

Mark scheme: Paper 2 – Optional themes

Option A: Freshwater – issues and conflicts

- 1 a** Describe the pattern of stream velocity shown in the cross profiles A and B. [4 marks]

In A, the highest velocity is in the centre of the channel, [1] just below the water surface [1].

In B, an asymmetrical channel [1], the thalweg has shifted to the deepest section of the channel [1].

- b** Suggest three natural causes of reduced river velocity. [6 marks]

Velocity would drop with

- a reduction in gradient
- an increase in friction, channel roughness
- extra load
- a decrease in discharge on meeting the sea or a lake.

- c** Explain how human occupation of floodplains increases the risk of flooding. [10 marks]

Urban development is likely to have the following hydrological effects:

- Bridges and embankments can restrict channel width and decrease the channel capacity.
- Vegetation clearance reduces evapotranspiration and infiltration.
- Impermeable surfaces reduce infiltration and increase the speed of runoff.
- Artificial drainage systems increase the speed of runoff and reduce lag time.

Most of these modifications should be fully explained with reference to at least one named example.

- 2 a** Describe the response to the storm event of basins A and B shown on the hydrograph. [4 marks]

Basin A is compact [1] with a short lag time [1].

Basin B is elongated [1] with a longer lag time [1].

There may be other valid points.

- b** Suggest a reason for the differences in the response of these two basins. [3 marks]

Basin shape – A is compact which means the tributaries deliver water to the gauging station on the river simultaneously, hence the sudden rise in discharge. Whereas, Basin B is elongated which means that the tributaries close to the gauging station deliver their water first, followed by the more distant streams leading to greater lag time.

- c** Briefly explain the value of hydrographs. [3 marks]

Hydrographs are used for monitoring [1] spatial variation and temporal trends in river discharge [1]. They are predictive tools which can warn of impending flood risk [1].

- d** Examine the reasons for conserving wetlands. [10 marks]

Wetland conservation focuses on waterways, standing water, and the land around them, usually including swamps, marshes, bogs, and similar areas. Wetlands have become a key issue for conservation due to their biological production, ability to filter and store water, mitigate flood damages, importance in providing habitat and food for waterfowl, as well as the many other species they host. From economic importance, to aesthetics, the reasons for protecting wetlands have become quite numerous over the past several decades.

A good answer accessing markbands E/F will define and locate wetlands, cover their ecological characteristics, and give at least four of reasons given above.

Option B: Oceans and their coastal margins

- 3 a** Describe two physical processes involved in the formation of this cliff-face. [4 marks]

Relevant processes would be erosion (attrition, abrasion, hydraulic action, undercutting) and sub-aerial processes (weathering and rock-fall). For full marks, the two processes should be specific.

- b** Explain why land use conflicts occur in coastal zones. [6 marks]

Coasts are zones of intense activity and attraction. They are rich in natural resources with natural, economic and amenity value such as landscape, climate, minerals, open space, and ecological interest. They attract developers, industrialists, recreationalists, conservationists and retirees. These groups compatibility may be limited, and conflict is a possibility.

Coastlines are a physical and economic interface where freight is handled and processed, generating industrial effluent, noise and traffic, but also jobs for local people. Heavy industry and tourism are seldom compatible. Where coastlines are vulnerable to attack from physical forces, controversy may arise over the costs and benefits of protection and competing priorities for local expenditure. At least four types of conflict should be mentioned for full marks.

- c** Referring to at least one example, examine the reasons why successful coastal management is difficult to achieve. [10 marks]

Successful coastal management should be enduring, aesthetically pleasing, avoid the disruption of marine and ecological processes and features, and be cost-effective. The reasons for limited success might include the following:

- Inaccessibility of the coastal zone.
- The large scale of the projects and the persistence of natural factors and processes causing the problems.

- Cost and other national or regional priorities may reduce funding for a management scheme.
- Conflicting local interests such as ecologists versus engineers.

For bands E-F there should be at least three well-developed reasons with reference to at least one example.

- 4 a** Describe the pattern of sea surface temperature anomalies (departures from the normal temperature) shown on the map between 120° E and 60° W and 30° N and 30°S. [4 marks]

Temperatures are up to 1.5°C higher than normal [1] at the eastern end of the Pacific close to the Equator [1], with cooler areas around -1° below normal [1] around 30° North and South [1] and towards the west.

- b** With the aid of a diagram, explain the physical features and processes associated with an El Nino event in the Equatorial Pacific. [6 marks]

The most likely diagram would show disruption of the Walker circulation for the Pacific for an El Nino year. The essential features are the weakening of the trade winds [1] and reversal of the equatorial current causing warm water to pool towards the east [1] with the following results:

The West Pacific becomes cooler [1] and high pressure and drought occur in Australasia [1].

The East Pacific becomes warmer and normal upwelling of cool water is suppressed [1]. Low pressure and rain result [1].

- c** Examine the socio-economic effects of an El Nino event. [10 marks]

The best answers will refer to the outcomes of specific dated events such as that of 1997–8.

The effects extended well beyond the Central Pacific and included:

- Fires in South East Asia and drought in Australia,
- Warmer waters off Peru caused the sardines to migrate and led to the collapse of the industry.
- Infrastructural damage, disruption of water supply and sewerage resulting from heavy rain along the coast of South America. Outbreaks of infectious diseases such as cholera, induced by warmer and wetter conditions in Ecuador.
- Mangoes, bananas rice and sugar cane production reduced in Central America and Caribbean due to excess clouding and poor ripening conditions.
- Drought in China and Australia caused failure of the grain harvest.

A good answer may cover a few effects in depth or adopt a broader approach. Positive outcomes might also be recognised but are not essential.

Option C: Extreme environments

- 5 a** Complete the flow chart by naming the causes of aridity labelled A-D. [4 marks]

A – High pressure zone
 B – Rain shadow
 C – Continentality
 D – Cold ocean current

- b** Outline the human factors responsible for the process of desertification. [6 marks]

Desertification occurs on the edge of tropical or temperate deserts, but is most acute in the semi-arid zones of Africa especially in the Sahel. It is caused by a combination of physical and human factors, the most important being drought and overpopulation. These both give rise to a range of secondary factors and together they cause the expansion of the deserts as their perimeters are gradually degraded by human pressure.

Overpopulation implies an imbalance between population and resources, especially food. Population pressure causes exploitation of marginal land with low carrying capacity and over-stocking of animals such as cattle and goats which destroy the already sparse vegetation that is typical of these areas. Vegetation destruction by the increasing use of fuelwood exacerbates the problem and results in soil degradation and the likelihood of no recovery. The threat of desertification is likely with increasing drought associated with future climate change.

- c** Referring to examples from extreme environments, discuss the extent to which lack of warmth is less of a hindrance to living than lack of water. [10 marks]

Both moisture and warmth are essential to all biological processes and where one or both are deficient, successful human existence is restricted.

Water is required in increasing quantities for:

- Sanitation and hygiene
- Food preparation
- Drinking water
- Farming
- Manufacturing
- Recreation
- Transport

With the exception of manufacturing, recreation and transport, all these are essential requirements are vital to human existence. If water supply is inadequate it can be supplemented by desalinisation or inter-basin transfer, but on a large scale this is impractical and very costly.

Lack of warmth, however, presents fewer problems because it can be overcome with heating. Nevertheless the expense incurred is significant.

The answer may agree or disagree with the question, but supporting evidence must be cited from at least two extreme environments.

- 6 a** Identify and locate from the map two physical features resulting from glacial activity and justify your answer. [4 marks]

At the south-west end of the Flaaajokull glacier there are mounds in the landscape suggestive of terminal moraine or other depositional features. The outwash plain to the south-west of it is likely to have been built up from glacial debris and volcanic ash. There are several erosional features including the many u-shaped valleys such as Hoffellsdalur, arêtes and pyramidal peaks. All features should be clearly located using grid or other references.

- b** Explain the effects of permafrost upon human activity in cold environments. [6 marks]

Permafrost is a layer of soil or bedrock that has been continuously frozen for at least two years and as long as tens of thousands of years.

The disruption of permafrost poses significant problems. Heat from buildings and pipelines, and changes in the vegetation cover can be, rapidly destroy it. Thawing of the permafrost increases the active layer and subsequent settlement of the soil cause subsidence. Consequently engineers have built structures either on a bed of gravel, up to 1m thick for roads, or used stilts.

- c** High latitude imposes more limitations on human activity than high altitude. Discuss this view. [10 marks]

The disadvantages of high latitude:

- Inaccessibility to main markets, hubs and urban agglomerations.
- Limited winter daylight makes all economic activity difficult.
- Thin soils, limited growing season.

The disadvantages of high altitude:

- Difficult terrain with steep slopes, thin and unproductive soils, and exposure to harsh weather conditions and in extreme cases, shortage of oxygen.
- Some, but not all mountain zones are inaccessible.

A good answer accessing markbands E/F will identify both the advantages and disadvantages of each region and some common economic opportunities and limitations. There is no right or wrong answer, but there must be factual support and named examples.

Option D: Hazards and disasters – risk assessment and response

- 7 a** Describe the trends in technological disasters shown by the graph. [4 marks]

The overall trend is one of increase particularly since 1990 [1]. Although population data is unspecified, relative change within and between regions can be described [2]. Give [1] for any other valid point.

- b** Account for the different trends shown by two of the world regions. [6 marks]

The best contrasts can be seen between:

Europe/Americas (early technological adopters) and Africa/Asia (late starters). Oceania (low incidence of technological disasters) might be chosen as a contrast to any of the others. Give [2] for a suitably contrasting pair and clear identification of the contrasts.

The reasons for the differences relate to the relative size, level of concentration and vulnerability of the two populations, the regional levels of industrial development, the existence of safety regulations and the level of reporting. Give [2] for each developed reason up to a maximum of [6].

- c** Technological hazards are more predictable and therefore less serious than natural hazard events. Discuss this view. [10 marks]

Technological hazards are essentially man-made and include war, radioactive leaks, oil spillages and contamination of the land. Their predictability is generally higher than that of natural hazards because they are under human control and in theory, safety regulations are adopted from the start. Nevertheless, there have been some devastating disasters such as in Bhopal and Chernobyl in the 1980s. Their devastation was due to inadequate monitoring, lack of safeguards and the exposure of vulnerable people to the immediate dangers of chemical and radioactive leaks.

The predictability of natural hazard events depends upon their type, location and the cost / availability of research which might allow for more careful monitoring. Tectonic hazards are unpredictable, whereas societies can prepare for droughts and cyclones / floods to a lesser extent.

The answer may take any line of argument, but must present a broad view supported by case study evidence.

- 8 a** Describe the features and current stage of development of the hurricane in this image. [4 marks]

The hurricane is mature / stage 3, [1] with a central eye [1] and fully developed cumulus clouds [1] and anti-clockwise rotation [1].

- b** Describe and explain the global pattern of hurricane (tropical cyclone/ typhoon) activity. [6 marks]

Hurricanes / tropical cyclones / typhoons originate in tropical latitudes just polewards of the Equator where the coriolis force is sufficiently strong for them to rotate and spin towards the west. They derive their energy from the process of evaporation as they pass over the ocean, but start to decay on reaching land when the evaporation process stops.

For full marks there must be description and explanation of three elements of pattern; origin, direction of spin and the oceanic energy source.

- c** Discuss the responses of a community to a local hazard event. [10 marks]

The content of this answer depends upon the specific hazard event chosen and the approach taken, but a good answer accessing markbands E/F is likely to cover three types of post traumatic adjustments:

- Modifying the event through improving building design and land zoning.
- Improved forecasting and warning
- Sharing the losses through insurance and disaster relief.

It is acceptable for alternative expressions to be used.

The specific hazard event must be recent (post 2000) and **not** include river flooding

Option E: Leisure, sport and tourism

- 9 a** Rank the countries in the table for 2008 according to their number of international tourist arrivals. [2 marks]

- 1 France
- 2 USA
- 3 Spain
- 4 China
- 5 Italy
- 6 UK
- 7 Ukraine
- 8 Turkey
- 9 Germany
- 10 Mexico

- b** Name two countries, one showing the greatest rise and the other the greatest fall in rank since 2000. [2 marks]

China (rise), Hungary (fall).

- c** Suggest three reasons for falling demand for a tourist destination on a national scale. [6 marks]

Unfavourable exchange rates, competition from other developing destinations, natural catastrophe, tourism fatigue. Give [2] for each developed reason.

- d** Discuss the view that tourism brings few benefits to local people. [10 marks]

Views for and against:

Economic gain - jobs, business, multiplier effect.

Economic loss – domination of foreign-owned tour operators leading to leakage and undermining of local businesses.

Socio-cultural gain - knowledge of language, education, involvement, cultural understanding.

Socio-cultural loss - cultural dilution, moral degradation, tourist / visitor conflict, under-investment in local social provision, diet change, disease.

Environmental benefits – rural revival and ecological conservation, game / marine reserves,
 Environmental loss – soil erosion, noise, water / atmospheric / land pollution, resource depletion, biodegradation.

To reach markbands E and F, both sides of the argument need mentioning, but there can be strong bias.

10 a Describe the characteristics of heritage tourism. [4 marks]

Tourism based on a historic legacy. This may include:
 Landscape features - Ayers Rock in Central Australia.
 Ancient cultural sites - Machu Picchu in Peru.
 Historic monuments and buildings - Le Louvre in Paris.
 An event – A royal wedding in London.

b Explain the location of leisure amenities in one named urban area. [6 marks]

The whole urban area should be considered and include the CBD and surrounding suburbs. Leisure should be broadly interpreted to include sports, recreational and tourist facilities and a sketch map showing the actual distribution of facilities within and around one city would enhance the answer. The reasons for location may vary with the city's age and economic status, but there are some common features:

It is possible to recognise a leisure hierarchy in cities whereby those resources attracting international tourists will occupy a central location, but low order attractions will be greater in number, occupy suburban land and have a smaller and residential sphere of influence. Therefore, the CBD is the focus of high order tourist facilities that are accessible to all and may exist there for historic reasons. Attractions include concert halls, museums, cathedrals and city parks. Lower order amenities with a regional sphere of influence such as sports stadia are likely to occupy cheaper land often at an accessible point in the suburbs such as a motorway junction. Further down the leisure hierarchy would be facilities serving local residents such as swimming pools, recreation grounds and tennis courts. At the city limits there may be leisure activities such as golf courses attracting a wealthier and more mobile population living outside or well beyond the city. These facilities would therefore draw on a large catchment, need and need a large area of land and charge for membership or entry.

c Discuss the benefits and costs of hosting a sporting event as a means of improving or regenerating cities. [10 marks]

The answer should recognise a range of urban sports events operating on different spatial and temporal scales from a "one off" major event to regular seasonal "hallmark" events. Thereafter, the focus of the essay may vary.

The benefits of hosting a major international event such as the Olympic games would be:

- International recognition and prestige.
- Local employment, increased consumer sales and tax revenue especially with affluent visitors.

- The legacy of additional recreational facilities for local population.
- Increased interest and participation of local youths in sport.
- Revival of old decaying industrial districts.

The costs might be:

- The legacy of expensive and underused facilities that local people cannot afford.
- The economic benefits are felt more by big business than locals.
- Money goes from public funds to private business.
- Crowding and infrastructural congestion.
- Significant crime and security issues.

A good answer achieving markbands E/F should draw a conclusion on the balance of benefits against costs and possibly the relative success of hosting events of different scales.

Option F: The geography of food and health

11 a Define and give one example of:

(i) A vector-borne disease,

(i) Malaria (mosquito), Schistosomiasis, River blindness and other valid examples.

(ii) A non-communicable disease. [2 + 2 marks]

(ii) Cancer, cardiovascular diseases, diabetes and other valid examples.

b Explain the epidemiological transition that is shown by this diagram that occurs during the process of economic development. [6 marks]

Low income countries – At this stage the death rate is relatively high due to infectious disease, especially amongst infants.

Middle-income countries - at this stage people have begun to adopt the habits of the wealthy, but do not have the resources to regulate these new habits. Smoking, increased consumption of calorific foods and alcohol exposure are markers and road traffic accidents and unhealthy sedentary life-styles are an increasing cause of death. The major infectious diseases are still a threat, but mainly amongst in the poorest sectors of society.

High income countries - by this stage infectious disease is insignificant. The death rate is low, but gradually increases as fertility levels drop and society ages. Although healthier life-styles are adopted by younger generations, the older generation is often affected by degenerative diseases reflecting previous habits such as smoking.

Approaches to this question may vary, but for each stage shown on the graph, there should be a brief and quantified explanation that refers to the data [2 × 3]

c Examine the relationship between human nutrition and disease. [10 marks]

Health is closely linked to food supply in terms of both quantity and quality. Malnutrition involves both a nutritional deficit and excess. Underfeeding or protein / energy deficiency may result in kwashiorkor and marasmus and vitamin deficiency in diseases such as rickets or beriberi. Obesity is a consequence of excess carbohydrate and fat intake which results in secondary illnesses such as heart disease, cancer and diabetes.

A good answer accessing markbands E and F will refer to both food deficit and excess, and refer to relevant named examples in each case.

12 a Describe the global pattern of calorie consumption. [4 marks]

The areas of highest consumption of over 3,500 kcal per capita per day [1] are the high income regions of North America and North West Europe [1]. The areas of lowest consumption of under 1500 calories per day [1] are the Sub-Saharan region [1]. There are minor variations between these two extremes. Answers that lack statistics should be given a maximum of [2].

b Explain one political and one economic cause of food shortage. [6 marks]

Political causes include:

Civil war – this may limit access to food markets, divert food aid to the military, reduce population mobility to acquire food from the wild, prevent normal farming activity and kill or maim farmers.

Economic causes include:

Food aid – this may undercut local food prices and deprive small farmers of a living.

High world food prices - these may cause lower wages and the loss of household exchange entitlements.

Trade liberalisation policies may expose poor farmers to unfair competition.

Give [3] for a well-developed cause in each case. Social or physical causes are irrelevant.

c Examine the principles and of sustainable agriculture. [10 marks]

The principles of sustainability uphold the idea of conserving the environment and its abiotic and biotic resources to maintain food yields for future generations. For example, the tonnage of fish removed from the ocean in one year allows the ocean and its fish stocks to recover and produce the same yield for years to come. This is the maximum sustainable yield.

The practice of sustainable management is achieved by conserving or maintaining:

- Soil structure, texture and fertility by applying manure or other organic fertilizer and crop rotation to maintain soil nutrient status and allow recovery between harvests.
- Biodiversity, which protects biological controls such as ladybirds which destroy aphids.

And by avoiding:

- The use of pesticides and inorganic fertilizers.
- High energy subsidies.
- Intensive energy inefficient practices such as factory farming.

In a good answer accessing E/F there should be a clear definition of sustainable agriculture with reference to most of these practices. Examples of specific and localised sustainable practices would also be expected.

Option G: Urban environments

- 13 a** Classify the 7 cities shown in the diagram according their population densities and describe the distinctive characteristics of each group. [4 marks]

Compact high density – Shanghai, Moscow

Medium area and medium density – London, Paris

Large area, low density – New York, Jakarta, Berlin.

Give [2] for an accurate 2–4 group fold classification and [2] for a quantified description that accurately refers to the data given.

- b** Explain the causes and consequences of urban sprawl. [6 marks]

Causes – centrifugal population movement due to push and pull factors:

Push: congestion and high land values in the city.

Pull: open space, cleaner air, less congestion and cheaper land at the rural-urban fringe or beyond.

Consequences – increased commuting, traffic congestion, pollution and stress if this movement is spontaneous, unplanned and on a large scale. Allow up to a maximum of [4] if only causes or consequences are addressed.

- c** Analyse the effect of urban structure upon microclimate. [10 marks]

Urban structure means the extent of the built-up area, building density (height and concentration), road density, heat sources, urban (buildings, roads) fabric and its albedo. A good answer would need to cover most of these.

Urban areas develop their own microclimates which reflect the underlying physical features and also the extent and characteristic of the built-up area. Urban structure affects climate in several ways:

Temperature - Buildings absorb heat during the day and release it at night. They also produce anthropogenic heat from artificial heating in winter and air conditioning in summer. The warming effect is intensified by tall buildings closely packed in the city centre. There are also suburban “hot spots” often found at major road junctions, airports.

Wind – Average wind speed in cities is reduced by friction with the rough built-up surface, but local wind speeds can be high. Narrow streets funnel winds along them causing eddies and the “canyon

effect” which can cause localised cooling. Paris and many Middle Eastern cities have been designed with a radial street pattern to allow fresh air to be drawn in from the urban perimeter.

Humidity – impermeable urban surfaces absorb heat due to low albedo (tarmac) and have little water storage capacity and are therefore drier. Urban areas are often short of vegetation resulting in less evapotranspiration and reduced relative humidity in comparison to the surrounding rural area.

City size is important and large high rise / high density cities such as Tokyo have a large thermal footprint than an African city such as Lagos, where less dense structures reduce the intensity of the urban heat island effect.

A good answer accessing markbands E/F will cover most of these effects.

14 a Name three inputs and three outputs in diagram A. [3 marks]

Inputs: food, water, energy, processed goods, building materials, timber and people.

Outputs: air, water and solid pollution (3 types), urban sprawl, psychological stress and people.

Give [1] for one correct input + one correct output.

b Name the city process and briefly explain the differences between diagram A and B. [2 marks]

The process is recycling and it has increased with the adoption of sustainable management in B.

c Explain what is meant by the urban ecological footprint. [5 marks]

The urban ecological footprint (EF) is the arable land area and resources required to sustain a city population. This measurement incorporates consumption of water, energy, land area used for infrastructure and different forms of agriculture, forests, and all other forms of energy and material “inputs” that people require in their day-to-day lives. It also accounts for the land area required for waste assimilation. EF can be compared with bio-capacity or the actual land area available. An urban EF is often greater than its bio-capacity because it consumes resources from beyond the city limits. For example, London has an EF 125 times its area. An ecological footprint lower than bio-capacity is deemed sustainable. Economic development accompanied by industrialisation and urban sprawl are likely to increase the urban EF as in the case of developing Chinese cities.

A good answer will include an explanation of urban consumption relative to bio-capacity. Answers achieving full marks should refer to at least one named city.

a Referring to one or more case studies, examine the extent to which the principles of sustainable city management have been successfully applied. [10 marks]

Sustainable urban management strategies seek to maintain and improve the quality of life for current and future urban dwellers. The principles of sustainable urban management include:

- Economic security - People should have access to employment and an adequate livelihood. If they become ill, permanently disabled or unemployed they shall be entitled to economic security.
- Housing – this should be healthy, safe, secure, affordable and within a neighbourhood that provides piped water, sanitation, drainage and transport,
- Health care provision – universal education, and child welfare. The home and workplace should be free from hazards and chemical pollution.
- Resource conservation - by reducing consumption of fossil fuels in housing, commerce, industry and transport and substituting renewable resources where possible.
- Cities it should draw on water resources up to their maximum sustainable yield and not beyond.
- Waste minimisation, recycling, reuse and reclamation, conservation of cultural, architectural, historical and natural assets
- The “Green agenda” - the provision of green space such as urban parks and playgrounds, should be encouraged.
- The “Brown agenda” which involves reclaiming, refurbishing or rebuilding on existing inner urban sites.
- Active involvement of local communities in the processes of improving their local neighbourhoods.

The chosen city may have already applied only some of these principles and the outcome may not yet be fully recognised. Some speculative evaluation is therefore acceptable.