

**Drayton Manor High School**

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| Exam Question |
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| (a) | Study Figure 1. Analyse the global pattern of the distribution of active volcanoes. *(4 marks)* |

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| (b) | Evaluate the significance of development in the effective response to tectonic mega-hazards. *(12 marks)* |

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| **Total:** 16 marks |

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| Source |
| **Figure 1: The global distribution of active volcanoes** |

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| Mark scheme |
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| (a) | 4 marks (AO3 = 4 marks)The key points you need to pick out from the map include: • Most active volcanoes lie on or near plate margins. • Especially around the Pacific Ocean (Pacific Ring of Fire), e.g. Mount Rainier. • Some lie in the middle of plates at hot spots above mantle plumes, e.g. Mauna Loa.**Hints and tips**Systematically break down the elements of the map to draw out the patterns.  |

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| (b) | 12 marks (AO1 = 3 marks, AO2 = 9 marks)Some suggested ideas are given below but you may wish to expand on these or include other relevant points.**AO1 Demonstrating your knowledge and understanding** • Mega-hazards are hazards that produce large-scale impacts. • The effect they have on people is determined to a large extent by the level of development of the country/countries involved.**AO2 Applying your knowledge and understanding** • By making relevant connections. • Supporting your evaluation with evidence. • Producing a balanced and coherent argument.Development can negatively affect the vulnerability of people leading up to the hazard, for example: • Unsustainable development increases vulnerability. • Lack of money can result in underinvestment in resilience training for the population. • Issues with social development, e.g. poor health/nutrition levels.Development can also negatively impact the post-hazard situation. • Damage to infrastructure such as homes and services. • Social — damage to provision of health and education.Development can also influence preparedness in a positive way, for example: • Investment in hazard monitoring. • Infrastructure resilience. • Mitigation strategies, e.g. tsunami walls. • Training and preparedness of local population.Following the hazard, there are opportunities for development to positively influence future resilience through, e.g. rebuilding strategies that make buildings more resilient.**Answers to this question will be given a mark within a level band****Level 1 (1–4 marks):** You show only a limited geographical knowledge and understanding of the significance of development. You make limited connections between aspects of your answer and support your interpretations with limited evidence. You draw unbalanced conclusions based on the material in your answer.**Level 2 (5–8 marks):** You show mostly relevant and accurate geographical knowledge and understanding of the significance of development. You make mostly relevant connections between aspects of your answer as appropriate and support your interpretations with some evidence. You draw conclusions based on the material in your answer but your conclusions may be limited or unbalanced.**Level 3 (9–12 marks):** You show relevant and accurate geographical knowledge and understanding of the significance of development. You make sound connections between aspects of your answer as appropriate and support your interpretations logically with evidence. You draw balanced and logical conclusions based on the material in your answer. **Hints and tips**Assess the ways in which development affects the effectiveness of the response to tectonic mega-hazards. You should review various pieces of information and draw them together in a conclusion at the end. |

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| Student Response A |
| (a) | Figure 1 shows that the majority of the world’s active volcanoes are found close to the major plate boundaries across the world. This is especially the case around the Pacific Ocean, where the boundaries at its edge form the Pacific Ring of Fire. Here, active volcanoes such as Mount St Helens in the USA and Fujiyama in Japan are found. In addition, there are some locations away from plate margins where volcanoes occur, especially the likes of Mauna Loa in Hawaii. This sits on a hot spot over a mantle plume.

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| **Examiner comment**The overall pattern is stated clearly. Thorough analysis is given of the patterns in the map, which is backed up with examples from the source. 5 marks. |

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| (b) | Mega-hazards cause large-scale impacts, in terms of either the area they cover, or the extent of the impacts on the people involved. In developing and emerging countries, the lower levels of development can have a large effect on how significant the impacts of a hazard are. But where development levels are higher, the impacts of hazards can be reduced.Lower levels of development can negatively affect the vulnerability of the local populations. For example, unsustainable development can increase vulnerability of local people. In Haiti prior to the 2010 earthquake, rapid rates of urbanisation led to the growth of shanty towns in Port au Prince. These buildings were less able to withstand the shaking of the earthquake and many collapsed. Even in the longer-established buildings, lack of proper design and poor construction techniques resulting from poverty caused many of the buildings to pancake as the floors collapsed on top of each other. In addition, lack of money can result in underinvestment in preparing the population to deal with the hazards when they occur. Furthermore, low levels of social development can make a population more vulnerable. If nutrition and health levels are lower to begin with, following an earthquake the population will be more vulnerable to diseases that readily spread in the make-shift camps people set up. For example, in Haiti in 2010, an additional 9,000 people died as a result of a cholera outbreak following the earthquake.Development can affect the response to the threat of hazards in a positive way too. For example, in richer countries money can be invested in monitoring hazards. In Japan before the 2011 earthquake, a network of 182 seismometers constantly monitored the country for signs of seismic activity. These provided the basis for the earthquake early warning system in place there and the tsunami warning system too. Buildings can be made ‘life safe’ in countries with more money. Again in Japan, strict building codes ensured that very few buildings collapsed due to seismic shaking during the 2011 magnitude 9.0 earthquake. Additionally, mitigation strategies can be implemented. The Japanese have a very extensive sea-wall defence against the tsunami threat (although there is evidence that these walls led to complacency among the local population during the 2011 quake, resulting in many thousands of deaths).Overall, then, development can have a significant effect, either positively or negatively, on how effective the response to tectonic mega-hazards is.

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| **Examiner comment**The student demonstrates accurate and relevant knowledge and understanding for AO1. They apply their knowledge and understanding to make relevant connections between development and impacts, supported by evidence and with sound judgements to create balanced and coherent arguments for AO2. Level 3, 11 marks. |

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| Student Response B |
| (a) | Volcanoes are found in many parts of the world including North America (Mount St Helens), Europe (Vesuvius), Asia (Fujiyama) and South America (Cotopaxi). There are also volcanoes in oceans including Tristan da Cunha and Kilauea.

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| **Examiner comment**Although this answer refers to many places on the map, it is too descriptive. A deeper analysis is needed to pick out the patterns. 2 marks. |

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| (b) | Mega-hazards occur whenever earthquakes or volcanoes cause impacts on people.A lower level of development can affect the vulnerability of the local populations in a negative way. Unsustainable development can make local people more vulnerable. In Haiti, because of poverty, there was a lack of proper building design and poor construction techniques before the 2010 earthquake. As a result, many of the buildings were flattened as the floors collapsed on top of each other.A lack of money can also result in underinvestment, so that the population is not properly prepared to deal hazard events. And a population is more vulnerable if there is a low level of social development and nutrition and health levels are lower to begin with. Following an earthquake, diseases can quickly spread through make-shift camps that people set up. In Haiti in 2010, for example, a cholera outbreak following the earthquake caused an additional 9,000 deaths. Lack of money also affected the rebuilding programme after the earthquake. By 2016, 60,000 of the 1.5 million Haitians left homeless after the quake were still living in camps.In richer countries, development can have a positive effect. The Japanese have built extensive sea-wall defences against the tsunami threat. However, there is evidence that these walls led to complacency among the local population during the 2011 quake. That resulted in many of them ignoring the tsunami evacuation warnings until it was too late.

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| **Examiner comment**The student shows accurate and generally relevant knowledge and understanding for AO1, although to improve their mark they should include more detail. The student has applied their knowledge and understanding to make some relevant connections between development and impacts, supported by evidence. Overall, however, more connections could be made and the answer is imbalanced between the positive and negative effects of development for AO2. Level 2, 7 marks. |

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