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MARKSCHEME

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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)** **Identify possible human factors A and B and possible physical factors C and D.**   *[4]*

A and B could be urbanization, deforestation, overgrazing, relevant farming methods, bridges and blockages (no credit for flood defences). C and D could be soil type, steepness of slopes, drainage density, frozen ground, vegetation, saturated ground, tidal influences.
Award *[1 mark]* for each correct factor.

(b) **Explain how *two* physical factors other than precipitation can affect the magnitude of floods.**   *[3+3]*

Possible factors include: basin shape, drainage density, rock type, soils, relief, vegetation.

In each case award *[2 marks]* for explanation of how the factor operates / links made with hydrological processes and *[1 mark]* for link clearly established with flood *[1 mark]* magnitude. For example:
Basin shape: rounded basin shape has potential for high magnitude flash flooding *[1 mark]* due to arrival of high volume of water at the same time *[1 mark]*. Whereas elongated basin shapes encourages lower peak discharge over an extended period of time *[1 mark]*.

(c) **"River management strategies always result in unwanted impacts." Using examples, discuss this statement.**   *[10]*

A range of river management strategies is required, some of which can have unwanted impacts – channel straightening, artificial levées (also accept dams and reservoirs). These could be balanced with measures that do not have such large impacts, such as flood relief basins and channels, afforestation, wetland restoration, river restoration schemes, water quality measures. Example of a named basin should be included.

In addition to physical impacts, there are human (social, cultural, economic) impacts to consider, including land zoning issues, transport changes, gains and losses for different user groups (*eg* diversions, or forced migration from dam-building).

To access band D, examples must be used. However, the use of one named river basin and strategy which includes a range of impacts (*eg* Aswan High Dam) is unlikely to progress beyond the D/E border. At bands E and F, a range of impacts should be discussed and a conclusion arrived at.

Marks should be allocated according to the markbands.

2. **(a)** Describe *two* characteristics of natural levées. *[2+2]*

- Raised bank *[1 mark]* above the flood plain *[1 mark]*
- Parallel to river channel *[1 mark]* so "fossil" levées may show former river channel *[1 mark]*
- Composed of alluvium *[1 mark]* showing annual/periodic accumulation *[1 mark]*
- Sorting/grading of material *[1 mark]* coarse material forms the levée with fine material further from river *[1 mark]*
- Asymmetrical cross section *[1 mark]*, steeper facing the river channel *[1 mark]*.

(b) **(i)** Define the term *wetlands*. *[2]*

Areas that are regularly saturated *[1 mark]* for a variety of reasons, due to groundwater or surface water (including freshwater marshes, swamps and bogs) *[1 mark]*.

(ii) Explain *two* reasons why some wetlands are protected. *[2+2]*

- Source of freshwater
- Maintain water quality
- Biodiversity source (niches)
- Natural flood defence
- Tourist resource / recreation
- Food / aquaculture
- Expect other suggestions.

In each case, award *[1 mark]* for identifying the reason for protection and *[1 mark]* for further development or exemplification.

(c) "Multi-purpose schemes result in more benefits than problems." Discuss this statement, referring to both physical *and* human impacts. *[10]*

Multi-purpose scheme (MPS) should be named and located. Dams and reservoirs likely to be included, built for a range of purposes *eg* water supply, electricity, irrigation. MPSs may also incorporate navigation, recreation, climate regulation or may have other purposes. However, solutions may not always have been fully realized in practice *ie* problems only partially solved.

Physical and human problems often associated with MPSs include: forced migration, loss of farmland and historic features/settlements, transport interruption, biodiversity loss, increased siltation, changing river load downstream (and water temperature change with ecosystem impacts), increased evaporation, seismic activity.

To access band D, some benefits and/or problems associated with a MPS should be described. For bands E and F, discussion is provided or a conclusion arrived at.

Marks should be allocated according to the markbands.

Optional Theme B — Oceans and their coastal margins

3.   (a)   **Describe the size and location of the oceanic "garbage patch" shown.**   *[2+2]*

The garbage patch is approximately 5000 to 6000 km long (west to east) *[1 mark]* and 500 to 600 km wide (north to south) *[1 mark]*.

Likely responses include the middle of the Pacific Ocean *[1 mark]*, towards the sub-tropics/tropics *[1 mark]*, inside a major ocean current cell/gyre/loop *[1 mark]* (such as the North Pacific current, the North Equatorial Current and the Kuroshio current), latitude 30°N, longitude 140°W to 160°E *[1 mark]*.

Award *[1 mark]* for each valid point and a further *[1 mark]* for additional detail.

(b)   **Explain why most types of ocean pollution occur along coastal margins.**   *[6]*

Most oceanic pollution occurs relatively close to its source. Award *[2 marks]* for indentifying different types of oceanic pollution (solids, solutes, radioactive materials, oil and chemical wastes). Likely coastal sources of pollution include land-based sewer systems, river systems, ports, a range of local industry including nuclear *[2 marks]*. Award the remaining *[2 marks]* for explanation of oil tankers, sea-trading vessels and fishing vessels producing pollution that is moved onshore by ocean currents and/or wind systems; or noting that ocean currents can move pollution towards coastal margins of sparsely populated areas *eg* Alaskan wilderness.

(c)   **Compare the conflicts that arise in coastal areas from habitat restoration schemes with those that arise from aquaculture.**   *[10]*

Conflicts associated with managing habitat restoration include conflicts between local residents, industrialists, environmentalists. Attempts to manage restoration could include introducing clean-up programmes, limits to visitor access and species reintroduction, *etc*. The source of the conflicts may include costs, funding, employment, local involvement, *etc*.

For aquaculture, conflicts might develop as a result of the introduction of exotic species, the transmission of disease, the release of chemicals into the water. There may be conflict between the aquaculture industry and local fishermen, environmentalists, water safety personnel, for example.

To access band D, both sets of conflicts must be described (balance is not necessary). At bands E and F, there should be some explicit comparison (*eg* severity, similar or different causes, or stakeholders).

Marks should be allocated according to the markbands.

4. **(a)** **Describe the pattern of ocean salinity shown on the map.** *[4]*

Highest salinity levels are found towards the tropics *[1 mark]* with higher levels in the Atlantic than the Pacific *[1 mark]*. Salinity levels generally decrease towards polar areas *[1 mark]*. Award *[1 mark]* for accurate quantification.

(b) **(i)** **Explain what is meant by the La Niña phenomenon.** *[2]*

La Niña refers to an intensification of "normal" ocean temperature conditions *[1 mark]*, bringing colder temperatures in the eastern Pacific and warmer in the west *[1 mark]*. Alternatively, there is high pressure in the eastern Pacific, low pressure in the western Pacific *[1 mark]*, a high altitude flow from west to east, and a surface flow from east to west *[1 mark]*.

(ii) **Using examples, analyse** *two* **economic impacts associated with La Niña.** *[2+2]*

- Loss of crops due to droughts and floods
- Cost of re-building damaged infrastructure (Australia, Brisbane floods, 2011)
- Costs of securing safe water supplies
- Benefits of increased fish stocks (Peru).

Award *[1 mark]* for an outlined impact and *[1 mark]* for use of examples.

(c) **Examine the role of oceans as a store and source of carbon dioxide.** *[10]*

The oceans account for an important share of the world's carbon dioxide (fossil fuels $10\,000 \times 10^{12}$ kg, atmosphere 750×10^{12} kg, and oceans $38\,000 \times 10^{12}$ kg). They also play an important role in the carbon cycle. Photosynthesis by phytoplankton forms organic compounds of carbon dioxide. Some of this passes through the food chain and sinks to the ocean floor where it accumulates in sediment. Eventually it is destroyed at subduction zones and later released during volcanic activity. It is a very long time-scale. Oceans also absorb and then store in solution carbon dioxide derived from the air.

Candidates may look at spatial variations in oceans as a source (more in warmer, nutrient rich water) and stores.

To access band D candidates must explain both store and source (balance not necessary). At bands E and F, a structured examination of both store and source begins to address the role/importance of the oceans.

Marks should be allocated according to the markbands.

Optional Theme C – Extreme environments

5. **(a)** **(i)** **Identify the vegetation types found at A and B.** *[2]*

A (Dega-Adi 9852) – Scrub.
B (Goro Faki 9646) – Scattered trees.

(ii) **Using the map extract and key, suggest *two* reasons why the area shown could be considered an extreme environment.** *[2+2]*

Likely reasons include the lava flows, the lack of settlement could be used as a surrogate for extreme conditions, seasonal rivers, disappearing streams, scattered trees, waterholes. Many of these suggest a seasonally wet-dry climate. Award *[1 mark]* for each valid reason and an additional *[1 mark]* for the development of a factor in a way that is clearly linked with the inaccessible/inhospitable nature of extreme environments.

(b) **Briefly explain *two* weathering processes likely to operate in area C on the map.** *[2+2]*

Possibilities include exfoliation, granular and block disintegration, freeze-thaw, salt crystal growth, carbonation, oxidation, hydrolysis. Do not credit erosion processes such as sand abrasion. Award *[1 mark]* for each process identified and a further *[1 mark]* for the brief explanation offered.

(c) **For *one named* type of extreme environment, examine the impacts of tourism on the natural environment.** *[10]*

The impacts on the natural environment include mass movement, erosion, land degradation, hazards, aesthetic changes, water shortages (and salinization), waste, introduction of exotic species, habitat removal. These can be positive/negative, short-term/long-term, intentional or unintentional.

Responses which deal with the human environment only cannot achieve above band C. To access band D, a named and located extreme environment should be addressed and candidates must examine the environmental impacts of tourism.

To access bands E and F, a variety of impacts should be examined.

Marks should be allocated according to the markbands.

6.   **(a)**   **(i)**   **Identify *one* type of cold extreme environment.**   *[1]*

- Polar/glacial (equally acceptable)
- Periglacial/tundra
- Alpine/high mountains.

Do not accept regions, such as Arctic.

(ii)   **State *three* physical characteristics of the cold extreme environment that you identified in (a)(i).**   *[3]*

Exact answer will depend on the cold environment chosen. Credit three valid statements that can be linked to the example chosen in (a)(i).

Polar/glacial – year-round/permanent snow/ice / cold all year *[1 mark]*, extreme seasonality *[1 mark]*, high latitudes above 65–70°N and some parts of the southern hemisphere *[1 mark]*, limited biological activity but does have ecosystem *eg* polar bears *[1 mark]*.

Periglacial/tundra – seasonal ground ice cover / fluctuating temperatures *[1 mark]*, underlain by sporadic/discontinuous permafrost *[1 mark]*, tundra biome *eg* low-lying perennials *[1 mark]*, found on edges of polar/glacial areas/latitude 60–70°N *[1 mark]*.

Alpine/high mountains in non-tropical latitudes – year-round/permanent snow/ice / cold all year due to altitude/snow line *[1 mark]*, extreme diurnal temperature variations *[1 mark]*, limited biological activity *eg* limit of tree-line but does have ecosystem *eg* alpine meadows *[1 mark]*.

(b)   **Explain why semi-arid areas are considered to be extreme environments.**   *[6]*

Semi-arid environments are areas with 250–500 mm rain per year *[1 mark]* and suffer seasonal water shortages *[1 mark]*.   Average temperatures are high (25°C upwards) for most of year *[1 mark]*.

The remaining *[3 marks]* should be allocated either for an in-depth explanation of these physical factors or for showing how they create challenges for resource development and human habitation. For instance, this creates difficulty maintaining sedentary agriculture as insufficient water supply without irrigation – and even then high evapotranspiration rates reduce effective water availability. Salinization is a common problem where over-abstraction has taken place. Credit explanation that incorporates other factors such as remoteness, inaccessibility, relief.

(c) **"Global climate change will prevent people from living in extreme environments." Discuss this statement with reference to *one or more* extreme environments.** *[10]*

Responses could deal with indigenous populations, settlements and/or economic activity in extreme environments (responses that do not deal with extreme environments should not progress beyond band C). Responses may argue that climate change will/will not have a major/minor impact on extreme environments. Some may argue that the impacts will vary from extreme environment to extreme environment. Some will examine the varying ability of different populations to adapt to change through technology.

To access band D, some impacts on people in extreme environments should be described.

To access bands E and F, responses must discuss both sides of the argument and draw conclusions.

Marks should be allocated according to the markbands.

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

7. (a) **Describe the pattern of high population exposure to tectonic hazards shown on the map.** *[4]*

- Areas of high exposure are linear
- They lie along some plate boundaries
- These include the Himalaya region, the Philippines, Japan and Indonesia
- NE China has non-linear/scattered areas of high exposure
- Some anomalous high areas *eg* some islands
- High exposure coincides with high population density areas.

Four valid statements are needed for *[4 marks]*. Up to *[1 mark]* for a list of place names.

(b) **Suggest *three* reasons why communities often underestimate the probability of a tectonic hazard event occurring in their locality.** *[2+2+2]*

Valid reasons could include lack of information and awareness of the hazard, poor education and ignorance of the risk resulting in lack of preparedness, poor information systems such as TV and radio, a long period since the last hazard occurrence, level of economic development, hazards as acts of God or fate, threat of the hazard compared with other concerns such as jobs, security, money, food availability, politics, civil unrest.

Award *[1 mark]* per reason identified and *[1 mark]* for some further detail of why this leads to underestimation of probability.

(c) **Examine the ways in which vulnerability to *either* earthquake *or* volcanic hazards can be reduced.** *[10]*

Vulnerability refers to the susceptibility of a community to a hazard or the impact of a hazard event. It is a function of demographic and socio-economic factors and of a community's preparedness/ability to deal with a hazard event when it happens.

Answer depends on the hazard chosen – a range of ideas can be covered, including larger-scale community/national government strategies, including relocation, as well as personal/individual actions (such as insurance). These include prediction and warning methods, hazard resistant engineering, preparedness, land use planning, modifying the event.

At band D, at least two ways should be described in some depth. At bands E and F, a clear understanding of vulnerability should be displayed (*eg* contrasting/varied ways are examined to highlight both property and social vulnerability).

Marks should be allocated according to the markbands.

8. **(a)** **(i)** **Identify a scale used to measure the magnitude of one hazard type.** *[1]*

Suitable magnitude scales would be the VEI or Richter.
Also accept intensity scales such as Mercalli or Saffir-Simpson scale.

(ii) **Describe the main features of the scale you identified in (a)(i).** *[3]*

- Statement of what is being measured (*eg* earthquake magnitude)
- May identify upper limit where one exists
- May identify critical boundaries (*eg* severe hurricane is 3+ on SS scale)
- Some idea of the differences between levels of the scale
- Provides example(s).

Three valid descriptive statements are needed for *[3 marks]*.

(b) **Explain the occurrence of hurricanes (tropical cyclones, typhoons) in a *named* area.** *[6]*

Answers should name and locate a specific area *[1 mark]* and explain the reasons for the occurrence of the hurricane in that particular area *[5 marks]*. The approach depends on the area chosen (could be a single town or wider region *eg* Caribbean). The formation of hurricanes (and thus their initial occurrence) is linked with a range of factors including water temperature and depth of warm water. Alternatively, their occurrence in coastal/inland areas can be explained with reference to hurricane development and tracks. Credit answers that claim increasing intensity/magnitude due to global warming.

(c) **"The economic impact of disasters is increasing while related deaths are decreasing." Discuss this statement, with reference to examples of disasters.** *[10]*

A disaster is a major hazard event that causes widespread disruption to a community or region so that the affected community is unable to deal with adequately without outside help.

Answers should examine reasons for the increasing economic cost of disasters and the differences between rich and poor countries. However, the relative financial cost may be greater in poor countries. There may also be indirect losses such as from a decline in tourism and individual losses may be greater where there is no insurance cover.

The general trend has been for fewer deaths in disasters (reasons should be given) – but there are notable exceptions such as the Indian Ocean and Japanese tsunamis. The fact that more people are living in vulnerable areas could also be considered. Answers that describe hazard events that are not disasters (*ie* do not require outside assistance) should not move above band D.

For band D, examples must be used and impacts described. For bands E and F, some discussion of the statement should be offered (*eg* may see it as a generalization and dependent on a country's level of development, or recognizes some types of disaster *eg* mega-disasters/tsunamis can still bring many deaths).

Marks should be allocated according to the markbands.

Optional Theme E – Leisure, sport and tourism

9. **(a)** **State the change in GNI:**

    (i) **during the year of the Olympic Games;** *[1]*

    +0.4 %. (accept +0.35 % to +0.45 %)

    (ii) **one year after the Olympic Games.** *[1]*

    –0.7 %. (accept –0.65 % to –0.75 %)

(b) **Describe what is meant by the** *sphere of influence* **of a sporting event.** *[2]*

The area (do not accept distance) from which a sporting event draws *[1 mark]* its competitors and/or supporters *[1 mark]*.

(c) **Suggest reasons why a country's GNI increases before and during the Olympic Games.** *[6]*

The answer can offer reasons for the specific changes shown in the graph, or may offer a general explanation (or one based on a case study). Any of these approaches is acceptable. For full marks both "before" and "during" must be addressed, but balance is not important.

Award up to *[4 marks]* for reasons why GNI is boosted before the Games. Reasons for growth could include investment (public and private), economic optimism, infrastructure development and its multiplier effect, sponsorship, development of specific sporting facilities *etc.* Credit any attempt made to distinguish between the higher and lower phases of growth shown in the graph (but do not expect this).

Award up to *[4 marks]* for each developed reason why GNI is boosted during the Games. Reasons for growth include tourism, retail sales, newspaper and media sales, food sales, transport receipts, *etc.*

In each case, award only *[1 mark]* for a list of benefits with no development, exemplification or use of data.

(d)	**Examine the changes in the international tourism industry that have led to the development of more remote tourism locations.**	*[10]*

Responses are expected to acknowledge the overall global increase in tourist numbers and the associated increase in revenues. This increase in the overall industry has increased the saturation of existing locations and led to new, more remote locations being developed. Reference to models of tourism may be relevant here. Ecotourism, adventure tourism, high value luxury tourism and back-packing are types of tourism that may occur in remote locations. In addition, an increase in transport infrastructure and reduced flight costs has made new locations more financially viable. Global warming may be opening up some remote locations to tourism, such as Greenland and Svalbard. A recognition amongst governments of the development potential provided by tourism has increased investment thus increasing access. Increasing standards of living in emerging economies is leading to an increase in the volume of global tourists in recognized markets. This is compounded by mass media and marketing.

While examples are not a specific requirement of the question, those answers that provide supporting examples are likely to access the higher markbands. At band D, at least two changes are described and linked to perceived remote locations. To access bands E and F a variety of changes are examined (*eg* may examine the most important change, or categorise the changes).

Marks should be allocated according to the markbands.

10. **(a)** **(i)** **Define the term** *carrying capacity*.   *[1]*

Maximum number of visitors/participants that a site can satisfy at one time.

(ii) **State whether location A or B has the higher perceptual carrying capacity and justify your answer.**   *[1+2]*

Location B *[1 mark]* because more people are prepared to tolerate more people *[1 mark]*. Award *[1 mark]* for some attempt at quantification or for a definition of perceptual carrying capacity as maximum number before a specific group of visitors considers the level of impact to be excessive.

(b) **Explain** *three* **factors that affect the distribution of sports facilities in urban areas.**   *[2+2+2]*

There are many factors that affect the distribution of sports facilities. Sports facilities might include large stadiums as well as parks, swimming pools, gyms, running tracks, and golf courses as well as other sports courts and fields.

Factors include accessibility, land values and the physical and socio-economic characteristics of urban zones. Accessibility – better accessibility makes it more available to larger numbers. Land availability and price – more land and cheaper land is generally available in suburban or edge of town locations (rural urban fringe). Competing land uses, such as commercial or residential developments, may affect choice of site. Rowing clubs and golf courses, for example, are closely linked to physical landscape. Socio-economic characteristics of the population of different urban zones may create a demand for different types of sports clubs, fitness centres *etc*.

Each valid suggestion should be awarded *[1 mark]* with up to a further *[1 mark]* awarded for development.

(c) **Examine the effectiveness of using sport and recreation to promote urban regeneration.**   *[10]*

Candidates are expected to identify the characteristics of effective urban regeneration. Arguments in support of sport and recreation include community cohesiveness, investment in associated infrastructure, community health benefits, creation of tourist destination, creation of jobs and reduction in crime.

Alternative arguments include lack of long-term production jobs, lack of inclusion of entire community (*eg* elderly), possible changes in popularity of sport, and fluctuations in success of sports teams.

At band D, at least two effects should be described. For bands E and F there should be some evaluation of the effectiveness (*eg* arrives at a judgement, or examines from different perspectives).

Marks should be allocated according to the markbands.

Optional Theme F — The geography of food and health

11. **(a)** **(i)** **Describe what is meant by** *fair trade***.** *[2]*

Credit any two of the following: trade that gives a higher/guaranteed minimum price/bigger profit for farmers *[1 mark]*, improved working conditions *[1 mark]*, sustainable methods of production *[1 mark]*, lack of any "middle man" *[1 mark]*.

(ii) **Referring to the diagram, identify** *two* **features of this system that make it an example of fair trade.** *[2]*

- Lack of middle-men / simplified production chain
- Certification by outside agency
- Purchasers in India are a local firm with vested interests.

Award *[1 mark]* for any of these.

(b) **Explain how fair trade can help to alleviate local food shortages in regions where food crops are grown.** *[6]*

More income returns to farmers and stays within the country (with an economic multiplier effect); greater possibility of farmers growing food crops, rather than industrial crops; raises likelihood of receiving emergency food aid in times of need from consumers. At least two distinct ideas must be developed for the award of full *[6 marks]* or more ideas in less detail.

(c)   **"Food miles are an excellent indicator of agriculture's environmental impact."**
      Discuss this statement, referring to examples.   *[10]*

Food miles are a measure of the distance that food travels from its source to the
consumer. This can be stated either in units of actual distance or of energy consumed
during transport.

The advantages of food miles are that they give an indication of the carbon footprint
from farm-gate to retail location and allow consumers to know the origin of the food
they are buying.   They also provide information about the likely type of
transportation used and the relative costs of different forms of transport.

The disadvantages of using food miles as an indicator of environmental impact are
that they do not take account of the carbon footprint of food production methods or
the energy/water requirements used in different farming systems. Locally produced
foods may have low food miles but a very high energy footprint (*eg* growing out-of-
season crops in glasshouses). Delivery of farm produce to retailers and consumers
may not necessarily take the shortest route available.

Food miles give no indication of the use of organic methods. The food miles concept
ignores other environmental aspects *eg* sustainability, indices of water usage, energy
efficiency, the use of chemical fertilizers, pesticides, herbicides, and their effect on
local ecosystems.

Conclusion – food miles are useful but far from perfect as an indicator of
environmental impact.

To achieve band D the answer must describe environmental impacts. To reach bands
E and F the answer must look at the advantages and disadvantages of food miles
(in respect to the range of environmental impacts). The argument need not be
balanced.

Marks should be allocated according to the markbands.

12. **(a)** **(i)** **Briefly describe what is meant by "diseases of affluence".** *[2]*

Rich societies suffer *[1 mark]* (from health conditions not commonly found in poor societies). They include the degenerative diseases associated with different lifestyles and/or increased overall life expectancy *[1 mark]*.

(ii) **State** *two* **examples of diseases of affluence.** *[2]*

Coronary heart disease; cancer; asthma; type 2 diabetes; peripheral vascular disease; obesity; hypertension; some allergies. Some sources also include clinical depression and other mental health conditions. (Do not credit diseases of poverty: malaria, tuberculosis, measles, pneumonia, and diarrheal diseases. Do not credit AIDS.)

(b) **Explain why health-adjusted life expectancy (HALE) is a better way to quantify the health of a community than infant mortality.** *[6]*

Infant mortality reflects health of mothers, nutrition, health care education and services. Many countries have reduced infant mortality with relatively small investments in health care services. Infant mortality is a "snap-shot", reflecting a limited time period.

The HALE includes many more health-related issues, and all age-groups. It also reflects a longer time period, including infant mortality, but also including mortality of other age-groups, and more importantly, ill-health throughout the population. Award up to *[3 marks]* for the explanation of how each measure is used to quantify health. For full marks, HALE must be clearly shown to be the better measure.

(c) **To what extent have the management strategies for** *one named* **disease been successful? Refer to** *one* **country or region in your answer.** *[10]*

The country or region must be clearly named and located. The disease should be identified. More than one management strategy should be examined. Strategies could involve prevention, treatment (palliative or curative), control/containment, public health measures. Each strategy should be clearly outlined in terms of its aims and methods, and the degree of success or failure should be evaluated.

To achieve band D the answer must describe relevant strategies to combat a named disease in a specific location.

To access bands E and F there should be some consideration of the merits of the strategies and a conclusion presented.

Marks should be allocated according to the markbands.

Optional Theme G — Urban environments

13. (a) (i) Define the term *urban ecological footprint*.   *[2]*

The (theoretical) measurement of the land and water an urban area requires to produce the resources it consumes *[1 mark]* and to absorb its waste under prevailing technology *[1 mark]*.

(ii) Referring to the diagram, state which city has the larger urban ecological footprint and justify your choice.   *[1+3]*

City B has a larger footprint *[1 mark]*.
Although there is a similar value for CO_2 from buildings, City B is lower only in air pollution *[1 mark]*. For all remaining values B has a higher reading *[1 mark]*. Award *[1 mark]* for valid quantification, or for any other valid reason.

(b) Explain *two* ways in which urban air pollution can be reduced.   *[2+2]*

There are many options including increased use of public transport; vehicle restrictions; congestion charging; car sharing/pooling; speed limit reductions; "park and ride" systems; introduction of filters in industrial chimneys; decreased use of coal and increased use of natural gas in industry and residential use; vehicle emission restrictions; use of electric vehicles; relocation or closure of polluting industries and power stations; government legislation; non-polluting public transport; alternative forms of energy.

For each way, award *[1 mark]* for the method and *[1 mark]* for the development.

(c) Referring to examples, compare the patterns of formal and informal economic activities in urban areas.   *[10]*

Answers should distinguish between formal and informal activities.   (Formal activities, whether in primary, secondary or tertiary sectors, have a salary, are registered and employees may pay tax and national insurance; informal activities are unregulated, unofficial, untaxed activities.)

Both exist in all cities to varying degrees and any one individual may be involved in both.

Formal activities tend to be geographically concentrated in a number of locations including areas such as the CBD, ports, major transport arteries, retail parks, strip malls, industrial zones, and, increasingly, edge of town developments.   Some activities, such as education, may be linked to residential areas. Some knowledge of the relevant location of these should be evident.

In contrast, informal activities are usually less geographically concentrated than formal activities, and more mobile, and are also found in a variety of locations. They are especially common in shanty towns, inner city areas and low income areas *eg* selling food from kiosks, and in the CBD (street vendors, shoe shining) but also in higher income residential areas as cooks, gardeners, nannies, security personnel.

Some people live and work on refuse dumps, collecting and/or recycling discarded materials.

A variety of approaches is possible. Responses may refer to the pattern of activities in one or more cities or compare their relative patterns in cities in MEDCs and LEDCs.

Responses that do not refer to specific examples of cities **or** activities should be limited to band D.

For band D, aspects of both patterns should be described for a named place (*eg* key locations identified).

To access bands E and F, both patterns should be developed, with good comparisons made at band F.

Marks should be allocated according to the markbands.

14. **(a)** **(i)** **Define the term** *megacity*.   *[1]*

A city with a population of more than 10 million people *[1 mark]*.

(ii) **Explain** *two* **processes responsible for population growth in megacities.**   *[2+2]*

Award *[1 mark]* for each of two valid processes such as natural increase, in-migration, and boundary redefinition (urban sprawl) and *[1 mark]* for the explanation of the process. Natural increase occurs when crude birth rates exceed crude death rates where a youthful population structure exists. In-migration can be from rural or urban areas, or from other countries. Boundary redefinition may cause the megacity to expand and engulf surrounding settlements.

(b) **Using** *only* **an annotated diagram, explain the operation of a sustainable urban system.**   *[5]*

Sustainable urban systems have a circular system where inputs (energy, water, people, materials, products, food) are reduced and outputs (solid, atmospheric and liquid waste) are recycled.

Explanations without a diagram can achieve a maximum of *[2 marks]*.

Explanations that separate the diagram from the text can achieve a maximum of *[3 marks]*.

(c) **Examine the effects of human activity on the climate of urban areas.**   *[10]*

The examination could compare different types of urban area or address a range of climatic effects.

The effects of human activity include the creation of an urban heat island, reduced visibility, air quality such as increased incidence of smog, increased thunder storm activity and rainfall, reduced likelihood of snow and frost, increased gustiness, reduced average wind speed, changes to humidity.

Urban heat islands are formed under high pressure conditions, especially in winter and are most clearly evident at the end of night. Sources of heating include energy generation, industry, transport, buildings, appliances and people. Because of higher temperatures, relative humidity will be lower.

Reduced visibility and air quality are caused by an increase in atmospheric pollutants in urban areas (dust, aerosols, and NO_x and SO_2, O_3, particulate matter). This leads to a greater incidence of fog and smog (polluted fog).

Thunderstorms are most likely due to the additional heat found in urban areas, resulting in more convectional activity. For the same reason, snow and frost are less likely in urban areas.

Rainfall is sometimes higher because there are more hygroscopic nuclei. However, the extra heat means that the air can hold more moisture before dew point is reached and condensation occurs.

Winds may be channelled along "canyons" causing an increase in "gusty" conditions. Buildings create more turbulence. Overall wind speeds are likely to be reduced due to the increased friction with buildings in urban area compared with open spaces in rural locations.

To achieve band D a link should be made between human activity and the climate of urban areas. At least two effects should be explained.

Bands E and F require a structured examination of either a range of climatic effects or different urban environments.

Marks should be allocated according to the markbands.