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GEOGRAPHY

Higher Level and Standard Level

Paper 2

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Optional Theme A — Freshwater – issues and conflicts

1. (a) Describe *two* processes involved in the transport of a river's load. ***[2+2 marks]***

Award ***[1 mark]*** for identifying the process, and ***[1 mark]*** for a brief elaboration of each process.
Suspension: particles of finer materials such as clay and silt are held up by turbulence and make up most of the total load.
Solution: the dissolved load, derived from the solution of rocks containing carbonates or salts.
Traction: the movement of the largest particles such as cobbles or boulders along the stream bed.
Saltation: the "jumping"/bouncing of medium-sized particles along the bed.
Flotation: leaves and twigs carried on the surface of the river.

(b) Explain *two* environmental impacts of agriculture on water quality. ***[3+3 marks]***

The environmental impacts could include salinization, agro-chemical runoff, pollution of groundwater and eutrophication. For each impact award ***[1 mark]*** for use of the correct term and a further ***[2 marks]*** for development.

For example, eutrophication ***[1 mark]*** is a nutrient enrichment of streams and lakes caused by agricultural runoff from nitrate fertilizers carrying excess nutrients ***[1 mark]***. This can cause algal blooms and reduced levels of oxygen in water ***[1 mark]***.

(c) "Floodplain management strategies have more costs than benefits." Discuss this statement. ***[10 marks]***

Responses should discuss how strategies may prevent or exacerbate the flood risk, or may do both depending on the hydrological conditions prevalent at the time. Possible strategies could include:

- the construction of artificial levees
- flood barriers/walls to protect settlements
- flood relief channels
- flood basins or zones to absorb floodwater
- the creation/maintenance/restoration of wetland areas
- the removal of settlements from flood prone areas
- afforestation to increase interception
- enlargement of the channel *e.g.* by dredging
- straightening of river channels
- terracing, soil bunds and contour ploughing to reduce runoff
- dam construction – though this not always related to floodplains.

Answers may refer to several strategies in breadth or fewer strategies in more depth. The inclusion of floodplain examples is not directly asked for but these are expected in responses reaching band D and above.

Answers that simply describe strategies without discussing whether they increase or decrease floods (or both) should not move above band C. Responses that present a balanced argument are likely to be credited at bands E and F.

Marks should be allocated according to the markbands.

2. (a) Describe *four* differences between the two hydrographs shown on the diagram. ***[4 marks]***

Differences could include:

- higher peak discharge in the urban area
- shorter lag time in the urban area
- steeper rising limb in the urban area
- the longer peak discharge in the forested area
- there may be other features *e.g.* differences in base flow, urban hydrograph has two peaks.

Award ***[1 mark]*** for each valid difference. For full marks there should be some quantification.

(b) Suggest reasons why the urban and forested hydrographs show different responses to the storm event. ***[6 marks]***

Answers should refer to the reasons for the rapid response in the urban area due to lack of interception, impermeable surfaces (roads, roofs, paving), thereby reducing infiltration, and the presence of artificial and rapid drainage channels (drains, sewers, flood channels), explaining the rapid rising limb, high peak discharge and rapid falling limb on account of overland flow/runoff.

The slower and lower response in the forested area could be explained by higher interception, the retention of water by litter, absorption by root systems, high soil and bedrock permeability.

Award ***[1 mark]*** for each valid reason suggested and award additional marks for depth of explanation (of the operation of factors and associated processes).

(c) With reference to a named river flood event, examine the relative importance of natural and human causes. ***[10 marks]***

The flood event should be located and dated by year.

Possible natural causes could be:
- excessive heavy or prolonged rainfall including flash flooding
- rapid snowmelt
- high antecedent rainfall and/or low rates of evaporation
- frozen ground preventing infiltration
- relief or basin shape conducive to flooding
- the nature of the soil/bedrock.

Possible human causes might include:
- removal of vegetation/deforestation
- urbanization of river basins
- farming methods that cause soil compaction
- river control that reduces flood arrival times downriver
- river control that results in higher peak discharge downriver
- straightening of river channels
- removal of wetland areas.

Not all of the above need to be included but the causes must be related to the named river flood event. Answers that do not refer to an actual event should not move above band C. Answers that examine the relative importance of human and natural causes are likely to be credited at bands E and F.

Marks should be allocated according to the markbands.

Optional Theme B — Oceans and their coastal margins

3. (a) Identify *two* reasons shown on the diagram why some coasts advance. ***[2 marks]***

Emergence / an emerging coast ***[1 mark]***.
Deposition / an outbuilding coast ***[1 mark]***.

(b) Explain why cliffs are often found along retreating coasts. ***[3 marks]***

Sea is gaining/eroding the land to cause a cliff ***[1 mark]***. Award further marks for an explanation of two or more processes, or an explanation of the cyclical nature of cliff erosion (wave-cut notch and subsequent collapse). Another approach may be to argue that a sea-level rise exposes new parts of the coastline to erosion/undercutting. There may be alternative explanations.

(c) Explain the global distribution of ocean ridges. ***[5 marks]***

Ridges are a linear belt of submarine mountains / or other definitional statement ***[1 mark]***. They occur at spreading (divergent) plate boundaries ***[1 mark]*** where convection currents in the mantle cause the plates to diverge thus allowing magma to rise ***[1 mark].*** The mid-ocean position should be clear ***[1 mark]*** and additional marks should be awarded for use of examples.

Other valid developments (including those using a diagram) can be awarded marks in substitution for those identified above.

(d) Examine how the exploitation of *one* named oceanic resource has led to geopolitical conflict. ***[10 marks]***

The question does not specify a particular resource, so candidates may examine fish, oil or other mineral resources. There should be some identification of the countries involved, the resource, the dispute and the nature of the conflict.

To reach band E and above, candidates are expected to have used one or more detailed, named examples. Potential examples include: Canada, Denmark, Norway, Russia and USA over Arctic oil and gas; South Korea and Japan over the East Sea/Sea of Japan (either oil or fishing).

Marks should be allocated according to the markbands.

4. (a) Outline *one* economic and *one* environmental benefit of coral reefs. ***[2+2 marks]***

Economic benefits include a range of tourist activities, fish stocks/nurseries, coral sales, economic role as "nature's flood defence" protecting coastal assets. Environmental benefits include maintaining biodiversity/habitats, role in marine food webs, carbon sink, environmental role in protecting coastlines.

In each case, award ***[1 mark]*** for identifying a valid benefit and ***[1 mark]*** for development or exemplification.

(b) Explain the function of the oceanic conveyor belt(s). ***[6 marks]***

An overview of the OCB's importance would be that it has a vital global role ***[1 mark]*** in regulating/moderating Earth's ocean and atmospheric conditions (there are other ways of expressing this) ***[1 mark]***.

The remaining ***[4 marks]*** should be allocated for more detailed explanation either of the causes/functioning of OCB or a more detailed examination of its role in specific regions *e.g.* transferring heat/energy between the Pacific and Indian Oceans and the Atlantic Ocean. The North Atlantic is therefore warmer than the North Pacific, so there is likely to be more evaporation, condensation and precipitation there. There are other important regional effects too, notably cold counter-current returning to the equator, leading to localized cooling in equatorial waters. Some aspects of OCB are still not fully understood / science is contested, and good answers may reflect on this.

Also accept wider interpretation of importance for human settlement and activities *e.g.* mild maritime climate of NW Europe.

(c) Examine the economic effects of El Niño and/or La Niña events. ***[10 marks]***

El Niño – along with La Niña – is officially defined as a sustained sea surface temperature anomaly across the central tropical Pacific Ocean. The mechanisms which cause these events are not well understood and are not expected to always be well-articulated in candidate responses. Some background explanation of the phenomenon may be useful in order to help explain the economic impacts.

There are both direct effects in the local zone of influence and knock-on effects in other places. There are both positives and negatives in both instances.

During normal (non-El Niño) conditions, at the ocean surface easterly trade winds move water and lower atmosphere air warmed by the sun towards the west. This also creates ocean upwelling off the coasts of Peru and Ecuador and brings nutrient-rich cold water to the surface, increasing fishing stocks.

El Niño events are associated with warm and very wet summers (December to February) along the coasts of northern Peru and Ecuador, with the economic costs of major flooding whenever the event is strong or extreme.

Further afield, El Niño events also result in drier conditions in parts of Southeast Asia and parts of Australia and the economic impacts of this, including bush fires, can also be addressed. Fewer tropical cyclones in western Pacific reduces disaster costs.

Changes to ocean currents can affect local fishing industries along affected coastlines (for instance, Peruvian anchovies may migrate south to Chilean waters).

La Niña events are essentially the opposite of El Niño events and are characterized by unusually cold ocean temperatures in the eastern equatorial Pacific. Rain on the western coasts of the Pacific is heavier than usual. Atlantic tropical cyclone activity is generally enhanced during La Niña events. Economic impacts of all of this may be explored although it is not necessary for full marks to be awarded.

Marks should be allocated according to the markbands.

Optional Theme C — Extreme environments

5. (a) Describe the distribution of hyper-arid and semi-arid regions in Africa. ***[2+2 marks]***

Hyper-arid: a very broad band across much of north Africa (may list countries but expect a distribution-type comment) ***[1 mark]***. Award ***[1 mark]*** for a further aspect of distribution, such as smaller distributions in south-west (Namibia) and in north-east Africa (accept east).

Semi-arid: award ***[1 mark]*** for each aspect of the distribution that is well-described or exemplified (*e.g.* found either side of the arid in the north); encircling the central/D R Congo/humid regions; discontinuous distribution in east Africa; widespread in southern Africa, especially in Botswana and Zimbabwe.

(b) Using located examples, suggest possible socio-economic impacts of climate change for arid and/or semi-arid environments. ***[6 marks]***

Climate predictions for arid and semi-arid areas are extremely varied. The approach taken will depend on the example used (*e.g.* some predictions for Sahel show increased, not decreased, rainfall).

Possible economic impacts include reduced crop yields, increased cost of irrigation water, cost of imports, the need for more dams *etc*. Negative impacts on economic activity may be linked to increased evaporation, water shortages, soil erosion, land degradation *etc*.

Social impacts for indigenous populations and settlements could include out-migration/loss of traditional nomadic cultures *etc.*, increased prevalence of disease, conflict due to resource shortages, *etc.*

Award up to ***[4 marks]*** for the explanation of a range of socio-economic impacts and up to ***[2 marks]*** for the effective use of examples.

(c) Examine the importance of water in the development of the landforms in any *one* extreme environment (glacial, periglacial, or hot, arid). ***[10 marks]***

For example, in hot, arid areas, water action includes erosion and deposition by exotic, endoreic and ephemeral rivers. Flash floods can produce sheetwash. Features include canyons, wadis, alluvial fans and bajadas. Water is also important in weathering in desert areas (Griggs' experiments). However, water action is not responsible for all desert land forms. Wind action forms dunes (barchans, seif, star *etc.*), deflation hollows, yardangs and zeugens.

A similar approach is valid for each of the other extreme environments. To achieve band E and above, particular landforms should be correctly identified and explained in a way that may acknowledge the contribution that other processes may also be making.

For answers examining more than one environment, only the highest scoring environment should be credited.

Marks should be allocated according to the markbands.

6. (a) (i) Define the term *freeze-thaw*. ***[1 mark]***

The freezing and subsequent thawing of water / when temperature rises above and falls below freezing/0°C ***[1 mark]***.

(ii) Describe the seasonal variations in the number of freeze-thaw days. ***[3 marks]***

There appears to be two peaks (bimodal): one in late spring and one in Fall/Autumn ***[1 mark]***. There are fewer in the summer and also in winter ***[1 mark]***. Credit attempts at quantification or any other significant detail ***[1 mark]***.
A list of monthly data should receive no more than ***[2 marks]***.

(b) Explain the importance of freeze-thaw cycles and solifluction processes for the development of periglacial landforms. ***[6 marks]***

Award up to ***[4 marks]*** for an explanation of how either process is linked to the development of one or more landforms. For instance, freeze-thaw (and associated frost heave) play a key role in the development of patterned ground and pingos (could also include tors or aspects of thermokarst). Solifluction is likely to be linked with patterned ground (also possibly lobes, terracettes). For the award of the full ***[6 marks]***, both processes should be included and related to the landform(s).

(c) Examine how the physical characteristics of any *one* extreme environment (glacial, periglacial, or hot, arid) affect resource development. ***[10 marks]***

For a periglacial environment, the characteristics are likely to include climate, permafrost, hours of daylight, length of winter, waterlogging, poor soils and subsidence (thermokarst). There are also a number of hazards such as avalanches, rock falls, icings and frost heave. These make resource development such as mining and associated infrastructure construction difficult. Services need to be provided in insulated pipes called utilidors. Waste disposal is difficult because of the low temperatures. Credit other ideas, for instance, management or risks associated with resource development, *e.g.* oil spills are broken down very slowly in cold temperatures; or ideas about farming / tourism / nature of ecosystem services.

A similar approach is valid for the other extreme environments. For glacial environments, the physical characteristics might include altitude, gradient, temperatures, depth of snow/ice, annual snowfall, speed of glacial movement, ablation, *etc.*

For hot, arid environments, the characteristics might include water availability (aquifers, oases), evaporation, type of surface (sand, rock, pebbles), gradient, temperature range (diurnal/seasonal) *etc.*

To access band E and above, answers should refer to named examples.

For answers examining more than one extreme environment, only the highest-scoring environment should be credited.

Marks should be allocated according to the markbands.

Optional Theme D — Hazards and disasters – risk assessment and response

7. (a) Describe the atmospheric conditions in the eye and the eyewall of a typical hurricane. ***[2+2 marks]***

In the eye the air is shown to be descending/warming ***[1 mark]***. This results in calm weather and clear skies ***[1 mark]***.
In the eyewall the air is rising, rotating around the eye / cooling ***[1 mark]***. This results in strong winds and heavy rain ***[1 mark]***.

Accept other plausible answers such as references to the release of latent heat in the eyewall causing rapid uplift / atmospheric pressure variations.

(b) Explain the conditions needed for the occurrence of a hurricane hazard event. ***[6 marks]***

Valid conditions might include:

- warm ocean temperatures of 26/27^{o} C provide the energy for the hurricane due to high rates of evaporation that trap latent heat which is released when condensation occurs during uplift
- suitable distance from the equator – allows the Coriolis force to operate giving rotation to the storm
- a stable atmosphere with no wind shear – the lack of variable wind speed with altitude allows vertical development of the storm to occur
- allow other valid conditions such as warm water depth of 50 m
- concentrated/vulnerable population in areas where the hazard is likely to strike *e.g.* coastal areas / removal of mangrove *etc.*

Answers should consider at least two conditions in detail or more in less detail to gain full marks. There should be some acknowledgement of the human dimension of the hazard event for maximum marks.

(c) "Rich countries experience hazard events while poor countries experience disasters." Discuss this statement with reference to *one* named hazard type. ***[10 marks]***

Answers should distinguish between a hazard (a threat that may cause loss of life or damage to property and the environment) and a disaster (resulting from a major hazard event and causing significant disruption, losses to life, property and ecosystems that the affected community is unable to deal with adequately without outside help).

Answers depend upon the type of hazard chosen but should refer to only one hazard type. It is expected that answers will discuss the ways in which rich countries are able to introduce measures that mitigate the effects of a hazard event thus reducing its impacts while poor countries are less able to do this and remain more vulnerable to the impacts of hazard events. It is expected that examples of hazard events from rich countries and poor countries would be included to illustrate this. Good answers may suggest that rich countries are also vulnerable to disasters dependent on the intensity and location of the hazard event.

Answers that refer to multiple hazards should only be credited for the best of these. Answers that simply describe hazard events in poor countries and rich countries should not move above band D. To reach bands E and F a balanced discussion is expected.

Marks should be allocated according to the markbands.

8. (a) Describe the changes shown in the graph. ***[4 marks]***

Award ***[1 mark]*** for each valid statement supported by evidence from the graph including dates and costs. Possible answers include:

- a general upward trend in the cost of hazard events (*e.g.* no events costing over $25 billion before 1975, many events costing over $50 billion after 1988)
- but not a simple rise – there are fluctuations
- identification of major anomalies/cost events (Kobe, Indian Ocean tsunami)
- fall in 2000s compared with 1990s
- there may be other creditable points.

(b) Explain the reasons for these changes. ***[6 marks]***

Answers could refer to:

- people have more possessions and more valuable possessions over time
- the increasing value of property and infrastructure over time
- more people are living in hazard prone areas.

Award ***[1 mark]*** for each valid reason; some development of each reason is expected for ***[2 marks]***. Accept other valid reasons but they must include a clear explanation.

Answers that refer to an increase in the number or intensity of hazard events over time must give valid supporting evidence.

(c) Examine the different types of responses that occurred during *and* after a named disaster. (Do *not* refer to technological hazards in your answer.) ***[10 marks]***

The disaster must be dated and located. How the event resulted in a disaster should be explained. The answer should refer to specific short-term ("during" as well as possibly before or immediate aftermath), medium and long-term responses ("after") related to the actual hazard event.

Short-term responses might include: search and rescue, emergency medical assistance, provision of security, emergency shelter, food and water and the clearing of debris resulting from the hazard event. Medium-term responses might include: destruction of damaged buildings, restoration of services such as communications, health care, transport and retailing, the return of displaced persons and rehabilitation programmes. Long-term responses may include: reconstruction, planning for future hazard events in terms of emergency response systems, the introduction of measures to mitigate future impact on people and property, awareness education and hazard training, the development of warning systems and evacuation strategies where relevant.

There may be alternate approaches – such as an examination of the efforts made by different agencies (NGOs, governments, *etc.*) – and these should be credited. Answers that simply describe local responses to a hazard event, as opposed to a disaster requiring outside assistance should not move above band D. Answers that examine a range of responses may be credited at bands E and F. Responses that examine a disaster outside the scope of the syllabus (*e.g.* floods) should be marked on their merits.

Marks should be allocated according to the markbands.

Optional Theme E — Leisure, sport and tourism

9. (a) Describe the trends shown in the graph. ***[4 marks]***

- government expenditure has grown in all areas
- south Asia and Caribbean growth higher than world average, Europe lower
- suggesting a developed world/developing world divergence
- the period of divergence begins in mid-2000s
- growth flattened for south Asia around 2008–2009
- there may be other relevant observations.

Award ***[1 mark]*** for each valid statement up to a maximum of ***[4 marks]***. Quantification is desirable but not essential given the complex nature of indexed data.

(b) Using a located example, explain *two* strategies used to develop tourism in low-income countries. ***[6 marks]***

Strategies could include government and/or private initiatives. Examples could range from a local ecotourism initiative in a low-income country to a national-scale promotion. Responsible tourism that safeguards the interests of indigenous people may be another approach. There may be other approaches.

Possible strategies that may be explored include investing in marketing and branding, infrastructure (such as airports, roads, communications *etc*.), investment in education and training for local people (very important in low-income countries), conserving tourism resources for the future, providing subsidies and financial incentives for tourist developments, specific planning legislation to support tourist development.

Award up to ***[3 marks]*** for the explanation of each strategy, provided it is accompanied by a located example.

(c) For a country you have studied, to what extent do the economic benefits of tourism outweigh the environmental costs? ***[10 marks]***

Answers will vary depending upon the case study chosen, but could include economic advantages such as employment and investment (as well as benefits to overseas tourism operators through leakages, *etc.*). Increased employment in the hospitality sector provides income (albeit often poorly paid and seasonal – and a good answer may want to comment on the sometimes debatable nature of the economic benefits).

The other side of the debate should focus on the environmental costs (*e.g.* natural resource consumption), waste (energy and water), loss of habitats (*e.g.* coral reefs, mangroves, *etc.*) because of development / visitor pressures. May use carrying capacity concept linked to trampling, *etc.*

There may be other approaches. Answers are expected to compare the costs and benefits rather than simply stating them and should arrive at an evaluative conclusion at band E. Direct reference to a relevant case study is required to access markbands above band D.

Marks should be allocated according to the markbands.

10. (a) Outline *one* political and *one* economic factor that affect participation in sport. ***[2+2 marks]***

Political factors could include investment in sports facilities, public health and education investment, education policies, subsidies for sporting activities and governing bodies, legislation.

Economic factors could include availability of private sports facilities, level of public investment in sports facilities, quantity of personal disposable income, cost of sporting equipment. Any single factor may have different effects at different scales (local, national, international).

In each case, award ***[1 mark]*** for identifying a valid factor and ***[1 mark]*** for a brief outline of how it affects sports participation. For example, investment in public health and education can impact participation because it raises public awareness of the personal health benefits of involvement in sport, making it more likely for people to participate. Public education also makes people more likely to participate because they are frequently prompted to participate by the public information.

(b) Referring to a national sports league you have studied, explain the factors that have determined the home location of its teams. ***[6 marks]***

Answers will vary depending upon the sport chosen and its context but must examine a sports league of national importance. Factors are likely to include population density, socio-economic factors, cultural and historical factors, government and private investment, and proximity to competing teams. There are other valid responses that should be credited.

Award up to ***[3 marks]*** for each factor that is well explained. A wider range of factors can compensate for less depth. A generic answer, or one using an inappropriate example, should not be awarded more than ***[3 marks]***.

(c) To what extent can tourism ever be made sustainable? ***[10 marks]***

Answers may make use of contrasting examples, some successful, some not. Answers should show a sound understanding of the concept of sustainability (supporting local people while conserving resources for the future).

Answers are likely to make reference to the pressures resulting from tourism, efforts to minimize impact of the tourism activity, including transport, accommodation, tourist activities and resource use and waste disposal. These efforts should be evaluated rather than simply described as a success or failure in order to access the higher markbands.

Responses may evaluate the effectiveness of tourism in sustaining both societies and ecosystems in the long-term.

Marks should be allocated according to the markbands.

Optional Theme F — The geography of food and health

11. (a) Describe the difference between malnutrition and low calorie intake. ***[2 marks]***

Malnutrition means an inadequate/unbalanced supply of energy, vitamins or other food-based nutrients (malnutrition includes both under- and over-nutrition) ***[1 mark]***. Low calorie intake is a subset of malnutrition and is therefore a condition where people receive insufficient calories to maintain a healthy weight ***[1 mark]***.

(b) Describe the pattern of undernourishment shown on the map. ***[4 marks]***

The highest rate/prevalence of undernourishment (over 50 %) is in central Africa ***[1 mark]***, especially the DRC ***[1 mark]***. South/southeast Asia is generally lower than Africa but higher than Europe/Russia/Australia ***[1 mark]***.

Other important features that may be awarded ***[1 mark]*** include: low levels in north Africa and south Africa; lower levels in the Middle East; higher value (may describe as anomaly) in Mongolia/central Asia.

For the award of full marks some quantification is necessary.

N.B. country names are not essential for the award of the full ***[4 marks]***.

(c) Explain *two economic* causes of food deficiency. ***[2+2 marks]***

The economic causes of food deficiency include: price increases in staple food items (regardless of why or how they arise, whether from local changes or changes in other regions or countries); transition from food-based agriculture to non-food commercial or export agriculture; inadequate transport infrastructure for food (including food aid) to be supplied and/or distributed efficiently; failure to invest in irrigation projects meaning that the area is unable to cope in times of low rainfall or drought. Credit other valid causes.

Award ***[1 mark]*** for each valid cause, with a further ***[1 mark]*** for its development.

(d) With reference to any *one* vector-borne, water-borne or sexually transmitted disease, compare its geographic impacts at the local and international scales. ***[10 marks]***

The response will depend on the disease selected. The relative importance of local and international scales will differ depending on the disease selected.

Some diseases, such as river blindness, have a serious local impact (and some national impacts) but relatively few or no international impacts. Other diseases, such as SARS and A-H1N1 influenza have the potential to impact all scales. Knowledge of the biology/pathology of the chosen disease is not expected, except in so far as it determines specific impacts of geographic importance.

Responses accessing band D and above should refer to both scales, though the amount of depth for each scale need not be equal. Credit should only be awarded for a single disease. In the case of responses which consider more than one disease, the disease scoring most marks should be credited.

Responses reaching bands E/F are expected to show accurate knowledge of a disease, and to consider a range of impacts before concluding whether or not the impacts are similar at the two scales.

Marks should be allocated according to the markbands.

12. (a) Briefly describe what is meant by "obesity". ***[2 marks]***

BMI (Body Mass Index) over a certain number / a form of malnutrition ***[1 mark]***, usually resulting from energy (calorie) intake exceeding the amount required ***[1 mark]***.

(b) Suggest why heart disease is considered a "disease of affluence". ***[4 marks]***

Rates of heart disease are lower in poorer countries than in richer/wealthier/more developed countries ***[1 mark]***. Award ***[1 mark]*** for each factor that is explained. These may include dietary factors *e.g.* a high fat intake (especially high saturated fat), high levels of "bad" cholesterol, and obesity. Lifestyle factors include insufficient physical exercise, stress levels, preference for sedentary occupations, reliance on powered forms of movement such as motor vehicles rather than walking, and decision to spend discretionary income on particular kinds of food.

For ***[4 marks]*** both dietary factors and lifestyle factors should be addressed. A wide range of suggested factors may compensate for depth of explanation.

(c) With the aid of a diagram or diagrams, explain the spatial process of a disease spreading through "diffusion by relocation". ***[4 marks]***

Relocation diffusion involves the movement of individuals ***[1 mark]***, taking the disease with them to new locations ***[1 mark]*** where it continues to spread through contact with then more people (*e.g.* airline passengers) ***[1 mark]***. Credit other valid points, including an example of a disease such as SARS for ***[1 mark]***. Responses which do not include a diagram may not be awarded more than ***[3 marks]***.

(d) Examine the factors which have led to more food becoming available in some areas in recent years. ***[10 marks]***

Numerous factors can result in more food becoming available.

The first major group of factors is those related to the improved productivity and/or total production of food-related agriculture. These factors include: increased area under cultivation as a result of land clearance and/or irrigation; higher yields due to better technology (*e.g.* drip irrigation instead of flood irrigation), mechanization, improved varieties (including GM crops and livestock).

Distribution and storage is also important. More food may become available because less is lost or damaged in transit as a result of improvements in the distribution network (highways, rail, planes) or in the vehicles used (*e.g.* refrigeration). Improved packing methods may also be important. Subsidies to local farmers for food crops, and reductions in food exports may also raise the amount of food available locally. Equally, a rise in income may also increase the availability of food within some sectors of society.

Increased food imports also play a part, and this means that increased availability of food may depend on the success of harvests a long way away from their eventual destination.

While changes of climate may bear some responsibility for increased food availability in some areas, this will normally be restricted to those areas which were previously suffering from a prolonged condition such as an extreme drought.

It is expected that responses reaching markbands E/F will consider a variety of factors, and support their ideas with accurate examples.

Marks should be allocated according to the markbands.

Optional Theme G — Urban environments

13. (a) Identify the *two* major components of urban growth. ***[2 marks]***

Natural change ***[1 mark]*** and net migration ***[1 mark]***.

There may be alternative ways of expressing these two components/processes and these should be credited.

(b) Referring to the map, describe the relationship between the level of urbanization and urban growth rate. ***[3 marks]***

The level of urbanization and urban growth rate show a negative relationship (*i.e.* cities with high annual growth more likely to be found in countries at an early stage of urbanization or *vice-versa*) ***[1 mark]***.
This can be exemplified through mention of specific countries or regions (*e.g.* the majority of cities with negative growth are found in Europe and North America) ***[1 mark]***.
For a third mark, either name or describe an anomaly (*e.g.* China and Brazil are anomalies because they contain significant numbers of cities with high and negative growth) or provide some quantification (*e.g.* making use of the urbanization percentages) ***[1 mark]***.

(c) Explain the pull factors associated with counter-urbanization. ***[5 marks]***

Counter-urbanization should be defined as a centrifugal movement / urban-rural movement (there may be other ways of expressing this) ***[1 mark]***.

The remaining ***[4 marks]*** are available for identifying and explaining the pull factors such as perceived environmental/social quality, housing availability/costs, commuting potential, pursuit of specific employment opportunities, amongst others. Either two factors can be well-explained for full marks or a larger range in less detail.

(d) Discuss the challenges facing *one or more* cities experiencing rapid growth. ***[10 marks]***

Answers are expected to identify the negative consequences of high growth rates in urban areas (scale can vary from megacity to smaller cities). Expect references to problems with housing, utilities, services, employment, public health and communication infrastructure. These problems are in turn likely to have economic impacts, as well as environmental impacts.

At bands E and F expect more than a list of problems. The scale of the challenges may be commented on, or the nature of rapid growth making it hard for city authorities to manage the growth successfully (and there may be links with the concept of sustainability).

Marks should be allocated according to the markbands.

14. (a) Using map evidence, describe *two* characteristics of Area A which suggest it is a high-class residential area. ***[2+2 marks]***

Possible answers include open space/landscaping, size and density of housing/buildings, curved/well-planned streets, cul-de-sacs or no-through streets, university, public transport access, lack of negatives (*e.g.* industry). Candidates should be awarded ***[1 mark]*** for each identified characteristic and ***[1 mark]*** for further description, brief justification/reasoning.

(b) Using map evidence, suggest *three* reasons why Area B may be a suitable location for a manufacturing activity. ***[2+2+2 marks]***

The area has excellent transport links and a port area providing ease of access and import/export, proximity to coast/road/highway, proximity to residential areas for labour supply, open space / room for expansion, possibly lower cost land (perhaps reclaimed, flood risk, *etc.*). These may be possible brownfield sites that are suitable for development.

Candidates should be awarded ***[1 mark]*** for each identified reason and ***[1 mark]*** for a brief explanation, provided some mention is made of map evidence (grid reference, names, directions, distances *etc.*).

(c) With reference to *one* named example, evaluate the success of a strategy designed to manage pollution in an urban area. ***[10 marks]***

The type of pollution depends upon the case study chosen, but it should be a case study of **urban** pollution (as opposed to any pollution event). Strategies discussed may include water treatment and infrastructure, transport strategies, legislation, planning strategies *etc.*

The response should explicitly outline the strategy adopted to manage the pollution, with reference to specific names and locations.

Responses should provide a clear evaluation of the management strategy rather than simple description. Responses that are limited to description or do not make reference to a specific case study should not progress beyond band D.

Marks should be allocated according to the markbands.