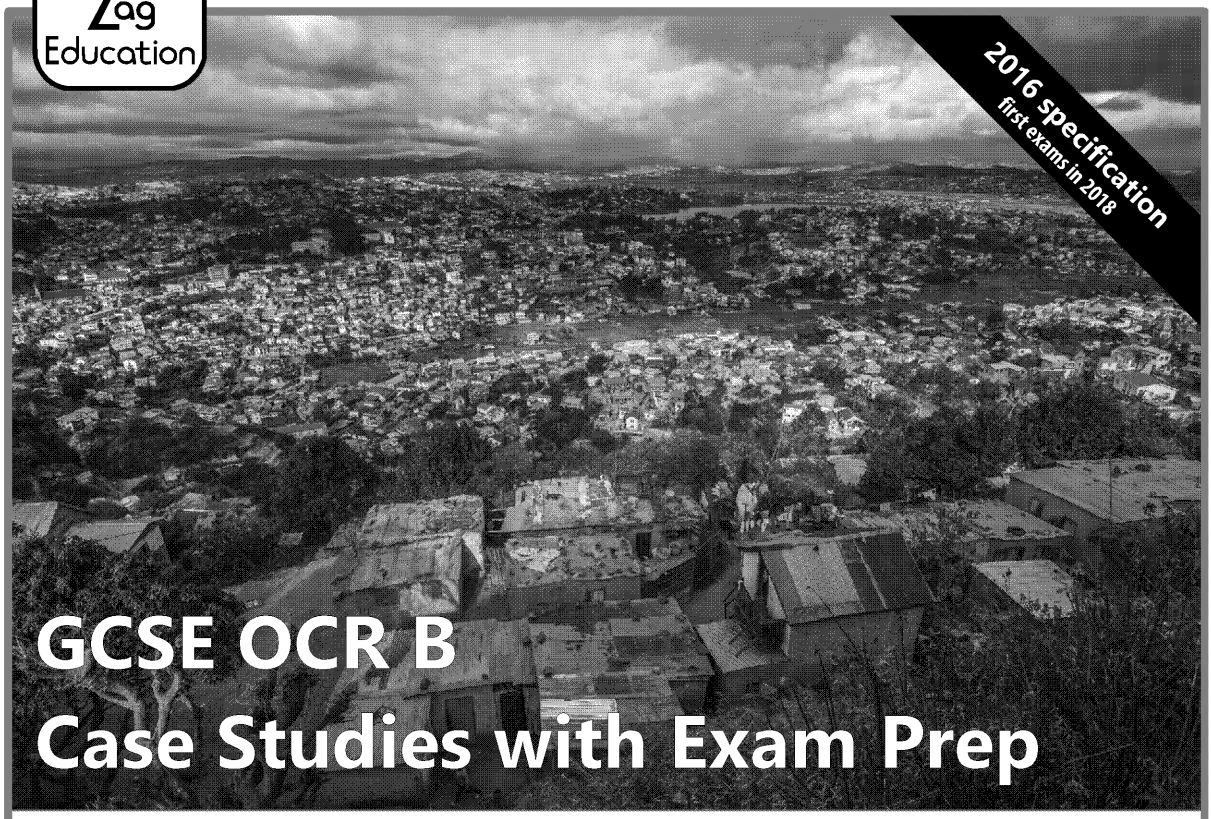
Zig Zag Education

Geography

GCSE | OCR B | J384



GCSE OCR B
Case Studies with Exam Prep

Global Hazards: Weather

Tropical Storm Chedza, Madagascar (2015)

zigzageducation.co.uk

POD 8844

Contents

Thank You for Choosing ZigZag Education ..... **ii**
Teacher Feedback Opportunity ..... **iii**
Terms and Conditions of Use ..... **iv**
Teacher's Introduction **1**
Tropical Storm Chedza – Eastern Africa and Madagascar, January 2015 ..... **2**
Part 1: Case Study **2**
Content 2
Fact Table 6
ICT Interactive Page 7
Springboards 8
Part 2: Exam Preparation **13**
Summary 13
Quick-fire Questions 14
Extension Questions 16
Exam-style Question 18

Teacher's Introduction

This resource has been developed to provide case studies and exam preparation material to support the GCSE OCR B specification (J384) **Topic 1: Global Hazards: Weather.**

This detailed case study is on **Tropical Storm Chedza, Madagascar (2015)** representing a **tropical storm event**.

The case study includes a main content section which can be used as part of a lesson plan or distributed to students for self-guided research; a selection of ICT interactive links to further students' research around each topic and a set of Springboard Images and discussion questions (also available as a PPT file accessible by digital download) which makes a fantastic starter activity.

*A webpage containing all the links listed in this resource is conveniently provided on ZigZag Education's website at **zzed.uk/8844***

You may find this helpful for accessing the websites rather than typing in each URL.

The exam preparation section which follows the case study contains a summary table, bringing together all of the key facts and figures relating to the case study; rapid-fire revision questions (with answers) to help recall and retention of the main points; and an exam-style question and mark scheme, written in the style of the OCR B sample material, so that students can practice answering questions relating to case studies and applying relevant knowledge in their answers.

The resource may be used as a source of reference for the required case studies for individual study, or for group work leading to discussion or debate. Subheadings in the information sections are designed to enable tabulated comparisons of social, economic and environmental impacts.

Other detailed case studies are available for this topic area representing contrasting natural weather hazard events arising from extreme weather conditions (tropical storms, flash flooding, heatwaves, and drought) in the UK and globally:

- Hurricane Sandy, USA (2012)
- Flooding, Morpeth, UK (2008)
- Flooding, Texas, USA (2015)
- Heat wave, UK (2015)
- Heat wave, Pakistan (2015)
- Drought, UK, (2004–2006)
- Drought, Brazil (2014–2016)

A PowerPoint presentation containing the Springboard Images starter activity to accompany this resource is available as a free digital download. Just register for free updates using the link below to download all available content for your school or purchasing site.

November 2018

Part 1: Case Study

Acronyms and Useful Terms

CRM	Malagasy Red Cross Society
HDI	Human Development Index
ITCZ	Intertropical Conv[illegible]one
NDRT	National D[illegible]esponse Team
NGO	No[illegible]mental Organisation
PURIRV	[illegible]ergency Infrastructure Preservation and Vulnerability Re

Content

Introduction and Overview

Tropical storm Chedza formed from the ITCZ (Intertropical Convergence Zone) near Mozambique and intensified as it moved over the ocean towards Madagascar and Réunion. The other affected countries were Malawi and Zimbabwe. The regions had witnessed heavy rain prior to the storm, which meant that the heavy rain associated with the storm exacerbated [illegible] flood events – rivers in Madagascar were [illegible] in excess of their normal heights. [illegible]om Chedza was further worsened by the [illegible] of another storm, Fundi, in early February, which tracked just off Madagasca[illegible]th-western tip. The floodwaters associated with Chedza were the highest seen since 1959, 55 years prior.

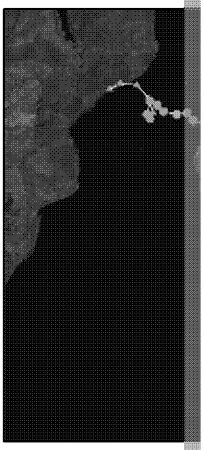


Figure 1: The

Although the wind speed wasn't high enough to be classified as a hurricane on the Saffir–Simpson hurricane wind scale (falling about 10 mph short of the 74 mph hurricane classification – maximum speed (10-minute sustained) was 65 mph)), the storm was classified as a tropical storm and a severe tropical storm on the SW10 scale.

Timeline of Eve

- **9th January** – monsoon trough thunderst[illegible] coast of Mozambique. Moved east-south[illegible] pressure.
- **14th January** – classified as a 'zone of d[illegible] France on Réunion, an island to the east [illegible] 'Tropical Depression 6' – the sixth of the
- **16th January** – classified as Tropical Sto[illegible] as it approached Madagascar, making l[illegible] (between Morondava and Belo sur Mer) landfall, wind[illegible]eds (10-minute) were s[illegible] Over[illegible], the storm weakened and was [illegible]
- **[illegible]th January** – Chedza reached Madag[illegible] UTC, and re-intensified into a tropical st[illegible] once more.
- **18th January** – the storm began to dissip[illegible]
- **19th January onwards** – Chedza reache[illegible] classified as a post-tropical cyclone.
- **22nd January** – Chedza finally dissipate[illegible]

Even so, Madagascar experienced $40 million [illegible]mages, and 80 deaths. Madagascar is a developing country, scoring low on the Human Development Index (HDI) (in 2014, Madagascar was ranked 154 of 188 countries), with a population living in poverty – the poverty headcount ratio at national pove[illegible]

around 90% live below the poverty line. Flooding is not uncommon in Ma
climate causes a period of high rainfall each year. Houses are often poorly

Preparation

Madagascar was already experiencing poor, seasonal weather prior to the s
was activated by the CRM – the Malagasy Red Cross Society – which helpe
flooding would result from the storm. Warnings were also issued by medi
Internet and newspapers), and additional text messages
and social media.

- During the storm and immediately after, the National Disast[illegible]eam (NDRT) was activated, and assess[illegible]area.
- 81 volunteers were trained in building shelters.
- Four water treatment units were set up.

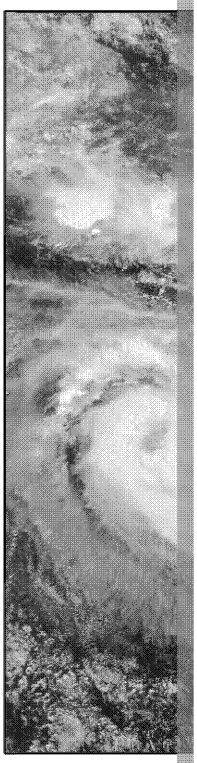


Figure 2: Che
la

Primary Effects

Social

- Approximately 100,930 people were affected by the storm.
- 54,795 people were displaced, especially in Vatovavy-Fitovinany (people began to return home at the end of January).
- 4,430 houses destroyed.
- 3,442 houses flooded.
- In Madagascar's capital city, Antananariv[illegible]rs portions of the city were flooded. The city is prone to annual flooding, becaus[illegible]two-thirds of it has been built on the floo[illegible]including some illegal settler[illegible]. Many of the city's residents who live in the flo[illegible]one areas are among the poorest residents of the city. During the storm, the pump which controls the city's water level by removing floodwater was damaged.
- Almost 1,000 schools were damaged, which disrupted the education of 48,000 students.
- Many water sources were damaged (some sources cite approximately 100), and several were contaminated by floodwater.

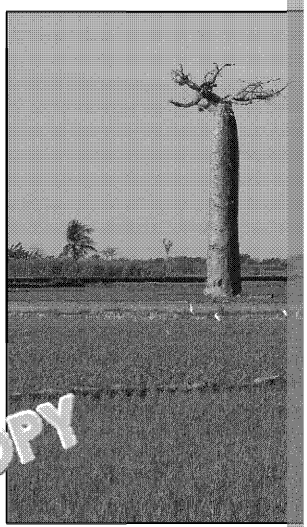


Figure 3: Rice fields aro
hectares of

Economic

- The President stated that the flooding had significantly damaged vital infrastru[illegible]r[illegible]– therefore, there was a repair [illegible]ociated with the rebuildin[illegible]. The[illegible]acture included 42 roads, [illegible]and one dam.
- Much [illegible]nd was flooded, and, therefore, 9,922 ha of paddy fields were damaged – locals tried to salvage the ric
- 1,226 cows were missing after the storm.
- Food security was, therefore, decreased later in the year, in a country w relatively insecure.
- Eight hospitals and 44 health centres were damaged.

- Government buildings were damaged.

Environmental

1. Land was flooded, and rivers were 3–4 metres above their normal levels.

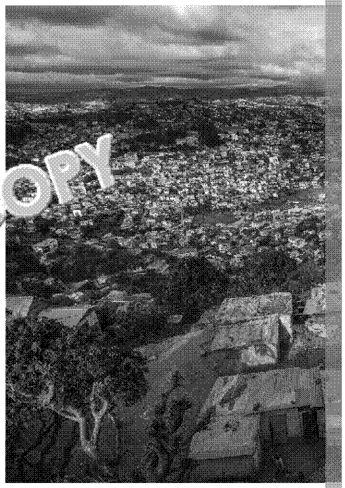


Figure 4: Madagascar's capital as a large proport

Secondary Effects

Social

2. The deaths in Madagascar [illegible] by landslides (50 lan[illegible] total).

Economic

3. Roads were damaged by landslides, and, therefore, needed to be restored and cleaned.

Immediate Responses

4. The Madagascan Government immediately provided $1.3 million and shelters for 20,000 people.
5. The government also began to clear the damage, and ordered flags to fly at half-mast.
6. Search and rescue operations were initiated.
7. Madagascar's National Social Insurance Fund provided food (e.g. rice), blankets and candles, and hygiene items such [illegible].
8. It was essential to assess [illegible] damage, to enable appro[illegible]ution of aid.
9. Interna[illegible] as[illegible]stance was not requested until 2[illegible]uary – almost two weeks later.

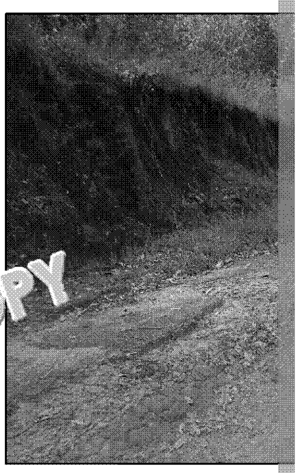


Figure 5: A road in centra collaps

10. Japan sent items including water purifiers and tents.
11. Other agencies, such as NGOs (Non-governmental Organisations) and Cross and UNICEF provided food, cooking pots, cutlery and crockery, shelter kits, mosquito nets and hygiene kits.
12. The World Bank provided $40,000 for 'cash for work' activities, via PU Infrastructure Preservation and Vulnerability Reduction Project). The restoration efforts and to provide local people with an income. Across households were involved, with each person working for 20 days, for
13. The European Union provided financial assistance. The €3 million was between Madagascar, Malawi and Mozambi[illegible]tential partners' distribute the aid, for use in shelters[illegible]repairs, the reduction in education and livelihood re[illegible].
14. Medium- and long-[illegible] were assessed by Food Security and Nu

Long-term Responses

1. The Malagasy Government called on the international community for a preparedness measures.
2. It was important to ensure that buildings were watertight and windpr next rainy season (the following November).
3. On 6th March, the government set up one main camp for displaced resi Antananarivo, to house 24,000 people for three months. After this time couldn't return home were resettled.

Effectiveness of Preparation

- The preparation did not allow for some prior warning to the people of Mad being given out across the media and text messages sent to residents.
- However, despite the early indicators of poor weather it was NGOs rat attempted to prepare the country for the coming storm.
- The small number of trained volunteers compared to the high number also indicates that they did not efficiently predict the scale of the disast

Effectiveness of Responses

1. Madagascar couldn't cope with the effects of the storm alone, and, ther international community – with a considerable delay.
2. The government's stockpiles of supplies and equipment were quickly d meaning that the government had limited resources for future storms i
3. Land for use as shelters was sometimes difficult to find, because some landowners were reluctant to allow people access in urban areas.
4. On 13th February, it was reported that 80,000 people were still affected, and had been 40,000 people were still in evacuation centres.
5. Planning for the new evacuation camp which opened in Mahajanga was criticised because there was no registration system, and the transfer of people was informal.
6. Remote communities had still not been reached in early February.
7. Some people didn't want to evacuate – because they would be away from their jobs and children's schooling.
8. Men stayed at home to protect their houses from crime, meaning that evacuation centres were usually filled with wome
9. A state of national disaster was not declared until 27th February.

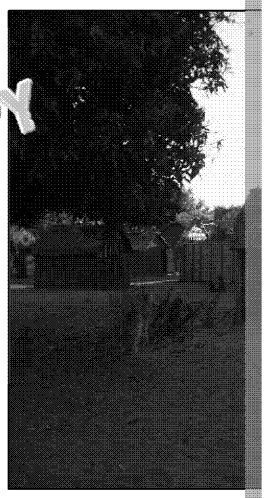


Figure 6: Traditiona wood, and, therefo

Conclusion

Tropical storm Chedza caused major flooding in some regions in Madagas levels for 55 years. Madagascar was experiencing its wet season; storms be increased the flood risk and landslides caused the fatalities rather than the delay, the international community was called upon, and provided a pletho

Fact Table

Number of deaths:
Cost of damages:
Rank on the HDI:
Number of people affected by [illegible]:
Number of people [illegible]:
Number [illegible] destroyed:
Number of houses flooded:
Number of schools affected (approx.):
Number of students affected:
Area of paddy fields flooded:
Number of cows lost:
Number of hospitals damaged:
Number of landslides:
Number of shelter spaces established:
Amount released immediately by the government:
Amount provided by World Bank for 'cash for work':
Number of families resettled:

ICT Interactive Page

Rather than type out these web

Videos

The track of Chedza:

- **https://www.youtube.com/w[illegible]?v=[illegible]gzwG63Itl4**

Footage of Ch[illegible]dza [illegible]ts:

- **https:[illegible].youtube.com/watch?v=N0ESeu1t9mg** (start from 1m 15s)

News Stories

Landfall of Chedza:

- **https://www.washingtonpost.com/news/capital-weather-gang/wp/20[illegible]up-in-the-southern-indian-ocean-one-particularly-intense-images/**

International assistance requested:

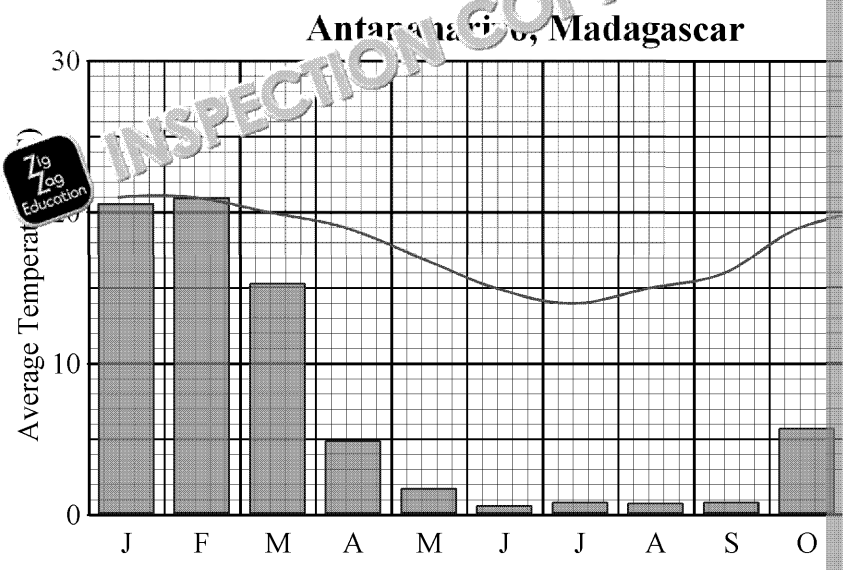
- **http://www.reuters.com/article/us-madagascar-aid-idUSKBN0L11UP[illegible]**

Concerns over the spread of bubonic plague due to displaced rats:

- **http://www.nydailynews.com/news/world/tropical-storms-fuel-conce[illegible]article-1.2098953**

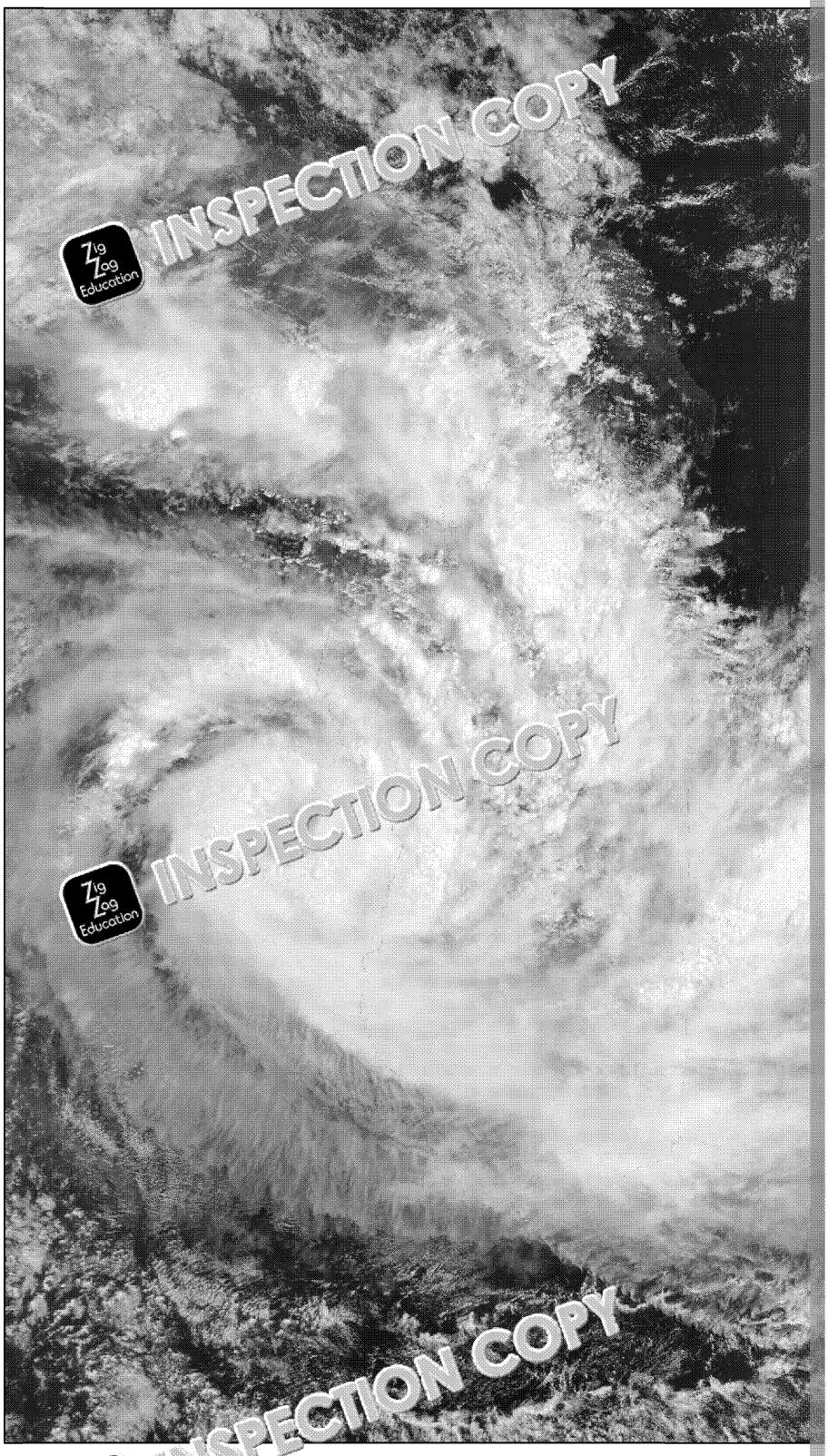
Springboards

Springboard 1



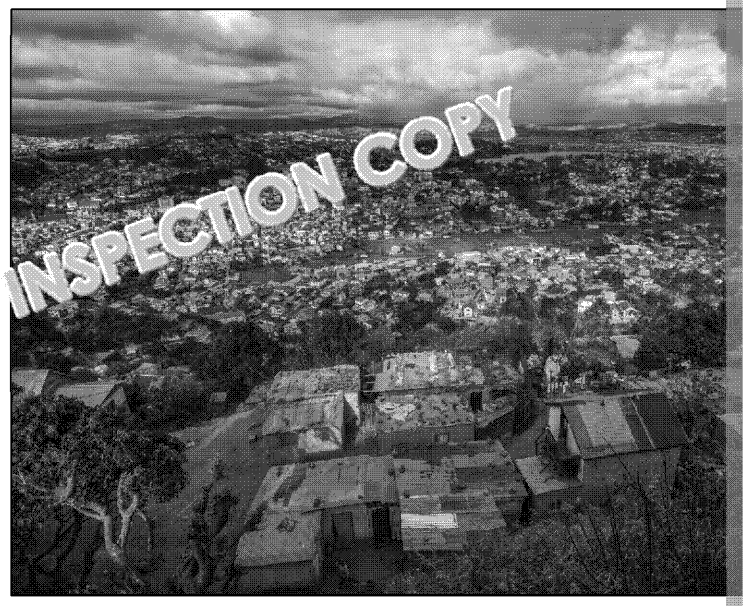
1. Do you think that the residents of Antananarivo are used to flooding? knowledge from the case study.
2. Where do you think that the majority of aid should be set up – in urba Explain why! As a whole, Madagascar has an urban population of just country's populati
3. How d t local people could prepare for a tropical storm?

Springboard 2



1. Comm the size of the storm.
2. Describe the likely conditions on the ground.
3. Discuss how and why the intensity of the storm will change as the sto

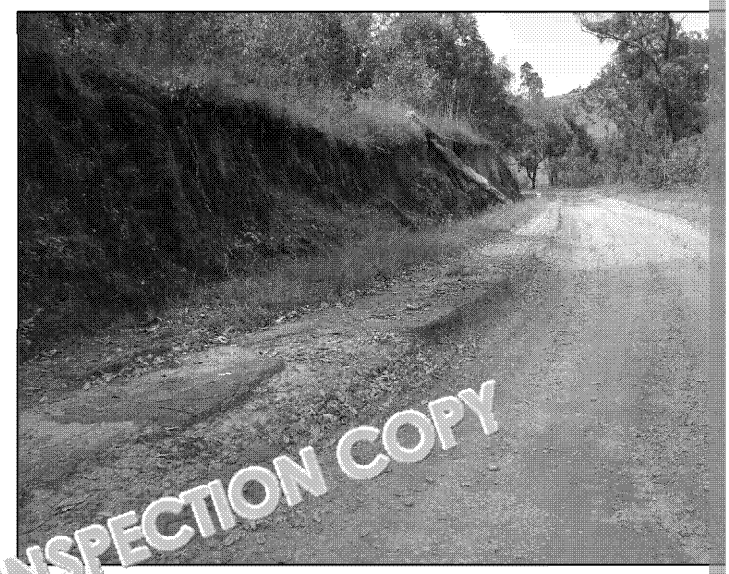
Springboard 3



Antananarivo – Madagascar's capital city.

1. Describe the city's topography (the shape/slope of the land), and the h
   What can be seen in the background?
2. How could the aspects that you have described in question 1 increase
   flooding or flood damage?
3. Why do you think people in this city wer st times reluctant to mov

Springboard 4



1. What d think was the largest cause of deaths from tropical storm
2. Suggest how transport could have been affected by Chedza – why is th
   vulnerable?
3. How could the recovery efforts have been more successful following C

Springboard Suggested Answers

Springboard 1

1	• The graph shows that rainfall is highly seasonal. There is a distinct w and March. December has the highest rainfall at over 300 mm. • Therefore, unless the ground can absorb all of this water, infiltration e inevitable. • Urban storm water has to be pumped out of the city. • We also know that two-thirds of the city is built on the floodplain. • Flooding is an annual event in Antananarivo.
2	• Allow the students to discuss this one. For example, students might s receive more aid due to the higher population density, or argue that re after a storm, and, having the greatest population, should receive far
3	• Ensure that they have sufficient food, water, supplies, shelter, and hy • Prepare their houses to withstand the storm. • Evacuate to camps/centres. • Any other valid suggestion.

Springboard 2

1	• The storm and its rain bands are very large – the whole of Madagasca the north-eastern tip. Madagascar is actually a very large island at 587 size of the UK. Madagascar only looks small because of the way that size nearer the poles.
2	• High winds (but not hurricane force – less than 74 mph), with intense
3	• Over land there is a decrease in energy because their energy source (wa Friction is also increased by the land surface.

Springboard 3

1	1. While areas on the periphery of the photograph are hilly, the centre of relatively flat, suggesting that it is located on a floodplain. 2. Houses are poorly built, with corrugated metal roofs, held down by h giving the appearance that they could be informal houses, lacking ap construction standards. 3. In the background, a river or one of the cities' lakes can be seen.
2	4. If the flat land is built on a floodplain, then flooding is likely to be a re grass could indicate the worst-affected areas, where there are fewer h hills in the background are likely to channel wa into the drainage b 5. The houses in the foreground, being p constructed, are likely to b run-off and landslides from the hillside above are likely. 6. The lake or river in the background is likely to expand in size, overtop especially lik pumps for storm water stop working due to flo
3	7. Fear of [illegible] shooting back at home – for example, men stayed behind ts. 8. Fear of lost jobs, income or education by moving away from home.

Springboard 4

1	• Landslides, caused by the flooding and saturated soil.
2	• Landslides damaged and cut off roads, making it harder for supplies t personnel to get to their destination. • This road is particularly vulnerable because it doesn't have a paved su be eroded by floodwater. In addition, ther[illegible]eep mud bank on th easily collapse when saturated, blo[illegible]ng [illegible]oad.
3	• International assistance [illegible] been requested sooner. • Government st[illegible]s of food and supplies could have been greater. • L[illegible] rban areas could have been more supportive by allo

Part 2: Exam Preparation

Summary

Tropical Storm Chedza, Madagascar

Question	
Where were the initial origins of tropical storm Chedza?	*Thunderstorms near*
Which countries were affected?	*Madagascar, Mozam*
When was Chedza first classified as a tropical storm?	*16th January*
When did Chedza make landfall?	*16th January*
What was the highest 10-minute sustained wind speed?	*65 mph*
When did Chedza finally dissipate?	*22nd January*
What was the financial damage caused by Chedza?	*$40 million*
How many deaths were caused by Chedza?	*80*
How were these deaths caused?	*Landslides*
What were 81 volunteers trained in?	*Shelter building*
How was the public warned about the storm?	*The media (TV, radi messages and social*
How many people were affected by the storm?	*100,930*
Which region was most affected?	*Vatovavy-Fitovinany*
How much of Antananarivo is built on a floodplain?	*Two-thirds*
How many students were affected?	*48,000*
How many roads were damaged?	*42*
How was transport infrastructure affected?	*Six bridges were des*
Name an important crop which was damaged.	*Rice*
How many cows were missing?	*1,226*
How many health centres were damaged?	*44*
How high were rivers above their normal levels?	*3–4 metres*
How much money did the government initially provide?	*$1.3 million*
How many shelter spaces did the government provide?	*20,000*
When was international assistance requested?	*28th January*
How much money did the World Bank provide for 'cash for work'?	*$40,000*
How much money did the European Union provide?	*€3 million*
Was this money only provided to Madagascar?	*No, the money was s Mozambique too.*
When would the next rainy season begin?	*The following Nove*
When did the government open a camp for displaced residents in Malagasy's capital city?	*6th March*
How many people were accommodated?	*24,000 for three mo*
What happened after three months?	*The remaining hund*
On 13th February, how many people were still affected?	*80,000*
On the same date, how many people were still living in evacuation centres?	*Approximately 20,0*

Quick-fire Questions

1	What is the name of the 'meteorological equator' that formed tropical storm Chedza?	
2	On what day was Chedza classified as a tropical storm AND made landfall on Madagascar?	
3	Where did Chedza make landfall in Madagascar?	
4	Which humanitarian network enacted a contingency plan?	
5	Describe the social issues associated with the storm.	
6	How were water sources polluted?	
7	Describe the impact to transport.	
8	Describe the damage to agriculture.	
9	How was healthcare affected?	
10	Describe the types of aid provided.	
11	Describe the World Bank's 'cash for work' scheme.	
12	Why did mostly women and children evacuate rather than men as well?	

Quick-fire Answers

1	What is the name of the 'meteorological equator' that formed tropical storm Chedza?	*The ITCZ (Inter*
2	On what day was Chedza classified as a tropical storm AND made landfall on Madagascar?	*16th January*
3	Where did Chedza make landfall in Madagascar?	*Between Moron*
4	Which humanitarian network enacted a contingency plan?	*The Malagasy R*
5	Describe the social issues associated with the storm.	*80 people died fr* *7,500 houses we*
6	How were water sources polluted?	*Sources were co* *bacteria.*
7	Describe the disruption to transport.	*42 roads were d* *routes were requ*
8	Describe the damage to agriculture.	*Thousands of he* *addition, 1,226*
9	How was healthcare affected?	*Eight hospitals*
10	Describe the types of aid provided.	• *Shelter item* • *Food, water* • *Sanitation –*
11	Describe the World Bank's 'cash for work' scheme.	*The World Bank* *the storm, which* *days, working fi*
12	Why are mostly women and children evacuate rather than men as well?	*Men often staye*

Extension Questions

1. Had Madagascar been a highly developed country, suggest how the co
been different.

2. Justify why there was relatively l[illegible] eparation prior to the arrival of

3. Assess the effecti[illegible]s of the responses to tropical storm Chedza.

Extension Answers

1. Much higher in financial terms, because of the greater amount of infrastructu would likely be less relative damage, due to the grater affluence overall. The s in a developed country, because houses would be more likely to survive the st would be less likely to require (as much) international assistance.

2. The country was already experiencing flooding due to high rainfall. Flooding and the storm at end January – during the wet season. It may also have be commu

3. The government took a long time to reach those affected by the storm, the inte immediately asked for help, and supplies were diminished by the storm. Whil organisation of the camp at Antananarivo, the remaining families were rehom evacuation efforts were reduced by the people themselves – those who were r were reluctant to let people shelter on their land.

Exam-style Question

Question 1

Case s – Extreme weather events in a UK and non-UK loc

Evaluate the ways the responses to an extreme weather even between contrasting countries.

Level Marking

Level	Mark	Description
1	1–2	• The student evidences basic knowledge • The student evidences limited understan exist between places, environments and • A limited ability to evaluate is evidenced knowledge and understanding. (AO3) • The ideas expressed by the student are • A named example is provided but place-
2	3–4	• The student evidences some knowledge • The student evidences good understand between places, environments and proc • A reasonable ability to evaluate is evider application of knowledge and understan • The ideas expressed by the student are • A named example is provided with some
3	5–6	• The student evidences thorough knowle (AO1) • The student evidences a firm understan exist between places, environments and • A strong ability to evaluate is evidenced knowledge and understanding. (AO3) • Ideas expressed by the student are in-de • A named example and place-specific de

Suggested Content:

Name of UK extreme weather event: UK heatwave 2015

Name of non-UK Extreme weather event: Tropical Storm Chedza, Madaga

- The extreme weather events experienced in the UK and Madagascar a climate and physical conditions within each of the two locations.
- The responses to each of the extreme weather events are very differen the hazard itself and usually due to the resources that are available to th

Tropical Storm Chedza, Madagascar	
• Thousands of people needed to be provided with shelter, and so the Government immediately provided $1.3 million and shelter for 20,000 people.	• The UK populatio advice and guida look after themse temperatures. Th indoors during th carry sun cream clothing, among
• Food, blankets, candles and hygiene items were provided to the people of Madagascar to ensure additional casualties did not arise in the period following the event.	• It was not neces additional essent stations were ha prevent people fr
• The European Union, foreign countries and NGOs provided aid to Madagascar in the form of food, cooking equipment, shelter kits and hygiene	• International aid a position to prov additional assista
• The responses to the tropical storm in Madagascar needed to have longer-running sequences; for example, a camp was set up in the capital, Antananarivo, for 20,000 people for three months.	• In response to th by the UK gover coordination and