Scheme of Work

# Cambridge International AS & A Level Geography

## 9696

For examination from 2018

Cambridge Advanced

# Contents

# Introduction

This scheme of work has been designed to support you in your teaching and lesson planning. Making full use of this scheme of work will help you to improve both your teaching and your learners' potential. It is important to have a scheme of work in place in order for you to guarantee that the syllabus is covered fully. You can choose what approach to take and you know the nature of your institution and the levels of ability of your learners. What follows is just one possible approach you could take.

Suggestions for independent study **(I)** and formative assessment **(F)** are also included. There is the potential for differentiation by resource, grouping, expected level of outcome, and degree of support by teacher, throughout the scheme of work. Timings for activities and feedback are left to the judgement of the teacher, according to the level of the learners and size of the class. Length of time allocated to a task is another possible area for differentiation.

## Key concepts

This scheme of work is underpinned by the assumption that learners will be able to make links between topics and develop a deep overall understanding of the subject. The key concepts are highlighted as a separate item in the syllabus and teachers should be aware that learners will be assessed on their direct knowledge and understanding of the same. Learners should be able to describe and explain the key concepts as well as demonstrate their ability to apply them to new situations and evaluate them. Reference to the key concepts is made throughout the scheme of work using the key shown below:

**Key Concept 1 (KC1)** – Space
**Key Concept 2 (KC2)** – Scale
**Key Concept 3 (KC3)** – Place
**Key Concept 4 (KC4)** – Environment
**Key Concept 5 (KC5)** – Interdependence
**Key Concept 6 (KC6)** – Diversity
**Key Concept 7 (KC7)** – Change

## Guided learning hours

Guided learning hours give an indication of the amount of contact time teachers need to have with learners to deliver a particular course. Our syllabuses are designed around 180 hours for Cambridge International AS Level, and 360 hours for Cambridge International A Level. The number of hours may vary depending on local practice and your learners' previous experience of the subject. The table below give some guidance about how many hours are recommended for each topic. You are recommended to work through the topics sequentially.

| Topic | Suggested teaching time (%) | Suggested teaching order |
|---|---|---|
| **Topic 1:** Hydrology and fluvial geomorphology | **15% of AS Level** | This topic considers the drainage basin as a system of outputs, stores and flows. Learners should also understand the discharge relationships in drainage basins. River channel process and landforms are also covered, as is the human impact on these elements. |
| **Topic 2:** Atmosphere and weather | **15% of AS Level** | This topic allows learners to develop an understanding of energy budgets over a range of scales. From this basis learners should be able to describe and explain weather processes and phenomena and how humans impact upon these systems. |
| **Topic 3:** Rocks and weathering | **15% of AS Level** | Learners should understand the global pattern of tectonics and the resulting landforms and processes. At a more local scale learners should be able to describe and explain weathering and slope processes and how humans can impact upon this. |
| **Topic 4:** Population | **15% of AS Level** | This topic considers population change and how this informs models such as the DTM. This leads onto the relationship between population size and resource availability. Learners should develop a case study of how we can manage natural increase and the associated issues. |
| **Topic 5:** Migration | **15% of AS Level** | Learners should be able to explain how migration forms a component of population change. They should be able to explain what pushes and pulls people from and to locations and how we can manage internal migration. |
| **Topic 6:** Settlement dynamics | **15% of AS Level** | This topic considers the changing settlement dynamics in both rural and urban areas. Learners should be able to describe and explain the changing structure of urban settlements and how this is managed. |

| Topic | Suggested teaching time (%) | Suggested teaching order |
|---|---|---|
| **Topic 7:** Tropical environments | **Chose two from the four topics, each should be 25% of A Level** | This topic considers the characteristics, locations and landforms of tropical environments. Learners will develop a thorough understanding of this type of ecosystem and why sustainable management of this is necessary. |
| **Topic 8:** Coastal environments | | This topic will allow learners to develop their understanding of coastal processes and how this leads to the development of coastal landforms. Learners will also consider coral reefs and why the sustainable management of the coast is necessary. |
| **Topic 9:** Hazardous environments | | This topic covers a range of hazards including their formation, effects and management. Learners will study hazards resulting from tectonic activity, atmospheric disturbances and mass movement. |
| **Topic 10:** Hot arid and semi-arid environments | | This topic considers the characteristics, locations and landforms of hot arid and semi-arid environments. Learners will develop a thorough understanding of this type of ecosystem and why sustainable management of this is necessary. |
| **Topic 11:** Production, location and change | **Chose two from the four topics, each should be 25% of A Level** | This topic considers agricultural systems and how agricultural change is managed. It also considers manufacturing and how the change in this industry is managed. |
| **Topic 12:** Environmental management | | This topic allows learners to consider the role of renewable energy and how energy supplies are managed. Learners will also consider how we recognise and manage environmental degradation. |
| **Topic 13:** Global interdependence | | This topic considers global trade patterns. Learners will develop an understanding of international debt and aid. Tourism is the second area of study within the topic and learners will be able to recognise why management of tourism is necessary. |
| **Topic 14:** Economic transition | | This topic considers the process of national development and the role of economic activity in this. Learners will appreciate that despite an increasingly globalised economy, regional disparities still exist and require management. |

## Resources

The up-to-date resource list for this syllabus, including textbooks endorsed by Cambridge, is listed at **www.cie.org.uk**
**Endorsed textbooks** have been written to be closely aligned to the syllabus they support, and have been through a detailed quality assurance process. As such, all textbooks endorsed by Cambridge for this syllabus are the ideal resource to be used alongside this scheme of work as they cover each learning objective.

## Teacher support

Teacher Support **https://teachers.cie.org.uk** is a secure online resource bank and community forum for Cambridge teachers, where you can download specimen and past question papers, mark schemes and other resources. We also offer online and face-to-face training; details of forthcoming training opportunities are posted online. This scheme of work is available as PDF and an editable version in Microsoft Word format; both are available on Teacher Support. If you are unable to use Microsoft Word you can download Open Office free of charge from **www.openoffice.org.**

## Websites

This scheme of work includes website links providing direct access to internet resources. Cambridge is not responsible for the accuracy or content of information contained in these sites. The inclusion of a link to an external website should not be understood to be an endorsement of that website or the site's owners (or their products/services).

The website pages referenced in this scheme of work were selected when the scheme of work was produced. Other aspects of the sites were not checked and only the particular resources are recommended.

## How to get the most out of this scheme of work – integrating syllabus content, skills and teaching strategies

We have written this scheme of work for the Cambridge International AS & A Level Geography 9696 syllabus and it provides some ideas and suggestions of how to cover the content of the syllabus. We have designed the following features to help guide you through your course.

**Learning objectives** help your learners by making it clear the knowledge they are trying to build. Pass these on to your learners by expressing them as 'We are learning to / about…'.

**Suggested teaching activities** give you lots of ideas about how you can present learners with new information without teacher talk or videos. Try more active methods which get your learners motivated and practising new skills.

**Extension activities** provide your more able learners with further challenge beyond the basic content of the course. Innovation and independent learning are the basis of these activities.

| Syllabus ref. and Key Concepts | Learning objectives | Suggested teaching activities |
|---|---|---|
| **KC2 and KC7**<br><br>14.2: The globalisation of economic activity | Learners need to know a case study of the global spatial organisation and operation of one TNC<br><br>Learners should be able to explain the factors in the emergence and growth of newly industrialised countries (NICs) Changes in the location of economic activity, e.g. outsourcing of manufacturing and offshoring services: nature, causes and impacts | **(I)** Learners should select/be given a TNC, they should then research and record the following factors:<br>• operations<br>• organisation<br>• production.<br><br>Learners should be aware of factors that have influenced growth and development: labour, health and safety regulations, pollution, government legislation and incentives, i.e. economic, social, environmental and political factors.<br><br>**Extension activity:**<br>Learners should be able to identify and explain the impacts of deindustrialisation in HICs.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/33 Nov 2015 Q7b<br>9696/32 Jun 2015 Q7a |
| **Past and specimen papers** | | |
| Past/specimen papers and mark schemes are available to download at **https://teachers.cie.org.uk** | | |

**Independent study (I)** gives your learners the opportunity to develop their own ideas and understanding with direct input from you.

**Past Papers, Specimen Papers** and **Mark Schemes** are available for you to download at:

**https://teachers.cie.org.uk**

Using these resources with your learners allows you to check their progress and give them confidence and understanding.

**Formative assessment (F)** is on-going assessment which informs you about the progress of your learners. Don't forget to leave time to review what your learner has learnt, you could try question and answer, tests, quizzes, 'mind maps', or 'concept maps'. These kinds of activities can be found in the scheme of work.

# Topic 1: Hydrology and fluvial geomorphology

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
|---|---|---|
| **KC3, KC5 and KC7**<br><br>1.1: The drainage basin system | Learners should be able to identify and explain the relationships between the outputs of a drainage basin, including: evaporation, evapotranspiration and river discharge<br><br>Learners should be able to identify and explain the relationships between the stores in a drainage basin, including: interception, soil water, surface water, ground water and channel storage | Introduce the idea of a system by using an analogy such as:<br>• Open systems, e.g. car, computer, domestic water supply.<br>• Closed systems, e.g. central heating, air conditioning.<br>Key concept:<br>• The global hydrological cycle – why is it a closed system?<br><br>Give learners a flow diagram with boxes for stores and arrows for flows. To differentiate this could be completely blank or partially filled in. Fill in a larger version of the same diagram as the discussion with class proceeds and learners complete their diagrams. Learners should record a written definition of global hydrological cycle comprising three ideas – 1 Closed 2 Water 3 Scale.<br><br>Compile a cross sectional diagram and/or flow diagram of a drainage basin. The two could be used side-by-side. The pictorial version may be easier to appreciate than the flow diagram. Outlines with surface, soil, rock, water table could be given or learners could be asked to do this themselves **(F)**. Labels such as sun, vegetation, urban areas, water bodies and river channel could be added. Encourage learners to use different colours for flows, stores, inputs and outputs to distinguish them. Learners could be introduced to a flow diagram version of a drainage basin as consolidation.<br><br>Learners should be encouraged to write definitions of the processes.<br><br>**Extension activity:**<br>Learners write an account of the processes that occur in the drainage basin system.<br><br>The concept of discharge needs to be introduced at an early stage.<br><br>Whole group discussion about the details of all the processes at work within the system and factors that influence those processes and the inter-relationships between the processes, e.g. soil moisture affects infiltration capacity. Introduce the relationship between infiltration capacity and rainfall intensity and its significance in producing different reasons for overland flow. If infiltration capacity is greater than rainfall intensity then the stores will fill |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | before overland flow occurs. This situation is typical of humid climates, e.g. UK. This type of overland flow is known as saturated overland flow and tends to occur on the lower slopes. If rainfall intensity exceeds infiltration capacity then Hortonian (or infiltration excess flow) flow occurs. The water cannot enter the ground so it runs straight off the surface. This occurs in arid and semi-arid environments where the rain is intense or in areas of impermeable surfaces.<br><br>**(I/F)** Using their new understanding of these concepts, learners to attempt 9696/12 Jun 2013 Q7. |
| **KC3, KC5 and KC7**<br><br>1.2: Discharge relationships within drainage basins | Learners should be able to identify the components of hydrographs (storm and annual)<br><br>Learners should be able to explain the influence on hydrographs, including:<br><br>Climate: precipitation type and intensity, temperature, evaporation, transpiration, evapotranspiration, and antecedent moisture<br><br>and<br><br>Drainage basin characteristics: size | Begin with a theoretical diagram of the storm hydrograph. Label fully including the axes. Learners could then be given their own data to construct a hydrograph **(I).**<br><br>This could be reinforced by a 'living graph' exercise – give learners a basic outline of a hydrograph with a series of explanatory captions which need to be inserted/attached around the diagram. This can be a very effective way of promoting discussion of the relative influence of different processes as well as a possible revision exercise. This could then be developed to look at the effects of different factors.<br><br>A range of different hydrographs could then be shown as the basis of a discussion about the factors which influence the nature of hydrographs.<br><br>Learners should be introduced to drainage basin characteristics, including: size, shape, drainage density, soil moisture, rock type, slope, vegetation, land use. It is worth emphasising that shape is a factor when area is the same. Attenuated response in elongated basins whereas flashy in round ones.<br><br>**(I)** Learners can develop a number of case studies to illustrate these general principles.<br><br>Introduce the idea of permeability which is the ability to transmit water and porosity which is the volume of pore space. If the pores are interconnected then the rock/soil may be porous and permeable e.g. sandstone. If the pores are tightly packed water holding is possible but transmission is very slow, e.g. clay. Optional – Introduce idea of a pervious rock which is one which is permeable via joints and bedding planes:<br>• clays are porous but not permeable<br>• sandstones are porous and permeable<br>• chalk is not as porous as clay and is permeable<br>• limestone is pervious, but not porous. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | and shape, drainage density, porosity and permeability of soils, rock type, slopes, vegetation type and land use. | Human activities are a significant factor in influencing hydrographs. It may be useful to include human activities in this section as well in terms of river basin management (1.4). Examples of land use changes that affect drainage basin characteristics include deforestation, afforestation, changes in farming practices, dam and reservoir building and urbanisation.<br><br>Learners should study a range of annual hydrographs/river regimes to appreciate the impact of climatic variations on discharge, e.g. comparison of Mediterranean, arid, cool temperate and alpine hydrographs can be instructive.<br><br>The important aspect here is how these factors and combination of factors influence the nature of the response of the river. Therefore they should be studied together with a selection of hydrographs.<br><br>Develop ideas of how changes in these factors cause different responses and changes to the volumes and nature of the flows. Human activities are a significant factor in influencing hydrographs. It may be useful to include human activities in this section as well in terms of river basin management (1.4). These are the same as listed for drainage basins above.<br><br>Water abstraction and water quality should be considered either as part of a relevant case study or in general terms. Depending on the river basin chosen, political factors may be relevant where the river crosses international boundaries.<br><br>**Extension activity:**<br>Learners could find and track data on drainage basins to add to their case studies using the National Water Archive (UK) at: www.nrfa.ceh.ac.uk/data/search, or hydrology web for international data at: www.hydrology.org.uk/Data_sources.php. |
| **KC1, KC3 and KC5**<br><br>1.3: River channel processes and landforms | Learners should be able to describe and explain channel processes, including:<br><br>Erosion: abrasion, corrasion, solution, cavitation and | In discussion with the group, these basic ideas and concepts can be introduced.<br><br>• Revise the concept of a system – inputs, outputs, flows, discharge. Idea of moving water because of gradient, therefore energy to carry out work.<br>• Ask what processes would be occurring in a channel.<br>• Introduce idea of dynamic equilibrium with respect to a river channel, e.g. adjustment of channel bed to transport its load.<br>• Suggest that there would be a changing dynamic downstream as a result of a number of aspects of the |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
|---|---|---|
| | hydraulic action<br><br>Load transport: traction, saltation, suspension and solution<br><br>Deposition and sedimentation, including how these relationships are displayed on the Hjülstrom curve<br><br>Learners should be able to identify differences in river flow, including: velocity and discharge, patterns of flow (laminar, turbulent and helicoidal) and thalweg<br><br>Learners should be able to identify channel types: straight, braided and meandering<br><br>Learners should be able to describe and explain the formation of river landforms like: meanders (river cliffs, | channel which vary, i.e. depth, wetted perimeter, channel roughness and load size.<br>• What are they and how may they change downstream?<br>• Discharge. Define and use as a springboard for discussion about cross sectional area which links directly to hydraulic radius via wetted perimeter. Look at two or three comparative diagrams of cross sectional area.<br>• Emphasise that helicoidal flow is not a corkscrew movement down the centre of channel, but is a flow across the channel on the surface and at depth.<br><br>**(I)** Ask learners to draw fully annotated diagrams of the three types of flow**.**<br><br>Introduce the idea of how variable discharge can influence channel efficiency by changing the level of water in the channel. (This idea will be picked up again in relation to landforms like braided channels.)<br>• Channel roughness<br>• Gradient<br>• Velocity<br>• Competence<br>• Capacity<br>• Friction/flow characteristics.<br><br>To reinforce all these ideas fieldwork or use of a sand tank would be ideal. However if this is not possible then discussion of measurement in the field in theory can aid understanding, e.g. difficulty of measuring discharge in low/high flow conditions. You could compare the use of orange peel and cork as floats versus flow meters in terms of accuracy and practicality.<br><br>At the outset emphasise that the processes of erosion and deposition are influenced by the dynamics of the channel and that they interrelate and produce landforms which will be considered in the next section.<br><br>For processes of erosion, most authorities consider that abrasion and corrasion result from the action of the transported load. The load is the tool for erosion. Closest analogy of this is that the load acts ‘like sandpaper’. This process assists in undercutting and bank caving. This is also the reason turbulent flow creates potholes in the river bed. Hydraulic action is a result of the sheer power of the water. Cavitation is the implosion of gas bubbles in turbulent flow causing shock waves which weaken the banks of the channel. Both processes lead to bank caving. Vertical, head ward and lateral erosion should be covered, either here or in connection with landform |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
|---|---|---|
| | point bars, oxbow lakes), riffle and pool sequences, waterfalls, gorges, bluffs, floodplains, levées and deltas | development. Processes of transportation can be covered easily by means of one diagram showing traction/bed load, saltation, suspension and solution.<br><br>Hjülstrom curve – begin with a diagram of the graph. Emphasise what it demonstrates via the axes of the graph. Explanation can be given by annotating the graph, highlighting critical erosion and deposition velocities in relation to fraction of the load. Reasons why clay particles need such a high velocity when they are such small particles need to be explained – this is due to their weak electrostatic charge which encourages them to stick together. Distinguish between the entrainment and settling location of these curves on the graph. Entrainment (ability of the river to pick up and transport material) is the velocity line between erosion and transportation and the settling velocity marks the division between transportation and deposition.<br><br>You could use survey maps of Zimbabwe (Victoria Falls) and Port Antonio as teaching tools. For meandering channels and floodplain characteristics the discussion can focus on the contrasts and reasons for these.<br><br>Encourage learners to consider the conditions under which each occur, e.g. braided channels are found in areas of variable discharge and large loads, whereas gradient variation causes meandering channels. The formation of a floodplain created by the meandering channel can be emphasised. Overbank sedimentation does not create the floodplain.<br>www.alevelgeography.com/meanders/<br>www.geographyas.info/rivers/river-landforms/<br><br>A description, explanation and an example or examples of the landforms listed in the syllabus is needed. Annotated diagrams can be a useful way of condensing the material. The floodplain with its assemblage of features can be considered as a section of work. This could be a way of creating the link between the geomorphology and the human impact on the physical environment, i.e. the final section of work in this topic.<br><br>**Extension activity:**<br>Learners can create an overview diagram of a theoretical long profile with smaller annotations and diagrams showing the landforms and the processes involved in creating them.<br>Learners should be introduced to a variety of deltas using maps and photographs. The nature of the landform in plan can then be discussed. The profile of a delta, topset, foreset and bottomset beds should be described as well as the processes of sedimentation.<br>www.geography.about.com/od/waterandice/a/Geography-Of-River-Deltas.htm |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
|---|---|---|
| | | **(F)** These past papers will help assess learner understanding:<br>9696/13 Nov 2011 Q1<br>9696/12 Jun 2013 Q1<br>9696/11 Jun 2104 Q1 |
| **KC5 and KC7**<br><br>1.4: The human impact | Learners should understand how modification to catchment flows and stores and to channel flows by land-use changes (deforestation, afforestation and urbanisation), abstraction and water storage occur<br><br>Learners should be able to explain the causes and impacts of river floods; prediction of flood risk and recurrence intervals<br><br>Learners should know how we can prevent and ameliorate river floods including:<br><br>Forecasts and warnings | Introduce the concept of flood risk, including prediction in terms of measurement like recurrence intervals (prediction is often given insufficient attention and it may be examined in its own right.) Factors such as global warming and climate change could be covered as factors influencing prediction and management.<br><br>Inadvertent changes versus management strategies, which are part of possible amelioration, could be considered. A case study would be the obvious way to consider river basin and river channel management. There are many well-documented examples other than the Mississippi. The use of local examples is encouraged.<br><br>On a sketch drainage basin outline, learners can annotate how changes in the drainage basin affect discharge. They should illustrate these annotations with sketch hydrographs. Changes they should consider are:<br>• deforestation<br>• afforestation<br>• urbanisation<br>• abstraction<br>• water storage, e.g. dams.<br><br>When covering hard and soft engineering techniques, the general principles of physical geography should be the starting point for discussion. For instance, you could consider how they increase channel capacity or decrease discharge and how the engineering schemes achieve this. Simply considering a catalogue of management measures without understanding how they alter the hydrological processes should be avoided.<br><br>**(I)** Learners should develop summaries: one of a soft engineering example and one of a hard engineering example. They should include what river processes meant the management was necessary and the effects the management had on the river system.<br><br>Emphasise the impact of the human activities upon the physical environment rather than the human activities as ends in themselves, i.e. hydrograph changes, modifications to channel and impact on discharges which then result in floods. The case study could include consideration of human use of, and impact on, floodplains. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
|---|---|---|
| | Hard engineering – dams, straightening, levées and diversion spillways<br><br>Soft engineering – floodplain and drainage basin management, wetland and river bank conservation and river restoration<br><br>Learners should know a case study of a recent flood event showing the causes of and impacts. They should evaluate attempts to reduce the impact of the flood | Make sure there is an emphasis on channel flow, i.e. volume and velocity. Learners are expected to be able to distinguish between flooding and channel flow and appreciate what flooding is, i.e. over bankfull discharge.<br><br>**(I)** Learners should research and record a case study of a recent flood event. Their work should include:<br>• the causes of the flood<br>• its impact on both people and the environment<br>• an evaluation of the attempts to reduce the impact of the flood.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/13 Nov 2014 Q7c<br>9696/11 Jun 2014 Q7c |
| **Past and specimen examination papers** | | |
| Past/specimen papers and mark schemes are available to download at https://teachers.cie.org.uk | | |

# Topic 2: Atmosphere and weather

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
|---|---|---|
| **KC1, KC2 and KC4**<br><br>2.1: Diurnal energy budgets | Learners should be able to explain the factors affecting diurnal energy budget, including: incoming (shortwave) solar radiation, reflected solar radiation, energy absorbed into the surface and subsurface, albedo, sensible heat transfer, longwave radiation, latent heat transfer – evaporation, dew and absorbed energy returned to earth | Introduce the idea that the atmosphere is an engine powered by the sun. Inputs must be balanced by outputs or overall heating/cooling may result.<br><br>Local energy budgets<br>Input-output analysis using day time and night time energy models. The 'day model' and 'night model' energy budget form the basis of 2.1 and need full discussion and explanation of albedo, the role of clouds as reflectors, scatterers and absorbers of light/heat. Learners should be made aware that different clouds perform different functions.<br><br>The concept of albedo needs a thorough discussion, possibly with reference to different surfaces around the school or centre. The difference between reflection and absorption and re-radiation needs examining as it relates to the wavelength of the radiation. A comparison between hot and cold bodies would help. Hot bodies such as the sun produce shortwave radiation. Cold bodies such as the earth produce longwave radiation which is easily absorbed by greenhouse gases and clouds. This can lead in to topic 2.4 for both urban climate and the effect of greenhouse gases.<br><br>Day model<br>Transfers of heat: evaporation, sensible heat transfer, incoming solar radiation, longwave radiation, surface absorption. Learners should draw the day model in their notes.<br><br>Night model<br>Transfers of heat: longwave radiation, sensible heat transfer, heat supply to the surface, condensation, production of dew. Learners should draw the night model in their notes.<br><br>Learners should be introduced to, or reminded of methods of heating: radiation, conduction, convection. Use analogies with which the learners can readily identify such as radiators, air conditioning, a Bunsen burner flame under a beaker of water, which they may have used in the lab, or pan of boiling water.<br><br>Make sure learners can distinguish between latent heat and sensible heat transfers. Latent heat transfers involve |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
|---|---|---|
| | | a phase change, e.g. gas to liquid. The phase changes mean energy is either 'stored' or 'released'. Sensible heat transfers involve energy gain or loss without a phase change. For example, water vapour does not undergo a phase change, but is involved in heat transfer.<br><br>**(I)** Ask learners to consolidate their knowledge by completing the following activities:<br>• Describe and explain the effect of cloud cover on the earth's heat energy budget.<br>• Draw a diagram to show energy transfers. Describe two ways in which the local energy budget might be different at night.<br><br>**(F)** This past paper will help assess learner understanding:<br>9696/12 Jun 2013 Q8 |
| **KC1, KC2 and KC5**<br><br>2.2: The global energy budget | Learners should know the latitudinal pattern of radiation: excesses and deficits<br><br>Learners should be able to explain atmospheric transfers, including: wind belts and ocean currents<br><br>Learners should be able to explain seasonal variations in temperature, pressure and wind belts: the influence of latitude, land/sea distribution and ocean currents | Introduce the simple idea of energy surplus and deficit. High temperatures at the equator and low temperatures at the poles. This can be demonstrated by giving learners a map of average annual distribution of insolation received. Shading areas of less than 150W/$m^2$ in one colour and more than 225W/$m^2$ in others raises several points for discussion, e.g. low values over equator due to high amounts of cloud cover.<br><br>Differing temperature patterns produce differential atmospheric pressure. How are the differences balanced? Air movement – winds (and ocean currents). This should lead into discussion of the general circulation of the atmosphere.<br>• Discuss the tri-cellular model of the general circulation of the atmosphere.<br>• Discuss details of the model.<br>• Learners should know and understand something of the three cells, know which are thermally direct and which thermally indirect and why.<br>• Learners should be able to map the world wind belts (which will probably include the pressure belts too).<br>• Learners should understand how the model helps to explain the pattern of winds. Therefore it is necessary to know about the forces which act on the air, the Coriolis and pressure gradient forces and the resolution of those forces. Influence of the rotation of the earth and deflection of air. Relationship between temperature and vertical and horizontal air movement, i.e. high pressure is subsiding air and low pressure is rising air.<br>• Introduce the idea that general circulation involves upper air movement as well as surface wind. Some explanation and clarification of these upper air movements in simple terms may be required. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | Useful satellite photographs showing evidence of the global circulation patterns are available at: www.metoffice.gov.uk/<br><br>A general atmospheric circulation diagram should be drawn and annotated. Testing of understanding can be done using questions and partly completed diagrams for the learners to fill in.<br>• Introduce the idea of effect of circulation on global distribution of surface temperature and pressure, probably using maps.<br>• Use a world map to show the distribution of isotherms for summer and winter, i.e. January and July.<br>• Use a world map to show the distribution of isobars for summer and winter, i.e. January and July.<br>• Learners write a description emphasising patterns and anomalies.<br>• Learners identify similarities and differences across the globe.<br>• Learners give an explanation of pattern. Factors: latitude/seasons and day and night. Highlight anomalies by relating back to the general circulation. Some of the reasons may not be accounted for on a global scale therefore this is the link into the next section on micro/local scale variations.<br><br>**Extension activity:**<br>Ask learners to annotate examples of satellite images to show why the different weather patterns are visible.<br><br>Make sure that you explain that models are simplifications of reality. This means there are always local variations. You should discuss how the following factors influence local changes<br>• ocean currents – influence of cold and warm currents on temperatures and wind patterns in coastal locations across the globe. Learners will need a map of ocean currents with names, direction of flow and characteristics<br>• proximity to the sea – specific heat capacity of water compared with land surfaces. Relate to temperature and pressure patterns and anomalies<br>• altitude<br>• aspect<br>• length of day and night and seasons<br>• cloud cover<br>• prevailing winds. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
|---|---|---|
| | | **(F)** These past papers will help assess learner understanding:<br>9696/11 Jun 2014 Q8b<br>9696/12 Jun 2014 Q2<br>9696/12 Jun 2013 Q2<br>9696/13 Nov 2014 Q2 |
| **KC5**<br><br>2.3: Weather processes and phenomena | Learners should be able to explain atmospheric moisture processes, including: evaporation, condensation, freezing, melting, deposition and sublimation<br><br>Learners should be able to explain the causes of precipitation, including: convection, frontal and orographic uplift of air and radiation cooling<br><br>Learners should be able to explain the formation of different types of precipitation, including: clouds, rain, hail, snow, dew and fog | Introduce diagram to show phase changes of water in the atmosphere – description and definitions.<br><br>Explain the ways in which phase changes can occur. You should also explain ways in which cooling can occur: radiation/adiabatic, conduction, convection.<br><br>An explanation of adiabatic changes as a fundamental principle is not specified but is needed. There could be a discussion as to why air could rise so that it reaches condensation level and raindrops could form. Warm air rises but it needs to keep on rising. A useful comparison with a hot air balloon would illustrate the concept. The balloon will only rise if the air inside is warmer than the air outside. If it is not then it will not rise and it might fall back to air. This would be a useful way of differentiating stability from instability.<br><br>Learners could then be asked to consider other ways that air could be made to rise. This would lead on to the concept of orographic (forced uplift) and uplift by undercutting cold air at a front.<br><br>Good cloud photographs can be found at www.cloudappreciationsociety.org/gallery/#p=1&i=0<br>Satellite photos of all areas of the world as well as local and regional weather information can be found at: www.metoffice.gov.uk/<br><br>**Extension activity:**<br>Give learners a diagram of orographic uplift and ask them to add labels at appropriate points to explain why differences in temperature and humidity occur on opposite sides of a hill/mountain. This is also a useful reinforcement/revision exercise for explaining orographic uplift mechanisms.<br><br>Introduce weather phenomena. This can be done by association with each air mass type or by dealing with forms of precipitation and including cloud formation. The way in which this is approached is largely personal preference.<br><br>Description and explanation should be linked to conditions in which they can be found. Use diagrams where |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | possible and include as much detail as is realistic in the time available, e.g. distinction between advection and radiation fogs.<br><br>Rainfall<br>• a brief coverage of Bergeron-Findeisen and coalescence theories<br>• types – frontal, orographic and convectional rainfall are easily incorporated with air mass stability<br>• distinguish between winter and summer stability and associated weather conditions. Cloud type related to air mass stability<br>• anticyclones. |
| **KC3, KC4 and KC7**<br><br>2.4: The human impact | Learners should be able to explain the enhanced greenhouse effect and global warming, including: the evidence, possible causes and atmospheric impact<br><br>Learners need to know a case study of an urban area which shows the effects of human activity on climate, including: temperature (heat island), humidity, precipitation and winds | This topic could be introduced using energy budgets – global and local – to link the two parts together and to link back to other parts of the topic and the atmosphere as a system.<br><br>Enhanced greenhouse effect<br>Causes – natural gases in the atmosphere. Identify these and the consequence of their presence – emphasise that it is a natural process. What would happen without it? Discuss how and why human activity has had an impact. Diagrams are useful. It may be necessary/essential to put the ozone layer in context here because there is often confusion between the greenhouse effect and ozone depletion. Relate the greenhouse effect to possible global warming/cooling. A section on climatic change is necessary.<br><br>**Extension activity:**<br>Ask learners to write a summary of the factors that force climate over long periods of time (Milankovitch cycles) and how the enhanced greenhouse effect is different to this.<br><br>The consequences of global warming should be discussed – it is important that learners appreciate that the issue is a matter of conjecture and that the consequences may be far-reaching but not certain. It is important to stress that only atmospheric impacts are required.<br><br>Introduce general principles – starting with the concept of the heat island and using this as a springboard for the other phenomena. Inter-relationships between temperature, wind speed, humidity, precipitation and pollution should be emphasised. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | A more detailed discussion of albedo is relevant here. Some basic fieldwork around the school with a thermometer and a simple system for measuring wind speed and direction will identify how buildings and other features affect climate parameters. **(I)** Learners could then draw a plan with the data shown.<br><br>Using a case study would be ideal, e.g. London, Los Angeles, which are well documented in the textbooks. However, it is worth noting that urban microclimates vary according to urban areas' size, shape and location. These factors can be built into a case study, e.g. Tokyo, Mexico City and Chicago may exhibit different characteristics because of their particular sites. Distortions of pattern within the urban area are also worthy of consideration, e.g. effects of the River Thames and Lea Valley in London.<br><br>It is important to appreciate the comparison between rural and urban microclimates. Relative climatic data and an assessment and comparison between day and night would be particularly useful.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/13 Nov 2014 Q8b<br>9696/12 Nov 2014 Q8c<br>9696/11 Jun 2014 Q2<br>9696/11 Jun 2014 Q2<br>9696/11 Nov 2013 Q2 |
| **Past and specimen examination papers** | | |
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# Topic 3: Rocks and weathering

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1, KC2 and KC3**<br><br>3.1: Plate tectonics | Learners should be able to explain the nature of plate tectonics and their global patterns<br><br>Learners should be able to identify types of plate boundaries: divergent (constructive), conservative and convergent (destructive)<br><br>Learners should be able to explain the processes and associated landforms at different plate boundaries, including: sea floor spreading, subduction, fold mountain building, ocean ridges, ocean trenches and volcanic island arcs | Begin with the basic structure of the earth. Then introduce a map of global distribution of plate boundaries and tectonic activity, encouraging learners to describe the plate boundaries – linear on continental margins/coastal, i.e. not random or scattered. The map could be annotated. Emphasise the idea of pattern globally.<br><br>Define a tectonic plate – key points:<br>• it is a slab of lithosphere<br>• it moves<br>• oceanic plates are different to continental plates<br>• oceanic plates are younger, thinner, denser (heavier) and mostly composed of basalt (sima)<br>• continental plates are older, thicker, less dense (lighter in weight), composed mostly of granite (sial)<br>• these differences explain which plates get subducted (the heavier plates).<br><br>Learners should be able to explain reasons for plate movement – convection currents in the mantle, ridge push/slab pull. Make brief reference to evidence that plate movement has occurred in the past – use of atlas maps, especially the South America /Africa 'fit'. Be careful not to launch into a long discussion about 'continental drift'.<br><br>Consider each plate boundary, their landforms, describing and explaining processes that operate. Diagrams are the best way of keeping the material manageable and easy to understand. Learners should be asked to draw what happens at each type of boundary. Special care should be taken in the diagram of a collision zone.<br><br>**(I)** Learners should research and identify a named example for each type of plate margin. They should then add to their diagrams from class specific locations, facts and figures to develop detailed named examples.<br><br>Learners should see how the two major types of margin are complementary, i.e. ridge push and slab pull balance each other out, so that the crust does not become progressively larger. This should reinforce the concept of a global system of plate tectonics.<br><br>Rates of movement equivalent to the growth of a finger nail. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | This part of the topic could, and probably should, be illustrated by reference to specific plate boundaries, e.g. Nazca-South American plate, mid-Atlantic ridge, Pacific-Eurasian-Philippine (island arcs/trenches), collision of Indian and Eurasian plates to form the Himalayas.<br><br>**Extension activity:**<br>Conservative margins and collision zones can be useful additions to this section. It would be useful for learners to consider similar information for this margin as they have with others, e.g. the San Andreas Fault.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/12 Jun 2013 Q3<br>9696/13 Nov 2014 Q9b |
| **KC2 and KC3**<br><br>3.2: Weathering | Learners should be able to explain the processes of physical (mechanical) weathering, of freeze-thaw, heating/cooling, salt crystal growth, pressure release (dilatation) and vegetation root action<br><br>Learners should be able to explain the chemical weathering processes of hydrolysis, hydration and carbonation<br><br>Learners should recognise the general factors affecting the | Introduce the classification of weathering processes. Define weathering – 'the breakdown of rocks *in situ* (where they are)'. Emphasise the idea that no transport is involved and the importance of moisture being present. Use annotated diagrams where possible. Photographs can help to explain how the processes operate; there are many available from past question papers. The difference between weathering and erosion should be stressed.<br><br>This can be reinforced by a matching exercise where learners are required to match weathering processes and their descriptions. This is a simple but often effective means of generating discussion and encouraging thought about the processes, especially when produced on slips of paper which can be physically rearranged and classified into sets representing physical/chemical/weathering.<br><br>**(I)** Learners should consider whether biological agents justify a separate category of weathering or whether these agents carry out physical/chemical processes, e.g. tree roots, humic acids, organisms. They should write a justification for this, adding named examples to illustrate their points.<br><br>Human impact could be introduced here and discussed with respect to increased carbonation – solution on buildings, etc. to cover part of 3.4.<br><br>Learners could be asked the difference between disintegration and decomposition.<br>The end products should be linked (this is important and is often forgotten by learners). Therefore physical weathering tends to produce block disintegration, and chemical weathering, decomposition, although differential heating and cooling of minerals, for example, in granite can produce granular disintegration. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | type and rate of weathering, including: climate, rock type, rock structure and relief<br><br>Learners should be able to identify specific factors affecting the type and rate of weathering: temperature and rainfall and how this is shown on a Peltier diagram | Introduce the ways in which factors such as climate, vegetation, soils, rock type and rock structure, relief and time may influence weathering processes. Climate and rock lithology are the two key factors. Climate plays an overarching role because it influences other factors like vegetation and soils.<br><br>The Peltier diagram should form the basis for class discussion and then questions can be set on it. It is a good idea to annotate the diagram with the processes. Learners are not required to be able to draw it from memory.<br><br>**Extension activity:**<br>Learners could explain how latitudinal variation of regolith depth illustrates role of climate in weathering processes and can be related to the areas on the Peltier diagram.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/11 Jun 2014 Q2<br>9696/11 Jun 2014 Q3 |
| **KC2 and KC3**<br><br>3.3: Slope processes | Learners should be able to recognise slope processes and the conditions under which each occurs and the effect they have on slopes<br><br>Learners should be able to explain different mass movements, including: heaves, flows, slides and falls<br><br>Learners should be able to recognise and | Introduce, using a diagram, the slope as a system with inputs and outputs. Learners should recognise that slope form is dynamic, as the result of processes. Emphasise that material could move without an external agent (mass movement) and with an agent (surface water runoff).<br><br>Introduce mass movement by looking at the relationship between internal strength and external forces that subsequently produce shear stress. If stress is greater than strength, then movement occurs.<br><br>**(I)** Learners should be asked to research the intrinsic and extrinsic factors that make a substance stronger or weaker.<br><br>Learners should realise that the critical angle of rest for different particle sizes/shapes result in changes to slope shape and form. This could be examined by obtaining different materials (sand/gravel) and testing which angles are stable.<br><br>Definition of mass movement: 'Movement of material downslope under the influence of gravity'. There is no other agent of movement, but slope wash and/or the presence of soil water may assist the process. Learners should have an understanding of the role of water in mass movements. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | explain water and sediment movement on hill slopes, including: rain splash and surface runoff (sheetwash and rills) | Introduce the classification of mass movement processes. A triangular diagram is the best way of discussing the variety of processes and the conditions for each type of process.<br><br>**(I)** Provide learners with a variety of data to plot on to a triangular graph. They can then write an explanation as to how the axes help to explain the nature and causes of different types of mass movement processes.<br><br>Learners should be able to explain each of the major processes and be aware of the resultant slope forms. For example, rotational slip may be a slide along a slip plane with a flow at the toe if there is clay at the base of the slope. So there will be a compound slope profile possible with concave and convex elements. They should produce simple diagrams of a slide and flow and should be asked why they think clays flow rather than slide. This leads on to a consideration of pore water pressure and why it operates best in weakening clay. Simple diagrams of water surrounding soil particles could be used to illustrate this.<br><br>**(I)** There are easily available photographs and learners should be asked to describe, draw/print and annotate a variety of mass movement types (slides, flows and falls).<br><br>It is important that learners realise that differences in slope processes produce differences in slope form, i.e. angle/gradient, shape, characteristics. The factors are similar to those that influence weathering – climate, soil, vegetation, rock lithology especially mixed lithology (e.g. chalk overlying clay).Introduce gradient (influences the shear stress) and aspect.<br><br>Water and sediment movement on hill slopes could be introduced by referring back to overland flow in 1.1. Hortonian flow can occur anywhere on a slope if the conditions are favourable whereas saturated overland flow tends to start lower down the slopes. The question to be asked and discussed is how this difference affects the amount and movement of water and soil.<br><br>Learners should discuss, possibly in groups, what happens when raindrops hit various types of surface, such as grass or bare soil. The Sheffield University website www.sheffield.ac.uk/draem/splash gives a very good explanation.<br>An interesting question for learners could be – what is the nature of rain splash under trees?<br><br>**Extension activity:**<br>Learners could be asked to explain why sheetwash is rare and why rills develop. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | **(F)** These past papers will help assess learner understanding:<br>9696/12 Jun 2013 Q9<br>9696/13 Nov 2015 Q3 |
| **KC4 and KC5**<br><br>3.4: The human impact | Learners should recognise how human activity has an impact on the stability of slopes, both by increasing and decreasing stability<br><br>Learners should be able to explain strategies to modify slopes to reduce mass movements, including: pinning, netting, grading and afforestation | Learners should understand that human activities which affect the stability of slopes may be:<br>• intentional (e.g. mining, quarrying, spoil heaps, stabilising slopes, coastal management)<br>• unintentional (e.g. effects of acid rain, deforestation or landslides linked to the construction of favelas).<br><br>**(I)** Ask learners to draw a spider diagram indicating how these various activities might interact and might lead to increased instability.<br><br>There has been much debate about how trees stabilise slopes and how deforestation might lead to mass movement. An interesting exercise would be for learners to draw particular types of trees and their root systems. Shallow-rooted tress will have limited stability potential. In fact trees have limited effect on deep-seated slope failures. Learners could be asked to draw diagrams of trees on slopes with different slope angles and then consider the weight of trees acting downslope. It will then be clear that large trees will provide very little stability.<br><br>Trees and vegetation have more influence on water/soil movement on slopes. It is important to stress that the influence of deforestation on mass movement is controversial. The impacts of vegetation may be positive, i.e. prevent movement, or negative due to the reduction of internal strength and increases in external stress. Examples are available in many textbooks and websites, but the use of local examples is encouraged .<br><br>**(I)** Learners must know a case study of the impacts of human activity on slopes. This should show the effects on the stability of the slope, and an evaluation of the attempts to reduce mass movement.<br><br>**(F)** This past paper will help assess learner understanding:<br>9696/11 Jun 2014 Q9c |
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# Topic 4: Population

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC3 and KC7**<br><br>4.1: Natural increase as a component of population change | Learners should understand the population measures of natural increase, birth rate and death rate, fertility rate and infant mortality rate<br><br>Learners should be able to explain the factors (social, economic, environmental and political) that affect levels of fertility and mortality<br><br>Learners should be able to interpret age/sex structures and population structure (age, gender, dependency and dependency ratio) | Global distribution maps showing population densities is the ideal starting point. This also introduces choropleth maps as a technique. You could also show topological map of the data.<br><br>**Extension activity:**<br>Ask learners to consider the positives and negatives of using choropleth maps to show data. They should illustrate this with population map examples.<br><br>Introduce basic terminology: birth rate, death rate, mortality rates, fertility rates, infant mortality rate and replacement level. **(I)** Learners should be able to define these and it would be useful for learners to build up a file of definitions (this would apply to definitions of physical geography features and processes as well).<br><br>The World Health Organization website has a list of birth and death rates by country.<br><br>Introduce the idea of overall population growth/decline through the equation below (this could link with topic 5).<br>Pop change = Natural increase/decrease +/- migration<br><br>Learners should be aware of the spatial distribution of population growth rates, i.e. global distribution. You could look at statistics to compare growth rates for different countries and groups of countries, e.g. HICs and LICs.<br><br>**(I)** This could be an opportunity for learners to practise interpretation of choropleth maps.<br><br>Learners should be able to explain birth rates and death rates. Emphasise the role of different factors on these rates and the ways in which they may change over time. Gender is also an important part of the population change argument.<br><br>Contrast population decline in Scandinavia and Continental Europe with rapid increase of population in some LICs.<br><br>Learners should be able to make an assessment of the social, economic, environmental and political factors which |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | affect levels of fertility and mortality. A comparison between HICs and LICs will be useful.<br><br>Population pyramids (age/sex structure diagrams)<br>Description – Compare two basic shapes: the wide-based, steep sided, low, narrow-topped pyramid of LICs and the wider-based, straight-sided, higher, wider-topped pyramid of MICs.<br><br>You could also consider rural and urban pyramids and regional variations.<br><br>Learners could be asked to list what might be meant by the term dependency as applied to population groups. This will lead on to the specific definition of dependency ratio. There could be a discussion as to whether the age groups are relevant to all countries and also whether it needs modification with reference to changes in retirement age.<br><br>The World Bank website: http://data.worldbank.org/indicator/SP.POP.DPND.OL has a list of dependency ratios for all countries and changes over the last 20 years. Learners could be asked to draw graphs or histograms of changes for markedly different countries and should be able to explain the issues associated with this.<br><br>**Extension activity:**<br>Learners could consider the implications of high dependency ratios and what countries have done to deal with these problems.<br><br>The International Data Base of the US Census Bureau is an excellent resource: www.census.gov/ipc/www/idb<br><br>Consider a range of different age/sex pyramids which have particular characteristics, for instance illustrating the following factors: influence of wars, baby booms, HIV/AIDS.<br>You could also show how these link to the level of development and stage in the demographic transition model (DTM).<br><br>**(F)** These papers will help assess learner understanding:<br>9696/12 Jun 2013 Q4<br>9696/12 Jun 2014 Q4<br>9696/11 Jun 2014 Q4<br>9696/12 Jun 2013 Q10c |

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| | | 9696/11 Jun 2012 Q3<br>9696/11 Jun 2014 Q10c |
| **KC2 and KC5**<br><br>4.2: Demographic transition | Learners should be able to explain changes in birth and death rate over time<br><br>Learners should develop a critical appreciation of the demographic transition model, stages 1-5<br><br>Learners should be able to explain the issues of youthful populations and ageing populations<br><br>Learners should be able to make links between population and development, including: changes in infant mortality rate and life expectancy over time | Learners should understand the historical perspective and be able to compare the changes in birth rate and death rate for different countries at varying levels of economic development.<br><br>Annotated diagrams can be the best way to approach the model.<br><br>Learners should draw the DTM for themselves. It concentrates their minds and engages them directly with the material. They can add population pyramids to illustrate each stage plus examples of countries in each stage. Emphasise the fact that it is a model and a simplification of reality. Application to contrasting countries, e.g. the UK and China.<br><br>Learners should be able to explain the usefulness and limitations of the model (this critical appraisal is important). Take into consideration application to cities as well as countries and remember that the model does not have migration built in.<br><br>**(I)** Learners should be asked to write an accompanying piece to the model which includes:<br>• a comparison of the population pyramids for each stage of the model<br>• consideration of different methods that could be used to depict the transitions seen in the model.<br><br>Links to development should be considered throughout and the relationship to population change should be kept in mind throughout the teaching of this topic. Stage 5 of the model should be discussed with reference to specific countries. There could be discussion as to whether a fifth stage is relevant and what this would look like.<br><br>**Extension activity:**<br>Learners could write a response to the following statement: Ageing populations: a benefit or a problem?<br><br>**(F)** This question will help assess learner understanding:<br>9696/12 Jun 2013 Q10a and 10b |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC4, KC5 and KC7**<br><br>4.3: Population - resource relationships | Learners should be able to explain the concept of food security and the causes and consequences of food shortages<br><br>Learners should appreciate the role of technology and innovation in development of food production. They should also recognise the role of constraints (e.g. war, climatic hazards) in relation to sustaining population<br><br>Learners should understand the concept of carrying capacity<br><br>Learners should be able to critically evaluate the concept of optimum population including overpopulation and underpopulation | Discuss the nature of food security using examples at varying spatial scale and different countries.<br><br>Learners could draw up a list of causes for food shortages and their consequences. They could perhaps classify these into different categories. Could food shortages have been predicted?<br><br>**(I)** Learners can research and record the principle of optimum population or overpopulation. It would be useful for them to identify named countries which experience these issues and some of the problems they face as a result.<br><br>Consider the role of technology and innovation in the development of food production such as Green Revolution, high yielding crops, genetic engineering, improved technology (farm equipment), improved transport and storage, fertilisers and irrigation.<br><br>Learners should understand the constraints on food production, e.g. war, climatic hazards, political issues and crop and animal diseases.<br><br>It is important that case study material is geared to the control of growth and the management of the results of change. It is also important to understand that these are relative concepts; discovery of new resources/technology could relieve overpopulation whilst maintaining the same absolute numbers, but the quality of life would improve.<br><br>Look at the relationship between population growth and growth of food production. Compare arithmetic increase of food production with geometric increase of population (Malthus).<br><br>Introduce idea of carrying capacity of land in relation to its population. This could be linked to Malthusian ideas and the opposite view of Boserup. Reference could be made to innovation and changes in technology.<br><br>Malthusian theory should be explained using a series of diagrams. It can be seen that by increasing the population levels resources are exceeded.<br><br>**(I)** Ask learners to summarise the solutions to the issues identified in Malthusian theory where the population exceeds the resources available. They should illustrate this with case study examples.<br>Introduce Boserup's more optimistic model of changing technology and innovation.<br><br>**(I)** Learners could be asked to produce a list of characteristics of underpopulated and overpopulated countries. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | Look at a graph of population in relation to GDP per person to ascertain concepts of over-, under- and optimum population.<br><br>**Extension activity:**<br>Learners write an evaluative piece on the following question: 'Can an optimum population exist or is it just a theoretical construct?'<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/13 Nov 2014 Q10c<br>9696/12 Nov 2014 Q4<br>9696/13 Nov 2014 Q10b |
| **KC4**<br><br>4.4: The management of natural increase | Learners must know a case study of one country's population policy regarding natural increase, showing the difficulties they faced and an evaluation of the attempted solution(s). (The case study must include attempts to alter the natural increase rate and to manage the results of population change.) | The case study must include attempts to alter the natural increase and to manage the results of population change. It should include:<br>• the history of population growth and change in the case study country<br>• population data to substantiate the case for population management<br>• the population structure of the country including birth rate and death rate and life expectancies<br>• an analysis of change over time with a discussion of reasons<br>• the controls, resulting population changes and how the country has managed these<br>• a discussion of the consequences of the policy, especially successes and/or failures e.g. gender imbalance, ageing population, rural/urban migration.<br><br>Death rate is a vital component of population change and is often forgotten by learners when discussing management/policies for controlling population growth, i.e. managing natural increase.<br><br>Example countries with population policies: China 'one child' policy, Singapore, Russia, Germany, UK, Italy or home country. |
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# Topic 5: Migration

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1, KC5, KC6 and KC7**<br><br>5.1: Migration as a component of population change | Learners should understand movements of populations (excluding all movements of less than one year's duration)<br><br>Learners should be able to explain the causes of migration, including: push and pull factors, processes of migration (including chain migration) and patterns of migration (including by distance and by age), the role of constraints, obstacles and barriers (e.g. cost, national borders) | Learners should know the definition of migration which should exclude all movements of less than one year, e.g. holidays and commuting (these are correctly termed circulation, rather than migration). Migration should involve a more or less permanent change of residence. It is important to stress this as some studies refer to seasonal migration which can be less than one year duration.<br><br>**(I)** It is a good idea to set some preparatory reading on the causes of migration so that learners have the foundations on which to build in the lesson.<br><br>A good introduction is to use a world map showing migratory patterns. Learners can describe these and attempt to explain them.<br><br>You should cover the physical (environmental), social, economic, political and historical factors influencing migration. Out of that discussion a need for classification may evolve. Challenge the learners to think of reasons for the global patterns of migration. This should be supported with data to show patterns of migration at global, continental and national scales (by distance and age).<br><br>In discussion learners could be asked to think of reasons why they might migrate and over what distance. What type of information would govern how they might make a decision? Would their reasons change as they get older? This might be a good opportunity to include the life-cycle model.<br><br>Economic, social, environmental and political reasons should be further discussed, expanding to consider the impacts on both receiving and source regions. Emphasise links with population structure and Topic 4 Population.<br><br>**Extension activity:**<br>What are the constraints, obstacles and barriers to migration?<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/13 Nov 2014 Q11a and 11b<br>9696/13 Nov 2014 Q11c |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1 and KC7**<br><br>5.2: Internal migration (within a country) | Learners should understand rural-urban and urban-rural movements, including: their causes and impacts on source areas and receiving/destination areas including population structures<br><br>Learners should be able to explain stepped migration within the settlement hierarchy and urban-urban movements<br><br>Learners should be able to explain the causes and impacts of intra-urban movements (within urban settlements) | The processes of migration should be discussed and the following theories introduced:<br>• stepped or stepwise-migration<br>• Gravity model<br>• Lee's migration model.<br><br>Rural-urban migration in LICs (and HICs) should be discussed. Learners could create a table listing push and pull factors for rural-urban migration and link this to pluses and minus in Lee's model. Discuss whether the pluses and minuses have equal status or whether some are more important than others. Would the importance vary with age and gender?<br><br>Urban-rural/counter-urbanisation in HICs (and LICs) should be explained. Learners should be able to explain the causes of this and its impacts on source areas and receiving/destination areas.<br><br>**(I)** Learners could research and record the reasons for urban-urban migration – and the impacts of this.<br><br>Intra-urban migration perhaps related to the life cycle model. There should be careful assessment as to whether moving to the suburbs is intra-urban. Are suburbs classified as urban? There is some dispute about this.<br><br>Links could be made to settlement hierarchy with Topic 6 on Settlement dynamics in mind.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/12 Jun 3013 Q11a<br>9696/11 Jun 2014 Q11 |
| **KC1 and KC7**<br><br>5.3: International migration | Learners should recognise voluntary and forced (involuntary) movements<br><br>Learners should be able to explain the | Learners should be able to classify migration into forced and voluntary and be able to give examples. This lends itself to a sorting exercise, where learners discuss and classify a number of examples of international migration. This could include causes, push factors, pull factors and consequences and/or specific examples of migration. In sorting the different elements, useful discussion usually occurs and may generate further enquiries.<br><br>Learners should be encouraged to distinguish carefully between refugees and economic migrants. The UNHCR definition of a refugee is someone who owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion is unable to return to their country |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | causes and patterns of international migrations (including economic migration and refugee flows) and impacts on source areas and receiving/destination areas | because of such fear. The definition has been slightly widened to include the effects of war and natural disasters This last extension of the definition creates a certain ambiguity which could be a good topic for a group debate. Reference to current migration from Syria and North Africa to Europe is a good starting point to that discussion but there are many local examples in Africa and Asia that would also be relevant (see below). Local examples are always better.<br><br>Learners should consider the characteristics of the individuals who migrate. This can then be followed up with the behavioural model of migration. The definition of migrability is the likelihood of an individual to migrate from one area to another. This reflects the migrants' socio-economic status, gender, age, physical and psychological make-up, etc. Mobility usually expresses the ability to move, e.g. access to transport.<br><br>Possible migration examples include:<br>• natural disasters, e.g. Montserrat<br>• voluntary economic migration, e.g. Mexico to USA<br>• emigration culture, e.g. Ireland<br>• cultural diversification, e.g. immigration to Australia<br>• refugees, e.g. Iraq, Syria, African states, Afghanistan, the Vietnamese boat people, Jewish people to Israel<br>• north Africa to Europe<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/11 Nov 2013 Q5<br>9696/12 Jun 2013 Q5c<br>9696/11 Jun 2014 Q11c<br>9696/11 Jun 2012 Q5 |
| **KC1, KC4 and KC7**<br><br>5.4: The management of international migration | Learners need to know a case study of one international migration stream: its causes, character, scale, pattern and impacts on source areas and | The case study can be related to different aspects of migration, e.g. forced/voluntary, long/short term, long/short distance. Try to choose a local example which may be particularly accessible to learners.<br><br>**(I)** Learners should create a summary of the case study. It should include:<br>• the causes of the migration, including economic, social, environmental and political reasons.<br>• the character of the migration<br>• the scale |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | receiving/destination areas. | • the pattern (spatial)<br>• its impact on source area and receiving area – this should include economic, social, environmental and political impacts<br>• facts and statistics to support key points.<br><br>The syllabus does not insist on knowledge of the management of population movement/resultant change, but it may be included.<br><br>Useful websites for learners to carry out their research:<br>www.refugeecouncil.org.uk<br>www.statistics.gov.uk<br>www.unhcr.ch<br>www.sln.org.uk/geography |
| **Past and specimen examination papers** | | |
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# Topic 6: Settlement dynamics

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| General introduction | Knowledge and understanding of the distinction between urban and rural<br><br>Relationships between settlements | Provide two images – rural and urban.<br>Challenge the class to define the terms rural and urban on the basis of the attributes shown by each image. Usually photographs are the most appropriate images (aerial photographs could introduce the spatial characteristics) but you could use a passage from a novel, a cartoon, a painting or a poem. The discussion could be extended as to whether such images are appropriate because of the great variability in settlement types and change over time.<br><br>A spider diagram could be built up from the image and other characteristics added as the class think of ideas associated with urban and rural environments. It does not take long but is an effective way of introducing the topic.<br><br>Introduce the idea of rural and urban areas as systems with inputs and outputs in order to maintain the links with the physical core. Suggest that they are both subject to change and processes that result in change over time, hence the topic title 'settlement dynamics'. |
| **KC3 and KC7**<br><br>6.1: Changes in rural settlements | Learners should understand contemporary issues in rural settlements in LICs, MICs and HICs (e.g. depopulation and service provision) including the impacts of internal migration and the consequences of urban growth<br><br>Learners should know a case study of a rural settlement (village or | **(I)** Learners can create a single page summarising work already covered on rural-urban and urban-rural migration as a way of preparing for this work.<br><br>Rural areas vary tremendously in nature depending on local and national conditions. This could be introduced by asking learners to list the factors that affect rural areas in HICs and LICs. This could be followed with a discussion as to how these might affect the nature of the rural areas such as service provision and growth/decay. There is scope here for relating these factors to the learners' own country/area.<br><br>**(I)** Learners should create a case study of a rural settlement (village or hamlet) or rural area. This can be selected from an LIC, MIC or HIC. It is ideal if the example can be a local one familiar to the learners. The impact of movement both from and to rural areas should be emphasised. They should record the management of issues in the rural settlement or rural area resulting from growth (or decline).<br><br>The case study should have detail about location (nationally, regionally and locally), size, functions, land use, population structure (if possible), reasons for decline and/or growth, issues with accessibility, changing nature of |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | hamlet) or a rural area showing some of the issues of its development and growth (or decline) and be able to give an evaluation of the responses to these issues | economic activity, population change and trends, e.g. counterurbanisation and perceptions of rural life. Textbooks have good examples which can be supplemented by other sources, e.g. maps and aerial photographs.<br><br>Rural deprivation and poverty may be included in LIC, MIC or HIC examples, e.g. lack of infrastructure, lack of services: financial, health, education.<br><br>The other areas that should be considered include:<br>• changing lifestyles, e.g. commuting, teleworking.<br>• changing economic activity, e.g. tourism, farm diversification as possibilities for a rural area.<br><br>Much depends upon the choice of case study.<br><br>Any development strategies which are relevant to the chosen example or of general application can be considered.<br><br>These case studies do not always fit the questions ideally. Check past papers when selecting case study material.<br><br>This section should include management of the issues which will be dependent on the case study chosen. What is essential is the management responses to the issues identified: attempted solutions, successes and failures. They may be past, present and future.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/13 Nov 2014 Q10b and 10c<br>9696/12 Jun 2014 Q6 |
| **KC1, KC2 and KC5**<br><br>6.2: Urban trends and issues of urbanisation | Learners should be able to explain urban growth, the processes of urbanisation and its causes and consequences in LICs, MICs and HICs, including: | Suggest that so far the study has been a static one and now it is necessary to consider the processes.<br><br>Population growth links to the idea of urbanisation. You should distinguish between urbanisation (the concentration of population into urban areas) and urban growth (growth in population numbers and/or physical expansion of the urban area). Emphasise the distinction between these two terms.<br><br>In 2015 54% of people lived in cities with a rapid population rise in MICs and LICs. It is predicted that by 2050 urbanisation will be 62% in Africa, 65% in Asia and 90% in Latin America (at present Latin America is the most |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | counterurbanisation and re-urbanisation, competition for land and urban renewal<br><br>Learners should be able to explain the concept of a world city: causes of growth of world cities and the development of a hierarchy of world cities | urbanised part of the world). A useful article is www.theguardian.com/global-development-professionals-network/2015/mar/26/2015-challenges-urbanisation<br><br>Settlements change over time and grow. Introduce the idea of the primate city with a definition. Suggest the idea of rank-size – this does not need detail, but it helps to endorse the idea of primacy. You may also want to consider competition for land and urban renewal.<br><br>HICs, e.g. UK<br>Historical background – 19th Century urbanisation and industrialisation, i.e. shift from primary to secondary industry, rural-urban migration as a consequence. Growth of the inner city, suburbanisation. Outward unplanned growth – urban sprawl. 20th and 21st Century car culture in the USA could be mentioned for comparative purposes. Annotate a diagram to show the rural-urban continuum.<br>This work will include intra-urban migration which links with 5.2 Internal migration (within a country).<br><br>LICs<br>Historical background explaining recent urbanisation related to rapid population growth, industrialisation and movement from rural to urban areas.<br><br>Introduce the idea of a hierarchy of settlement within a country using the rank-size rule. Emphasise the idea of a theory and its application to reality.<br><br>**(I)** Learners should develop a case study for both LICs and HICs to demonstrate settlement growth over time and the reasons for this. A local case study might be appropriate.<br><br>Learners should be able to define/classify cities. You should introduce the concept of a world city and distinguish between a primate city and a world city. Global hierarchy of world cities of differing status, e.g. alpha, beta and gamma world cities. Causes of world city growth should be considered (economic, social and political) and development of a hierarchy of world cities.<br><br>**(F)** This past paper will help assess learner understanding:<br>9696/11 Jun 2014 Q6 |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1, KC2 and KC5**<br><br>6.3: The changing structure of urban settlements | Learners should be able to explain the factors (social, economic, environmental and political) that affect the location of activities within urban areas (including planning) and how urban locations change over time for retailing, services and manufacturing<br><br>Learners should be able to explain the changing central business district (CBD)<br><br>Learners should appreciate the competition for space (spatial competition) in urban areas, the concept of bid rent, and functional zonation<br><br>Learners should be able to explain residential segregation: causes | Urban structure (functional zoning) needs to be examined and the factors affecting the location of activities. Learners should also appreciate the manner in which this zonation changes over time. This needs examining for retailing, services and manufacturing.<br><br>The idea of a model may simplify the complexities of the reality of land use in the urban area. The models are not examined but may help understanding, e.g. Burgess, Hoyt**,** Harris and Ullman. There is a need to stress that these models were developed for HICs and may not be applicable to LICs or MICs.<br><br>**(I)** Learners should explain using annotated diagrams showing how each of the four urban models outlined above may or may not be applicable to LICs and MICs.<br><br>Consider the pattern and details of characteristics of each area, e.g. housing density, type, age and how land use changes, e.g. residential, retail and manufacturing services.<br><br>The CBD needs specific study. The definition of CBD is used to distinguish from inner city.<br><br>Vertical as well as horizontal zonation should be considered, e.g. in the CBD office space above ground floor retail. The character and function of the CBD should be emphasised and a distinction between core and frame is appropriate. Competition for space and the concept of bid rent should be discussed. To do this an annotated diagram of the bid rent model would be appropriate.<br><br>Learners should understand the reasons for invasion and succession. This may be the result of not only economic and social factors but also political factors, e.g. planning and changing government policy. For example, Johannesburg illustrates well how the post-apartheid government resulted in corporate business relocating to a northern suburb (Sandton), whilst the CBD had high-rise, high value locations taken over by small businesses (often ground floor retail and first floor services) and informal economy.<br><br>The nature and development of residential segregation needs exploring. This should be considered in light of the role of the housing market and the influence of family and friends, culture and planning.<br>Learners could consider the advantages and disadvantages of living in a segregated area such as a particular neighbourhood, ghetto or cultural enclave. Consider the reasons why residential segregation develops within urban areas, e.g. race, ethnicity, language, religion, inertia, income/ability to pay, the local property market (landlords, gatekeepers), planning decisions. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | (income and race/ethnicity) and processes (e.g. operation of the housing market, influence of family and friends, culture and planning) | Change in urban areas should be discussed. This should include:<br>• counterurbanisation<br>• re-urbanisation<br>• gentrification.<br><br>Counterurbanisation (movement into rural area beyond the urban limit) should be distinguished from suburbanisation, which involves centrifugal movements to the suburbs of population and other functions, including:<br>• retail – out of town shopping and hypermarkets in suburban locations<br>• manufacturing and service industries moving to outer edge of urban space, i.e. suburban locations.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/12 Jun 2013 Q12a and 12b<br>9696/11 Jun 2012 Q6 |
| **KC1, KC4 and KC7**<br><br>6.4: The management of urban settlements | Learners should know a case study of urban settlements showing the challenges of, and evaluating the attempted solutions in, each of the following:<br>• a shanty town (squatter settlement) in an LIC or MIC<br>• providing infrastructure (either power or transport) for a city | Two case studies are needed:<br>• a shanty town (squatter settlement) in an LIC or MIC<br>• the provision of infrastructure (either power or transport) for a city.<br><br>To begin, you could analyse a map of location of informal settlements. This could involve comparing a photograph of a squatter settlement with that of an inner city area which learners could describe, annotate and explain.<br><br>Shanty town case study<br>It may be possible to select a case study of shanty towns and/or squatter settlement, which can also be used to consider strategies for reducing urbanisation. Management of the shanty/squatter area should also be covered.<br>The case study of the shanty town should include:<br>• location<br>• characteristics<br>• problems<br>• management of these areas within the urban structure<br>• a consideration of whether the area represents a ‘slum of despair’ or a ‘slum of hope’. ‘Slums of hope’ have service schemes, housing improvement and stronger social structures.<br>Infrastructure provision case study |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | It is important to restrict it to infrastructure and not to other provision and changes. The case study could cover:<br>• a traffic management scheme<br>• a power provision scheme.<br><br>**(F)** This past paper will help assess learner understanding:<br>9696/11 Jun 2014 Q12 |
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# Topic 7: Tropical environments

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| General introduction | The intention is to convey an overview of the option at the outset<br><br>Main climatic types, biomes and their locations in the tropics | Learners could study a world map of the major biomes of which the tropical rainforest (TRF) and savanna are two examples. They could then discuss why these biome distributions occur. They should:<br>• consider latitudinal distribution<br>• relate biomes to the global climate map and global population distribution.<br><br>Emphasise the humid tropics/low latitudes and the link between the sub-sections on climate, vegetation and soils in the syllabus through these maps.<br><br>**(I)** Give climate data for selected stations, e.g. equatorial climate (humid tropical), savanna climate (seasonally humid tropical), monsoon climate. Learners should plot this data on climate graphs and describe in detail climatic characteristics of each as a lead in to explanation.<br><br>**Extension activity:**<br>Learners could consider why there is concern over the protection of tropical environments. This could cover concepts such as the importance of wilderness areas, pristine physical environments, biodiversity, resources, endangered species, the threats posed by indiscriminate exploitation and the need for conservation.<br><br>There is the possibility to develop links to Advanced Human Options Topic 2 Environmental management and 3.3 Tourism.<br><br>This website may be useful:<br>www.worldclimate.com |
| **KC1 and KC2**<br><br>7.1: Tropical climates | Learners should be able to describe the global distribution and climatic characteristics of humid tropical and seasonally tropical environments, | The foundations will have been laid at AS through Topic 2 Atmosphere and weather.<br><br>A good starting point is a recap on the general circulation of the atmosphere. Then focus on the Hadley cell and the formation of ITCZ, low pressure at the Equator, descending air at 30˚ N and S, producing high pressure. Air masses, associated wind belts – trade winds. Migration of thermal equator according to the seasons. Relate to the resultant changing position of pressure and wind belts, onshore/offshore winds and resultant rainfall. Relationship of Earth to Sun as it moves to produce seasonal variations in temperature. Ocean currents also have an influence |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | including: the roles of the intertropical convergence zone (ITCZ), subtropical anticyclones and monsoons<br><br>Learners should be able to explain the key features of temperature and rainfall and their annual and diurnal variations in the humid tropical and seasonally humid tropical environments | that should be considered.<br><br>Go to: www.thebritishgeographer.weebly.com/the-climate-of-tropical-regions.html for information on the three different climatic types.<br><br>Examples:<br>West Africa aptly demonstrates the change from equatorial to savanna climate with seasonal variation in rainfall. It may be appropriate to introduce the West African ecocline (vegetation transect) to demonstrate links between climate, vegetation and human activities and to stress the gradual change in climate and vegetation characteristics especially for the savanna.<br><br>**(I)** Learners could be given climate statistics for stations on a transect north-south in West Africa and asked to plot annual climate graphs with an explanation based on the movement of the ITCZ and maritime-continental transition.<br><br>For Indian sub-continent Monsoon climate learners should consider the sub-tropical jet stream and its relation to surface conditions. Go to www.teachindiaproject.org/Monsoon.htm for information on the Indian monsoon with an interactive e-book and webquest.<br><br>**Extension activity:**<br>Learners could create well annotated maps to locate examples and explain the climatic variations. |
| **KC1, KC2 and KC6**<br><br>7.2: Landforms of tropical environments | Learners should be able to explain the formation of characteristic landforms:<br><br>Granite: (deep weathering profiles) tors, inselbergs and bornhardts | The theme of this section of work should emphasise the link between process and form. It will be familiar from AS work. See the AS Level scheme of work 3.2 Weathering and 3.3 Slope processes.<br><br>Review with learners the weathering processes:<br>• physical – exfoliation, dilatation, crystal growth, frost action (possible in highland areas)<br>• Chemical – hydrolysis, hydration, carbonation.<br><br>Remind learners of the Peltier diagram, they could annotate this with what they can remember from the AS course.<br>Latitudinal variation of weathering depths should also be covered. This should link to basal surface of weathering which should be defined (sometimes known as the weathering front). |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | Limestone: tropical karst (cone karst, tower karst and cockpit karst) | Learners should be aware of the following factors that influence weathering rates:<br>• Van't Hoff's Law<br>• the role of water<br>• rock structure – joint patterns can increase the surface area and allow ingress of water<br><br>These factors influence both the rate and amount of weathering. The role of time should be introduced – many tropical areas have been stable tectonically for a very long time.<br><br>Granite – characteristics of granite composition and structure. Weathering of granite: hydrolysis. Weathering front-basal surface, joint pattern, corestones, saprolite.<br><br>Evolution of landforms:<br>• etchplanation theory: deep weathering creates an irregular weathering front. This is exhumed by stripping which could happen for a number of reasons, including climate change, fluvial activity or vegetation removal. Learners should appreciate the cyclical nature of the stripping.<br>• pediplanation – uplift of a pediplain which allows vertical fluvial incision. Learners should be aware of pediment formation and the role of water in lateral planation of these surfaces and the relation to parallel retreat of slopes. Link to 10.2 Processes producing desert landforms.<br><br>Learners need to be able to describe and explain the formation of the following landforms: tors, inselbergs and bornhardts.<br><br>Learners could be asked to produce diagrams of the transition from weathering zones and weathering front, to bornhardts, koppies and tors and contrast this with diagrams of incision and pedimentation. This could be followed by general discussion as to whether the features would be different (suggest that the former process might lead to more rounded forms). Excellent images of these landforms are available at:<br>www.siue.edu/GEOGRAPHY/ONLINE/Gillespie.htm<br><br>Limestone – characteristics of limestone composition and structure. Joint pattern, bedding planes and vertical joints. Permeability. Learners should understand how limestone is weathered due to carbonation-solution.<br><br>Tropical karst limestone forms – emphasise vertical nature of the weathering to produce scale of these landforms. As with granite landforms, learners could be asked to draw a sequence of diagrams distinguishing between |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | cockpit and tower karst.<br><br>These websites provide good examples for limestone scenery:<br>www.courses.washington.edu/tesc243/jamaica/index_files/page0004.htm – cockpit karst in Jamaica<br>www.siue.edu/GEOGRAPHY/ONLINE/Gillespie.htm – tower karst in Thailand<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/22 Nov 2014 Q1b<br>9696/22 Nov 2014 Q2a |
| **KC1, KC2 and KC6**<br><br>7.3: Humid tropical (rainforest) ecosystems and seasonally humid tropical (savanna) ecosystems | Learners should appreciate the concepts of plant communities, including: development of climax, subclimax and plagioclimax<br><br>Learners should be able to recognise vegetation characteristics<br><br>Learners should be able to explain nutrient cycling, including: Gersmehl diagrams, soil fertility, energy flows and trophic levels<br><br>Learners should be able to explain soil | This section needs an introduction to the ecosystem as a concept, and its structure, functioning and development over time.<br><br>Plant communities – learners should be aware of the concept of vegetation development over time and be able to distinguishing between climax, subclimax and plagioclimax stages. Ask learners to produce a spider diagram or flow chart illustrating the manner in which the pathway to a climax vegetation type is inhibited (natural processes) to produce a subclimax, or disrupted by human activity to produce a plagioclimax structure.<br><br>Tropical rainforests – learners should be aware of their structure, characteristics, adaptations and nutrient cycling. They should be able to describe and explain the relationship to climate/reasons for the nature of the forest/large biomass/high productivity.<br><br>Case study material could be introduced here to consider the human and physical factors which determine the nature of the forest, or it can be studied as a separate section after all the theory is covered. Familiarity with secondary succession and how it differs is important as it ties in with the idea of management and sustainability. The websites below have useful resources:<br>http://www.internetgeography.net/topics/rainforest.html<br>www.s-cool.co.uk/a-level/geography/ecosystems/revise-it/the-tropical-rainforest<br><br>Savanna – learners should be aware of its characteristics, the adaptations of vegetation to seasonal variation of rainfall, nutrient cycling and productivity rates. Comparison with TRF and explanation of differences can be part of formative assessment. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | formation, including: soil forming processes, soil types and profile characteristics (oxisols/latosols, tropical red and brown earths) | Learners should be able to describe and explain the spatial variation of vegetation (ecocline) north to south across the savanna in West Africa (reference back to 7.1) and link this to the spatial variation in seasonal rainfall. The website below provides a useful introduction to the savanna ecosystem:<br>https://php.radford.edu/~swoodwar/biomes/<br><br>As part of their work on both TRFs and savanna, learners should be familiar with and be able to explain the following key concepts:<br>• biomass – total mass of living organisms present in an area. Expressed as mass per topic area measured as dry weight. It is a weight, compared with productivity, which is a rate<br>• productivity – rate of energy production, usually on an annual basis. Gross Primary Productivity (GPP) is total energy production including respiration. Net Primary Productivity (NPP) is the total amount of energy transferred from sunlight into organic matter (photosynthesis) minus the energy lost via respiration. It is expressed as a rate g/m²/yr<br>• trophic levels – a feeding level within a food chain from which energy is lost. Biodiversity is a term used to describe the variety of species, both floral and faunal within an ecosystem<br>• nutrient cycling – Gersmehl diagrams. Learners could be provided with a blank Gersmehl diagram and asked to modify it for tropical rainforest and savanna areas<br>• plant succession, climax vegetation, plagioclimax, seres, prisere, sub-seres, plagioseres seral stages, subclimax.<br><br>**Extension activity:**<br>Learners could be asked to draw two Gersmehl diagrams to show how nutrient cycling differs between savanna and TRF ecosystems.<br><br>Soils<br>Introduce some basic background detail if soils have not been studied previously. This might include a definition of soil and information about its composition and structure.<br><br>Learners should be able to describe and explain soil forming processes, including: the role of precipitation-evaporation ratios, leaching and upward capillary action, gleying, ferrallitisation, laterisation, calcification and duricrusts. Learners should understand the factors which influence soil formation, including: climate, vegetation, relief, fauna, geology and time.<br>**(I)** Learners could produce well annotated soil profiles for tropical soils. These should include oxisols/latosols, |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | tropical red earths and tropical brown earths. Different soil classifications use different names such as ferrisols for oxisols.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/22 Nov 2014 Q1a<br>9696/22 Nov 2014 Q2b |
| **KC1, KC4 and KC7**<br><br>7.4: Sustainable management of tropical ecosystems | Learners should know a case study of some of the threats to (exploitation) and problems of sustainable management of areas within either the rainforest ecosystem or the savanna ecosystem and evaluate attempted solutions | The main idea in this section is a case study of sustainability in relation to the functioning of the physical environment and human use of that environment in order to maintain its resources. Concepts and issues discussed could include carrying capacity, soil erosion, leaching, infertility, zoning and biosphere reserves. This should be linked to human activities and management strategies. The case study should focus on:<br>• its location – use of sketch maps<br>• the issues affecting sustainability<br>• the strategies employed to increase sustainability<br>• the relative success of those strategies (i.e. positive and negative aspects).<br><br>Good images at: www.nasa.gov<br>Focus on Brazilian rainforest: www.inpe.br/ingles/ |
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# Topic 8: Coastal environments

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1 and KC3**<br><br>8.1: Coastal processes | Learners should be able to explain wave generation and characteristics: fetch, energy, refraction, breaking waves, high and low energy waves, swash and backwash<br><br>Learners should understand marine erosion: hydraulic action, cavitation, corrasion/abrasion, solution and attrition<br><br>Learners should be able to explain sub-aerial processes: weathering and mass movement<br><br>Learners should be able to explain marine transportation and deposition: sediment sources and characteristics, sediment cells and | You could begin with a general introduction to the idea of the coastline as the zone of interaction of many processes**.** Learners could be asked to list and classify the processes acting on the coastline (interface between marine and sub-aerial processes) and the factors that might influence this interaction.<br><br>Introduce a definition of a wave and develop this to consider wave terminology – wave height, frequency, crest and trough. This can be done by means of a diagram drawn by the learners. Stress that it is the wave form (energy) which moves and not the water itself.<br><br>Learners should understand the factors controlling wave formation and size. This should include:<br>• wind velocity<br>• depth of water<br>• fetch, i.e. the distance the wind has travelled across the water surface influences the nature of the wave.<br><br>Waves possess energy and therefore they have the ability to carry out processes. Learners should be warned that simply drawing a straight line from an atlas map will not indicate fetch, e.g. fetch from the South Atlantic to the British Isles is unrealistic.<br><br>Learners should also be aware of wave zones, including breaker, surf and swash. They should be able to describe and explain:<br>• breaking waves – waves break when the water depth is too shallow to support the whole oscillation<br>• swash – movement of water up the beach<br>• backwash – movement of water down the beach<br>• how the relative strength of backwash and swash influence the nature of the wave.<br><br>Constructive waves/swell waves (low energy) have swash which is greater than backwash. They tend to have a large fetch, long wavelength, low height, found on low gradient beaches and are low energy waves which deposit material. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | longshore drift | Destructive waves/storm waves (high energy) have backwash which is greater than swash. They tend to have a short fetch, short wavelength, high waves and frequency, found on steeply sloping beaches and are high energy waves which erode.<br><br>Learners should be able to make a distinction between low energy coasts and high energy coasts.<br><br>Wave refraction – link to headlands and bays. Variations in water depth – deeper water around headlands, concentration of erosion whereas deposition in bays. Wave refraction off the end of a spit – link to deposition and recurved ends of the spit.<br><br>**Extension activity:**<br>Learners could be asked to draw a diagram of wave refraction around a headland and then to assess the consequences for erosion and deposition.<br><br>Relationship between wave type and beach profile<br>Learners should understand the relationships between the wave types and beach profiles. Explain how beaches may be in a state of dynamic equilibrium because the steeper profile produced by swell waves (more swash pushing material onshore) will cause destructive waves which comb material down the beach (backwash greater than the swash) and may deposit if offshore (bars or berms). This will reduce the gradient and a return to constructive waves. Beach profiles may show significant variation between the stormy seasons and less stormy seasons due to variations in wave energy and dominant wave type, linked to wind direction.<br><br>**(I)** Learners should draw the two different profiles related to the two types of waves.<br><br>One approach to the study of processes is via the sediment cell (termed littoral cell in North America). A topic of study could consider a section of coastline and the dynamic equilibrium between erosion and deposition, sources/inputs and sinks/outputs.<br><br>Learners should know the sources of sediment: weathered cliffs, beach material, offshore bars, river sediment, beach nourishment. They should also be able to explain the formation of sediment sinks: offshore bar, beaches (could be in the form of a spit), sand dunes. Learners should be familiar with the transport of sediment around the cell via longshore drift and how current and tidal action influences this within the cell. Cells are ideal topics for study of coastal management – link to 8.4. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | Learners should recognise a variety of marine processes, including waves as agents of erosion via:<br>• hydraulic action or impact, i.e. the sheer force of the waves exerts a pressure which can be up to 30,000 kg/sq.m in storms<br>• wave quarrying (cavitation) – the compression of air in openings in the rocks at the coast as the wave hits. Decompression takes place as the wave recedes. This process weakens the structure and increases surface area for other forms of erosion. Therefore large blocks can be 'quarried' (removed from the cliff face). Also known as quarrying<br>• corrasion/abrasion in which the load carried by the breaking waves acts as a tool, rather like sandpaper, smoothing the rock. Important in producing the notch at the cliff base and in shaping wave cut platforms<br>• attrition reduction in calibre of the load carried by waves as abrasion occurs between the particles<br>• solution is active in calcareous rocks like chalk and limestone where carbonation-solution creates soluble material which is carried away by the waves.<br><br>**(F)** This past paper will help assess learner understanding:<br>9696/22 Nov 2013 Q4b |
| **KC3 and KC6**<br><br>8.2: Characteristics and formation of coastal landforms | Learners should be able to explain the formation of erosional landforms: cliffs and wave-cut platforms, caves, arches and stacks<br><br>Learners should be able to explain the formation of depositional landforms: beaches in cross section (profile) and plan, swash and drift aligned beaches, simple and compound | Cliffed coastlines – photographs will be very useful here and have been used in many past papers and can be used as stimulus for discussion about how marine processes could create such features.<br><br>Learners should be able to explain the evolution of a typical cliff profile: cliff, notch, abrasion/wave cut platform, beach. Cliffs should be studied in profile (cross section) and plan. This is an important distinction which should be known.<br><br>Learners should be able to describe and explain the factors influencing cliff form:<br>• sub-aerial processes of weathering and mass movement. Detail about processes, e.g. frost shattering, carbonation-solution, hydrolysis – those processes which typify the coast rather than weathering itself. Similarly with mass movement<br>• lithology and rock structure<br>• isostatic and eustatic sea level changes<br>• human activity.<br><br>**(I)** Learners could produce a cross profile of a cliff with the respective process and locations annotated or do the same thing in the form of a spider diagram. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | spits, tombolos, offshore bars, barrier beaches, coastal dunes, tidal sedimentation in estuaries, coastal saltmarshes and mangroves<br><br>Learners should understand the role of sea level change in the formation of coastal landforms | Learners should understand there is a variety of cliff forms that are caused by the interaction of different factors:<br>• vertical cliffs in massive resistant rock, e.g. chalk, limestone, granite<br>• complex/composite form – Mixed lithology which have undergone rotational slip<br>• slope over-wall cliffs actively eroded cliff base and a contrasting upper slope of 'dead'/degraded cliff between 5° and 50° which represents past periglacial processes when sea level was lower. Rise in sea level has produced new vertical cliff face<br>• active and inactive cliffs – the latter are dominated by sub-aerial processes<br>• shore (wave-cut) platforms – raised beaches and degraded cliff lines, linked to sea level change. Development of spits may lead to degraded cliff lines as wave attack is prevented.<br><br>Annotation of photographs can be a useful exercise. Human activities may be introduced here, e.g. building on cliff tops may be a contributory factor in cliff collapse/rotational slip.<br><br>Introduce the concept of headlands and bays and their relationship to lithology along a section of coast. Learners should be able to recognise this in plan diagrams and headland profiles. They should be able to explain the evolution of landforms produced due to erosion on the headland (deep water, wave refraction, concentration of erosion on the headland: caves, arches, stacks). Having considered headlands and focused on erosion, the logical progression is into bays and deposition, shallow water and breaking waves.<br><br>www.britannica.com/science/coastal-landform covers a variety of coastal landforms.<br><br>Learners should be able to describe and explain landforms of constructive coasts:<br>• beaches should be studied in profile (cross section) and plan. Gradient, variation in calibre of material from cliff to low tide, storm beach, berm, offshore bar. Relate back to wave type – constructive/destructive and swell and storm profiles, 8.1<br>• micro-features (not specifically mentioned in the syllabus but a useful addition to understanding the nature of beaches). Ripples, cusps, runnels. Formation of these features and understanding of processes operating to produce these small scale features<br>• simple spit is a fairly long narrow straight ridge of sand shingle with one end attached to the mainland and one end in open water. It could be pointed out that shingle is only present in coasts with an offshore supply of coarse material as a result of glaciation and where physical erosion produces coarse material. Sand is characteristic of most beaches worldwide<br>• compound spits which have laterals/recurved laterals |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | • bars have both ends attached to the mainland. Usually has a lagoon behind it, e.g. Slapton Sands and Slapton Ley (lagoon behind the bar), Devon, UK<br>• offshore bars and relationship to spits and longshore drift, e.g. Chesil beach, Dorset, UK, in which offshore material deposited during the Pleistocene has moved inland as a result of the Flandrian transgression (post-glacial rise of sea level).This might also be the explanation for Slapton Sands<br>• tombolos are islands that are linked to the mainland by bars of sand or shingle. Wave refraction can be important and waves are refracted around the island<br>• barrier islands and their relationship to offshore bars. Good examples are off the south-east coast of the USA<br>• coastal sand dunes – formation, form and plant succession in relation to stabilisation of the sand. Profile diagrams are very useful and can be part of formative assessment<br>• salt marshes may be considered in relation to spits and tidal sedimentation in estuaries. Plant succession in so far as the vegetation stabilises the sediment<br>• mangroves replace salt marshes in many tropical coastal areas. Their relation to coastal sedimentation on low energy coasts could be analysed. Their role in protecting coasts can be linked to 8.4.<br><br>**Extension activity:**<br>Learners could make links to human activity on the coast and how this influences the stability and long-term nature of these landforms. Depositional landforms in particular are unstable and fragile environments.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/22 Nov 2014 Q3a<br>9696/21 Nov 2015 Q4 |
| **KC1, KC3 and KC6**<br><br>8.3: Coral reefs | Learners should know the characteristics, distribution and formation of fringing reefs, barrier reefs and atolls<br><br>Learners should understand the | The formation and development of reefs should be explained. Learners should understand the role of coral polyps – a single organism living in a symbiotic relationship with zooxanthellae/algae. Reef form is related to algal variety. This is necessary basic understanding, although questions are likely to focus on reef form and theories of formation.<br><br>Learners should know the conditions for coral growth:<br>• temperature 23–25˚C<br>• water depth less than 25 m but not exposed to air |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | conditions required for coral growth<br>Learners should recognise the threats to coral reefs (global warming, sea-level rise, pollution, physical damage) and possible management strategies | • light for photosynthesis due to clean, clear sediment free water<br>• well-oxygenated water produced by strong wave action.<br><br>**(I)** Using maps, learners should show where the global distribution of coral occurs and how these regions satisfy the criteria above.<br><br>Forms of reefs should be discussed, including fringing, barrier and atoll. Learners should be able to demonstrate links between the three forms. The theory of reef formation should be covered – Darwin, Australia, is the best documented and demonstrates the evolution from fringing through barrier to atoll but the other theories need to be discussed. This is best done in a series of diagrams.<br><br>Go to http://animals.nationalgeographic.com/animals/invertebrates/coral/ for information and images.<br>Go to www.ocean.si.edu/corals-and-coral-reefs for information about coral reefs.<br><br>Learners should recognise and be able to explain why the main threat to coral reefs is global warming. Little can be done about the issues related to global warming (greenhouse gases) but legislation can be introduced to reduce pollution, both from the sea and the land (sediment and fertiliser input). Zonation of areas of coral reefs (such as the Great Barrier Reef in Australia) for conservation such as restricting fishing and tourist activities has been quite successful.<br><br>Coral reefs would be an excellent example to use for sustainable management of a section of coastline, see 8.4. However, a reef alone cannot exemplify all the aspects of human impact which require study so it needs to be used in addition to one or more other case studies.<br><br>Go to www.coral.org/ for information on conservation strategies and the effects of El Nino. |
| **KC4 and KC5**<br><br>8.4: Sustainable management of coasts | Learners should know a case study of some of the problems of sustainably managing a stretch or stretches of coastline, and be able to evaluate the | Learners should develop a case study of one stretch of coastline. This should be of manageable length i.e. not the whole south coast of the UK or the south-east coastline of USA. A sediment (littoral) cell is a useful topic for study. Ideally, it would include both cliffs and depositional features resulting from longshore drift.<br><br>Coastal protection measures<br>Learners should be able to explain how hard and soft engineering strategies work to protect coastlines. They should also be aware of other coastal protection policies such as integrated planning, e.g. SMPs (Shoreline |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | attempted solutions (including hard engineering and soft engineering) | Management Plans), government policy, managed retreat, 'do nothing'.<br><br>**(I)** Learners should create a summary showing how conflict around coastal management may arise.<br><br>Learners should be aware of the cost-benefit analysis of alternative protection measures. Sustainable management may involve more than coastal protection, i.e. zoning of human activities, marine reserves and limits on fishing.<br><br>A range of case studies may be considered appropriate which illustrate particular threatened landforms e.g. coral reefs, spits, salt marshes (see below). However, ideally, learners should appreciate the balance of processes along a section of coastline and be able to evaluate the advantages and disadvantages of the possible solutions, which may involve both physical protection and human utilisation of a stretch of coastline. A coral reef coastline may not offer sufficient coverage of all aspects of this topic so that, although it exemplifies a coastal area under threat, the range of landforms is somewhat restricted and it is advisable to consider examples of other stretches of coastline too.<br><br>Care is needed when using textbook case study material which may not be familiar to the learner. Start with a well labelled map so that they have a spatial context; try to find photographs as well. Maps can be a useful and time-saving means of describing a coastline provided the detail is included. This could also form the basis of an independent study leading to formative assessment.<br><br>Go to www.mottmac.com/article/10091/sustainabole-coastal-investment-programme-india for information on sustainable coastal management in India.<br>Go to www.geographyas.info/coasts/coastal-management/ for two UK based case studies.<br><br>**(F)** This past paper will help assess learner understanding:<br>9696/22 Nov 2014 Q3b |
| **Past and specimen examination papers** | | |
| Past/specimen papers and mark schemes are available to download at https://teachers.cie.org.uk | | |

# Topic 9: Hazardous environments

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1, KC2 and KC3**<br><br>9.1: Hazards resulting from tectonic processes | Learners should know the global distribution of earthquakes and volcanoes and how this relates to plate tectonics<br><br>Learners should understand earthquakes and the resultant hazards, including: shaking, landslides, soil liquefaction and tsunami<br><br>Learners should understand volcanoes and the resultant hazards, including: types of eruption and their products (nuées ardentes, lava flows, mudflows, lahars, volcanic landslides, pyroclastic flows and ash fallout)<br><br>Learners should know | Start with a world map showing the relationship between hazards and population distribution and densities. Annotate or highlight multi-hazardous zones. Discuss level of economic development and likely variations on the impact of the hazards and how people are able to respond.<br><br>**(I)** Encourage learners to keep diaries of hazardous events as they occur throughout the course: newspaper cuttings, television/radio news and current internet sources. They should record the date, time, magnitude, location, cause, impact, scale of response – short-term/long-term; local, national, global.<br><br>Activity related to tectonic plates<br>As an introduction to this go through with learners the following concepts:<br>• a definition and description of lithospheric plates and their different characteristics<br>• the global distribution of tectonic hazards – this should be related to plate boundaries and the resulting global distribution of tectonic plates<br>• activity related specifically to plate margins<br>• types of plate margin – convergent/destructive; collision, divergent/constructive; conservative/passive<br>• causes of plate movement – convection currents relate to direction of movement – slab pull at the destructive margins and slab push at the mid-oceanic ridges. Relation between crustal creation (divergent margin) and crustal destruction (convergent margin). Rates of movement.<br><br>Clear well annotated diagrams are ideal here – ones that can be reproduced easily.<br>www.usgs.gov/natural_hazards has information on seismic and volcanic hazards.<br><br>Learners should appreciate, ideally through case study research, that there are many factors which influence the impact of hazards such as: economic (e.g. level of development); social (e.g. ethnic groups, education); physical (e.g. magnitude and frequency); political (e.g. aid, international relations); and psychological (e.g. perception of risk).<br><br>The prediction of hazards should be covered within each specific section. This should include concepts such as – precaution, protection, prevention, preparedness, costs, benefits, aid, insurance and hazard perception. |

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| | the primary and secondary impacts on lives and property<br><br>Learners should understand how prediction, hazard mapping, preparedness and monitoring of earthquake and volcanic hazards occur and how the perception of risk changes | Differences in response due to variations in levels of wealth, economic and technological development should be considered for all of the concepts listed above.<br><br>Differentiate between forecast and prediction:<br>Forecast is a relatively imprecise statement of time, place and nature of the expected event.<br>Prediction is a relatively precise statement of time, place and ideally the nature and size of the event, i.e. a precise forecast.<br><br>**Extension activity:**<br>Ask learners to consider the ideas of risk and vulnerability:<br>• Risk – exposure of people to a hazardous event.<br>• Vulnerability – the ability of a person or group to anticipate, cope with and recover from the impact of a natural hazard.<br>They could be asked to produce a list of the factors they consider affect vulnerability.<br><br>These ideas are best conveyed through case study material, rather than as general principles. This is a matter of individual choice and resources. However the ideas above form the guidelines which can be followed in each of the hazards in this option.<br><br>Earthquakes<br>Learners should be able to define terms such as focus, epicentre and seismic waves.<br>Measurement of earthquakes: Richter (magnitude), Moment Magnitude scale and Mercalli (intensity) scales.<br>Tables of comparison for Richter and Mercalli will be instructive.<br><br>Learners should be able to link the causes of seismic hazards to the type of plate boundary or fault lines. They should appreciate that the effects extend beyond the immediate plate boundary and at different depths because of the inclination of the Benioff zone.<br><br>Learners should be able to describe and explain the hazards associated with seismic events, including:<br>• primary hazard – shaking<br>• secondary hazards – landslides, soil liquefaction, tsunamis.<br><br>The Japan tsunami of March 2011 is well documented with extensive video and photographs – these can be found |

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| | | at the following websites:<br>http://www.britannica.com/event/Japan-earthquake-and-tsunami-of-2011<br>www.bbc.co.uk/news/world-asia-pacific-12722187<br><br>**(I)** Learners could be asked to summarise and explain the global impacts of the Indian Ocean tsunami (Dec 2004).<br><br>**Extension activity:**<br>Learners could explore other physical factors which may compound the impact such as geological conditions. www.msf.org.uk/tectonic-activity-and-hazards-earthquakes is aimed at A Level geography learners with examples from Haiti, Japan, Turkey and Italy. It has a range of activities to enhance understanding.<br><br>Management of seismic hazards<br>It must be made clear to learners that there is no way to accurately predict earthquakes, but there are many methods used to make estimates and to prepare. You could discuss:<br>• seismic gap theory<br>• monitoring of earthquake zones – use of instruments, seismograph, radon gas, geophysical changes<br>• animal behaviour is always popular but there should be a discussion as to why it is not reliable<br>• hazard mapping<br>• community preparedness, e.g. Earthquake Awareness Day in Japan<br>• hard engineering: earthquake proof building structures are an example of technological fix http://ngm.nationalgeographic.com/big-idea/10/earthquakes explains how buildings can be made earthquake proof.<br><br>Response to earthquakes<br>Learners should develop two contrasting case studies, ideally earthquakes of similar magnitude, one in an LIC and one in an HIC.<br><br>Kobe 1995 is an excellent example of an earthquake which had a huge impact on a country seemingly prepared. It provides many issues for discussion and is well documented. Examples should relate to the particular plate boundary and contain factual detail. Issues of the causes, hazardous nature and impact of the event should be at the core of the study. Scale is a useful framework for the case study, for example area affected; long and short-term impacts. The two Christchurch, New Zealand, earthquakes also provide a useful study such as to why the 2010 earthquake produced no casualties but the later 2011 event, at a lower magnitude, did. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | Through the case studies, learners should develop their awareness of secondary events, e.g. mass movements landslides and mudflows – link with 9.2. Soil liquefaction is a common secondary hazard and these mass movements can compound the effects of the tectonic hazard.<br><br>Volcanoes<br>Learners should be clear about the different types of volcanic activity and how this is related to the plate margin:<br>• destructive margins – explosive activity, pyroclastic flows/nuées ardentes, ash fallout, acid viscous lava flows. Resultant landforms – dome volcanoes, composite cones, cinder cones.<br>• constructive margins – less explosive activity – fluid, basic, basalt lava flows, fire fountaining, lava bombs, e.g. Iceland. Resultant landforms: shield cones – low, gently sloping, wide cones, plateau basalts (Snake River Plateau, USA, Deccan Plateau, India)<br>• hot spots, e.g. Pacific plate. These are 'plumes' of molten material from the mantle which are ejected on the surface far from a plate boundary, e.g. Hawaiian Islands. They tend to produce isolated activity and can occur on continents as well.<br><br>Emphasise hazardous nature of volcanic activity, particularly pyroclastic flows, lava flows and pyroclastic bombs, fire fountains and lahars.<br>www.story.maps.arcgis.com/apps/MapJournal/?appid=4c77a56bbcd743b69232cf3fd9c7a61c is on the world's most active volcanoes.<br>http://volcanoes.usgs.gov/index.html has useful information.<br><br>Learners should be able to describe and explain the secondary hazards associated with volcanoes:<br>• lahars – mudflows. Link to 9.2. A lahar is a type of mass movement. The best example is Nevado del Ruiz in Colombia, 1985<br>• climate change – as the addition of dust to the atmosphere results in temporary cooling, e.g. Mount Pinatubo in the Philippines.<br><br>As with earthquakes, learners should realise we cannot accurately predict eruptions, but many techniques are used to produce as much warning as possible and to prepare:<br>• prediction – monitoring indications of imminent activity such as harmonic tremors, bulges in the cone, geochemical changes, gravitational changes, temperature changes, satellite monitoring<br>• reduction – control, hazard mapping, building structures. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | Human responses to volcanic activity<br>Case studies best exemplify this section. Highlight the physical causes and nature of the activity. The example should be closely tied to the relevant plate boundaries so that the causes and nature of the eruption are clearly known and understood. The links can be made to the impact on the population. Two case studies which contrast the type of activity and level of economic development of the country would be ideal.<br><br>**(I)** Ask learners to research the idea of possible increasing frequency of hazardous events and numbers affected. They should be able to give reasons for this, for example, the role of global warming in the increasing number of atmospheric disturbances.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/22 Nov 2014 Q6b<br>9696/22 Nov 2014 Q6a |
| **KC3 and KC4**<br><br>9.2: Hazards resulting from mass movements | Learners should understand mass movements and the resultant hazards, including their nature and causes<br><br>Learners should appreciate the impacts of mass movements on lives and property<br><br>Learners should understand how prediction, hazard mapping, preparedness and monitoring of the hazard occurs and | Mass movement<br>This topic could begin with revision of the theoretical work covered in 3.3 Slope processes. The focus for this topic should be on the hazardous nature of the mass movement activity and the management of this. This section may be short because foundations were laid in the AS course and case study material has been covered already.<br><br>Learners should be able to describe and explain the causes of mass movements, including:<br>• physical causes – the idea of downslope movement of material under the influence of gravity<br>• the relationship between internal strength of, and external stress on, weathered material on a slope.<br><br>https://ees.as.uky.edu/sites/default/files/elearning/module11swf.swf has an animation showing factors affecting mass movement.<br>• nature and speed of the movement which should lead to the classification of processes: flows, slides and falls<br>• landslides and mudflows<br>• lahars – link to previous section – volcanic activity<br>• snow avalanches may be new material. Nature of snow avalanches: slab (dry), wet, powder avalanches. Causes: conditions for avalanche formation. Precaution, prevention, control. Avalanches as hazards: human responses. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | how the perception of risk can change over time | Human management/mismanagement<br>There could be a discussion as to why mass movements are hard to predict and the effect this has on management. The best form of management is before the events – learners could be asked how areas at risk can be identified.<br><br>**(I)** Learners should identify case studies of mass movements to illustrate the above main points. These can also be used to emphasise mismanagement: Vajont Dam, Italy, 1959; Aberfan, UK, 1966; Holbeck Hall, Scarborough, UK, 1993. The case study material may be linked closely to 3.4.<br><br>**(F)** This past paper will help assess learner understanding:<br>9696/11 Nov 2013 Q3 |
| **KC3 and KC4**<br><br>9.3: Hazards resulting from atmospheric disturbances | Learners should recognise the global distribution of areas most at risk from large scale tropical disturbances (cyclones, hurricanes and typhoons) and small scale atmospheric disturbances (tornadoes)<br><br>Learners should be able to explain the processes causing the formation and development of cyclones, hurricanes, typhoons and tornadoes | Cyclones<br>These may variously be classified as hurricanes, cyclones and typhoons. The National Hurricane Center website has excellent resources: www.nhc.noaa.gov<br><br>**(I)** Learners could be asked to produce a location map to show global distribution of cyclones and the areas most at risk. They should explain why some areas are more at risk from others and the reasons for the global distributions of cyclones.<br><br>Learners should be able to describe and explain the conditions for formation. This requires an understanding of processes of instability, adiabatic changes of temperature, release of latent heat (link to 2.1 and 2.2). The causes of this are due to sea surface temperatures, rapid evaporation and uplift of air and latent heat transfer. The Coriolis force determines direction of movement.<br>**(I)** Learners draw a cross section of a cyclone which should be fully labelled and annotated.<br><br>Hazardous effects: Learners should be able to discuss the primary effects – high winds (measure of the Saffir-Simpson scale), heavy rainfall and storm surges which may result in flooding and landslides.<br><br>Magnitude and frequency: These hazards have considerable potential to damage life and property. Location may be an important factor, e.g. barrier islands of the eastern seaboard of the USA. May be increasing in frequency and magnitude because of global warming. Learners asked as to why global warming might influence the impact of tropical cyclones. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | Learners should understand the hazards from large scale atmospheric disturbances, including: storm surges, coastal flooding, intense rainfall leading to severe floods and mass movement and high winds<br><br>Learners should understand the hazards from small scale atmospheric disturbances, including: intense precipitation (rain and hail), high winds and pressure imbalances<br><br>Learners should recognise the primary and secondary impacts on lives and property<br><br>Learners should understand how prediction, preparedness and | Prediction: Forecasting technology, seasonal pattern of the storms. However it is notoriously difficult to guarantee track and speed of movement of both hazards. Reminder to discuss the distinction between forecasting and prediction.<br><br>Precaution: Evacuation, protection: coastal and river defences against flooding, drills, land use planning/zoning. Insurance, perception of the risk.<br><br>Learners should summarise two contrasting case studies, one in an HIC, one in an LIC. The impact of the storm and the response to the event should be emphasised. Population densities, perception of the risk and contrasting levels of empowerment to control the environment can be highlighted in the contrasting choices.<br>Recent examples: Cyclone Nargis, Irrawaddy Delta, Burma May 2008. Useful because of the political implication of the rescue and management of the aftermath.<br>Go tohttp://news.bbc.co.uk/1/shared/spl/hi/americas/05/katrina/html/ for an in depth report on Hurricane Katrina.<br>Go to www.npr.org/series/164212970/full-coverage-uperstorm-sandy for audio stories of people involved in Superstorm Sandy.<br><br>Tornadoes<br>Definition: A tornado is a short-lived, violently rotating, narrow, funnel-like column of cloud that reaches the ground from a cumulo-nimbus cloud. It is associated with intense low pressure conditions.<br>Learners should understand the formation of tornadoes. In the Midwest of the USA, they are caused by interaction between warm air from the Gulf of Mexico and cold air from the north and west. This creates a supercell and major updraughts of air which form over land and not sea. Measurement of magnitude is via the Fujita Tornado scale.<br><br>Go to www.bbc.co.uk/science/earth/natural_disasters/tornado for information and videos about tornadoes.<br><br>Hazardous effects: Mostly strong winds, but also possible intense hail storms and explosion outwards of buildings because of differences in pressure. Prediction is more difficult than for cyclones. Movement, although short-lived, is difficult to predict.<br><br>**Extension activity:**<br>Learners could be asked to explain differences in prediction between hurricanes and tornadoes.<br><br>Images of tornadoes: www.chaseday.com/tornadoes.htm. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | monitoring of large and small scale atmospheric disturbances occurs and how the perception of risk can change over time | Frequently asked questions about tornadoes: www.spc.noaa.gov/faq/tornado<br>World Meteorological Organization: www.wmo.ch<br><br>Small scale atmospheric disturbances: This mostly concerns rain, hail and high winds. Explanation can be sought by referring back to topics 2.1 and 2.2. These disturbances are so frequent that there are probably many local events that can be used as examples.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/22 Nov 2014 Q5b<br>9696/22 Nov 2014 Q5 |
| **KC4 and KC7**<br><br>9.4: Sustainable management in hazardous environments | Learners need to know a case study of some of the problems of the sustainable management of a hazardous environment and be able to evaluate the attempted or possible solutions | Case studies incorporated at each stage will fulfil the requirements for this section of work. Therefore a separate section may not be needed. General guidance on case studies:<br>• Knowledge of the cause and nature of the event and its location is fundamental. In the case of tectonic hazards, the nature and location of the plate boundary is essential.<br>• The information should be focused under side headings.<br>• Annotated maps and diagrams which are reproducible in examination conditions are ideal.<br>• Factors that influence the impact of the hazard include physical, economic, social, political. Discussion and awareness of causes and factors that influence magnitude and response are important, e.g. nature of the underlying material in an earthquake can magnify the event. Political tensions may potentially influence availability of aid, e.g. Iran 2003.<br>• Timescale, i.e. short-term and long-term view of factors and impacts should be considered.<br><br>Links should be made between the physical event and the human response. Case studies which contrast an HIC with an LIC provide useful material for discussion of human response to the physical event. In addition to this an evaluation of the impact in terms of magnitude and timing of the physical event, preparedness, precautionary measures, prevention and control measures also need consideration. |
| **Past and specimen examination papers** | | |
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# Topic 10: Hot arid and semi-arid environments

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1, KC2 and KC3**<br><br>10.1: Hot arid and semi-arid climates | Learners should be able to describe the global distribution and climatic characteristics of hot arid and semi-arid environments<br><br>Students should be able to define and explain the causes of aridity, including: pressure and wind systems, influence of ocean currents and rain shadow effect<br><br>Learners should be able to recognise the key features of hot arid and semi-arid environments: high wind energy environments, diurnal and seasonal variations in precipitation and temperature | Share with learners the traditional definition of arid and semi-arid areas:<br>• arid: less than 250 mm per annum (year)<br>• semi-arid: 250–500 mm per annum (year).<br><br>Definitions now use P:PET ratios (Precipitation:Potential EvapoTranspiration) and the aridity index:<br>• arid: 0.03–0.2 mm P:PET ratio<br>• semi-arid: 0.2–0.5 mm P:PET ratio.<br><br>In semi-arid areas rainfall may vary up to 40% above or below the mean.<br>Aridity index:<br>• –100 (areas with no precipitation)<br>• 0 (areas where P=PET)<br>• +100 (areas where P>PET).<br><br>Arid areas are between –40 and –100 and semi-arid areas are between –20 and –40.<br>www.fao.org/docrep/T0122E/t0122e03.htm has information on the characteristics of arid and semi-arid environments.<br><br>Using an atlas, ask learners to describe the global distribution of hot arid and semi-arid climates. Learners should consider:<br>• Latitude<br>• West coast – influence of cold ocean currents, e.g. Humboldt (Peruvian), Benguela currents<br>• Continental interiors<br><br>Go to www.ced.org.in/docs/inecc/arid_booklet/Arid-3-Arids.pdf for information on the semi-arid area of Rajasthan, India. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | Learners should be able to describe and explain the characteristics of a semi-arid climate:<br>• temperatures: annual, diurnal range, rainfall annual amounts, variability, convectional rainfall, flash floods P:E ratios<br>• rainfall reliability, water availability, effective precipitation, soil moisture budgets<br>• albedo<br>• high wind energy environments.<br><br>**(I)** Learners could provide a comparison table of arid and semi-arid environments. This would also be useful for revision.<br><br>Discuss with learners the causes of aridity:<br>• descending limb of Hadley cell and related winds which control latitudinal distribution, e.g. Sahara desert<br>• offshore ocean currents, relate to global distribution map, e.g. Namib and Atacama Deserts<br>• rain shadow areas, relate to continental interiors and high mountains, e.g. Andes, Patagonia, Rockies, North America<br>• continentality. |
| **KC2 and KC3**<br><br>10.2: Landforms of hot arid and semi-arid environments | Learners should understand weathering processes, including: thermal fracture, exfoliation, salt weathering, chemical weathering, and their effects<br><br>Learners should understand the processes of erosion, transport and deposition by wind, including: corrasion/ abrasion, deflation, | Emphasise link between process and form throughout, you could also link back to topic 2.2 and hydrological regimes, which could be the starting point, because the topic straddles climate and landforms.<br><br>Desert environment hydrology<br>Learners should understand water flows and stores, groundwater and why there is a predominance of Hortonian overland flow (rainfall intensity invariably exceeds infiltration capacity). There could be a link back to topics 1.1 and 1.4.<br><br>Briefly mention perennial and ephemeral water courses, surface stores, oases, playa lakes, exotic rivers with seasonal flows. This should allow you to make links with human activities in semi-arid areas like the Sahel, for example, tapping groundwater supplies.<br><br>Throughout there should be discussion about these processes, the extent to which they dominate arid areas and the factors that influence the processes. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | traction, saltation, and suspension<br><br>Learners should understand the processes of erosion, transport and deposition by water action, including: hydrological regime, episodic rainfall, sheet and flash floods<br><br>Learners should be able to explain the formation of characteristic landforms, including: sand dunes, wind sculpted rocks (yardang, zeugen), wadis, alluvial fans, arroyos, pediments and piedmont zone (bahadas, playas, salt lakes and inselbergs)<br><br>Learners should appreciate the relative roles of aeolian and fluvial processes: evidence for past climate change | There could be a link to topic 3.2 but treated in greater detail and linked to the development of landforms:<br>• Physical – exfoliation – conductivity of rocks, coefficients of expansion of different mineral of different sizes and colours. Peeling of surface layers of rock – curvilinear sheets. May be aided by dilatation/pressure release. Relate to diurnal range of temperature. Link to water – episodic rainfall, upward capillary movement of water as a catalyst for the process of salt weathering. Exfoliation domes, bornhardts, in semi-arid areas.<br>• Salt weathering – evaporation of water in joints and pores of rocks, expansion of salt crystals by heating and hydration.<br>• Frost shattering in high altitude deserts.<br>• Chemical – limited because of lack of water but present. Hydration especially in semi-arid areas. Greater chemical weathering in semi-arid areas due to greater vegetation cover producing organic acids to facilitate processes.<br>• End products of weathering – block and granular disintegration – link back to the process topic 3.2.<br>• Erosion and transportation – chief agent wind.<br>• Erosion – corrasion/abrasion. Process of abrasion – produces mushroom or pedestal rocks. Discussion about role of wind, transportation of sand particles. Concentration within a metre or less of the surface. Changing view, it is now thought that the role of water and chemical weathering is important. Yardangs and zeugen can be mentioned but structure as well as wind may be an influential factor. These landforms should be drawn to emphasis their differences **(I)**. www.geology.about.com/od/structureslandforms/ig/erosional/yardang.htm shows the formation of yardangs.<br>• Erosion – deflation – erosion of sand to produce deflation hollows. Dimensions large – other factors – structural and then chemical processes once the hollow has reached the water table.<br>• Transportation – suspension, saltation, traction.<br>• Deposition – sand dunes. Reasons for deposition, reduction in wind velocity, initiator of velocity reduction – changing gradient of the surface (an obstacle), changing atmospheric conditions.<br>• Variety of sand dunes according to local conditions. Barchans, seif (linear), transverse, star, etc. Annotated diagrams are an ideal way to present the description of these landforms possibly drawn by learners **(I)**.<br>• Specified landforms – wadis, alluvial fans, arroyos (flash-floods relate to discharge and the relative importance of erosion, amount of load and debris removal), pediments, piedmont zones, bahadas, salt lakes, playas, inselbergs. A diagram is ideally suited for this and will be good for revision. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | (Pleistocene pluvials) and the role of past processes in the development of landforms | **(I)** Learner activity – provide an unlabelled block diagram of a piedmont zone (mountain front with embayments, knick, pediment) with veneer of alluvial material, bahada (peripediment), playa. Ask the learners to name and annotate the features shown.<br><br>Evolution of the profile – learners should know about the theories of formation.<br>Pediplanation – to include parallel retreat of slopes (scarp retreat) and pedimentation, i.e. the formation and extension of the pediment. Theories of pedimentation:<br>• an erosional feature as the result of lateral planation by stream and sheet floods<br>• a transportational slope.<br><br>Lead a discussion of scarp retreat as the result of weathering and formation of a boulder controlled slope which retreats parallel to itself over time, thus extending the pediment, as opposed to the undercutting of the mountain front by lateral corrasion. Relate the theories to the form of the desert cross profile, e.g. the slightly concave pediment seems to indicate the action of running water. Residual masses of mesas, buttes, inselbergs. These masses represent different stages in the evolution of pediplanation. Learners could be asked whether these landforms could be forming today as a lead in to the next section**.**<br><br>Learners should recognise the importance of climatic change in the evolution of desert landforms. They should be aware of pluvials, which are wetter periods coincidental with the glacials of the Pleistocene. This led to the movement south of mid latitude rainfall, and southern extension of the desert into the savanna. Learners could be asked to assess the effect of past climate on the evolution of desert landforms (both erosion and depositional)**.** Evidence for climate change ranges from geomorphological to geological to archaeological.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/22 Nov 2014 Q8a<br>9696/22 Nov 2014 Q8<br>9696/22 Nov 2014 Q7b |
| **KC1, KC2 and KC4**<br><br>10.3: Soils and vegetation | Learners should understand the characteristics of vegetation, including: biomass productivity | Learners should understand why biodiversity is limited, and how this is linked to trophic levels/food chain and limited nutrient cycling. Introduce the two theories of fragility and resilience. They are fragile because food chains are simple, but also resilient because the organisms are highly adapted. This could be an issue for group discussion or debate taking both sides of the argument. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | (biodiversity, limited nutrient cycling and fragility), adaptation of plants to extreme temperatures, physical and physiological drought<br><br>Learners should be able to explain soil processes, including: upward capillary movement of water and minerals (salinisation)<br><br>Students should be able to explain the process of desertification (both natural and human factors) leading to the degradation of soils and vegetation in semi-arid environments | **(I)** Learners should research vegetation characteristics and adaptations to high temperature, drought, salinity and soils which are shallow and nutrient deficient. They should distinguish between physical and physiological drought. This might include strategies to:<br>• reduce water loss<br>• maximize water take-up<br>• reduce overheating<br>• reduce reproduction in times of adverse conditions.<br><br>Introduce the issues with soils in arid/semi-arid environments. Here evaporation is greater than precipitation therefore there is upward movement of water by capillary action. Halomorphic/saline soils are produced due to the process of salinisation, i.e. evaporation of water to produce saline crusts.<br>Go to www.southampton.ac.uk/~imw/Qatar-Sabkhas.htm for information on desert landscapes and soils.<br>Go to www.desertmuseum.org/books/nhsd_desert_soils.php for information on the formation of desert soils.<br><br>A typical desert soil – shallow, grey, saline and nutrient poor. Discuss learners' expectations of desert soils and reasons. Learners should understand soil formation processes including salinisation. Solonchaks, solonetz, solod, and be able to appreciate and account for the variations. They should be able to explain the creation of duricrust. Learners could be asked to decide whether these soils relate to arid or semi-arid environments and why.<br><br>Desertification<br>Definition – there are many definitions. The most accepted is the UN definition. Ask learners why there are many definitions and how this could lead to uncertainty about what is happening.<br><br>Causes of desertification – human activity and/or natural causes could provide the opportunity for individual research of factors and then a class debate.<br><br>Access a map of desertification and ask learners to describe the distribution and suggest possible causes. Perhaps link in with a map of climate. Learners should be able to explain how the following could contribute to desertification:<br>• overcultivation<br>• overgrazing<br>• deforestation<br>• population changes including migration |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | • climate change.<br><br>Case study – Sahel is a classic example and there are good examples in China.<br><br>Soil degradation<br>Learner should be able to explain the causes of soil degradation, both due to human activity or natural causes. This is an opportunity for individual research of factors and then a class debate. This may be linked with desertification but they are distinct. It is also relevant to consider salinisation, especially where excessive irrigation is used. Natural causes tend to be made worse by human activities leading to soil erosion and soil exhaustion in fragile environments.<br><br>**Extension activity:**<br>Once causes and the intricate inter-relationships are understood, learners could devise ways of overcoming some of the problems. |
| **KC1 and KC4**<br><br>10.4: Sustainable management of hot arid and semi-arid environments | Learners need to know a case study of the problems of sustainable management in either a hot arid or a semi-arid environment and be able to evaluate the attempted or possible solutions | One possibility is a case study to include problems of desertification and its management in a sustainable fashion and possibly water supply and the management of that supply. It should illustrate some of the problems of the physical environment and relate these to human activity and the ways in which the problems of rainfall reliability and drought have been overcome, e.g. dams and reservoir schemes, tapping of groundwater supplies, tube wells, irrigation. The process of desertification, typical of the arid margins (semi-arid areas like the Sahel in sub-Saharan Africa) is a useful vehicle for discussion of the combination of physical factors (lack of rainfall) and human activities responsible for environmental degradation and the need for sustainable measures. It is important that the case study relates either to an arid or a semi-arid area. This needs to be explicit.<br><br>Possible case studies include:<br>• Sudan – Gezira Irrigation scheme<br>• Tunisia – water management<br>• Zambia – drought<br>• Egypt – Nile Valley is the best documented example in accessible texts<br>• Sub-Saharan Africa – drought in the semi-arid Sahel.<br><br>It is essential to have one case study that deals with the issue of sustainable management. The key is sustainability – could be economical sustainability as well as ecological sustainability. Ideally it should be a |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | combination of the two.<br><br>**(I)** Learners could write an essay on the Gezira Irrigation scheme:<br><br>**(F)** This past paper will help assess learner understanding:<br>9696/22 Nov 2014 Q8b |
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# Topic 11 Production, location and change

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1, KC3 and KC5**<br><br>11.1: Agricultural systems and food production | Learners should know the factors (physical, social, economic and political) affecting agricultural land use and practices on farms, including: the roles of irrigation, land tenure, the nature of demand and distance from markets and agricultural technology<br><br>Learners should be able to explain the concept of an agricultural system with inputs, throughputs, subsystems and output<br><br>Learners should be able to explain intensive and extensive production and agricultural productivity and the associated issues | The main factors to be covered are physical (land/relief, soil, climate, hazards), social (e.g. population pressure, cultural practices, inheritance laws, education, health), economic (e.g. motive, money/capital, labour force, distance from market), and political (e.g. government policy, NGO assistance, aid, debt). Learners should be able to identify positive and negative factors associated with each.<br><br>Introduce the concept of an agricultural system with inputs, throughputs, subsystems and outputs.<br><br>A blank systems diagram could be filled in by learners as each input, output and process is referred to. This would help to reinforce the links between each. Learners could be asked why a farm is like an open system and the advantages of examining farms in this way (positive/negative feedback).<br><br>This needs to be done for one arable system and one pastoral system. Learners could be asked why the diagrams are different and whether a system approach is more suitable to an arable or pastoral system.<br><br>Examine the differences between intensive and extensive production and discuss the issue of agricultural productivity in the context of intensive and extensive production.<br><br>Issues in the intensification of agriculture and the extension of cultivation need to be addressed and this leads on from the previous section.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/33 Nov 2105 Q1b<br>9696/31 Jun 2015 Q1b<br>9696/32 Jun 2015 Q1a |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC4 and KC5**<br><br>11.2: The management of agricultural change | Learners need to know a case study of the need for, and some difficulties in, the management of agricultural change in one country, at the local scale (the farm, holding or producer) and at the national scale, and be able to evaluate the attempted solutions | This topic needs to be taught in the context of a case study of agricultural change in one country at both the local scale (the farm, holding or producer) and the national scale.<br><br>Agricultural change may occur as a result of government policy or because of external factors such as population pressure, profit motivation or climate change. Modern technology has introduced controversial methods such as GM crops. Alternatives include organic farming.<br><br>The choice of case studies ideally should be as local and familiar as possible.<br><br>In a global economy, farmers are affected by external factors.<br><br>It is important to stress the difference between increasing yield per hectare and increasing land area under cultivation. Both strategies are possible, but may not go hand in hand, one or the other may be the preferred option depending on the location.<br><br>Learners should be able to explain the need for agricultural change, difficulties in bringing about change, management issues and evaluation of attempted solutions.<br><br>Economic aspects of agricultural change: http://www.britannica.com/topic/agricultural-economics<br>Sustainable agriculture: www.monsanto.com/whoweare/Pages/default.aspx<br>Various farming issues: www.defra.gov.uk/<br>Linking environment and farming: www.leafuk.org<br><br>**(F)** This past paper will help assess learner understanding:<br>9696/32 Jun 2015 Q1b |
| **KC1 and KC3**<br><br>11.3: Manufacturing and related service industry | Learners should know the factors affecting the location of manufacturing and related service industry (land, labour, capital, markets, | The syllabus lists a number of factors that affect the location of manufacturing and service industry. These need to be examined in an integrated way.<br><br>The differences in location factors for old ‘heavy’ industries such as steel or shipbuilding compared to modern ‘light’ or ‘footloose’ industries could be a useful starting point. This could be stimulated by two locational diagrams. Simulation exercises can be very useful here. Consider the relative roles of the various factors and link factors to productivity. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | materials, technology, economies and diseconomies of scale, inertia, transport and government policies)<br><br>Learners should be able to explain industrial agglomeration, functional linkages, the industrial estate and the export processing zone (EPZ)<br><br>Learners should be able to explain the informal sector of manufacturing and services, including: its causes, characteristics, location and impact | The theories of Weber, Lösch, Smith (spatial margins to profitability) and the Product Life Cycle model could be presented to learners in a comparative form, perhaps with sufficient discussion to ensure that the concepts behind them are understood. The concepts are more important than the details of the models. So, learners do not need to be able to draw or recall the content of the models and theories, but should be able to interpret a diagram based on one of the above.<br><br>The emphasis needs to be on the functional linkages, the industrial estate and the export processing zone (EPZ):<br>• character<br>• location<br>• organisation<br>• productivity.<br><br>The location factors have changed over time due to factors which include new technology and competition. Case studies of industrial change could be introduced, such as the global shift in the steel industry.<br><br>Looking at past questions does indicate areas of the syllabus that need attention to detail but bear in mind that not all previous papers are directly relevant because of syllabus changes.<br>• case study 1 – Industry in Maharashtra, India<br>• case study 2 – Industrial development in South Korea<br>• case study 3 – High-tech industry in the UK<br>• case study 4 – The US manufacturing belt<br>• case study 5 – The Rise of the Pacific Rim.<br><br>Learners should understand and be able to explain the advantages and disadvantages of EPZs and industrial estates in detail. Case studies need to be compared and consolidated. Learners should look for similarities of approach in the successful countries. Examples could be mentioned from Mauritius, China, Mexico and much of SE Asia. In the economies of many LICs, a large informal sector exists. The informal sector is often associated with those who migrate from rural areas to urban areas and who live in informal housing. Unable to find work in the formal sector, they find, or create, work in the informal sector.<br><br>**(I)** Learners should define the informal sector: They should consider the following features:<br>• characteristics<br>• materials used |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | • profile of the labour force<br>• location(s)<br>• lack of regulation<br>• impact<br><br>Learners could be asked to consider how the informal sector may or may not be a springboard for industrial development or future employment, and the effects of the dynamism of the sector.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/33 Nov 2015 Q2a<br>9696/32 Jun 2015 Q2a |
| **KC2 and KC4**<br><br>11.4: The management of change in manufacturing industry | Learners need to know a case study of the industrial policy for one country's manufacturing and consequent changes in the character, location and organisation of its manufacturing, showing some of the issues faced and be able to evaluate the attempted solutions | A case study is required for one country's manufacturing and consequent changes in that industry. This should focus on changes in character, location and organisation of its manufacturing showing some of the issues faced.<br><br>Governments try to control and develop their resources by planning industrial development. It is useful to study policy priorities (type of industry, location), changes in policy over time and difficulties or issues in industrial change in the chosen country. Some possible examples could be:<br>• the industrial and economic development of Singapore<br>• spatial changes in China's industrial structure<br>• industry in the north-east of England.<br>Evaluation is a crucial aspect of the case study as it tests learners' higher order skills.<br><br>www.enterprise-development.org/page/industrial-policy<br>www.oecd.org/eco/Industrial-Policy-for-a-sustainable-growth-path.pdf<br>www.unido.org/resources/publications/publications-by-type/policy-advice/industrial-policies-and-strategies.html is a useful site as it compares a number of countries. |
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# Topic 12: Environmental management

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC2, KC4 and KC5**<br><br>12.1: Sustainable energy supplies | Learners should recognise renewable and non-renewable energy sources<br><br>Learners should appreciate the factors at the national scale affecting demand for and supply of energy and the balance between different sources (including sustainability, levels of development, resource endowment, climate, income, technology, pollution, energy policy and energy security)<br><br>Learners should be able to describe and explain trends in the consumption of fossil fuels, nuclear power and renewables (hydro-electric power (HEP), wind and biofuels) in LICs, MICs | Learners should be able to classify resources into renewable and non-renewable. Facts and statistics for energy use can be taken from an atlas to build on this.<br><br>Learners should engage in an analysis of trends in use of energy as a starting point, e.g. energy demand and supply in a country in 2005 and 2020. It is important that there is detail about each of the sources of energy in this section. Focus on a particular source of energy – requirements for production, location, contribution to energy budget, etc.<br><br>Suggested case studies:<br>• USA – energy alternatives for the future<br>• wind farms in Europe – a topical issue<br>• solar power and the use of biofuels is another topical issue.<br><br>The following sites have energy consumption and energy imports by country:<br>www.yearbook.enerdata.net<br>http://data.worldbank.org/indicator/EG.IMP.CONS.ZS<br><br>**(I)** Ask learners to compare the approach to sustainable energy in LICs and HICs.<br><br>This section is focused on supply and demand and the relationships and balance between them and different sources. This will involve factors such as sustainability, levels of development, resource endowment, climate, income, technology and pollution. Government energy policy and energy security is an essential part of the analysis.<br><br>Maps and statistics can be studied to show that the main producers of energy are not necessarily the main consumers. Learners could provide a useful summary of this using selected resources.<br><br>Local case studies are encouraged and are often highly effective.<br>A good starting point is graphs and data. Learners should be able to relate changes in technology to trends in |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | and HICs<br><br>Learners should be able to explain the environmental impacts of energy production, transport and usage at local and global scales | consumption. This can be done through a comparison of statistics for present demand/ supply and future demand/supply. A possible comparison of LICs and HICs could be carried out here.<br><br>Learners should be aware all energy production has some environmental impact (including renewables). Fuel extraction and electricity production create industrial waste, transport may spill crude oil, etc. This can be demonstrated by use of case studies, e.g. the Exxon Valdez oil spill or the Trans-Alaska pipeline which has great effects on the natural environment. Nuclear energy has distinct actual and potential impacts locally which may affect wider areas e.g. Chernobyl. The Fukushima, Japan, example provides a link with natural hazards (tsunamis). Learners do not have to consider the human impact of these.<br><br>**Extension activity:**<br>Learners could assess data on carbon dioxide emissions and levels of pollution. They could consider the impact of deforestation and planting of biofuels. They could compare burning fossil fuels with nuclear energy, which may be seen as 'clean' but has other possible dangers.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/32 Jun 2015 Q3a<br>9696/33 Nov 2015 Q3a<br>9696/31 Jun 2015 Q3a |
| **KC2, KC4 and KC5**<br><br>12.2: The management of energy supply | Learners need to know a case study of one country's overall electrical energy strategy and one located scheme showing some of the issues of changes in demand for and supply of electricity, in power production and its location, and be able to evaluate the | Learners need two case studies which should be on:<br>• a national, overall electrical energy strategy<br>• one named located scheme to produce electricity.<br><br>One case study may be sufficient as long as it covers both scales, e.g. Zimbabwe and Kariba (HEP).<br>More than one case study could be developed, e.g. the home country and a contrast (LIC, MIC or HIC).<br><br>It is anticipated that the scheme studied will be from the same country to offer greater detail and depth.<br><br>Both case studies should examine the issues of changes in demand and supply and evaluate the overall success of the strategy.<br>**(F)** These past papers will help assess learner understanding:<br>9696/32 Jun 2015 Q3b |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | success of the overall strategy | 9696/31 Jun 2015 Q3b |
| **KC3, KC4 and KC7**<br><br>12.3: Environmental degradation | Learners should be able to explain the nature, causes and solutions to pollution on land, in the air and in water<br><br>Learners should be able to explain the demand for, and supply of, water and issues of water quality<br><br>Learners should be able to explain factors in the degradation of rural environments, e.g. overpopulation, poor agricultural practices, deforestation<br><br>Learners should be able to explain factors in the degradation of urban environments, e.g. urbanisation, industrial development, inadequate waste | There is a variety of causes of land, air and water pollution.<br><br>Learners should be able to give a definition, classify, and explain the causes and sources of pollution. Learners could use spider diagrams to brainstorm the topic. Add water as a resource to the discussion. You could link this to AS Hydrology and fluvial geomorphology through water quality, abstraction, etc.<br><br>You may also include noise pollution and visual pollution. This is not essential but it could be a useful link to the problems of urban growth and push/pull factors. Useful websites for this are:<br>• www.water-pollution.org.uk/types.html water pollution<br>• www.explainthatstuff.com/waterpollution.html water pollution<br>• www.environmental-protection.org.uk/ air quality in the UK.<br><br>Learners should be able to explain why degradation of rural environments occurs in LICs, MICs and HICs. It is suggested you use a case study from the learners' home country or any context learners can readily understand. www.conserve-energy-future.com/causes-and-effects-of-environmental-degradation.php<br><br>Degradation can result from urbanisation, industrial development and inadequate waste management. There are a number of case studies that can be used as basis for analysis, such as:<br>• the problems of the city of Rome, Italy<br>• Cairo, Egypt, Africa's largest city<br>• many appropriate USA cities<br>• urban redevelopment in Glasgow, UK.<br><br>You may want to compare one LIC and one HIC city but this is not necessary. Ideally, it should be an urban area familiar to the learners and could lead to class discussion as noted for rural environments. Possible case studies:<br>• São Paulo, Brazil<br>• London Docklands, UK.<br><br>Case studies used will be a matter of individual choice, but they need to identify: |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | management. Learners should appreciate the constraints on improving the quality of degraded environments<br><br>Learners should be able to explain the protection of environments at risk (local or regional scale), including their needs, measures and outcomes | • risk factors: general risk factors, e.g. population pressure and specific risk factors (to time and/or place), e.g. road building project. Awareness of the need for some form of environmental protection<br>• the measures involved: proposed or taken<br>• the outcomes: relative success/failure.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/32 Jun 2015 Q4a and 4b<br>9696/33 Nov 2015 Q4a and 4b |
| **KC4**<br><br>12.4: The management of a degraded environment | Learners need to know a case study of one degraded environment, showing the causes, problems faced, issues in attempts to improve it and be able to evaluate the solutions | This section may be covered by reference to any case study.<br><br>Factors, causes, problems, issues, management strategy, attempts or initiatives, and relative success or failure are the key elements. |
| **Past and specimen examination papers** | | |
| Past/specimen papers and mark schemes are available to download at https://teachers.cie.org.uk | | |

# Topic 13: Global interdependence

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1, KC2 and KC5**<br><br>13.1: Trade flows and trading patterns | Learners should be able to explain visible and invisible imports and exports. Global patterns of, and inequalities in, trade flows<br><br>Learners should appreciate the factors affecting global trade: including resource endowment, locational advantage, historical factors such as colonial ties, trade agreements and changes in the global market<br><br>Learners should understand the role of the World Trade Organization (WTO) and free trade. They should be able to critically evaluate the impacts of trade on exporting and | This topic could be introduced by reference to an atlas and the use of world outline maps. The analysis of patterns should include visible and invisible imports and exports and inequalities in trade flows. www.imf.org/external/np/pp/eng/2011/061511.pdf is an exhaustive account of global trade.<br><br>Having examined global patterns it is necessary for learners to examine the factors that have led to these patterns, especially inequalities. Factors that will help in this analysis are resource endowment, locational advantage or disadvantage, historical factors such as colonial ties, trade agreements and changes in the global market. Trade agreements could include case studies on NAFTA, OECD and GATT.<br><br>Learners should be able to explain how the change in global trade has been influenced by the rise of the NICs and the Pacific Rim countries. Much of world trade is organised into trading blocs, based mainly on economic or historical associations. This topic could be introduced by using a matching exercise with the various blocs' acronyms, e.g. ASEAN, and their definitions.<br><br>Learners can explore economic, social, environmental and political factors. It helps to identify short-term and long-term changes and internal and external factors. This could be used as interim assessment **(F)**. Learners could be asked if they had experience of Fairtrade products and where they came from.<br><br>Learners should study the issues surrounding fair trade. This should include:<br>• a definition of Fairtrade<br>• who benefits from Fairtrade? Why?<br>• the negative and positive outcomes of Fairtrade in both exporting and importing countries<br>• the issues of tariffs, child labour and unfair/comparative advantage.<br><br>Many products are now available as fairly traded items. Role play can be used to explore the perspectives of producers, consumers and middlemen. Learners could find one product which is fairly traded and/or one which is unfairly traded and write a profile to present to the class. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | importing countries<br><br>Learners should understand the nature and role of Fairtrade | **(F)** These past papers will help assess learner understanding:<br>9696/32 Jun 2105 Q5a<br>9696/33 Nov 2015 Q5b<br>9696/32 Jun 2015 Q5a<br>9696/31 Jun 2015 Q5a |
| **KC1, KC5 and KC6**<br><br>13.2: International debt and international aid | Learners should be able to explain the causes, nature and problems of debt for countries; the international debt crisis and debt relief<br><br>Learners should be able to describe different types of international aid and aid donors: relief aid, development aid, tied aid, bilateral aid and multilateral aid<br><br>Learners should be able to critically evaluate the impacts of international aid on receiving countries | This topic should involve an examination of the nature of debt and the problems that this causes. Debt should be examined at the national and global scale, culminating in an analysis of the international debt crisis. Since 2005 the issue of debt cancellation has arisen at a number of G8 summits. Learners could follow the arguments individually or in small groups.<br><br>**(I)** Crippling debt and inability to even pay back the interest on the debt means that many countries are unable to invest in development and so endure poverty, etc. Learners should explore this in the context of the vicious poverty cycle and record why international debt can have these sorts of impacts.<br><br>There are many ways to tackle this topic but it lends itself to debate, discussion and evaluation. It must be rooted in factual knowledge. The resources should help although many are not available in textbook form and require imaginative research.<br>• www.imf.org/external/np/sta/ed/ed.htm<br>• www.gfmag.com/global-data/economic-data/xtegh9-external-debt-in-countries-around-the-world is an exhaustive account of world (external) debt.<br><br>Types of aid<br>Some of these overlap. A brainstorming session or spider diagram could be used to distinguish them. Expand to include definitions and examples which are essential for full answers. At some stage it would help to hold a class discussion or debate about the relative merits of trade versus aid and debt. It may be sensible to mention this early on, so learners make the link back to trade and debt. Consider the topic in relation to donor and recipient countries.<br><br>Learners should consider the distribution and direction of aid globally. They could compare this with trade and GDP maps of development (the indices are closely connected). The types of aid which should be considered include:<br>• aid as grants |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | • aid as loans which lead to debt, i.e. debt as an outcome of aid donation<br>• capital projects for development, e.g. HEP schemes.<br><br>A critical appreciation of aid in terms of its impacts on receiving countries (e.g. positive/negative; short-term and longer-term; spatially) is required of learners. Useful websites are shown below:<br>www.gov.uk/government/topics/international-aid-and-development<br>Animated graphs comparing development indicators: www.gapminder. org<br>Make poverty history: www.makepovertyhistory.org<br><br>**(F)** These questions could help learners check their understanding:<br>9696/32 Jun 2015 Q5b<br>9696/31 Jun 2015 Q5b |
| **KC1, KC2, KC5 and KC6**<br><br>13.3: The development of international tourism | Learners should know the reasons for, and trends in, the growth of international tourism<br><br>Learners should be able to explain the impacts of tourism on the environments, societies and economies (local and national) of tourist destinations<br><br>Learners should understand carrying capacity and the tourism multiplier effect | It is useful to reach a consensus as to what tourism is – this could be done by a brainstorming session, from which it should emerge that there are many kinds of activity which could be classed as tourism. Distinguish between leisure and recreation. Make the link to trade.<br><br>Reference to a thematic atlas map of tourist origins and destinations could form the basis for a discussion of global patterns of tourism. Tourism is a rapidly changing industry and it is important to use up-to-date statistics: http://data.worldbank.org/indicator/ST.INT.ARVL has data on tourist arrivals at every country www.euromonitor.com/global-trends-in-travel-and-tourism/report<br><br>**(I)** Learners could use statistics for tourism destinations for different years to analyse the rate of growth in international tourism and to record key patterns.<br><br>A suggestion is to discuss the learners' own experiences of holiday destinations (if applicable) and their perceptions as gathered from the media. How was the destination different from their perception before they went?<br><br>A case study on the environmental impact of tourism is important. Local examples are encouraged as they are relevant and familiar. It is essential that both positive and negative environmental impacts on tourist destinations are included. Perception of impacts should be discussed.<br><br>Learners should appreciate that tourism may be an unstable industry, subject to rapid change. |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | Learners should be able to explain recent developments in different types of tourism (including ecotourism)<br><br>Learners should be able to critically evaluate the life cycle model of tourism | Learners may be able to contribute experience of this from their own lives or home areas. Use could be made of news reports about the impacts of terrorist acts on tourism (e.g. Bali) or hazards (e.g. the Asian tsunami).<br><br>Local familiar case studies are recommended, but it is essential that they contain facts, statistics, locations and preferably a map. Suggested examples include:<br>• growth of tourism in Australia<br>• the effects of terrorism on tourist trade<br><br>The tourism industry is dynamic, constantly redefining what tourism is and diversifying the tourism product. There are many case studies that could be used as a basis for this topic. Some examples could be:<br>• nature tourism in Costa Rica<br>• tourism in Thailand<br>• tourism in Kenya.<br><br>www.geography.org.uk/journals/journals.asp?articleD=848 – ecotourism in Amazonian Peru.<br>Impacts of tourism: www.gdrc.org/uem/eco-tour/envi/one.html<br><br>The intention is to lead into the idea of the life cycle model. The life cycle model could be presented and appropriate case study examples could be used to demonstrate its application (and predictions?).<br>www.Geographyfieldwork.com/ButlerModel.htm<br>www.pacis-net.org/file/2010/P02-12.pdf<br><br>**Extension activity:**<br>Learners should be able to critically evaluate the value of the Butler model.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/33 Nov 2015 Q6b<br>9696/32 Jun 2015 Q6b<br>9696/32 Jun 2015 Q6a |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC4, KC5, KC6 and KC7**<br><br>13.4<br>The management of a tourist destination | Learners need to know a case study of one tourist area or resort, its growth and development, showing the issues of sustainability it faces and be able to evaluate the impacts of tourism on the destination's environment(s), society and economy | The case study may best be located somewhere which is familiar to, or readily understood by, learners.<br><br>Emphasis should be given to management issues at all stages.<br><br>Suggested case studies:<br>• tourism in South Africa<br>• Mediterranean tourist resorts<br>• Goa, India<br>• the Seychelles.<br><br>Specific case studies where there is a need to protect the areas:<br>• Canada<br>• Antarctica<br>• Amazon rainforest. |
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# Topic 14: Economic transition

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC2, KC2 and KC7**<br><br>14.1: National development | Learners should understand the nature of primary, secondary, tertiary and quaternary sectors and their roles in economic development<br><br>Learners should understand the nature, causes (physical and human) and distribution of global inequalities in social and economic wellbeing<br><br>Learners should be able to critically evaluate some of the measures and indices of social and economic inequality | This section could be introduced by showing a series of slides or photographs of people at work in different occupations, leading to a general discussion of the basis for classification of the four sectors. If too simplistic at this level, statistical analysis could be done.<br><br>There is little agreement in the textbooks about the classification: this makes an excellent point for discussion after learners have completed research as an out of class activity.<br><br>Discussion could be linked to the Clark Fisher sector model of development. A follow-up exercise could use triangular graphs, or a series of pie charts, to compare the distribution pattern of employment structures in different countries and/or change over time.<br><br>**(I)** Learners could be given data on the changing employment structure of a country/area and portray it in a meaningful way.<br><br>Learners should be able to define and describe global patterns of development using world maps showing different indices, e.g. GNP. They should consider development distribution and anomalies. Learners could be encouraged to discuss whether the north/south divide is still a relevant concept.<br><br>Describe the pattern – spatial patterns are particular to geography and an understanding of them is important. Patterns may be repetitions of the same phenomenon and may show clusters, highs and lows, etc. Anomalies are exceptions to the pattern.<br><br>Ask learners to explain the pattern. This is a higher order skill and needs understanding of the factors that influence development. Learners should recognise that development is a continuum.<br><br>Use a brainstorming session and a matching exercise to analyse the effectiveness of different economic and social indicators in demonstrating variations in quality of life. This could be done through case studies:<br>• case study 1 – Sub-Saharan Africa<br>• case study 2 – Development in a Javanese village<br>• case study 3 – Development in a named NIC |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | | These are useful websites:<br>United Nations Conference on Trade and Development: www.unctad.org<br>OneWorld (online civil society portal): www.oneworld.org<br>United Nations: www.un.org |
| **KC2 and KC7**<br><br>14.2: The globalisation of economic activity | Learners need to know the global patterns of resources, production and markets<br><br>Learners should be able to explain Foreign Direct Investment (FDI) and the new international division of labour (NIDL). Factors affecting the growth and spatial structure of transnational corporations (TNCs)<br><br>Learners need to know a case study of the global spatial organisation and operation of one TNC<br><br>Learners should be able to explain the factors in the emergence and growth of newly industrialised countries (NICs) | Globalisation is the process in which national economies are becoming more and more integrated into a single global economy. It includes the spread of ideas and cultures too. Actions and decisions taken in one part of the world have knock-on effects in other parts. The global patterns of resources, production and markets needs to be examined.<br><br>LICs tend to be dependent on the primary sector (agriculture and extractive industries). The nature of the industries also varies spatially.<br><br>Learners should be able to explain NIDL which is the shift of low-end manufacturing and assembly jobs from traditional HIC centres to new locations where labour costs are lower and other locational advantages may exist. It also involves the relocation of other types of work, such as research to some NICs.<br><br>The nature and effects of Foreign Direct Investment (FDI) need to be examined with the use of specific examples. http://www.worldbank.org/en/topic/trade covers all countries.<br><br>A possible case study is deindustrialisation in the UK and EU.<br><br>Learners could develop a model of the way in which TNCs grow and develop over time. They could look at the motor vehicle industry and different companies globally as an introduction. Link the TNC to the whole notion of globalisation. Emphasise diversity and change.<br><br>Try keeping the theory to a minimum and doing the work through the case study to reduce teaching time.<br><br>Case study: there are a variety of TNCs that could be used as examples. It might be desirable to choose one that is not familiar to learners.<br><br>**(I)** Learners should select/be given a TNC, they should then research and record the following factors:<br>• operations |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| | Changes in the location of economic activity, e.g. outsourcing of manufacturing and offshoring services: nature, causes and impacts | • organisation<br>• production.<br><br>Learners should be aware of factors that have influenced growth and development: labour, health and safety regulations, pollution, government legislation and incentives, i.e. economic, social, environmental and political factors.<br><br>**Extension activity:**<br>Learners should be able to identify and explain the impacts of deindustrialisation in HICs.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/33 Nov 2015 Q7b<br>9696/32 Jun 2015 Q7a |
| **KC1 and KC7**<br><br>14.3: Regional development within countries | Learners should be able to explain regional disparities in social and economic development and explain the concept of core-periphery<br><br>Learners should be able to explain the process of cumulative causation from initial advantage(s), spread and backwash effects, regional divergence and convergence | Learners should be aware that economic development is rarely evenly distributed within a country. Learners could be asked to assess the relevance of the core-periphery model.<br><br>**(I)** Learners should research how regional disparities could be reduced. They should record potential policies that could spread economic growth.<br><br>Case studies chosen should examine the concept of core-periphery and the process of cumulative causation. In Europe the contrast between the north and south of Italy might be a good example.<br>China would also be a good example with the contrast between coastal areas and inland areas.<br><br>www.Geography.about.com/od/politicalgeography/a/coreperiphery.htm is a discussion of the core-periphery model.<br><br>**(F)** These past papers will help assess learner understanding:<br>9696/31 Jun 2015 Q7b<br>9696/33 Nov 2015 Q8<br>9696/31 Jun 2015 Q8 |

| Syllabus ref and Key Concepts | Learning objectives | Suggested teaching activities |
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| **KC1, KC2, KC3 and KC5**<br><br>14.4: The management of regional development | Learners need to know a case study of one country's regional development policy, its regional disparities, some of the difficulties faced in trying to overcome these disparities and be able to evaluate the attempted solutions | Learners should focus on one country's regional development policy. The study of the management of the issues should be focused on the following points:<br>• the nature of policy<br>• regional disparities<br>• the relative success or failure of the strategies, e.g. economic, social, political and environmental<br>• how the development policy has affected different regions of the country and different groups of people.<br><br>Possible case studies:<br>• the industrial and economic development of Singapore<br>• regional policy in the UK<br>• regional development in Canada<br>• Hong Kong<br>• industrial growth in Malaysia<br>• India. |
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