# KESTEVEN AND SLEAFORD HIGH SCHOOL

## Geography Scheme of Learning

## Year 10 – Term 1/Unit 1 – Living with the physical environment/The challenge of natural hazards – Tectonic Hazards

**Intent – Rationale**

Living with the physical environment is about physical processes and systems, how they change, and how people interact with them at a range of scales and in a range of places. Natural hazards explore how these pose a major risk to people and poverty. Tectonic hazards examine earthquake and volcanic eruptions which are the result of physical processes. The unit explores the effects of and responses to tectonic hazards and how they vary between areas of contrasting levels of wealth. An exploration of management looks at how different management strategies can reduce the effects of tectonic hazards

| Sequencing – what prior learning does this topic build upon? | Sequencing – what subsequent learning does this topic feed into? |
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| • **Year 7 – Restless planet**<br>• **Year 9 – Resource management**<br>• **Year 9 – Impossible places** | • Year 11 – The development gap<br>• Year 10 – Sustainable urban development<br>• Year 12 – Tectonic processes and hazards<br>• Year 12/13 – Water and water insecurity (drought and floods)<br>• Year 13 – Carbon and carbon insecurity (climate change) |
| **What are the links with other subjects in the curriculum?** | **What are the links to SMSC, British Values and Careers?** |
| • Science – climate change, geological variations and tectonic processes | • SMSC – SP2,3,4; M2,3;<br>• BV –<br>• Careers – GB4a), b), d), e), f), g), h), i)<br>• Careers – role of volcanologist, climatologists, scientists, engineers, aid organisations, governments, farmers etc.s |
| **What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?** | **What are the opportunities for developing mathematical skills?** |

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| • WideWorld Magazine<br>• GeoActive articles<br><br>**FROM THE LIBRARY**<br>*Atlas of the World's Worst Natural Disasters-904*<br>*Earthquakes and Volcanoes-551*<br>*Raging Planet-551.2*<br>*Earthquake: The World reacts-551*<br>*Plate tectonics-551*<br>*Plate tectonics and Continental Drift*<br>*Horrible Geography – Earth-Shattering earthquakes* | • Interpretation of trends in earthquake and volcanic events<br>• Use of logarithmic scales in earthquake measurement<br>• Interpretation of occurrence and data graphs on tectonic events and their magnitude<br>• Exploring trends in death rates versus magnitude |

# The challenge of natural hazards – Tectonic Hazards
# Year 10 – Term 1

## Intent – Concepts

| What knowledge will students gain and what skills will they develop as a consequence of this topic? |
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| **Know**<br>• Natural hazards pose major risks to people and property.<br>• Earthquakes and volcanic eruptions are the result of physical processes<br>• The effects of and responses to, a tectonic hazard vary between areas of contrasting levels of development<br>• Management can reduce the effects of a tectonic hazard<br>**Apply**<br>• Be able to explain the theory of plate tectonics |

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- Be able to predict the likely impacts of a tectonic event
- Be able to describe different physical processes at various plate margins
- Suggest the most appropriate responses to managing the threats caused by tectonic hazards (decision-making)
- Interpret data over time to judge the significance of tectonic hazards
- Classify mitigation and adaptation strategies used to manage tectonic hazards

**Extend**

- Understand the global distribution of earthquakes and volcanic eruptions and their relationship to plate margins
- Predict future tectonic trends based on current data, and assess the reliability of scientific data
- Evaluate the extent to which primary or secondary impacts are more significant for a particular tectonic event
- Predict future trends in tectonic hazards and likely consequences
- Assess the relative importance of mitigation and adaptation strategies to manage tectonic hazards

| What subject specific language will be used and developed in this topic? | What opportunities are available for assessing the progress of students? |
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| **Conservative plate margin**<br>Tectonic plate margin where two tectonic plates slide past each other.<br>**Constructive plate margin**<br>Tectonic plate margin where rising magma adds new material to plates that are diverging or moving apart.<br>**Destructive plate margin**<br>Tectonic plate margin where two plates are converging or coming together and oceanic plate is subducted. It can be associated with violent earthquakes and explosive volcanoes.<br>**Earthquake**<br>A sudden or violent movement within the Earth's crust followed by a series of shocks.<br>**Immediate responses**<br>The reaction of people as the disaster happens and in the immediate aftermath. | Assessment will take 3 main forms:<br>1. In starters, plenaries and during the lessons – formative assessment to reinforce prior knowledge e.g. word searches, bingo, memory recall, definition matches etc.<br>2. For homework's -tasks that require students to research new knowledge (e.g. a The Haiti Earthquake – The Tohoku earthquake) or apply existing knowledge to exam-style Qs (e.g. Qs from CGP book)<br>3. Summative assessments – past exam paper Qs in test or exam conditions, either as end-of-unit tests or in Y10 or Y11 formal exams. |

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| **Long-term responses**<br>Later reactions that occur in the weeks, months and years after the event.<br>**Monitoring**<br>Recording physical changes, such as earthquake tremors around a volcano, to help forecast when and where a natural hazard might strike.<br>Plate margin<br>The margin or boundary between two tectonic plates.<br>Planning<br>Actions taken to enable communities to respond to, and recover from, natural disasters, through measures such as emergency evacuation plans, information management, communications and warning systems.<br>**Prediction**<br>Attempts to forecast when and where a natural hazard will strike, based on current knowledge. This can be done to some extent for volcanic eruptions (and tropical storms), but less reliably for earthquakes.<br>**Primary effects**<br>The initial impact of a natural event on people and property, caused directly by it, for instance the ground buildings collapsing following an earthquake.<br>**Protection**<br>Actions taken before a hazard strikes to reduce its impact, such as educating people or improving building design.<br>**Secondary effects** | |

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| The after-effects that occur as indirect impacts of a natural event, sometimes on a longer timescale, for instance fires due to ruptured gas mains resulting from the ground shaking.<br>**Tectonic hazard**<br>A natural hazard caused by movement of tectonic plates (including volcanoes and earthquakes).<br>**Tectonic plate**<br>A rigid segment of the Earth's crust which can 'float' across the heavier, semi-molten rock below. Continental plates are less dense, but thicker than oceanic plates.<br>**Volcano**<br>An opening in the Earth's crust from which lava, ash and gases erupt. | |

## Intent – Concepts

| Lesson title | Learning challenge | Higher level challenge | Suggested activities and resources |
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| 1. Natural Hazards | To be able to identify a natural hazard and consider the risk they pose | To be able to understand that these risks are to people and property | Starter: Define what a 'natural event' is and what different types of natural hazards are there?<br>So…how does a natural hazard become a natural disaster?<br>Discuss<br>What is a hazard risk?<br>What factors will affect your risk of being effected?<br>Challenge question:<br>Do you think the risk is greater in rich or poor countries<br>Describe the distribution of the hazards (use an atlas). Which areas / regions of the world are at greater risk of natural hazards? Challenge: look at data on wealth of some of the most |

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| | | | effected regions and suggest why they might cope less well with hazards.<br>5. Graph interpretation |
| 2. Frequency of natural hazards | To analyse graphs and data and to examine the level and frequency of natural disasters over time | To consider the whether a natural hazard is a natural disaster. To consider why we might be at more risk from natural hazards into the futures | Starter: A natural hazard is a natural disaster! Discuss!<br><br>Factors affecting hazards and their impact<br>Graph interpretation<br>Graph analysis. Compound graph of natural disasters.<br>Graph analysis. Numbers of deaths over time.<br>Extension: Using the spider diagrams on page 9 (Ox) to explain why in the future more people will be at risk from natural hazards. Include three developed ideas |
| 3. Hazard Trends and the distribution of Tectonic Hazards | To understand and describe the patterns of tectonic hazards | To consider the idea that tectonic hazards might be increasing in frequency | Starter: maths skills check…calculate the frequency this mean deaths must have increased? Yes / No? write ideas on whiteboards<br>Graph skills and analysis (see PP links)<br>Discuss the locations you know that have earthquakes and volcanic activity and why this occurs. Tectonic theory.<br>Distribution of earthquakes and volcanoes analysis.<br>https://www.youtube.com/watch?v=zocutif0cQY Ice Age 4 clip<br>Theory of continental drift:<br>https://www.youtube.com/watch?v=UvIDxu7twpc&safe=active |
| 4. Tectonic Hazards – patterns of distribution | To describe the patterns of tectonic movement and the hazards produced | Identify the key locations of tectonic movement (identify the 'ring of fire') | Starter: how much can you remember about tropical storms?<br>Using the 3 maps from and the Oxford Textbook pages 10-11<br>1. Distribution of earthquakes and volcanoes analysis.<br>. Describe the pattern of earthquakes in 2015.<br>2. Describe the pattern of volcanoes – include a definition of 'volcano'<br>3. Explain the tectonic plate theory (try and include key terms |

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| | | | crust / convection / oceanic / continental / constructive / destructive/ conservative / collision / slab pull theory / subduct)<br>Skill Link: How to describe a distribution:<br>Pattern: clustered/linear/random/dispersed<br>Reference to plate boundaries<br>Reference to continents or oceans or countries<br>Reference to lines of latitude/longitude (not for volcanoes & earthquakes)<br>Use North/South/East/West/centre/edge<br>Name continents and/or countries<br>Extension task: - Explain the range of physical geographical features they produce (e.g.: ocean trenches / fold mountains)<br>2. Describe the factors affecting risk. (urbanisation / poverty / climate change / farming) |
| 5. The Earth's structure and plate boundaries | To understand the structure of the earth and the processes that create movement at plate margins | To explore the link between the earths structure and where tectonic activity takes place | Starter: Why in the future will more people will be at risk from natural hazards? Think of 3 factors that will contribute to this. Rank order greatest risk to least risk. Justify your rank order in a short paragraph.<br>Sketch out how they think the earth ins structured using the key terms.<br>Draw and describe the earths layers (mantle / core / inner & outer / crust).<br>http://www.bbc.co.uk/education/clips/zb23cdm<br>Seismic monitoring equipment around the world allows us to map the location and size of earthquakes as they occur, enabling us to predict the probable impact of future earthquakes. The pattern of the internal structure of the Earth, tectonic plates, and three main types of plate boundaries are all shown graphically. |

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| | | | Use P. 13 glue in the 3 diagrams showing the 3 different types of plate movement, add descriptions to explain the processes<br>• Explain the processes that happen at this plate margin when the two plates move.<br>• Give some named examples of the features they create. (e.g.: earthquakes / fold mountains / volcanoes / ocean trenches).<br>• Annotate (label) which type of plate is involved (e.g.: continental / oceanic) and give named examples of the plates. (e.g.: Eurasian)<br>EXTENSION: Activity 1 & 2 page 13 |
| 6. Plate boundaries and types of volcano | To understand the processes that create movement at plate margins and the different types of volcanoes | Evaluate which are worse – primary or secondary effects. | Starter: without looking in your book talk to your partner about different plate boundaries and how they move<br>➢ Paired discussion: Is volcanic activity found at all plate margins?<br>➢ How do volcanoes form?<br>➢ Can you get volcanoes away from plate margins?<br>Video explanation – then add detail to grid<br>Plate boundaries and volcanic activity.<br>Volcanoes and their characteristics, explore 3 types of volcanoes. Is volcanic activity found at all plate margins?<br>How do volcanoes form?<br>Can you get volcanoes away from plate margins?<br>Plenary: True or false.<br>https://www.youtube.com/watch?v=DnBggrCdkN0<br>***Homework practice question. Explain two human developments that would increase the risk of people being affected by natural hazards (4 marks)*** |

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| 7. **Volcanic hazards** | **To be able to identify a range of volcanic hazards** | Evaluate the effectiveness managing these hazards | Starter: 2 minute – talk 2 types of volcanoes to your partner.<br>Quick Quiz (see PP)<br>Complete table of different types of volcanic hazards.<br>True or false discussion<br>What do the terms primary hazard and secondary hazard mean?<br>What do the terms primary effects and secondary effects mean?<br>Activities pages 16-17 |
| 8. **Volcanic Activity** | To understand how volcanoes, form at plate margins and the hazards they present | How reliable is the current evidence for the theory of plate tectonics | Starter:<br>Read pages 14-15 pf the black Cambs book (back of C3 in a red box)<br>Answer these questions<br>How many active volcanoes are their globally?<br>When does a volcanic eruption occur?<br>What is a hot spot?<br>Define the terms dormant and extinct<br>How do we see evidence of past activity?<br>Where are volcanoes found (plate margins)<br>What is the ring of fire?<br>Draw out the table of on page 15 and write a comparison of the different types of volcano (composite and Shield). Add two diagrams of the characteristics of each type of volcano |
| 9. Living in tectonically active zones | To know why people, live in areas of tectonic activity and to understand the measurement of hazards | Evaluate the risk of living in tectonic areas | STARTER: Shield volcanoes are more dangerous than Composite volcanoes.<br>Over 500 million people live near active volcanoes….why?<br>Video clip of why people live near volcanoes in Iceland. See film of different reasons (social / economic / environmental)<br>https://www.youtube.com/watch?v=oOwcFuv2xKE&safe=active<br>Reasons and reducing the risks. |

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| | | | Summary of opportunities.<br>Diagram of techniques used to monitor volcanic activity.<br>Use page 19 complete a diagram of each of the range of techniques used to monitor volcanic activity.<br>Next to each diagram…<br>Explain how each technique is used to monitor volcanoes can help to predict an imminent eruption. |
| 10. Living in tectonically active zones (IT lesson – opt) | To produce a news article on living in tectonically active regions | Why do people still continue to live in these areas? | Working in a pair, imagine that you are interviewing a volcanologist who is giving you information about why people life near areas of volcanic activity.<br>Produce a news article with the details of the interview. Include the following as subheadings:<br>1. What are the range of economic opportunities offered by volcanic regions?<br>2. How can monitoring reduce the risk from volcanic eruptions – use the recent examples to help you<br>3. Explain the 3 P's of prediction, planning and preparation – include some examples of where this has helped.<br>4. What is the hazard risk equation and how might this help us when considering volcanic eruptions? Why has the risk of natural disasters increased over the last 30 years?<br>5. Why is volcano monitoring so important?<br>6. Why is it that not all volcanoes in the world are monitored?<br>8. Why can we not prevent all loss of life or damage to property when a volcano erupts?<br>9. Explain why more people die in some volcanic eruptions that others.<br>http://www.express.co.uk/news/world/859732/Bali-volcano-update-Mount-Agung-eruption-video-latest-news<br>http://www.bbc.co.uk/news/world-asia-41395831 |

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| 11. Earthquakes and their measurement | To understand the causes and impacts of earthquakes and how they can be measured. | Evaluate the measurement of earthquakes and how this can create different impacts even when the earthquake may have similar values on the Richter scale | Starter: 5W's?<br>Why and how do earthquakes occur?<br>How are earthquakes measured? Mercalli and Richter scale<br>https://www.youtube.com/watch?v=NaNw9LHq9dc&safe=active<br>Diagram of an earthquake zone.<br>Scatter graph and map plotting.<br>Analysis of data. |
| 12. Earthquakes and their impact | To examine the range of impacts from earthquake events and consider the variability of death toll | Discuss: Death toll varies depending on wealth | Starter: Quickly draw out a diagram of an earthquake on the whiteboard<br>*Using pages 22-23*<br>1. *Explain some of the primary effects of earthquakes.*<br>2. *Explain some of the Secondary effects of earthquakes.*<br>3. *Outline the physical and human factors that can affect the number of deaths and scale of damage.*<br>4. *Explain the phrase 'it is not the earthquakes that kill people – buildings do'*<br>5. *How does population density impact on the number of deaths that occur in an earthquake?* |
| **15** & 16. An earthquake Case Study | To investigate the causes, effects and responses to the Haiti Earthquake (named case study in a LIC) | Evaluate the range of impacts from the Haiti earthquake | In groups use the next 10 minutes to sift through the statements about the event.<br>Mystery activity to investigate the causes, effects and responses to the Haiti Earthquake<br>Causes<br>Primary Effects<br>Secondary Effects<br>Immediate Responses<br>Longer term responses<br>Briefly summarise the causes of the earthquake |

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| | | | Effects (primary and secondary)<br>And the Responses<br>(immediate and long term)<br>Each group to summarise and feedback<br><br>Part 2<br>Read the article adapted from the BBC – "Why did so many people die in Haiti's quake?"<br><br>Highlight the reasons for so many deaths – try and use 2 different colours to highlight the physical and human factors that exacerbated (made worse) the high numbers of deaths.<br><br>Write 2 developed paragraphs that explain why Haiti's death toll was so much higher than other earthquakes of a similar magnitude. Use data and examples in your 2 developed paragraphs. |
| 13. Tohoku Earthquake, Japan – a HIC | To examine the range of impacts from earthquake events and consider their variability | Evaluate the range of impacts from the Tohoku earthquake | Starter: Why will this help reduce the impacts from earthquakes?<br>Watch the video clip to get an overview of what happened. You will then be completing a sheet with causes, effects and responses on.<br>https://www.youtube.com/watch?v=l_Fz_RpUH4g<br>10 minute overview<br>https://www.youtube.com/watch?v=VuWTETyzR9Y<br>Second video – 10 things you didn't know…<br>• Complete the sheet to show causes, primary effects, secondary effects and responses.<br>• You can write on the sheet or type it and print it off. |

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| | | | Extension: Produce an annotated map to show the location of the earthquake.<br>On a word document, paste an **outline map**. Mark on the location of Tokyo, Sendai and Fukishima Nuclear Power Station. Label the main islands.<br>Annotate the location of the epicentre, the magnitude of the earthquake, the depth of the focus and the date and duration of the event. Use the textbook to help with this information. |
| 14. Comparing Earthquake Events | To consider why the impact from earthquake vary in countries of differing economic development. | Evaluate why the impact from different earthquake events varies | Starter: Talk to your partner about Tohoku…one thing that you were most 'surprised' about?<br>1. Complete the Tohoku earthquake background and video (s).<br>2. Case study detail.<br>3. Summary of the 2 events in a table.<br>4. Level of risk equation.<br>Write 2 developed paragraphs that explain why the impact from the Tohoku earthquake was so different to that in Haiti; especially considering that the Tohoku earthquake was so much more powerful.<br>Use data and evidence in your 2 developed paragraphs. |
| 15. End-of-unit test. | | | |

**3.1.1.2 Additional tectonic Hazards summary and suggested resources / teaching ideas**

| Key idea | Specification Content | Teaching ideas | Resources |
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| 1 Earthquakes and volcanic eruptions are the result of physical processes | • Plate tectonics theory<br>• Global distribution of earthquakes and volcanic eruptions and their relationship to plate margins<br>• Physical processes taking place at different types of plate margin (constructive, destructive and conservative) that lead to earthquakes and volcanic activity | • Structure of the earth cloze exercise<br>• Discussion of Pangea and what happened?<br>• Show clip for information<br>• Explanation of the evidence of continental drift, notes on the evidence<br>• Explanation of plate tectonic theory and note down plates<br>• Read through copies of slides 6-8 then answer the question<br>• Describe the patterns in global tectonic activity<br>• Explain the distribution using the plate boundaries map<br>• Explanation of types of plate boundaries<br>• Watch clip about plate margins<br>• Fill in plate margins table using Oxford pg 12-13<br>• Oreo plate boundaries | • Earthquakes and volcanoes are the result of physical processes PP<br>• The structure of the earth<br>• Continental drift diagram<br>• Print slides 6-8<br>• Volcano and EQ distribution<br>• Plate boundary map<br>• Different plate margins table<br>• Oxford pg 12-13 |
| 2 The effects of and responses to, a tectonic hazard vary between areas of contrasting levels of development | • Primary and secondary effects of a tectonic hazard<br>• Immediate and long-term responses to a tectonic hazard<br>• Use named examples to show how the effects and responses to a tectonic hazard vary between two areas of contrasting levels of wealth | • Contrast the two types of volcano using the information from Cambridge pg 15<br>• Notes made around the earthquake activity diagram from explanation<br>• Introduction to the Nepal Earthquake using maps and diagrams<br>• Fill in the Nepal earthquake table during the documentary<br>• Introduce the Christchurch earthquake using maps and diagrams<br>• Do the sorting exercise into cause, effect and response<br>• Annotation of the causes around the NZ map and diagram<br>• Sort the effects into primary and secondary effects and then do a diamond 9 based on the importance of the effects and explain their orders<br>• On a copy of the responses to the earthquake classify them into immediate and longer-term responses<br>• Contrast the effects and responses from both of the earthquakes | • The effects of, and responses to, a tectonic hazard vary between areas of contrasting wealth PP<br>• Volcano types<br>• EQ activity diagram<br>• Nepal earthquake 2015 vid sheet<br>• Life_after_earthquake_in_Nepal_full_documentary<br>• NZ card sort<br>• NZ EQ diagram<br>• Copy of responses page from the card sort document |

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| | | • Explain why there are differences, using prompts from the final slide (could be homework) | |
| 3 Management can reduce the effects of a tectonic hazard | • Reasons why people continue to live in areas at risk from a tectonic hazard<br>• How monitoring, prediction, protection and planning can reduce the risks from a tectonic hazard | • Why would anyone want to live in these areas on the photos? Discussion<br>• Analysis of tectonic distribution vs population density maps, where are the areas that are densely populated and at high risk of hazards?<br>• Explanation of the spider diagram of reasons why people live in hazardous areas<br>• Watch the clips giving specific examples of some of the points from the spider diagram, students should make notes<br>• Sorting activity from the PP<br>• In groups of 4 each has one type of management to memorise information on from the sheet. Students then exchange information and check its accuracy using the sheet.<br>• Using the information students do the DME from the final slide (could be homework) | • Living with hazards and management of hazards PP<br>• Tectonics vs pop density<br>• Copy of slide 4<br>• Management information<br>• Copy of slide 9 |