GCSE Case Study: Storm Babet 2024

Teachers notes
These lesson objectives are intended for the **KS4 GCSE Geography curriculum**, specifically focusing on the topic of **extreme weather in the UK**. However, the content can be tailored to suit different key stages, accommodating varying levels of prior knowledge and understanding.

Lesson Aim:
To investigate the causes, impacts, and risk reduction strategies associated with Storm Babet, and to assess whether this event is indicative of increasingly extreme weather patterns in the UK.

Lesson Objectives:
- Explore the causes of Storm Babet.
- Analyse the social, economic and environmental impacts of Storm Babet on the UK.
- Understand the strategies used to reduce the risks and impacts of Storm Babet.
- Use the Storm Babet case study to examine extreme weather events in the UK.

Assumed Prior knowledge:
Before studying the case of Storm Babet, students should understand key concepts related to UK weather, including depressions, anticyclones, and the different types of rainfall patterns. They should be comfortable reading maps and using an atlas to locate places within the UK. Additionally, students should be able to distinguish between social, economic, and environmental impacts. This prior knowledge is essential for analysing Storm Babet and its effects on the UK.

Resources needed:
Atlas
Storm Babet Case Study Worksheet
Scissors
Glue stick

All the blank worksheets for this lesson can be found as a separate download within The Flood Hub GCSE Storm Babet case study page. The answers for the worksheets can be found at the end of this document.

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Notes for Each Slide:
Teachers should decide what students should copy into their workbooks. While most content is provided on the worksheet, any additional information can be recorded in the workbooks.

Slide 1 - Learning Objectives
- Read the learning objectives aloud to the class to set clear expectations for what they will explore, analyse, understand, and examine regarding Storm Babet and its implications for extreme weather in the UK.

Slide 2 - Storm Babet background
- Read the slide about Storm Babet aloud to the class, emphasising the key points.

Slide 3 - Fill the blanks activity
- **Activity:** Fill the blanks on worksheet.
- Instruct the students to fill the blanks on their worksheet about the background of Storm Babet using the information you've just covered. Encourage them to ask questions if they need clarification.

Slide 4- Fill the blanks answers
- Reveal the correct answers on the slide and instruct the students to review their work and correct any answers.

Slide 5 - Rain and wind figures
- **Activity:** Record rainfall and wind gust figures on worksheet
- Read the slide aloud to the class, emphasising the key points. After reading, instruct the students to note down the rainfall and wind gust figures on their worksheet, along with the relevant locations and dates. Check that students are keeping up and have recorded the correct information.

Causes of Storm Babet
Slide 6 - Jet stream
- Start by introducing the next few slides, focusing on the causes of Storm Babet. Read aloud the slide about the jet stream, then explain the concept.
- The concept of the jet stream involves a high-altitude, narrow band of strong winds in the atmosphere that flows from west to east. Located approximately 5 to 7 miles above the Earth's surface, the jet stream significantly impacts weather patterns by influencing the movement and development of weather systems, including storms. It acts like a conveyor belt, guiding and steering these systems across different regions, which can affect their intensity and path.

Slide 7 - Warm sea surface temperature
- Introduce the slide on "Warm Sea Surface Temperatures" and then read the information aloud.
- Warmer sea surface temperatures contribute to storm formation and intensification. When sea temperatures are higher than usual, they release more moisture into the atmosphere, which can enhance storm development and strength. For Storm Babet, the elevated temperatures in the North Atlantic added extra energy to the storm, making it more powerful.

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Slide 8 - Air pressure

- Read the slide aloud to the class and explain the concepts:
- A significant low-pressure system over the UK helped draw the storm in. A high-pressure area over Scandinavia prevented the storm from moving eastwards, prolonging its impact over the UK.

Slide 9 - Causes of Storm Babet activity

- **Activity:** Match the causes of Storm Babet to the matching description.
- Instruct the students to match each cause of Storm Babet to its corresponding description on their worksheet.

Slide 10 - Causes of Storm Babet activity answers

- Instruct the students to check their worksheets against the answers on the slide. Make sure they have matched each cause of Storm Babet with the correct description. Ask them to correct any mistakes and let you know if they have any questions or need further clarification.

Locations Affected

Slide 11 - Locations affected

- Read the slide aloud about the locations worst affected by Storm Babet. Highlight the importance of this information for understanding the geographical scope of the storm's effects.

Slide 12- Locations affected activity

- **Activity:** Instruct the students to use an atlas to match the names of the locations most severely affected by the storm with their corresponding locations on the map provided in their worksheet.

Slide 13 - Locations affected answers

- Reveal the answers for the map and locations and instruct the students to check their labels against the correct answers.

Impacts of Storm Babet

Slide 14 - Social, Economic and Environmental factors

- Introduce the slide by explaining that over the next few slides, some impacts of Storm Babet will be shown. It is important to distinguish between social, economic and environmental impacts.
- Explain that there can be overlap between these categories. For example, environmental damage may also affect local businesses and residents, showing how interconnected these impacts can be. Understanding these categories helps us grasp the full scope of the storm's effects.

Slide 15, 16 and 17 - Photos of the impacts of Storm Babet

- Instruct the students to look at the next few slides, which show pictures depicting the severity of Storm Babet. As you flick through the images, ask the students to consider how each type of damage might affect daily life. Encourage them to think about the social, economic, and environmental impacts of each scenario. Ask them to identify and discuss the different types of impacts these issues might have on communities, infrastructure, and the environment.

Slide 18 - Impacts of Storm Babet sorting activity

- **Activity:** Instruct the students to cut out the impacts of Storm Babet and categorise them by sticking them under the headings Social, Economic and Environmental impacts.

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Slide 19 - Social impacts

- Read through the slide with the students, which covers the social impacts of Storm Babet, including fatalities, displacement, school closures and evacuations. Ensure that students have correctly placed these social impacts into the appropriate column on their worksheets.

Slide 20 - Economic impacts

- Read through the slide on economic impacts, which includes infrastructure damage, business losses, cost of damage, agricultural damage, and power outages. Make sure students have correctly placed these economic impacts into the appropriate column on their worksheets.

Slide 21 - Environmental impacts

- Read through the slide on environmental impacts, which includes landslides, flooding, soil erosion, debris and waste, and pollution. Ensure that students have correctly placed these environmental impacts into the appropriate column on their worksheets.

Reducing the risk

Slide 22 - Early warnings

- Introduce the next section by explaining that it focuses on reducing the risks associated with storms. Discuss the various management strategies that were implemented before and during Storm Babet to minimise damage. Highlight that these strategies were designed to mitigate the storm's impact and protect communities.
- Explain that the Met Office issued two red warnings for heavy rain and that red warnings are relatively rare and indicate the highest level of alert for severe weather, reflecting the significant risk of serious impacts on health, safety, and property. These warnings are crucial for alerting the public and authorities to prepare for the storm, helping to reduce its overall impact.

Slide 23 - Flood Protection

- Explain the flood protection measures implemented during Storm Babet. Read aloud the information.
- Ensure that students understand how these measures helped to manage and reduce the impact of flooding. Emphasise the scale of the response and its role in mitigating damage and protecting communities.

Slide 24 - Evacuations and rescues

- Read aloud the information about evacuations and rescues from the slide. These reduce the risk by ensuring that people are moved out of harm's way before the worst effects of the storm hit, which prevents injuries and saves lives. By responding quickly and efficiently, emergency services minimise the potential for fatalities and reduce the overall impact on communities.

Slide 25 - Reducing the risk activity

- Instruct the students to answer the questions on their worksheet about reducing the risk of Storm Babet. Encourage them to use the information discussed in class, such as early warnings, flood protection measures, and emergency responses. Ensure they understand how these strategies helped to minimise the storm's impact and protect communities. Circulate the room to provide assistance as needed and clarify any questions.

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Slide 26 - Does Storm Babet show that the weather in the UK is becoming more extreme?

- Read the slide aloud and encourage the students to think critically about how they would answer this question if it appeared in an exam: "Does Storm Babet show that the weather in the UK is becoming more extreme?"
- Guide the students to consider the key points listed on the slide:
  - The intensity of Storm Babet, including rare red weather warnings and significant damage.
  - The frequency of severe weather events, noting the pattern of recent storms.
  - The widespread impacts on infrastructure and communities.
  - Historical comparisons showing an increase in storm frequency and severity.
- Ask the students to think about how they would structure their response, using evidence from the slide to support their argument. Remind them to consider both the data provided and their understanding of broader climate trends. Encourage them to practice forming a balanced, evidence-based conclusion that they could use in an exam setting.

Slide 27 - Does Storm Babet show that the weather in the UK is becoming more extreme?

- Direct the students to answer the question on their worksheet about whether Storm Babet shows that the weather in the UK is becoming more extreme. Remind them to use the key points discussed in class.

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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:

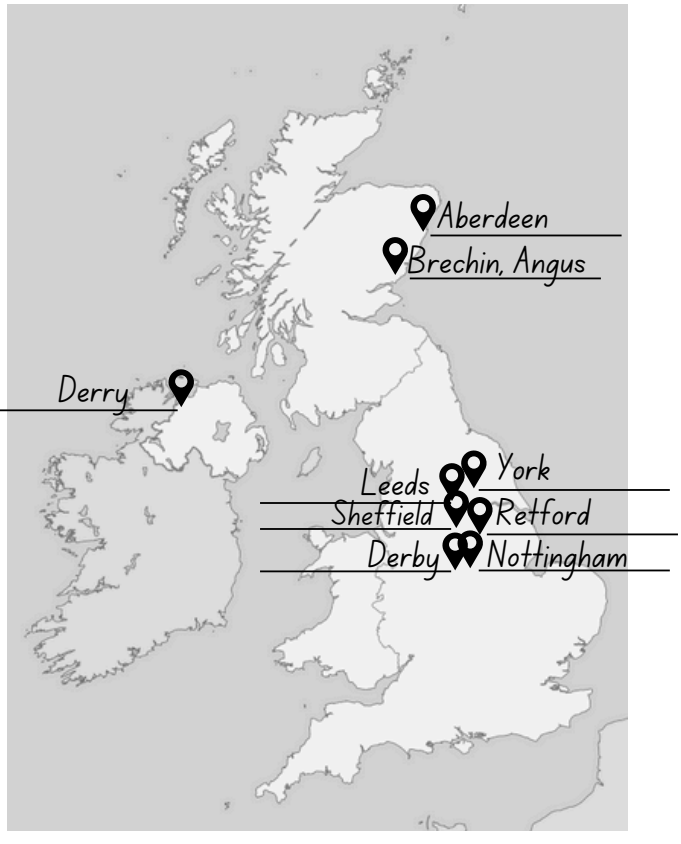
Match the cause to the description

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
Fatalities and Injuries: 7 people died across the UK due to flooding and wind-related incidents.	**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.	**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.
Displacement: Hundreds of people were rendered homeless due to flooding and property damage. 1,250 properties in England were flooded.	**Business Losses:** Many businesses suffered due to flooding and power outages, resulting in job losses and economic downturns.	**Soil Erosion:** Soil Erosion: Intense rainfall increased soil erosion and disrupted local habitats, affecting wildlife and potentially reducing biodiversity.
School Closures: Numerous schools across Cheshire, Norfolk, Suffolk, Yorkshire, Scotland and North Wales, were closed due to a "danger to life".	**Cost of Damages:** Estimates calculate the costs of damage due to Storm Babet to be between £450m - £650m.	**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.
Evacuations: Over 10,000 people were evacuated from their homes and forced to stay in temporary accommodation. Disrupting their daily life.	**Agricultural Damage:** Flooding damaged crops and farmland, killed livestock, and resulted in significant financial losses for farmers, leading to disruptions in food supplies.	**Pollution:** Flooding spread pollutants from roads, industrial sites, and farms into rivers, contaminating water sources with harmful chemicals and affecting aquatic life.
	Power Outages: Around 100,000 customers initially lost power, affecting homes and businesses.	**Flooding:** Widespread flooding damaged rivers, lakes, and wetlands, displacing wildlife.

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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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