GEO.HU17 Large-Scale Food Supply: The Indus Basin Irrigation System, Pakistan

Total Marks

AQA 8035 · Calculators not allowed · about 50 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Identify the country and the river on which the Indus Basin Irrigation System is primarily based. Name the country and the river.

(Total for Question 1 is 1 mark)

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2 On a labelled diagram of the Indus Basin system, identify one man-made structure that diverts water from the river for irrigation. Name the structure you would label on the diagram.

Figure (to be drawn): A blank map-style diagram of a river with space for labels would be provided in the printed pack; students write the label on the diagram.

(Total for Question 2 is 1 mark)

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3 State two major plains or provinces that are irrigated by the Indus Basin Irrigation System in Pakistan. Give two names.

(Total for Question 3 is 2 marks)

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4 Describe briefly how canals and link canals in the Indus Basin System increase the area of land available for irrigation in the Punjab and Sindh plains. Mention canals and link canals in your answer.

(Total for Question 4 is 2 marks)

5 Give one example of a large dam associated with the Indus Basin system that provides water storage and hydropower for Pakistan. Name the dam and give its primary purpose in one short sentence.

(Total for Question 5 is 1 mark)

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6 Explain two ways in which the Indus Basin Irrigation System increases food supply in Pakistan. Give two separate benefits.

(Total for Question 6 is 2 marks)

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7 Explain one environmental problem caused by intensive irrigation in the Indus Basin, and briefly explain how that problem reduces crop productivity. Base your answer on salinisation or waterlogging and name which you are describing.

(Total for Question 7 is 2 marks)

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8 Describe one economic benefit for farmers or the national economy that results from increased irrigation supplied by the Indus Basin system. Give one clear point.

(Total for Question 8 is 1 mark)

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9 Give one operational or maintenance problem for the Indus Basin Irrigation System that can reduce water availability for food production, and state briefly why it reduces supply.

(Total for Question 9 is 1 mark)

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10 Explain briefly how unequal distribution of water between upstream and downstream users in the Indus Basin can affect food supply for downstream farmers. Give one clear effect.

(Total for Question 10 is 2 marks)

11 A simplified local authority report states that the Sindh irrigation command area has 3 200 000 hectares of agricultural land and that 1 120 000 hectares are reliably irrigated by the canal network. Calculate the percentage of the command area that is reliably irrigated. Give your answer to one decimal place.

(Total for Question 11 is 2 marks)

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12 Suggest one social impact for rural communities when large-scale irrigation increases agricultural productivity in the Indus Basin. Give one impact and a brief reason.

(Total for Question 12 is 1 mark)

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13 Identify one management strategy that can be used to reduce salinisation in irrigated soils in the Indus Basin, and state briefly how it works to protect crop yields.

(Total for Question 13 is 1 mark)

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14 Give one reason why ageing irrigation infrastructure in the Indus Basin system can reduce the efficiency of water delivery to farmers. Give one brief reason.

(Total for Question 14 is 1 mark)

15 Use named evidence from the Indus Basin Irrigation System in Pakistan to answer this question.

'To what extent are large-scale irrigation schemes such as the Indus Basin Irrigation System successful in increasing food supply?' Evaluate using specific advantages and drawbacks and reach a judgement.

(Total for Question 15 is 8 marks)

Mark scheme · GEO.HU17 Large-Scale Food Supply: The Indus Basin Irrigation System, Pakistan

Question 1

- **B1** Pakistan and the Indus River named, oe
- **Answer: Pakistan; the Indus River.**

Question 2

- **B1** barrage, headwork or canal head identified and labelled, oe
- **Answer: Barrage (or headwork) labelled as the structure that diverts water into canals.**

Question 3

- **B1** Punjab named, oe
- **B1** Sindh named, oe
- **Answer: The Punjab plain and the Sindh plain.**

Question 4

- **B1** canals carry water from the river to fields away from the main channel, extending irrigation, oe
- **B1** link canals connect tributaries and main canals to distribute water over a wider area, increasing irrigated land, oe
- **Answer: Canals carry water away from the Indus into the interior plains so fields far from the river can be irrigated; link canals join rivers and main canals to spread water further across the Punjab and Sindh, increasing the total irrigated area.**

Question 5

- **B1** Tarbela Dam named with purpose of water storage and hydroelectric power, oe
- **Answer: Tarbela Dam, used for water storage and hydroelectric power generation.**

Question 6

- **B1** provides reliable water throughout the year, allowing multiple cropping or irrigation of cash and food crops, oe
- **B1** increases crop yields by reducing drought risk and enabling controlled watering, oe
- **Answer: The system provides reliable water year round so farmers can irrigate more land and grow more than one crop per year; it increases yields by reducing drought stress and allowing crops to receive controlled watering.**

Question 7

- **B1** identifies salinisation or waterlogging as the problem, oe
- **B1** links the problem to reduced productivity, e.g. salts or saturated soils damage roots and reduce yields, oe
- **Answer: Salinisation: salt build up from repeated irrigation raises soil salinity, which damages plant roots and reduces crop yields. Or waterlogging: poor drainage leaves soils saturated so roots cannot get oxygen, reducing crop growth and yields.**

Question 8

- **B1** example such as higher crop yields leading to higher incomes or greater food exports named, oe
- **Answer: Higher crop yields increase farmers income and can boost national food production for domestic supply or export, benefiting the economy.**

Question 9

- **B1** examples such as siltation/desilting costs, ageing infrastructure or high maintenance costs named with brief reason, oe
- **Answer: High siltation in canals raises desilting and maintenance needs, reducing actual water flow to fields until canals are cleared, lowering water available for crops.**

Question 10

- **B1** identifies unequal distribution or upstream abstraction as the issue, oe
- **B1** links to effect such as reduced irrigation water for downstream farmers leading to lower yields or crop failure, oe
- **Answer: If upstream users or reservoirs take more water, downstream farmers receive less irrigation water, which reduces their ability to irrigate crops and can lower yields or lead to crop failure in dry periods.**

Question 11

- **M1** 1120000 / 3200000 seen or equivalent, oe
- **A1** 35.0% cao
- **Answer: 35.0%.**

Question 12

- **B1** examples such as improved food security, reduced rural poverty, or rural employment increases named with brief reason, oe
- **Answer: Improved food security and nutrition because higher and more reliable crop yields increase local food availability and incomes.**

Question 13

- **B1** examples such as improved drainage, periodic flushing with good quality water, crop rotation with salt-tolerant species, or controlled irrigation scheduling named with brief mechanism, oe
- **Answer: Improved drainage, which lowers the water table and removes salts from the root zone, protecting crops from salt damage and preserving yields.**

Question 14

- **B1** examples such as leaking canals, collapsed embankments, or outdated control structures leading to water loss or unreliable supply named with brief reason, oe
- **Answer: Leaking or silted canals from ageing infrastructure cause water loss before it reaches fields, so less water is available for irrigation and crop yields fall.**

Question 15

- **Level 4** (7-8): A well-developed, balanced evaluation using accurate named evidence from the Indus Basin system; considers multiple benefits and significant drawbacks, links them to impacts on food supply and sustainability, and reaches an explicit, justified conclusion about overall success.
- **Level 3** (5-6): Clear evaluation using named examples from the Indus Basin; discusses both advantages and drawbacks and gives a supported judgement, though some points lack full development.
- **Level 2** (3-4): Some relevant points made about advantages and/or drawbacks with limited named detail; a simple judgement is given with limited supporting evidence.
- **Level 1** (1-2): One or two brief, relevant points about large-scale irrigation are made with little or no specific evidence and no clear judgement.
- **Level 0** (0): No relevant content.
- **Indicative content:**
  - Advantages such as reliable year-round water from canals and dams (e.g. Tarbela reservoir), enabling multiple cropping, higher yields and improved national food security.
  - Economic benefits including increased farmer incomes, potential for export earnings and support for agro-industries in irrigated regions such as Punjab.
  - Social benefits including more stable rural employment and improved food availability for local populations.
  - Drawbacks including environmental problems such as salinisation and waterlogging that reduce soil fertility and long-term productivity.
  - Operational issues such as heavy siltation, high desilting and maintenance costs, and ageing canal infrastructure that reduce efficiency and water delivery.
  - Political and distributional problems, for example unequal allocation of water between upstream and downstream users within the Indus Basin, harming downstream farmers in Sindh at times.
  - Counter-argument that management strategies, such as improved drainage, canal lining, better scheduling and modernisation of infrastructure, can mitigate problems but require investment and governance to be effective.
  - A balanced conclusion weighing short-term gains in food supply against long-term sustainability challenges, and arguing whether the scheme's net effect on food supply is largely positive where maintenance and management are effective, or more mixed where environmental degradation and distribution conflicts persist.