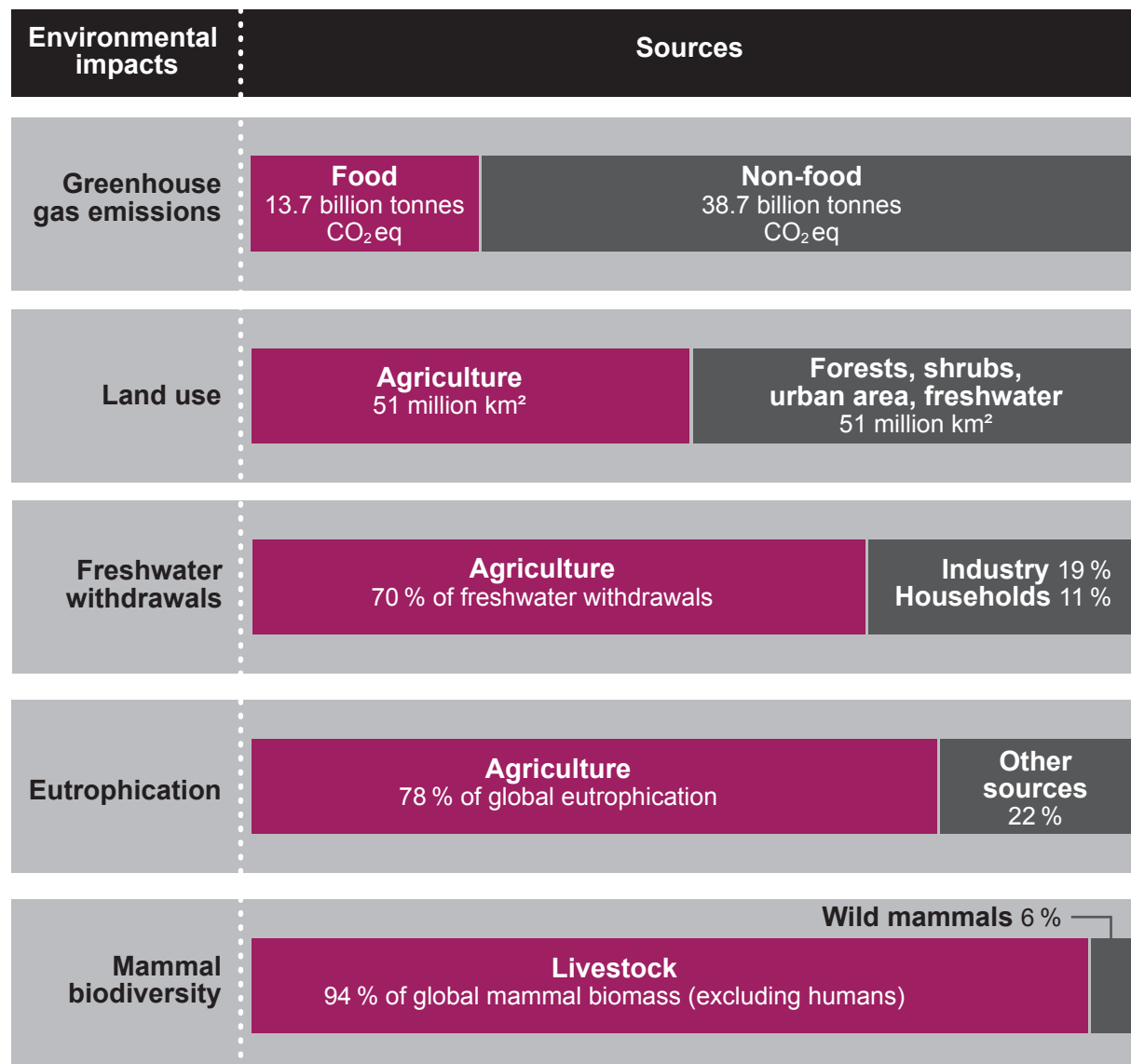
Answers written on this page
will not be marked.



Section A

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

Figure 1: Environmental impacts of agriculture



1. (a) (i) Identify the environmental impact whose source is 78 % from agriculture. [1]

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- (ii) State **one** pollutant responsible for the environmental impact named in (a)(i). [1]

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- (iii) Describe **two** ways ecological services may be affected by the environmental impact of land use, shown in **Figure 1**. [2]

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- (b) Calculate the percentage of greenhouse gas emissions that originate from food, shown in **Figure 1**. [1]

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- (c) Outline **two** actions that households can take to reduce the percentage of greenhouse gas emissions that originate from food. [2]

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(Question 1 continued)

- (d) Describe possible reasons for the difference between the biomass of livestock and wild mammals, shown in **Figure 1**. [2]

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- (e) Discuss how a rights-based ethical approach to the environmental impacts associated with agriculture in **Figure 1** may be controversial within society. [3]

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Citizen scientists play an increasingly important role in biodiversity monitoring.

A group of citizen scientists were asked to rate the importance of various motivating factors to collect data (**Figure 2(a)**). They were then asked what data they record during planned searches (**Figure 2(b)**) and about the locations of their planned searches (**Figure 2(c)**).

Their responses in **Figures 2(a)**, **2(b)** and **2(c)** are ordered by how important they were rated.

Figure 2(a): Motivation for species data collection

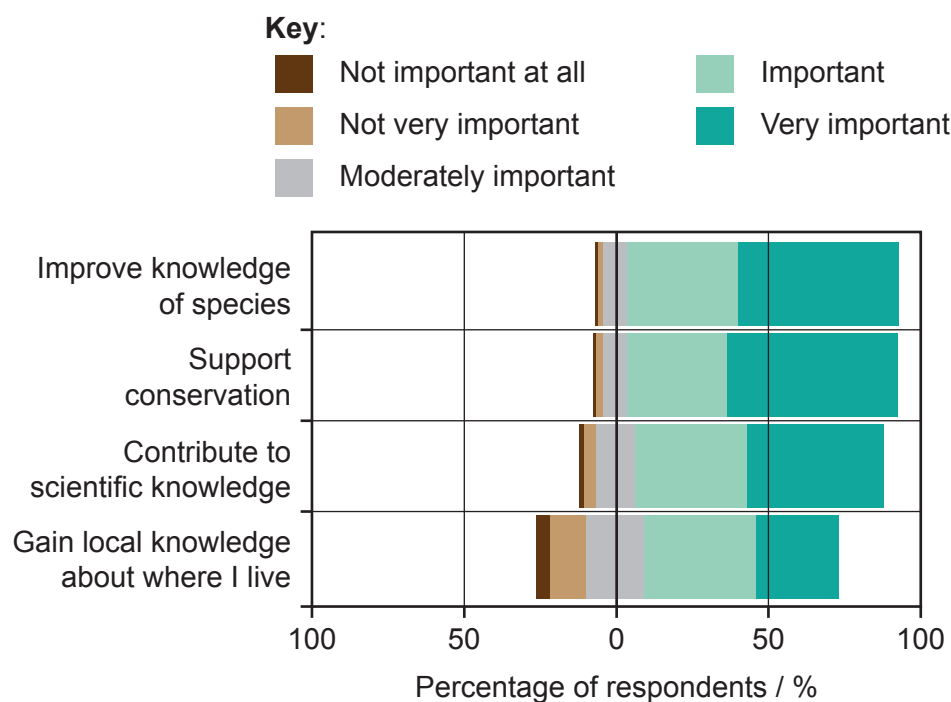


Figure 2(b): Species recorded in searches

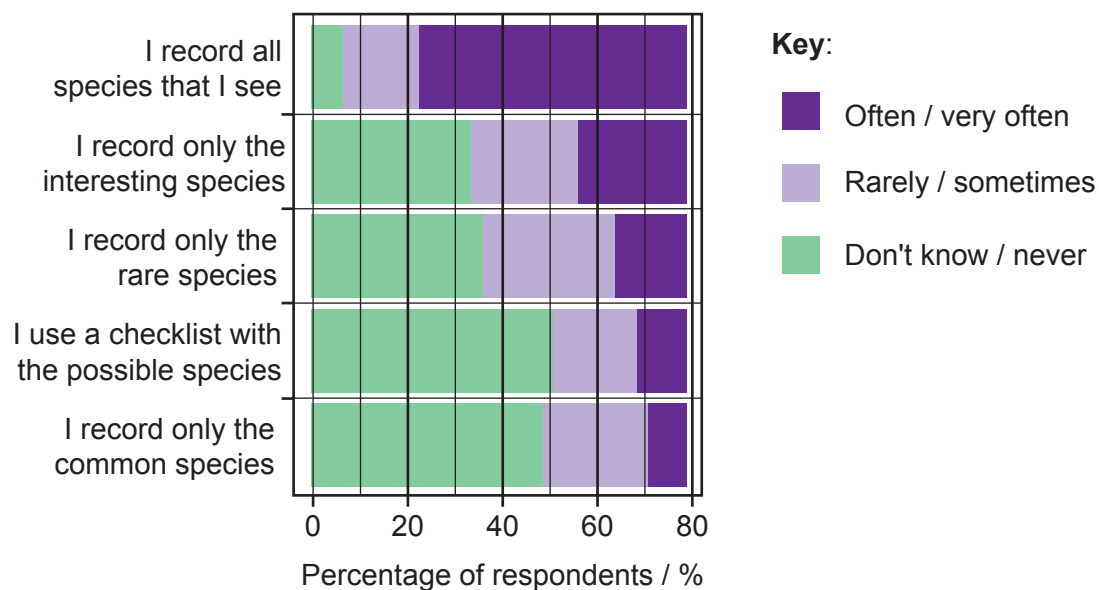
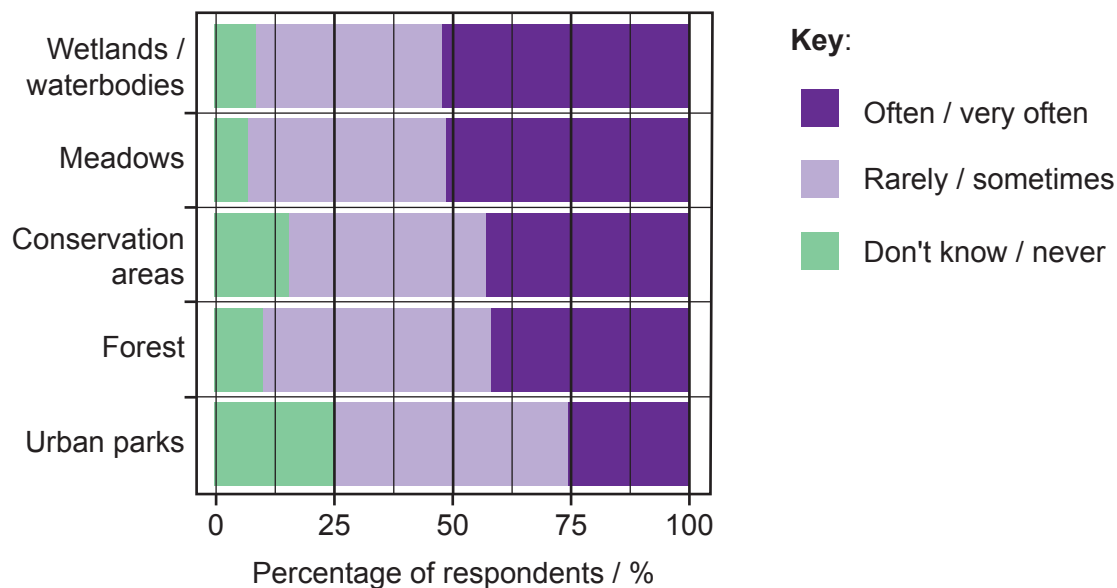


Figure 2(c): Locations of searches



2. (a) State the motivational factor with the highest percentage of “very important” responses, as shown in **Figure 2(a)**. [1]

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- (b) Identify the approximate percentage of citizen scientists who stated they record all species they see “often/very often”, as shown in **Figure 2(b)**. [1]

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- (c) Outline possible reasons for the differences between citizen scientist responses to “Wetlands / waterbodies” and “Urban parks”, as shown in **Figure 2(c)**. [2]

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- (d) Outline **one** method by which citizen scientists can collect data from the locations shown in **Figure 2(c)**. [1]

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(This question continues on the following page)



(Question 2 continued)

- (e) With reference to **Figure 2(a)**, **Figure 2(b)** and **Figure 2(c)**, evaluate the use of citizen science in collecting, monitoring and managing biodiversity data.

[4]

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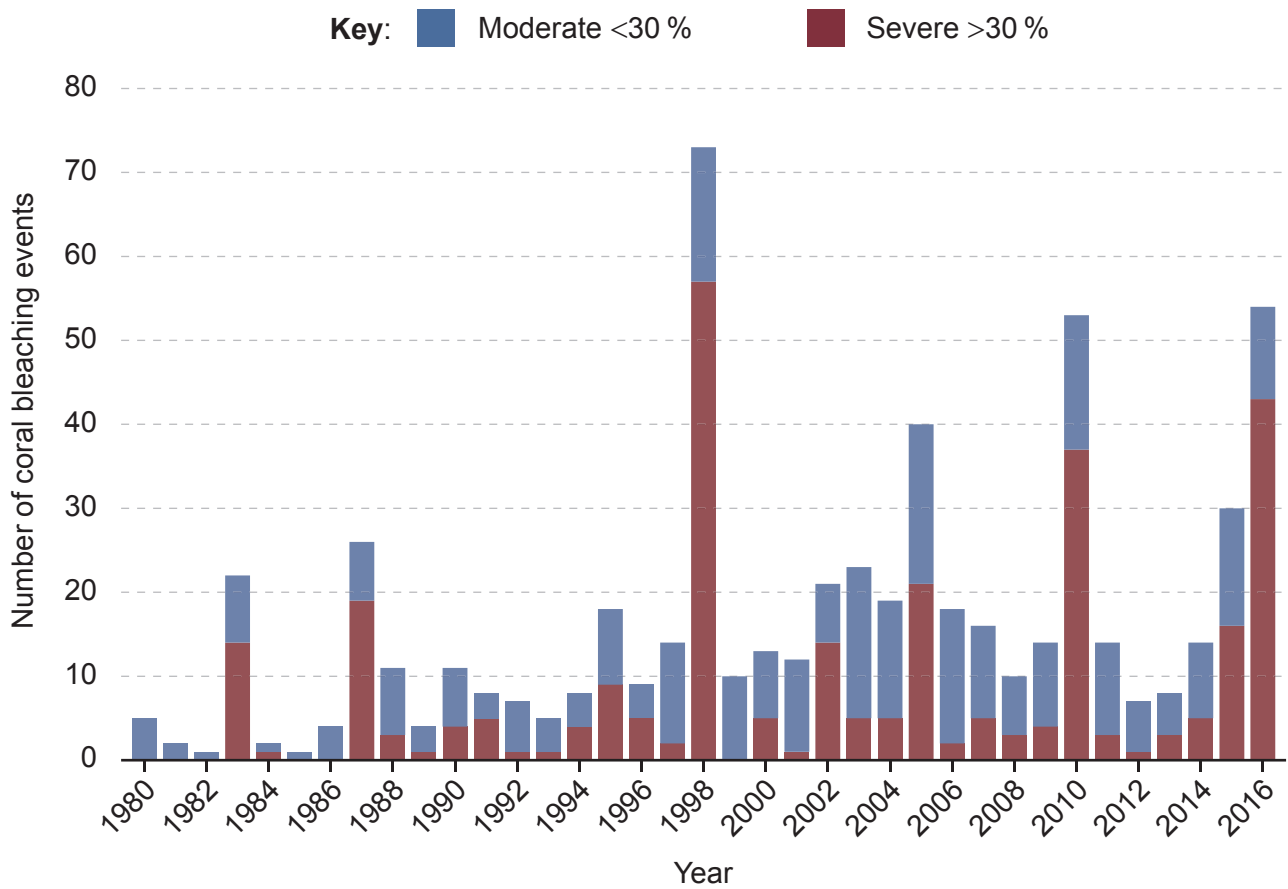
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Figure 3: Number of coral bleaching events around the world, 1980–2016



3. (a) Calculate the change in the number of severe coral bleaching events from 2015 to 2016 shown in **Figure 3**. [1]

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- (b) Outline **two** possible reasons for the coral bleaching events shown in **Figure 3**. [2]

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- (c) Describe how coral bleaching events may impact the economies of coastal societies. [2]

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- (d) Outline **two** limitations of environmental laws in addressing coral bleaching events. [2]

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- (e) Describe how the concept of eco-economic decoupling might help reduce the potential for future coral bleaching events. [2]

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Figure 4(a): Flash drought* frequency (1981–2000)

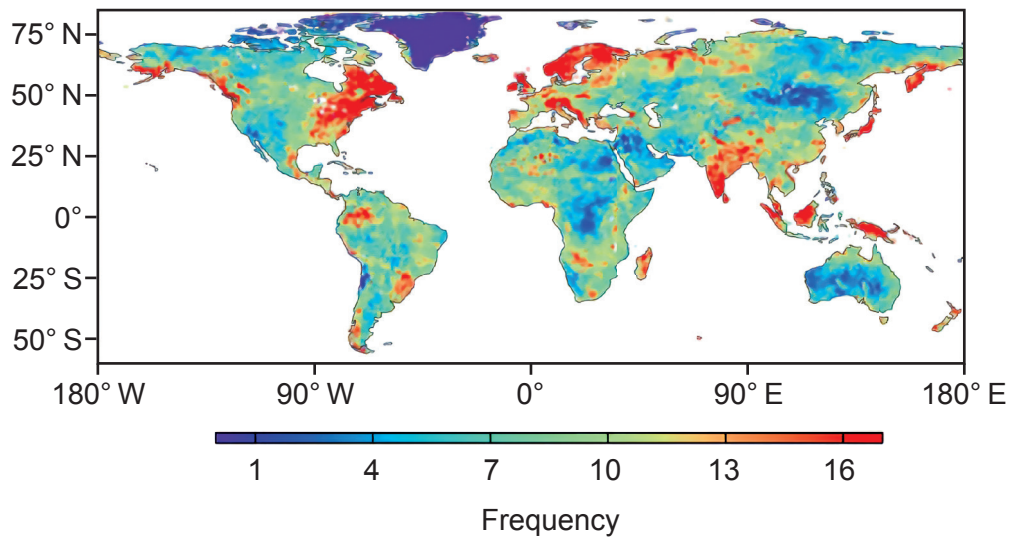


Figure 4(b): Flash drought frequency (2001–2020)

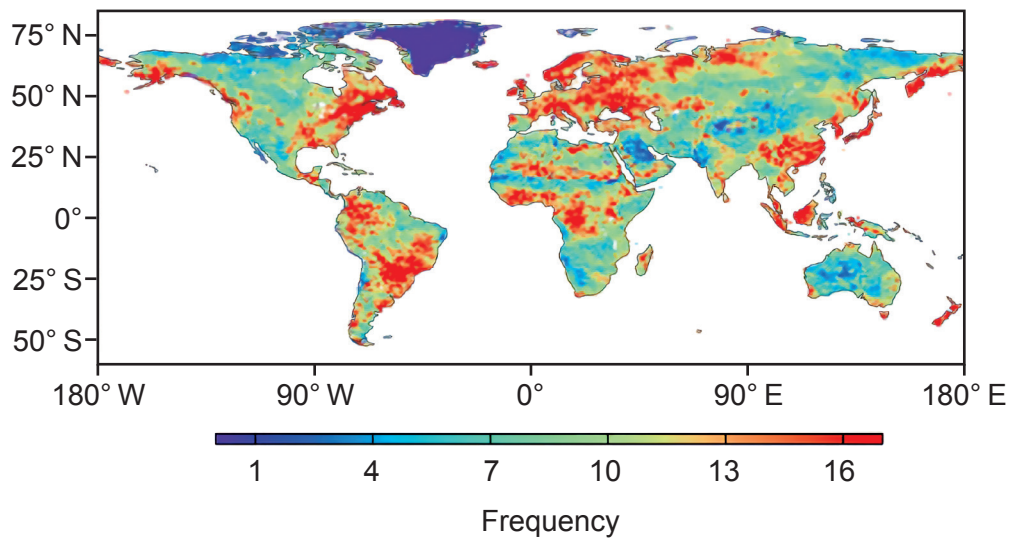
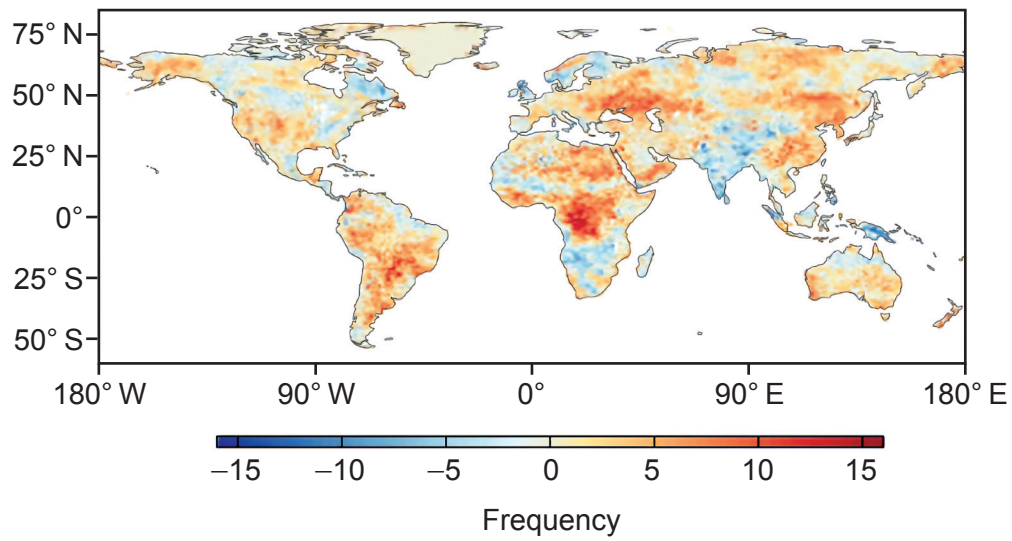


Figure 4(c): Net flash drought frequency (2001–2020 minus 1981–2000)



* flash drought: a type of intense drought with rapid onset, leaving farmers and other stakeholders little time for preparation. Thereby, flash droughts have greater impact on the agricultural and ecological sectors.



4. (a) Describe the overall trend of flash droughts between 1981–2000 and 2001–2020 in Asia, as shown in **Figure 4(a)** and **Figure 4(b)**.

[2]

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- (b) Outline **two** possible human causes for the change in frequency of flash droughts between 1981–2000 and 2001–2020, as shown in **Figure 4(a)** and **Figure 4(b)**.

[2]

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- (c) Identify the continent with the highest net flash drought frequency, as shown in **Figure 4(c)**.

[1]

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- (d) Outline **two** ways in which governance can mitigate the impacts of flash droughts.

[2]

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(Question 4 continued)

- (e) Explain how the changes in net frequency of flash droughts shown in **Figure 4(c)** can influence environmental migration and political stability.

[3]

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Section B

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

5. (a) Outline why the hydrological cycle is considered a closed system. [4]
- (b) Explain how the chemical and physical properties of water help to support and maintain living organisms. [7]
- (c) To what extent could mitigation strategies be successful in bringing freshwater use back within the planetary boundary? [9]
6. (a) Outline the difference between carrying capacity and biocapacity, and the factors that influence both. [4]
- (b) Discuss how government policies can increase or decrease human population growth. [7]
- (c) To what extent is a technocentric approach the most effective way of increasing the biocapacity of a given area? [9]
7. (a) Identify **four** possible impacts of urban sprawl on the surrounding terrestrial ecosystems. [4]
- (b) Using named examples for both, explain how the reintroduction of apex predators and keystone species can impact biodiversity. [7]
- (c) To what extent do *ex situ* strategies play a more successful role in conserving biodiversity compared to *in situ* strategies? [9]



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References:

- Figure 1:** Hannah Ritchie, Pablo Rosado, and Max Roser (2022) - “Environmental Impacts of Food Production” Published online at OurWorldinData.org. Retrieved from: ‘<https://ourworldindata.org/environmental-impacts-of-food>’ [Online Resource]. Data source: Poore and Nemecek, 2018; UN FAO; UN AQUASTAT; Bar-on et al.,. Licensed under CC BY 4.0 <https://creativecommons.org/licenses/by/4.0/>. Source adapted.
- Figure 2:** (a): [Motivation for species data collection] Bowler, D.E., Bhandari, N., Repke, L. et al. Decision-making of citizen scientists when recording species observations. *Sci Rep* **12**, 11069 (2022). <https://doi.org/10.1038/s41598-022-15218-2>. Open access article licensed under CC BY 4.0 <https://creativecommons.org/licenses/by/4.0/>. Source adapted.
- (b): [Species recorded in search] Bowler, D.E., Bhandari, N., Repke, L. et al. Decision-making of citizen scientists when recording species observations. *Sci Rep* **12**, 11069 (2022). <https://doi.org/10.1038/s41598-022-15218-2>. Open access article licensed under CC BY 4.0 <https://creativecommons.org/licenses/by/4.0/>. Source adapted.
- (c): [Locations of searches] Bowler, D.E., Bhandari, N., Repke, L. et al. Decision-making of citizen scientists when recording species observations. *Sci Rep* **12**, 11069 (2022). <https://doi.org/10.1038/s41598-022-15218-2>. Open access article licensed under CC BY 4.0 <https://creativecommons.org/licenses/by/4.0/>. Source adapted.
- Figure 3:** Hannah Ritchie, Fiona Spooner, and Max Roser (2022) – “Biodiversity” Published online at OurWorldinData.org. Retrieved from: ‘<https://ourworldindata.org/biodiversity>’ [Online Resource]. Data source: Hughes, T. P., et al. (2018). Spatial and temporal patterns of mass bleaching of corals in the Anthropocene. *Science*. Licensed under CC BY 4.0 <https://creativecommons.org/licenses/by/4.0/>. Source adapted.
- Figure 4:** (a) [Flash drought frequency (1981–2000)] Zeng, Z., Wu, W., Peñuelas, J. et al. Increased risk of flash droughts with raised concurrent hot and dry extremes under global warming. *npj Clim Atmos Sci* **6**, 134 (2023). <https://doi.org/10.1038/s41612-023-00468-2> Open access article licensed under CC BY 4.0 <https://creativecommons.org/licenses/by/4.0/>. Source adapted.
- (b) [Flash drought frequency (2001–2020)] Zeng, Z., Wu, W., Peñuelas, J. et al. Increased risk of flash droughts with raised concurrent hot and dry extremes under global warming. *npj Clim Atmos Sci* **6**, 134 (2023). <https://doi.org/10.1038/s41612-023-00468-2> Open access article licensed under CC BY 4.0 <https://creativecommons.org/licenses/by/4.0/>. Source adapted.
- (c) [Net flash drought frequency (2001–2020 minus 1981–2000)] Zeng, Z., Wu, W., Peñuelas, J. et al. Increased risk of flash droughts with raised concurrent hot and dry extremes under global warming. *npj Clim Atmos Sci* **6**, 134 (2023). <https://doi.org/10.1038/s41612-023-00468-2> Open access article licensed under CC BY 4.0 <https://creativecommons.org/licenses/by/4.0/>. Source adapted.

