GEO.KS34 Strategies to Increase Water Supply: Transfer, Dams and Local Schemes

Total Marks

AQA 8035 · Calculators not allowed · about 50 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Define the term 'water transfer scheme' as used in planning regional water supplies.

(Total for Question 1 is 1 mark)

2 Describe ONE advantage of building a large dam and reservoir to increase water supply for a region.

(Total for Question 2 is 2 marks)

3 Explain TWO disadvantages of mega-dams and large reservoirs for water supply and local communities.

(Total for Question 3 is 4 marks)

4 Give TWO examples of small-scale water supply schemes suitable for rural communities in low-income countries.

(Total for Question 4 is 2 marks)

5 Describe how a basic rainwater harvesting system works in a village setting to increase local water supply.

(Total for Question 5 is 3 marks)

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6 Suggest TWO practical ways that an urban water supply network can reduce water loss through leakage.

(Total for Question 6 is 2 marks)

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7 Compare the likely initial financial cost and the time taken to implement a large-scale water transfer scheme with a small-scale local scheme such as rainwater harvesting.

(Total for Question 7 is 3 marks)

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8 Explain how involving a local community in the management of a hand-dug well increases the sustainability of that small-scale water supply scheme.

(Total for Question 8 is 4 marks)

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9 A town's water utility reduces annual losses from leaks from 1200 megalitres to 1080 megalitres by repairing pipes. Calculate the percentage reduction in water lost. Give your answer to one decimal place.

(Total for Question 9 is 2 marks)

10 State ONE environmental impact caused by creating a large reservoir for water supply.

(Total for Question 10 is 1 mark)

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11 Describe the basic stages of a simple household sand and charcoal filtration system used to make collected water safer to drink in a rural settlement.

(Total for Question 11 is 3 marks)

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12 Give ONE social benefit that a large-scale inter-regional water transfer scheme can bring to the receiving urban area.

(Total for Question 12 is 1 mark)

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13 Explain ONE political or social reason why large-scale water transfers can be controversial between regions or countries.

(Total for Question 13 is 3 marks)

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14 Suggest TWO ways in which solar-powered pumps improve rural access to groundwater for small-scale water schemes in sunny low-income regions.

(Total for Question 14 is 2 marks)

15 Compare the advantages and disadvantages of large-scale water supply strategies (such as dams and inter-regional transfers) and small-scale local strategies (such as rainwater harvesting and wells) for meeting water needs.

Compare the advantages and disadvantages of large-scale and small-scale water supply strategies.

(Total for Question 15 is 6 marks)

Mark scheme · GEO.KS34 Strategies to Increase Water Supply: Transfer, Dams and Local Schemes

Question 1

- **B1** a scheme that moves water from an area of surplus to an area of deficit, using canals, pipelines, tunnels or pumped systems, oe
- **Answer: A water transfer scheme moves water from an area of surplus to an area of deficit using canals, pipelines, tunnels or pumps.**

Question 2

- **B1** one advantage named, e.g. stores large volumes of water for supply in dry periods, oe
- **B1** linked detail, e.g. reservoir water can be released to maintain river flow and support agriculture and urban demand during droughts, oe
- **Answer: A dam and reservoir can store large volumes of water for use in dry periods, allowing controlled releases to maintain river flow and supply agriculture and cities during droughts.**

Question 3

- **B1** disadvantage 1 named, e.g. displacement of people when land is flooded for the reservoir, oe
- **B1** linked detail, e.g. communities lose homes, farmland and cultural sites and may not receive adequate compensation, oe
- **B1** disadvantage 2 named, e.g. environmental impacts such as loss of habitat and changes to river ecosystems, oe
- **B1** linked detail, e.g. reduced sediment flow can affect fisheries and downstream soil fertility, and wetlands can be lost, oe
- **Answer: Disadvantages include displacement of people when land is flooded for the reservoir, with loss of homes and farmland and often inadequate compensation; and environmental impacts such as loss of habitat, altered river flow and reduced sediment downstream affecting fisheries and soil fertility.**

Question 4

- **B1** example 1, e.g. rainwater harvesting (collection from roofs into tanks), oe
- **B1** example 2, e.g. hand-dug wells with rope-and-bucket or small solar pump, or household sand filtration, oe
- **Answer: Examples include rainwater harvesting from roofs into tanks, and hand-dug wells with a rope-and-bucket or small pump, or simple household sand filtration systems.**

Question 5

- **B1** catchment described, e.g. rainwater collected from roof gutters into downpipes, oe
- **B1** storage described, e.g. water stored in a tank, cistern or barrel for later use, oe
- **B1** use or basic treatment described, e.g. simple lids or first-flush devices reduce contamination and water is used for drinking with basic treatment or for domestic uses, oe
- **Answer: Rainwater is collected from roof gutters into downpipes, directed into a storage tank or cistern, and kept covered to reduce contamination; water can be used for domestic needs and treated simply before drinking.**

Question 6

- **B1** way 1, e.g. regular maintenance and rapid repair of burst pipes, oe
- **B1** way 2, e.g. pressure management and leakage detection using sensors and district metering, oe
- **Answer: Regular maintenance and rapid repair of burst pipes; and pressure management plus leakage detection using sensors and district metering.**

Question 7

- **B1** large-scale cost point, e.g. large transfer schemes require very high initial capital investment, oe
- **B1** small-scale cost point, e.g. small schemes are much cheaper per community and use local materials, oe
- **B1** time to implement comparison, e.g. large schemes take many years to plan and build while small schemes can be set up quickly, oe
- **Answer: Large-scale transfers require very high initial capital investment and long planning and construction times, whereas small-scale schemes cost much less per community, use local materials and can be set up quickly.**

Question 8

- **B1** point 1, e.g. local ownership encourages careful use and maintenance, oe
- **B1** linked detail, e.g. users are more likely to repair and protect the well if they organised and contributed to it, oe
- **B1** point 2, e.g. training and local management build skills and reduce reliance on external technicians, oe
- **B1** linked detail, e.g. community-trained caretakers can manage simple repairs and maintain hygiene standards, extending the life of the scheme, oe
- **Answer: Local ownership encourages careful use and maintenance because people who organised and contributed to the well are more likely to protect and repair it; training local caretakers builds skills and reduces reliance on external technicians, so the scheme lasts longer and hygiene is maintained.**

Question 9

- **M1** method seen: (1200-1080) / 1200 x 100 or 120 / 1200 x 100, oe
- **A1** 10.0% cao
- **Answer: 10.0%.**

Question 10

- **B1** any correct environmental impact, e.g. habitat loss and flooding of ecosystems, oe
- **Answer: Loss of habitat and flooding of ecosystems where the reservoir is formed.**

Question 11

- **B1** stage 1, e.g. coarse screening to remove large debris, such as a cloth or mesh, oe
- **B1** stage 2, e.g. water passes through layers of sand and gravel to remove particles, oe
- **B1** stage 3, e.g. charcoal or activated carbon removes odors and some impurities and water is boiled or disinfected for safety, oe
- **Answer: First water is screened through cloth or mesh to remove large debris, then it passes through layers of sand and gravel which trap particles, and finally charcoal absorbs odors and some chemicals; water is then boiled or disinfected before drinking.**

Question 12

- **B1** one social benefit, e.g. improved domestic water supply allowing better public health and hygiene, oe
- **Answer: Improved domestic water supply, which can lead to better public health and hygiene for the urban population.**

Question 13

- **B1** reason stated, e.g. source communities may lose water and feel the scheme is unfair, oe
- **B1** linked detail, e.g. reduced water supply downstream can harm agriculture, livelihoods and lead to protests, oe
- **B1** governance detail, e.g. disputes over allocation and perceived inequity can strain relations between regions or countries, oe
- **Answer: Source communities may lose water and see the transfer as unfair; reduced downstream supply can harm agriculture and livelihoods and cause protests, and disputes over allocation can strain relations between regions or countries.**

Question 14

- **B1** way 1, e.g. provide reliable pumping without diesel or grid electricity, reducing fuel costs, oe
- **B1** way 2, e.g. lower running costs and easier maintenance can make wells more sustainable for communities, oe
- **Answer: Solar pumps provide reliable pumping without diesel or grid power, reducing fuel costs, and their lower running costs and simple maintenance make wells more sustainable for communities.**

Question 15

- **Level 3** (5-6): A well-developed comparison that evaluates both large-scale and small-scale strategies, using specific and balanced points about cost, timescale, environmental and social impacts, scalability and sustainability, and reaches a justified conclusion about which approach is more appropriate in different contexts.
- **Level 2** (3-4): A clear comparison that discusses advantages and disadvantages of both approaches with some development, but with limited balance or few contextual judgements, and includes a simple conclusion.
- **Level 1** (1-2): One or two relevant points about advantages or disadvantages of one or both approaches, with limited or no comparison and no clear conclusion.
- **Indicative content:**
  - Advantages of large-scale strategies: can deliver large volumes of water to meet urban and industrial demand; provide storage for droughts and regulate river flow; can support economic growth at regional scale.
  - Disadvantages of large-scale strategies: very high capital cost and long construction time; can displace communities and damage ecosystems; political disputes over water allocation and high maintenance or sedimentation costs.
  - Advantages of small-scale strategies: low initial cost, quick to implement, use local materials and skills, empower communities and are more easily adapted to local needs; lower environmental footprint and easier to maintain locally.
  - Disadvantages of small-scale strategies: limited reach and volume so may not meet the needs of large cities or intensive agriculture; can be vulnerable to seasonal variability and may require many installations to scale up.
  - Context matters: in densely populated urban regions a mix of approaches may be needed, while in remote rural areas small-scale methods are often most appropriate; consider long-term sustainability, governance and who benefits when judging which approach is preferable.
  - A balanced conclusion should weigh capacity, cost, social and environmental impacts and sustainability to justify when each approach is most suitable, or why a combination may be best.