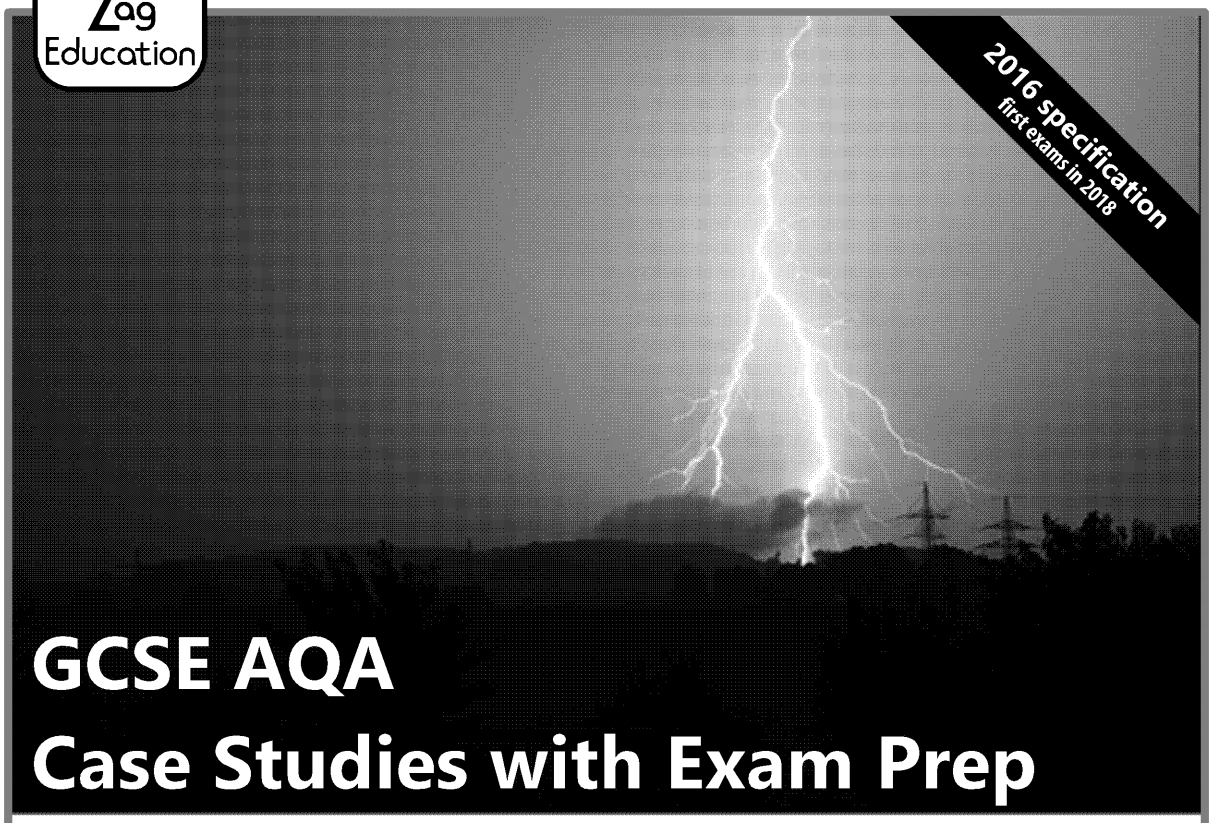
Zig Zag Education

Geography

GCSE (9–1)| AQA | 8035



GCSE AQA
Case Studies with Exam Prep

The Challenge of Natural Hazards: Weather Hazards

UK Heatwave – 1st July 2015

zigzageducation.co.uk

POD 8791

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 **Heatwave, UK (2015)**.

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/8791***

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 different UK extreme weather events:

- South-eastern Drought, UK (2004–2006)
- Flooding in Morpeth, UK (2008)
- Winter Storms, UK (2013–2014)
- Extreme Cold, UK (2010)

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

Content

Causes and Prior Weath Conditions

1st July 201 a one-day heatwave spread throughout the UK, including to northern Scotland.

Was this really a heatwave?

The Met Office use the World Meteor definition of a heatwave – **over five d average maximum temperature is at l long-term average of 1961–1990.**

Heatwaves are often caused by a prolo called an anticyclone, in part caused by

This heatwave was only one day in leng occurrences – such as the heatwaves of Ju August 1990 and the longer heatwave of

- The day was the hottest July day on record on the UK; 36.7 °C, the highest temperature, was recorded at 14:13 GMT at Heathrow.
- However, that temperature didn't break the highest ever temperature record in the UK: 38.5 °C, reached in August 2003, in Fa arm, Kent.
- The warmest the south-east of England – many areas saw ter into th 30s.
- Northe England reached 30 °C in places.
- Scotland was warm too – 29.0 °C was recorded in Aviemore (in the Cai
- The hot weather broke down into thunderstorms, heavy rain and flood and south-west England. In Scotland, one-centimetre hailstones were f in Dorset and East Anglia.
- Thunderstorms occurred over the following weekend (4th–5th July).

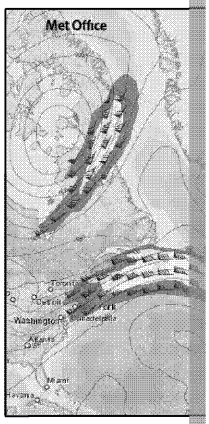


Figure 1: Th

So what caused the hot weather?

- Low pressure out in the Atlantic towards the west of the UK pushed hot air from Spain northwards, over the UK – a southerly wind.
- The jet stream was above the UK, allo ing f warm air northwards.
- The weather chart to th ows the area of low pressure er t lantic. The isobars over the UK ar art, showing that the winds were gentle.
- Sand from the Sahara Desert reached the UK due to the southerly winc
- The cold front out to sea brought cloud over the UK from the west – te even higher if there had been less cloud.

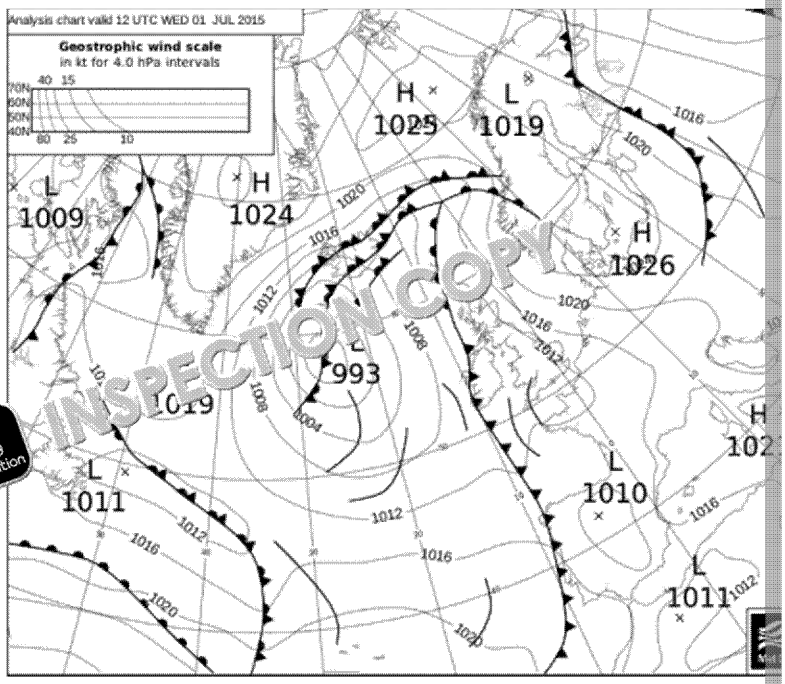


Figure 2: Weather chart for 1st July

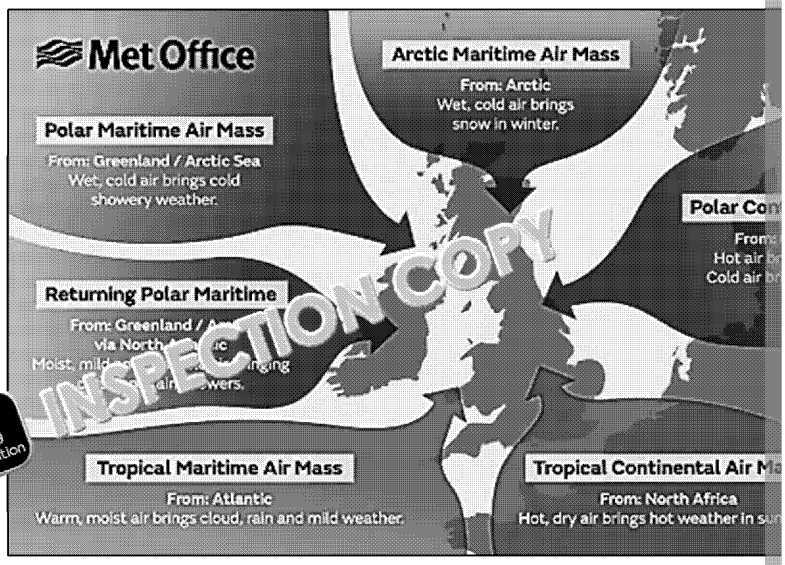


Figure 3: Which air mass do you think affected the UK?

Social Impact

The main social issues related to travel delays and health effects. These included the following:

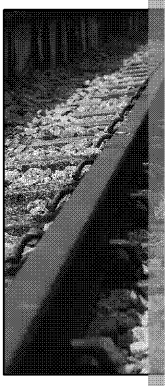


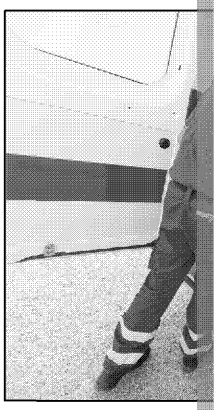
Figure 4: Trai

Travel

- Travel disruption on the M1 due to a lorry fire (the lorry was carrying batteries). Road surfaces also [illegible]ed.
- Rail cancellations and delays – trains in the east and south-east of England were slow down so that the tracks wouldn't buckle in the heat.
- There were a large number of breakdowns.
- The evening commute that evening was unpleasant: 33 °C was recorded at King's Cross underground station – the tubes themselves were likely to be even hotter.
- A monorail at the Alton Towers theme park broke down, affecting 80 p
- Rubbish collections in Bath and North Somerset were also delayed bec their compactors overheated.

Health

- UV (ultraviolet) radiation levels were high due to strong sunlight.
- Air quality was poor due to high ozone levels.
- Warnings were issued because the very dry air could cause breathing difficulties to people with asthma and other respiratory problems.
- 999 calls doubled on that day; similarly, activations of alarms held by the elderly and disabled also doubled.
- There were increased instances of heatstroke and sunstroke.
- Five people who attended the Royal Norfolk Show were hospitalised.



Figu

Economic Impact

Due to the heatwave's short duration, there were few economic effects. Retail often reports a slight reduction in sales during such events; however, ice cream sales would have increased. Due to the heat in workplaces without air conditioning, productivity at work may have temporarily decreased. Electricity consumption is likely to have risen, though, from increased use of air conditioning and fans.

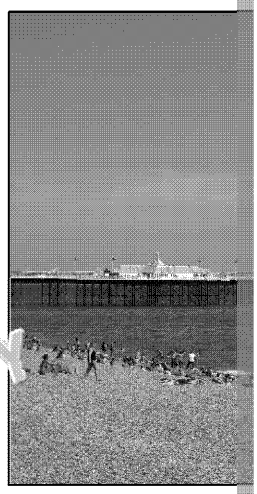


Figure 6: Beach

Environmental Impact

Similarly to the economic impacts, the short duration of the event minimised the environmental effects. However, it is thought that the heat contributed to a fire at Thetford Forest in East Anglia, which burnt 30 acres of land (which equates to 0.12 km^2).

Management to Reduce Risk

Much of the management in the UK focused on the health implications. The media issued warnings and gave advice in a variety of forms, such as TV, newspapers and online.

Health issues and advice

A Level 3 heat health alert was sent out in England, meaning that heatwave action was necessary. The following day, 2nd July, the scale was dropped back to Level 1 (summer preparedness). Health warnings were given to children and the elderly, and friends and family were urged to check on elderly people. It wasn't just people who were affected – ice-lollies were given to animals at London and Chester Zoos, and the elephants were also hosed wi

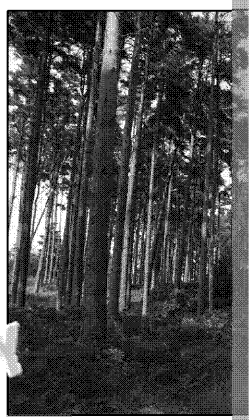


Figure 7: The hot wea
at

Advice included:

- Stay indoors between 11am and 4pm (other advice was to stay out of the sun between 11am and 3pm).
- Commuters should take sun cream and water.
- Wear loose clothing.
- Employers were advised to keep th[illegible] employees cool, including those
- Schools cancelled sports d[illegible]s.
- Spectators at Wimb[illegible] were advised to wear hats.
- Some [illegible] handed out bottles of water.
- Kent C[illegible] Council advertised to locals that they should drink suffici[illegible] warned residents about dehydration.
- The police warned against swimming in rivers and lakes without lifeguards, as two people had drowned the previous week. One person in Cumbria had died during the early hours of that morning from drowning.
- Muslims who were fasting for Ramadan were advised to drink 1.5–2 litres of water during their night-time breaks from fasting, and to stop fasting if they felt ill.

What does a Level

- Alerts are sent out
- Organisers must en
- Healthcare provide people.
- Check indoor temp in hospitals and ca

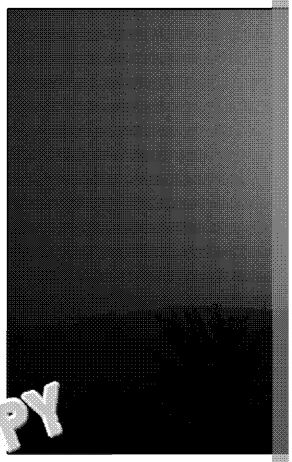


Figure 8: The hot weathe flooding in

The government also has a heatwave plan for England. The plan was first published in 2004, an[illegible] has since been rewritten and revised, follo[illegible] heatwave in 2003, which caused [illegible] deaths. The aim of the pl[illegible]

- ✓ reduce [illegible]
- ✓ advise [illegible] different people, including the NHS, local authorities, pr[illegible] community
- ✓ be based on Met Office alerts
- ✓ be planned and coordinated by different authorities
- ✓ allow for long-term coordination, such as building design

Evidence for More Extreme Weather

While 2015 didn't see the hottest temperature on record, 1st July was the wa[illegible] heatwave only lasted for one day as air arrived from the south, unlike the l[illegible] seen in the past. It is true that there have been several heatwaves since the [illegible] is a long-term average of weather (usually 30 years), it may be slightly pre[illegible] climate change. However, heatwaves are predicted to [illegible]come a common fe[illegible]

Fact Table

Temperature recorded at Heathrow:	36
Temperatures across south-east Engla[illegible]	M
Temperature in northern [illegible]land:	30
Tempera[illegible] in Aviemore:	29
Temperat[illegible]ecorded inside King's Cross underground station:	33
Number of people trapped inside King's Cross underground station:	80
Number of people hospitalised who attended the Royal Norfolk Show:	5
Area of Thetford Forest burnt:	30
Level of heat health alert:	3

Key Terms

Look up the following terms and co[illegible] your own definitions

- Air Mass
- Air Pollution/Quality
- Heatwav[illegible]
- Isobar[illegible]
- Jet Stre[illegible]
- Low Pressure
- Ozone
- Urban Heat Island
- UV Radiation

ICT Interactive Page

Rather than type out these we

Videos

BBC News – hottest July day on record (with video):

- **http://www.bbc.co.uk/news/uk-3334097**

The weather explained:

- **http://www.bbc.co.uk/news/uk-33352602**

Evening th storms:

- **https://www.youtube.com/watch?v=xNLJl8kJKpE**

News Stories

The Telegraph – live updates throughout the day:

- **http://www.telegraph.co.uk/news/weather/11709865/UK-weather-The-live.html**

The Guardian:

- **https://www.theguardian.com/uk-news/2015/jul/01/heatwave-hits-he-flies-past-32c**

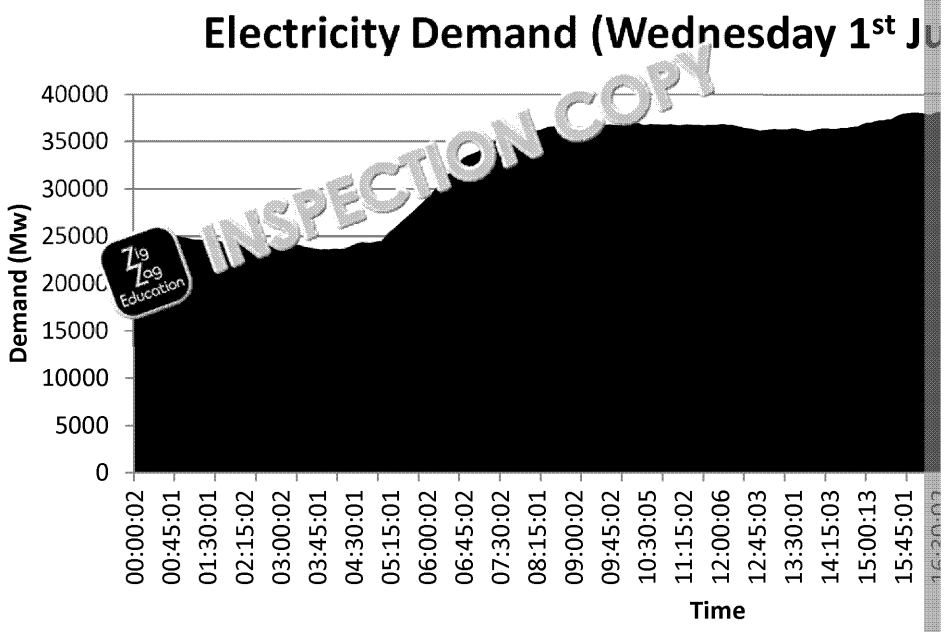
Springboards

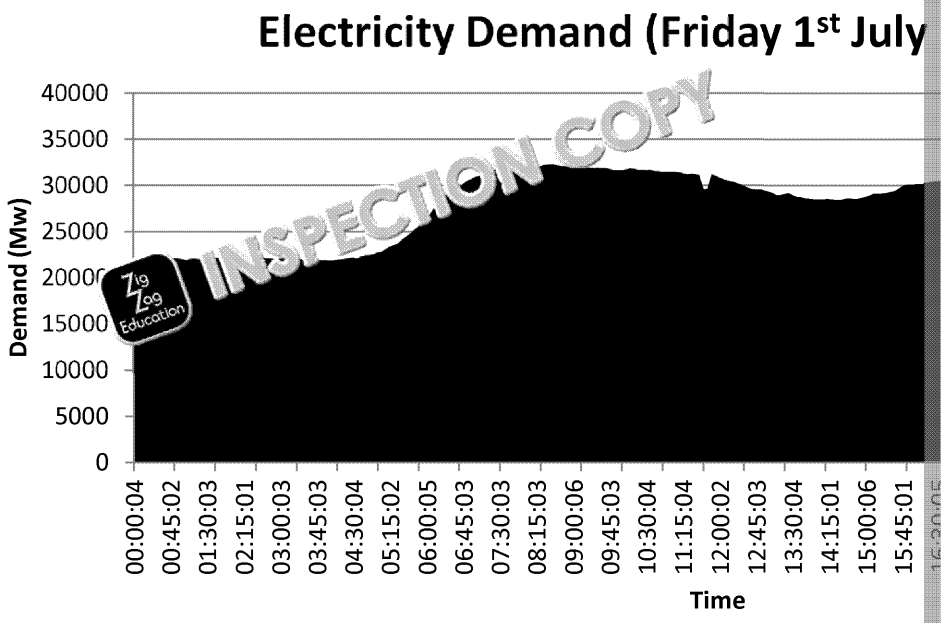
Springboard 1

1. Describe the pattern of heat forecast for the UK, Ireland and the area of on the

2. Explain the pattern shown on the heat map.

3. Suggest how the heat could have affected the public throughout the da





Familiarise yourself with the 'GB National Grid Status' website at **http://w**
Focus on the weekly and yearly demand graphs on the left-hand side. The
graphs above was obtained from this site.

1. Compare the two gr... July 2015 and 1st July 2016. What are th...
2. Can y... the differences? Could there be other reasons?
3. What do you think were the largest impacts caused by the heatwave?

Springboard Suggested Answers

Springboard 1

1	• Very hot over the continent with less cooling near the coast than remaining in the 20s. • Warmest in the south-east, just north of London, with levels of c coolest on the west coasts. • Higher over land than over ocean, as sun warmed the land surf
2	• Warm air pushed northwards up from the continent; cooler in co sea, but warm air still pushing northwards. • Warm in the south-east, nearest the continent – cloud was pushi breezes would have lowered the temperature in the west. • Northward passage of air brought high temperature up through • Densely populated area around London likely to have created a • Cooler over the oceans, due to the large body of cold water (ocea up!).
3	• The hot and dry air was uncomfortable, and people were advise disrupted, especially rail travel. Schools cancelled sports days, a sporting events were affected by the heat.

Springboard 2

1	• Electricity demand was high throughout the whole 24-hour pe shape is shown by the two (except for the early hours of the mor in 2015) • Demand is lowest overnight (many businesses are shut and most rise from about 5am as people start to get up and go to work. • High use during daytime hours. The dip in the afternoon is attri (solar photovoltaics) output. • In 2015, a larger peak occurred in the evening than the morning 2016, which saw a larger morning peak.
2	• There is likely to be higher use of air conditioning and fans in 20 demand in 2015. • However, as the weekly graph on the gridwatch website shows, demand than Wednesdays – therefore, we would expect 2016 to • There may have been different amounts of solar PV installed, an (e.g. cloud cover) could have altered betw the two years.
3	• Health and travel – the short du on unlikely to have had a s environmental impact • Allow any well response!

Summary

UK Heatwave

Question	
When was the heatwave ... did it last?	
What was ... temperature recorded during this heatw...	
Where was the warmest area of the UK overall?	
Was Scotland also warm?	
Where was the low pressure that caused warm air to cover the UK?	
Where did sand reach the UK from?	
Was there any cloud cover?	
Why was the M1 motorway congested?	
Why were trains slowed down?	
Why was the commute home for many Londoners unpleasant?	
Why was sunburn an issue?	
Why were people with asthma affe...	
How were 999 service...	
Suggest tw... ...ents that were commoner on that day.	
What happened at Thetford Forest?	
What heat health level was the heatwave?	
How was advice given to the public?	
Which age groups are most vulnerable to the heat?	
When was it advised that people stay indoors?	
What sort of clothes were people advised to wear?	
Which local authority gave advice to the public to drink plenty of water?	
People were tempted to cool off in rivers and lakes. Why was this a problem?	
Followers of which religion may have b... ...ticularly affected by the heatwave?	
Since when has Eng... ...a heatwave plan?	
Why was ... written?	
Which organisation is central to the plan in providing weather alerts?	

Question	
When was the heatwave – how long did it last?	*One day – 1st July 2015*
What was the highest temperature recorded during this heatwave?	*36.7 °C at Heathrow*
Where was the warmest area of the UK overall?	*The south-east, where tem*
Was Scotland also warm?	*Yes – temperatures reache Cairngorms*
Where was the low pressure that caused warm air to cover the UK?	*Out in the Atlantic Ocean*
Where did sand reach the UK from?	*The Sahara Desert*
Was there any cloud cover?	*Yes – a cold front brought from the west*
Why was the M1 motorway congested?	*A lorry fire*
Why were trains slowed down?	*If the trains travelled too f buckled*
Why was the commute home for many Londoners unpleasant?	*The tubes were very hot – recorded at King's Cross*
Why was sunburn an issue?	*UV levels were high*
Why were people with asthma affected?	*The air was very hot and*
How were 999 services affected?	*Very busy – the number o*
Suggest two ailments that were common that day.	*Sunstroke and heatstroke*
What happened at Thetford Forest?	*A fire burnt 30 acres of fo*
What heat health level was the heatwave?	*Level 3*
How was advice given to the public?	*Through the media – e.g.*
Which age groups are most vulnerable to the heat?	*The young and elderly*
When was it advised that people stay indoors?	*Between 11am and 4pm*
What sort of clothes were people advised to wear?	*Loose fitting clothes and h*
Which local authority gave advice to the public to drink plenty of water?	*Kent County Council*
People were tempted to cool off in rivers and lakes. Why was this a problem?	*Risk of drowning – especi*
Followers of which religion may have been particularly affected by the heatwave?	*Islam (Muslims)*
Since when has England had a heatwave plan?	*2004*
Why was the plan introduced?	*There was a large number heatwave in the preceding*
Which organisation is central to the plan in providing weather alerts?	*The Met Office*

Quick-fire Questions

1	How cl[illegible]s t[illegible] to the hottest ever recorded UK temperature?	
2	How did the hot weather end?	
3	Where was the jet stream at the time?	
4	Where did cloud come from?	
5	Why did Saharan sand reach our shores?	
6	Describe the delays to rail t[illegible]l.	
7	What w[illegible]issues associated with the hot weather?	
8	How could people reduce the risk to their health?	
9	Do you think that there were any industries which benefitted from the hot weather?	
10	Why was advice given to avoid swimming in wat[illegible]ut [illegible]feguards present?	
11	Why were Muslims likely t[illegible] esp[illegible]ally affected by the heatwave?	
12	Comm[illegible]he frequency of heatwaves.	

Quick-fire Answers

1	How cl[illegible]s 1[illegible] to the hottest ever recorded UK temperature?	*The hottest ev highest on tha*
2	How did the hot weather end?	*Thunderstorm*
3	Where was the jet stream at the time?	*To the north o*
4	Where did cloud come from?	*A cold front o Atlantic.*
5	Why did Saharan sand reach our shores?	*The hot air ori air mass.*
6	Describe the delays to rail travel.	*Rail services w area, trains wo*
7	What were the issue[illegible]s [illegible]d with the hot weather?	*Issues relating strong sunligh air caused dis*
8	How could people reduce the risk to their health?	*Staying indoo cool by closing fitting clothes,*
9	Do you think that there were any industries which benefitted from the hot weather?	*Manufacturer*
10	Why was advice given to avoid swimming in water [illegible]t [illegible]ifeguards present?	*Risk of drown hazards, obstr*
11	Why were Muslims likel[illegible] [illegible]especially affected by the heatwave?	*Due to Ramad general public drink up to tw*
12	Comme[illegible]e frequency of heatwaves.	*Heatwave freq major heatwa*

Extension Questions

1. Describe the weather in the UK on 1st July 2015.

2. Suggest why the effects of the heatwave were limited.

3. Comment on how the heatwave on 1st July 2015 was different from prev

Extension Answers

1. The whole of the UK was warm, with the highest temperatures in the south-e England and Scotland were also warm. Cloud moved i… om the west throug weather broke down in thunderstorms in Sco… d, … north-east and the sou south-east).

2. The heatwave only l… …ay (i.e. it wasn't prolonged and didn't last for effects di… h… …o build). There was also a plan in place to minimise t warnin… given to citizens on how to reduce their risk.

3. Very short (one-day) duration – other heatwaves have lasted for days or week too – for example, warm air arrived from over the continent, rather than a lon caused by anticyclonic high pressure.

Exam-style Question

With r[illegible]nc[illegible] to an extreme weather event in the UK, assess the ma[illegible]ment strategies were successful in reducing the ri

Level Mark Scheme

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

Indicative Content:

- The student should offer an evaluation of the extent to which the management extreme UK weather event were successful in reducing the risk.
- The student should clearly identify the successes and failures of the management reducing the risk of the weather event.

Suggested Content:

Successful:

- A Level 3 alert was issued and the media gave people advice.
- Healthcare advisors had to phone high-risk, vulnerable people.
- Ice lollies were also given to animals at some zoos to protect them in the heat.

Unsuccessful:

- The UK is generally underprepared for such heat. This meant that travel
- Many buildings in the UK do not have air conditioning and, therefore, this

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 argument
- Student utilises an appropriate range of geographical phrases.

For 3 marks:

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