Edexcel GCE Geography from 2008
Unit 4 Geographical Research: exemplar responses

- This is an exemplar response from the **June 2013** examination series.
- It is an example of candidate work which has been word processed and adapted to make it more suitable as a teaching and learning aid.
- Errors, including QWC errors, have in most cases been kept. The aim of these exemplar reports is to highlight good practice and areas of potential improvement. The marking levels and examiners comments given are indicative and should be used as a basis for discussion in the classroom, rather than indicating a specific grade.
- Comments and indicative marks are provided at the end of the exemplar.

Pre-release research focus:

OPTION 1: Tectonic Activity and Hazards
• Explore the different challenges posed by tectonic hazards both before and after the events.
• Research the different impacts that tectonic hazards have on areas at different levels of development.

Report Title:
It is essential you use your own research to support your arguments.

OPTION 1: Tectonic Activity and Hazards
1 To what extent is the level of development the main factor affecting the challenges posed by tectonic hazards?

(Total for Question 1 = 70 marks)

Plan
Intro
Methodology
Challenges before:

- Prediction EQ Istanbul, L'Aquila, V Mt St Helens only 20%
- Prep: EQ FEMA, LEDCs poverty, V Phivolcs false security
- Landuse – EQ USA but San Andreas, LEDC slums, V usually MEDCs but Montserrat

Challenges after:

- Emergency – Japan v Christchurch v Haiti
- Aid MEDCs to LEDCs, Sichuan
- 2nd / 3rd hazards Iceland 2010
- Deggs model
- Rebuilding – Sichuan v Haiti, Mt St Helens

Other factors

- Magnitude – tsunami
- Location of focus

Eval and conc

1. Introduction

Tectonic hazards can be defined as geophysical events that have the potential to threaten lives and property. They are either seismic (earthquakes and secondary hazards of tsunami) or volcanic (eruptions) (Bishop: Hazards and Responses).

These pose challenges – the difficulties in managing the hazard events to reduce loss of life and property both before and afterwards. The challenges before include both attempts at prediction, community preparedness and land use planning whilst the challenges after include the emergency response, aid and secondary and tertiary hazards and rebuilding in the long term (Philip Allan Tectonic Hazards conference 2012).

To a large extent this is affected by the levels of development in a country as more economically developed countries have more capital to invest in preparation and also have better coordinated responses that NICs, LEDCs or LDCs. This is shown on the Park's model (Figure 1) in terms of the challenges after the event as MEDCs return to normal more rapidly and are better prepared.

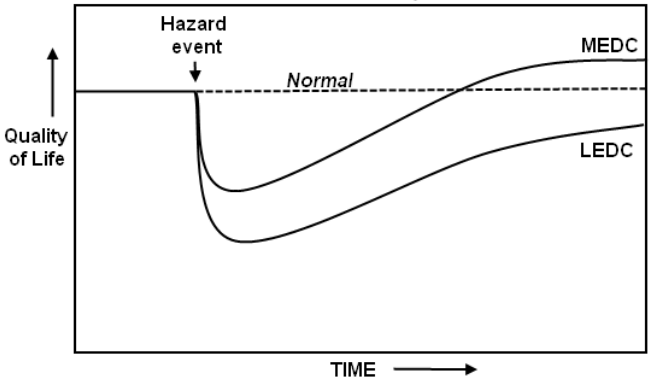


Figure 1: Park's model

However other factors also affect the challenges, particularly in terms of those after the event, such as the magnitude and frequency of the hazard. This report will argue that level of development is important but should not be considered the only factor in determining degree and type of challenge.

This report will assess the extent to which levels of development are the main factor affecting the challenges posed by tectonic hazards by comparing case studies of different levels of development such as the Mt St Helens eruption in 1980, which although not recent is well documented, with the 1985 eruption of Nevado del Ruiz in a comparative MIC. It will then use case studies to assess other factors such as magnitude and frequency and the challenges posed.

2 Methodology

Research began by using the Edexcel textbook by Dunn et al and Bishop's Hazards and Responses to gain a broad understanding of the challenges posed. These were reliable as they were endorsed by the exam board and written by specialists.
Websites such as the USGS, Volcanolive and the Montserrat Volcano Observatory were then used to research case study detail such as the Souffriere Hills eruptions 1995-97, needed for my report. This data was reliable as it was collected by specialists using sensitive equipment thus avoiding bias where as wikipedia was avoided as it could be contributed to by anyone thus may be bias or inaccurate.

Professor Ian Stewart's 'Top 10' documentaries aired recently in 2012 and the Philip Allan Tectonic Hazards conference also helped provide examples such as prediction of earthquakes on the North Anatolian fault. These provided detailed and accurate notes so were reliable. This information was used to verify information found on YouTube about the North Anatolian fault which helped to illustrate the effect of development.
Finally, Geofiles 602 and 590 were used as well as Geofactsheet 159 and an article in Geography Review on Mt St Helens. These were useful as they were aimed at students. This breadth of resources makes my information more reliable by helping to eliminate bias and providing a range showing varying development as well as frequency and magnitude.

3 The effect of levels of development

3.1 Challenges before

3.1.1.Prediction

Prediction of earthquakes is complicated as their locations can be located at plate boundaries or fault lines but not the time they will strike (Bishop: Hazards and Responses). MEDCs and NICs tend to be more successful in this as it requires expertise and expensive technology which LICs and LEDCs lack. For example, scientists have successfully monitored a cascade of earthquakes since 1939 on the North Anatolian Fault through stresses to locate the next earthquake in Istanbul. However, prediction remains a challenge event o MEDCs in terms of timing as the 2009 L'Aquila earthquake in Italy, and MEDC, highlights. An evacuation was cancelled but 4 hours later an earthquake struck killing 300 (Top 10 documentary).
Predicting eruptions is also more successfully done by MEDCs and NICs for similar reasons. For example, the 1980 eruption of Mt St Helens was predicted and 200 people evacuated (USGS) whereas LEDCs often fail to do so. However, again prediction is limited in all development levels as only 20% of the worlds volcanoes are actually monitored (USGS).

3.1.2 Community preparedness

Community preparation is also influenced by development levels as MEDCs have the capital and human resources to invest in awareness raising projects whereas LDCs and developing countries may be more concerned by other more pressing issues such as poverty alleviation. The USA illustrates this as it is a well prepared MEDC with regular shake out drills and FEMA has published instructions for what to do in the event of an earthquake (USGS and FEMA websites).

Preparation for volcanic eruptions is also better achieved by NICs and MEDCs. However, in some cases LEDCs are prepared although without always having a positive effect in terms of managing the challenge of the hazard.
Preparation for volcanic activity is also better achieved by HICs and MEDCs. However, with the help of the USGS Phivolcs successfully predicted the 1991 Mt Pinatubo eruption and evacuated 1000s of people. However more recently PhiVolcs has been criticised for now doing enough to raise awareness of risk and people accuse it of being complacent and creating a false sense of security. This creates a worse disaster risk equation as the vulnerability of the population increase if LEDCs fail to manage the challenge of preparing the community successfully.

3.1. 3 Landuse planning

Landuse planning can successfully reduce the destructive effects of tectonic hazards by moving people and property away from the danger zone (Edexcel A2 textbook – Dunn et al). This is usually managed more successfully in MEDCs as they have the data and the governance structures needed to implement plans. However, landuse planning has limitations even in HICs. This is because expensive settlements already exist in danger zones such as in California with San Francisco sitting on the San Andreas fault in a high risk zone. The high value of the location over-rides the risk of living there. Similarly, some LEDCs manage landuse planning effectively such as Montserrat where access to the south side of the island and the former capital Plymouth is limited (Figure 2) to reduce the people affected in the event of another eruption (Montserrat Volcanic Observatory). However, in LEDCs squatter settlements associated with industrialisation often limit the effectiveness of landuse planning.

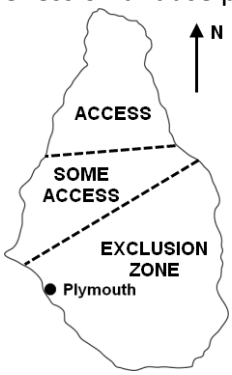


Figure 2: Map of planning zones on Montserrat.

Thus the level of development does to a large extent affect the how successfully the challenge of landuse planning is met but it is not always the case that MEDCs are more successful.

3.2 Challenges after

3.2.1Emergency response

The level of development can greatly affect the emergency response to a hazard as the MEDCs tend to have fewer people at risk in the light of better preparation and better coordinated responses than MEDCs. For example following the Japan earthquake in 2011 within 24 hours 62 search and rescue teams were operating (NASA) and following the 2012 Christchurch

earthquake within 2 hours satellite imagery was being used to pinpoint where aid and rescue should be targeted (Christchurch government website).
In comparison, following the Haiti earthquake in 2010 there was no clear direction and people took on rescue efforts themselves which shows the influence in Haiti of it being an LDC (Disaster Relief Committee website).
This is also true of volcanic eruptions as the developing country of Columbia had no strategy 3 days after the Nevado del Ruiz eruption in 1985, whereas after the eruption of Mt St Helens in an MEDC the National Guard dispatched helicopters which rescued 130 people (Geography Review). These developed countries tend to be more successful in emergency response so development level is a key reason affecting the challenges posed by tectonic hazards.

3.2.2 Secondary and Tertiary hazards

As the primary tectonic hazard of an earthquake or volcanic eruption has already occurred, the level of development has a reduced effect on the challenges posed as vulnerability has already been increased, although to varying extents as illustrated by Degg's model in Figure 3 (Edexcel A2 Geography Dunn et al):

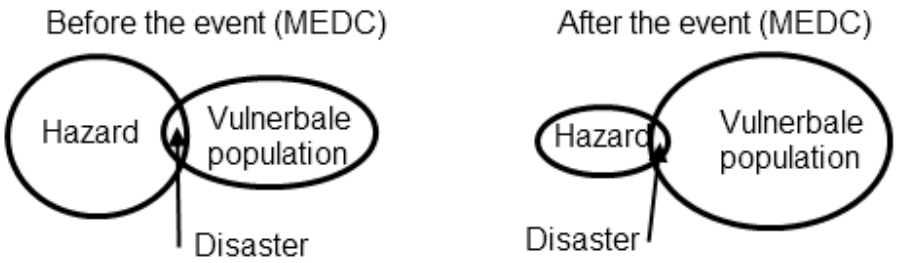
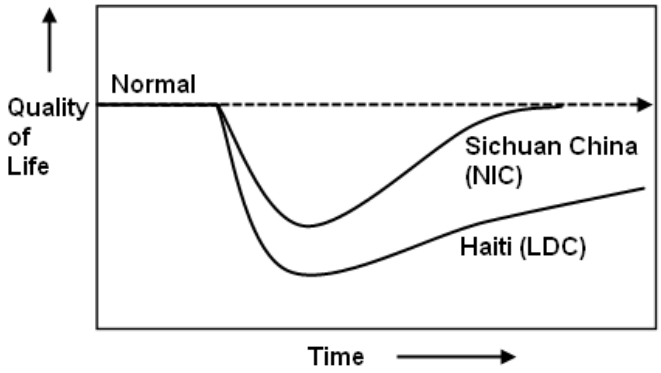


Figure 3: Degg's model

However in some cases the challenge of secondary and tertiary hazards is greater for MEDCs due to their more globalised nature, thus levels of development do have some influence. For instance, in the Icelandic eruption of 2010, MEDCs in North America and Europe which are globally connected were seriously effected by the 8 day ban on flights caused by the ash cloud which affected 48% of air travel and cost airlines £130 million per day (BBC news website).

3.2.3 Rebuilding

Arguably the level of development of a country is the key factor in affecting the challenge of rebuilding following a tectonic hazard event. This is because MEDCs and HICs have more capital and greater access to the infrastructure required for rebuilding than LEDCs and LDCs. This is clearly illustrated by a comparison of the 208 Sichuan earthquake in the NIC China which had growth rates of 8-10% in the last decade and thus lots of capital (The Economist) with the 2010 earthquake in Haiti. The Chinese government quickly pledged $10 million to allow rebuilding to commence (Geofile 602) whereas 6 months after the Haiti earthquake 98% of rubble remained to be cleared and one year later 1 million people remained homeless (USGS).
This is also the case with volcanic eruptions as LEDCs struggle to clear debris and repair buildings due to lack of wealth. Park's model can be used to illustrate this difference:



4 Other factors

4.1.Magnitude

There are other factors aside from levels of development that affect the challenge posed by tectonic hazards once of which is magnitude. The greater the magnitude the greater the potential for destruction thus the greater the challenges of emergency response and rebuilding. For example, despite being an MEDC the tsunami wave 40.5m high that struck Honshu and Sendai in 2011 caused 15894 deaths and damaged 322000 buildings due to its huge power and magnitude (USGS) where as the small localised tsunami generated after the 2010 Haiti earthquake only killed 3 people. Thus to some extent the level of development can be overridden as the main factor by magnitude although this is not always the case.

4.2 Frequency

The frequency of tectonic hazard events also has a large impact on the challenges posed by a tectonic hazard, particularly when according to Park's model a country has not yet returned to normal conditions and thus is more vulnerable. This can effect countries at all levels of development if disasters are frequent enough. For example, although Haiti is an LDC it is arguable that the emergency and long term challenges were exacerbated by the 59 major aftershocks that measured 4-5 on the Richter scale as much as the very low levels of development in Haiti. Similarly the challenge of rebuilding 50,000 buildings destroyed by the 2011 Japan earthquake may have been worsened by the 7.1 magnitude aftershock that occurred before Japan had returned to normal and was thus in a more vulnerable state. In places were tectonic hazard occur infrequently people may 'forget' they are at risk as in Kashmir in 2005 when a major earthquake caused 70,000 deaths. It had been about 100 years since a major earthquake and so people had no memory of the risk or the possible impacts, or how to respond.

5 Evaluation and conclusion

To a large extent the level of development is the main factor in affecting the challenges posed by tectonic events as it affects challenges both before and after whereas other factors such as the hazards magnitude and frequency mainly affect the challenges after the event. This is shown by MEDCs and NICs better ability to predict events, such as in Istanbul in the future and

the 1980 eruption of Mt St Helens versus the inability of many LEDCs and LDCs to prepare for hazard events such as in Haiti or the Philippines.
Although there are disadvantages for both MEDCs and LEDCs in the challenge of landuse planning, levels of development are the driving factor in this challenge such as the high value of existing developed land in California and the uncontrolled growth of slums in some LEDCs and NICs which in both cases can't be moved.
The challenges after are also affected by development levels as MEDCs have more rapid and coordinated responses and rebuilding plans than LEDCs and LDCs, for example by comparing the 2008 Sichuan earthquake and the 2010 Haitian earthquake or the response of the USA to the eruption of Mt St Helens compared to that of Nevado del Ruiz. Despite MEDCs being more affected by tertiary and secondary hazard the challenge is still influenced by level of development.
However in some cases other factors such as magnitude and frequency do override the effect of levels of development but as this is limited to the challenge after the hazard rather than both before and after, the level of development is the main factor at work.

Comments

Mark scheme section	Strengths	Areas for improvement	Mark scheme level
Introducing, defining and focusing on the question (10)	• Definitions used are good • Good focus on challenges and the range of factors to be considered • Some setting out of framework and approach, including examples to be used	• There is a sense of direction / argument although this could be developed	9-10 marks (Level 4)
Researching and methodology (15)	• Range of sources mentioned • Explains why range was used • Research is wide ranging and all relevant – up to date plus some 'classic' case studies; good factual accuracy	• Dates of sources could have been stated • Recognizes strengths and weaknesses of sources but could have added more depth	12-15 marks (Level 4)
Analysis, application and understanding (20)	• The report is selective; it avoids getting bogged down in descriptive detail of hazards • Comparative throughout • Focused on challenges and levels of development • Logical flow to analysis (before, during after) • Shows conceptual understanding	• Diagrams are relevant but could have been better used to support the argument more fully	17-20 marks (Level 4)
Conclusions and evaluation (15)	• Does have ongoing evaluation at the end of most sections i.e. 'however' and 'whereas' moments • Good recall of main content • Identifies some complexity – it is not all about level of development, other factors come into play • Overall conclusion is clear and a judgment is made	• Could have returned to the models used (i.e. concepts) and used these to add structure to the final conclusion.	12-15 marks (Level 4)
QWC (10)	• Terminology good • Structure logical • Report style • Sources referred to in main text	• Could integrate Figures a little more fully	9-10 marks (Level 4)