Can Britain beat the storms ahead?

By Richard Gray

Along with all the damage and disruption, the deluge has brought heartache, tragedy and disease to its victims. Floods are scary things. And they are due to get a lot scarier.

Climate scientists predict that by the end of the century storms like those that have swept across England this summer will hit Britain far more frequently. National average rainfall will increase by around 20 per cent, and much of that will fall in extreme, torrential downpours bringing a month's worth of rain in a single day.

The reason is that, as the climate warms, the atmosphere above our heads will be able to hold more and more moisture which, when it is eventually released as rain, means much heavier rain, explains Peter Stott, a climate scientist at the Met Office's Hadley Centre for Climate Change.

"Extreme rainfall events are likely to get more extreme and it will lead to flooding," he says. "Although it is hard to predict exactly where the floods will occur on a local scale, people need to start thinking about whether we are ready for more of these."

An unusual meteorological event is responsible for this summer's weather. A shift to the south in the position of the jet stream brought a heatwave to eastern Europe and storms normally found in higher latitudes to England.

After years of worry about drought, the rain was initially welcomed, but as the ground became saturated it grew clear how ill-prepared the country is to cope with flooding.

Yet flooding is not a new phenomenon in Britain: history is peppered with such incidents. In 1953 a major storm engulfed much of the east coast and killed more than 300 people. Six years earlier, in March

1947, rivers burst their banks across the south, causing more than £300 million of damage in today's money. In October 2000, flooding hit Kent, Wales and Yorkshire, causing widespread havoc.

Despite this, we continue to build in harm's way on flood plains and neglect the infrastructure supposed to protect us. Scientists now warn that as the climate changes over the century, even improved flood barriers and coastal defences will not be enough.

Sea levels are expected to rise by up to 30in by 2080 and coastal erosion will render many current defences useless. Parched ground, caused by hotter summers, will be less able to absorb water, increasing the risk of flash flooding.

Climate modellers predict that by 2080, floods like this summer's, which have previously only happened once in every 150 years, will happen every 20 to 30 years. Insurers expect losses of more than £21 billion a year by the 2080s.

"The last two months should serve as a wake up call," says Celine Herweijer, principal scientist on climate change at disaster management consultants Risk Management Solutions. "We need quick, swift government action to deal with the increased risk of these heavy precipitation events."

Flood experts have already begun detailed mapping of British cities and towns in an attempt to understand how they will flood, using three-dimensional maps to predict how deep flood water will be and for how long it will linger.

Justin Butler, managing director of environmental risk consultants Ambiental, says that the Environment Agency needs to sacrifice land to give the water somewhere to go, rather than, as in the past, trying to control its flow.

A report by the Department of Environment, Food and Rural Affairs, entitled Making Space for Water, drew the same conclusions last year. It proposed sacrificing farmland, meadows and even sports pitches as a way of ensuring the least damage to buildings. This technique can also help to tame the destructive currents.

In Germany, the authorities have exploited marshland and constructed "wells" to help slow down floods. In Japan, properties are built on

raised ground with parkland, tennis courts and sports fields used to hold flood water.

Dr Butler says: "Constructing hard defences and flood walls, you are in effect only pushing the problem further downstream. There needs to be a significant upgrading of the sewer network and drainage systems to cope with more severe storm events."

The recent floods have revealed that in some areas drainage systems have been left to crumble and silt up with debris and litter. A recent recommendation by the Environment Agency states that for each new house built, more than £20,000 needs to be spent on new infrastructure such as drainage and sewers. Often, though, new developments are tagged on to the existing systems, adding to the strain.

David Crichton, a flood hazard specialist at the Benfield Hazard Research Centre, University College London, says: "The money that should have been spent on improving infrastructure just hasn't been spent. That is going to have to change."

As the flood risk increases, other experts claim the UK will need to change its building habits altogether. They believe it will be cost-effective to spend money making homes flood-resilient.

WATER WORLD

MAP SHOWS POTENTIAL EXTENT OF FLOODING IN BRITAIN BY 2080

— ACTUAL COASTLINE

• MOST AT RISK FROM TIDAL FLOODING/ HISTORY OF FLOODING

PERTHSHIRE

More than 6,000 properties at risk of river flooding

Rainfall to increase by 30%

ST ANDREWS, FIFE COAST AND FORTH ESTUARY

Famed for its low-lying golf courses, this area is particularly at risk of coastal flooding from rising sea levels

Low-lying parts of Edinburgh on the opposite side of the River Forth will also suffer as tides grow stronger

SCOTLAND

Scotland is less at risk of widespread flooding than England but localised flooding is still a problem. There has only been limited research completed at a local level

NORTH AYRSHIRE AND WEST COAST

Around 7,500 properties on low-lying areas in Paisley and Kilmarnock at risk from river flooding.

Dumbarton and Helensburgh at risk of coastal flooding

Rainfall to increase by 30%

HUMBER

The main risks are from sea level rise and river flooding

Sea levels expected to be 11 inches higher by 2050

Annual damage from flooding likely to increase up to £200 million

Winter rainfall to increase by 20%

BRISTOL CHANNEL, SEVERN AND AVON

Risk from sea level rise and storm surges, particularly on the Bristol Channel while extensive river flooding on the Severn and Avon will become more common.

Winter rainfall to increase by 30% while sea level to rise by 32 inches

More than a million homes will be at risk of coastal or river flooding by the end of the century

NORFOLK

Risk from river flooding is relatively small as the Broads provide capacity to reduce impact of river floods. Sea level rise poses the greatest risk, due to increases of up to 30 inches and causing significant coastal erosion. Tidal surges pose an even greater threat, sending sea water miles inland

Cost of annual damage likely to increase by 35%

20,000 homes at high risk of flood damage

Winter rainfall to increase by 30%

WALES

Annual cost of flood damage in Wales to rise from £70m to £1400m

Risk of flooding increased ten-fold

Flood risk has only been assessed on a national scale

THAMES VALLEY

Risk from tidal and river flooding

Winter rainfall in London to increase by 30%

Thames to rise by an average of 20 inches

1.25 million people and £80bn of property and major infrastructure on flood plain already

Annual damage from flooding expected to increase by £150 million

69 tube stations, 400 schools and 16 hospitals at risk of flooding in London alone as climate warms

MEDWAY ESTUARY

Risk from sea level rise and river flooding

Winter rainfall to increase by 22%

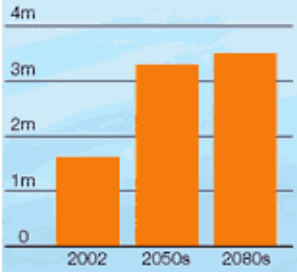
Sea level to rise by 21 inches

250,000 properties at risk of flooding

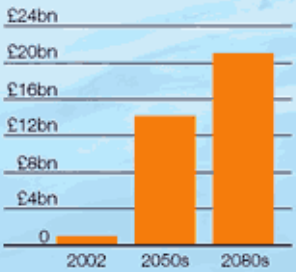
Damage to increase by up to £80 million a year

ST ANDREWS
FIRTH OF FORTH
HELENSBURGH
DUMBARTON
EDINBURGH
PAISLEY
KILMARNOCK
CARLISLE
LEEDS
YORK
HULL
WIGAN
SHEFFIELD
BOSTON
KING'S LYNN
NORWICH
SHREWSBURY
COVENTRY
WORCESTER
GLOUCESTER
CHELTENHAM
OXFORD
LONDON
ROCHESTER
CARDIFF
BRISTOL
FOLKESTONE

Number of people at high risk in England and Wales



Average annual damage in England and Wales



SOURCES: BBC, ENVIRONMENT AGENCY, FORESIGHT PROGRAMME, SCIENCE MEDIA CENTRE