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Recent floods in the United Kingdom

December 24th–25th 1999 was certainly not a white Christmas for most parts of the United Kingdom. In the south, for example, floodwaters left eight trains stranded. This disruption at a crucial time of year for families followed heavy rains and high tides that hit vast areas of Southern England and which led to flood warnings being issued in Sussex, Hampshire and Kent by the Environment Agency. Ray Kemp, the spokesman for the Environment Agency in the south, said Pevensey Bay, near Eastbourne, was likely to be hardest hit by the flooding. Waves 5m high were experienced at the height of the storms after about 1,000 people were evacuated.

Whilst flooding at this time of year should not be unexpected, it seems that increasingly in the United Kingdom, no time of year is entirely free from this so-called 'natural' hazard. In August 1999, for example, a summer heatwave ended in heavy, thundery showers accompanying severe storms and leading to severe floods at Pendleford near Wolverhampton.

Is global warming to blame?

The phenomenon known as 'global warming' is mentioned every time severe weather events occur in the United Kingdom, but just how much is it to blame for our seemingly changing climate and increased flooding? Average surface air temperature has risen by between 0.3ºC and 0.6ºC in the last century and for the United Kingdom this resulted in 1999 being one of the hottest years on record (see Figure 1).

Whilst scientists and climatologists do not yet fully understand the complexities of global weather systems, this change in temperature, for whatever reason, will undoubtedly affect future weather and climate patterns. There is a general scientific consensus that recent global warming has occurred as a result of human influence on a naturally occurring phenomenon – the greenhouse effect (Figure 2). This exacerbation of a natural process (by which some gases in the

Figure 1: Monthly weather summary for England and Wales, 1999

'Warmest year on record with plenty of sunshine but offset by frequent thunderstorms and local flooding'

January
Mainly mild, windy and wet but with some generous sunshine. Dull and quiet at the month's end.
This has been the sunniest January since 1991 and the fourth sunniest since 1909. The mildest (along with 1994) since 1993.

February
Generally mild. Changeable and windy at times with snow in the second week. Sunny and dry away from the west.
This has been the 10th sunniest February since 1909.

March
Mainly mild and changeable. Some snow in places first week.
This has been the 3rd mild March in a row.

April
Mostly unsettled and rather wet. Wintry spell mid month with some snow. Very warm closing days.
This was the warmest April since 1993 and the sunniest since 1995.

May
Mostly warm and changeable. More unsettled in NW, sunnier and warmer in SE. Breezy start to fourth week with thunderstorms later.
The dullest May since 1994 and the sixth month in sucession to be warmer than normal.

June
Rather wet. Some severe thunderstorms at first, then mainly cool and unsettled but with some very warm days at times.
The coldest June since 1991.

July
Mostly very warm and sunny especially in the south, but cooler in the north and northwest. It was notably dry over some parts of England.
The driest July since 1911 and the sunniest since 1990.

August
Very hot start, then mostly rather cool and unsettled. Frequent thunderstorms and heavy downpours in places. Warm and dry closing days.
The wettest and dullest August since 1992.

September
Very warm or hot at first. Generally very unsettled with frequent thunderstorms, heavy downpours and local flooding in places.
The warmest September since 1949 and the sunniest since 1991.

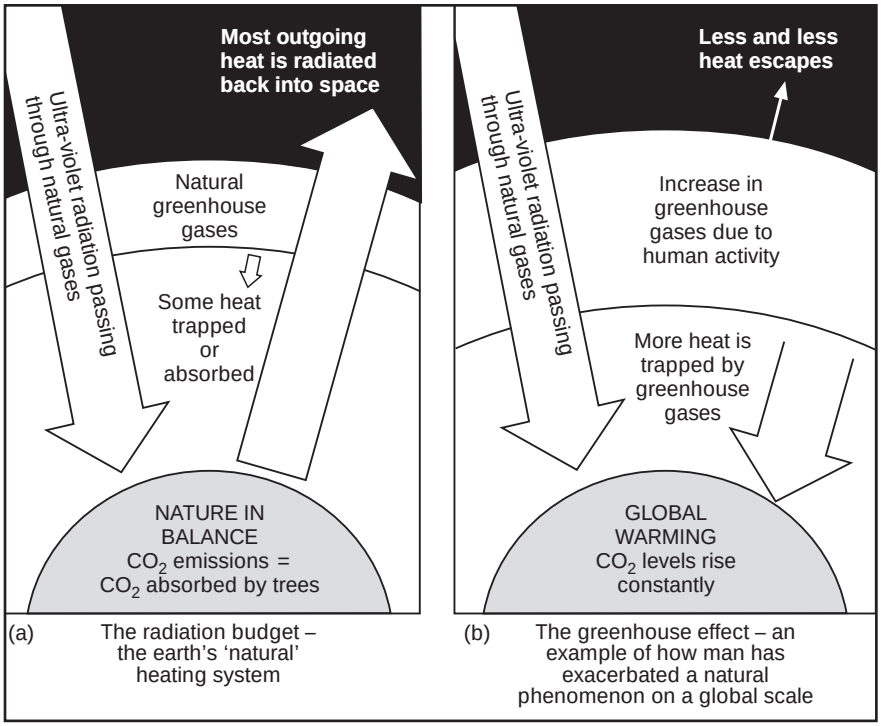
October
Very sunny and dry most of the time after a breezy start with some thunder. Unsettled beginning of 4th week with gales and heavy rain around 24th/25th. Mainly sunny and dry thereafter.
The sunniest October since 1959.

November
Mainly mild and dry the first fortnight. Cold spell third week with some wintry /thundery showers. More disturbed during the last week with gales and heavy rain in places though still mostly mild.
The driest November since 1990.

December
Disturbed with frequent gales and some snow in the north. Sunshine well above normal but very wet with local flooding. Wintry spell third week.
The sunniest December since 1962 and the wettest since 1993.

Source: Meteorological website (www.met-office.gov.uk)

Figure 2: The greenhouse effect and the radiation budget



Source: D. Waugh (1995) *Geography: An Integrated Approach*, 2nd edn, Nelson.

atmosphere prevent radiated heat from escaping) has been happening since at least the beginning of the industrial revolution. From the invention of the steam engine and subsequent industrial developments such as the internal combustion engine, concentrations of carbon dioxide, methane, nitrous oxide and chloroflurocarbons have greatly increased. As the effects of these so-called greenhouse gases continue to be felt across the world, research continues into their likely impacts.

Future scenarios

In 1999 the Inter-Government Panel on Climate Change published its 'Report on Climate Change Scenarios for the United Kingdom'. This claims that by the end of the present century, emissions of carbon dioxide could be as much as five times their present level, despite all the attempts at reduction globally. This is a 'worst case' scenario, the results of which would include higher global temperatures and sea levels, causing great social and economic upheaval. Yet this is only one of many possible outcomes portrayed in the report. As the report itself states, it must be remembered that scenarios are neither predictions nor forecasts, but alternative images of how the future might unfold. They are based on possible outcomes of different variables – for instance, population increase, economic growth, energy consumption and land use change. This results in several scenarios portraying a large range of possible futures, in which carbon dioxide emissions range from 4 gt (gigatonnes – a billion tonnes) per year to 34 gt!

Making accurate predictions from which to work is therefore not an easy task for those involved in trying to reduce emissions. This is partly because the gases themselves take decades to accumulate and have a very long life span – the effects are therefore cumulative and not immediately noticeable. Some argue that worst-case scenarios, such as that in which the Gulf Stream is diverted away from Britain's shores, leaving us with a climate more like that of Northern Canada, are simply scaremongering. Many others, however, believe that other scenarios provide examples of 'the very real threat that climate change represents to us' (Michael Meacher – Environment Minister in 1999). The degree of sensitivity of the climate to change is not clearly understood, but scientists generally believe that if greenhouse emissions dropped slightly, world temperatures in 2100 could be 1.0ºC higher than in 1990. If, instead, they were to increase a lot, and the climate proves very sensitive, the rise could be 3.5ºC.

Either way, the United Kingdom will be affected by the two main types of climate change effects:

- rising sea levels, leading to coastal flooding;
- changes in weather systems and an increase in the frequency of depressions passing over the UK.

Recent floods

Not only people's lives and possessions are affected by floods but also their long-term physical and mental health. Referring to the flooding at Northampton, the Emergency Planning Officer, Cliff Snelling, said: 'The area was characterised by piles of debris. At night, when the work stopped, an air of gloom and depression came over the area. After the first couple of months only 50% of people had moved back in.' The strain of losing so much takes its toll on people's health, and many elderly residents chose to stay in residential care rather than return to face their flood-damaged homes. A few families could not face going back, instead selling their houses at a greatly reduced price. Even after a year, some effects remained, with people anxiously watching the rivers every time it rained. In the worst hit areas, social services launched flood emergency response teams, able to offer practical and emotional support for up to six months after the floods.

After flooding in Yorkshire in 1998 the Assistant Director of Social Care and Health, Sally Bresnahan, said: 'For me, the most distressing thing was seeing the contents of homes in black bags and skips. Anything that was wet had to be thrown away.'

Against this backdrop of continuing misery and recurring floods across the country, the Environment Agency has been heavily criticised for not giving sufficient warning of torrential rains and subsequent flooding. Agency chiefs did admit their work had not been up to standard and later announced various measures costing £7 million to speed up the flood warning systems.

What can be done to reduce future flooding?

Whatever their views on the causes and likely future impacts of global warming, scientists and

environmental campaigners say that human exacerbation of this phenomenon can be reduced by a number of approaches:

- a reduction in energy consumption by making fewer journeys
- better insulation, to reduce energy consumption
- making use of advanced technology to achieve more efficient burning of fossil fuels
- wider use of natural gas in place of coal
- decarbonisation of exhaust gases from power stations
- increased use of renewable energy sources
- planting of trees and better land use management of existing forested areas
- controversially, greater use of nuclear power.

A major issue, however, is educating the public – especially in view of the fact that results are not immediate and will not benefit people living today, but future generations. The effects we are seeing today in terms of increased flooding resulting from climate change are the result of greenhouse gases emitted up until 1968. This is because the climate takes about 30 years to 'catch up' with pollution already emitted. Today's pollution and its damaging effects will not be felt until 2030.

A second difficulty is that attempts to improve energy efficiency have to be made at different scales, from individuals in their own homes, through to local authority policies on energy efficiency, to government legislation on fuel prices and finally to international discussions and agreements. The most recent of the latter took place at Buenos Aires in November 1998. Delegates from 180 countries attended and the United Kingdom was represented by the Environment Minister Michael Meacher. The conference developed discussions which had previously been initiated at the Kyoto Summit, and although many delegates would have liked to have seen a faster track to dealing with emissions on a global scale, the summit was a success in other respects. Most importantly perhaps is the fact that the United States, probably the world's worst polluter, is now firmly on board, together with many Third World countries. The latter will be helped by the Clean Development Mechanism to introduce and use technology with lower pollution levels. Also firmly involved in discussions were many large oil and industrial companies, including BP, Shell, Amoco and General Motors.

The initiatives proposed at Kyoto are gaining ground. The United Kingdom now has a legally binding target to reduce greenhouse gas emissions by 12.5% of 1990 levels by 2008–2012. In addition there is a higher domestic target of reducing carbon dioxide emissions to 20% below 1990 levels by 2010. The government published a consultation paper in October 1998 seeking views on policy options for meeting this target. It is the government's intention to develop a balanced programme of cost-effective measures across all sectors of the economy, exploiting opportunities for a more energy efficient industrial sector, the development and marketing of innovative technologies, better insulated homes and a more sustainable, less polluting transport system.

A similar strategy is in place on an EU-wide basis under which the European Commission has reached an agreement with ACEA, the European car manufacturers' representative. Under the terms of this agreement, ACEA is committed to achieve a reduction in carbon dioxide emissions from new cars sold in the EU, to an average of 120 g/km by 2005, or at the latest 2010. This will be a cut of about a third from the current average.

- January 1998 – Britain was hit by gales, heavy rain and flooding in many areas
- March 1998 – Easter flooding in Central and Southern England caused damage costing £1.5 billion, with the worst hit areas in the West Midlands (Figure 3). Five people lost their lives and 2,500 homes in Northampton were flooded. 7,000 people had to find emergency accommodation, leaving behind their homes and possessions. The local council's contingency plans were tested to the limit, with mass shelters, food and drink needed in addition to a widespread cleaning-up programme. Many people suffered more than they should, but arguably had only themselves to blame. Over half of the households affected had no contents insurance, relying instead on help from friends, relatives, the local authority, an appeal fund and the Benefits Agency.

Figure 3: Flooded streets in Northampton, April 1998

Photo: Paul Duckett

- October 1998 – Torrential rain and flooding caused damage estimated at between £100 and £300 million. This was the third occasion flooding had occurred in the United Kingdom this year and all of Wales was under a general flood warning. There was also bad news for home insurance in areas at risk. Premiums in flood-affected areas rose dramatically – in some cases by 30%.

Solutions closer to home

At the same time as international agreements are being developed and government strategies are being planned and put into action, individuals also need to seek solutions closer to home, especially in areas at risk from increased flooding. This risk of flooding has been greatly increased over the years by the development of housing on greenfield sites located on or near to river floodplains. To help educate residents in such areas, the UK Environment Agency, the government body responsible for flood warnings in England and Wales, has spent £2 million on a national advertising campaign which included radio adverts and 2,000 outdoor poster sites in high-risk areas. Homes and businesses also at risk were sent information packs. The agency also launched a new telephone information service. Floodline, as it is called, offers advice on home protection and details on flood warnings. People in high-risk areas who are registered with Floodline will receive an automatic voice message detailing new flood warnings. The agency's intention is to give two hours' advance notice of floods, but admits many cannot be accurately forecast.

In many cases, people's attitudes are a crucial factor in limiting the damage caused by floods. A staggering 1.3 million homes and businesses in England and Wales are at risk from flooding, but only 5% of people in these risk areas take the threat of flooding seriously enough to make any preparations to face it. The Environment Agency's Chief Executive, Ed Gallagher says there are simple ways of minimising the long-term effects of flooding:

- have adequate insurance protection
- protect vital documents
- clearly mark the location of gas and electricity switches which need to be turned off in a flood
- move valuable items out of the reach of water as soon as the first flood warnings are issued.

Figure 4: 'Floodline – how to reduce damage' – advice from the Environment Agency

More than one-and-a-half million homes and businesses are at risk in England and Wales and one of them could be yours. You have a better chance of reducing the damage if you are prepared. Take these few simple steps:

- Call Floodline on 0845 988 1188 for advice and information about flooding or in an emergency, contact the police
- Check if there are any specific flood warning arrangements for your area
- Find out if your area has been flooded before
- Don't wait for the flood to happen – prepare now
- Make a family flood plan so everyone knows what to do in a flood and how to contact each other
- Make a flood kit (torch, battery radio, necessary medication, emergency numbers, rubber gloves, insurance policy) and keep it in a safe place – upstairs if possible
- Make as many preparations as you can in daylight
- Know where to turn off gas and power supplies
- Watch what's happening. Is the weather worsening? What are other people doing? Should you be doing the same?
- Move your car to higher ground. Only two feet of fast flowing water can wash your car away
- Check on neighbours, they may need your help
- Block doors with sandbags or floorboards. If you can't get hold of sandbags improvise with carrier bags or pillow cases filled with sand or earth
- Move people, pets and treasured possessions upstairs or to higher ground
- Try to keep warm and dry. Take warm clothes and blankets upstairs if possible, along with a thermos and food
- Keep watching and listening – keep an eye on the weather and monitor television and local radio for announcements
- Don't touch items that have been in contact with the water - floodwater is likely to be contaminated and could contain sewage
- Don't think it can't happen again

Source: Website www.environment-agency.gov.uk/flood

Focus Questions

1. Start a weather log, possibly at different scales and locations. Note any instances of severe weather and flooding, both in the UK and abroad. Try to include associated weather systems and any other causes or factors that worsened the problems.

2. From this article and other floods you have studied, complete the following table:

Causes of flooding	Effects of flooding

Colour code the first column into 'natural' and 'human' causes. Colour code the second column into 'long-term' and 'short-term' effects

3. Pick out all the statements referring to 'who is to blame' for some of the effects of flooding in the UK. Study them carefully and decide whom you think the ultimate responsibility lies with – is it the Environment Agency, local councils or the people who live in at-risk areas?

4. Discuss how effective you feel the Environment Agency's strategies for minimising risks are (Figure 4). What else could/should be done?