8.3 Increasing Water Supply: Large-Scale Engineering Schemes: 30-minute Pack

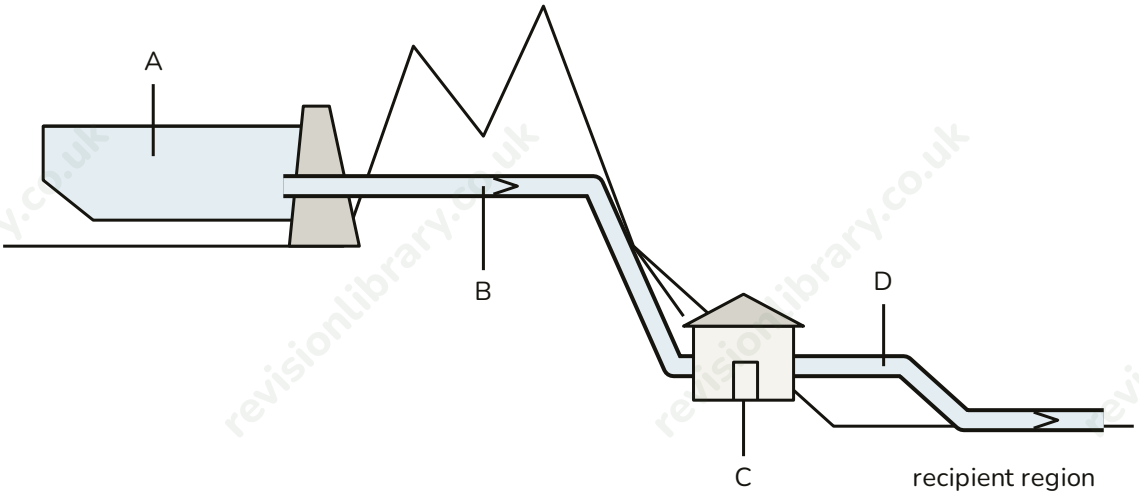
AQA 8035 · Calculators not allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A simplified diagram of a large-scale transfer scheme similar to the Lesotho Highlands Water Project has four marked features: A is a highland lake held back behind a dam; B is a passage running through the mountains; C is a small power station building below the dam; D is a pipe leading out of the scheme to the plains where the water is used. Give the correct feature name for each letter.



(Total for Question 1 is 4 marks)

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2 Calculate the following. A reservoir created by a dam stores 1,200 million cubic metres of water. Each year 200 million cubic metres are transferred to Gauteng for use. How many years would it take to transfer an amount equal to half the stored volume? Show your working.

(Total for Question 2 is 2 marks)

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3 Explain how hydroelectric power included in the Lesotho Highlands Water Project provides a benefit to Lesotho beyond royalty income from water sales.

(Total for Question 3 is 3 marks)

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4 Give THREE financial or economic drawbacks that Lesotho or South Africa may face because of the Lesotho Highlands Water Project.

(Total for Question 4 is 3 marks)

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5 'Evaluating the costs and benefits of large-scale water transfer schemes shows that benefits outweigh costs.' To what extent do you agree with this statement? Use evidence in your answer.

(Total for Question 5 is 8 marks)

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6 Using the Lesotho Highlands Water Project as an example, suggest one reason why the construction costs of large-scale water transfer schemes are very high.

(Total for Question 6 is 2 marks)

7 Suggest one way the negative social impacts of displacement caused by dam construction could be reduced in a future large-scale transfer scheme.

(Total for Question 7 is 2 marks)

8 Explain THREE reasons why large-scale inter-basin water transfer schemes like the LHWP can be controversial between donor and recipient countries.

(Total for Question 8 is 3 marks)

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Mark scheme · 8.3 Increasing Water Supply: Large-Scale Engineering Schemes: 30-minute Pack

Question 1

A: reservoir or dam lake (accept dam), oe	**B1**
B: tunnel(s) through the mountains, or transfer tunnel, oe	**B1**
C: hydroelectric (HEP) power station or power plant, oe	**B1**
D: delivery pipeline, aqueduct or outlet tunnel carrying water to the recipient region (e.g. Gauteng), oe	**B1**

Answer: A: reservoir (the lake behind the dam); B: tunnel through the mountains (transfer tunnel); C: hydroelectric power station; D: delivery pipeline or outlet carrying water to the recipient region (Gauteng).

Question 2

0.5 x 1,200 = 600 million cubic metres and 600 / 200 seen, oe	**M1**
3 years cao	**A1**

Answer: 3 years. Working: half of 1,200 million m3 = 600 million m3; 600 / 200 = 3 years.

Question 3

hydroelectric power supplies electricity for domestic use and industry in Lesotho, oe	**B1**
this reduces dependence on imported electricity or fossil fuel generation, lowering energy costs or improving energy security, oe	**B1**
surplus electricity can be sold or used to power local development, supporting economic growth, oe	**B1**

Answer: The hydroelectric power provides electricity for domestic use and industry in Lesotho, reducing reliance on imports and fossil fuels and improving energy security; surplus power can be sold or used to support local development and economic growth.

Question 4

very high initial construction costs leading to long-term debt, oe	**B1**
ongoing maintenance and repair costs for dams and tunnels, oe	**B1**
economic dependence on a single large project or on payments that might be renegotiated, oe	**B1**

Answer: High initial construction costs causing long-term debt; ongoing maintenance and repair costs for the complex infrastructure; and a risk of economic dependence on payments that could be renegotiated or reduced.

Question 5

Level 3 A detailed, balanced evaluation that uses specific, accurate reference to the LHWP and at least one other example or general evidence; weighs economic, social and environmental costs against benefits such as water security, hydroelectric power and income, and reaches a clear, justified judgement about the extent to which benefits outweigh costs.	**7-8**
Level 2 A clear evaluation with some specific reference to the LHWP or another example; both costs and benefits are considered but the analysis may be less developed or less well balanced; a conclusion is given but may lack full justification.	**4-6**
Level 1 Some relevant points about costs or benefits are made, with limited or generalised detail and little evaluation; a simple or unsupported conclusion may be given.	**1-3**

Indicative content:

- Benefits: provides reliable water supply to high-demand urban and industrial regions (e.g. Gauteng), supporting economic activity, jobs and public water supply security.
- Benefits: hydroelectric power generation provides energy for the donor country (Lesotho), improving energy security and offering a revenue stream from electricity sales.
- Benefits: royalty payments and associated infrastructure investment can provide significant government income for the donor country and funds for development projects.
- Costs: social costs include displacement of communities, loss of farmland and cultural sites, and long-term social disruption for relocated people.
- Costs: environmental costs such as habitat loss, altered river flows downstream, changes to aquatic ecosystems and sedimentation issues in reservoirs.
- Costs: very high construction and maintenance costs leading to long-term debt burdens; financial risk if projected payments are renegotiated or shortfalls occur.
- Evaluation points: weigh the scale and distribution of benefits against localized but severe social and environmental harms; consider time scale, e.g. long-term economic gains versus immediate social displacement.
- Evaluation points: consider alternatives or complementary measures, such as demand management, water recycling and smaller-scale projects, and whether a mixed strategy reduces risks.
- A supported judgement should state whether, for the context used, the economic and supply benefits justify the social and environmental costs, or whether costs outweigh benefits, with evidence and reasoned justification.

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Question 6

because of expensive engineering work required, e.g. building large dams, tunnels through hard rock and long transfer infrastructure, oe **B1**

linked detail, e.g. remote highland locations increase transport and labour costs, oe **B1**

Answer: Because of the costly engineering: constructing large dams and long tunnels through hard rock is expensive, and remote highland locations increase transport and labour costs.

Question 7

resettlement with fair compensation and provision of equivalent land, housing and services, oe **B1**

linked detail, e.g. involving affected communities in planning and providing training or livelihoods support, oe **B1**

Answer: Provide resettlement with fair compensation and equivalent housing and services, and involve affected communities in planning while offering training and livelihoods support to replace lost incomes.

Question 8

questions over who benefits most, e.g. recipient region gains water while donor region may suffer local costs, oe **B1**

disputes about adequate compensation or royalties for displaced people and affected communities, oe **B1**

political and environmental concerns, e.g. changes to river flow affecting downstream users and international agreements, oe **B1**

Answer: They can be controversial because of disagreements over who benefits most, with the recipient region gaining water while local donor communities bear costs; disputes arise about fair compensation and royalties for displaced people; and political and environmental concerns exist over altered river flows affecting downstream users and international relations.

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