



GCSE Case Study: Storm Babet

Fill in the blanks:

Storm Babet, an Extratropical Cyclone, hit the UK on 18th October 2023. It was one of the most severe storms in recent years, causing widespread Flooding and damage. The storm claimed the lives of seven people and was the second Met Office named storm of the 2023-24 season.

Highest Rainfall: 150-200 mm.

Highest gusts of wind: 121 MPH

Causes:

Match the cause to the description

Strong Jet Stream	→	A significant low-pressure system over the UK helped draw the storm in.
Warm Sea Surface Temperature	→	A high-pressure area over Scandinavia prevented the storm from moving eastwards, prolonging its impact over the UK.
Low Pressure Area	→	A powerful jet stream steered the storm towards the UK.
Blocking High Pressure	→	Elevated temperatures in the North Atlantic provided additional energy to the storm.

Locations affected:

Using an atlas, match the names of the locations most severely affected by the storm with their corresponding locations on this map:

- Derry
- Brechin, Angus
- Aberdeen
- Leeds
- Derby
- Nottingham
- Retford
- Sheffield
- York





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Cut out the impacts of Storm Babet and categorise them by sticking them under the headings **Social, Economic and Environmental impacts**.

Social Impacts	Economic Impacts	Environmental impacts
<p>Fatalities and Injuries: 7 people died across the UK due to flooding and wind-related incidents.</p>	<p>Infrastructure Damage: Infrastructure Damage: Significant damage to roads, bridges, railways, and airports, leading to transportation disruptions. Leeds Bradford Airport was closed on 20th October after a large plane skidded off the runway whilst landing.</p>	<p>Landslides: Heavy rains from Storm Babet triggered landslides, causing damage to forests and natural habitats. For example, a slope near houses at the base of Chilwell Quarry collapsed due to the intense rainfall in October.</p>
<p>Displacement: Hundreds of people were rendered homeless due to flooding and property damage. 1,250 properties in England were flooded.</p>	<p>Business Losses: Many businesses suffered due to flooding and power outages, resulting in job losses and economic downturns.</p>	<p>Soil Erosion: Soil Erosion: Intense rainfall increased soil erosion and disrupted local habitats, affecting wildlife and potentially reducing biodiversity.</p>
<p>School Closures: Numerous schools across Cheshire, Norfolk, Suffolk, Yorkshire, Scotland and North Wales, were closed due to a "danger to life".</p>	<p>Cost of Damages: Estimates calculate the costs of damage due to Storm Babet to be between £450m - £650m.</p>	<p>Debris and Waste: The storm caused extensive damage and debris, including hazardous materials. Over 750 tonnes of debris were removed from Sunderland's promenades and beaches after recent storms including Storm Babet.</p>
<p>Evacuations: Over 10,000 people were evacuated from their homes and forced to stay in temporary accommodation. Disrupting their daily life.</p>	<p>Agricultural Damage: Flooding damaged crops and farmland, killed livestock, and resulted in significant financial losses for farmers, leading to disruptions in food supplies.</p>	<p>Pollution: Flooding spread pollutants from roads, industrial sites, and farms into rivers, contaminating water sources with harmful chemicals and affecting aquatic life.</p>
	<p>Power Outages: Around 100,000 customers initially lost power, affecting homes and businesses.</p>	<p>Flooding: Widespread flooding damaged rivers, lakes, and wetlands, displacing wildlife.</p>



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Reducing the Risk:

Describe what early warnings are and why they are important during a storm like Storm Babet.

The Met Office provides weather forecasts and warnings to alert the public about severe weather events like storms, helping people prepare in advance. The Environment Agency's Flood Warning Service specifically issues flood alerts, warnings, and information to help communities prepare for and respond to potential flooding.

What impact do you think the Met Office's red and amber warnings had on public safety?

How might people's actions have changed in response to these warnings?

The Met Office's red and amber warnings likely improved public safety by alerting people to severe weather, allowing them to take necessary precautions. In response, people might have altered their plans, stayed indoors, avoided travel, and prepared their homes to protect themselves from potential damage.

List the flood protection strategies implemented during Storm Babet (e.g., flood alerts, sandbags, pumps).

During Storm Babet, the Environment Agency issued flood alerts, deployed sandbags, and sent over 300,000 warnings. These efforts helped protect 96,000 properties and involved deploying 25 pumps to manage and remove excess water.

Describe the roles played by local authorities and emergency services during the storm.

During Storm Babet, local authorities and emergency services played crucial roles by implementing response plans to manage the storm's impact. They facilitated evacuations and rescue operations, including airlifting workers from a North Sea drilling platform to ensure safety and minimise risk.

Is the weather in the UK is becoming more extreme?

Using the information provided, discuss whether Storm Babet is evidence that weather in the UK is becoming more extreme. In your answer, consider the intensity, frequency, and impacts of recent storms, and compare these to historical weather patterns.

Storm Babet suggests that weather in the UK is becoming more extreme based on its intensity, frequency, and impacts, and when compared to historical patterns.

Intensity of the Storm - Storm Babet was notably intense, with heavy rainfall and high winds causing widespread flooding, landslides, and significant damage. The issuance of rare red weather warnings and the loss of 7 lives highlight its severity, indicating that such storms are becoming more intense compared to those in the past.

Frequency of Severe Weather Events - Storm Babet is part of a trend of increasing severe storms, including Storm Ciara and Storm Dennis in 2020. The rising frequency of these events suggests a shift towards more volatile weather, which is often linked to climate change. This trend supports the idea that extreme weather is becoming more common in the UK.

Widespread Impacts - The extensive impacts of Storm Babet, such as flooding, transport disruptions, and economic losses, show the growing vulnerability of UK infrastructure and communities. The scale of the damage reflects the increasing risk associated with severe weather events.

Historical Comparisons - Historical records reveal that while intense storms have occurred before, recent data shows an increase in both the frequency and severity of such events. This aligns with broader climate trends of rising global temperatures and changing atmospheric conditions, contributing to more extreme weather.





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Background:

Storm Babet, an **extratropical cyclone**, hit the UK on **18th October 2023**. It was one of the most severe storms in recent years, causing widespread flooding and damage. The storm claimed the lives of seven people and was the second Met Office named storm of the 2023-24 season.

- Storm Babet brought 150-200mm of rain to the wettest areas of eastern Scotland, leading to two Met Office red warnings for rain.
- In Angus, Scotland, 19th October 2023 was the wettest day on record since 1891.
- This period was the third-wettest independent 3-day stretch for England and Wales on record.
- Babet also brought strong winds, gusting over 58 mph across northeast England and much of Scotland.
- Gusts reached 121 mph at Kincardineshire, Scotland.

Causes:

- **Strong Jet Stream:** A powerful jet stream steered the storm towards the UK. (The jet stream is a core of strong winds around 5 to 7 miles above the Earth's surface, blowing from west to east.)
- **Warm Sea Surface Temperatures:** Elevated temperatures in the North Atlantic provided additional energy to the storm.
- **Low Pressure Area:** A significant low-pressure system over the UK helped draw the storm in.
- **Blocking High Pressure:** A high-pressure area over Scandinavia prevented the storm from moving eastwards, prolonging its impact over the UK.

Locations affected:

- **Northern Ireland:** Derry: Experienced extensive damage due to flooding..
- **Midlands:**
 - Derby and Nottingham: Rivers exceeded record levels, causing significant flooding.
 - Retford, Nottinghamshire: Evacuation orders were issued for parts of the town.
- **Scotland:**
 - Brechin, Angus: Became accessible only by boat at one point due to severe flooding.
 - Aberdeen: Major roads were closed as flood defences were overtopped by the river South Esk.
- **Northern England:** Leeds, Sheffield, and York: Roads and railways were shut down due to flooding.

Impacts:

Social Impacts

- **Fatalities and Injuries:** 7 people died across the UK due to flooding and wind-related incidents.
- **Displacement:** Hundreds of people were rendered homeless due to flooding and property damage. 1,250 properties in England were flooded.
- **School Closures:** Numerous schools across Cheshire, Norfolk, Suffolk, Yorkshire, Scotland and North Wales, were closed due to a "danger to life".
- **Evacuations:** Over 10,000 people were evacuated from their homes and forced to stay in temporary accommodation. Disrupting their daily life.

Economic Impacts

- **Infrastructure Damage:** Significant damage to roads, bridges, railways, and airports, leading to transportation disruptions. Leeds Bradford Airport was closed on 20th October after a large plane skidded off the runway whilst landing.



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- **Business Losses:** Many businesses suffered due to flooding and power outages, resulting in job losses and economic downturns.
- **Cost of Damages:** Estimates calculate the costs of damage due to Storm Babet to be between £450m - £650m.
- **Agricultural Damage:** Flooding damaged crops and farmland, killed livestock, and resulted in significant financial losses for farmers, leading to disruptions in food supplies.
- **Power Outages:** Around 100,000 customers initially lost power, affecting homes and businesses.

Environmental Impacts

- **Landslides:** Heavy rains from Storm Babet triggered landslides, causing damage to forests and natural habitats. For example, a slope near houses at the base of Chilwell Quarry collapsed due to the intense rainfall in October.
- **Flooding:** Widespread flooding damaged rivers, lakes, and wetlands, displacing wildlife.
- **Soil Erosion:** Intense rainfall increased soil erosion and disrupted local habitats, affecting wildlife and potentially reducing biodiversity.
- **Debris and Waste:** The storm caused extensive damage and debris, including hazardous materials. Over 750 tonnes of debris were removed from Sunderland's promenades and beaches after recent storms including Storm Babet.
- **Pollution:** Flooding spread pollutants from roads, industrial sites, and farms into rivers, contaminating water sources with harmful chemicals and affecting aquatic life.

Reducing the risk:

- **Early Warnings:** The Met Office issued two red warnings for heavy rain in eastern Scotland from October 19th to 21st, with amber warnings across Scotland, Northern Ireland, Wales and northern England.
- **Flood Protection:** The Environment Agency (EA) issued flood alerts, deployed sandbags, and sent over 300,000 warnings. They protected 96,000 properties and deployed 25 pumps.
- **Emergency Response:** Local authorities and emergency services implemented response plans to manage the storm's effects.
- **Evacuations and Rescues:** Emergency services facilitated evacuations and rescue operations, including airlifting workers from a North Sea drilling platform.

Is the weather in the UK becoming more extreme?

- **Intensity of the Storm:** Storm Babet brought intense rainfall and high winds, leading to widespread flooding, landslides, and significant damage across the UK. The severity of the storm, including the issuance of rare red weather warnings and the 7 lives lost, highlights the increasing intensity of storm events in the region.
- **Frequency of Severe Weather Events:** Storm Babet is part of a pattern of recent severe storms in the UK, such as Storm Ciara and Storm Dennis in 2020. The frequency of such extreme weather events suggests a trend towards more volatile weather conditions, which many experts link to climate change.
- **Widespread Impacts:** The extensive damage caused by Storm Babet, including flooding of homes, disruption to transportation, and economic losses, underscores the growing risk and impact of extreme weather in the UK. The scale of the storm's effects reflects the increasing vulnerability of infrastructure and communities to such events.



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Practice questions:

- Describe the impacts of Storm Babet on the UK. How do these impacts indicate that weather events in the UK are becoming more extreme? (4 marks)
- Using the example of Storm Babet, explain how the intensity of recent storms supports the argument that the UK's weather is becoming more extreme. (6 marks)
- Compare the frequency and severity of Storm Babet with another recent UK storm, such as Storm Ciara or Storm Dennis. What does this comparison suggest about trends in extreme weather in the UK? (6 marks)
- Evaluate the effectiveness of early warning systems and flood protection measures during Storm Babet. How do these responses reflect the challenges posed by increasingly extreme weather in the UK? (8 marks)
- Discuss how the impacts of Storm Babet align with scientific predictions about climate change. What evidence from the storm supports the theory that climate change is leading to more extreme weather in the UK? (8 marks)
- Using a case study of Storm Babet, assess how the increasing frequency of extreme weather events could affect the future planning and management of UK infrastructure. (8 marks)