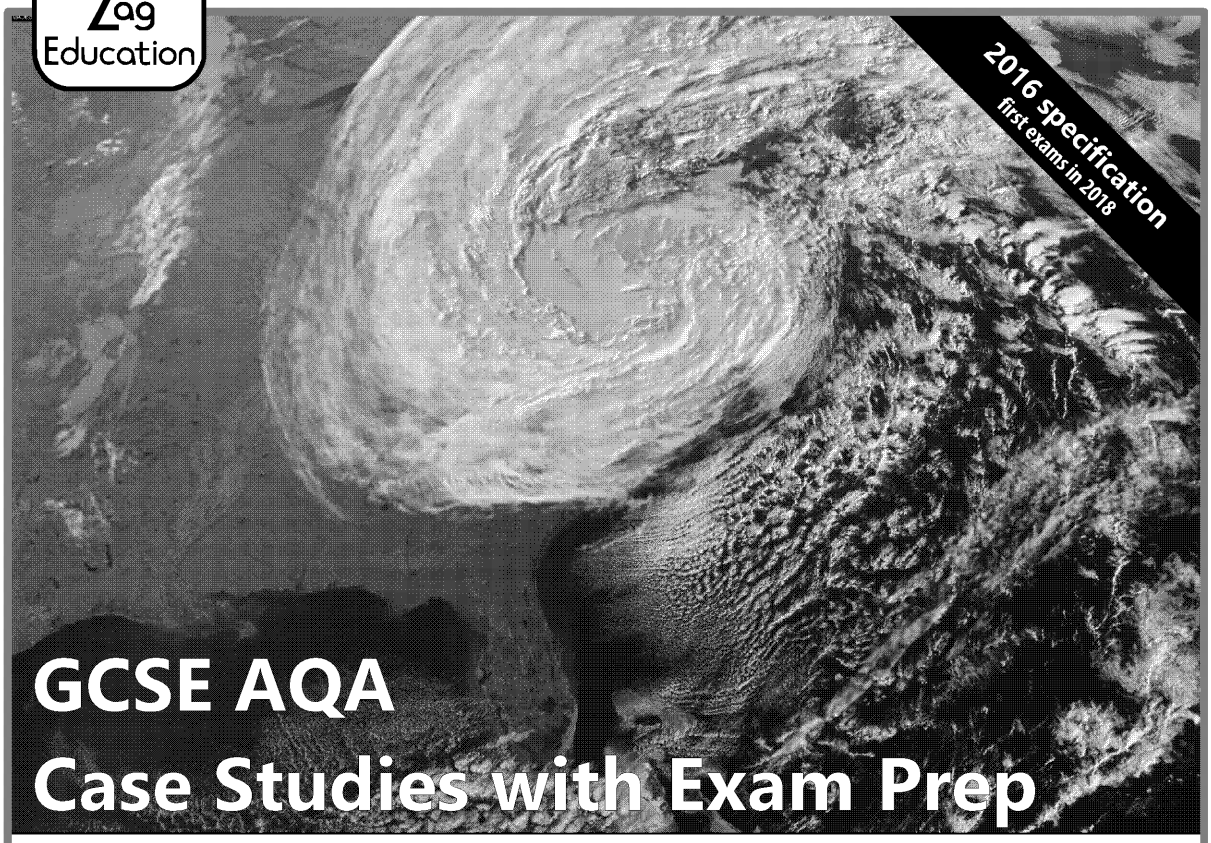
Zig Zag Education

Geography

GCSE (9–1)| AQA | 8035



GCSE AQA
Case Studies with Exam Prep

The Challenge of Natural Hazards: Weather Hazards

Hurricane Sandy in the USA: October 2012

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POD 8784

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Contents

Teacher's Introduction

This resource has been developed to provide case studies and exam preparation material to support the GCSE AQA specification (8035) **Section A: The challenge of natural hazards; Theme 3.1.1.3 – Weather Hazards**.

This detailed case study is on **Hurricane Sandy, USA (2012)** representing a **high income country** based on World Bank classifications.

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/8784***

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 AQA 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 case study resources are available for this topic area which can be used to compare and contrast between storms at locations across the world's equatorial oceans:

- Typhoon Haiyan, Philippines (2013)
- Cyclone Hudhud, India and Nepal (2014)

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

Free Updates!

Register your email address to receive any future free updates* made to this resource or other Geography resources your school has purchased, and details of any promotions for your subject.

** resulting from minor specification changes, suggestions from teachers and peer reviews, or occasional errors reported by customers*

Go to **zzed.uk/freeupdates**

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Part 1 – Case Study

Acronyms

ECMWF	European Centre for Medium-Range [illegible]her Forecasts
FEMA	Federal Emergency Manage[illegible]nt [illegible]ency
USGS	United States Geol[illegible]al [illegible]vey

[illegible]tent

Introduction and Overview

From humble origins as a series of thunderstorms over Western Africa on 11th October, Hurricane Sandy was cited in the United States as the second most costly hurricane ever, second only to Hurricane Katrina in 2005. A storm surge caused by the hurricane resulted in extensive coastal flooding in New Jersey and New York, in part due to a spring tide coinciding with the event. Inland, the hurricane caused flooding and heavy snowfall in northern states.

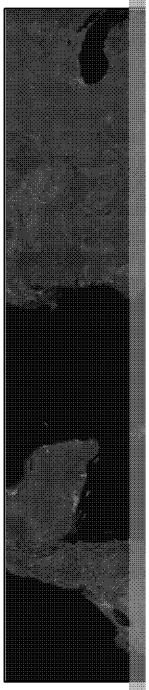

Figure 1

Hurricane Sandy was a Category 3 hurricane on th[illegible]in-Simpson hurricane wind scale which origin[illegible]te[illegible]in the Caribbean as a tropical wave on 2[illegible]ctober 2012. Hurricane status was first achieved [illegible]October. The hurricane lost power and [illegible]red [illegible]d as a late-season post-tropical cyclone up[illegible]dfall in the United States East Coast on 29th October. Landfall occurred close to Atlantic City, New Jersey.

The hurricane moved northwest towards the US on October 28th–30th because high pressure over Ontario pushed eastwards – deflecting Sandy off the usual course of northeast and out into reintensified as it made contact with a mid-latitude weather system.

Facts about the storm:

- Max wind speed: 115 mph (185 km/h).
- Eight countries affected.
- 233 deaths (all affected countries).
- 71 direct deaths in US (including 49 in New York) and 81 indirect deaths (US).
- High winds spann[illegible]n in diamet[illegible]
- 24 stat[illegible]Canada affected; most damage in New Jersey and New York.
- Cost of approx. US$75 billion.
- 19,729 flights cancelled in US.

Timeline of

- 11th October – starts as th[illegible]
- 22nd [illegible]ctober – classified [illegible]ve develops
- 24th October – achieves hu[illegible]
- 25th October – Category [illegible](major); hits Cuba; later [illegible]
- 26th October – hits the Ba[illegible]
- 27th October – winds lowe[illegible]hurricane force again
- 29th October – hits the US[illegible]with hurricane force winds
- 2nd November – dissipate[illegible]

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- Wind speeds of 80 mph on reaching the New Jersey coast (hurricane fo
- At the time, losses were estimated as $20 billion to property and $10–3
- 10–20 cm rainfall expected, with up to 30cm in places; 30–91 cm snowf
  descended from the North.
- 130cm–3.3m storm surge as landfall coincided with a full moon and re
  tide.
- 346,000–350,000 homes in New Jersey and 3[illegible]homes in New York

Preparation

The storm was identifi[illegible] by the ECMWF, a[illegible]recasting agency, on 23rd Oct[illegible]. The storm received extensive media coverage, with advice given to residents. However, the impacts of the storm were worse than expected, partly due to complacency and conflicting reports and information fed to the media, and also through expectations that the storm would significantly weaken as it moved towards land. The storm did not weaken as expected, even though the pressure system was very low, and many people were relatively unprepared for its consequences. Even so, at least two days' war[illegible]was given that the storm

Figure 2: Sand bags are utilise

Once it became apparent that the [illegible]ould affect the US, preparation fo
undertaken, and measur[illegible]mented to reduce the damage.

Below is a [illegible]ar[illegible]of the actions taken:

- Preside[illegible]bama signed an emergency declaration allowing states to r
- The government's emergency agency (FEMA) was readied, and monit
  public advice and updates.
- The USGS would monitor the storm and storm surge throughout the e
  stream flow gauges and storm surge height sensors, and provided data
  the National Weather Service.
- Advice was provided via phone apps.
- 45,000 National Guard and US Air Force personnel were on alert for d
  Guard was mobilised.
- US Navy ships were readied for deployment.
- Shelters were prepared.
- Tropical Storm Watch was set up.
- Power contractors were booked to r[illegible]or[illegible]wer after the event – com
  millions of customers would l[illegible]electricity supplies.
- Transport routes, r[illegible]d airports were closed.
- School[illegible]e
- Reside[illegible]re evacuated in the states of New Jersey, New York, Penn
- States of emergency were declared.

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Primary Effects

The primary effects can be divided into social (affecting people), economic (affecting businesses and financial systems and environmental (affecting the natural habitats and landscape). Primary effects are the direct impacts caused by and during the storm – from its winds, rain/snow, flood and storm surge.

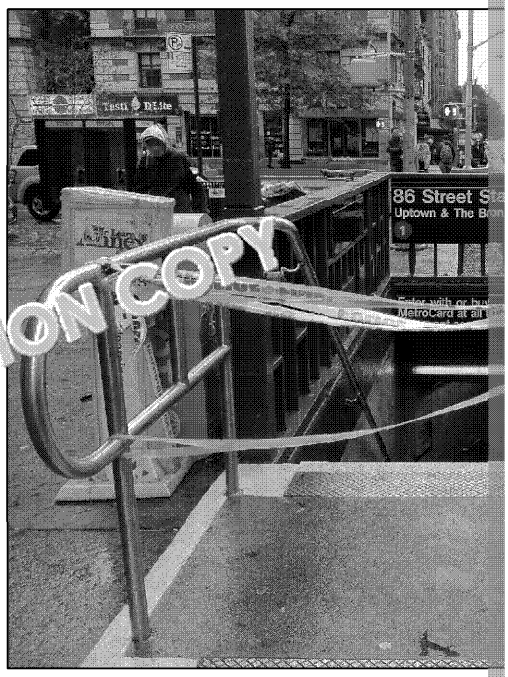

Figure 3: Stations on the New York Subway

Social Effects

- While there were 71 direct deaths caused directly by the storm in the US, there were 41 deaths attributed solely to the storm surge, mainly through drowning (direct deaths being from the winds, fallen trees, and floodwater, rather than the indirect ef as pneumonia caused by loss of power or immersion in cold water, or caused by the use of faulty electrical generators due to the loss of main
- Up to eight million people lost power across 15 states.
- Travel was disrupted (e.g. streets and New York subway).
- Houses were flooded – up to 100,000 on Long Island.
- Some homes partially collapsed; for example, from falling trees and he

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Economic Effects

- Extensive property damage was caused by the flood, including to homes, businesses and boardwalks (including Atlantic City, Seaside Heights (and also the amusement park / pier) and Coney Island).
- Sea defences and s[illegible] were d[illegible]op[illegible] such as the sea[illegible] of Lower Manhattan in New York City. This caused extensive flooding of urban areas, along with uninhabited stretches of coastline. Sea defences including sea walls, riprap (rock armour) and groynes were also damaged due to the storm.

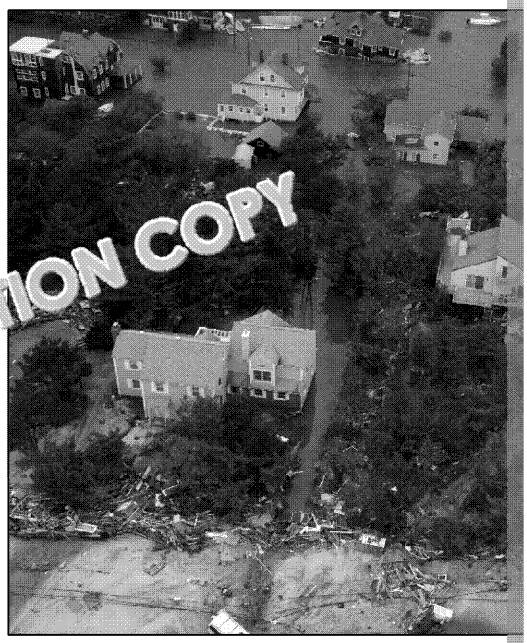

Figure 4: Damaged house[illegible]

- Property damage from the whole storm itself (including inland damage) was initially estimated at $20 billion, with between $10 billion and $30 billion through[illegible] lost business. $18 billion worth of [illegible]ge was estimated for New Y[illegible]rk C[illegible]y alone.
- Power was lost t[illegible]e coastal areas due to the flo[illegible]o[illegible]e distribution network and a powe[illegible]ion. Some properties on Coney Island and Rockaway Beach were without power for weeks. Some traffic lights and street lighting were not repaired for months after the storm.
- Price of restoring the New York City subway – seven tunnels flooded.
- A water tanker ship ran ashore.

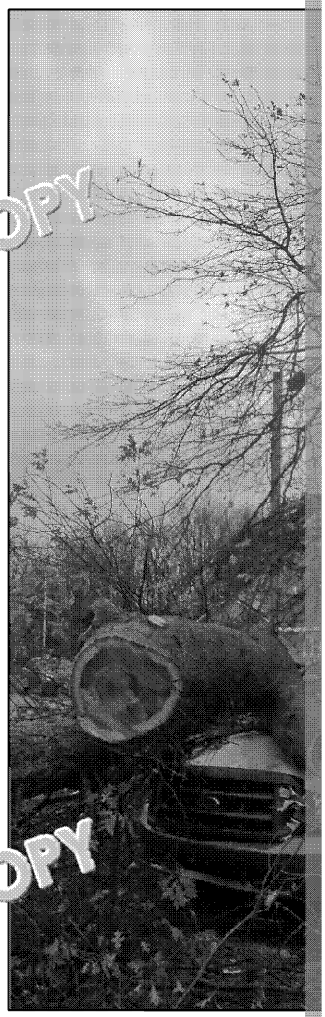

Figure 5: This truck is 'for[illegible]

Environmental Effects

- Sand dunes were destroyed in the Hamptons, a section of Long Island in New York. In addition, various ecological a[illegible]ea[illegible] were damaged, such as the [illegible]a[illegible]ay Wildlife Refuge and [illegible]son River. The salt co[illegible]o[illegible] was also increased throug[illegible]nundation by salt water. There was also the need to repair damaged wetlands due to the inundation of salt water.
- Beach morphology was altered, including the loss of sand.

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- The storm surge reached 13 feet (approximately 4 m) above normal tid
  sources claim a height of 8.99 feet (2.75 m) above the normal tide level.
  double the height of storm surges recorded over the previous century.
- Saline sea water caused flooding inland.
- Oil spills spread across the surface of floodwater.
- Thousands of trees were blown down.

Secondary Effects

Secondary effects result from t[illegible] effects – for example challenges ca[illegible] damaged sanitation and power ser[illegible]

Figure 6: Hea

Social Effects

- Many citizens were evacuated or displaced (approx. 7,000 residents in emergency shelters) as a result of the storm surge; for example, in low lying areas of New York City. This helped, in part, to fill hotels in a usually slow season, and helped mitigate hotel losses due to the reduced tourist numbers.
- Mould damaged damp houses.
- One year after the storm, 30,000 people were still displaced in New Jer
- Secondary deaths from hypothermia (due to loss of power), carbon mo
- Drinking water was polluted and sewerage works were overwhelmed, raw sewage.
- Patients at Bellevue Hospital in New [illegible] were evacuated to othe power system failed.
- Increased stress and [illegible] health issues.
- Tempo[illegible] to children's education – schools (and also univer
- Cance[illegible] of sporting events.
- Petrol shortages due to difficulties.

Economic Effects

- The New York Stock Exchange was closed for two days.
- Manufacturing plants were temporarily affected by closure due to loss Internet/phone access and flood damage.
- Casinos were heavily impacted by temporary closure and loss of busin
- Travel was severely disrupted in the region. For example, the New Yor flooded in part. Petrol stations closed due to power failure and the diff to the petrol stations. Rationing occurred at the stations which remain flights were also cancelled at local airports.
- Fires broke out in New York. In the borough [illegible]ns (Breezy Point), one fire caused by broken gas pipes, b[illegible] firefighters had difficulty
- The loss of business was est[illegible] be relatively temporary with the industry. It was est[illegible] the time that the biggest impact would oc quarter) [illegible] an overall predicted loss of tourist spending of $ 2013 a[illegible] associated loss of $1.2 billion through reduced employmer There was damage to boardwalks in Atlantic City and Seaside Heights Pier (containing tourist attractions) in Seaside Heights, New Jersey.

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- The cost was offset slightly by the estimated creation of 281,000 constru 299,000 in New York. Hotels were also busy following the storm due t imported construction workers. Car sales increased due to flood dama basements or flooded streets. Mining and logging companies also bene of products. However, many professional and scientific construction-r by the public sector, rather than the private sector.
- Tourism in New York City quickly bounced ba as many attractions v approximately 100 hotels flooded). D beaches and boardwalks following summer where the majority of homes damaged w rather than holida
- Costly clean-up debris exposed as floodwater receded.
- Superm goods were destroyed by floodwater, or perished becaus couldn't work due to power cuts.

Immediate Responses

- 1,500 FEMA personnel deployed (search and rescue, support and com Incident Management Assistance teams.
- 4,000 Red Cross workers deployed.
- 7,700 personnel from Homeland Security deployed to inspect housing.
- 12,000 members of the US Coast Guard were deployed (search and res distribution, helped remove debris, provided temporary generators an enforcement).
- 15 medical teams.
- The New York Guard remained for three months d provided gener
- The Salvation Army served food.
- Other community organisations h with the rescue, ensured that p shelters and helped extinguish fires.
- On 30th October, President Obama set up the National Power Restorati proce ecovery restoration.
- The US ernment provided $50.5 billion in emergency spending.
- $23 million raised from a television event *Hurricane Sandy: Coming Toge* was raised by Disney–ABC.

Figure 7: Aid provision immediately following San

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- Temporary accommodation set up.
- Hardware and other services deployed included:
  - three helicopter carriers
  - six mobile emergency response systems
  - three ships of the National Response Reserve Fleet
  - 40 mobile communication devices
  - 350 ambulances

Long-term Responses

- Hurricane Sandy Rebuilding Task Force established to rebuild, increas
  that b[illegible]nfrastructure (e.g. water, sewage, transport and communic
  disaste[illegible]d that power grids would be less affected.
- Build it Back programme was set up.
- On 29th January 2013, President Obama signed a bill which provided $
  also increased FEMA's borrowing ability for flood insurance.
- Government aid to New Jersey and New York expected by July 2013 w
  respectively.
- In June 2013, the Office of Storm Recovery provided $3.8 billion to reb
  infrastructure in New York (following Sandy and other storms). Chequ
  homeowners to rebuild.
- Insurance claims to private insurers reached $6.3 billion in New Jersey
  Insurance claims are likely to be less than expected as damage from sto
  from many domestic and business claims.
- One year afterwards, a task force was set up to increase climate change
- Flood maps were updated.

Effectiveness of Preparation

Critics claim that vulnerability was increased by a prior lack of investment
US should have learnt from previous disasters such as Katrina. Critics also
New York [illegible]and that those who remained behind had too little food.

The US Coast Guard was praised for its effective preparation and response, u
command and training, and had learnt from previous disasters. However, fe
than the 60,000 personnel that were put on alert. Their equipment was also o

Effectiveness of Responses

Again, critics raised several concerns. Firstly, some argued that FEMA sper
smaller, more frequent problems, and less time preparing for large events s

Others criticise the speed of repair work – citing the fact that many people
temporary accommodation after Sandy, or waiting for repair work to take
by the speed that money was provided by the government – for example, s
had received money more quickly than for Sandy. The governor of New Je
cheque' from the government; however this wasn't possible because it was
and ensure the efficient spending of the public money.

Beneficial [illegible]ses include the increased preparation for future storms, and
systems installed for more accurate forecasting by the National Weather Servi
models were better than the US models at the time because they were at high

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Conclusion

Hurricane Sandy was a major disaster as it unexpectedly made landfall in t
sweeping across the Caribbean. The hurricane caused a large number of de
many in the United States – a developed country. The hurricane caused a l
enacted, and disaster relief was swiftly provided, to reduce the impacts to p
environment. With a disaster on this scale, it was inevitable that some critic
the spending and recovery times.

Table

Maximum wind speed:	115 m
Category:	3
Number of countries affected:	8
Number of National Guard and Air Force personnel on alert:	45,00
Number of deaths (all affected countries):	233
Diameter of area affected by high winds:	1,800
Number of states affected:	24
Number of people without electricity in the United States:	8 mil
Total cost:	US$7
Number of flights cancelled in US:	19,72
Maximum wind speed:	115 m
Losses to property:	$20 b
Losses to business:	$10–
Size of storm surge:	30cm
Number of homes destroyed in New Jersey:	346,0
Number of homes destroyed or damaged in New York:	305,0
Number of people still living in temporary accommodation one year later:	30,00
Number of FEMA personnel deployed:	1,500
Number of Red Cross workers deployed:	4,000
Number of personnel from Homeland Security:	7,700
Number of members of the US Coast Guard deployed:	12,00
Amount raised through two televised fundraising events:	$40 m
Amount pledged by the government in January 2013:	$50.5

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ICT Interactive Page

Rather than type out these we

Videos and interactive content

Hurricane Sandy: As It Happened – *Wall Street Journ*

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

Hurricane Sandy – ABC Ne[illegible]

- **https://ww**[illegible]**com/watch?v=YeutC1WN6dc**
- **https:**[illegible]**.y**[illegible]**atube.com/watch?v=tETbvybF7Jg**

Damage and flooding maps:

- **http://www.nytimes.com/newsgraphics/2012/1120-sandy/survey-of-t**
  after-the-hurricane.html
- **http://project.wnyc.org/flooding-sandy-new/#12.00/40.7378/-74.0702**

Before and after photographs – USGS:

- **http://coastal.er.usgs.gov/hurricanes/sandy/photo-comparisons/new**

Storm mapping:

- **http://www.telegraph.co.uk/news/worldnews/northamerica/usa/964**
  Hurricane-Sandy-in-real-time.html

Photographs

- **http://www.telegrap**[illegible]**k/**[illegible]**ws/picturegalleries/worldnews/964497**
  50-dram[illegible]**-i**[illegible]**f-destruction.html**
- **http://**[illegible]**huffingtonpost.com/2013/10/29/hurricane-sandy-impact-i**
- **http://w**[illegible]**w.theatlantic.com/photo/2012/11/hurricane-sandy-the-after**

News Stories

New York Times updates:

- **http://www.nytimes.com/interactive/2012/10/28/nyregion/hurricane-s**

Links to BBC and *Guardian* articles:

- **http://www.bbc.co.uk/news/world-us-canada-20123727**
- **https://www.theguardian.com/us-news/hurricane-sandy**

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Springboards

Springboard 1

1. Explain what the photo shows. What are the implications for people or
2. Suggest how the media could report on this storm.
3. Hurricane Sandy was unofficially named 'Fra[illegible]storm'. Can you thir was called this? Do you think such na[illegible]ful?

Springboard 2

1. How could the United States prepare for such an emergency?
2. Do you think that the United States is fully equipped to deal with a na Hurricane Sandy?
3. To what extent do you think that preparation for the storm was succes

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Springboard 3

1. What do you think are the social effects of a storm such as Sandy?
2. What might be the primary and secondary effects of the destruction sh
   assume that the houses have been flooded.
3. What do you think the priorities should be fo[illegible]ng up after the sto

Springboard [illegible]

1. What [illegible] think the consequences of the damage shown in this phot
2. Explain how businesses may have been damaged both during and afte
3. Could there be any benefits to the damage shown in this photo?

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Springboard 5

1. What [illegible] caused this 'blackout'? What's unusual about it?
2. Do you [illegible] that New York City was prepared for a storm of this size
3. How could New York and the surrounding area increase resilience for

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Springboard Suggested Answers

Springboard 1

1	• Shows Hurricane Sandy from above, aft[illegible] impact with the eastern co[illegible] • High winds, intense rainfall, sn[illegible] in northern areas.
2	• Provide constant up[illegible] [illegible] which areas could be affected and how. • Provide advice [illegible] to prepare and where shelters are. • [illegible] messages from government and law enforcement; for exam
3	• [illegible]orm made landfall in the US on the night of 29th October – two • While this made the storm memorable, the storm went by other nam however, several names for the same storm could cause confusion.

Springboard 2

1	• Ensure that emergency personnel, equipment and supplies are readily prior to the event. • Ensure that there are adequate shelters. • Liaise with other organisations, to ensure that efforts are coordinated. • Ensure that effective search and rescue is planned. • Ensure that the latest weather information is available and acted upon • Ensure that recovery plans are in place. • Ensure that there are funds available for the re[illegible]ery operations.
2	• Yes – the US is a large enough countr[illegible] with the wealth and expertise However, there was criticism [illegible] speed that funds were released an recovery processes. Even a year after the event, there were thousands temporary [illegible]ation – however, this fact must be considered ag [illegible]es needed.
3	• [illegible]s up to the student to weigh up the number of deaths and the bil along with the size and effects of the storm to reach a balanced and re

Springboard 3

1	• Deaths, injuries and bereavements. • Stress and mental health issues – for example, people were displaced have been damaged, along with sometimes irreplaceable possessions. • Cancellation of events. • Loss of utilities; increased difficulty in obtaining food, sanitation and
2	• Damage to homes and possessions from mould. • The tree may have damaged the houses across the street – water may • Food in fridges and freezers will have gone off and defrosted because electricity cables has been down. • Luckily, there appear to be relatively little damage in this area.
3	• Ensure safety of workers! • Ensure that there aren't any people trapped or injured (e.g. from colla • Ensure that injured people have access to healthcare. • Ensure that people have shelter, food and water. • Ensure that the dead are retrieved – otherwise disease could spread. • Clear fallen debris so that roads are clear, and restore utilities – power • Assess damage to homes and businesses. • Repair and rebuild, with increased resilience and lessons learnt.

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Springboard 4

1	• Lost trade while rebuilding. • Significant and lengthy rebuilding process. • Insurance company payouts. • Debris created will need to be removed so that they don't pollute the
2	• Flooding and physical damage to buildings and merchandise. • Temporary loss of trade or loss of turnover. • Staff may not be able to easily travel to work; for example, they may b accommodation. • Loss of power means that shops can't open, and refrigerated goods ar • Insurance claims could take a long time to process.
3	• Increased work for those employed in building, maintenance, decorat • Manufacturers of goods and cars benefit – they get to sell replacemen

Springboard 5

1	• Electrical substations were damaged by floodwater, causing the areas Individual buildings or streets are likely to be affected by downed po • While part of the city still has power, the buildings in the foreground
2	• Storm defences were overtopped. • Large-scale damage to power and transport systems. • Significant financial damage to the city, including flooding of the New
3	• Implement a more robust power system – for example, a 'micro grid', by substations. • Bury power cables (but these can be flooded instead!) • Increase storm defence height (such as storm surge defences). • Any other valid suggestion.

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Summary

Hurricane Sandy, 2012

Question	
When did Sandy develop as a tropical storm?	
When did Sandy make landfall in the United States?	
Which Category did Sandy achieve on the Saffir–Simpson hurricane wind scale?	
Was Hurricane Sandy a hurricane upon landfall in the US?	
Where did Sandy make landfall in the US?	
How many deaths were caused by the hurricane (all countries)?	
How many deaths were caused in the US alone?	
What was the financial cost of the hurricane?	
How many flights in the US were cancelled?	
How much rainfall and snowfall was expected from the hurricane?	
How many homes were damaged in New Jersey and New York (combined?)	
How did President Obama assist with the preparation?	
How many National Guard and Air Force personnel were on alert?	
How many people lost their electricity supply?	
How many houses were destroyed on Long Island (New York)?	
Why did some houses collapse?	
What was the estimate for the value of property damage caused by Sandy?	
How many New York City subway tunnels were flooded?	
How high was the storm surge?	
How many people were evacuated to emergency shelters?	
How many people were still living in temporary accommodation up to a year after the storm?	
How long was the New York Stock Exchange closed for?	
How many construction jobs were temporarily created after the storm?	
How many **FEMA** personnel were deployed?	
How many **Red Cross** personnel were deployed?	
How many **US Coast Guard** personnel were deployed?	
How did the media help raise funds?	
How many months did the New York Guard stay for?	
How much money did President Obama release?	
Outline two task forces that were set up.	
What was updated after the event?	

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Question	
When did Sandy develop into a tropical storm?	*22nd October 2012*
When did the hurricane make landfall in the United States?	*29th October 2012*
Which Category did Sandy achieve on the Saffir–Simpson hurricane wind scale?	*Category 3*
Was Hurricane Sandy a hurricane upon landfall in the US?	*Technically, Sandy hurricane force wi*
Where did Sandy make landfall in the US?	*Near Atlantic City,*
How many deaths were caused by the hurricane (all countries)?	*233*
How many deaths were caused in the US alone?	*71 direct, 81 indir*
What was the financial cost of the hurricane?	*US$ 75 million*
How many flights in the US were cancelled?	*19,729*
How much rainfall and snowfall was expected from the hurricane?	*Rainfall – 10–20 c Snowfall – 30–91*
How many homes were damaged in New Jersey and New York (combined?)	*Approx. 650,000 (a*
How did President Obama assist with the preparation?	*He signed an emer apply for financial*
How many National Guard and Air force personnel were on alert?	*45,000*
How many people lost their electricity supply?	*8 million*
How many houses were flooded on Long Island (New York)?	*100,000*
Why did some houses collapse?	*Excessive snowfal*
What was the estimate for the value of property damage caused by Sandy?	*$20 billion*
How many New York City subway stations were flooded?	*7*
How high was the storm surge?	*Up to a maximum*
How many people were evacuated to emergency shelters?	*7,000*
How many people were still living in temporary accommodation up to a year after the storm?	*30,000*
How long was the New York Stock Exchange closed for?	*Two days*
How many construction jobs were temporarily created after the storm?	*281,000*
How many **FEMA** personnel were deployed?	*1,500*
How many **Red Cross** personnel were deployed?	*4,000*
How many **US Coast Guard** personnel were deployed?	*12,000*
How did the media help raise funds?	*Televised fundrais million from two c*
How many months did the New York Guard stay for?	*3*
How much money did President Obama release?	*$50.5 billion*
Outline two task forces that were set up	*Power restoration,*
What was updated after the storm?	*Flood maps. Also computers.*

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Quick-fire Questions

1	When and where did [illegible] Sandy make landfall in the United States?	
2	What is the name of the American government's disaster planning body?	
3	How much warning was given that the storm was approaching?	
4	Which agency monitored the development of the storm by taking physical measurements?	
5	Name three agencies which prepared for disaster relief.	
6	Name two states where residents were evacuated.	
7	How many direct deaths did Sandy cause in the United States?	
8	How many people lost electricity?	
9	Name any coastal resort that was damaged by Sandy.	
10	How was travel disrupted by Sandy?	
11	How was the environment affected by Sandy?	
12	Why were thousands of people made temporarily homeless?	

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13	Why did people die of hypothermia following the storm?	
14	How were businesses affected by the loss of utilities?	
15	Why did fires break out following the storm?	
16	How was tourism revenue in [illegible] decreased by the storm?	
17	Why was the[illegible]er impact on tourism in New York?	
18	How did the US Coast Guard assist with the response following Hurricane Sandy?	
19	How did the media help with funding?	
20	How much aid was signed off by President Obama in in January 2013?	
21	Why were flood maps updated following the storm (think!).	
22	Which organisations were praised for its preparation and response?	
23	Were there any criticisms of the preparation of Hurricane Sandy?	
24	What criticism was directed at FEMA?	
25	Why was the governor of New Jersey's request for a blank cheque denied?	

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Quick-fire Answers

1	When and where did [illegible] Sandy make landfall in the United States?	*8pm on Monday*
2	What [illegible] name of the American government's disaster planning body?	*FEMA – Federal*
3	How much warning was given that the storm was approaching?	*Two days*
4	Which agency monitored the development of the storm by taking physical measurements?	*USGS – United*
5	Name three agencies which prepared for disaster relief.	*The National Gu*
6	Name two states where residents were evacuated.	*New Jersey, New*
7	How many direct deaths did Sandy cause in the United States?	*71*
8	How many people lost electricity?	*8 million*
9	Name a coastal resort that was damaged by Sandy.	*Atlantic City, Se*
10	How was travel disrupted by Sandy?	*Roads were flood* *Airports closed* *Subway stations*
11	How was the environment affected by Sandy?	*Loss of trees, inu* *beaches, spread o*
12	Why were thousands of people made temporarily homeless?	*Floodwater dama* *drying out / repl* *destroyed by the*
13	Why did people die of hypothermia following the storm?	*Loss of power me*

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14	How were businesses affected by the loss of utilities?	*Machinery, computers and tills and lighting and heating couldn't be used Internet connections and p*
15	Why did fires break out following the storm?	*Gas pipes were damaged b*
16	How was tourism revenue in New Jersey decreased b[illegible]?	*Fewer tourist arrivals the Attractions and shops wer*
17	Why was there a lesser impact on [illegible] New York?	*There were more indoor at*
18	How did the US [illegible] assist with the response following Hurricane Sa[illegible]	*Search and rescue, transpo generators and helped mai*
19	How did the media help with funding?	*Televised fundraising even*
20	How much aid was signed off by President Obama in in January 2013?	*$50.5 billion*
21	Why were flood maps updated following the storm (think!).	*The older flood maps were*
22	Which organisation was praised for its preparation and respo[illegible]	*The US Coast Guard*
23	Were there any criticisms of the preparation for H[illegible]ndy?	*Yes – some argue that the*
24	What criticism was directed at [illegible]?	*The organisation spent too events, rather than the lar*
25	Why was the [illegible]or of New Jersey's request for a blank cheque denied?	*The spending of public mo spending is efficient and p*

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Extension Questions

1. Explain the distribution of hurricanes in the North Atlantic.

2. How might a hurricane have different effects (social and economic) between a developed country and a developing country?

3. Read the quote below.

> *'A hurricane isn't a point on the map – it's a big storm and its impacts will be felt far away.'*
> *FEMA Administrator, Craig Fugate*

   Discuss what is meant by this statement.

4. Describe the planning involved prior to Hurricane Sandy.

5. Distinguish between the primary and secondary effects of a hurricane.

6. Suggest where the greatest impacts of Hurricane Sandy were seen – in the USA or Caribbean?

7. How can safety for residents be increased prior to a hurricane?

8. How important do you think the media is in providing education about tropical storm preparation techniques?

9. To what extent do you think that the United States was prepared for Hurricane Sandy?

10. How effective were the planning and recovery efforts relating to Hurricane Sandy?

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Extension Answers

1. Hurricanes normally develop in the Caribbean (where there are warm seas – s least 27 °C) and travel north away from the equator du[illegible] high-pressure trop (subtropical ridge).

2. There might be more deaths i[illegible] developing country due to less resilient struc medical care, fewer [illegible]ive warnings, and with more harmful second issues. Th[illegible] not be able to fully finance the disaster aid and recov internat[illegible]community for help. In terms of overall cost, there might be less there is likely to be a lower value of infrastructure to be affected.

3. Hurricanes are structures with a very wide diameter – for example, several hu miles of hurricane-force winds; the rest are gale force). The effects spread out collapses into a post-tropical cyclone – as in the case of Hurricane Sandy.

4. There were several aspects of planning – for example, to ensure safety of peop flights, closing the New York City subway, ensuring that emergency shelters events of the storm, ensuring that personnel were in place afterwards, and tha agencies.

5. Primary effects – are those caused by the wind and water during the storm – t blown down, the roofs damaged by winds, the contamination of freshwater su are caused by the primary effects – such the spread of disease caused by wate perished food caused by lack of power to fridges.

6. The student may argue th[illegible]here was significant damage to buildings, infrast piers and boardwalks in coastal areas caused by the storm surge, devastating additi[illegible]e effects of the wind.

7. Evacuation and the preparation of emergency shelters, and the release of up-t regarding the storm, such as via the news and mobile phone apps.

8. Very important; however, the information shouldn't be contradictory or conf storms by different names.

9. Allow any relevant discussion – such as the large numbers of personnel on al storm, and the large sums of money opened up by President Obama prior to l may also discuss the shortfalls in equipment, such as its age, or the relatively l weighed up against the severe effects of the storm.

10. The student is likely to use the various facts and figu[illegible]nd critiques present well-reasoned judgment – allow any viewpoint[illegible]as it is backed up with

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Exam-style Question

With r[illegible]nc[illegible] to a tropical storm you have studied, assess t[illegible] prepar[illegible] helped minimise the effects of the storm.

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Level Mark Scheme

Indicative content:

- The student should offer an evaluation of the extent to which the effect by the preparation carried out in advance of the event.
- Students are likely to discuss the preparation carried out in terms of m protection and planning. Assessment of these el nts does not need
- Evaluation may lead to the student identif p ticular elements of pr role in reducing the effects.

Level	Mark	Description
1	1–3	• The student evidences basic knowled (AO1) • The student evidences limited understa exist between places, environments and • A limited ability to evaluate is evidence knowledge and understanding. (AO3)
2	4–6	• The student evidences some knowled (AO1) • The student evidences good understan exist between places, environments and • A reasonable ability to evaluate is e application of knowledge and understan
3	7–9	• 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)

Suggested Conte

Monitoring:

- The storm was identified by the ECMWF on 23rd October.
- The USA's emergency agency (FEMA) carried out monitoring of the st updates.
- The USGS monitored the storm and storm surge throughout the event FEMA, the US Army and the National Weather Service.

Prediction:

- There were conflicting reports regarding the expected strength of the s complacency.
- Despite the uncertainty, two days' warning was given before the storm

Protection:

- Residents were evacuated from New Jersey, Ne k, Pennsylvania ar

Planning:

- The storm was given extens e a coverage, providing advice to re
- President Obama si an emergency declaration allowing states to
- 45,000 N tio d and US Air Force personnel were on alert, rea need
- US Na ips were ready to be deployed when needed.
- Power contractors were booked, ready to restore power following the e caused by the widespread loss of power.

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Evaluation of effectiveness:

- Despite media coverage and evacuations, 72 people still lost their live
much greater given the size of the storm.
- Eight million people lost power access across 15 states and so the bo
helped speed up the restoration process. However, some properties o
Rockaway Beach were left without power for a number of weeks. The
in restoration also resulted in some people dying from hypothermia.
- Travel was severely disrupted, as there was no preparation to minim
would have on travel. Some traffic lights and street lighting were not re
storm.
- Extensive damage was done to the environment, including damage to
such as the Jamaica Bay Wildlife Refuge and the Hudson River. Prepa
protection of humans and urban environments, as opposed to natural
- Many buildings were not designed to withstand the storm, meaning 30,0
a year on from the storm.

Spelling and Grammar (SPaG) – total of 3 marks

For 1 mark:

- Student shows some ability to spell and punctuate correctly.
- Student shows limited use of grammar to convey their argument.
- Student utilises a basic range of geographical phrases.

For 2 marks:

- Student generally uses good spelling and punctuation throughout.
- Student shows some accurate use of grammar to convey their argume
- Student utilises an adequate range of geographical phrases.

For 3 marks:

- Student uses correct spelling and punctuation throughout.
- Student shows accurate use of grammar to clearly convey their argume
- Student utilises a broad range of geographical phrases.

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