



## GEO.HU10 Water Insecurity: Physical and Human Causes of Water Stress

Total Marks

AQA 8035 · Calculators not allowed · about 60 minutes

Name: \_\_\_\_\_ Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

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**Answer ALL questions. Show all your working.**

- 1** Define the term 'water stress' as used in studies of water supply and demand in a region.

(Total for Question 1 is 1 mark)

- 2** Define the term 'water scarcity' in the context of national or regional water resources.

(Total for Question 2 is 1 mark)

- 3** Define the phrase 'water security' for a country or city context.

(Total for Question 3 is 1 mark)

- 4** Give TWO human causes of increasing global water demand that put pressure on freshwater resources.

(Total for Question 4 is 2 marks)

- 5** Give TWO physical causes of water stress related to climate and weather patterns.

(Total for Question 5 is 2 marks)

**6** Table A shows an invented water-stress index category for six countries. The category names are: Low stress, Moderate stress, High stress, and Severe stress. Table A: Country P 9% population in Severe stress, Country Q 40% in Severe, Country R 0% Severe, Country S 25% Severe, Country T 2% Severe, Country U 60% Severe. Use these figures to answer parts a to c about the distribution of severe water stress.

**(a)** Using Table A, state which country has the highest proportion of its population in the Severe stress category. **(1)**

**(b)** Describe the pattern shown by the Severe stress percentages across the six countries in Table A. **(3)**

**(c)** Calculate the mean percentage of population in the Severe stress category across the six countries. Give your answer to one decimal place. **(2)**

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**(Total for Question 6 is 6 marks)**

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**7** A city uses 120 litres per person per day while a nearby town uses 80 litres per person per day. Calculate the difference in litres per person per day and state which place uses more water.

**(Total for Question 7 is 2 marks)**

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**8** Explain how over-abstraction of groundwater can lead to water insecurity in a rural region.

**(Total for Question 8 is 4 marks)**

- 9** Give TWO common human sources of pollution that contaminate rivers and groundwater and contribute to water insecurity.

(Total for Question 9 is 2 marks)

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- 10** Suggest ONE way that poverty can restrict a household's access to a clean water supply in a low-income country, naming the mechanism involved.

(Total for Question 10 is 2 marks)

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- 11** Explain TWO human causes of water insecurity linked to governance and investment decisions.

(Total for Question 11 is 6 marks)

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- 12** State ONE commonly used indicator or method for measuring national water stress levels, naming the metric.

(Total for Question 12 is 1 mark)

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- 13** Explain how pollution of groundwater by agricultural chemicals can reduce long-term water security for a farming region.

(Total for Question 13 is 4 marks)

- 14** Suggest TWO reasons why conflict or political instability can be a human cause of water insecurity, focusing on supply systems and maintenance.

(Total for Question 14 is 2 marks)

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- 15** Name a real, recent example of an urban water crisis, giving the place, country and year when the crisis peaked, that illustrates human and physical causes of water insecurity.

(Total for Question 15 is 1 mark)

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- 16** Use examples and evidence of physical and human causes to answer this question.  
'Governance and human behaviour are more important than climate in causing water insecurity.' Assess the extent to which you agree with this statement for countries and regions facing water stress.  
'Governance and human behaviour are more important than climate in causing water insecurity.' Assess the extent to which you agree with this statement, using named or hypothetical examples.

(Total for Question 16 is 12 marks)

# Mark scheme · GEO.HU10 Water Insecurity: Physical and Human Causes of Water Stress

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## Question 1

- **B1** the situation where demand for water is close to, or exceeds, the available supply so there is pressure on water resources, oe
- **Answer: Water stress is when demand for water is close to or exceeds available supply, creating pressure on water resources.**

## Question 2

- **B1** a more severe shortage where available water supplies are insufficient to meet basic human and environmental needs, oe
- **Answer: Water scarcity is a more severe shortage where available water supplies are insufficient to meet basic human and environmental needs.**

## Question 3

- **B1** having reliable access to sufficient, safe and affordable water to meet household, economic and environmental needs, oe
- **Answer: Water security is having reliable access to sufficient, safe and affordable water to meet household, economic and environmental needs.**

## Question 4

- **B1** population growth increasing domestic water use, oe
- **B1** expansion of industrial activity requiring water for manufacturing and energy, oe
- **Answer: Population growth increasing domestic water use; expansion of industrial activity needing water for manufacturing and energy.**

## Question 5

- **B1** low or unreliable rainfall, oe
- **B1** prolonged drought periods reducing river flow and groundwater recharge, oe
- **Answer: Low or unreliable rainfall; prolonged drought periods reducing river flow and groundwater recharge.**

## Question 6

- (a) **B1** Country U
- (a) **Answer: Country U.**
- (b) **B1** there is a wide range from 0% to 60%, showing great variation between countries, oe
- (b) **B1** some countries have very low Severe stress (e.g. Country R 0%, Country T 2%) while others have high values (Country Q 40%, Country U 60%), oe
- (b) **B1** this suggests water stress is unevenly distributed and depends on country-specific factors, oe
- (b) **Answer: The percentages vary widely from 0% to 60%, with some countries showing very low severe stress (Country R 0%, Country T 2%) and others very high (Country Q 40%, Country U 60%), indicating uneven distribution of severe water stress between countries.**
- (c) **M1**  $9 + 40 + 0 + 25 + 2 + 60 = 136$  seen, oe
- (c) **A1** 22.7% cao
- (c) **Answer: 22.7%.**

## Question 7

- **M1** 120 - 80 seen, oe
- **A1** 40 litres per person per day, city uses more cao
- **Answer: 40 litres per person per day; the city uses more water.**

### Question 8

- **B1** over-abstraction lowers the water table or groundwater levels, oe
- **B1** this reduces the yield from wells and boreholes so people and irrigation systems get less water, oe
- **B1** linked consequence, e.g. wells may run dry or require deeper drilling which is costly, reducing access for poorer households, oe
- **B1** linked consequence, e.g. reduced groundwater can cause land subsidence or salinisation near coasts, further harming reliable supply, oe
- **Answer: Over-abstraction lowers groundwater levels so wells and boreholes yield less water; this can make wells run dry or require deeper, more expensive drilling, reducing access for poorer households, and can cause problems such as land subsidence or coastal salinisation that further reduce reliable supply.**

### Question 9

- **B1** agricultural runoff containing fertilisers and pesticides, oe
- **B1** untreated sewage or industrial effluent entering watercourses, oe
- **Answer: Agricultural runoff with fertilisers and pesticides; untreated sewage or industrial effluent entering rivers and aquifers.**

### Question 10

- **B1** lack of money to pay for piped connections or to buy water from vendors, oe
- **B1** linked detail, e.g. households may rely on distant or unsafe sources because they cannot afford installation or treatment, oe
- **Answer: Lack of money to pay for piped connections or to buy treated water; as a result, households may rely on distant or unsafe sources because they cannot afford installation or treatment.**

### Question 11

- **Level 1** (1-2): Simple statements of one or two causes with little or no development, or one developed point only.
- **Level 2** (3-4): Clear explanation of two causes, with some linked development of how each causes water insecurity.
- **Level 3** (5-6): Detailed explanation of two distinct governance or investment causes, each developed into a clear causal chain showing how decisions reduce availability, quality or access to water.
- **Indicative content:**
  - Under-investment in water infrastructure, such as failing to build or maintain pipes and treatment plants, leads to leakages, contamination and unreliable supply, so even where water exists it fails to reach households.
  - Poor governance and corruption can divert funds away from water projects or lead to contract mismanagement, so intended improvements do not happen and services remain poor.
  - Weak regulation of industrial and agricultural pollution allows contaminants to enter rivers and aquifers, reducing safe water availability and increasing treatment costs.
  - Policy choices that prioritise urban or industrial users at the expense of rural communities can leave large populations without reliable supply, increasing inequality in access.

### Question 12

- **B1** e.g. Falkenmark indicator, which measures renewable freshwater per person per year, oe
- **Answer: For example, the Falkenmark indicator, which measures renewable freshwater per person per year.**

### Question 13

- **B1** chemicals such as nitrates and pesticides can percolate into aquifers and contaminate groundwater, oe
- **B1** contaminated groundwater is unsafe to drink and may exceed health limits, increasing treatment needs, oe
- **B1** linked consequence, e.g. expensive treatment or abandonment of wells reduces available safe water and imposes costs on farmers and households, oe
- **B1** linked long-term point, e.g. some aquifers are hard to clean and contamination can persist for decades, reducing long-term security, oe
- **Answer: Nitrates and pesticides can percolate into aquifers contaminating groundwater; this makes water unsafe to drink and increases treatment needs, and because aquifers are hard to clean, contamination can persist for decades so available safe water is reduced and costly to restore.**

#### Question 14

- **B1** damage to pipelines, treatment works or pumping stations during conflict reduces supply, oe
- **B1** disruption of staff, funding and logistics prevents maintenance and repairs, leading to longer-term system failure, oe
- **Answer: Conflict can damage pipelines and treatment works reducing supply, and can disrupt staff, funding and logistics so maintenance and repairs do not happen, causing longer-term system failure.**

#### Question 15

- **B1** Cape Town, South Africa, 2017-2018, oe
- **Answer: Cape Town, South Africa, 2017-2018.**

#### Question 16

- **Level 1** (1-3): Simple, limited response with a few general points about either governance or climate, little development, and no clear judgement.
- **Level 2** (4-6): A reasonable assessment that discusses both governance/human behaviour and climate, with some evidence or example, but the analysis is limited and the conclusion is only partly justified.
- **Level 3** (7-9): A detailed, well-balanced assessment that uses specific evidence or named examples to weigh the roles of governance/human behaviour and climate; reaches a clear, justified conclusion about the relative importance of each factor.
- **Indicative content:**
  - Arguments supporting the statement: poor governance, under-investment, corruption and unsustainable abstraction policies directly reduce water access and quality even where physical supply might be adequate, showing human factors can be decisive.
  - Human behaviour examples include overuse in agriculture and industry, pollution and lack of water pricing, which can create scarcity by wasting or contaminating available resources.
  - Arguments against the statement: prolonged drought or low rainfall due to climate variability and change can drastically reduce renewable freshwater and make even well-managed systems struggle, so climate can be the dominant driver in some regions.
  - Combination points: in many real cases both factors interact, e.g. Cape Town 2017-2018 combined low rainfall with increasing demand and governance choices about supply augmentation and restrictions.
  - A strong answer will weigh examples, consider variability between regions, and conclude whether governance and behaviour generally outweigh climate, or whether their relative importance depends on the context.