



GEO.HU4 Urban Sustainability and Reducing Cities' Environmental Impact

AQA 8035 · Calculators not allowed · about 50 minutes

Total Marks

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Name: _____ Date: ____ / ____ / ____

Answer the short questions with brief answers. Full-sentence responses are required for the 6-mark and 12-mark questions. Suggested time: 50 minutes.

- 1** Define the term 'urban sustainability' in the context of cities such as Freiburg Vauban.

(Total for Question 1 is 1 mark)

- 2** State TWO features of the Vauban district in Freiburg that make it an example of sustainable urban design.

(Total for Question 2 is 2 marks)

- 3** Give one example of a water conservation strategy used in sustainable urban areas, giving the strategy name.

(Total for Question 3 is 1 mark)

- 4** Name TWO energy conservation measures that can be retrofitted to existing urban housing.

(Total for Question 4 is 2 marks)

- 5** State one waste reduction or recycling scheme a city council might introduce to reduce landfill.

(Total for Question 5 is 1 mark)

6 Give two examples of sustainable urban transport strategies, apart from cycle infrastructure.

(Total for Question 6 is 2 marks)

7 Describe briefly how green roofs contribute to energy conservation and urban sustainability in a district like Vauban.

(Total for Question 7 is 3 marks)

8 Explain ONE advantage and ONE disadvantage of using water butts and grey water recycling together in a residential area for garden watering and toilet flushing.

(Total for Question 8 is 2 marks)

9 The table below shows a fictional mode share for journeys to work in a mid-sized city before and after a sustainable transport programme that introduced park and ride, improved buses, congestion charging and new cycle corridors. Use these figures to answer parts a to c. Mode | Before programme (%) | After programme (%) Private car | 62 | 45 Bus | 15 | 25 Cycle | 6 | 15 Walk | 10 | 10 Other | 7 | 5

(a) Using the table, state which single transport mode had the largest percentage point increase after the programme. **(1)**

(b) Calculate the reduction in private car mode share in percentage points. Show your working. **(2)**

.....
(c) Explain TWO likely reasons, using the table data, why the cycle share increased so much compared with walking remaining the same. **(3)**

(Total for Question 9 is 6 marks)

10 State TWO ways a city council could encourage household recycling participation in a suburb similar to Vauban.

(Total for Question 10 is 2 marks)

11 Explain TWO ways that insulating homes and installing solar panels in an urban neighbourhood reduce the environmental impact of the city.

(Total for Question 11 is 6 marks)

- 12** A small neighbourhood records that before a waste reduction campaign, 400 kg of household waste per month went to landfill. After introducing separate food waste collection and a textiles reuse scheme, landfill output fell to 260 kg per month. Calculate the percentage reduction in landfill waste. Show your working and give your answer to one decimal place.

(Total for Question 12 is 2 marks)

- 13** Explain THREE environmental benefits of pedestrianisation of a busy city centre street.

(Total for Question 13 is 3 marks)

- 14** Which one of the following is a direct benefit of congestion charging in a city centre?

- ☐ A. Increased car ownership
- ☐ B. Reduced peak-time traffic volumes
- ☐ C. Higher on-street parking availability for residents only
- ☐ D. Reduced public transport funding

(Total for Question 14 is 1 mark)

15 Use the example of the Vauban district, Freiburg (Germany), and other strategies you have studied to answer this question.

'Urban sustainability strategies such as energy retrofits, water conservation and sustainable transport are highly effective at reducing a city's environmental impact.' Assess the extent to which you agree with this statement.

'Urban sustainability strategies such as energy retrofits, water conservation and sustainable transport are highly effective at reducing a city's environmental impact.' Assess the extent to which you agree with this statement. Use named examples such as Vauban, Freiburg, and at least two distinct strategies in your answer.

(Total for Question 15 is 12 marks)

Mark scheme · GEO.HU4 Urban Sustainability and Reducing Cities' Environmental Impact

Question 1

- **B1** meeting the needs of the present urban population without compromising the ability of future generations to meet their needs, with balanced social, economic and environmental aims, oe
- **Answer: Urban sustainability is meeting the needs of the present urban population without compromising the ability of future generations to meet their needs, balancing social, economic and environmental aims.**

Question 2

- **B1** extensive cycle paths and low car ownership, oe
- **B1** energy-efficient housing with solar panels and good insulation, oe
- **Answer: Extensive cycle paths with low car ownership, and energy-efficient housing with solar panels and good insulation.**

Question 3

- **B1** example e.g. grey water recycling, water butts, or low-flow fittings (any one named) oe
- **Answer: Grey water recycling.**

Question 4

- **B1** insulation of walls/loft insulation, oe
- **B1** installation of solar panels/solar retrofit, oe
- **Answer: Wall or loft insulation and installation of solar panels (solar retrofit).**

Question 5

- **B1** e.g. curbside separated recycling collection, food waste collection for composting, or household glass and plastic bottle banks (any one named) oe
- **Answer: Curbside separated recycling collection.**

Question 6

- **B1** park and ride, oe
- **B1** congestion charging, pedestrianisation, or improved public transport such as tram or bus priority (any two distinct named) oe
- **Answer: Park and ride, and congestion charging.**

Question 7

- **B1** green roofs provide insulation, reducing heat loss in winter and reducing overheating in summer, oe
- **B1** they reduce energy demand for heating and cooling, lowering greenhouse gas emissions, oe
- **B1** they also absorb rainwater, reducing runoff and pressure on drainage, and provide urban biodiversity benefits, oe
- **Answer: Green roofs provide insulation, reducing heat loss in winter and reducing overheating in summer, which lowers energy demand for heating and cooling and so reduces emissions; they also absorb rainwater, reducing runoff and supporting urban biodiversity.**

Question 8

- **B1** advantage, e.g. reduces mains water demand and saves household water bills, oe
- **B1** disadvantage, e.g. initial installation costs and need for maintenance or potential hygiene concerns if not managed correctly, oe
- **Answer: Advantage: using water butts and grey water recycling reduces mains water demand and can lower household water bills. Disadvantage: there are initial installation costs and ongoing maintenance, and potential hygiene concerns if systems are not properly managed.**

Question 9

- (a) **B1** bus
- (a) **Answer: Bus.**
- (b) **M1** 62 - 45 seen, oe
- (b) **A1** 17 percentage points cao
- (b) **Answer: 17 percentage points.**
- (c) **B1** reason 1, e.g. the introduction of cycle corridors made cycling safer and faster, encouraging people who used cars or buses to switch to cycling, supported by the large increase in cycle share, oe
- (c) **B1** reason 2, e.g. park and ride and improved buses reduced car journeys but did not affect short walking trips, so walking stayed the same while those able to cycle from slightly further away switched to bikes, oe
- (c) **B1** linked point, e.g. cycling can replace medium-distance trips more easily than walking, so cycle mode share could grow at the expense of car and bus trips rather than walking, oe
- (c) **Answer: Because cycle corridors made cycling safer and faster, people who previously drove or used buses were encouraged to switch to bikes; and park and ride plus improved buses reduced long car trips but did not affect short walking trips, so walking stayed the same while cycling grew, replacing medium-distance car or bus journeys.**

Question 10

- **B1** providing easy curbside separate collections for recyclables, oe
- **B1** running public education campaigns and providing free or subsidised recycling bins, oe
- **Answer: Provide easy curbside separate collections for recyclables, and run public education campaigns with free or subsidised recycling bins.**

Question 11

- **B1** insulation reduces heat loss so households use less energy for heating, oe
- **B1** linked development, e.g. lower energy demand reduces fossil fuel burning and greenhouse gas emissions at a city scale, oe
- **B1** solar panels generate renewable electricity locally, reducing reliance on grid electricity from fossil fuels, oe
- **B1** linked development, e.g. solar power can lower peak demand on the grid and cut emissions, and it can reduce energy bills for households, oe
- **B1** combined effect, e.g. together insulation and solar reduce overall energy consumption and carbon footprint, improving air quality and helping the city meet sustainability targets, oe
- **B1** further linked point, e.g. local generation and lower demand increase resilience to power disruptions and reduce transmission losses, oe
- **Answer: Insulation reduces heat loss so households need less energy for heating, which lowers fossil fuel use and greenhouse gas emissions at the city scale. Solar panels generate renewable electricity locally, reducing dependence on grid electricity from fossil fuels and lowering peak demand; together these measures reduce energy consumption and the carbon footprint, improve air quality, cut bills and increase resilience.**

Question 12

- **M1** $(400 - 260) / 400 \times 100$ seen, oe
- **A1** 35.0% cao
- **Answer: 35.0%.**

Question 13

- **B1** reduces vehicle emissions locally, improving air quality, oe
- **B1** reduces noise pollution, creating a quieter environment, oe
- **B1** allows more space for trees and green infrastructure which can reduce urban heat and support biodiversity, oe
- **Answer: Pedestrianisation reduces vehicle emissions in the street improving air quality, reduces noise pollution creating a quieter environment, and creates space for trees and green infrastructure which help reduce urban heat and support biodiversity.**

Question 14

- **B1** B, reduced peak-time traffic volumes
- **Answer: B**

Question 15

- **Level 4** (10-12): A thorough, well-balanced assessment that uses detailed, accurate reference to named examples such as Vauban and other studied strategies; weighs evidence of effectiveness, scalability and limitations, and reaches a clear, justified conclusion about the extent of effectiveness.
- **Level 3** (7-9): A clear assessment that considers effectiveness with reference to at least one named example and several strategies; provides reasoned judgement though some points may be less developed.
- **Level 2** (4-6): Some relevant points about how strategies reduce environmental impact are made, with limited evidence or named detail; a simple conclusion is given with limited justification.
- **Level 1** (1-3): One or two isolated points about sustainability strategies are made with little or no development or examples.
- **Level 0** (0): No relevant content.
- **Indicative content:**
 - Evidence that strategies are effective: energy retrofits and insulation reduce energy demand and emissions; solar retrofits produce renewable electricity and lower grid dependence; Vauban demonstrates integrated design with low car ownership, renewable energy and energy-efficient buildings delivering lower per-capita emissions.
 - Water conservation such as grey water recycling and water butts reduces mains water demand and pressure on treatment works, improving resilience and lowering energy used in water supply.
 - Sustainable transport measures such as congestion charging, park and ride and improved public transport can significantly reduce car use and emissions, as shown in cities that introduced them, and cycle infrastructure can increase active travel.
 - Limits to effectiveness: high upfront costs and the need for subsidies can limit rollout, and retrofit coverage may be incomplete in an existing city so benefits are uneven; social and behavioural barriers affect uptake, for example reluctance to change travel habits.
 - Potential unintended consequences: congestion charging can push traffic to inner residential streets unless combined with wider measures; renewable energy needs storage or grid integration to manage intermittency; recycling schemes require public participation to work effectively.
 - Scalability and equity: Vauban is a relatively small, planned district with favourable conditions; scaling similar approaches to whole cities with mixed housing and income levels is more challenging and may need additional policy, funding and community engagement.
 - A high-quality conclusion should weigh the strong potential effectiveness of these strategies against practical limitations and argue whether they are sufficient on their own or need to be part of an integrated, well-funded package to achieve major environmental impact reductions.