GEO.PH20 Causes, Impacts and Management of Desertification

Total Marks

AQA 8035 · Calculators not allowed · about 50 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Define 'desertification' in the context of land degradation in semi-arid regions such as the Sahel.

(Total for Question 1 is 2 marks)

2 Give TWO human causes of desertification in marginal dryland areas such as the Sahel region.

(Total for Question 2 is 2 marks)

3 Table: Vegetation cover (%) measured in a Sahelian village over four years. Year 2017: 42, 2018: 35, 2019: 28, 2020: 22. Describe the pattern shown by the data.

(Total for Question 3 is 3 marks)

4 Explain one physical cause of desertification, using an example relevant to the Sahel region.

(Total for Question 4 is 4 marks)

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5 Give one impact of desertification on people living in a Sahel village.

(Total for Question 5 is 1 mark)

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6 Give one impact of desertification on the natural environment in dryland areas such as the Sahel.

(Total for Question 6 is 1 mark)

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7 Using the vegetation cover figures from Question 3 (2017 42%, 2018 35%, 2019 28%, 2020 22%), calculate the percentage decrease in vegetation cover between 2017 and 2020. Give your answer to one decimal place.

(Total for Question 7 is 2 marks)

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8 Describe how overgrazing by livestock can lead to desertification in semi-arid regions such as the Sahel.

(Total for Question 8 is 3 marks)

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9 Explain how rapid population growth can increase the risk of desertification in marginal areas like parts of the Sahel.

(Total for Question 9 is 4 marks)

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10 Name a specific area within the Sahel region used as a case study of desertification, and give the country and a relevant date or decade when droughts increased pressure on the land.

(Total for Question 10 is 2 marks)

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11 Describe how planting shelter belts or windbreaks can help reduce soil erosion and desertification around a farming village in the Sahel.

(Total for Question 11 is 3 marks)

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12 Explain how an appropriate soil-water management technique, such as zai pits or magic stones, helps to restore degraded land in dryland areas like the Sahel.

(Total for Question 12 is 4 marks)

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13 Give TWO ways in which appropriate technology can reduce pressure on trees and vegetation in a Sahelian community.

(Total for Question 13 is 2 marks)

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14 Suggest one reason why reforestation projects to tackle desertification in the Sahel might fail, even when trees are planted.

(Total for Question 14 is 3 marks)

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15 Use the Sahel case study (for example Niger or Mali, and the 1970s and 1980s droughts) and other named examples where relevant.

'Evaluate the effectiveness of strategies used to reduce the risk of desertification in semi-arid regions such as the Sahel.'

(Total for Question 15 is 9 marks)

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Mark scheme · GEO.PH20 Causes, Impacts and Management of Desertification

Question 1

- **B1** land degradation in dryland areas due to a combination of natural and human factors, oe
- **B1** resulting in loss of vegetation, reduced soil fertility and reduced productive capacity of the land, oe
- **Answer: Desertification is the process of land degradation in dryland or semi-arid regions caused by natural and human factors, leading to loss of vegetation, reduced soil fertility and a fall in the land's productive capacity.**

Question 2

- **B1** overgrazing by livestock, oe
- **B1** removal of fuelwood or deforestation, oe
- **Answer: Overgrazing by livestock; removal of fuelwood or deforestation.**

Question 3

- **B1** there is a steady decline in vegetation cover from 2017 to 2020, oe
- **B1** supported with data, e.g. it falls from 42% in 2017 to 22% in 2020, oe
- **B1** the rate of decline is roughly similar each year, showing ongoing degradation rather than a single sudden drop, oe
- **Answer: The data show a steady decline in vegetation cover from 42% in 2017 to 22% in 2020, a fall of 20 percentage points; the decrease is gradual each year, indicating ongoing degradation.**

Question 4

- **B1** identify a physical cause, e.g. reduced and variable rainfall due to climate variability, oe
- **B1** linked detail, e.g. less rainfall means less water for crops and vegetation so plants die back, oe
- **B1** further development, e.g. without plant roots the soil is more exposed to wind erosion and surface crusting, oe
- **B1** impact link, e.g. this process reduces soil fertility and leads to the spread of degraded, desert-like ground, oe
- **Answer: Reduced and variable rainfall, as occurs in the Sahel, reduces soil moisture and plant growth; with fewer plants the soil becomes exposed to wind and rain erosion, losing fertility and leading to desert-like degraded land.**

Question 5

- **B1** reduced crop yields leading to food shortages or loss of income, oe
- **Answer: Reduced crop yields, causing food shortages or loss of income.**

Question 6

- **B1** loss of biodiversity or decline in native plant and animal species, oe
- **Answer: Loss of biodiversity, with declines in native plant and animal species.**

Question 7

- **M1** (42 - 22) / 42 x 100 or equivalent seen, oe
- **A1** 47.6% cao
- **Answer: 47.6%.**

Question 8

- **B1** overgrazing removes protective vegetation cover, oe
- **B1** soil becomes exposed to wind and water erosion, oe
- **B1** this leads to loss of topsoil and reduced plant regrowth, contributing to land degradation, oe
- **Answer: Overgrazing removes protective vegetation cover, leaving soil exposed to wind and rain; exposed topsoil is eroded away and the land loses its ability to support plants, leading to ongoing degradation and desertification.**

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Question 9

- **B1** population growth increases demand for food and fuelwood, oe
- **B1** linked detail, e.g. more land is cultivated and more trees are cut for cooking and heating, reducing vegetation cover, oe
- **B1** further development, e.g. marginal land that was previously left fallow is brought into use, increasing soil exhaustion, oe
- **B1** result link, e.g. these pressures raise vulnerability to erosion and reduce land productivity, contributing to desertification, oe
- **Answer: Rapid population growth increases demand for food and fuelwood, so more land is cultivated and more trees are cut; marginal land is brought into use and soils become exhausted, exposing soil to erosion and reducing productivity, all of which raise the risk of desertification.**

Question 10

- **B1** named area, e.g. the Sahel region in Niger or Mali, oe
- **B1** date detail, e.g. severe droughts in the 1970s and 1980s, oe
- **Answer: For example, the Sahel region of Niger (or Mali), where severe droughts in the 1970s and 1980s increased pressure on the land.**

Question 11

- **B1** planting lines or belts of trees or shrubs upwind of fields reduces wind speed, oe
- **B1** reduced wind speed lowers wind erosion and the amount of soil blown away, oe
- **B1** they also can trap moving soil and create microclimates that help crops establish, oe
- **Answer: Shelter belts of trees or shrubs planted upwind reduce wind speed, which lowers wind erosion and soil loss; they can trap moving soil and create a more favourable microclimate that helps crops establish, reducing the risk of desertification.**

Question 12

- **B1** identify the technique, e.g. zai pits or stone lines (magic stones), oe
- **B1** explain how it traps or retains water, e.g. zai pits collect and concentrate rainfall around the seed, stone lines slow runoff and allow infiltration, oe
- **B1** explain the effect on soil and plants, e.g. increased soil moisture improves germination and crop yields, and organic matter builds up, oe
- **B1** link to desertification reduction, e.g. healthier vegetation protects soil from erosion and increases land productivity, oe
- **Answer: Techniques such as zai pits or stone lines collect and concentrate scarce rainfall and slow runoff so water infiltrates the soil; this raises soil moisture, improves seed germination and crop yields, builds organic matter and vegetation cover, and so protects soil from erosion and reduces desertification.**

Question 13

- **B1** fuel-efficient stoves that use less wood, oe
- **B1** alternative fuels or solar cookers to replace cutting fuelwood, oe
- **Answer: Fuel-efficient stoves that use less wood; alternative fuels or solar cookers to replace cutting fuelwood.**

Question 14

- **B1** seedlings may die due to lack of water in severe drought conditions, oe
- **B1** or grazing animals may eat young trees if not protected, oe
- **B1** or there may be insufficient community engagement or maintenance to ensure survival, oe
- **Answer: For example, seedlings can fail because of severe drought and lack of water, grazing animals may eat young trees without protection, or projects may lack local engagement and ongoing maintenance so planted trees do not survive.**

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Question 15

- **Level 3** (7-9): A well-developed evaluation that integrates named strategies and place detail, weighs strengths and limitations of different approaches (soil-water management, tree planting, shelter belts, appropriate technology and top-down projects), and reaches a balanced, justified judgement on overall effectiveness, showing understanding of scale and sustainability.
- **Level 2** (4-6): A clear evaluation that refers to at least two strategies with some named place detail; strengths and limitations are identified but the judgement is less fully supported or balanced.
- **Level 1** (1-3): Simple, brief points about one or two strategies with little or no place detail and no clear, supported judgement.
- **Level 0** (0): No relevant content.
- **Indicative content:**
  - Named strategies: soil-water techniques such as zai pits and stone lines; shelter belts and windbreak planting; reforestation and agroforestry; controlled grazing and rotational grazing; fuel-efficient stoves and alternative energy to reduce tree cutting; large scale irrigation or governmental programmes.
  - Strengths: many community-led, small-scale techniques are low cost, suit local conditions, improve water retention and vegetation cover and can be sustained by local farmers, examples include zai pits in Burkina Faso and stone lines in Niger.
  - Limitations: small-scale schemes may not reach large areas or cope with severe droughts; seedlings may fail without water or protection; political instability, lack of funding or poor governance can hinder large programmes; top-down irrigation can cause salinisation if poorly managed.
  - Scale and sustainability: combination approaches often work best, e.g. integrating soil-water methods with community management and policy support; long-term maintenance, training and secure land rights increase success.
  - Evidence from the Sahel: shelter belts and local water-harvesting have helped restore farmland in some villages since the 1980s, but wider-scale desertification continues where pressures from population growth and climate variability persist.
  - Judgement: conclude whether strategies are generally effective, under what conditions and with what caveats, for example that appropriate, locally led techniques combined with policy support are most effective, whereas isolated or poorly funded projects are not.

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