

GCE A LEVEL

WJEC Eduqas GCE A LEVEL in GEOGRAPHY

ACCREDITED BY OFQUAL

GUIDANCE FOR TEACHING Part 2

Teaching from 2016

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Introduction

The Eduqas A level Geography specification encourages learners to apply geographical knowledge, theory and skills to the world around them. In turn this will enable learners to develop a critical understanding of the world's people, places and environments in the 21st century. Learners should be able to develop both knowledge and understanding of contemporary geographical concepts together with transferable skills that will enable learners to progress to higher education and a range of employment opportunities.

The focus of the specification is to develop an enthusiasm for and competence in geography by using contemporary real-world contexts, from a range of specified spatial scales, and through engagement with and practical application of geographical skills and techniques in the field. This specification draws on both physical and human geography, explores people-environment interactions and encourages development of fieldwork at the local level to enable learners to pose enquiry questions.

The specification covers the required subject content at an appropriate level of rigour and challenge for a GCE A level qualification. The content is organised into the required core and a non-core component. These non-core themes allow for rigour and in-depth treatment and also provide flexibility for teachers to select themes to develop a course of study suited both to their interests and circumstances. The specialised concepts and geographical skills (quantitative and qualitative skills and approaches) are embedded in the core and non-core content.

In addition to this Guidance support is provided in the following ways:

- Specimen assessment materials and mark schemes
- Face-to-face CPD events
- Online examination reviews
- Examiners' reports on each question paper
- Free access to past question papers and mark schemes via the secure website
- Direct access to the subject officer
- Free online resources – [Eduqas Digital resources](#)

The specification, latest news and resources are available on the Eduqas AS/A Geography webpage <http://www.edukas.co.uk/qualifications/geography/as-a-level/>

Aims of the Guidance for Teaching

The principal aim of the Guidance for Teaching is to offer support to teachers in the delivery of the new WJEC Eduqas A level in Geography specification and to offer guidance on the requirements of the qualification and the assessment process.

The guide is **not intended as a comprehensive reference**, but as support for professional teachers to develop stimulating and exciting courses tailored to the needs and skills of their own learners in their particular institutions. In addition, it must not be used instead of the specification, but must be used to support the delivery of it.

The Guidance offers assistance to teachers with regard to possible classroom activities and links to digital resources (both our own, freely available, digital materials and some from external sources) to provide ideas when planning interesting, topical and engaging lessons.

Please be aware that many of the resources mentioned in this Guidance are web-based and accessed via hyperlinks. As a result, you are advised to view this Guidance electronically.

Assessment Strategy

Assessment Objectives and their related command words

The table below illustrates how the Assessment Objectives (AOs) are divided and shows where they are also sub-divided into strands and elements. Some examples of the command words that could be used in examination papers when addressing these AOs have also been included. Furthermore, the final column includes some sample questions to give an example of how the various AOs would be addressed in an examination paper.

Assessment Objective	Strands	Elements	Example command words	Example questions from Sample Assessment Materials
AO1 Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change, at a variety of scales.	N/A	This AO is a single element.	Define Identify State Describe Distinguish Explain Give an example Outline	Define the term quaternary industry. [2] Describe how the process of gentrification leads to changes in the characteristics of places. [6]
AO2: Apply knowledge and understanding in different contexts to interpret, analyse and evaluate geographical	N/A	1a – Apply knowledge and understanding in different contexts to analyse	Analyse Compare Contrast Explain why	Explain why seasonal changes in the polar ice mass balance are the result of variations in inputs and outputs. [6]

information and issues.		geographical information and issues.		
		1b – Apply knowledge and understanding in different contexts to interpret geographical information and issues.	Suggest Interpret	Suggest one reason why rates of coastal erosion vary. [2] Suggest how tourism can affect local rural communities. [8]
		1c – Apply knowledge and understanding in different contexts to evaluate geographical information and issues.	Assess Discuss Justify Evaluate Examine To what extent	Examine why some people have benefited more than others from recent changes in the central areas of cities. [15] - AO1 (10); AO2.1c (5) 'National governments have lost control of who and what is crossing their borders.' Discuss this statement. [20] - AO1 (10); AO2.1c (10)
AO3: Use a variety of relevant quantitative, qualitative and fieldwork skills to:	1 – investigate geographical questions and issues.	N/A	Calculate Describe (pattern/variations) Draw Identify Label State	Use Figure 3 to describe variations in the rates of change in the polar ice mass. [5] Use Figure 5 to describe the concentration of digital companies in the UK. [5]

- investigate geographical questions and issues - interpret, analyse and evaluate data and evidence - construct arguments and draw conclusions.			Select Estimate	
	2 – interpret, analyse and evaluate data and evidence.		Explain Compare Suggest	Use Figure 2 to compare the coastline dynamics of Klaipeda and Kaliningrad. [5] Use Figure 4 to analyse changes to this landscape between 1992 and 2009, caused by climate change. Include relevant data in your answer. [5]
	3 – construct arguments and draw conclusions.		Analyse To what extent Assess Discuss Evaluate	'The economic impacts of earthquake activity are always greater than the social impacts'. Discuss. [38] - AO1 (14) AO2.1a (20) AO3.3 (4)

Adapted from [GCE Subject Level Guidance for Geography March 2015](#)

Command Word Glossary

Define	Give the precise meaning of a term, phrase or concept
Identify	Point out and name from a number of possibilities
State	Give a specific name, value or other brief answer without explanation
Describe	Identify distinctive features and give descriptive, factual detail. Describe how...
Distinguish	Make clear the differences between two or more concepts
Explain	Give an account; factual detail e.g. of a process
Give an example	Provide accurate evidence (response given demonstrates knowledge and understanding)
Outline	Give a brief summary of the main characteristics
Analyse	Break down in order to bring out the essential elements or structure
Compare	Give a point by point identification of similarities and differences
Contrast	Give a point by point identification of differences only
Explain why	Give reasons or causes and show an understanding of <u>why</u> something has occurred/ applied to resource
Suggest	Put forward plausible and informed ideas based on wider geographical knowledge and understanding
Interpret	In relation to NEA and skills – bring out the meaning, explain
Assess	Goes beyond knowledge and understanding to weigh up the importance of the subject. This means there are a number of possible explanations/arguments/outcomes. The main possible explanations/arguments/outcomes should be given with justification on which is/are favoured
Discuss	Goes beyond knowledge and understanding to offer a considered review that includes a range of arguments or factors with more than one side of the evidence given with supporting examples. It becomes a written debate, identifying through description and explanation, both positive and negative points and reaches a conclusion from the debate
Justify	Goes beyond knowledge and understanding to explain why the choice given is better than other possible options
Evaluate	Goes beyond knowledge and understanding to evaluate. Requires a judgement about the overall quality or value of the feature(s)/issue(s) in terms of the strengths and limitations. Supporting evidence should be clearly given. A viewpoint, after consideration of the evidence should be given, with personal judgement/opinion

Examine	Consider an argument or concept in a way that uncovers the assumption and interrelationships of the issue, and is often followed by the 'role of' or 'importance'
To what extent/How far do you agree?	Goes beyond a knowledge and understanding to give possible explanations for and against and justify a viewpoint(s)
Calculate	Ascertain by reckoning
Draw	Draw to represent, an accurate diagram or graph
Identify	Point out and name from a number of possibilities
Label	Add labels to a diagram
State	Give a specific name, value or other brief answer without explanation
Select	Pick out the most appropriate material
Estimate	Obtain an approximate mathematical or statistical value

Delivering the specification

Summary of Assessment

Component 1: Changing Landscapes and Changing Places

Written examination: 1 hours 45 minutes

20.5% of qualification

Section A - either Coastal or Glaciated Landscapes

Section B - Changing Places.

Each section is assessed through compulsory structured data response questions and one extended response question.

Component 2: Global Systems and Global Governance

Written examination: 2 hours

27.5% of qualification

Section A - Global Systems, the Water and Carbon Cycles.

Section B - Global Governance, learners are required to study processes and patterns of global migration and global governance of the Earth's oceans.

Sections A and B are assessed through compulsory structured questions and one extended response question.

Section C - 21st Century Challenges

Section C is assessed through one compulsory extended response question with resource material drawing on both A Level Component 1 and A Level Component 2.

Component 3: Contemporary Themes in Geography

Written examination: 2 hours 15 minutes

32% of qualification

Section A: Tectonic Hazards.

Section A is assessed through one compulsory extended response question.

Section B: Contemporary Themes in Geography

Chose two from four optional themes:

- Ecosystems
- Economic Growth and Challenge: India or China or Development in an African Context
- Energy Challenges and Dilemmas
- Weather and Climate

Section B is assessed through two essay questions chosen from four optional themes.

Component 4: Non-exam assessment (3000 - 4000 words)
20% of qualification

One written independent investigation based on the collection of both field and secondary data.

Specialised concepts

Specialised concepts are relevant to the core and non-core content. These must include the concepts of:

- Causality
- Equilibrium
- Feedback
- Identity
- Inequality
- Interdependence
- Globalisation
- Mitigation and adaptation
- Representation
- Risk
- Resilience
- Sustainability
- Systems
- Thresholds

Integration of the specialised concepts is illustrated in the introduction to each component within the specification. Reference is made to these concepts within this guide to further highlight possible opportunities for discussion with your students.

Note also that 'Geography Review' is starting to address these concepts in more detail within the publication.

- Vol 30 (1) looks in detail at **mitigation and adaptation** in differing contexts
- Vol 30 (3) addresses **feedback** in numerous physical and human contexts

Possible delivery models

Model A

Allows for AS and A Level students to be taught in the same class. After AS examinations time can be dedicated to fieldwork and preparation for Non-Exam Assessment (NEA) for those continuing into the second year.

Year	AS Level Geography	A Level Geography
12	Changing Landscapes (C1) Changing Places (C2)	Changing Landscapes and Changing Places (C1) Contemporary Themes in Geography (C3) Section A
	AS Exam	Independent Investigation (C4)
13		Global Systems and Global Governance (C2)
		Contemporary Themes in Geography (C3) Section B

Model B

Where only A Level students are taught in the class. Summer term can be devoted to fieldwork and the NEA. This model will allow time for residential or day fieldwork after students completing AS Levels have completed their examinations.

Year	A Level Geography
12	Changing Landscapes and Changing Places (C1) Global Systems and Global Governance (C2)
	Independent Investigation (C4)
13	Independent Investigation (C4)
	Contemporary Themes in Geography (C3) Section A Contemporary Themes in Geography (C3) Section B

Model C

Where only A Level students are taught in the class. Summer term can be devoted to fieldwork and the NEA. This model will allow time for residential or day fieldwork after students completing AS Levels have completed their examinations. In addition, by teaching Component 3 Section B earlier, this may open up more fieldwork and NEA possibilities (ideal for larger centres where it is more challenging for students to come up with an individual question in a large cohort).

Year	A Level Geography
12	Changing Landscapes and Changing Places (C1) Contemporary Themes in Geography (C3) Section B
	Independent Investigation (C4)
13	Independent Investigation (C4)
	Global Systems and Global Governance (C2) Contemporary Themes in Geography (C3) Section A

Amplification of content and Learning plans

This section gives examples of planning for each of the units. The first column of each plan is taken directly from the specification. The second gives some additional elaboration of the geographical content column in the specification. The third column provides possible learning ideas, opportunities and/or resources. Teachers should read the amplification of content across the whole focus box before considering the teaching ideas and resources suggested. Other approaches and exemplar materials are equally valid and teachers are encouraged to develop their own approaches to the specification that best suits the needs of themselves, their location and the needs of their particular learners. The approaches below are designed as guidance in order to provide starting points and are neither comprehensive nor mandatory.

[Additional resource links can also be viewed here](#)

Water and Carbon cycles

Focus	Amplification of content	Teaching/learning approaches and resources
2.1.1 The concepts of system and mass balance	Candidates should have knowledge of the main inputs, outputs, stores and flows which comprise the water cycle at a global scale. This might include quantitative data showing the percentages of water in each store and the volumes of water (in cubic kilometres). They should be familiar with the subject-specific terminology which appears in the specification, including cryosphere, groundwater, and mass balance. These are all important terms which could feature legitimately in examination questions, and must not be misunderstood. Candidates should understand that hydrological stores	<i>What are the main elements of the global water cycle?</i> - Students discuss the main stores and flows with reference to a system diagram (e.g. Dunn page 3), and reflect on the usefulness of system theory - Complete a table (i) outlining each element of the water cycle (ii) assessing briefly whether these flows and stores have varied over time <i>How do different global water stores compare in terms of their size, distribution and characteristics?</i> - Discussion of students' prior knowledge (where applicable) of water stores including the cryosphere and groundwater

	change in size over varying timescales. A sensible approach to take might be to examine, firstly, seasonal changes in glacial accumulation and ablation, and the implications of this for other hydrological flows and stores. Secondly, possible effects of naturally-occurring phenomena lasting years or decades, such as El Niño, can be explored. Finally, students should be made aware of storage changes over very long timescales, including glacial and inter-glacial periods. The depth of learning should be commensurate with the time available: only an overview of these changes and the factors and processes responsible is expected. The key specialized geographic concept of equilibrium might also be introduced here, along with an understanding of dynamic equilibrium i.e. the way balance is achieved in the long term through the operation of processes and fluxes operating over different timescales. As part of this focus box, candidates will gain an understanding of the main transfers occurring within and between land, ocean, atmosphere and cryosphere. These include evaporation, precipitation, ice ablation, surface runoff and groundwater movements. An important focus for teaching and learning is the different range of timescales over which these processes operate. The transition from a full glacial to interglacial period - and the carbon transfer changes this brings - may last hundreds or thousands of years. Significant transfer changes can also	stores • Lecture or independent research focusing on ‘tricky’ parts of the focus box, for example geological factors affecting groundwater storage • Make use of numerical data (from text book diagrams) to perform simple calculations (e.g. percentages of water held in different stores) <i>How and why have water stores changed in the past?</i> • Discussion of students’ prior knowledge (where applicable) of past glacial epochs. Most A level Geography textbooks will give a sound account of this. Alternatively, use: https://www.youtube.com/watch?v=yNiMhjPHPu0 • A starting point for further independent research into changing water and ice storage: https://www.youtube.com/watch?v=1nSlj9tvhbY • If time allows, the ‘snowball earth’ film: https://www.youtube.com/watch?v=NqpQci6iWx0 <i>How is an appreciation of time and scale important for the study of water flows and transfers?</i> • Group/pair research work reviewing the content of focus boxes 2.1.1 and classifying transfers according to the time scale and spatial scale they operate over • Reading Geography Review 25(1) pages 38-41 for an account of small-scale hill slope transfers operating over hours and days
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	take place on much shorter timescales e.g. the onset of the annual monsoon in East Asia. There are also spatial contrasts to explore here. Candidates can reflect on the global impact of sea level rise that would follow e.g. if Greenland were to become ice free.	
2.1.2 Catchment hydrology – the drainage basin as a system	Candidates should know about catchment hydrology and the way the drainage basin operates as a system. This extends and deepens knowledge gained from the global overview provided by the previous focus box. Firstly, candidates should understand precipitation variables including amount, duration and intensity. As part of this work they might develop their quantitative skills by studying precipitation data linked with flood events. This will help them comprehend how short duration (but high intensity rainfall) can cause flooding, yet so too may low intensity (but long duration) rainfall. Precipitation type is another important influence and candidates might appreciate the extreme intensity which can be associated with frontal precipitation. Drainage basin hydrological flows should be studied in depth, particularly if candidates are using this topic as a frame for the independent investigation. Candidates should be able to do more than merely list these flows. They might additionally explore the relative importance and role of different flows in different geographical contexts, such as humid or arid environments, and the	<i>What are the main hydrological inputs in a drainage basin and how do they operate?</i> • This can be taught, or group/pair research work can be carried out. This topic is covered in most A level textbooks, for both past and present courses (e.g. Dunn Chapter 1) • A PowerPoint containing relevant slides is available at: https://www.hoddereducation.co.uk/media/Documents/magazine-extras/Geography%20Review/Geog%20Rev%20Vol%2029%20No%201/GeographyReview29_1_Rivers.pptx?ext=.pptx <i>What are the main hydrological flows in a drainage basin and how do they operate?</i> • This can be taught, or group/pair research work can be carried out. This topic is covered in most A level textbooks, for both past and present courses (e.g. Dunn Chapter 1) • Geography Review 25(1) pages 38-41 provides a detailed account of overland flow, as does https://water.usgs.gov/edu/watercyclerrunoff.html • A PowerPoint containing relevant slides is available at: http://gis.ess.washington.edu/grg/courses/ess326/5-

	interrelationship between these flows. Throughflow, stem flow, infiltration, overland flow mechanisms, percolation, groundwater flow and channel flow are all mentioned in the specification. Progression from GCSE is expected in candidates' understanding of overland flow. They should be aware of two different causes, namely saturation overland flow and infiltration excess overland flow. They might also be aware of the importance of overland flow contributing areas within the catchment. Drainage basin stores should be studied in depth and candidates should be able to do more than merely list them. These include the interception store, vegetation store, surface store, soil moisture store, channel store and groundwater store. The interconnections and relative importance of the stores might be studied. For instance, the vegetation store plays an important role in determining the effectiveness of the soil moisture store. Plant roots help to aerate the soil; humus derived from organic matter can retain water in the soil. Catchment outputs include evaporation, transpiration and channel discharge. Candidates should be aware of temporal and spatial variations in the importance of these outputs. Marked seasonal changes can be observed in some contexts. Different types of vegetation are adapted to the environment in ways which may maximize or	Hydrology.ppt <i>What are the main hydrological outputs in a drainage basin and how do they operate?</i> • This topic is covered in most A level textbooks, for both past and present courses (e.g. Dunn Chapter 1) • There is no shortage of consolidation work that can be carried out using hydrograph questions from past A level examination papers; for example, WJEC Specification (from 2009) http://pastpapers.download.wjec.co.uk/w12-1201-01.pdf or Edexcel Specification A 1991-2008
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	minimize rates of transpiration, for instance the tropical rainforest and coniferous forest. Looking ahead to focus box 2.1.7, it may be useful to explore transpiration rates in the tropical rainforest and the temperate grassland.	
2.1.3 Temporal variations in river discharge	Candidates should understand what is meant by the river regime as the pattern of river flow, or discharge, over a period of time (typically one year). They should appreciate how simple and complex regimes are the outcome of the range of geographical characteristics including seasonal variations in precipitation and temperature, drainage basin relief and human influences such as dam and reservoir construction. The Colorado River is a widely used and popular case study that could be applied here. Candidates should know about storm hydrographs and be able to identify the main components including baseflow, rising limb, peak discharge, falling (or recessional) limb. In addition to simple single peak hydrographs they might examine more complex discharge patterns over long time periods in order to demonstrate clear progression from GCSE level. Candidates should be able to ask and answer geographical questions about hydrographs, such as: why is hydrograph A flashy and hydrograph B non-flashy?	<i>What are the main characteristics of river regimes?</i> - Group/pair research work developing quantitative skills using river regime data (bar charts); each group researches a different regime and results are shared. For example, Russian regimes: http://www.rusnature.info/geo/05_3.htm or the River Colorado: http://noc.ac.uk/science-technology/marine-resources/minerals-products/metals-sulphides-nodules <i>What factors affect river regimes?</i> - Students can make use of this Geography in the News (RGS-IBG) case study of the River Colorado (also widely covered by text books) http://www.rgs.org/OurWork/Schools/School+Members+Area/Landscape+processes/Regime+change.htm <i>How is the shape of river hydrographs influenced by different climatic factors and processes?</i> - This topic is covered in most A level textbooks, for both past and present courses (e.g. Dunn Chapter 1) - Students can work in pairs or independently to investigate

	They will be aware of the climatic factors that could play a role, particularly precipitation duration and precipitation intensity. High intensity rainfall can generate a very different hydrograph shape compared with one generated by prolonged rainfall. The seasonal effects of evaporation and transpiration rates are also important, particularly when antecedent conditions come into play. The flashiest hydrographs are associated with high intensity rainfall falling on previously saturated soil at a time of year when evaporation and transpiration outputs are minimal. Finally, candidates should understand the importance of non-climatic influences on storm hydrographs, including the size and shape of the drainage basin, drainage density, slope angles, land use and vegetation type. Again, it could be useful to establish links here with tropical rainforest and temperate grassland vegetation types, given that these are relevant to focus box 2.1.7. Soil and rock porosity and permeability are also important influences. Water movements through soil and rock must also be understood in focus box 2.1.6 and 2.1.8. Within the scheme of work, this could be a good place to establish some synoptic links with carbon flows and fluxes.	high intensity rainfall events, for example: http://news.bbc.co.uk/1/hi/8376031.stm - Students can work in pairs or independently to investigate long duration rainfall events, for example: http://www.rbwm.gov.uk/public/Environment_Agency_Winter_2012_Flood_Event_Report.pdf <i>How is the shape of river hydrographs influenced by non-climatic catchment factors and processes?</i> - This resource includes information about the Rhone and Colorado rivers, and also serves as a plenary for focus box 2.1.3 in its entirety. Students can work with this material independently prior to group discussion and idea sharing: http://www.pearsonschoolsandfecolleges.co.uk/Secondary/Other/Humanities/Heinemann1619Geography/Samples/Samplematerials/AS_Level_Geog_Edexcel.pdf - Students can consolidate this focus box using: https://water.usgs.gov/edu/watercyclerrunoff.html
2.1.4 Precipitation and excess runoff within the water	Candidates should understand the causes of uplift and the resulting processes of condensation and cloud formation. The three main causes are orographic/relief, frontal and convection mechanisms. Candidates should learn to use	<i>How do condensation and clouds form?</i> This topic is covered in most A level textbooks, for both past and present courses (e.g. Raw page 103 and Dunn page 7).

cycle	terminology carefully, particularly in relation to frontal rainfall caused by the interaction of contrasting air masses along the polar front. They might also go beyond listing of the three causes and additionally consider interactions, for instance when a weather front crosses a relief barrier. Theories of precipitation formation should be understood. The two recognized theories are (1) the collision mechanism, wherein super condensation nuclei generate large heavy water droplets which collide with smaller droplets sweeping them a long into their wake and (2) the Bergeron-Findeisen theory of ice-crystal growth. The last of these is a complex theory involving supercooled water droplets and ice crystals. Candidates should understand the most important contexts for excess runoff generation. In the UK this includes prolonged precipitation and intense storms. Causes may include frontal rainfall in winter or convection events in summer. In either case, examples and supporting data can be used to support arguments. Looking further afield, candidates should have knowledge and understanding of monsoon rain events (e.g. in East Asia) and snowmelt discharge events (e.g. the River Colorado).	- Independent reading for students: https://water.usgs.gov/edu/watercyclecondensation.html <i>What are the mechanisms of precipitation formation?</i> - This is a complex area of science. A relatively simple account is found at https://water.usgs.gov/edu/watercycleprecipitation.htm whereas more detailed tutorials are also available online, such as: https://www.youtube.com/watch?v=WByQ3yKxi1s&t=11s A further video showing the Bergeron process: https://www.youtube.com/watch?v=-UXpJ3KRO_sl - The collision theory is outlined in this short film: https://www.youtube.com/watch?v=WByQ3yKxi1s <i>Why is excessive runoff generated in certain climatic zones?</i> - Group reading and discussion of library or online materials dealing with monsoon rainfall, prolonged and intense rainfall (e.g. hurricanes) and ice melting. Students working in pairs or groups can each present a short PowerPoint dealing with one of these three scenarios. These topics are covered in most A level textbooks, for both past and present courses. Online support can be found at: https://water.usgs.gov/edu/watercyclesnowmelt.htm http://www.nationalgeographic.org/encyclopedia/monsoon/ https://www.nasa.gov/feature/goddard/2016/nasas-imerq-
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	Candidates are expected to have studied how changing land use and river basin mismanagement can result in excess runoff generation. Typically, this may involve a study of deforestation and flooding in the Ganges delta, which would also support the study of tropical rainforest removal affecting the carbon cycle, and links between the water and carbon cycles in focus box 2.1.9. River basin mismanagement can be studied at contrasting spatial scales. There may be a local example in proximity to the school where new build properties have been sited unwisely on a flood plain, or where vegetation and forest have been removed. In Wales and Scotland, forestry commission land must be managed carefully in order to avoid excess run off generation when timber is harvested.	measures-hurricane-earls-deadly-rainfall-in-mexico <i>How and why is excessive runoff generated by certain human activities?</i> - This topic (and the associated topic <i>human causes of flooding</i>) is covered in most A level textbooks, for both past and present courses. Land use and river basin mismanagement should be focused on. - Excessive runoff and flooding in Wales: http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/static/documents/Research/ENV0005_Flooding_in_Wales_ENGLISH_AW_LR(1).pdf
2.1.5 Deficit within the water cycle	Candidates should understand the causes of deficit within the water cycle. Firstly, they must study meteorological causes, including seasonal variations or longer term climate change. Seasonal variations in the UK can be the focus here, and the way these have sometimes been extreme. The UK drought of 1976 remains a standout case study which is widely supported with resources online and in textbooks. The advantage of using a past case study - as opposed to projected climate change impacts - is that recorded data and evidence can be used to support arguments (as opposed to hypothetical scenarios). However, it is important for candidates to understand that deficits may worsen in the future. This will reinforce teaching of focus box 2.1.9 which asks for students to	<i>What are the meteorological causes of water cycle deficits?</i> - This topic is covered in depth by Dunn Chapter 2, pages 23-29; the UK 1976 drought can be researched here: http://www.rgs.org/OurWork/Schools/School+Members+Area/Hazards+and+risk/Drought+doubt.htm - A useful overview of seasonal water deficits (using Athens as an example) appears here: http://www.pearsonschoolsandfecolleges.co.uk/Secondary/Other/Humanities/Heinemann1619Geography/Samples/Samplematerials/AS_Level_Geog_Edexcel.pdf <i>What are the human causes of water cycle deficits?</i>

	study changing patterns of precipitation on account of anthropogenic greenhouse gas emissions, and projected climate change. Human causes of water deficit include aquifer depletion and the extraction of surface water resources. Candidates should understand the human pressures that may lead to these outcomes, including population growth, agricultural demands and the use of water by industry. Arguments ought to be grounded in evidence. Possible examples to use include the Ogallala aquifer, which stretches from Texas to South Dakota (the water level is dropping 90 to 150 cm per year) or the inland Aral Sea, which has all but vanished. More than any other water body in the world, the Aral Sea has come to epitomize the devastating economic and ecological effects of excessive demands placed upon freshwater water stores. It may be possible to synthesise ideas within this focus box by exploring the depletion of reservoirs during the 1976 drought. Candidates should have knowledge and understanding of natural and artificial recharge of aquifers to address any deficit which develops. Aquifers are permeable porous water bearing rocks such as chalk. Artesian aquifers develop where sedimentary rocks have formed a syncline or basin like structure, with of the aquifer confined between impermeable rock layers. The geology of the London	- This topic is covered in depth by Dunn Chapter 2, pages 45-57. This account also links the idea of a water cycle deficit with the concept of water insecurity risk. Risk is one of the key geographic concepts underpinning the A level course. <i>What strategies are there to manage aquifers in order to tackle water deficit?</i> - Introductory reading about aquifers can be found at: https://water.usgs.gov/edu/earthgwaquifer.html - Working in pairs, students can research an aquifer which is under stress, and any artificial attempts to recharge it, for example: https://www.scientificamerican.com/article/the-ogallala-aquifer/ http://www.nationalgeographic.com/magazine/2016/08/vanishing-midwest-ogallala-aquifer-drought/ http://www.groundwateruk.org/Rising_Groundwater_in_Central_London.aspx
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	Basin provides a good example of this and also of the pressures linked with high rates of abstraction. In addressing natural recharge, emphasis should be placed on the timescales over which this made occur, and the desirability of this (in the case of the London Basin, recharge threatens buildings and underground train tunnels with flooding, and so must be prevented).	
2.1.6 The global carbon cycle	Candidates should understand the main inputs, outputs, stores and flows in the carbon cycle. This will include an overview of the size of various stores measured in gigatons of carbon dioxide equivalent (GtC), for instance the atmosphere contains 600 billion tonnes of carbon or 600 GtC. As part of this foundation work, the concept of mass balance should also be introduced. Candidates should know about carbon pathways and processes, and how they operate at varying spatial and temporal scales. At the local (and short-term) scale, this includes the role of plants in carbon sequestration, photosynthesis, respiration and decomposition. Candidates should understand these processes in some detail (they may use the chemical equation for photosynthesis, for example). They should also have some familiarity with correct technical terms such as glucose, carbohydrates, metabolism. They should appreciate the link between carbon sequestration in vegetation and the release into the atmosphere of carbon dioxide following	<i>What are the main elements of the carbon cycle?</i> - Students discuss prior learning at KS3-5 geography and science that relates to carbon stores and flows, including knowledge and understanding of ecosystems, biomes and atmospheric carbon - Teaching and learning support is provided in course text books for 2016 (first teaching) A level Geography, for example: Dunn pages 78-80; there is an overview of the topic at: https://www.rgs.org/NR/rdonlyres/6FDC37EC-9324-4CE7-8A96-86DFCA1EABB0/0/SCO_WaterandCarbonCycling.pdf - Students complete a table (i) outlining the main flows/stores/ inputs/outputs (ii) quantifying these (Gt values) <i>How is carbon exchanged between the atmosphere and the land (ecosystems)?</i> - Students discuss prior learning at KS3-5 geography and science that relates to photosynthesis, respiration and decomposition; and the origins of carbon-rich fossil fuels - Teaching and learning support is provided in course text

	fossil fuel combustion. Candidates should understand the larger scale fluxes or exchanges that take place between the ocean and the atmosphere including absorption by biota and the diffusion of carbon dioxide in and out of the oceans. The oceans are the world's largest carbon store: 50 times greater in size than that of the atmosphere. 93 per cent of carbon dioxide is stored in undersea algae plants and coral, with the remainder in a dissolved form. The exchange flux between oceans and atmosphere operates on a timescale of several hundred years and this should be appreciated. Finally, carbon pathways and processes between the land and oceans at the continental scale should be studied. The role of chemical weathering is extremely important and candidates are expected to have basic knowledge of the chemical processes and compounds involved. Candidates might be expected to have some familiarity with technical terms such as calcium bicarbonate, and to use examples of particular landscapes such as the Yorkshire Dales or Tibetan Plateau from which carbon is removed in solute form by the combined processes of weathering and water transport. Finally, they should understand that the formation of new calcium-rich sediments and rocks below the oceans is part of the carbon cycle too. Carbon sequestration in sediments can	books for 2016 (first teaching) A level Geography, for example: Raw pages 106-108 <i>How is carbon exchanged between the ocean and the atmosphere?</i> • A highly detailed account is provided by Dunn pages 83-84; further support (at a high academic level) is provided at: https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch7s7-3-4.html • The topic is complex and will require a homework consolidation exercise such as: Explain the different ways in which carbon is transferred from the atmosphere to the ocean (AO1 task; 5 marks) <i>How is carbon exchanged between the continents (land) and oceans?</i> • Students discuss prior learning at KS3-5 geography and science that relates to chemical weathering (carbonation) and river solute loads • Teaching and learning support is provided in course text books for 2016 (first teaching) A level Geography, for example: Skinner pages 33-34
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	operate over a timescale of millions of years.	
2.1.7 Carbon stores in different biomes	Candidates should gain an overview of the varying size of different carbon stores found in both tropical rainforest and in temperate grassland biomes (thereby extending their GCSE or KS3 biome studies). Carbon cycling is part of the nutrient cycle, and nutrient cycles for both biomes could be studied as a starting point to think about how climatic factors have affected the size of the stores (note that carbon does not circulate in the same way that nutrients such as potassium do, however). Climatic factors including temperature, precipitation and light influence the large size of the biomass nutrient store in the rainforest and the large soil nutrient store found in temperate grasslands. As part of this work, candidates will understand that carbon is an important component of soil organic matter. Candidates should understand the main human influences on changing sizes of carbon stores. In particular, the land use changes of deforestation, afforestation and agricultural activity should be studied in some detail by using examples. These may usefully relate to the required studies of tropical rainforest and temperate grassland e.g. deforestation in Amazonia averaged around 17,500 square	<i>What are the main characteristics or rainforest and temperate grassland carbon stores and cycles?</i> - Students discuss prior learning at KS3-5 geography and science that relates to biome nutrient cycling (including carbon), and soil fertility - Teaching and learning support is provided in course text books for 2016 (first teaching) A level Geography, for example: Raw pages 110-114 - Also see: https://www.slideshare.net/geographyalltheway/ib-geography-ecosystems-nutrient-cycling <i>How can human activity result in changes to carbon stored in biomes and ecosystems?</i> - Students discuss prior learning at KS3-5 geography and science that relates to biome and ecosystem removal e.g. tropical rainforest removal, urbanisation and monoculture nutrient cycling. They can construct a table which contains facts about each activity but also assesses critically the extent to which vegetation (and thus carbon storage) is entirely lost or modified (particularly in the case of forest clearance for agriculture) - Teaching and learning support is provided in course text books for 2016 (first teaching) A level Geography, for example: Skinner pages 31-33 and 45-46. - Positive changes are reviewed

	kilometres per year during the 1980s and 1990s. Forest trees typically store around 180 tonnes of carbon per hectare above ground. Data such as these can be used to calculate changes in carbon storage. Soil erosion occurring in the USA during the 1920s and 1930s (the 'Dust Bowl') is another well-known and relevant example. Positive changes on carbon storage can also be studied in relation to agricultural activity. These are manure, plant debris, composts and biosolids from sewage which are applied to agricultural soils. They are all high in organic carbon and therefore represent additional carbon inputs to the system.	at: http://www.dpi.nsw.gov.au/agriculture/resources/soils/soil-carbon/increasing-soil-organic-carbon-of-agricultural-land
2.1.8 Changing carbon stores in peatlands over time	Originally, peatlands covered over four million km² or 3 per cent of the surface of the planet; they occur on all continents, from the tropical to boreal and Arctic zones and from sea level to high alpine conditions. It is estimated that peat stores more than 250 GtC (gigatons of carbon) worldwide. Candidates are expected to study carbon storage in peatlands in some detail. Firstly, they should understand the process of peat formation and the resulting accumulation of carbon. This is a relatively complex chemical process and candidates will need to take care with terminology (such as aerobic and anaerobic). Many universities and agricultural/environmental organizations offer educational support online that helps introduce students to peat formation. Context should be added through the use of located examples of peat formation, such as the western coast and islands of Scotland, or	<i>How is peat formed and why does this lead to increased carbon storage?</i> - Group/pair research work exploring the formation and significance of peat / peatlands / peat moorlands. Different groups of students could investigate a different peat area within the UK prior to sharing findings with the rest of class. Useful websites include: - Wales: https://www.forestry.gov.uk/fr/INFD-8Z7BSH - Scotland: http://www.snh.gov.uk/about-scotlands-nature/habitats-and-ecosystems/mountains-heaths-and-bogs/peat-bogs/ - England: http://publications.naturalengland.org.uk/publication/30021 - This topic is also supported by <i>Teaching Geography</i> 42(1) (Spring 2017) pages 26-29

	Welsh peatlands. The timescale over which peat has formed in these environments should be understood and links may be usefully established with natural periods of climate change including the end of the Pleistocene glaciation. Candidates should gain an overview of the human pressures on peatlands. Peat extraction was practiced by subsistence communities in the British Isles in the past and continues to be an important fuel source in some rural areas today. Peat is also used in some industries such as whisky production. In addition to direct pressures on peat, indirect impacts arise from drainage programmes. However, harm done to peat stores has led to management efforts to restore this environment, particularly in high income countries such as the UK (which leads the way). This part of the course lends itself well to student-led investigative work. There are many UK websites that provide extensive details of peat restoration schemes. These include Wildlife Trust, Forestry Commission and Scottish National Heritage resources. Efforts may involve re-establishing a plant cover dominated by peatland species including sphagnum mosses, and re-wetting harvested sites by raising and stabilizing the water table near the surface.	- Students can independently investigate peat formation using: http://www.fao.org/docrep/x5872e/x5872e05.htm <i>How does peat extraction and land drainage lead to a reduction in carbon storage?</i> - Group/pair research work exploring the human uses of peat / peatlands / peat moorlands, and ways in which this leads to degradation and the loss of carbon storage. Different groups of students could investigate a different peat uses. Useful websites include: section 1, pages 10-11 of http://publications.naturalengland.org.uk/publication/30021?category=24011 - A quantitative analysis of peat removal and carbon storage loss can be carried out using data from section 5 of http://publications.naturalengland.org.uk/publication/30021?category=24011 <i>What strategies are there for the restoration of peatlands?</i> - Group discussion of one historical and one contemporary example e.g. http://www.wildlifetrusts.org/peatlands - This topic is also supported by <i>Teaching Geography</i> 42(1) (Spring 2017) pages 26-29
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	Part of the impetus for restoration has been provided by greenhouse gas emission targets. Peatlands are sinks and sources of natural greenhouse gases, particularly carbon dioxide (CO₂) and methane (CH₄). By restoring peat environments, local and national governments can offset greenhouse gas emissions produced by economic activity. This also gives economic value to peatlands within a carbon trading economy such as that which exists in the European Union. Links can be established here with the ecosystem services approach.	
2.1.9 Links between the water and carbon cycles	Candidates should think critically about the synoptic links that can be established between water and carbon cycle studies. In the first instance this can be done through a study of the causes and consequences of recent increases in the atmospheric carbon store on account of anthropogenic greenhouse gas emissions. Candidates need to understand the science behind this, including the energy budget or balance between incoming and outgoing solar radiation. They should study the evidence for increasing greenhouse gas emissions in the atmosphere and the accompanying claim that recent increases are unprecedented in their scale and rate. Amongst the many possible impacts of increasing atmospheric carbon storage, candidates should pay	<i>Why is atmospheric carbon storage increasing?</i> • Students discuss prior learning at KS3-5 geography and science that relates to anthropogenic greenhouse gas emissions • Teaching and learning support is provided in course text books for 2016 (first teaching) A level Geography, for example: Skinner pages 39-40 • A short NASA film is still available at: https://www.youtube.com/watch?v=ab6jV4VBWZE <i>What does an increase in the greenhouse gas emissions result in energy budget changes and a warming climate?</i> • Students discuss prior learning at KS3-5 geography and science • Teaching and learning support is provided in course text books for 2016 (first teaching) A level Geography, for

	particular attention to effects on the water cycle and Earth's oceans. They should consult the most recent available reports on precipitation patterns, extreme weather and river discharge. A consensus has emerged amongst UK meteorologists that the UK has entered a flood-rich period marked by more intense winter rainfall events. This is in line with IPCC climate change projections. The other focus for students is sea level rise and acidification of the oceans. The relative decline in the size of ice storage and the accompanying increase in ocean storage is a key water cycle change which is predicted to accelerate during the 21st century. Acidification of the oceans follows on from increased oceanic sequestration of carbon dioxide. A brief overview of the ecological effects of this should be gained e.g. coral bleaching. Finally candidates should investigate links between the water and carbon cycles at the local scale. Some may even want to pursue this as a topic for their independent investigation. The links which are explored might include seasonal changes which are naturally occurring. At some times of the year, high rates of runoff flush large amounts of organic matter including leaves into rivers. High outputs of water from the basin coincide with high output of carbon in biomass transported away from the basin by river flow. Another approach might be to look at how local land use changes such as ploughing or the harvesting of crops	example: Dunn pages 87-88 - Up-to-date information on the rise in global means surface temperature (GMST) can be found in Geography Review 30(3) pages 35-37 and at the IPCC website (2014 report) https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf <i>What are the main projected impacts of climate change on water and carbon stores and cycling?</i> - Teaching and learning support is provided in course text books for 2016 (first teaching) A level Geography, for example: Skinner pages 34-38. Note that the focus should be on water and carbon storage. Students can devise a table which includes climate change impacts such as tree line and biome shifts and outlines what the net impact would be for carbon storage, or for water cycle movements in particular contexts. Alternatively, this might be done using spider diagrams - Online support of climate change impacts (but remember to customise the material in ways which emphasise the implications for water and carbon storage) is provided at http://www.metoffice.gov.uk/climate-guide/science/uk/obs-projections-impacts - Geography Review 30(4) provides an account of the global carbon cycle and climate change <i>In what ways are carbon and water cycles linked at the local</i>
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	have effects for both water and carbon cycling. This part of the specification is open to interpretation and there is no prescribed route for inquiry. As part of their geography A level, candidates are expected to gain an understanding of specialised concepts including feedback, thresholds and equilibrium in natural systems. It is required that they do so as part of their study of water and carbon cycles. If they are already familiar with these concepts from the study of other topics such as landscapes, then all that is required here is revision and reflection of what has already been learned prior to its application in a new context. Alternatively, teachers who deliver the water and carbon cycle early in the A level course may choose to introduce these concepts for the first time here.	scale? - A useful starting point for local studies is: https://www.geography-fieldwork.org/a-level/water-carbon/ - Students can work together in pairs to devise inquiry questions linking the two cycles
2.1.10 Feedback within and between the carbon and water cycles	The specification requires students to consider for examples of feedback occurring within and between of the water and carbon cycles. These include 1. Methane feedback: as global mean surface temperature increases, widescale permafrost melting is occurring at high latitudes in Russia and Canada. Large amounts of methane, which is a powerful greenhouse gas, are stored in frozen soils. As the temperature rises, more methane is released which accelerates anthropogenic warming further. This is a relatively simple feedback mechanism for students to understand.	<i>In system theory, what is meant by feedback, thresholds and equilibrium?</i> - Teaching and learning support is provided in course text books for 2016 (first teaching) A level Geography, for example: - o Skinner pages 02-03 (feedback and equilibrium) - o Dunn page 301 (thresholds) - Also see the on-going 'Geographical ideas' series in Geography Review, for example feedback in 30(3) pages 27-29

	2. Cryosphere (ice) feedback, for example: accelerated melting of arctic ice, land based glaciers and permafrost due to the loss of snow cover and associated changes in albedo. 3. Terrestrial carbon feedback: this can include the way changes in vegetation or drainage will also impact on soils and their ability to store carbon. 4. Marine carbon feedback: this is a complex area of science and candidates are only expected to gain a brief overview of possible ways in which different ocean functions might interrelate with one another in ways which provide feedback effects. For instance, seawater can, through inorganic processes, absorb large amounts of CO₂ from the atmosphere. Sea water absorption may increase if atmospheric levels rise. However, warmer water is less effective at absorbing carbon dioxide, and so the effects may be limited beyond a certain point of atmospheric warming. Also, ocean acidification impacts on coral growth and other marine ecosystems in ways which may reduce biological sequestration of carbon dioxide in the oceans. Finally, students should have knowledge of the implications of system feedback effects for life on Earth, including people. This can be studied by exploring the contrasting IPCC climate change projections which have factored in the possibility of accelerated warming on account of positive feedback effects such as Arctic	<i>What feedback effects are there within and between the water and carbon cycles, in relation to a warming climate?</i> • Students can work in small groups to each investigate a different feedback mechanism prior to sharing their findings via a brief presentation. For example: - o Methane feedback: Raw page 117 - o Cryosphere (ice albedo) feedback: Dunn page 118 - o Terrestrial carbon feedback (soil erosion following deforestation): https://www.researchgate.net/figure/222537003_fig1_Fig-1-Simple-deforestation-feedback-loop - o Marine carbon feedback: https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch7s7-3-4.html <i>What are the implications of these feedback effects for the planet and its people?</i> • This is a broad question which students can investigate independently as a plenary exercise. For example, they could collect information about cryosphere impacts at high latitudes where feedback effects and warming are expected to be strongest: http://www.grida.no/publications/geo-ice-snow/ Also see Raw pages 312-318
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	permafrost thawing. This is a good opportunity for students to develop quantitative skills by studying different projections and estimates, and by reviewing the ranges of possibilities put forward by scientists as likely outcomes.	
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Recommended reading:

- Oakes, S. (2017) WJEC/Eduqas A-level Geography Student Guide 4: Water and carbon cycles, Banbury: Hodder Education
- Raw, M., Palmer, A., Stiff, P., Barker, D. and Harris, H. (2016) OCR A Level Geography Second Edition, Banbury: Hodder Education
- Dunn, C., Warn, S., Oakes, S., Holmes, D., Adams, K. and Witherick, M. (2016) Edexcel A level Geography Book 1 Third Edition, Banbury: Hodder Education
- Skinner, S., Banks, P., Whittaker, I., Abbiss, P. and Fyfe, H. (2016) AQA A-level Geography Fourth Edition, Banbury: Hodder Education

[Additional resource links can also be viewed here](#)

Processes and patterns of global migration

Focus	Amplification of content	Teaching/learning approaches and resources
2.2.1 Globalisation, migration and a shrinking world	Through their study of Changing Places, candidates will be aware of the key specialised geographic concept of globalisation. Here, this understanding can be reinforced in a different context as they study and understand the increasing economic, social, political, cultural, environmental and technological connections between countries and regions. This creates, in theory, a 'borderless world'. As these connections continue to grow regions and countries become more interdependent. Candidates should understand the fundamental distinctions between differing types of migration. The classification of migrants as national or international, forced or voluntary and temporary or permanent, will need to be studied. Candidates should also appreciate the need to map international migration, and should be familiar with the patterns seen both historically and currently e.g. migration to the E.U. Candidates should appreciate the difficulties in accurately quantifying migration in a constantly	<i>Do we live in a 'borderless world'?</i> - Students could conduct their own research on the origins of a piece of technology e.g. mobile phone. Students should make links to as many countries as possible illustrating a 'borderless world' - Define 'globalisation' through reading and discussion of Geography Review Vol. 29 (3) <i>How can we classify migration?</i> - In small groups, students are given a type of migration to research focusing on case studies, the reasons for the migration and the consequences. Students present their understanding to the class and differences between the types of migrations are highlighted e.g. Migrant crisis: Migration to Europe explained in graphics http://www.bbc.co.uk/news/world-europe-34131911 - Use of 'Who lives where' data to map migration patterns in Europe https://docs.google.com/spreadsheets/d/1FMw_ZTIZxZNtjwYdUr6oRBnfJ0L1tTh5uWWyReEUHmw/edit#gid=0 - Useful resource to show global patterns http://www.bbc.co.uk/news/world-32912867

	changing world. Candidates are expected to have knowledge of the main factors that have led to increased globalisation such as the reduction in cost and increased availability of transport, the rapid growth in communication and information technology and media representations of places.	<i>What are the most important factors in creating a shrinking world?</i> Students could debate the relative importance of the factors creating a shrinking world using 'Impacts of globalisation on migration' by Andy Pink, Issue 1, Geofile Series 35, 2016 or Geography Review February 2015 'ICT and Globalisation' or Geography Review April 2014 'Football in Africa: migration, identity and globalisation'
2.2.2 Causes of international economic migration	Candidates should understand the causes of international out-migration. The key specialised geographic concept of causality might be introduced here. The main 'push' factors such as poverty, primary commodity prices and poor access to markets within the global system should be discussed. Candidates are expected to understand both historic and current migration policies that restrict and encourage the movement of economic migrants. Relevant examples might be; freedom of movement within the EU; legislation involved with the colonial past and the Commonwealth; and the migration of diaspora communities both locally and globally.	<i>What factors drive international out-migration?</i> - Students could identify different push factors in the following article (a long piece but case studies can be easily extracted e.g. migration from Bangladesh to the Gulf States p. 17-21) https://assets.publishing.service.gov.uk/media/57a08a7fed915d622c000787/WP1_Drivers_of_Migration.pdf <i>What have been the recent drivers of migration?</i> - Students could watch the video and create a table with explanations of the reasons why young Romanians leave their country? http://www.bbc.co.uk/news/world-europe-25181607 - Students could watch the video and prioritise the importance of differing push and pull factors on migration from Haiti to the USA. http://www.bbc.co.uk/news/world-

	Candidates should understand how superpower economies can attract economic migrants to advance the host country's economic power and political status. Candidates should study policies designed to attract highly skilled migrants to the host nation. A suitable example could be the points system used by the Australian government. Governments such as those in the UK or China create global hubs for investment further attracting highly valued migrants. East London Tech City, backed by the UK government as a technology hub for new industries, could serve as a relevant example here.	us-canada-17039167 - Students could read the article on how Britain and Poland came to be intertwined from a historic aspect. Students, individually or in small groups, could be provided with a time period to assess the migration between Poland and the UK and to complete further research to present to the rest of the class focusing on the causes of large scale migration http://www.bbc.co.uk/news/magazine-28979789 <i>How do superpowers attract migrants to their own advantage?</i> - A class based discussion of the benefits of points based immigration systems in countries such as Australia and Canada. Some useful leads on differing policies can be found here http://www.bbc.co.uk/news/uk-politics-29594642 - How are the Chinese government trying to turn Shanghai into a global hub http://www.postwesternworld.com/2015/08/24/shanghai-global-financial/ - Why London is a global hub for migration http://www.economist.com/node/21557524
2.2.3 Consequences and management of	Candidates should understand the economic, social, environmental and political consequences for the source and host nations	<i>What are the consequences of migration and how is it managed?</i> Students could read the article and try to explain the cost

international economic migration	or regions due to economic migration. Candidates need to appreciate that economic migration has an impact on a local, national and global scale, but that these impacts can bring opportunities as well as challenges to societies concerned (e.g. a 'brain gain' would bring economic benefits and increased multiculturalism but could also give rise to increased racism and discrimination). Candidates need to understand that as international migration continues to accelerate, countries and regions come to rely increasingly on each other creating an ever shrinking and interdependent world. Candidates should study the migration policies adopted by both source and host countries to manage migration flows. Candidates should recognise the difficulties that exist in managing conflicting views held by individuals and groups regarding the consequences of migration, and in particular, cultural change. The UK will need to form the basis of study here but the study could be extended to include other regions of interest.	and benefits to the host or receiving country from migration. The class could have a debate on arguing whether migration brings gains or further issues to countries. http://www.bbc.co.uk/news/magazine-25880373 • Students assess the success of the management of migration between Mexico to USA focusing on the new shelters opening to enable migrants to recover http://bbc.in/Q4vqAt • Individually or in small groups, students could research different migration policies including the key themes of the policy, the effectiveness of the policy and the features of the policy that focuses on highly skilled/highly valued migrants. Students could present their findings to the class and similarities and differences can be highlighted between migration policies • Students could summarise the resources below to investigate the positive and negatives consequences of migration for the host country, the exporting country and for the migrants themselves Geography Review, September 2015 '<i>EU migration to the UK</i>' Geography Review, September 2014 '<i>Forced Labour in the UK: Why are migrants so vulnerable?</i>'
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2.2.4 Causes, consequences, and management of refugee movements	Candidates should be able to clearly distinguish between refugees and economic migrants but should also understand that the distinction is sometimes blurred by economic refugees who are seeking economic gain but claim persecution in the host country. Candidates should understand the causes of international and internal refugee movements. These can include persecution, war, natural disasters or economic injustices such as land grabs. Such drivers can be local or on a much larger scale, leading to national inter-regional or international migration. Candidates need to understand the economic, social and political consequences of the movement of refugees into neighbouring countries and more developed economies. Candidates should be aware of some of the more apparent issues surrounding housing, discrimination and repatriation. The recent Syrian Refugee crisis could give current context to this study as candidates discuss the consequences of migration for the refugees themselves and for people in host countries such as Turkey, Jordan or Sweden. The key	<i>What are the causes of international refugee movements?</i> The GA have a range of excellent teaching ideas and resources on migration and refugees here • Students could research the definitions and the differences between refugees, asylum seekers and economic migrants • Students could watch the video on the large scale displacement of Afghans due to war and environmental disasters. Students need to create a flow diagram focusing on the causes and the consequences of such a large scale movement of people http://www.aljazeera.com/video/asia/2012/05/201251220388160962.html • Students could read and summarise the resource below to gain some understanding of the causes of refugees during the Arab spring which prompted the biggest migrant wave since second world war http://www.theguardian.com/world/commentisfree/2015/jan/03/arab-spring-migrant-wave-instability-war • Students could use the resources below to create a table to categorise the consequences of refugees into economic, social and political J. Crispin and F Jegede, Population, Resources and Development, Second edition Page 72 Read Geography Review Vol. 30 (1) pages 2-5 on 'Forced migrants in the UK'
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	geographic concepts of risk and resilience (i.e. the ability of countries to deal with the influx of refugees on a grand scale) would likely be considered when delivering the content covered in this focus box. Candidates should understand the management of refugees by UNHCR, national governments and NGOs. UNHCR serves as the ‘guardian’ of the 1951 Refugee Convention and other associated international laws and agreements. It has a mandate to protect refugees, stateless people and people displaced internally. On a daily basis it helps millions of people worldwide at a cost of around US\$5 billion annually. UNHCR works often with the UN's World Health Organisation (WHO) to provide camps, shelter, food and medicine to people who have fled conflict. It is key that candidates understand the effectiveness of the management strategies, but also the difficulties of working with the different stake holders to implement the management policies successfully. Candidates should understand the issues of powerless states in conflict or disasters to manage the movement of groups of people,	- Students could attempt to interpret the map of the number of asylum seekers and investigate the patterns identified to present to the rest of the class. http://www.theguardian.com/news/datablog/interactive/2012/apr/05/asylum-seekers-2011-mapped <i>How successful are attempts to manage refugee movements?</i> - Individually or in small groups, students should research the impact and the role of different groups who manage refugees such as NGO's, international communities through the work of UNHCR, national governments and regional governments D. Waugh, <i>Geography An Integrated Approach</i>, 2nd edition, Page 344 - Research into war torn states http://www.worldatlas.com/articles/the-world-s-most-war-torn-countries.html - States such as Djibouti are powerless to control the flows of refugees and migrants through the country http://ec.europa.eu/echo/files/aid/countries/factsheets/djibouti_en.pdf https://www.theguardian.com/global-development/2016/may/23/all-roads-djibouti-refugees-flee-yemen-civil-war-migrants-head-there
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	including refugees, soldiers and militia groups, when borders are less controlled.	
2.2.5 Causes, consequences, and management of rural-urban migration in developing countries	Candidates should understand the push factors in encouraging rural-urban migration in developing countries including mechanised agriculture, MNC's, land grabs, displacement of indigenous peoples by global systems and environmental challenges. Again, the key geographical concept of causality could be considered. Candidates should understand the pull factors in encouraging rural-urban migration in developing countries including large scale employment, the feeling of being 'modern', freedom from pressures from the family and more opportunities for higher quality education and healthcare. Candidates should understand the economic, social, environmental and political consequences on both rural and urban areas due to rural-urban migration in the emerging countries such as an ageing population, economic gain, remittance and social tension.	<i>What are the causes of rural-urban migration in developing countries?</i> - Students could research examples of mass migration from rural to urban areas in developing countries such as China, India, Brazil and Turkey. In small teams, each group is given a different developing country to research and identify push and pull factors leading to migration. Discussion can help to identify similar factors across many countries <i>What are the consequences of rural-urban migration in developing countries?</i> - Students could read the article and evaluate to what extent migration is beneficial to the exporting region. Impact of migration: The villages made up of the women left behind http://www.bbc.co.uk/news/world-europe-14386472 #geographyteacher Aug 10, 2011 - Students could read the article and identify the cause and consequences of rural-urban migration in China. In small groups, each group is given a section of the article to summarise to the rest of the class http://www.migrationpolicy.org/article/chinas-young-rural-urban-migrants-search-fortune-happiness-and-independence

	Candidates need to appreciate that rural-urban migration can bring benefits as well as challenges to societies within a country.	Students could be split into 3 groups – the causes, the consequences and the management strategies. Using the resource and further research, students have to create a presentation for the rest of the class. The presentations lead to a discussion on the effectiveness of the management strategies to overcome the original issues (the push and pull factors) and to address the on-going issues (the consequences) http://geographyfieldwork.com/SaoPauloManagement.htm J. Crispin and F Jegede, Population, Resources and Development, Second edition Page 66-68 D. Waugh, <i>Geography An Integrated Approach</i>, 2nd edition, Page 342
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Recommended reading:

- Waugh, D. (2000) *Geography An Integrated Approach*, 2nd edition, Oxford University Press (revised editions available)
- J. Crispin and F Jegede, (2000) Population, Resources and Development, 2nd edition, Collins

[Additional resource links can also be viewed here](#)

Global Governance of the Earth's oceans

Focus	Amplification of content	Teaching/learning approaches and resources
2.2.6 Global governance of the Earth's oceans	Candidates should understand the main purpose of Post-1945 supranational institutions for global governance including UN and UNESCO, EU, G7/G8, G20, G77 and NATO. This will include an overview of membership of these organisations and reasons for their existence. Understanding is also required of the difference between government (and the rule of law) and governance (steering mechanisms). Candidates should know about the main laws and agreements regulating the use of the Earth's oceans in ways that promote sustainable economic growth and geopolitical stability. They need to understand the difference between a law and an agreement, and should gain an overview of relevant work of the UN, (e.g. establishing the UN Convention on the Law of the Sea (UNCLOS) and the exclusive economic zone (EEZ)). They should also consider the contribution towards sustainable use of the oceans and oceanic ecosystems made by other UN agreements including sustainable development goals (SDGs) and CITES.	<i>What are the main post-1945 supranational institutions for global governance?</i> • Students discuss the difference between government and governance • Complete a table (i) outlining the membership/purpose of the specified supranational institutions (ii) assessing whether these institutions have legal powers or merely advise and steer <i>Which laws and agreements regulate use of the oceans?</i> • Lecture or independent research - UNCLOS and EEZ for example http://www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm • Discussion of students' prior knowledge (where applicable) of SDGs and CITES <i>What is a superpower? In what ways do oceans have</i>

	Candidates should understand the term global superpower and be able to provide supporting examples of global superpowers. They need to appreciate the strategic value of the oceans for global superpowers, with reference to both economic and military power. They should understand how maritime trade is increasingly affected by security issues, and the implications of disruption to global energy and commodity flows at oil transit chokepoints (such as the Suez and Panama canals) must be understood. Students need to appreciate the issues affecting governance of these chokepoints. Also, an example of a piracy hotspot must be studied, such as the Indonesian coast, along with possible governance solutions. Candidates should understand the connections between states and populations across the globe that are a legacy of the UK's past role as a maritime power. Candidates should appreciate that, at a local scale, maritime cities, such as Bristol and Liverpool, are especially well-connected places. They need to be aware of the existence of the Commonwealth and of enduring links between the UK and its ex-colonies in the post-war period, epitomised by the journey of the HMS Windrush from Jamaica to the UK in 1948.	<i>strategic value and create security issues for states?</i> • Geography Review 29(3) provides an account of what a superpower is (Question and Answer feature); • A starting point for independent research into security issues: http://www.marketwatch.com/story/forget-somalia-this-the-new-sea-piracy-hot-spot-2015-10-07 <i>How has the UK's past role as a maritime power helped to create a network of connected places?</i> • Group/pair research work using maps and history websites. Note: enduring connections may be political (Commonwealth membership) or cultural (countries where English is an official language)
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2.2.7 Global flows of shipping and sea cables	Candidates should gain an overview of changing trends and patterns/networks of shipping, including containers and oil tankers. They will understand that movements fluctuate over time in line with global economic trends and new markets. They need to be familiar with some ways in which shipping is regulated, such as controls on cleaning (e.g. under UNCLOS, It is illegal for ships that have recently delivered oil to use seawater to wash out their tanks. Single-hulled oil tankers were phased out after the Prestige sank off the coast of Spain in 2002). Candidates should understand why the growth of smuggling and people trafficking are issues of concern and are expected to have supporting knowledge of the scale of such problems. They should also have knowledge of the outcomes of international efforts to manage these flows. Candidates should be able to draw on specific evidence for support, for instance the issue of migrants crossing the Mediterranean and the European Union's response to the ensuing crisis. Candidates should gain an overview of changing trends and patterns in the growth of seafloor cable data networks, including recent connectivity gains in previously unconnected areas such as the East	<i>What are the main trends and patterns for shipping movement, including containers and oil tankers?</i> • For patterns, group/pair research work should focus on exploring world maps • For contemporary trends use newspaper reports e.g. Financial Times https://next.ft.com/content/1e98963c-1853-11e6-bb7d-ee563a5a1cc1 <i>How are shipping networks regulated?</i> • Relevant UNCLOS provisions can be investigated at source: http://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf <i>Why is there growing concern about smuggling and people trafficking growing? What can be done?</i> • Group/pair research work focusing on the causes and political reaction to the Mediterranean crisis <i>What are the main trends and patterns for seafloor cable data network growth? What causes and uses are driving data network growth?</i> • Group discussion of cable map, for example: http://www.submarinecablemap.com/#/ • Reading on global wealth and consumption trends: Geography Review 27(1) page 9
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	African coastline. They need to understand the causes of this network growth (e.g. emerging markets and new consumer demand, or government planning) and should have an overview of the varied ways in which different societies are making economic and social use of planetary-scale data networks. Candidates are expected to have knowledge of the risk which tsunamis and undersea landslides pose to seafloor cable data networks and the consequences for global systems when network functions are impaired (e.g. earthquakes and underwater movements near Taiwan). They are expected also to be familiar with the global governance of seafloor cable data networks, including international conventions which have been in place since the 1880s for telegraph and telephone cables.	<i>What physical risks are seafloor cable data networks exposed to? How are they protected?</i> • <i>Guardian</i> map of seafloor cables includes examples of damage: https://twistedsifter.files.wordpress.com/2012/07/map-of-undersea-submarine-cables-around-the-world.jpg?w=800&h=487 • An overview providing the basis for a Socratic seminar: http://www.independent.co.uk/life-style/gadgets-and-tech/everything-you-need-to-know-about-the-undersea-cables-that-power-your-internet-and-why-theyre-at-a6710581.html
2.2.8 Sovereignty of ocean resources	Candidates should gain an overview of the distribution of major ocean resources including minerals and fossil fuels, both on the continental shelf and in deeper water. They are expected to have knowledge of the historical establishment and subsequent reproduction of territorial limits and sovereign rights that benefit some states but not others. The EEZ is the area of water extending 200 miles from a state's shoreline. The coastal state has	<i>What are the main distribution patterns for ocean minerals and fossil fuels?</i> • Group/pair research work using maps: each group researches a different resources (oil, gas and metals) and results are shared. • For example: http://noc.ac.uk/science-technology/marine-resources/minerals-products/metals-sulphides-nodules

	the right to exploit, develop, manage and conserve all resources found in its adjacent waters. This includes both biotic (fish) and abiotic (oil, gas or minerals) resources found in the water, or on the ocean floor, of the EEZ. Candidates should understand how the contested ownership of islands and surrounding sea beds can be a source of geopolitical tension, using examples such as the South China Sea (China and the Philippines) and the Falkland Islands. They also need to have knowledge of the global governance of Arctic Ocean resources and appreciate the management interactions that occur between the local scale (claims of indigenous people), the national scale (including claims of rival superpowers Russia and the USA) and the international scale (the Arctic Council). Candidates should understand the injustices which arise from the unequal access to ocean resources amongst the world's states and nations. They need to have knowledge of the geographical consequences of isolation for poor landlocked countries, such as long-term developmental issues and subsequent governance of this issue. UNCLOS states that the 42 states with no sea coast have a right of access to and from the ocean for the purpose of enjoying 'the	<i>How are territorial limits and sovereign rights over marine resources established?</i> • Lecture or independent research on main elements of EEZ rules <i>Why are islands often a source of geopolitical tensions between states?</i> • Group discussion of one historical and one contemporary example • For example, South China Sea (2016) involving China: https://www.theguardian.com/world/south-china-sea <i>What attempts have been made to establish ownership of Arctic Ocean resources?</i> • Students can make use of this legacy A-level exercise dealing with the Arctic: http://qualifications.pearson.com/content/dam/pdf/A-Level/Geography/2013/Exam-materials/W47879A_GCE_Geography_6GE03_June_2015_P_S2.pdf <i>What Injustices arise from the unequal access of states to ocean resources?</i>
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	freedom of the high seas'. Candidates should be familiar with an example of an indigenous coastal population who claim to have been treated unjustly in relation to ocean resource use in their coastal waters (e.g. Alaska).	- Group reading and discussion: http://www.economist.com/news/americas/21650574-why-its-better-have-coastline-interiors - Extension reading: http://unohrlls.org/UserFiles/File/LLDC%20Documents/UNCLOS%20June%202012/UNCLOS%20Panel%20Summary%20Report%20FINAL.pdf <i>What injustices arise from some indigenous people's lack of access to ocean resources?</i> - Group reading of the "subsistence issue" and discussion of how this issue interrelates with ideas of justice and equity for people https://www.culturalsurvival.org/ourpublications/csq/article/alaska-native-subsistence-a-matter-cultural-survival
2.2.9 Managing marine environments	Candidates should understand the concept of the Global Commons. They should appreciate how this concept has informed changing approaches and attitudes to the management of the Earth's oceans (a global common) over time. The example of whaling could be used as an illustration of the tragedy of the commons which required remedy (IWC). The students' understanding of the key geographical concept of mitigation could be introduced or reinforced here to encourage application of knowledge to a different context.	<i>What is meant by the Global Commons?</i> - Reading: http://www.rgs.org/NR/rdonlyres/700FB902-27EC-46E1-9872-BB91A41421EF/0/GlobalSystemsandGlobalGovernanceFinal.pdf - Research the history of whaling and the reasons why the IWC was established to avert 'the tragedy of the commons' : http://www.jstor.org/stable/24359530?seq=1#page_scan_tab_contents - Reading: Geography Review 30 (4) pages 22-24 on the Arctic Ocean

	Candidates should understand the causes of over-exploitation of marine ecosystems, including consumer demand in developed and emerging economies, and weak or ineffective governance of the oceans as a global common. They should understand what the direct and indirect consequences of over-exploitation of marine life (such as fish or coral) are, or could be, both for their own community and other affected communities. Candidates should focus on (i) impacts on long-term global food availability and (ii) sustainable development for communities dependent on fishing or marine/coastal tourism. Candidates should understand the concept of sustainable development with combined/holistic social, economic and environmental goals. They need to appreciate why there is an urgent need for sustainable management of marine environments in order to promote long-term global economic growth and stability: failure to safeguard marine ecosystem stocks poses a serious threat to long-term human well being. Candidates should have knowledge of local initiatives such as no-catch zones (in Scotland's Lamlash Bay), European fishing quotas limits and local conservation measures (policies for North Wales Sea Fisheries), all of which aim to safeguard local environments, societies and economies in the	<i>What are the causes of over-exploitation of marine ecosystems? What are the consequences of this for ourselves and others?</i> • In pairs/groups, students can examine educational materials from the Fish Fight campaign: http://www.fishfight.net/ • Geography Review 28(3) pages 10-13 <i>Why is more sustainable management of marine environments needed for long-term global growth and stability?</i> • Group reading and discussion of library or online materials dealing with fish stock collapse for example: http://www.greenpeace.org/international/en/campaigns/oceans/seafood/understanding-the-problem/overfishing-history/cod-fishery-canadian/ <i>What local actions help support sustainable management of marine environments?</i> • A useful starting point for local research and the possible basis for an NEA topic: http://gov.wales/topics/environmentcountryside/marineandfisheries/compliance-monitoring/commercial-sea-fisheries-regulation-by-law/?lang=en
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	long-term.	
2.2.10 Managing ocean pollution	Candidates should have knowledge of the global pattern of oil spills and affected areas and its correlation with global trade networks. They should also understand the role of ocean currents and poor governance of terrestrial waste disposal (especially plastic waste) in the creation of oceanic garbage patches, notably in the North Pacific. They should be familiar with the global pattern of major eutrophic dead-zones and understand how terrestrial run-off gives rise to this phenomenon, and the risks and issues it creates. Candidates should have knowledge of the potential contribution that strategies at varying scales can make to the reduction of marine waste. They need to be aware of global conventions (UNLOS), international EU rules on waste management, national UK legislation and local awareness-raising and actions such as beach clean-up led by campaigning non-governmental organisations and citizen groups. Candidates should understand that these actions at different scales collectively contribute to the global governance of oceans and coastal waters.	<i>What are the causes and consequences of ocean pollution and garbage patches? What are the causes and consequences of eutrophic dead-zones?</i> - Lecture or reading using http://www.rgs.org/OurWork/Schools/Teaching+resources/Key+Stage+5+resources/21st+Century+Challenges/Plastic+pollution+in+the+oceans.htm - Discussion starting points include http://nationalgeographic.org/encyclopedia/dead-zone/ and http://www.nola.com/environment/index.ssf/2014/02/tulane+to+announce+1+million+d.html (with map) <i>What strategies are there to manage marine waste at different geographic scales, from global conventions to local (citizen-led) actions?</i> - Lecture or student reading using: https://21stcenturychallenges.org/plastic-pollution-in-the-ocean/ <i>How do different geographical scales of governance interact in UNESCO marine heritage sites?</i> As a starting point use UNESCO links: http://www.iucn.org/sites/dev/files/import/downloads/marine_wh_laffoley_douvere.pdf

	Candidates should have knowledge of one in-depth case study of an ocean issue which highlights the different geographical scales of governance and the way they interact with one another; examples can be selected from the UNESCO marine heritage site list.	and https://cmsdata.iucn.org/downloads/marine_natural_heritage_and_the_world_heritage_list.pdf
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Recommended reading:

- Oakes, S. (2017) WJEC/Eduqas A-level Geography Student Guide 5: Global Governance: Change and challenges, Hodder Education

[Additional resource links can also be viewed here](#)

Tectonic Hazards

Focus	Amplification of content	Teaching/learning approaches and resources
3.1.1 Tectonic processes and hazards	An overview of the Earth's internal structure should be given so that students have a context in which to place tectonic processes. Students should understand the layered structure of the earth (inner core, outer core, mantle, including the asthenosphere, and crust) and have knowledge of the significant boundaries (Lehmann discontinuity between inner and outer core, Gutenberg discontinuity between outer core and mantle and Mohorovicic discontinuity between mantle and crust) Students should have a knowledge of the physical characteristics (thickness, composition and physical behaviour) of each layer. Candidates should recognise the difference between oceanic and continental crust. The mechanisms that generate movement of tectonic plates should be understood. This could start with internal heating and lead to convection currents, ridge push and slab pull. The mechanics of plate movement can be linked to the processes operating at different margins; diverging, converging (ocean/ocean, ocean/continental and continental/continental) and	<i>What are the characteristics of the earth's structure?</i> • http://www.burkemuseum.org/geo_history_wa/The%20Restless%20Earth%20v.2.0.htm - Earth structure and processes • http://www.tulane.edu/~sanelson/eens1110/ - lecture notes of Tulane University • http://openhightschoolcourses.org/mod/book/tool/print/index.php?id=6645#ch2989 text and audio For introduction see Chapter 2 of Tectonic Hazards; Dunn and Degg (2012) <i>What mechanisms generate the movements of the tectonic plates at different margins?</i> • http://www.geolsoc.org.uk/Plate-Tectonics/Chap3-Plate-Margins/Mid-plate/Hawaiian-Islands - good explanations and visuals • http://www.pbslearningmedia.org/resource/9a60ceac-7574-4a2c-ba64-e45e8035f4e6/life-on-fire-hot-spots/

	conservative. These processes can also be applied to hot spots. Note that as the unit is about hazards the focus is on process rather than the production of specific landforms other than volcanoes. Students should know the distribution of earthquakes and volcanoes with an emphasis on their link to plate boundaries and hot spots. They should understand the link between earthquakes and volcanoes and tectonic processes. The impact of tectonic hazards is partially dependent on the physical characteristics of earthquakes and volcanoes. Students should know that earthquakes and volcanoes vary in magnitude - Mercalli and Richter scales for earthquakes and Volcanic Explosively Index for volcanoes. The hazard profile of earthquakes and volcanoes can also be characterised by: • predictability - the probability of an event occurring over time and space • the frequency - the return interval of events of a certain size using the idea that the larger the event the less frequently it occurs • duration - the length of time that a hazard exists using the concept that the longer the hazard the severe it is likely to be • the speed of onset - the time difference between	<i>How do we explain the global distribution of tectonic hazards?</i> http://www.pbslearningmedia.org/resource/ess05.sci.e.ss.earthsystectonic/tectonic-plates-earthquakes-and-volcanoes/ http://www.iris.edu/hq/inclass/fact-sheet/why_do_earthquakes_happen http://www.decodedscience.org/the-pacific-ring-of-fire-source-of-major-earthquakes-and-volcanic-activity/26828 - the ring of fire case study http://www.iris.edu/hq/inclass/fact-sheet/how_often_do_earthquakes_occur
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	the start of the event and its peak areal extent - the size of the area covered by the hazard	
3.1.2 Volcanoes, processes, hazards and their impacts	Students should have a knowledge and understanding of the characteristics of the major types of volcano including shield, composite and cinder. Differences in shape, structure and composition can be identified. These characteristics can be related to the nature of different volcanic eruption types. Particular reference can be made to explosive and effusive eruptions. The type of volcano and eruption type can be related to tectonic situation Volcanic processes lead to the production of particular hazards and these can often be related to the type of volcano: - pyroclastic flows - superheated clouds of ash, gas and small tephra that travel at high speeds - lava flows - rivers of molten rock that pour from an erupting vent - ash fall - fragments of rock produced when magma or rock is ejected during an explosive eruption - lahars - a mixture of water and rock fragments that flows down the slopes of a volcano - jokulhlaups - sudden discharge of glacial meltwater - volcanic landslides - large masses of debris that move rapidly down the volcanoes slopes and are triggered by a variety of processes	What are the main types of volcano and eruptions? http://www.tulane.edu/~sanelson/Natural_Disasters/volcanoflandforms.htm What is the difference between an explosive and effusive eruption? https://laulima.hawaii.edu/access/content/group/2c084cc1-8f08-442b-80e8-ed89faa22c33/book/chapter10/volcanoes.htm https://www.youtube.com/watch?v=3Bm1L3iGnEU - effusive eruptions https://www.youtube.com/watch?v=EupnfA-PDaw&list=PLkTSXWtpgL230x1i3quAeNqiDUtUfPAA&index=2 - explosive eruptions How do differing volcanic hazards impact on people? http://pubs.usgs.gov/fs/fs002-97/ - volcanic hazards

	• toxic gases - gases within the magma that are released when it rises to the surface and pressure is released Students must study examples of at least two contrasting contexts the risk and impacts of volcanic activity. The contexts chosen by centres could cover volcanic activity in a number of situations such as contrasting levels of development, contrasting populations, contrasting types of volcano etc. When studying the examples there is the opportunity to incorporate material from 3.1.5 to provide this focus box with a context. It would be possible to explore the key geographical concept of inequality in this context. The study of each example should be organised so that impacts can be discussed using as a number of categories. The presence and importance of these categories will vary with the examples chosen but can be seen as: • demographic - mortality, migration, population structure changes • economic - costs of losses • social - health, infrastructure, families • environmental - biosphere, lithosphere hydrosphere, atmosphere These impacts can be (i) primary in that they are the immediate and direct consequence of the event or (ii)	http://volcanoes.usgs.gov/vhp/hazards.html - hazards processes and impacts http://www.decodedscience.org/jokulhlaups-glacial-flash-floods-release-meltwater/49179 - jokulhlaups formation For volcanoes, see also Chapter 5 of Tectonic Hazards; Dunn and Degg (2012)
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	secondary in that they are indirect consequences of the event. The areal scale of the impact can be local (in the immediate vicinity of the event), regional (at a broader scale that can range in scale according to the event studied) or global (at a world wide scale) It is recognised that detailed exemplar material for volcanic events may not fall within the last two decades but they should not be historic in character.	
3.1.3 Earthquakes, processes, hazards and their impacts	Students should have a knowledge and understanding of the mechanisms that lead to earthquake events. The main characteristics of earthquake events should be understood including: focus - the point within the earth at which the earthquake originates depth of focus - shallow, intermediate and deep focus epicentre - the point on the earth's surface vertically above the focus Students should understand the character of P and S waves and how they are generated by earthquakes. Earthquakes, and the associated wave movements, produce a number of hazards including: ground shaking - the vibration of the earth during an earthquake caused by seismic waves	<i>What are the main characteristics of earthquake events?</i> The GA have a range of excellent teaching ideas and resources on tectonics (including a range of case studies of recent earthquakes) here http://cse.ssl.berkeley.edu/lessons/indiv/davis/inprogress/QuakesEng3.html - definitions and diagrams http://www.bgs.ac.uk/discoveringGeology/hazards/earthquakes/SeismicWaves.html - types of seismic wave http://www.slideshare.net/tudorgeog/341-earthquake-hazards-1063365 - PowerPoint on hazards https://geogabout.wordpress.com/2015/04/25/nepal-

	• liquefaction - the way in which the soil liquifies during an earthquake. The water separates from the soil particles and rises to the surface • landslides - on steep slopes the vibration causes by earthquakes can trigger landslides and mudflows (sometimes linked to liquefaction) • tsunamis - earthquakes cause the bodily displacement of large bodies of water by movement of the sea floor. Students must study examples of at least two contrasting contexts to demonstrate the risk and impacts of earthquake activity. The contexts chosen by centres could cover earthquakes in a number of situations such as contrasting levels of development, contrasting populations, depth of focus etc. When studying the examples there is the opportunity to incorporate material from 3.1.5 to provide this focus box with a context. The study of each example should be organised so that impacts can be discussed using as a number of categories. The presence and importance of these categories will vary with the examples chosen but can be seen as: • demographic - mortality, migration, population structure changes • economic - costs of losses • social - health, infrastructure, families • environmental - biosphere, lithosphere	earthquake-2015/ - Nepal earthquake, 2015 http://geogabout.blogspot.co.uk/search/label/Japan%20earthquake%202011 - Sendai earthquake and tsunami, 2011 Students could use this structured presentation to organise a comparison of two earthquake events http://slideplayer.com/slide/6965720/ For earthquakes, see also Chapter 3 of Tectonic Hazards; Dunn and Degg (2012) For tsunami, see also Chapter 4 of Tectonic Hazards; Dunn and Degg (2012)
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	These impacts can be (i) primary in that they are the immediate and direct consequence of the event or (ii) secondary in that they are indirect consequences of the event. The areal scale of the impact can be local (in the immediate vicinity of the event), regional (at a broader scale that can range in scale according to the event studied) or global (at a world wide scale).	
3.1.4 Human factors affecting risk and vulnerability	Students should understand the difference between risk (the probability of a hazard event causing harmful consequences) and vulnerability (the geographic conditions that affect the susceptibility of a community to a hazard or the impacts of a hazard) There are a number of factors affecting the risk and vulnerability of a place or community to tectonic hazards. • economic factors that can be related to the wealth of the place or community. This is linked to both the level of development and technology. Where wealth and technology is present then impacts can be managed by responses such as preparation, prediction and mitigation • social factors such as the population density where more people are at risk in densely populated areas. Population structures can contain high proportions of age and gender groups that are susceptible to hazards. Public	<i>Why are some places more vulnerable than others to tectonic hazards?</i> http://21stcenturychallenges.org/natural-hazards-2/ - David Sanderson videos https://www.e-education.psu.edu/geog030/node/379 discussion of various factors influencing risk and vulnerability https://www.youtube.com/watch?v=vvRojV-Z1rk - Why was Haiti so vulnerable? See also Chapter 1 of Tectonic Hazards; Dunn and Degg (2012)

	education can reduce the vulnerability by empowering and making the population more adaptive. • political factors such as good governance and preparation of emergency services can reduce the vulnerability of a population • geographical factors associated with the location of the tectonic event can impact upon vulnerability. The populations and facilities associated with urban and rural environments can affect vulnerability. The time of day will affect the exposure of a population as this will impact on the number of people in circulation. Isolation will impact on access for emergency services. These factors can be examined with a theoretical focus but can also be seen in the context of the examples used to illustrate the impacts of volcanoes and earthquakes. In this form they will have variable application and each case study need not cover all factors nor have equal application.	
3.1.5 Responses to tectonic hazards	Strategies used to manage tectonic hazards can be divided into those that attempt to predict and warn populations about the event, those that attempt to mitigate the impacts of the event and those that respond to the event. All attempt to increase the resilience of the population. Monitoring, prediction and warnings take a number of	<i>How successful are the responses to tectonic hazards?</i> http://news.bbc.co.uk/1/hi/world/south_asia/6197766.stm – D.A.R.T. tsunami warning system in Indian Ocean http://www.wikihow.com/Survive-a-Volcanic-Eruption -

	forms depending on the tectonic hazard. Students should be aware these have a varying degree of accuracy and effectiveness. Techniques of mitigation take a variety of forms according to the event and wealth of the country. These include building design, home preparedness, physical defences, evacuation, land use control, preparation of emergency services etc. Strategies that respond to the event can be divided into short and long-term responses. These can be defined as rescue followed by rehabilitation followed by reconstruction. The hazard management cycle offers a way of organising responses. The range of responses used to manage tectonic hazards can be studied in the context of the examples used to illustrate the impacts of volcanoes and earthquakes. An exhaustive study of all responses is not required.	general advice and student friendly http://www.pbs.org/wgbh/nova/vesuvius/predict.html - predicting volcanic eruptions http://www.scmp.com/news/asia/east-asia/article/1849838/families-near-japanese-volcano-sakurajima-evacuated-major - evacuation and alert levels near Sakurajima volcano in Japan, 2015 http://www.kochi-kia.or.jp/earthquake/english/?s=00&ss=000-01 - strategies to deal with earthquakes in Kochi, Japan https://www.youtube.com/watch?v=uwCABmP3uQ4 – between 35th and 45th minute of programme (hazard management in Japan)
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Recommended reading:

- Warn, S. (2017) WJEC/Eduqas A-level Geography Student Guide 2/3: Changing Landscapes and Tectonic Hazards, Hodder Education.
- Dunn, C. and Degg, M. (2012) Top Spec Geography – Tectonic Hazards, Geographical Association.

[Additional resource links can also be viewed here](#)

Contemporary Themes in Geography - Ecosystems

Focus	Amplification of content	Teaching/learning approaches and resources
3.2.1 The value and distribution of ecosystems	There are essentially two types of ecosystem; terrestrial and aquatic. Students should be able to name and describe the differences between the four major terrestrial ecosystems; Mountain, Grassland, Desert and Forest and also the two main aquatic ecosystems; Freshwater and Marine. Students should be able to appreciate the value of ecosystems as providers of goods and services for the survival and well-being of humans. Ecosystems provide food, water, timber, air purification through photosynthesis, soil formation and pollination. An example of where ecosystems provide commodity goods for humanity would be a coral reef. This is an ecosystem in which fish and coral formations, rock and seawater interact together. Some 500 million people worldwide use coral reefs for tourism, fishing, pearl culture and other activities. Experts have identified four different kinds of services, all vital to human health and well-	<i>What are the main types of ecosystem and how do they provide for humans?</i> Different types of ecosystems http://www.ecosystem.org/types-of-ecosystems INTERACTIVE - See an amazing tapestry of world ecosystems http://story.maps.arcgis.com/apps/MapJournal/index.html?appid=dc91db9f6409462b887ebb1695b9c201&webmap=dd6f7f93d54341a69a47002696cf5744 ... FACTFILE - http://ec.europa.eu/environment/nature/info/pubs/docs/ecosystem.pdf VIDEO - Ecosystem Services: https://www.youtube.com/watch?v=BCH1Gre3Mg0 The UK National Ecosystem Assessment (UK NEA) was the first analysis of the UK's natural environment in terms of the benefits it provides to society and continuing economic prosperity carried out in 2011.

	being: Provisioning services supply the goods themselves, such as food, water, timber and fibre. Regulating services govern climate and rainfall, water (e.g. flooding), waste, and the spread of disease. Cultural services cover the beauty, inspiration and recreation that contribute to our spiritual welfare. Supporting services include soil formation, photosynthesis and nutrient cycling, which underpin growth and production. Ecosystems also benefit the well-being of humans including medicines, gene pools and providing increased resilience to hazards. Students need to be aware of the; • Distribution of the major global biomes; rainforest, tundra • Relationship between temperature / precipitation and the distribution of biomes including forests, grasslands and deserts	
3.2.2 The structure and functioning of ecosystems	Students should understand that an ecosystem is a system with both biotic and abiotic components.	<i>How do differing ecosystems function?</i> QUIZLET - contains learning materials, various games, spelling challenges and a test.

	Biotic elements are the living parts of an ecosystem, such as plants and animals. Abiotic elements are the non-living parts such as climate and soil. Both biotic and abiotic components are linked together through nutrient cycles and energy flow. Students must also be able to explain the structure of the biotic components in an ecosystem and be able to give examples of autotrophs, saprotrophs and heterotrophs in a functioning ecosystem. Energy flows within an ecosystem via the food chain and at different trophic levels energy is either dispersed, diminished or degraded. Students should be able to compare the nutrient cycles of two biomes, explaining the size of stores and rates of flow. The tropical rainforest and desert biomes provide good comparison opportunities as they have largely varying amounts of precipitation and evaporation rates. An understanding of the different net levels of primary productivity linked to the presence of limiting factors such as; temperature, moisture, light and nutrient availability.	Ecosystem Interactions: useful diagrams of energy flows, trophic levels and nutrient cycle http://www.s-cool.co.uk/a-level/geography/ecosystems/revise-it/ecosystem-processes Profiles of four different biomes http://revisegeography.weebly.com/uploads/7/2/5/0/7250096/biomes.pdf Tropical Rainforest Biome - case study Prezi presentation Useful nutrient cycle diagrams for a tropical rainforest: http://www.s-cool.co.uk/a-level/geography/ecosystems/revise-it/the-tropical-rainforest Hot Desert Biome - case study Prezi presentation Useful nutrient cycle diagram for a desert: Nutrient Cycling SlideShare http://www.slideshare.net/geographyalltheway/ib-geography-ecosystems-nutrient-cycling Primary Productivity Table compares the different NPP's for 9 different ecosystems. Comparative tables and figures on NPP http://www.globalchange.umich.edu/globalchange1/current/lectures/klings/energyflow/energyflow.html
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	Primary production is the production of organic matter from inorganic carbon sources; this usually occurs through photosynthesis. Photosynthesis carried out by all plants in an ecosystem is called the gross primary production (GPP) 49-60% of the GPP is consumed during plant respiration. The remainder that is not used up in respiration is known as net primary production (NPP). The two main factors that contribute to the NPP of a biome are P to E ratios (Precipitation to Evaporation) and how far away from the equator they are located (and therefore their proximity to the sun).	
3.2.3 Biodiversity under threat	Biodiversity affects ecosystem function, as does disturbance and succession. Students should be aware of the ways in which biodiversity can be measured. Threats to biodiversity from direct action and indirect action operating at a range of scales from local to global should also be studied. Tropical rainforests such as the Amazon rainforest are particularly at risk from deforestation and mineral exploitation.	<i>What are the main threats to biodiversity?</i> FACTFILE - http://www.greenfacts.org/en/ecosystems/ecosystems-greenfacts.pdf Maps to show biodiversity scores for the UK and the rest of the World http://www.nhm.ac.uk/research-curation/research/projects/worldmap/diversity/index.html Rising deforestation in the heart of the Amazon - in pictures http://www.theguardian.com/environment/damian-carrington-blog/gallery/2011/jul/11/amazon-rainforest-deforestation-in-pictures

	Coral reefs such as the Great Barrier Reef's biodiversity is also under threat due to climate change and coral bleaching. Wetlands such as the East Anglian Fens biodiversity is under threat also because of industry, pollution and tourism.	<i>Which ecosystems are at the greatest risk?</i> Amazon rainforest deforestation rises sharply - http://www.bbc.co.uk/news/world-latin-america-13449792 VIDEO - The Fight for Amazonia - Raids in the Rainforest: First in three part series http://www.youtube.com/watch?v=Sf6MHwmyt04 VIDEO - Brazilian city's boom threatens Amazon http://www.bbc.co.uk/news/business-17643589 VIDEO - Damming the Amazon: Brazil plans 20 HEP dams by 2025. Indigenous residents & rainforest threatened http://www.nytimes.com/video/world/americas/10000001526824/damming-the-amazon.html VIDEO - Illegal mining in Peru destroying #Amazon: http://www.youtube.com/watch?v=QyvntL7pqws ARTICLE - Coral Reefs: Ecosystems of Environmental and Human Value http://www.globalissues.org/article/173/coral-reefs VIDEO - Great Barrier Reef Threatened by Coal Mining https://www.youtube.com/watch?v=nw1AA5YbX-c
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		ARTICLE - Wetlands Under Threat WWF http://d2ouvy59p0dg6k.cloudfront.net/downloads/WETTHREATSENG.doc GEOFILE - Biodiversity under threat – Freshwater wetlands in the East Anglian Fens https://melbapymelt.files.wordpress.com/2010/11/wicken-fen-draft-version-gf631.pdf
3.2.4 Conserving biodiversity	Students should be made aware of a range of strategies to conserve biodiversity, from total protection through no access to sustainable use. According to the United Nations, fragile environments include arid and semi-arid areas, mountainous areas, polar locations, freshwater and intertidal wetlands, rainforests and coral reefs. An awareness of conservation issues including decisions on which habitats and/or species to conserve. The Habitat Directive ensures the conservation of over 1000 rare, threatened or endemic animal and plant species. Some 200 rare and characteristic habitat types are also targeted for conservation in their own right. The UK Government have established a grants	<i>To what extent can we conserve biodiversity?</i> MAGAZINE - A complete outline and review of ongoing bird conservation in Nepal, very detailed with lots of case study material (2012). The Habitat Directive website outlines the names of species, nature and biodiversity law and strategies to conserve biodiversity. Biodiversity 2020 a DEFRA publication (2011); A strategy for England's wildlife and ecosystem services. The biodiversity strategy for England builds on the Natural Environment White Paper and provides a comprehensive picture of how UK are implementing our international and EU commitments. It sets out the strategic direction for biodiversity policy for the next decade on land (including rivers and lakes) and at sea. There is also a progress update available (2013). The Darwin Initiative Project database can be accessed

	scheme called The Darwin Initiative. It helps to protect biodiversity and the natural environment through locally based projects worldwide. The initiative funds projects that help countries rich in biodiversity but poor in financial resources to meet their objectives. Students should be aware of the different projects that it has supported and how these projects have helped to conserve biodiversity and how successful they have been.	through the following link http://www.darwininitiative.org.uk/project/ecosystems-biomes/ Why is the rainforest important? VIDEO - Sustainable management of the rainforest in Costa Rica Costa Rica management overview VIDEO - The cost of #sustainability: Environmental Special. Destruction of Amazon in search of gold #Peru http://www.aljazeera.com/programmes/countingthecost/2012/05/2012511105242122194.html 21st Century Challenges - Britain's biodiversity
3.2.5 Ecosystems at a local scale	Students should be able to describe and explain the succession of one ecosystem at a local scale. In the UK local ecosystem may encompass deciduous woodland, sand dunes and wetland areas. Students should be able to describe the primary and secondary successions in their chosen ecosystem. Succession is the changes that occur over time as a plant community reaches a seral	<i>What influences succession within an ecosystem?</i> The Land Cover Map 2007 (LCM2007) is the latest land cover map to be produced by the Centre for Ecology & Hydrology. It has been derived from satellite images and digital cartography and gives land cover information for the entire UK. Land cover is based on UK Biodiversity Action Plan Broad Habitats. Opportunities for fieldwork fit well into the teaching of this particular focus. The Royal Geographical Society has provided some useful help on different fieldwork techniques

	climax. It is influenced by; competition, number of new species and environmental stress. Students should be aware of the differences between a primary and secondary succession. A secondary succession is a succession that develops on land that has previously been vegetated. For example, an area might have been cleared for farming, but later abandoned. This abandoned land becomes colonised in a secondary succession. There are a number of arresting physical factors that can prevent vegetation from reaching the natural climax, examples of these are; • grazing by animals • spontaneous fire (as a result of lightening or intense heat) • mudflow • disease • change in climate • volcanic eruption The arresting factors create subclimax communities. It is only when these are	to investigate succession through transects of local ecosystems. VIDEO - Ecological Succession: From Pioneer to Climax Communities. Easy to understand video with accompanying transcript and quiz available to follow the video. ANIMATION - Forest Succession ANIMATION - Forest Primary Succession
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	removes that a climax community can be reached. Plant successions can be stopped from reaching the climatic climax, or deflected towards a different climax, by human interference. The resulting vegetation is known as a plagioclimax. Examples of human activity that create plagioclimaxes are: • deforestation or afforestation • animal grazing or trampling • fire clearance	
3.2.6 The Arctic tundra biome	Students should be familiar with the characteristics of the climate, plants, animals and soils of the Arctic tundra biome. They should also be aware of the interdependence between the climate, plants, animals and soils of the Arctic tundra biome and the impact a changing climate has on the interrelationships between these characteristics.	<i>What are the main characteristics of the Arctic tundra biome?</i> Tundra profile http://www.geography.learnontheinternet.co.uk/topics/tundra.html More detailed profile of the Tundra biome https://prezi.com/dclly6g5efwp/arctic-tundra-biome/ PODCAST - Global Warming and the Arctic Tundra http://www.bbc.co.uk/programmes/p02w3dfd Historically the short summers and cold winters meant that the tundra regions were too cold for trees to grow tall, leaving a landscape dominated by grasses, flowering plants and low shrubs. But recent warming has led to the shrubs getting

		taller, and more dense in some parts. And taller shrubs means that the snow does not lay in a smooth blanket, losing the insulating effect in winter and reducing the amount of sunlight reflected back out to space. Why are cold environments often viewed as ‘fragile’? Cold environment ecosystems http://www.blueplanetbiomes.org/tundra.htm Cold environment soils and nutrient cycling http://www.britannica.com/EBchecked/topic/418612/North-America/41450/Grassland-desert-and-tundra-soils
3.2.7 Sustainable use of the Arctic tundra biome	Students should be able to explain what the threats to the Arctic tundra currently are, including; • climate change • mineral exploitation • tourism They should be able to explain what the threat is and the stakeholders involved and the importance of using this particular biome sustainably (in terms of economic, social and environmental sustainability). Consideration should be given of the view of	<i>What are the issues associated with the development of cold environments?</i> Trans-Alaskan pipeline - http://www.alyeska-pipe.com/Default.asp ANWR - http://www.anwr.org/ Siberian oil crisis - http://www.helsinki.fi/~lauhakan/whale/decay/pechora.html PODCAST - A life with Tundra (an insight into the life of a subsistence hunter) http://www.bbc.co.uk/programmes/b00hrg65 GEOFILE - Decision making exercise on fossil fuel exploration in the Mackenzie

	the indigenous populations and how these conflict with the other stakeholders. The key geographical concept of resilience (of native peoples) could be revisited during discussion. At least two strategies used to manage the Arctic tundra biome should be studied and evaluated in terms of sustainability.	valley https://geographyalevelslc.files.wordpress.com/2014/03/geofile-high-technology-for-energy-in-the-arctic.pdf BROCHURE - WWF: Linking Tourism and Conservation in the Arctic Ten Principles for Arctic Tourism, Code of Conduct for Tour Operators in the Arctic and Code of Conduct for Arctic Tourists VIDEO - Arctic Peoples http://wwf.panda.org/what_we_do/where_we_work/arctic/arctic_peoples/ MAGAZINE - The EU and The Arctic: an in-depth look at EU policy and conservation projects http://awsassets.panda.org/downloads/thecircle0116_web.pdf
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Recommended reading:

- Holmes, D (2006) Contemporary Case Studies: Ecosystems and Biodiversity, Phillip Allan Updates

[Additional resource links can also be viewed here](#)

Contemporary Themes in Geography - Economic Growth and Challenge: either India or China

INDIA

Focus	Amplification of content	Teaching/learning approaches and resources
3.3.1 The physical background of India	The Indian subcontinent covers a vast geographical area of 3.3 million sq. km and therefore has a wide range of physical features that can be studied. The Himalayas separates the country from mainland Asia and lies between 8° 4' and 37° 6' north of the Equator. It is surrounded by the Bay of Bengal in the east, The Arabian Sea in the west and the Indian Ocean to the south. Relief and drainage patterns – A suggested approach could be to classify India into several physical regions and look at the relief and drainage patterns within each one. For example: The Himalayan Mountains to the North, The Indo-Gangetic Plain (which is dominated by three major rivers – The Ganges, the Indus and the Brahmaputra), The Peninsular Plateau, The Coastal Plains, The Thar Desert and The Islands Characteristics and patterns of climate – A wide range of climates can be observed in	<i>What are the main features of India's physical environment?</i> 'Maps of India' provides maps of the physical geography of India along with summaries of the main geographical features: http://www.mapsofindia.com/geography/ Introduction to India – low level but provides a basic background to the physical geography of the country: BBC Class Clips: http://www.bbc.co.uk/education/clips/z6mhyrd Although aimed at key stage 3 the Royal Geographical Society provides useful background information on India: http://www.rgs.org/OurWork/Schools/Teaching+resources/Key+Stage+3+resources/New+India/New+India.htm Summary explanation of the monsoon climate: http://www.coolgeography.co.uk/A-level/AQA/Year%2013/Weather%20and%20climate/Tropics/Tropics%20-%20monsoons.htm How Indian monsoon rains are caused, BBC Class

	India varying from arid desert in the west, humid tropical climates in the far south and alpine tundra in the Himalayan north. The climate is strongly influenced by the Thar Desert and the Himalayas and encounters four different types of season associated with the monsoon. The movement of the Intertropical Convergence Zone can be studied in the context of the monsoon rainfall and how it affects climate within India. Water availability - Rivers can be identified as sources of water availability. A suggested classification of rivers could be the Himalayan, the Deccan, the coastal and the rivers of the inland drainage basin. Rivers in India fluctuate greatly in volume due to the presence of the monsoon and/ or being snow-fed from the Himalayas. Water availability becomes more limited nearer the Thar Desert in the west.	Clips: http://www.bbc.co.uk/education/clips/zhxg9i6 A good link to an animation that helps explain the Intertropical Convergence Zone: http://www2.palomar.edu/users/pdeen/Animations/23WeatherPat.swf Water resources and use in India can be found here: http://www.eoearth.org/view/article/156948/
3.3.2 The demographic, social and cultural characteristics of India	With the fastest growing population in the world it is estimated that India will overtake China as the most populated country by 2030 and currently has a population of 1.2 billion (2015). India is organised as a federation of states and union territories which have substantial political independence. Factors affecting population distribution,	<i>How have the demographic, social and cultural characteristics of India changed?</i> Background to India's economic and political history and demographics: Miller, G. and Warn, S. (2010). Emerging Superpowers: India and China: The Geographical Association, pgs. 9-10 & 16-21

	growth and structure - Population distribution can be studied by observing the regional differences between the north and south of the country. The population is concentrated in the fertile northern floodplains where subsistence agriculture dominates and 47% of the population growth is concentrated into just 4 states. Census data confirms that India's rate of increase is slowing with sharp regional variations, ranging from 5.1% in Nagaland to just 1% in Kerala. The growing proportion of Indian's over 60 and the unbalanced sex ratio at birth can also be observed. Political systems and governance influencing social change including health, education and welfare – Being the world's largest democracy and having a federal style of government has greatly influenced the impact on health, education and welfare in India. However, it should also be noted that whilst democracy is assumed to be beneficial, it has led to India having a poor reputation in terms of burdensome bureaucracy, corruption and conflict between state and central government. Cultural influences including attitudes to gender, the caste system in India – India's cultural influences are strong, particularly in the rural areas that account for over 70% of the	India's demographics: Marriott, A. (2005). Demographic Change and Population Policy in China and India: Nelson Thorne Geofile online Demographic profile of India (2014): http://www.indexmundi.com/india/demographics_profile.html India, The World's Largest Democracy: BBC Class Clips: http://www.bbc.co.uk/education/clips/z6mhyrd What is India's Caste System?, BBC, February 2009; http://www.bbc.co.uk/news/world-asia-india-35650616 Useful summary of caste in India: http://www.dummies.com/how-to/content/indias-caste-system.html
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	population. The caste system is deeply rooted in India's culture and there are many issues that stem from this. India also has a high ratio of males to females and there are particular attitudes towards gender that are often reported in the media.	
3.3.3 Opportunities and constraints of India's physical environment	The physical environment has played a major role in India's economic development. The resource base including energy sources and minerals – India has a wealth of energy and mineral resources that can be studied. There are coal and bauxite reserves that are relatively unexplored and unutilised. Copper and gold are also present but under explored. The physical environment including relief, climate and water availability - The agricultural sector in India is very strong and provides employment for the majority of the population. The fertile floodplains of the north are the result of its unique physical environment and as such support a successful agricultural sector. However, the remote mountainous regions can often prohibit the development of industry and services. Constraining effects of climate variability	<i>What opportunities and constraints for economic development are presented by India's physical environment?</i> How the monsoon affects economic activity in India: http://monsoon.yale.edu/monsoon-affects-economy-health-in-india/ Natural resources in India; http://www.importantindia.com/12331/types-of-natural-resources-in-india/ How the monsoon affects India's economy: http://www.hindustantimes.com/delhi/how-monsoon-affects-indian-economy/story-I90fyG2LbcSuc4VnDktiNM.html The fertile North of India: http://www.nytimes.com/2008/06/22/business/22indiafood.html?_r=0

	on human activity including droughts and floods – The distribution of human activities can be linked to the variability of climate. The arid climate of the Thar Desert presents a major constraint in the west whilst the monsoon rainfall can be hugely disruptive in the growing urban areas as it weakens infrastructure. Droughts and floods can be studied in the context of agriculture and urban activities where they can affect electricity supply, sanitation and water contamination.	
3.3.4 The economic and political background of India	There have been major changes to India's economic policy after independence in 1947 and again in 1991 as an outcome of economic crisis. The socialist government post 1947 ensured a high level of state control of key industries. Today the economy has had a major about-turn, opening it up to economic globalisation since economic reform in 1991. Distribution of economic activity can be studied by looking at the sectors involved. Agriculture, manufacturing and the service sector have a different distribution of activity. There is a disparity between urban and rural areas as well as between states. Comparisons can be made between the economic activity present in the metropolitan areas of Mumbai and Delhi and that of remote rural settlements	<i>How have political changes in India impacted on the development of the economy?</i> India's path to economic development: http://www.tutor2u.net/geography/reference/indias-path-to-economic-development Economic change in India: Miller, G. and Warn, S. (2010). Emerging Superpowers: India and China: The Geographical Association, pgs. 36-43 India's claim to superpower status and economic growth: Dunn, C. (2010). Contemporary Case studies: Superpowers: Philip Allan Updates, pgs. 63-66 Background on key growth industries and SEZs: Brown, M. (2013). India: A case study of a Newly Industrialising Country: Nelson Thorne Geofile online

	within states themselves. There is also scope to compare states such as Kerala with Bihar or Uttar Pradesh. Influence of political systems of democracy in India on economic change – After a major economic crisis in 1991 when India had to borrow money from the International Monetary Fund there was a change in government policy. This economic reform led to globalisation of the economy. Students need to be aware of the impact these changes have had on the economy. Role of government in the location and development of economic activity – A study of Special Economic Zones in India would provide a good example of the influence that the government has had. The controversy surrounding these zones adds additional depth to the discussion.	Democracy in India: http://www.importantindia.com/10586/essay-on-democracy-in-india/ Guide to India's Special economic Zones: http://www.india-briefing.com/news/guide-indias-special-economic-zones-9162.html/ And... http://articles.economictimes.indiatimes.com/2005-07-08/news/27506703_1_special-economic-zone-act-sez-act-sez-bill
3.3.5 The global importance of India	Post-reform India has emerged as a leading world economy. It is certainly a demographic superpower with considerable influence worldwide. India is a nuclear power, is strategically important and has developed world class services, often being named 'the back office of the world'	<i>How has India grown as a global power?</i> Growth of call centres in India: Nash, S. (2010). Globalisation of services – Calling India: Nelson Thorne Geofile online Growth of Bangalore's economy and the importance of

	Recent changes in the size and structure of India's economy – There needs to be an understanding of the scale of the economy as well as the importance of the service sector as a percentage of GDP. Students should also appreciate that a large agricultural base still dominates and there is a considerable economic contribution from the manufacturing sector. The global shift, outsourcing and offshoring including the role of India as the global outsourcing capita - A study needs to be made of outsourcing as one of the keys to India's success. The focus should not only include call centres but other back office administrative work and software development. Numerous examples can be found to illustrate this such as British Airways and American Express. Influence of India's use of political (soft) power in the wider world including its participation in global organisations, governance, conventions and treaties – This could be looked at in the context of India's influence as a founder member of GATT, a member of the G20 and as one of the BRICS	outsourcing: Emerging superpowers: Booming Bangalore. (2010). [DVD] Pumpkin Interactive Ltd TedTalk: Hans Rosling, Asia's Rise How and When (2009) http://www.ted.com/talks/hans_rosling_asia_s_rise_how_and_when Case Study of Tata: Emerging TNC: Dunn, C. (2010). Contemporary Case studies: Superpowers: Philip Allan Updates, pgs. 66-67 Case study of Coca Cola – hugely successful but often controversial TNC in India: http://www.coca-colaindia.com/ Geocases: India: The rapid growth of the service sector: http://www.geocases1.co.uk/india1.htm Tata's Global Influence, 2011 (Chairperson has now changed) http://www.economist.com/node/18285497 Map and brief summary of the G-20 nations: http://www.mapsofworld.com/world-maps/g20-countries.html
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3.3.6 Threats to India's environment associated with economic growth	There is a complicated relationship between the environment and economic growth. The environmental impact of uncontrolled development across India has been mostly negative as the country addresses the challenges of poverty. The risks posed to the environment will continue to grow without focus on sustainable development. Environmental pressures associated with economic growth – These must include fossil fuel use, industrial pollution, soil erosion, deforestation and desertification. Each of these can be looked at in some depth in the context of India's rapid economic development. Environmental issues of water security, food security and energy security – Rapid economic development has led to an increased demand for water, food and energy in both urban and rural areas. Case studies can be used to illustrate this such as the need for irrigation in rural areas of Gujarat or the environmental impact of the Narmada dam project. Environmental pressures associated with rapid urbanisation – This has led to the uncontrolled growth of slums in cities with environmental problems of waste, water and	What are the main threats to India's sustainable development? The environmental impact of economic growth : Miller, G. and Warn, S. (2010). Emerging Superpowers: India and China: The Geographical Association, pgs. 48-53 Coca Cola's impact on water resources in India has been well documented: The Guardian, June 2014 http://www.theguardian.com/environment/2014/jun/18/indian-officals-coca-cola-plant-water-mehdiganj The Guardian, March 2006 http://www.theguardian.com/money/2006/mar/19/business.india1 Strength of feeling towards Coca cola in India can be seen on this website (although biased) http://killercoke.org/crimes_india.php Impact of air pollution on crop yields: http://www.theguardian.com/environment/2014/nov/03/india-air-pollution-cutting-crop-yields-by-almost-half Environmental pressures in Bangalore: Challenges of Urbanisation: Inequalities in Bangalore. (2010). [DVD] Pumpkin Interactive Ltd
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	air pollution. Dharavi slum in Mumbai could provide a suitable example as well as a focus on the resilience of the population.	
3.3.7 Sustainable development in India	There has been a long history of environmental concern in India and ensuring sustainable development has been an issue for some time. People's movements to raise environmental issues, such as the Chipko protests against the exploitation of resources, have been allowed to develop because of India's democratic structure. Strategies to manage one environmental problem associated with economic growth - Several examples are possible here such as rainwater harvesting projects to manage water shortages in Gujarat or Rajasthan or banning auto-rickshaws in Delhi to combat vehicle pollution. Strategies to improve the security of either water or food or energy – Strategies can be local or regional and could be from the state or NGOs. Biogas production in rural Maharashtra provides a good example of a sustainable solution to improved energy security. Strategies to improve the sustainability of urban communities - India's urban population	<i>How successful are strategies to combat these threats?</i> Case studies for Sustainable Electricity (Muppandal Wind Farm) and Biogas: Energy Security: India's Sustainable Solutions. (2010). [DVD] Pumpkin Interactive Ltd New Delhi's plans for driving restrictions: The Guardian, April 2016: http://www.theguardian.com/environment/2016/apr/15/india-smog-choked-capital-imposes-driving-restrictions Rainwater harvesting projects in India: http://indianexpress.com/article/good-news/go-with-the-flow-the-rainwater-harvesting-movement-is-steadily-gaining-momentum/ Delhi's plans to ban auto rickshaws, Guardian: March 2010 http://www.theguardian.com/world/2010/mar/18/delhi-plans-ban-autorickshaws Mumbai's slum solutions, BBC 2008: http://news.bbc.co.uk/1/hi/world/south_asia/7558102.stm NGO project to improve slums and the lives of people who live there: The Guardian, April 2016: http://www.theguardian.com/cities/2016/apr/14/slum-

	has grown rapidly in recent years. This has led to a number of challenges that present problems for sustainability. The ways in which local government and private investors address the growth of slums, increasing inequality and the informal sector can be studied.	women-ahmedabad-india-housing-revolution Strategies to improve sustainability in Bangalore: Challenges of Urbanisation: Inequalities in Bangalore. (2010). [DVD] Pumpkin Interactive Ltd Decision making exercise to improve the sustainability of a slum. The activity 'Improving a Shanty Town' can be adapted to a real life example such as Dharavi in Mumbai: Leat, D. (2003). More Thinking Through Geography: Chris Kington Publishing, pgs. 43 -49
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Recommended Reading:

- Miller, G. and Warn, S. (2010). Emerging Superpowers: India and China: The Geographical Association (revised edition published in 2017)

[*Additional resource links can also be viewed here*](#)

Contemporary Themes in Geography - Economic Growth and Challenge: either India or China

CHINA

Focus	Amplification of content	Teaching/learning approaches and resources
3.3.1 The physical background of China	Students will need to develop knowledge of the relief of China, from the mountainous west to the flat terrain in the east. In part, this pattern was created by China's vast rivers carving their way through the landscape. A basic introduction to China's fluvial systems would assist students' understanding of patterns of development. There are significant climatic variations within China including vast differences in rainfall totals. Mean temperature maps can help explain differences in the length of the growing season across the country. It is important that students grasp the interconnectivity of these physical aspects and that these, in turn, impact on the pattern of economic development.	<i>What are the main features of China's physical environment?</i> <i>Relief and drainage:</i> http://www.geographynotes.com/articles/relief-features-and-climatic-characteristics-of-china/504 http://www.britannica.com/place/China/Relief http://afe.easia.columbia.edu/china/geog/maps.htm#2a http://www.britannica.com/place/China/The-eastern-region#toc70977 <i>Climate:</i> http://factsanddetails.com/china/cat10/sub64/item399.html http://www.chinamaps.org/china/china-temperature-map.html <i>Water Availability:</i> https://www.stratfor.com/image/chinas-annual-water-availability
3.3.2 The demographic, social and cultural characteristics of China	A clear east/west split is evident in terms of distribution of population, as exemplified by the Heihe–Tengchong line. Internal migration impacts on population growth patterns in	<i>How have the demographic, social and cultural characteristics of China changed?</i> <i>Population distribution:</i>

	China as migrants tend to be younger leaving a more elderly rural population and slower population growth in rural areas. China's population has needed to adapt to the new economic climate. Students should be aware of population growth rates regionally and nationally and how these affect the population structure. These patterns can be explained by the One-Child policy and improvements in health care in recent years. Students should be aware of the most recent revisions made to the One-Child policy. Students will be expected to recognise the transition made from the state-led economy to a market-led economy after Mao's death in 1976. An understanding of the differences between communism and capitalism will also aid pupils' understanding of the subsequent changes seen in Chinese society. The 'Iron Rice Bowl' no longer exists; the implications of this transition for the entire population was enormous. Students should be aware of the disparities that exist in the provision of education, health and welfare within China. These disparities can then be linked to other fields of study such as regional economic disparities and migration patterns. The Hukou system plays a	http://www.lahistoriaconmapas.com/atlas/china-map/china-population-distribution-map.htm http://www.rgs.org/webcasts/activities/chinacity.html (a quick starter) http://www.migrationpolicy.org/article/chinas-young-rural-urban-migrants-search-fortune-happiness-and-independence https://en.wikipedia.org/wiki/Migration_in_China https://cac-ib-geography.wikispaces.com/Chinese+to+Shanghai Population Growth: http://www.newgeography.com/content/002218-china-urbanizing-and-moving-east-2010-census http://www.worldometers.info/world-population/china-population/ http://www.bbc.co.uk/news/world-asia-34665539 http://news.nationalgeographic.com/2015/11/151113-datapoints-china-one-child-policy/ http://www.theguardian.com/world/2015/oct/29/china-abandons-one-child-policy Population Structure: http://www.bbc.co.uk/news/world-asia-19630110 http://www.chinausfocus.com/finance-economy/population-structure-changes-have-significant-economic-implications/ https://www.sciencedaily.com/releases/2015/10/151026092918.htm http://www.healthdata.org/news-release/rapid-change-china-brings-significant-improvements-health
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	major part in re-enforcing these inequalities e.g. lack of rights for families of migrant workers in cities. Political changes have led to an improvement in the provision of healthcare in China but inequalities persist - both within urban areas and between rural and urban areas. Attitudes towards women are evolving and vary across the country and in different settings – one change is the increasing dominance of females in some modern factories. 92% of the population of China are Han Chinese. The remaining 8% consists of 55 recognised (and unrecognised) minority ethnic groups. One minority group whose treatment under China's state laws has been highlighted is the Tibetans and this could form a basis for study. However, there are many other groups within Chinese society that are considered a minority on the basis of ethnicity, disability or sexuality. Evolving attitudes to their position in society could also be studied. The changes outlined can be linked to political systems and students should show an understanding of the evolving nature of	Political change: http://news.bbc.co.uk/1/hi/world/asia-pacific/5237748.stm http://www.cnbc.com/2016/01/17/how-chinas-economy-has-evolved-in-charts.html http://www.cato.org/policy-report/januaryfebruary-2013/how-china-became-capitalist Increased inequality due to political systems: https://china.savethechildren.net/sites/china.savethechildren.net/files/library/Inequality_in_China.pdf Education: https://en.wikipedia.org/wiki/Education_in_China http://www.buseco.monash.edu.au/units/dru/papers/working-papers-05/1205-xl-china.pdf (long but some good information) https://www.youtube.com/watch?v=D5YyUaqVbho&nohtml5=False The evolution of the Hukou: https://en.wikipedia.org/wiki/Hukou_system http://www.theguardian.com/world/2014/jul/31/china-reform-hukou-migrant-workers https://futurechallenges.org/local/chinas-hukou-system-further-its-educational-inequality/ Health: https://en.wikipedia.org/wiki/Healthcare_reform_in_China
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	political systems within China. https://www.sciencedaily.com/releases/2013/06/130606190825.htm https://www.youtube.com/watch?v=5wGLFaVb98w&nohtml5=False Welfare: http://www.theguardian.com/global-development/2013/apr/23/china-welfare-system-inflexible-unfair http://www.theguardian.com/business/economics-blog/2015/aug/19/china-poverty-inequality-development-goals http://news.bbc.co.uk/1/shared/spl/hi/picture_gallery/04/asia_pac_china0s_wealth_gap/html/1.stm http://www.theworldofchinese.com/2014/09/iron-rice-bowl-losing-its-lustre/ Attitudes to women: http://www.theguardian.com/world/2011/nov/02/chinas-great-gender-crisis https://en.wikipedia.org/wiki/Women_in_China http://www.economist.com/node/21539931 http://www.economist.com/news/china/21577396-supply-female-factory-workers-dwindles-blue-collar-women-gain-clout-girl-power Minority groups: http://www.bbc.co.uk/news/world-asia-china-23081653 http://www.bbc.co.uk/news/world-asia-china-20457627 http://asiasociety.org/ethnic-minorities-china http://news.bbc.co.uk/1/hi/world/asia-pacific/8478911.stm
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3.3.3 Opportunities and constraints of China's physical environment	Students should be made aware of the resource base of China. This can be done via maps showing mineral and energy sources within the country. Students should understand the role that mineral and resource exploitation can play in regional economic development and the development of industry. Students could study how the physical environment has played a role in developing the economy of China within a global context – the location and development of the container ports could be included here. Historically, China has suffered from both droughts and flooding. Coupled with the relief of the land, these two hazards have greatly impacted the patterns of economic development within the country. Natural disasters can render land less productive and can lead to food insecurity. This can, in turn, bring economic hardship and can lead to outmigration on a grand scale. Students could study patterns of water availability - the presence of water viewed either as a factor to aid or to constrain development. This can lead to a discussion of the impact of climate change in China and the future economic geography of the country.	<i>What opportunities and constraints for economic development are presented by China's physical environment?</i> <i>China's resource base:</i> Students could use the following resources to split a base map of China into regions and create a table outlining the resource base of each region: http://www.chinatouristmaps.com/china-maps/maps-of-resources.html http://www.mapcruzin.com/free-maps-thematic/china_res_1971.jpg http://en.chinamining.com.cn/Maps/2006-07-31/1154313964d292.html http://www.china.org.cn/english/en-shuzi2004/zr/zrzy-kc.htm http://en.cgs.gov.cn/Facts/27026.htm http://fortune.com/2014/07/11/coal-china/ http://www.sciencedirect.com/science/article/pii/S0301420713000469 <i>Global opportunities:</i> http://www.statista.com/topics/1958/natural-resources-in-china/ http://phys.org/news/2012-07-china-stockpiling-rare-earths.html https://chovanec.wordpress.com/2010/10/02/the-politics-of-rare-earth/ https://thebusinessofmining.com/2010/10/04/the-rise-of-china-in-mining/
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	Students should also be aware that a plentiful water supply is vital for industrial development and that therefore, a lack of water resources has impacts far beyond the agricultural sector. China has attempted to overcome these natural barriers to development. Initiatives are often large scale projects such as the Three Gorges Dam or the South-North Water Project. The sheer scale of these engineering projects inevitably leads to controversy and can impact wide areas. Students should recognise that these impacts, in addition to the projects themselves, can bring risks to the natural environment or peoples and can also lead to further economic opportunities and constraints.	Students could use this resource to inform a debate on how the location of ports help shape economic opportunities within a country: http://www.phoenixryzing.org/maps_schedules.html Water: http://chinawaterrisk.org/resources/analysis-reviews/the-state-of-chinas-agriculture/ http://cleantechnica.com/2014/03/22/solar-power-water-use-infographic/ Students could use this resource to consider how water availability can affect the location of differing industries: http://www.wri.org/blog/2013/08/majority-china%E2%80%99s-proposed-coal-fired-power-plants-located-water-stressed-regions Droughts and flood: Students could use the following resources to develop a map of flood and drought prone areas in China: http://www.theguardian.com/world/2009/jun/30/china-climate-change-warning http://worldwater.org/wp-content/uploads/sites/22/2013/07/ch05.pdf (page 12 water conflicts) http://www.theguardian.com/environment/2011/jun/17/china-evacuation-floods http://www.ibtimes.com/china-droughts-are-driving-down-corn-production-forecasts-worlds-second-largest-2201617 http://www.financialsense.com/contributors/evelyn-browning-
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		garris/floods-droughts-crop-problems-china http://www.icharm.pwri.go.jp/training/pdf2007/07_proposal_report/china.pdf (map on slide 3) Flood response: Students could use the following resources to evaluate the success of differing approaches to controlling flooding: http://reliefweb.int/sites/reliefweb.int/files/resources/Full_Report_1302.pdf http://reliefweb.int/sites/reliefweb.int/files/resources/Full_Report_1302.pdf https://en.wikipedia.org/wiki/Three_Gorges_Dam#Floods.2C_agriculture.2C_industry http://www.theguardian.com/environment/2010/jul/19/three-gorges-dam-flood-test Water transfer schemes: http://www.theguardian.com/world/2014/dec/12/china-water-diversion-project-beijing-displaced-farmers http://www.water-technology.net/projects/south_north/ http://english.cntv.cn/2014/09/15/VIDE1410760215506312.shtml Students could present information based on this series of news reports outlining the South-North Water Project and assessing its impact on China http://english.cntv.cn/special/quenchingamightythirst/ Relief: https://commons.wikimedia.org/wiki/File:1941_China_from_the_East.jpg
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3.3.4 The economic and political background of China	Students should understand how the nature of economic activity varies across China. A good starting point would be an overview of how employment has changed by industrial sector in recent years and the associated distribution of economic activity that has emerged. Political upheaval and the adoption of modified communism have led to enormous economic changes in China since 1976. To understand these impacts, students should be made aware of the main political changes that have taken place in this recent period. A landmark change was the introduction of the Open Door Policy in 1978 and the subsequent formation of Special Enterprise Zones. Students should be aware of the characteristics of these zones, including the formation of joint ventures. The success of these enterprise zones has exacerbated internal inequalities within China, with economic growth concentrated in eastern areas. Town and Village Enterprises saw unprecedented growth during the 80s and 90s and although this growth has slowed in recent years, TVE's remain as major	<i>What are the patterns of economic activity in China?</i> <i>Industry by sector:</i> Students could complete a short examination style question to describe recent changes in employment structure of China. http://blogs.reuters.com/felix-salmon/2012/02/02/why-jobs-require-cities/ <i>Distribution of industries:</i> Using these resources, students could describe the distribution pattern of various industries within China: http://fortune.com/2014/07/11/coal-china/ http://www.steelonthenet.com/maps.html http://revel.unice.fr/eriep/?id=3476 http://blogs.wsj.com/chinarealtime/2013/03/15/china-the-jobs-report/ http://www.slideshare.net/Fordlovers/fakta-om-fordonsindustrin-china (slide 10) <i>How have political changes impacted the economy?</i> <i>Political changes:</i> https://www.youtube.com/watch?v=uRZEVqC_ZU https://www.youtube.com/watch?v=F7AN2D9WISs https://www.youtube.com/watch?v=rMTNNe1a9iY http://csis.org/blog/china-economic-reform-timeline Students could summarise the main policy changes seen as China modernised.
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	employers in rural areas. As the economy of China continues to evolve and government policy attempts to push economic development to the west and north, there will be further changes to the economic picture within China. Students can bring their studies up to date by recognising that the slowdown in the Chinese export economy could lead to an economy based on a 'home' rather than a 'foreign' market.	<i>What role did the government play in determining the location and development of economic activity?</i> TVEs https://chinaperspectives.revues.org/773 https://transformationallogistics.wordpress.com/2008/11/06/tves-township-and-village-enterprises-in-china/ SEZs http://www.worldbank.org/content/dam/Worldbank/Event/Africa/Investing%20in%20Africa%20Forum/2015/investing-in-africa-forum-chinas-special-economic-zone.pdf https://prezi.com/5vlibdwvzhtt/how-do-special-economic-zones-in-china-affect-the-economy-an/ http://blogs.worldbank.org/developmenttalk/china-s-special-economic-zones-and-industrial-clusters-success-and-challenges http://base.d-p-h.info/en/fiches/dph/fiche-dph-7976.html https://www.youtube.com/watch?v=ND_Y4hfkesA https://www.youtube.com/watch?v=y0pq1qM5rJU Students could use these resources to outline the main characteristic of SEZ and the impact these had on the Chinese economy. <i>Influence of 'Western' economies/Joint ventures:</i> http://www.theatlantic.com/magazine/archive/2011/12/how-walmart-is-changing-china/308709/ http://www.telegraph.co.uk/finance/newsbysector/transport/96
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		84276/Jaguar-Land-Rover-seals-Chinese-joint-venture.html http://chinaautoweb.com/auto-companies/ http://www.bbc.co.uk/news/business-20386558 Recent changes in policy: http://www.wsj.com/articles/chinas-shift-away-from-industry-drains-life-from-a-steel-town-1441652778 http://www.businessgreen.com/bq/news/1803757/china-launches-emission-cutting-factory-closure-programme http://asiahouse.org/chinas-shift-export-led-domestic-consumption-driven-economy-will-see-6-5-growth/
3.3.5 The global importance of China	The first point that students must address is the recent changes in size of the Chinese economy. The term 'recent' is not clearly defined but students should be aware of changes post 1978, and those that happen during the life of the specification. As this guide is being assembled, a question mark exists surrounding the health of the Chinese economy and this should be addressed. China's current position should be put into a global context. Students should also focus on changes to the economic structure of the country. This could include the shift within the industrial sector from public to private ownership as well as a shift in employment from primary to	In a global context, what have been the recent changes to China's economy? Economic changes: http://www.theguardian.com/business/2010/aug/16/chinese-economic-boom https://www.youtube.com/watch?v=UNObD7GEcQ8&app=desktop http://www.economist.com/blogs/freeexchange/2015/01/chinas-slowdown http://fortune.com/2015/01/20/chinas-growth-slowed-to-24-year-low-in-2014/ Change in economic structure: http://www.economist.com/blogs/analects/2013/04/economic-rebalancing http://www.economist.com/news/business-books-

	secondary industries and the subsequent growth of tertiary industry. The role of China as the workshop of the world should then be developed with a focus placed on outsourcing and offshoring. By developing an understanding of these terms students will become aware of the global shift. This can be done by considering shipping patterns and through other innovative mapping techniques. Having considered China's role as the 'workshop of the world' this will lead onto the study of China as a country with increased global influence. China's influence and participation in global organisations, governance, conventions and treaties can be studied through several different examples. Firstly students should be aware of what is meant by 'soft' or political power. Areas where China is wielding increased power include the United Nations. Students should consider why China is keen to gain influence and what impacts this increased influence is likely to have on the country.	quarterly/21627564-private-companies-have-been-hugely-underestimated-china-unstated-capitalism (Discuss the difference between public and private sector jobs) https://www.youtube.com/watch?v=WISHo61nRWw&nohtml5=False https://www.youtube.com/watch?v=WWAO3ZhD8_Q&nohtml5=False (Why is farming playing a less significant proportion of China's GDP ?) http://www.theguardian.com/business/2016/mar/01/chinese-manufacturing-decline-sharp-global-downturn-factory-output-china-uk (Outline reasons for growth of Chinese economy as an industrial workhouse) http://www.wsj.com/articles/as-growth-slows-china-highlights-transition-from-manufacturing-to-service-1453221751 http://www.improving-visualisation.org/vis/id=206 How did the global shift affect China? Outsourcing and offshoring http://www.allchinasourcing.com/china_sourcing_advantages.htm http://www.chinabusinessreview.com/chinas-emerging-role-in-global-outsourcing/ http://www.chnsourcing.com/outourcing-news/about-china-outsourcing/advantages/ (Why is outsourcing attractive for companies?) http://www.economist.com/news/leaders/21569739-
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	China joining the WTO was a significant step for both the country and the WTO itself. Students should be aware of the benefits of joining the WTO for China but should also have an understanding of why so many viewed China joining the WTO with suspicion. As the leading global emitter of CO₂, China's stance on environmental matters is of increasing importance. This was illustrated during the Paris climate change negotiations in 2015. China's influence was significantly greater than it was during the Kyoto Protocol discussions two decades earlier.	outsourcing-jobs-faraway-places-wane-will-not-solve-wests http://www.designworldonline.com/offshore-manufacturing-the-pros-and-cons/ http://www.supplychain247.com/article/mapping_supply_chains_in_the_global_economy http://www.theguardian.com/world/2008/oct/21/china-globalrecession How influential is China as a political power? Power: https://en.wikipedia.org/wiki/Soft_power Overview: http://globalgatewayadvisors.com/chinas-growing-role-in-international-organizations-promotes-cooperation/ https://en.wikipedia.org/wiki/Foreign_relations_of_China China and the UN: http://www.reuters.com/article/us-china-un-diplomacy-idUSTRE6B16Z320101203 http://www.reuters.com/article/us-un-assembly-china-idUSKCN0RQ0HW20150926 http://www.reuters.com/article/us-un-assembly-china-idUSKCN0RS1Z120150929 (What are the positive impacts of China's role in the U.N.?) WTO: http://news.bbc.co.uk/1/hi/business/1702241.stm https://www.youtube.com/watch?v=TQjv-iGWEiQ
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		(Why was China joining the WTO seen by some as a controversial matter?) http://www.economist.com/node/21541408 https://www.wto.org/english/thewto_e/acc_e/s7lu_e.pdf https://www.cigionline.org/series/looking-back-looking-forward-china-and-world-trade-organization-10-years-after-accession (How has China benefited from being a member of the WTO and how has China contributed to the WTO?) http://www.scmp.com/news/china/policies-politics/article/1885376/paris-climate-summit-chinese-president-urges-world http://www.ft.com/cms/s/2/15be0e10-9dca-11e5-b45d-4812f209f861.html https://www.chinadialogue.net/article/show/single/en/8356-What-is-China-s-position-at-Paris-climate-talks-
3.3.6 Threats to China's environment associated with economic growth	Students need to be aware of the serious risks facing the environment due to the recent rapid economic growth. The use of fossil fuels directly impacts air quality in China and contributes to the process of climate change. The rapid growth of industry has had negative impacts on differing parts of the environment. Many waterways are polluted and industrial waste has led to an increased incidence of	<i>What are the main threats to China's sustainable development?</i> http://www.resilience.org/stories/2015-02-05/charts-showing-the-long-term-gdp-energy-tie Graphs here outline the problem linking Chinese economic growth to the reliance on fossil fuels. <i>Impacts of climate change on China:</i> http://www.bbc.co.uk/news/world-asia-china-32006972 https://www.chinadialogue.net/blog/7458-How-climate-

	cancer in some areas - dubbed 'Cancer Villages'. Air quality issues are particularly apparent in urban areas, the cities in China's industrial north regularly making international headlines. Climate change and the intensification of farming practices have led to soil degradation which has impacted on the lives of people in some of the poorest parts of China. Deforestation has led to desertification in the north and west of China and to soil erosion in parts of the country, particularly on the Loess Plateau. Students need to be aware that land degradation in China leads to the creation of further problems such as food security. The recent growth in affluence has increased the purchasing power of Chinese people and has enabled the country to become increasingly reliant on imports and new technologies for their food supply. This creates an increasing demand for energy and has contributed to further debate on energy security within China. Lastly, food security cannot be maintained without water security and as China has become increasingly industrialised the demands on water have increased	change-will-impact-China-latest-IPCC-report/en Cancer villages: http://www.theguardian.com/world/2013/jun/04/china-villages-cancer-deaths https://www.youtube.com/watch?v=O1pbNTvkYSA Water pollution: http://factsanddetails.com/china/cat10/sub66/item391.html Air pollution: http://www.theguardian.com/world/2015/nov/09/airpocalypse-now-china-pollution-reaching-record-levels Soil degradation and desertification http://www.geocases1.co.uk/printable/Desertification%20and%20land%20degredation%20in%20China.htm http://www.bbc.co.uk/news/world-asia-pacific-12112518 https://www.youtube.com/watch?v=iaaXgKKv4ko Deforestation: http://factsanddetails.com/china/cat10/sub66/item389.html http://www.scmp.com/comment/insight-opinion/article/1204076/deforestation-blame-beijings-pollution Food/ Water security: http://www.bloomberg.com/news/articles/2014-01-21/china-aims-for-food-security-as-pollution-destroys-crop-land http://chinawaterrisk.org/resources/analysis-reviews/the-state-of-chinas-agriculture/
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	rapidly. These issues of food, energy and water security are interconnected. Failure to address them will inevitably have a major impact on the quality of life of China's citizens in the future. There are ample opportunities to discuss the key geographical concepts of causality and equilibrium when discussing the effects of human activity on natural systems.	http://www.fao.org/docrep/004/ab981e/ab981e0c.htm https://www.youtube.com/watch?v=p0cFyHm348w http://textile-future.com/textile-manufacturing.php?read_article=2366 Energy Security: http://www.bbc.co.uk/news/business-21709881 http://www.theguardian.com/environment/2011/may/19/china-three-gorges-dam
3.3.7 Sustainable development in China	Students should study a strategy or strategies to manage one environmental problem associated with economic growth. Students will also be expected to show an understanding of strategies to sustainably manage water or food or energy security. Listed here are possible threads of study. A final theme of study is sustainable cities. It is suggested that similar contexts are used to those already covered during the study of managing air and water pollution in cities. However, there are many other good examples of sustainable living in Chinese cities. Some of the better ones include the creation of eco-cities. China's huge expenditure on renewable energy is also part of the drive towards a more sustainable way of living and can be viewed within the context	How successful are strategies to combat these threats? Managing air pollution: http://www.chinadaily.com.cn/china/fightairpollution/ http://www.theguardian.com/environment/chinas-choice/2014/jan/23/china-beijing-authorities-measures-tackle-air-pollution https://www.youtube.com/watch?v=80Z4xnSNAHs&nohtml5=False https://www.youtube.com/watch?v=zKJhyv-rSUo&nohtml5=False Managing water pollution: http://www.ibtimes.com/china-announces-ambitious-plan-clean-its-water-close-down-polluting-factories-1886320 https://beijingtoday.com.cn/2016/03/smelly-waterways-to-be-cleaned-by-2018/ http://www.china.org.cn/environment/2015-03/26/content_35158000.htm

	of helping to create sustainable urban areas.	Managing desertification: http://www.theguardian.com/world/2011/jan/04/china-desertification https://www.youtube.com/watch?v=Jfn01u-2rNs https://www.newscientist.com/article/mg22429994-900-great-wall-of-trees-keeps-chinas-deserts-at-bay/ Improving water security: http://english.cntv.cn/2015/05/25/VIDE1432560240203185.shtml http://www.aquatechtrade.com/aquatech-news/enhancing-water-security-in-china/ (a long PDF file – but it does include solutions towards the end) Improving food security: http://www.reuters.com/article/us-syngenta-ag-m-a-chemchina-idUSKCN0VB1D9 https://www.youtube.com/watch?v=J0GcAJorQEk&nohtml5=False http://www.theguardian.com/global-development/2012/may/10/chinese-food-security-investments-africa Improving energy security: http://thediplomat.com/2017/01/deconstructing-chinas-energy-security-strategy/ Sustainable urban communities:
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		https://www.youtube.com/watch?v=t-Piq37Lhgg&nohtml5=False http://www.huffingtonpost.com/china-hands/chinas-sustainable-cities_b_7250178.html http://www.bbc.co.uk/news/world-asia-china-35351597 https://www.virgin.com/virgin-unite/leadership-and-advocacy/the-green-energy-race-in-china
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Recommended reading:

- Miller, G. and Warn, S. (2010). Emerging Superpowers: India and China: The Geographical Association (revised edition published in 2017)

[Additional resource links can also be viewed here](#)

Contemporary Themes in Geography - Development in an African Context

Focus	Amplification of content	Teaching/learning approaches and resources
3.3.8 Definitions, measures and patterns of development	The term 'development' is difficult to define. It can be defined as 'the progressive improvement in standards of living and quality of life for an increasing proportion of the population'. The definition is dynamic, due to changing definitions and changes in the development process itself. In response to this dynamism, the term 'development' has been defined in many different ways: in economic terms, in human terms and increasingly in terms of sustainability. Until the 1970s development was largely equated with economic development, hence the drive towards industrialisation by lesser developed countries. By 1980 the concept of development took in social progress and human development. Even before the 1980s, it was evident that growing environmental problems associated with overuse of resources, destruction of the rainforest and global warming were threats to both economic progress and the eradication of poverty – hence in the 1980s and 1990s questions of sustainability became increasingly associated with the development process. There are a wide range of development indicators that could be studied but it is expected that students will be able to make reference to simple and composite quantitative measures and also to more recent progress	<i>How has the definition of development changed?</i> - There are a wide range of websites that cover definitions of development, including: http://www.worldbank.org/depweb/english/sd.html http://hdr.undp.org/en/content/what-human-development <i>How have the indicators used to measure development changed?</i> - Definition of measures of development can be taught through a simple card sort to match up the terms and the definitions - Useful definitions http://www.s-cool.co.uk/a-level/geography/world-development/revise-it/measuring-differences-in-development http://www.coolgeography.co.uk/A-level/AQA/Year%2013/Development%20&%20Globalisation/Background/T

	made towards the use of qualitative measures that go beyond covering material conditions towards a consideration of aspects such as freedom, security, the plight of indigenous groups and sustainability. The distinction between the development gap and the development continuum should be clearly understood. The development gap is visible on a global scale, with the richest 20% of people consuming around 80% of global resources, and the poorest 20% earning just 1.3% of global income. More traditionally, this gap was represented by the out-dated Brandt-line. It is now more widely accepted that development is a dynamic process and that not all countries will follow the path of the Rostow Model through defined stages of development. Today, as countries develop, they make a gradual transition through different stages along the development continuum. Variations in levels of development between regions, ethnic groups and genders is becoming increasingly important. More recent measures to calculate gender inequality such as the GEM (Gender Empowerment Measure) or GDI (Gender-related Development Index) can be used to help identify development patterns in Sub-Saharan Africa which are different to those generated through reliance on more traditional income-focused measures.	ypes%20of%20development.htm • Up to date tables of measures of development can be found at: • CIA factsheets • UNDP human development reports • World Bank • For qualitative indicators: - o http://www.happyplanetindex.org/ What patterns of development can we see in Sub-Saharan Africa? Students could collect development data for a range of countries and then establish where they fit on a continuum. Use of different measures and data will generate differing patterns. The World Development Indicators database has mapped Sub-Saharan Africa based on various development indicators. Comparing general patterns could be a good starting point before focusing on the chosen countries. http://data.worldbank.org/products/wdi-maps Variations within countries should be looked at here, depending on the country context chosen. Ghana shows a well-documented development divide between north and south. Some recent, regional data with explanatory comment can be found here: http://www.egn.org.gh/categories/developmental-
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		economics/51-bridging-the-ghanaian-development-divide
3.3.9 The influence of physical factors on the development of two or more countries	Many factors influence levels of development within a country. The influence of its resource base of minerals and energy sources should be explored through in-depth studies of two countries such as Nigeria, a country with large oil and gas reserves, and a contrasting country such as Sierra Leone which has a poor resource base. The nature of soils, relief, climate and water availability are important influences on the development of a country. Fertile soils and flat, well-irrigated land can lead to the development of a strong agricultural sector. Water availability is key in Sub-Saharan Africa with many countries particularly susceptible to periodic droughts. The ongoing effects of climate change are increasing the vulnerability of countries such as Kenya where a significant numbers of arable crops are grown for export and where subsistence farming supports a high proportion of the rural population. For many countries the variability of their climate and ensuing floods or droughts cause them to rely heavily on aid. This fails to build resilience, hindering long-term development. The choice of case studies will be important here. At least two countries should be studied in depth in	<i>To what extent has the physical environment influenced development?</i> Pages 4 – 7 of this IMF report discusses the resource base in Sub-Saharan Africa. It contains some useful reading, map resources and data that could be used by students to assess the effect of a strong resource base on levels of development – particularly that of oil rich nations. The following article looks at the history of oil exploration in Nigeria and its impact on development http://news.bbc.co.uk/1/hi/world/africa/7840310.stm Geofiles 629 (2011) covers many of the physical factors that affect development in Ethiopia.

	order to exemplify all elements set in the specification.	
3.3.10 The influence of economic factors on the development two or more countries	The influence of trading blocs has been both positive and negative for Sub-Saharan Africa. Policies of protectionism and subsidies, tariffs and quotas imposed on exports from Sub-Saharan Africa can severely hinder development. However, accessibility to markets and development of free trade deals can be beneficial for the region. Africa also has its own trading blocs. The development of intra-regional trade on the continent is seen by many as the key to ensuring long-term development. The Tripartite Free Trade Agreement (TFTA) was signed in Cairo during 2015, amalgamating three of Africa's main trading blocs: the Southern African Development Community (SADC), the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA). The creation of a 'mega bloc' in Africa could positively impact development in Sub-Saharan Africa in the future. The resource curse, also known as the paradox of plenty, refers to the paradox that countries with an abundance of non-renewable natural resources (like fossil fuels and certain minerals), tend to have less economic growth, less democracy, and worse development outcomes than countries with fewer natural resources. Suitable examples for study in Sub-Saharan Africa could include oil exploitation or conflict (blood) diamonds funding civil wars	How have economic factors influenced development? • An investigation into the role of trade blocs including that of the EU and OPEC will provide an interesting contrast. Looking at the impact that these have on the developing nations of Africa including the role of tariff, quotas and “dumping” of raw materials. • Nigeria will provide a good example of oil as a resource and the impact of an MNC on levels of development • As well as Angola, Sierra Leone or Zimbabwe could provide contexts for the study of conflict diamonds • There are many examples of MNCs who have chosen to invest in Africa including General Electric, Wal-Mart • Gambia, Rwanda (Geoactive Online 468) and Kenya have both developed a tourism sector. Success has varied at minimising the environmental impact • Fairtrade resources: - o www.fairtrade.org.uk - o http://www.fairtrade.org.uk/en/farmers-and-workers/cocoa/kuapa-kokoo

	in Angola. The availability of cheap labour and the provision of favourable economic conditions have seen the influence of MNCs increase in the region. An examination of the growing influence of MNCs on two or more countries could look at foreign direct investment, outsourcing and offshoring or land grabs to grow food or biofuels. With its rich natural and cultural resources Sub-Saharan Africa has enormous potential for the development of tourism. Although it is still for the most part in the early stages of development, the sector is growing very quickly. Its challenges are not linked to its incredible resources, but rather to broader and longstanding issues facing the continent such as infrastructure, health and hygiene and security. However, tourism and eco-tourism are valuable development tools for some countries in Sub-Saharan Africa with a significant proportion of GDP generated from this sector. Kenya and Gambia have established a strong tourism base, with the new destinations of Rwanda and Uganda following suit. Issues such as social, economic and environmental impacts of tourism will need to be evaluated here as well as issues of sustainability. Lastly in this section the value of Fairtrade as a strategy to aid development in particular Sub-Saharan African countries should be considered.	Land grabs by MNC such as palm-oil giant Wilmar in Uganda are discussed in this 2015 Guardian article https://www.theguardian.com/global-development-professionals-network/2015/mar/13/african-land-grabs-companies--financiers-regulation
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3.3.11 The influence of political, social and cultural factors on the development two or more countries	There is increasing awareness of the influence of the political, social and cultural factors impacting development. Candidates should be given a brief introduction to the colonial history of Sub-Saharan Africa to consider its effect on levels of development in countries studied. The role of governance, and neo-colonialism, global organisations and corruption should also be considered. In particular, the increasing presence of China in Sub-Saharan Africa will provide scope for neo-colonialism discussions with interesting links to be made with Frank's dependency theory. Social factors studied should include education, health and welfare, both in terms of investment and priority for national governments. Social and cultural constraints should look at the role of women as well as ethnic divisions and how that hinders development of the countries studied.	<i>To what extent have political, social and cultural factors influenced development?</i> Political • Geofile 727 Division of Sudan Social • Geofile 571 "Ebola-achieving zero" • Geography Review 29 (2) pages 20-21 • Malaria • Dengue Fever • Yellow fever Social and cultural • Geofile 671 Women's role in development
3.3.12 The impact of development on the environment of two or more countries	The transition of a country through the development continuum leads to enormous societal changes associated with consumerism. As consumption increases diets change and fossil fuel dependency increases and the issue of waste disposal, both solid and liquid, become increasing problems for society and governments. As urbanisation increases deforestation gathers pace with trees utilised as a source of building materials as well as fuel. Exploitation of water resources is a continuing problem without sustainable solutions in many Sub-Saharan African countries.	<i>How has the development process impacted the natural environment?</i> • Nutritional transition provides a link between development and development and food • Lagos provides an urban example of how development has lead to the huge growth of the city from rural-urban migration and the issues associated with waste and air pollution • Water issues are covered well by: - o www.wateraid.org • For agro-industrialisation it will depend on the countries chosen but there are sources at:

	Agro-industrialisation often has a negative impact on the environments of less developed nations. The intensification of agriculture has impacts on rates of soil erosion and water usage. The increased use of fertilisers and pesticides affects ecosystems. Agro-industrialisation also brings an increase in the mechanisation of agriculture which will have environmental consequences due to increased energy use and air pollution. If countries have followed Rostow's model of development they may have industrialised with limited attention to the environmental impact of this growth. Countries with a mineral base will have exploited it, again without making protection of the environment a priority.	- o www.farmafrica.org - o www.foe.org.uk - o http://www.theguardian.com/global-development/2014/feb/24/gm-crops-european-scientists-africa-promote-biotech - o http://www.independent.co.uk/news/world/africa/the-gm-crops-debate-moves-to-africa-and-it-s-just-as-noisy-10126512.html Both Namibia, Sierra Leone and Nigeria provide interesting examples of the negative impacts of the extractive industries on the environment
3.3.13 Challenges of desertification in two or more countries	A discussion of the causes (causality) of desertification in Africa, including the human and physical factors will be required here. Clear links to poverty and demand for natural resources should be made. Physical causes could include soil erosion, changing rainfall patterns (including intense rainfall). Human causes include population growth, overgrazing, over cultivation, deforestation, climate change and war, although this list is not exhaustive. Social, economic, political and environmental consequences of desertification need to be examined and will depend on the located examples chosen.	<i>How severe are the challenges posed by desertification in Sub-Saharan Africa?</i> Building on the knowledge from the previous focus box, students will study issues surrounding desertification in greater depth Causes: • Section 2 of this journal article provides interesting discussion points for students http://article.sapub.org/10.5923.j.ijaf.20130302.03.html#Sec2.2 Consequences: • http://www.unesco.org/mab/doc/ekocd/chapt

	There are a wide range of strategies that attempt to address the causes and consequences of desertification at the individual, national and international level. The Great Green wall is a particularly interesting project. This will form an 8,000 km natural barrier across the African continent. Government policies that address individual causes of desertification, such as rapid population growth, are also valid in this section.	er11.html - Strategies to address the above include: - The Great Green Wall http://www.greatgreenwall.org/great-green-wall/ http://www.bbc.co.uk/news/10344622 - Alternative fuels - Biogas chambers - Upesi stoves
3.3.14 Strategies to promote development in two or more countries	There are a wide range of strategies at different scales that could be studied here. The choice of country examples from previous focus boxes will most likely form a basis for studying the strategies being implemented to promote development. The role of national governments in Sub-Saharan Africa is complex; they can be the recipients and facilitators of bi-lateral aid projects or can succeed in creating an attractive environment for economic investment. The use of industrialisation to facilitate development is seen as a successful model and is implemented by many Sub-Saharan African governments. Countries establish Special Economic Zones which can attract MNCs and FDI to boost development. Ethiopia, Nigeria and Zambia are examples of countries who have set up SEZs with varying degrees of success.	How successful are strategies to promote development in Sub-Saharan Africa? - International organisations www.worldbank.org www.undp.org www.imf.org - NGOs http://www.farmafrica.org/ http://practicalaction.org/ www.oxfam.org.uk - FDI/MNCs http://www.ft.com/cms/s/0/79ee41b6-fd84-11e4-b824-00144feabdc0.html#axzz49IvNPwd - As mentioned above there is a wealth of information on China in Africa in Geofile and Topic Eye articles. Also: http://www.theguardian.com/global-

	There are a variety of international aid agencies which work at different scales in Sub-Saharan Africa and use either “top down” or “bottom up” strategies. The work of NGOs and microfinance schemes have become prominent in recent years due to a shift in attitude towards sustainability and gender equality as part of the development process. Students should study a range of examples which can be linked to specific factors hindering development such as gender inequality or food or fuel poverty. There is a wealth of information available for students to research independently on this aspect. An assessment or evaluation of the success of these strategies should be made. The World Bank and International Monetary Fund (IMF) are two of the most powerful international financial institutions. Historically, they have been the major sources of lending to African countries and have done important work in promoting good governance and evaluating reform efforts. Recent investments include \$1 billion for the Great Lakes region of the DRC with funds earmarked for financing health and education services, hydroelectric projects and cross-border trade. The loan is intended as an incentive to end Congo’s violence, despite the country’s endemically poor governance. However, as African economies grow and governments turn increasingly to private capital (remittances and FDI) as a source of	development/interactive/2013/apr/29/china-commits-billions-aid-africa-interactive o http://www.economist.com/news/middle-east-and-africa/21639554-china-has-become-big-africa-now-backlash-one-among-many Bilateral aid could be studied in the context of the Cahora Bassa Dam in Mozambique or any multitude of Chinese investments in HEP or irrigation schemes <i>How do global financial institutions implement strategies to promote development?</i> The World Bank’s website discusses some of the development projects funded in Sub-Saharan Africa: http://www.worldbank.org/en/region/afr/projects Their annual report on their work in Africa gives a basic introduction to their current role in the region http://www.worldbank.org/en/about/annual-report/regions/afr One current focus are IPPs (Independent Power Projects) designed to electrify Sub-Saharan Africa http://www.worldbank.org/en/topic/energy/publication/independent-power-projects-in-sub-saharan-africa
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	funding, many argue that the role of these institutions in the region, as long as growth continues, is likely to diminish in the future.	
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[Additional resource links can also be viewed here](#)

Contemporary Themes in Geography - Energy Challenges and Dilemmas

Focus	Amplification of content	Teaching/learning approaches and resources
3.4.1 The classification and distribution of energy resources	The objective here is to provide students with an overview of how energy resources are classified. Energy resources are classified as either non-renewable or renewable. Non-renewable resources have been built up over time and, because their rate of formation is very slow, are finite. Non-renewable resources include fossil fuels. Renewable energy resources yield a continuous flow that can be consumed in any given period of time provided current use does not exceed net renewal rates during the same period. Renewable resources can be further divided into 2 sub-groups, critical or recyclable resources including biomass energy (which require management to ensure sustainable use) or non-critical or everlasting resources such as tides, waves, wind, running water and sunshine.	<i>How can we classify energy resources?</i> Warn S. Holmes D. AS/A-Level Geography Contemporary Case Studies: The Energy Issue ISBN 978-1-4441-1983-1 Energy classification pp 12-14 For an exercise to sort energy into non-renewable and renewable categories: http://nationalgeographic.org/activity/energy-sources-and-energy-use/ For information on non-renewable fossil fuels: http://www.discoveringfossils.co.uk/fossilfuels.htm For some relevant slides see energy exam-board powerpoint under topic 1 at: https://geographyalevelslc.com/a-level-unit-3/

	Students need to have an overview of the global distribution of fossil fuel stocks and reserves Direct access to fossil fuel reserves is a coincidence of geological history and international boundaries. Some countries find themselves with more fossil fuel sources than their needs while others have none. Reserves run down over time, as is the case with gas with the UK's once abundant North Sea oil and gas supplies. Remaining oil and gas will increasingly concentrate in the Middle East over the next 30 years. Alternatives to conventional fossil fuel source include nuclear, solar, ocean, wind, biomass, hydrological and geothermal energy.	<i>How are energy resources distributed across the globe?</i> For the Global distribution of energy resources see: http://www.bbc.co.uk/education/guides/z3pppv4/revision/3 For information on alternatives to fossil fuel sources: http://www.greencitytimes.com/Renewable-Energy/renewable-energy.html http://nationalgeographic.org/encyclopedia/renewable-energy/ http://video.nationalgeographic.com/video/alternative-energy See coverage of alternative energy sources in pdf Guide 2 pages 47-53 at : http://www.beaconsdec.org.uk/climate-change/?doing_wp_cron=1465571024.0342330932617187500000
3.4.2 Physical factors determining the supply of energy	Students need to know and understand the physical factors that determine the supply of energy. Examples of each of the following physical factors are required: Geological factors influence oil and gas traps and the formation of deltaic swamps in which coal formed. Direct access to fossil fuel reserves is a coincidence of geological history and international	<i>Which are the most important physical factors in determining the supply of energy?</i> Warn S. Holmes D. AS/A-Level Geography Contemporary Case Studies: The Energy Issue ISBN 978-1-4441-1983-1 Patterns of global availability pp 15-22 For the global distribution and production of oil and coal

	boundaries. For example Saudi Arabia has large oil reserves and Russia has large oil and gas reserves. Geological factors also influence the location of active areas for geothermal energy such as Iceland. Certain forms of renewable energy are constrained by climatic factors. Solar power requires high insolation rates; wind power relies on high, constant wind speeds characteristic of areas affected by westerly wind belts and hydropower is usually linked to areas of high precipitation. Relief factors include the influence of relief on creating suitable locations for dam construction. The deep, narrow valleys of the west slopes of the Sierra Nevada in California provide sites for dams and reservoirs such as at Shasta in the Upper Sacramento River Basin and Oroville on the Feather River. Relief is also important for providing a 'head' of water which is stored and then released to drive turbines and generate hydropower. Certain locations provide favourable conditions for sustainable energy generation from waves, tides (tidal power is restricted to a few estuaries with a very large tidal range such as the River Severn) and biofuels	see: http://www.bbc.co.uk/education/guides/z3pppv4/revision/3 For the global distribution of natural gas see: http://archiv.eurotopics.net/en/home/presseschau/archiv/magazin/magazin_aktuell/gas_2009_01/zahlen_und_fakten_gasreserven/ For geothermal energy from active areas see: http://www.geography-site.co.uk/pages/physical/earth/volcanoes/volcanoliving.html http://environment.nationalgeographic.com/environment/global-warming/geothermal-profile/ A map of world solar energy potential can be found at http://micro-hydro-power.com Now that's what I call a solar farm! VIDEO - World's largest opens in Abu Dhabi: http://www.bbc.co.uk/news/world-middle-east-21830846 Ivanpah Solar Electric Generating System (ISEGS) in the Mojave Desert: http://www.greencitytimes.com/Sustainability-News/ivanpah-solar-electric-generating-system.html Wind power generation in Denmark: http://www.theguardian.com/environment/2016/jan/18/denmark-broke-world-record-for-wind-power-in-2015
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		http://denmark.dk/en/green-living/wind-energy/ For information on the Shasta and Oroville dams: http://www.watereducation.org/aquapedia/shasta-dam Tidal energy: http://www.youtube.com/watch?v=RX8in2voMl0 http://www.tidallagoonswanseabay.com/ Swansea Bay tidal lagoon Vaxjo, Sweden, makes use of its very unique geography, as over half of the city is covered by forest, to produce renewable energy. Biomass and biofuels, mostly from wood chips, sawdust, bark and peat (forestry remnants), represent the major forms of energy for the city buildings and buses http://www.greencitytimes.com/Sustainable-Cities/vaxjo.html
3.4.3 The changing demand for energy	Students need to know and understand that for all countries, no matter what their present stage of development, the demand for energy is rising. Economic factors strongly influence the demand for energy. All economies are increasing their demands for energy. This is especially true of newly emerging economies, especially the very large countries of Brazil, Russia, India and China (BRIC) where energy for manufacturing is the main growth. In order to be successful, all	<i>How and why is the demand for energy changing?</i> Warn S. Holmes D. AS/A-Level Geography Contemporary Case Studies: The Energy Issue ISBN 978-1-4441-1983-1 Patterns of consumption pp 28-30 Changing Patterns of energy consumption geographymonkey.com/changing-patte... Students are asked to use a website to calculate their

	economies (including those already developed) need to grow each year. In one way or another, that growth needs energy. Growing international trade has led to the transport of goods by air, sea and all forms of land transport. Countries that experience a low level of development need to grow so that large proportions of their populations can rise out of poverty. The growth in global population is the key demographic factor increasing the demand for energy. A range of social factors have increased the demand for energy. In developed economies, as well as getting to and from work, people want to travel to see friends, enjoy pastimes and go on holidays. Entertainment, even staying at home and watching TV, requires energy. To make life easier and free up time for leisure, labour saving devices are needed. For many of the social reasons above technology has produced equipment that requires energy. Car ownership grows continuously throughout the world. Around the home, washing machines, vacuum cleaners, TVs, computers, games consoles, sound systems and mobile phones have developed. Electronic gadgets are found in almost all activities.	carbon footprint and then compare their results with that of an older person. This person is asked to complete the questionnaire as if it were the year they were 18 years old. A Venn diagram is available for whiteboard or printing to structure the comparisons. One category might indicate little change, whereas another could show a great degree of change: http://resources.hwb.wales.gov.uk/VTC/2010-11/geog/dcells-sustainability/eng/3.1/activities/pl-how-is-the-demand-for-energy-changing.html Students are asked to analyse graphs on changing energy demand. Selected graphs taken from Key World Energy Statistics, International Energy Agency highlight changes in global energy consumption 1973 -2006 and changes in different fuel types. Global patterns of oil consumption in 2009, with annual changes from 1965 -2009 are displayed: http://resources.hwb.wales.gov.uk/VTC/2010-11/geog/dcells-sustainability/eng/3.1/activities/pl-Global-Changes-in-Energy-Demand.html An interactive activity asks the students to categorise a series of images into six groups. Three factors that affect changing energy demand - economic, social, technological. Students also need to determine whether the images show +ve [increased] demand or –ve [reduction in] demand. http://resources.hwb.wales.gov.uk/VTC/2010-11/geog/dcells-sustainability/eng/3.1/activities/pl-Why-is-the-demand-for-energy-changing.html
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		Images and video links provide stimuli for students to explain the increasing demand for energy in China: http://resources.hwb.wales.gov.uk/VTC/2010-11/geog/dcells-sustainability/eng/3.1/activities/pl-Chinas-increasing-demand-for-energy.html Resources covering the changing demand for energy in Vietnam are covered in the Resource Folder for WJEC GCE G4 paper for June 2013. Some relevant exercises can be found at: http://www.geographypods.com/changing-patterns-of-energy-consumption-6hrs.html Students to discuss the relative importance of the factors influencing the global demand for energy
3.4.4 The global management of oil and gas	Students need to know and understand factors influencing the global management of oil and gas. The imbalance between the supply of and demand for oil and gas is managed through transfers, storage and pricing. Oil and gas exploration and production is managed by MNCs and national governments. Oil supplies are managed by OPEC and national governments.	<i>Who is responsible for the global management of oil and gas?</i> Warn S. Holmes D. AS/A-Level Geography Contemporary Case Studies: The Energy Issue ISBN 978-1-4441-1983-1 Geopolitics pp. 16, 23, 94 and gas supplies p.18 and oil supplies pp 21-2, 52-3 players in the oil and gas industry p. 57 See 'the key players involved with energy security' at: http://www.rgs.org/OurWork/Schools/School+Members+Ar

		ea/Ask+the+experts/Global+energy+security.htm Information on the structure of the industry: https://en.wikipedia.org/wiki/Petroleum_industry Useful energy PowerPoint for revision purposes: Energy security http://www.slideshare.net/anicholls1234/energy-security-geography Students could refer to Geography Review 30 (1) pages 26-27 'Cheap oil. Is it a good thing?' to discuss some of the main impacts of falling oil prices on different countries								
3.4.5 Problems associated with extraction, transport and use of energy	Students need to know and understand the environmental, political, technological and economic problems associated with the extraction, transport and use of fossil fuels and other forms of energy . At present, most energy is carbon based. Suitable alternatives are essential. Nuclear is a major supplier worldwide, but generates debate. It produces long lasting dangerous waste, it could fall into the hands of terrorists or it may be converted to producing nuclear weapons. However, there have been few leaks and containment is improving, and otherwise produces clean and plentiful energy. Wave and wind power have relatively little damaging impact but much of their potential is yet to be developed. Some HEP schemes have led to the release of methane, more powerful as a	<i>What problems are associated with the supply and use of energy?</i> Warn S. Holmes D. AS/A-Level Geography Contemporary Case Studies: The Energy Issue ISBN 978-1-4441-1983-1 Environmental and social issues pp 38-46 http://resources.hwb.wales.gov.uk/VTC/2010-11/geog/dcells-sustainability/eng/index-energy.html Provides a series of activities which investigate problems associated with the supply of energy Students to complete a table using all the information: <table><tr><td></td><td colspan="3">Problems associated with fossil fuels / other form of energy</td></tr><tr><td></td><td>Extraction</td><td>Transport</td><td>Use</td></tr></table>		Problems associated with fossil fuels / other form of energy				Extraction	Transport	Use
	Problems associated with fossil fuels / other form of energy									
	Extraction	Transport	Use							

	greenhouse gas than CO ₂ . Biofuels lead to destruction of rainforest and use of agricultural land needed for food. Geothermal, tidal and solar sources of power have few drawbacks, but the range of locations where they can be exploited is limited.	<table><tr><td>Environmental</td><td></td><td></td><td></td></tr><tr><td>Political</td><td></td><td></td><td></td></tr><tr><td>Technological</td><td></td><td></td><td></td></tr><tr><td>Economic</td><td></td><td></td><td></td></tr></table> Students to discuss the relative importance of the problems associated with alternative energy and fossil fuels	Environmental				Political				Technological				Economic			
Environmental																		
Political																		
Technological																		
Economic																		
3.4.6 Energy mixes and development	Students need to know and understand that the energy mix of a country is the particular combination of energy sources used within it for production of power and consumption. Students need to investigate the energy mix at the local, national and global scales. At the local scale students need to research at least 2 examples of the growing use of appropriate technology for sustainable energy micro-generation in developing countries . At the national scale students need to research factors influencing the energy mix of at least 3 countries at different stages of development (HIC, emerging economy and LIC). At the global scale students need to know and understand the economic and political factors affecting world energy prices and energy mix (see 4.4.4 and 4.4.7).	<i>Which factors influence the energy mix at a local, national and global scale?</i> Warn S. Holmes D. AS/A-Level Geography Contemporary Case Studies: The Energy Issue ISBN 978-1-4441-1983-1 Energy mix pp 31-34 Leapfrogging The Grid: How Solar Is Solving Africa's Electricity Crisis #energy huffingtonpost.co.uk/edward-lowel/le... VIDEO - How solar lighting is transforming lives in Kenya: http://www.aljazeera.com/programmes/earthrise/2013/08/2013821385999288.html #energy #geographyteacher VIDEO - Solar power for Ethiopia's mobile phone users: http://link.brightcove.com/services/player/bcpid1659202292001?bckey=AQ~~,AAAAmtVJIFk~,TVGOQ5ZTwJb sT0Mq3k9H8GCa4jV3vL4M&bctid=2669785561001																

		VIDEO: Solar lamps helping millions of Kenyans who do not have access to electricity http://www.aljazeera.com/video/africa/2014/03/new-solar-project-brings-light-kenyans-201432013548123657.html VIDEO - Senegal solar panels provide farming water http://www.aljazeera.com/video/africa/2014/03/senegal-solar-panels-provide-farming-water-20143128333519115.html Solar-powered lamp-post provides ray of light for Mali: http://www.theguardian.com/global-development/poverty-matters/2012/dec/28/solar-powered-lamp-post-mali Relationship between energy use and economic development http://www.nationmaster.com/graph/ene_com_ene_use-energy-commercial-use Commercial energy use by country Resources covering the energy mix of France, Malaysia and Botswana are covered in the Resource Folder for WJEC GCE G4 paper for June 2010 Sweden energy strategy
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		Students are given a summary of the Swedish Energy Policy; energy aims; targets; action plan; and 6 sets of graphs and statistics on Sweden's energy use. Students to discuss the factors influencing a country's energy mix
3.4.7 The need for sustainable solutions to meet the demand for energy	Students need to know and understand policies for demand reduction and increased energy efficiency at the global, national and local scale. Students also need to know and understand clean technologies for fossil fuels including carbon capture, carbon sequestration and gasification and transport technologies. Students need to assess the sustainability of alternative energy sources.	<i>How sustainable are solutions to meet the demand for energy?</i> Warn S. Holmes D. AS/A-Level Geography Contemporary Case Studies: The Energy Issue ISBN 978-1-4441-1983-1 Cleaning up coal pp 47-46 http://www.greencitytimes.com/Sustainability-News/cop21-a-historic-step-forward-for-clean-energy.html See coverage of CCS in pdf Guide 2 pages 46-47 at : http://www.beaconsdec.org.uk/climate-change/?doing_wp_cron=1465571024.0342330932617187500000 VIDEO - Explainer: Carbon capture and storage. youtube.com/watch?v=BhTIm9... Resources covering the carbon capture and storage and the sustainability of alternative energy sources are covered in the Resource Folder for WJEC GCE G4 June 2010 Students to research the sustainability of alternative

		energy sources using information from 4.4.1 and 4.4.5 and determine whether they are economically viable, socially equitable and environmentally bearable
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Recommended reading:

- Warn S. Holmes D. (2011) AS/A-Level Geography Contemporary Case Studies: The Energy Issue ISBN 978-1-4441-1983-1

[Additional resource links can also be viewed here](#)

Contemporary Themes in Geography - Weather and Climate

Focus	Amplification of content	Teaching/learning approaches and resources
3.5.1 Global controls on climate	The objective is to provide students with an overview of the structure of the atmosphere including the characteristics of different layers. There are four vertical layers within the atmosphere, each with its own particular characteristics. Although the atmosphere is predominantly composed of nitrogen and oxygen, important roles are played by trace substances such as CO ₂ , water vapour, ozone and particulate matter. The troposphere is of most human significance, although human impact is detectable in the stratosphere. The outer limit of the atmosphere is set at 1000km, but the vast	<i>Which factors control the earth's climate?</i> Use the websites to understand the structure of the atmosphere: http://www.s-cool.co.uk/a-level/geography/introduction-to-weather-and-climate/revise-it/heating-of-the-atmosphere http://nationalgeographic.org/encyclopedia/atmosphere/ Use the websites to understand the atmospheric heat budget: http://www.metlink.org/teachers/useful-links/#energy

	majority of our weather and climate is found within the lower 12km. Students need to know and understand that there are variations in energy and heat <u>between latitudes</u>. The tropics have an energy surplus as they gain more from insolation than is lost by radiation, but the higher temperate and polar latitudes have an energy deficiency losing more by radiation than is gained by insolation (the atmospheric heat budget). This imbalance in energy distribution sets up a transfer of heat energy from the tropics to higher latitudes. This Global Transfer of Energy is the basis of global atmospheric circulation which gives rise to the high and low pressure belts and the planetary surface winds associated with the earth's major convection cells: the Hadley, Ferrel and polar cells. These make up the tricellular model that controls atmospheric movements and the redistribution of heat energy. Students also need to know and understand that the solar control of temperature is further modified by oceanic circulation (with warm currents transferring water polewards and cold currents transferring water equatorwards), continentality (a land surface heats up and cools down more quickly than an ocean surface) and altitude, although these elements will be studied in more detail	http://www.coolgeography.co.uk/A-level/AQA/Year%2013/Weather%20and%20climate/Structure/Heat%20Budget.htm Students try this exercise on the Earth's energy budget: http://education.ilab.org/reading/energy_budget.html For an overview of atmospheric circulation and the tri-cellular model: http://www.metlink.org/teachers/useful-links/#circulation http://www.s-cool.co.uk/a-level/geography/introduction-to-weather-and-climate/revise-it/atmospheric-circulation-and-motion http://geographyforone.wordpress.com/global-atmospheric-system/ Students to draw their own diagram of convection cells and pressure belts and superimpose (using tracing paper or acetate overlay) on the diagram the associated patterns of winds. For information on the atmospheric heat budget and the influence of oceanic circulation, continentality and altitude on climate: http://www.s-cool.co.uk/a-level/geography/introduction-to-weather-and-climate/revise-it/energy-transfers-and-insolation
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	in 4.5.2.	Find out more about the earth's atmosphere and climate here: http://www.bbc.co.uk/science/earth/atmosphere_and_climate Students to examine the mechanisms by which energy is redistributed between areas that have a net energy surplus and those with a net energy deficit
3.5.2 World's major climate types	Students need to have a broad knowledge and understanding of the world's major climatic types, including temperature, precipitation, winds and pressure characteristics. However, detailed reference needs to be made to only the UK's climate (4.5.3), the Cool temperate western margin climatic type. Students should know and understand the reasons for seasonal variations of climate as follows: the seasonal movement of the ITCZ including migrations of the heat equator and pressure and wind belts associated with the movement of the sun's overhead position over the year together with; the effects of the warm and cool ocean currents and temperature differences between the continental land masses and neighbouring ocean waters. For the tropical region seasonal changes can be illustrated by the Monsoon climate that occurs mainly on the eastern side of the continental land masses in	<i>What are the distinctive characteristics of the earth's major climate types?</i> VIDEO - What is climate? Video explaining the characteristics of different global climate zones: Polar, Temperate, Arid, Tropical (savannah, equatorial and monsoon), Mediterranean: http://www.educationscotland.gov.uk/weatherandclimatechange/resourcebank/videos/video_tcm4598364.asp Use the website: http://www.geography.learnontheinternet.co.uk/topics/climatezones.html for an overview of world climate zones. Describe and compare the distribution of global climates using an atlas Use standard A level texts such as 'Geography – An Integrated Approach' D. Waugh and associated text

	the Tropics extending approximately across 5 – 20 degrees of latitude. The climate is marked by a distinct hot, wet and a cooler dry season which is determined by the annual movement of the ITCZ between the Tropics and associated movement of pressure belts and the seasonal reversal of winds consequent upon this. The Monsoon climate regime is most clearly seen over India but exists in other regions north and south of the Equator on the eastern edge of continents e.g. East Africa. The wet monsoon season occurs with the movement of the ITCZ into the region bringing an area of low pressure and drawing in hot moist winds from off the ocean. Rainfall is increased by orographic uplift where these moist winds are drawn over uplands e.g. the Western Ghats in India. Reference should be made to temperature, precipitation, winds and pressure change. It would be pleasing to see students offering some supporting statistics in relation to temperature and precipitation changes. Temperatures are high averaging 30 degrees centigrade and humidity is also very high - average rainfall is around 200cms decreasing with distance inland. Cyclones and hurricanes are frequent towards the end of the rainy season. The cooler dry season coincides with the extension of continental high pressure as	explanation. VIDEO - Climate and seasons Use the website: http://geographyforone.wordpress.com/itcz-and-africa/ to see an excellent animation of the ITCZ over Africa. Students can see how the ITCZ moves over Africa and the resulting seasonal variations in rainfall. Students can click on individual towns and cities to see climate graphs which also show you how rainfall and temperature varies with the seasons. The Monsoon climate regime is best analysed via annotated climate sketch maps see e.g. 'Geography – An Integrated Approach' D. Waugh and associated text explanation. Use the website: http://www.coolgeography.co.uk/A-level/AQA/Year%2013/Weather%20and%20climate/Tropics/Tropics%20-%20monsoons.htm for details of the Monsoon climate with particular reference to India Professor Iain Stewart explains why India's intense monsoon rains only last for three months a year in the summer http://www.bbc.co.uk/science/earth/atmosphere_and_climate/climate#p00gd4mq
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	the ITCZ moves back towards the Equator and across into the tropics beyond. With high pressure dominating there is air subsidence and out blowing winds are dry. Temperatures remain relatively high at 25 plus degrees centigrade in lowland areas and evaporation rates are also high.	Monsoons – a resource looking at the link between rainfall and food production in India Teachers notes and Excel data sheet
3.5.3 Climate and weather of the UK	Students need to know and understand the climate and weather of the UK (Cool temperate western margin climatic type). This climatic type is characterised by relatively mild temperatures (average seasonal range 5–20°C), along with high humidity and precipitation (averaging 600 mm) throughout the year. However, precipitation totals are significantly higher over upland areas in the face of prevailing moist westerly winds coming off the ocean, e.g. in the Cambrian Mountains of Wales. Conversely, precipitation totals are low in rain-shadow areas, e.g. lowland East Anglia. The temperatures and precipitation figures are mainly influenced by the mid-latitude position, low-pressure belt and the mild westerly prevailing winds. The latter are warmed by warm currents, e.g. the Gulf Stream, on the west margin of landmasses. Students need to know and understand the sources and characteristics of air masses	<i>What are the main characteristics of the UK climate and how can they be explained?</i> Comprehensive coverage of this focus box available: http://thebritishgeographer.weebly.com/the-climate-of-the-british-isles.html Britain's Weather http://www.coolgeography.co.uk/A-level/AQA/Year%2013/Weather%20and%20climate/British%20Isles/British-Air%20masses.htm UK weather defies prediction - Jet streams & ocean currents mean UK has some of world's most changeable weather http://www.theguardian.com/uk/2011/sep/03/uk-weather-defies-prediction-forecasters VIDEO - Why is British weather so unpredictable? http://www.bbc.co.uk/news/science-environment-17223307 VIDEO - Why has it been so wet in the

	and their influence on the UK'S weather (the Polar Continental, Polar Maritime, Arctic Maritime, Tropical Maritime and Tropical Continental air masses). The weather is strongly influenced by variations in the position, pattern and amplitude of the jet stream influencing the passage of westerly-moving depressions along the polar front, with intervening spells of anticyclonic conditions.	UK? http://www.bbc.co.uk/weather/features/18821920 VIDEO - How the jet stream influences our weather http://www.bbc.co.uk/weather/features/18869916 VIDEO - The link between depressions and jet streams http://www.bbc.co.uk/weather/feeds/24354927 Additional resources include: Mid-latitude weather systems video (with downloadable resources) Depression based exercise where students draw contours of temperature, pressure and precipitation to work out what the system looks like: Student worksheets and notes for teachers. Use WOW data to track a cold front across the UK and work out its speed. Mid-latitude weather systems and air masses practical exercises. Current UK weather conditions from NOAA UK weather webcams <u>Students to define the terms 'air mass' and 'source region'</u> <u>Students to produce a table summarising the effects of air masses on the weather of the British Isles in both summer and winter</u>
3.5.4 Extreme weather	Students need to know and understand that	<i>What are the causes and consequences of recent and</i>

events	there is strong evidence that global warming has led to climate change including extreme weather events. In some locations, the occurrence of heat waves has more than doubled due to human influence. Increases in heavy precipitation have probably also occurred over this time, but vary by region. It is likely that the number of heavy precipitation events over land has increased in more regions than it has decreased in since the mid-20th century. In the future, it is likely that the global frequency of tropical cyclones will decrease or stay the same, although maximum wind speeds and rainfall will increase. There has been a poleward shift and intensification of the mid-latitude depressions in the North Atlantic from the 1950s to the early 2000s, which is linked to a poleward shift in Northern Hemisphere jet streams. On the basis of current evidence about the observed impacts of climate change on environmental conditions, climate change will be an increasingly important cause of human insecurity globally in the future. The greater the impact of climate change, the harder it is to adapt.	<i>cyclic climate change?</i> For causes of recent changes, extreme weather hazards and impacts of climate change already observed, impact on food production and on security http://www.metlink.org/ipcc-updates-geography-teachers/#8 This is FAQ 2.2 figure 2 from the WG1 report for the 2013 IPCC 5AR. WG1 FAQ 2.2 Have There Been Any Changes in Climate Extremes? WGII FAQ 1 Are risks of climate change mostly due to changes in extremes, changes in average climate, or both? WG1 TFE.9 table 1 Global scale assessment of recent extreme weather and climate events From 4AR: Box TS.5 Extreme Weather Events <i>What makes people vulnerable to extreme weather events?</i> Extreme weather, rising sea levels & altering local climates are affecting an increasing number of people globally geographical.co.uk/nature/climate... Extreme weather 'keeps people poor' http://www.bbc.co.uk/news/science-environment-24538078
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		Climate refugees: the communities displaced by global warming – video gu.com/p/4ba7t/stw How Climate Change is Behind the Surge of Migrants to Europe time.com/4024210/climat... IPCC links This is Figure 12.3 from the WGII report for the 2014 IPCC 5AR. WGII FAQ 12.1: What are the principal threats to human security from climate change? WGII FAQ 12.3: How many people could be displaced as a result of climate change? WGII FAQ 12.4: What role does migration play in adaptation to climate change, particularly in vulnerable regions? WGII FAQ 12.5: Will climate change cause war between countries?
3.5.5 Impacts and management of climatic hazards	Students need to have knowledge and understanding of the term 'hazard' and the impacts of hazards associated with low-pressure and high-pressure systems in either tropical or temperate climates. The definition of a climatic hazard is an extreme climatic/weather event(s) causing harm and damage to people, property, infrastructure and the environment. It includes not only the direct impacts of the climate/weather event itself but also the other (secondary) hazards 'triggered' by that event e.g. landslides 'triggered' by torrential rain. The impact is dependent upon: the severity of the event and also the path/track and spatial extent	<i>What are the impacts of hazards associated with both high-pressure and low-pressure systems?</i> Use the WJEC & Eduqas AS/A Geography (from 2016) Resources Index for a range of case studies of the impacts of hazards associated with low-pressure and high-pressure systems Use the following links to research the short and long term effects of Hurricane Katrina and Typhoon Haiyan http://serc.carleton.edu/research_education/katrina http://www.metlink.org/secondary/haian-yolanda/ Students to categorise the impacts of their selected low- and

	of that weather event; the density distribution of the people and density and types of human activity in the areas affected and the preparedness and capacity of the authorities and the people to cope with the impact of the event (resilience). In tropical regions low-pressure systems hurricanes and cyclones are associated with torrential rain and high winds triggering secondary hazards of flooding, tidal waves and sea incursions, landslides, mudflows and wind borne debris. In temperate regions low-pressure systems are associated with severe storms, heavy rainfall/snowfalls and gale force winds triggering secondary hazards of flooding, sea insurgences (especially where the deep depression coincides with a time of very high tides), landslides and wind borne debris. In tropical regions high-pressure systems are associated with low rainfall, high evaporation rates and drought, triggering secondary hazards of a falling water table, loss of vegetation, wild fires, soil erosion and desertification. In temperate regions high-pressure systems result in low rainfall and drought, triggering secondary hazards in summer of falling water tables and loss of vegetation. In winter high-pressure systems are associated with frost and fog and secondary hazards may include temperature inversion with air pollution intensifying the fog conditions. Students should have knowledge of	high-pressure events into demographic, economic, social and environmental impacts. Impacts can be further categorised on the basis of spatial scale (local/regional) and temporal (short/long term) <i>How successful are strategies to manage climatic hazards?</i> For examples of hurricane management see: VIDEO - Hurricane preparedness series from NHC youtube.com/watch?v=Fq_1Pw... VIDEO - World's biggest hurricane simulator aims to improve forecasts youtube.com/watch?v=8QHjtO... Hurricane preparedness - Using app to allow people to communicate after a hurricane in Tahiti f-st.co/6o3Qh1B Remaking New York City. After Hurricane Sandy, the city's plans to mitigate future disaster aljazeera.com/indepth/featur... VIDEO - Hurricane defences following Katrina youtube.com/watch?v=Cp1RWWh... Students to use 'yardsticks' by which the strategies may be evaluated: 1. Balance of coverage of the different stages – prevention, immediate emergency measures, reconstruction and
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	both the short-term and long-term impacts of low-pressure climatic hazards on the environment and human activity. These should be studied with reference to at least one specific low- pressure event in either a tropical or temperate climate. Students should also have knowledge and understanding of the short-term and long-term impacts of high- pressure climatic hazards on the environment and human activity. These should be studied with reference to at least one specific high pressure event in either a tropical or temperate climate There may be reference to demographic effects at both time scales such as deaths and long-term migration. Economic effects may analyse losses in the short term such as cessation of production and costs of damage in the long term, such as the effects on economic activity and infrastructure. Social effects may include observations on health, homelessness and bereavement. There may also be consideration of the effects on the environment such as landslides, deforestation and salinisation. When discussing the strategies to manage the impacts of hazards associated with low-pressure and high-pressure systems, students may present logically sequenced points progressing from monitoring, prediction and warning of future hazards, immediate response to lessen the impact once it has occurred to long-term	restoration of services, long-term measures or 2. Evaluation on the basis of the finances and human resources available to the agencies involved in the formulation and implementation of strategies at community/local, regional, national and in some cases international level or 3. On the basis of advances in strategy policies and implementation of them compared to those in place prior to the last hazard event or 4. By comparison with strategies in place elsewhere to meet a similar hazard event e.g. comparison on an area-to-area basis or on a wider scale - strategies in lesser-developed countries may be relatively weak when compared to those implemented in developed countries or 5. Effectiveness on the evidence of how well strategies in place reduced the impact of an actual event Students to discuss the statement: 'Hazards associated with low-pressure systems have short-term impacts whereas those associated with high-pressure systems have long-term impacts' Students to discuss the extent to which the damaging effects of low- and high- pressure systems can be minimised
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	planning for hazard mitigation. Students should display a grasp of a number of these, but do not expect all to be considered as students may choose to use examples that enable only a limited number of strategies to be discussed.	
3.5.6 Impacts of human activities on the atmosphere at local and regional scales	Students need to know and understand that the main impact of human activity on the atmosphere at both the local and regional scale is the formation of urban microclimates. The main impact of human activities in urban areas is to destroy the existing microclimate and create a new one. Urban areas affect all microclimate variables. Temperatures increase, particularly during anticyclonic conditions, in the night and in winter. Wind characteristics are altered, including wind speed (reduced through friction or increased through channelling between tall buildings) wind direction and turbulence. Precipitation levels are higher with thunderstorms and hail more likely. There are also changes to the hydrology of urban areas in terms of humidity levels (lower) and evapotranspiration rates (higher). The increase in particulate matter results in a higher frequency, duration and intensity of fog, a higher incidence of cloud, and therefore lower amounts of sunshine. Human activity also induces changes in atmospheric composition, higher concentrations of gases such as carbon dioxide	<i>How does human activity impact the atmosphere in urban areas?</i> For information on urban microclimates see: http://www.metlink.org/teachers/useful-links/#uhi http://www.field-studies-council.org/urbaneco/urbaneco/introduction/microclimate.htm http://thebritishgeographer.weebly.com/urban-climates.html http://www.coolgeography.co.uk/A-level/AQA/Year%2013/Weather%20and%20climate/Microclimates/Urban_climates.htm How urban heat islands are making India hotter. Urban microclimates = health risks http://www.theguardian.com/global-development/poverty-matters/2013/jan/09/delhi-mumbai-urban-heat-islands-india Students to discuss factors that influence the size, shape and intensity of the 'urban heat island'

	and sulphur dioxide and particulates leading to particulate pollution, photochemical smog and acid rain. Students need to know and understand strategies introduced to reduce the impact of human activity on urban climates, through land use planning and improved urban design, and improve air quality through transport policies, legislation and technological solutions.	For details and examples of impacts of urban areas on air quality http://geographical.co.uk/nature/climate/item/897-the-geography-of-smog http://www.rgs.org/OurWork/Schools/School+Members+Area/The+carbon+and+water+cycles+climate+and+change/Urban+Air+Pollution+Smog+in+Chinese+Cities.htm Reducing urban heat island effects http://thebritishgeographer.weebly.com/urban-climates.html Improving air quality http://geographical.co.uk/nature/climate/item/1583-80-000-saved-annually-by-eu-air-legislation http://www.iflscience.com/technology/pollution-guzzling-air-cleaning-buildings http://www.xprize.org/news/smog-eating-buildings-battle-air-pollution MT: Smog-eating bus shelter developed to combat China's deadly air pollution bit.ly/1LuJSxy pic.twitter.com/bZnAy38fSU Transport policies: France - Paris to take breath of fresh air with car-free Sunday pollution m.france24.com/en/20150926-pa...
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		Transmilenio rapid bus network, Bogota, Colombia https://www.youtube.com/watch?v=IjhMQM8eaVY Copenhagen, Denmark http://www.theguardian.com/cities/2014/oct/16/copenhagen-cycling-innovation-lycra-louts-green-wave-bike-bridges
3.5.7 People, climate and the future	Students need to know and understand the impact of anthropogenic climate change on shifting climate belts There is a high risk that the large magnitudes and high rates of climate change this century will result in abrupt and irreversible regional-scale changes to terrestrial and freshwater ecosystems, especially in the Amazon and Arctic, leading to additional climate change. Amazon forest to transform to less dense, drought- and fire-adapted ecosystems. This would risk reducing biodiversity in an important ecosystem, and would reduce the amount of carbon absorbed from the atmosphere through photosynthesis. It would also reduce the amount of evaporation, increasing the warming locally. Students need to know and understand the concept of reaching atmospheric tipping point, a critical threshold when global or regional climate changes from one stable state to another stable state. The tipping point event may or may not be reversible.	<i>What are the possible impacts of anthropogenic climate change?</i> For changes in Amazon basin Ecosystem Feedbacks from Carbon and Water Cycle Changes Boreal-tundra biome shift http://www.metlink.org/climate/ipcc-updates-for-a-level-geography/carbon-cycle-feedbacks/#244 http://www.metlink.org/climate/ipcc-updates-for-a-level-geography/tipping-points/ The GA have a wide range of teaching ideas and resources based around investigating climate change at http://geography.org.uk/resources/investigatingclimatechange/ http://geography.org.uk/resources/beacons-climatechange/ An online, interactive lesson on climate change from NGfL Cymru and a newer version here for AS/A2 geography (with

	Students need to know and understand strategies implemented at the international, national and local level to both mitigate and adapt to climate change.	links to the WJEC specification). We recommend avoiding the 'controversies' sections which could be misleading. <i>How successful are strategies to mitigate and adapt to climate change at a variety of scales?</i> Reducing greenhouse gas emissions in Poland 9. Mitigation Strategies – The European Union Emissions Trading Scheme – Developing the Indian solar industry 10. Adaptation Strategies – The impact of three urban policies in Paris on climate change adaptation and mitigation http://www.foe.co.uk/campaigns/climate/climate_change_solutions.html http://www.greenpeace.org.uk/climate http://livinginthefuture.org/episodes/1-introducing-lammas.php http://www.theguardian.com/environment/gardening-blog/video/2011/mar/22/lammas-eco-village-off-grid-video Students to discuss whether it is easier to adapt to climate change rather than mitigate against it
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[Climate change updates for geography teachers can be viewed here](#)

[Additional resource links can also be viewed here](#)

Fieldwork Opportunities

The list on Appendix C of the specification provides suggestions of fieldwork opportunities that may be carried out in relation to each theme. These suggestions are designed as guidance in order to provide starting points and are neither comprehensive nor mandatory.

Additional resources to help place and deliver fieldwork are listed below:

- Water and Carbon cycles
<https://www.geography-fieldwork.org/a-level/water-carbon/>
- Ecosystems <http://www.rgs.org/OurWork/Schools/Fieldwork+and+local+learning/Fieldwork+topics+and+themes/Physical+geography/Ecosystems.htm>
- Weather and Climate
<http://resource.download.wjec.co.uk.s3.amazonaws.com/vtc/2013-14/DfES03/hwb/index-dfes03.html>

Integrating Skills

Geographical skills in relation to both an equal weighting of quantitative and qualitative skills are required for A level learners and the list in Appendix A of the specification indicates those selected for study for all components in this specification. All the skills need to be addressed within these components but not all will apply to fieldwork. The four required days of fieldwork should contribute to learners building a holistic and balanced understanding of quantitative and qualitative skills related to fieldwork and the six-stage enquiry process.

Definitions:

- Quantitative research is “explaining phenomena by collecting numerical data that are analysed using mathematically based methods (in particular statistics).”
- Qualitative research seeks to answer questions about why and how people behave in the way that they do. It provides in-depth information about human behaviour.

Source: <http://www.skillsyouneed.com/learn/quantitative-and-qualitative.html>

The following book will also provide teaching ideas to integrate the vast majority of required mathematical skills into your teaching programme:

<https://www.hoddereducation.co.uk/Product/9781471863554.aspx>

Additional guidance:

Qualitative skills

- [RGS article](#)
- Learning to analyse qualitative data - [online tutorial](#)

Quantitative skills

- [I-Use project](#). Including ‘How to’ video guides and student tasks
- GA ‘How to guides’ [Conducting statistical tests in fieldwork](#)

Learners need to develop competence in using the geographical skills specified in the DfE Geography GCE AS and A Level Subject Content (December 2014) as shown in the 'Integrating geographical skills in delivery of the core themes' tables in Appendix A of the specification.