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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 **The Summer Heatwave**, **UK (2015)** representing a **heat wave event** in the UK.

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/8845



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)
- Tropical Storm Chedza, Madagascar (2015)
- Flooding, Morpeth, UK (2008)
- Flooding, Texas, USA (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

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

UK Heatwave – 1st July 2015

Part 1: Case Study

Acronyms and Useful Terms

IPCC – Intergovernmental Panel on Climate Ch NDMA – The National Disaster Managar el Chanority

Atmospheric Circulation

Green Roof

Heat Inde

Heatway

High Pressure

Humidity

Low Pressure

Monsoon

Population Density

Pre-monsoon Rain

Sea Breeze

Urban Heat Island



Content

Causes and Prior Weather Conditions

1st July 2015 saw a one-day language. 1st July 2015 saw a one-day 's fwa 's spread throughout the UK, including

- ecord in 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 Faversham, Kent.
- The warmest area was the south-east of England many areas saw temperatures 🕥 and in 79
- ngland reached 30 °C in places.
- Scotland was warm too 29.0 °C was recorded in Aviemore (in the Cal

Was this really a heatwave?

The Met Office use the World Meteo definition of a heatwave – **over <u>five</u>** average maximum temperature is at long-term average of 1961–1990.

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

This heatwave wo ıly one day in len occurrence as the heatwaves of and the longer heatwave o



The hot weather broke down into thunderstorms, heavy rain and flood and south-west England. In Scotland, one-centimetre hailstones were in Dorset and East Anglia.

Thunderstorms occurred over the following weekend (4th-5th July).

So what caused the hot weather?

- Low pressure out in the Atlantic towards the Lost of the UK pushed hot air from S- i (1) Lowards, over the UK a southerly
- The jet strain we the UK, allowing the warm air no. 79 ds.
- The weeter chart to the right shows the area of low pressure over to the Atlantic. The isobars over the UK are far apart, showing that the winds were gentle.



Figure 1: 🎵

- $^{\circ}$ 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 televen higher if there had been less cloud.

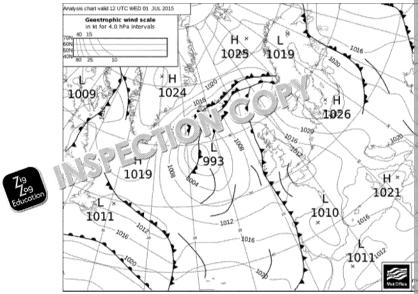


Figure 2: Weather chart for 1st July

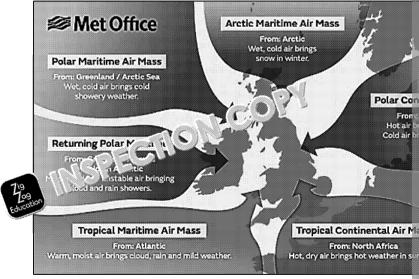


Figure 3: Which air mass do you think affected the UK?

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Social Impact

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

Travel

- Travel disruption on the M1 due to a lorry fire (the lorry was carrying batteries). Road surfaces also be ed.
- Rail cancellations and delays trains in the electronic and south-east of England were start a line is that the tracks wouldn't buck he he heat.
- There we a 'n hoer of breakdowns.
- The evening was unpleasant: 33 °C wedge 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
- 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, a fi of alarms held by the elder d Libied also doubled.
- There 2 instances of heatstroke and





Figure 4: Tra

Five people who attended the Royal Norfolk Show were hospitalised.

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.

Environmental Impact

Similarly to the economic ir a cts, he short duration of the event minimis is a extronmental effects. However, 700 or 321 that the heat contributed to a orest in East Anglia, which burnt 30 acres of forest (which equates to 0.12 km²).



Figure 6: Beach

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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 Fng and meaning that heatwave action was a gest of the following day, 2nd July, the dropped back to Level 1 (summer property). Health warnings were given to character the elderly, and friends and family were ged to check on elderly people. It wasn't just people who were affected – ice-lollies were given



Figure 7: The hot wea

to animals at Bristol and Chester Zoos, and the elephants were also hosed wi

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 their employees cool, including those
- Schools cancelled sports days.
- Spectators at Wimbledon were advised to whats.
- Some train stations handed said for water.
- Kent County Council and to locals that they should drink suffice warned and the should drink suffice
- The purarned 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.

The government also has a heatwave plan for England. The plan was first published in 2004, and has since been rewritten and revised, following the heatwave in 2003, which caused 2,000 excess deaths. The aim of the plan is to be a second control of the plan is



Figure 8: The hot weather flooding in

- ✓ reduce risk
- advise a people, including the NHS, local authorities, procomm
- ✓ be based on Met Office alerts
- ✓ be planned and coordinated by different authorities
- ✓ allow for long-term coordination, such as building design

What does a Level

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

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Evidence for More Extreme Weather

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





Temperature recorded at Heathrow:

Temperatures across south-east England:

Temperature in northern England:

Temperature recorded in Aviemore:

Temperature recorded inside King's Cross underground station:

Number of people trapped inside King's Cross underground station:

Number of people hospitalised who attended the Royal Norfolk Show:

Area of Thetford Forest burnt:

Level of heat health alert:





rite a list of definitions for the following key terms.

- Air Mass
- Air Pollution/Quality
- Heatwave
- **Isobars**
- **Iet Stream**
- 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:

1 http://www.bb

Evening the Education 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





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Springboards

Springboard 1



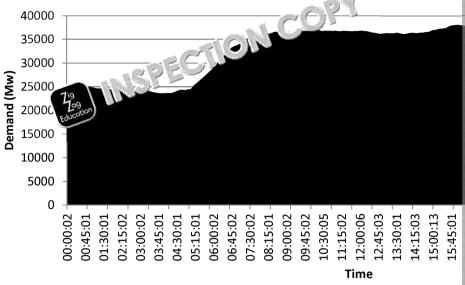
- 1. Describe the protection of the UK, Ireland and the area of on the 700
- 2. Explain battern shown on the heat map.
- 3. Suggest how the heat could have affected the public throughout the da

NORTH CHON CORY

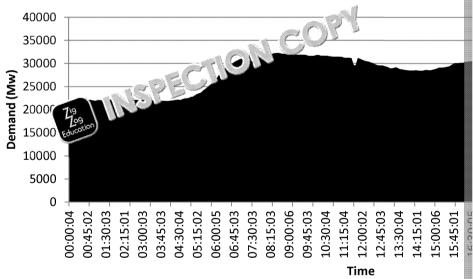




Electricity Demand (Wednesday 1st July 1984)



Electricity Demand (Friday 1st July



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

- 1. Compare the two grant or July 2015 and 1st July 2016. What are the
- 2. Can you plain in Ifterences? Could there be other reasons?
- 3. What think were the largest impacts caused by the heatwave?

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Springboard Suggested Answers

Springboard 1

1	 Very hot over the continent with less 2 on 1 g rear the coast than remaining in the 20s. Warmest in the sout 2 is the north of London, with levels of coolest on the sout 2 is coasts. The remaining in the 20s. Warmest in the sout 2 is the north of London, with levels of coolest on the sout 2 is coasts. The remaining in the 20s.
2	 Variable air pushed northwards up from the continent; cooler in cosea, but warm air still pushing northwards. Warm in the south-east, nearest the continent – cloud was pushing 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 and Cooler over the oceans, due to the large body of cold water (oceang!).
3	The hot and dry air was uncomfortable, and people were advised disrupted, especially rail travel. Schools cancelled sports days, ar sporting events were affected by the heat.

Springboard 2

Sprin	gboard 2
1	 Electricity demand was in the two upon the whole 24-hour pershape is shown in two (except for the early hours of the more in the interior of the more in the interior of the more interior of the interior of the
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 between the two years.
3	 Health and travel – the short durat on antikely to have had a senvironmental impact Allow any well



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Part 2: Exam Preparation

Summary



UK Heatwave

OK Heatwave	
)
Question	
When was the heatwave in the aid it last?	One day – 1st July 2015
What was 19 het Imperature 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 reached 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 the west
Why was the M1 motorway congested?	A lorry fire
Why were trains slowed down?	If the trains travelled too f
Why was the commute home for many Londoners unpleasant?	he lubes were very hot – King's Cross underground
Why was sunburn an issue?	UV levels were high
Why were people with the districted?	The air was very hot and d
How were 79 vic arrected?	Very busy – the number o
Suggest two education has that were commoner on that day.	Sunstroke and heatstroke
What happened at Thetford Forest?	A fire burnt 30 acres of for
What health level was the heatwave?	Level 3
How was advice given to the public?	Through the media – e.g. T
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. Whwas this a problem?	Risk of drowning – especie
Followers of which religion may have ' (r) is alarly affected by the heatwave?	Islam (Muslims)
Since when has Eng's to heatwave plan?	2004
Why was the ducation written?	There was a large number heatwave in the preceding
Which organisation is central to the plan in providing weather alerts?	The Met Office

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Quick-fire Questions



1	How 79 was 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	
7	What 79 the 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 the at lifeguards present?	
11	Why were Muslims like broke ecially affected by the heatwave?	
12	Con 79 n the frequency of heatwaves.	
7 8 9 10	Who was advice given to avoid swimming in wheat lifeguards present? Why were Muslims life and be a pecually affected by the heatwave?	



Quick-fire Answers

	Quick-fire Answers	
	Quick-fire Answers	
1	How class was to one hottest ever recorded UK temperature?	The hottest highest on t
2	How Education hot weather end?	Thundersto
3	Where was the jet stream at the time?	To the nort?
4	Where did cloud come from?	A cold front Atlantic.
5	Why did Saharan sand reach our shores?	The hot air c
6	Describe the delays to rail travel.	Rail services this area, tro
7	What were the issues to I with the hot weather?	Issues relati strong sunh air caused d
8	How Education people reduce the risk to their health?	Staying ind houses cool loose-fitting
9	Do you think that there were any industries which benefitted from the hot weather?	Manufactur
10	Why was advice given to avoid swimming in water ut lifeguards present?	Risk of drou underwater exposure.
11	Why were Muslims like; box specially affected by the heatwave?	Due to Ram general pub drink up to
12	Com Education the frequency of heatwaves.	Heatwave fr major heata





Extension Questions

- 1. Describe the weather in the UK on 1st July 2015.
- 2. Suggest why the effects of the heatwave ver (1) ited.
- 3. Comment on how the harman state of 1st July 2015 was different from previous







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Extension Answers

- 1. The whole of the UK was warm, with the highest temperatures in the souther England and Scotland were also warm. Cloud moved it from the west through weather broke down in thunderstorms in Scotland to the southeast).
- 2. The heatwave only low and (i.e. it wasn't prolonged and didn't last for effects didn't have to build). There was also a plan in place to minimise the warning of the prolonged and didn't last for effects didn't last for
- 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 long caused by anticyclonic high pressure.





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Exam-style Question

Question 1

MON COPY weather event in a UK and non-UK loca Case stu

Explain now the consequences of extreme weather events diff contrasting countries.

6 marks

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Level Marking

Level	Mark	Description
1	1-2	 The student evidences basic knowledge The student evidences limited understar exist between places, environments and The ideas expressed by the student are A named expressed provided but place-
2	3-4 EC	 The tu er dences some knowledge It is udent evidences good understand between places, environments and processed by the student are A named example is provided with some
709 Education	5-6	 The student evidences thorough knowled (AO1) The student evidences a firm understand exist between places, environments and lideas expressed by the student are in-defeated. A named example and place-specific defeated.

Suggested Content

Name of UK extreme weather event: Heatwave, 1st July 2015 Name of non-UK extreme weather event: Texas and Oklahoma Floods, 20

As the two weather events are different and in contrasting countries, the
events are also different. The table below demonstrates the differences
and environmental consequences.

	Texas and Oklahoma flood	
Socia Education Consequences	 com flooding, 16 deaths from agos. 11 people were reported missing. Thousands of houses were damaged, including houses contents by floodwater. 10,000 customers were without electricity. Severe disruption to transport. 	There we deaths although implication heatstree. The issister were not and rail of heatstree flooding and rail Condition service Undergreen.
Economic Consequences	 The extreme weather was predicted to cause \$3 billion of economic damage, and that at least a further \$1 billion would be paid out by the insurance industry. Damage to property, infrastructure and utilities needed to be repaired a commercial buildings we see damaged, resulting in a contrade. Agriculture of the property of the	The he which r There r custom
Environ 79 709 Conseque	S were damaged and downed by the flooding and tornados. When the floodwater receded, the areas flooded were covered in silt, debris and branches.	There we ffects event. It was to a fire Anglia, (which

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