

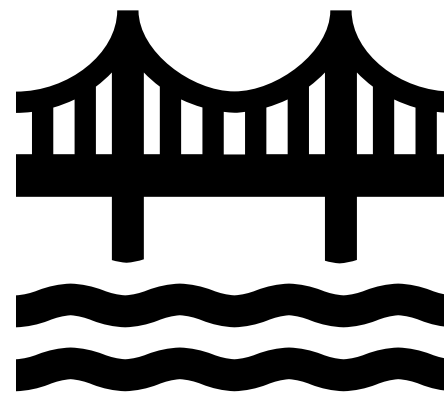
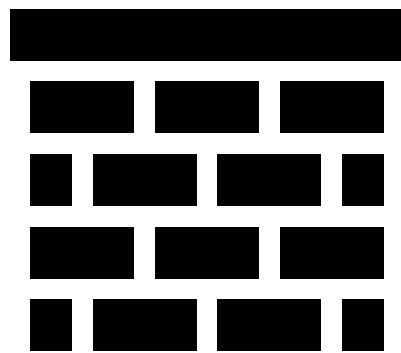
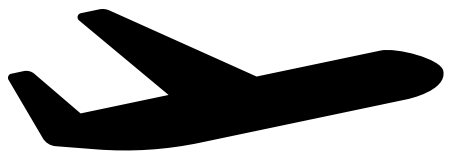
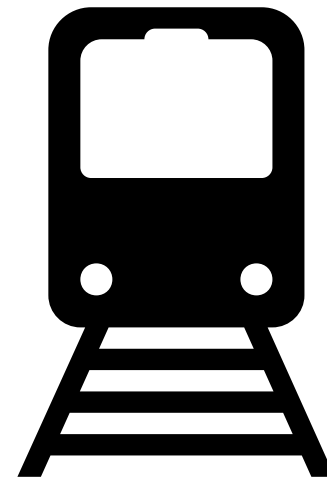
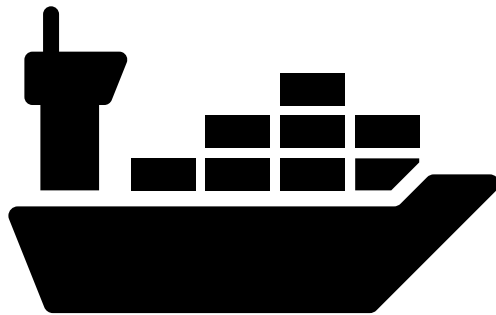
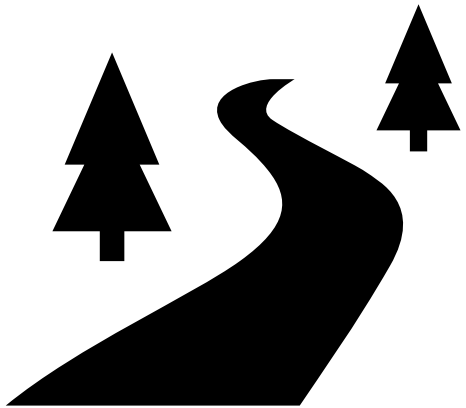


Climate Change



Infrastructure

- Infrastructure delivers services that supports jobs, drives economic growth, increases safety, and improves quality of life.
- Infrastructure in the UK is significantly impacted by the natural variability of the climate.





**245,000 Miles
of Road**



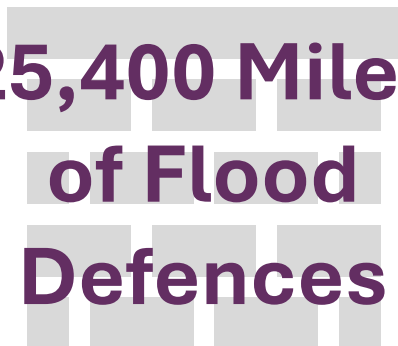
**52 Major
Ports**



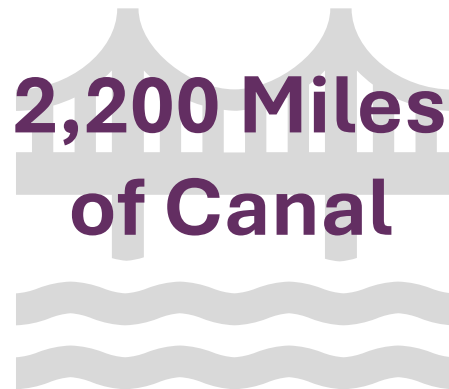
**2,537 Railway
Stations**



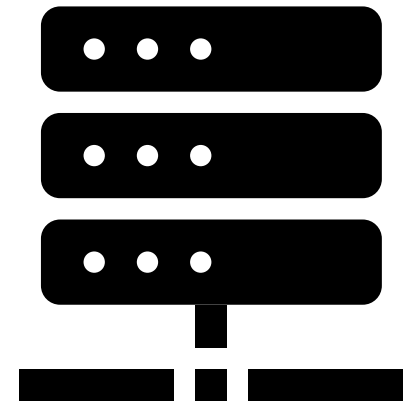
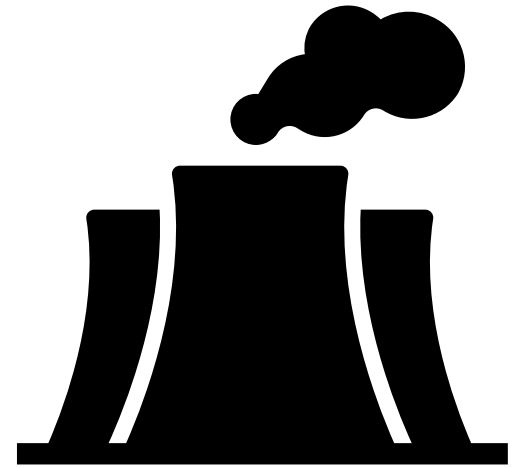
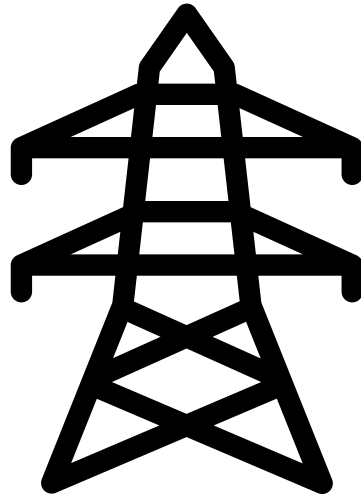
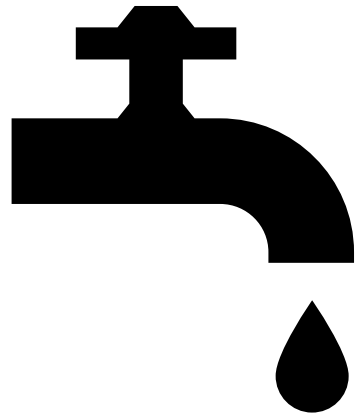
**55 Major
Airports**



**25,400 Miles
of Flood
Defences**



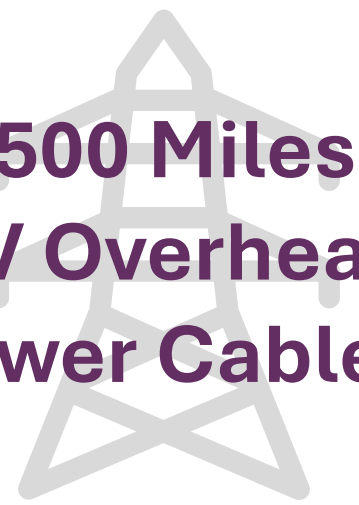
**2,200 Miles
of Canal**



9000
Wastewater
Treatment
Plants



15,500 Miles of
HV Overhead
Power Cables



460 Power
Stations



510 licensed
landfill sites



52,500
Mobile Base
Stations



3.5 million
square
metres of
data centres



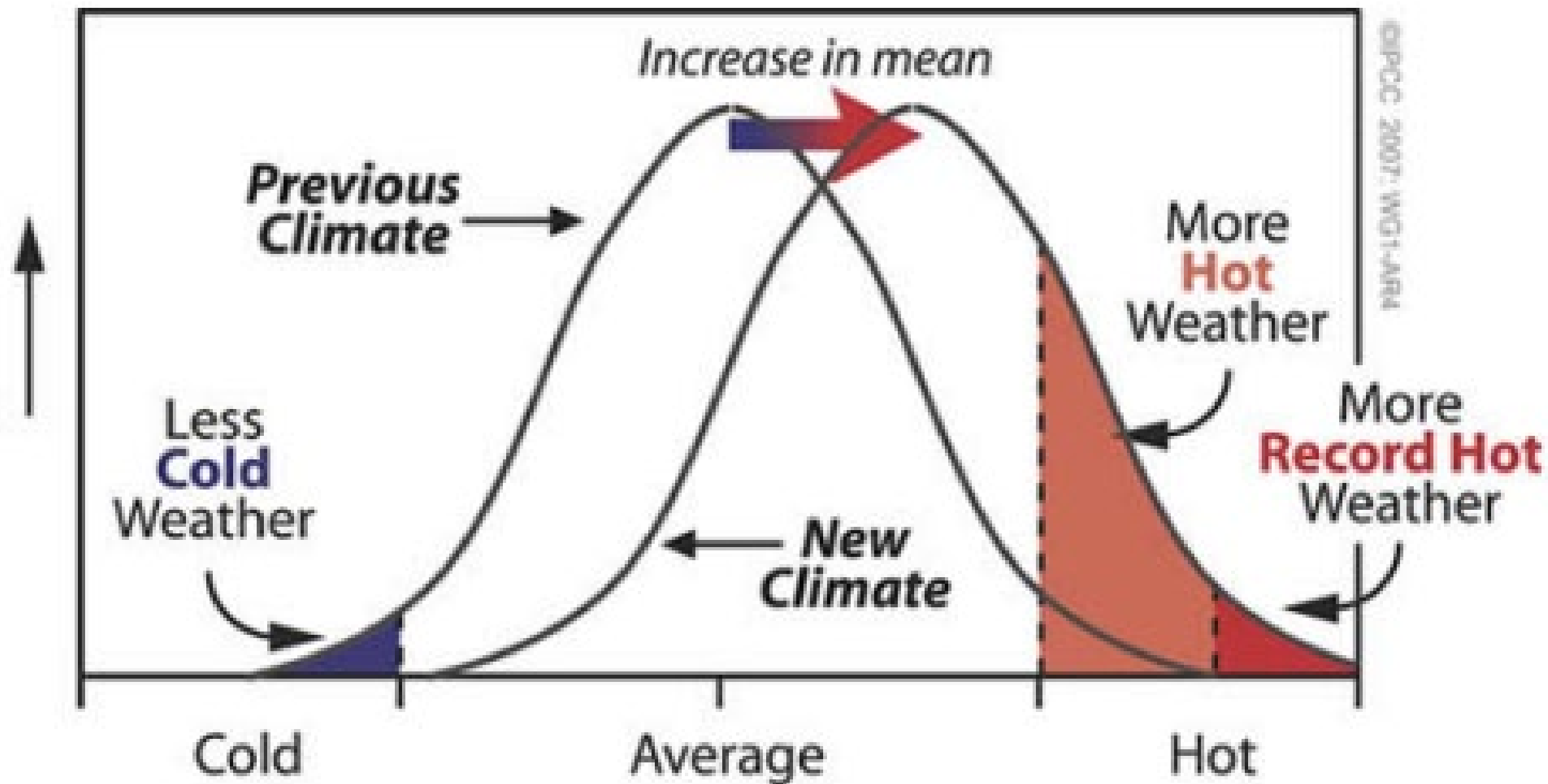


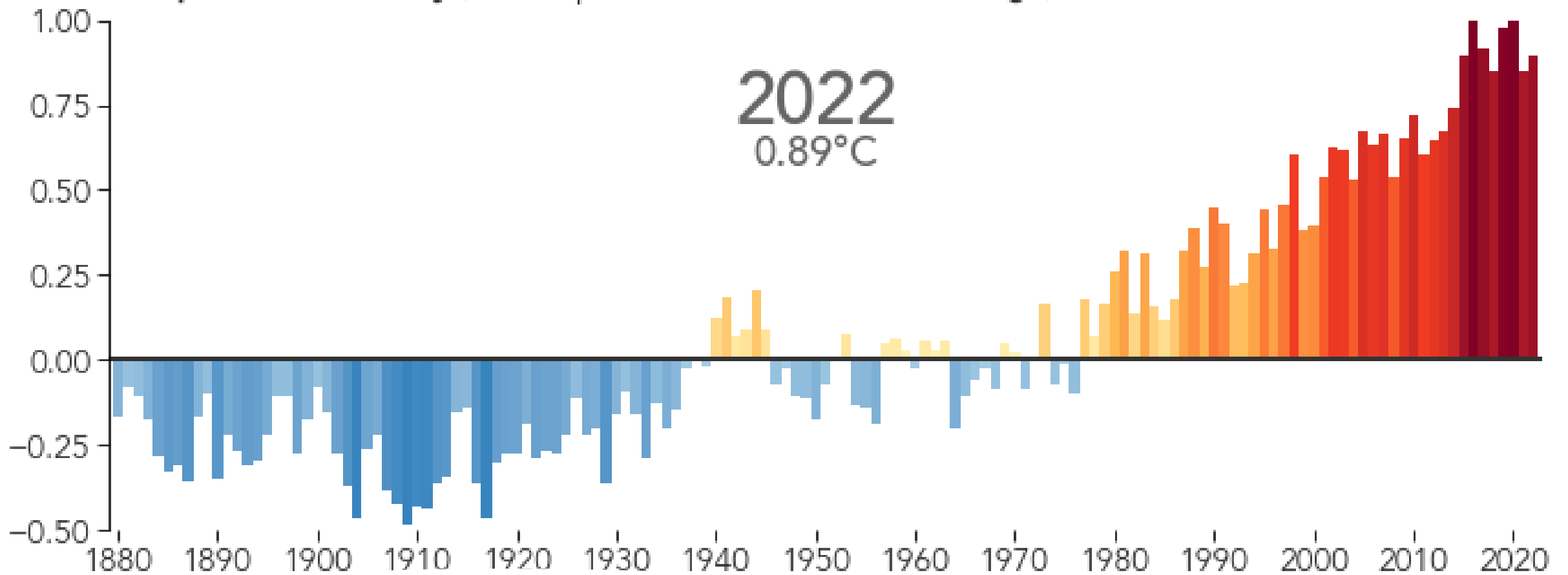
- Climate change can alter the design life and effectiveness of infrastructure services.

Infrastructure

- It is important to consider the scale of possible changes and variability in the UK's future climate in the context of risks to existing and future infrastructure

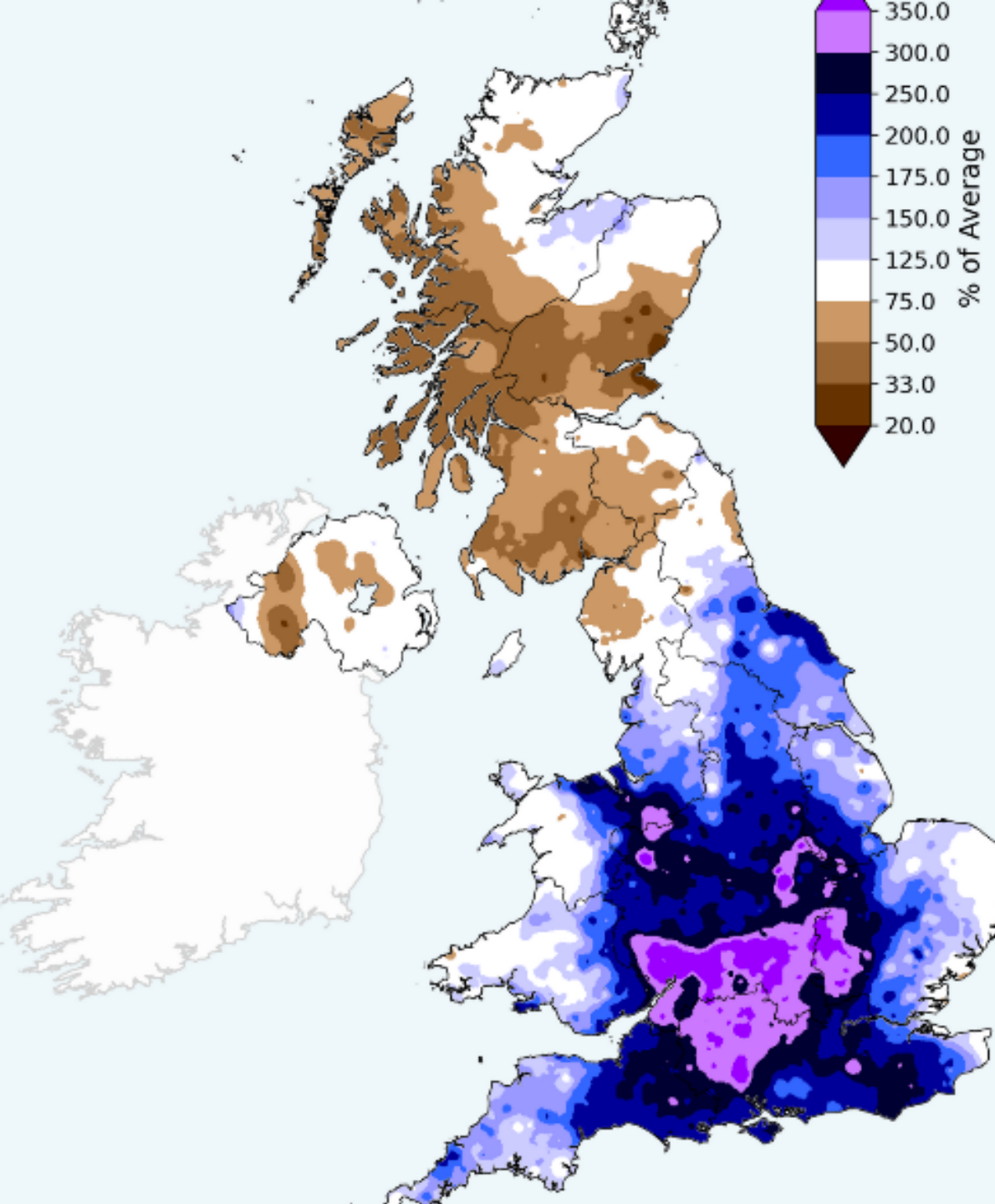
Probability of occurrence





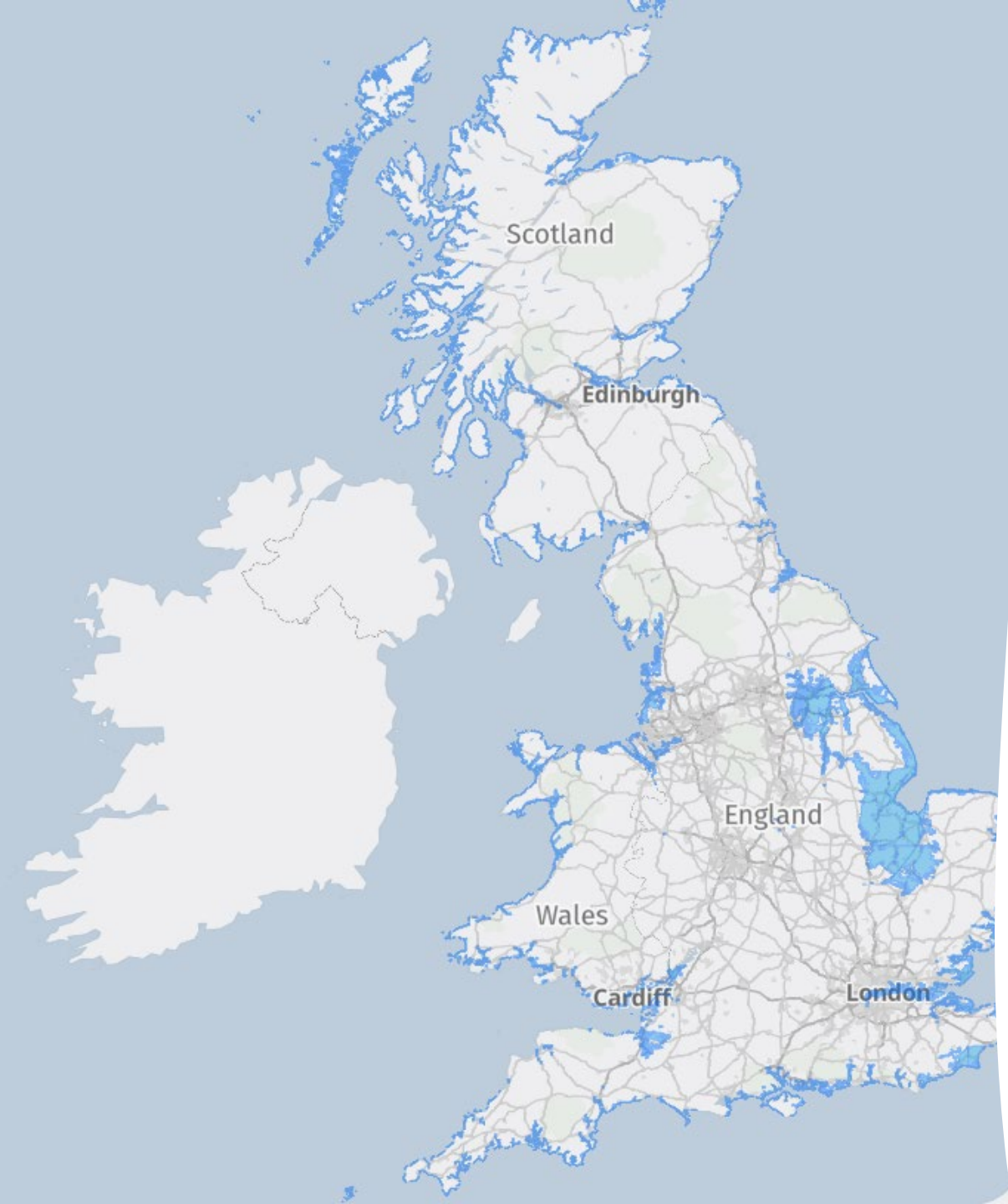
What has happened to date?

- The UK's ten warmest years on record have all occurred since 2000.
- 2024 was provisionally the fourth warmest year on record, with a mean temperature of 9.78°C, continuing the long-term warming trend.



What has happened to date?

- The UK saw 107% of the long-term average rainfall in 2024, with notable wet months like February and September, which saw more than 200% of their average rainfall in some areas.
- Several storms in 2024, including Storm Isha and Storm Darragh, brought significant wind and rain impacts



What has happened to date?

- Sea level around the UK rose by about 1-2mm/year during the 20th century, with the rate of rise varying from decade to decade and increasing to over 3mm/year in the past decade.
- Peak sea levels during extreme weather events appear to be rising at a similar rate.



What has happened to date?

- The UK has experienced frequent severe windstorms in recent years, including multiple storms in the 2023/24 season.

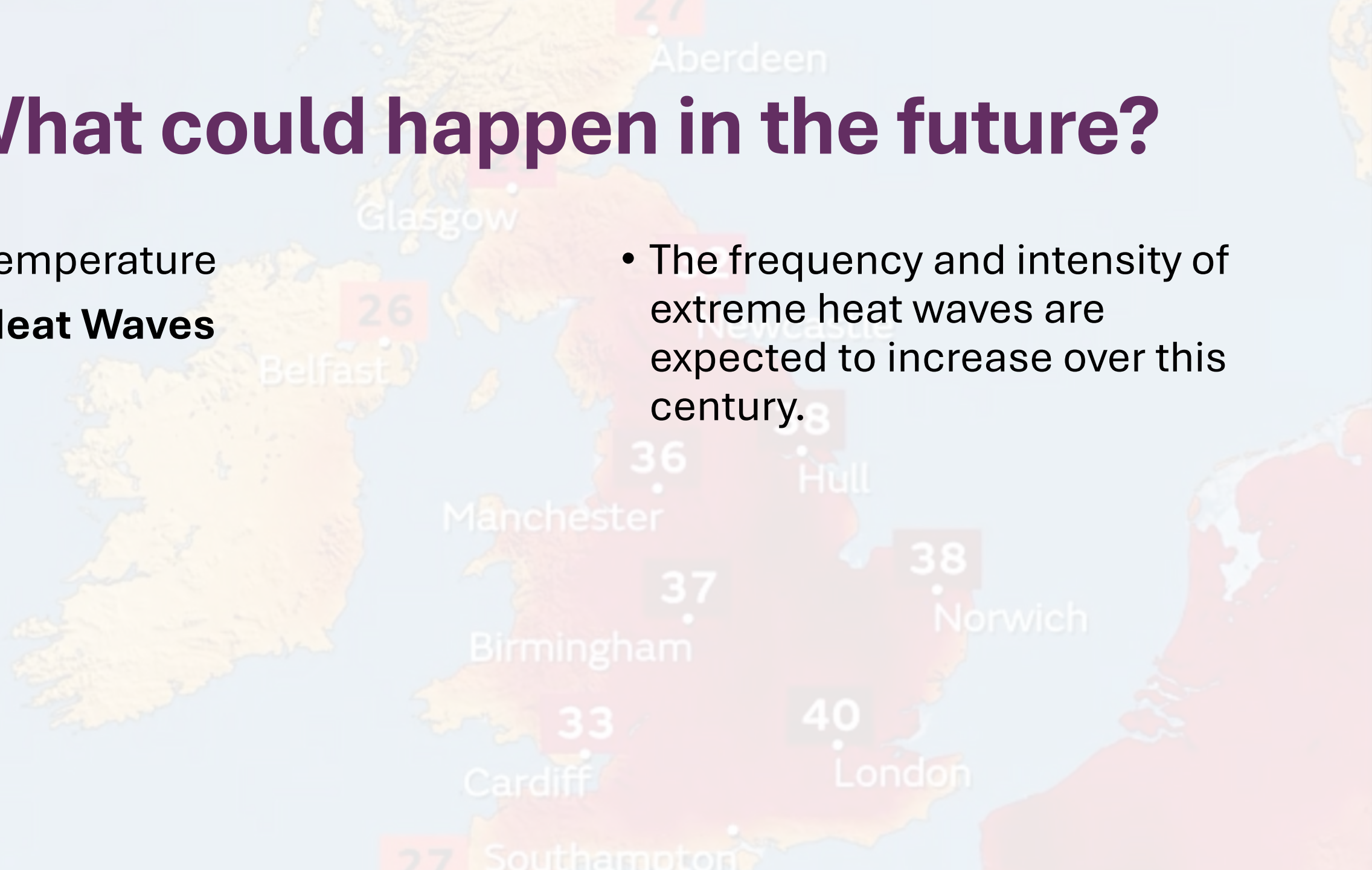
What could happen in the future?

- **Temperature**

- All UK regions are expected to warm – more so in summer than in winter.
- Changes in average summer temperatures are expected to be greatest in parts of Southern England and least in the Scottish Islands.
- Winter nights are expected to become milder.

What could happen in the future?

- Temperature
- **Heat Waves**
- The frequency and intensity of extreme heat waves are expected to increase over this century.



What could happen in the future?

- Temperature
 - Heat Waves
 - **Rainfall**
- Annual average rainfall may not change much over the 21st century, but regional and seasonal changes may occur.
 - The west of the UK may see winter rainfall increase by up to a third by the end of the century.
 - There will be an increased chance of summers having lower rainfall but downpours may become heavier when they occur

What could happen in the future?

- Temperature
 - Heat Waves
 - Rainfall
 - **Sea Level**
- This will continue to rise around the UK, probably at a faster rate than observed in the last century.
 - This will lead to higher peak sea levels during extreme weather events

What could happen in the future?

- Temperature
 - Heat Waves
 - Rainfall
 - Sea Level
 - **Humidity**
- Relative humidity may decrease by up to 5-10% during summer, with the greatest reductions in Southern England and smaller reductions further north

What could happen in the future?

- Temperature
 - Heat Waves
 - Rainfall
 - Sea Level
 - Humidity
 - **Solar Radiation**
- This may increase on average across the UK, with the greatest increase expected in Southern England

What could happen in the future?

- Temperature
 - Heat Waves
 - Rainfall
 - Sea Level
 - Humidity
 - Solar Radiation
 - **Fog**
- The annual number of ‘fog days’ is expected to fall by 20-50% with the largest decreases in Northern Britain and North Wales.
 - During winter, there may be an increase of 5-20% in the number of fog days across Southern Britain and the Midlands.

What could happen in the future?

- Temperature
 - Heat Waves
 - Rainfall
 - Sea Level
 - Humidity
 - Solar Radiation
 - Fog
 - **Wind**
- Changes to atmospheric circulation may shift storm tracks north or south, although changes in wind speeds are uncertain

What could happen in the future?

- Temperature
 - Heat Waves
 - Rainfall
 - Sea Level
 - Humidity
 - Solar Radiation
 - Fog
 - Wind
 - **Lightning**
- Increases in the number of 'lightning days' are expected across the whole of the UK during all seasons, although the figures are uncertain.

Energy

There are several ways in which a changing climate can cause vulnerabilities in the energy infrastructure:



Energy

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There are several ways in which a changing climate can cause vulnerabilities in the energy infrastructure:

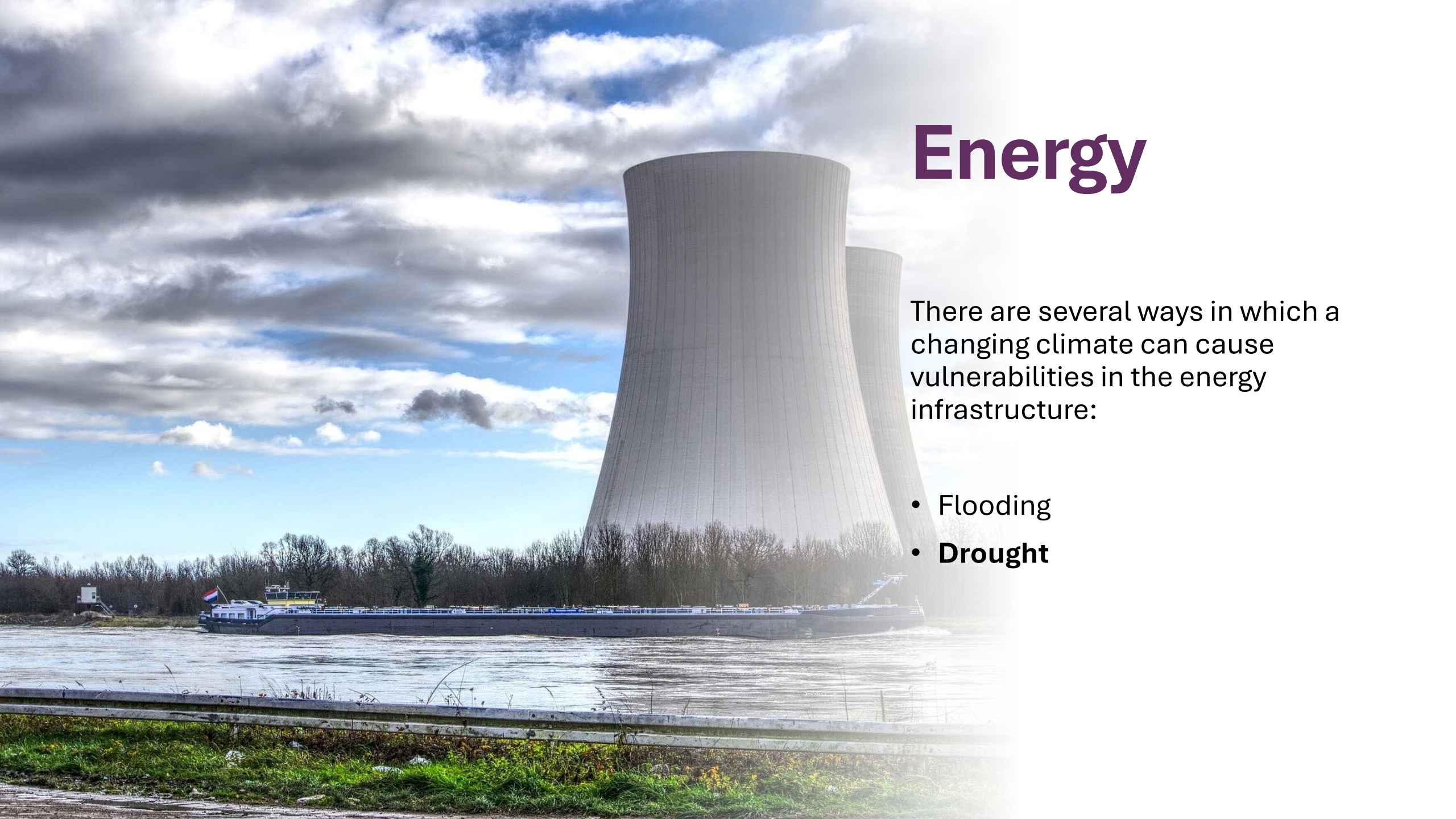
- **Flooding**



Energy

There are several ways in which a changing climate can cause vulnerabilities in the energy infrastructure:

- Flooding
- **Drought**





Energy

There are several ways in which a changing climate can cause vulnerabilities in the energy infrastructure:

- Flooding
- Drought
- **Extreme Weather**

Transport

The transport system is very vulnerable to the impacts of climate change. The transport infrastructure comprises many different systems, and each is vulnerable to a range of climate threats.

Transport

Roads / Pedestrian Routes /
Cycle Paths:

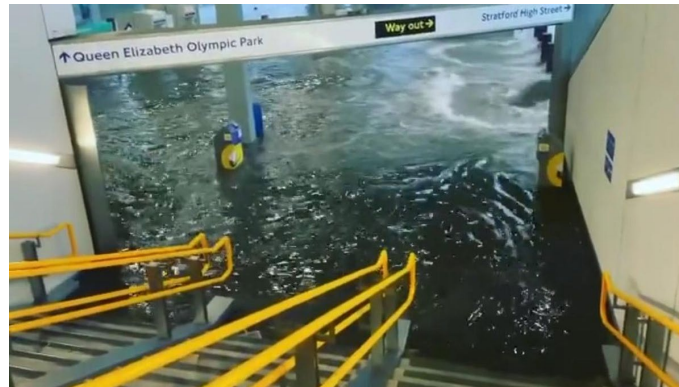
- Storm Surge
- Prolonged Rainfall
- Flood
- Drought
- Snow
- Extreme Wind
- Frost
- Fog
- Soil Shrinkage



Transport

Surface and Underground Railway:

- Storm surge
- Prolonged rainfall
- Flood
- Snow
- Extreme wind
- Prolonged High Temperatures
- Humidity affecting trackside equipment



Transport

Airport / Airways:

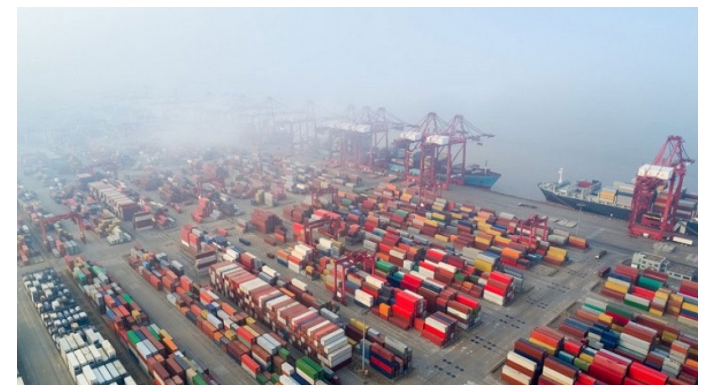
- Electric Storm
- Flood
- Drought
- Snow
- Extreme Heat
- Extreme Wind
- Fog



Transport

Ports / Coastal Infrastructure:

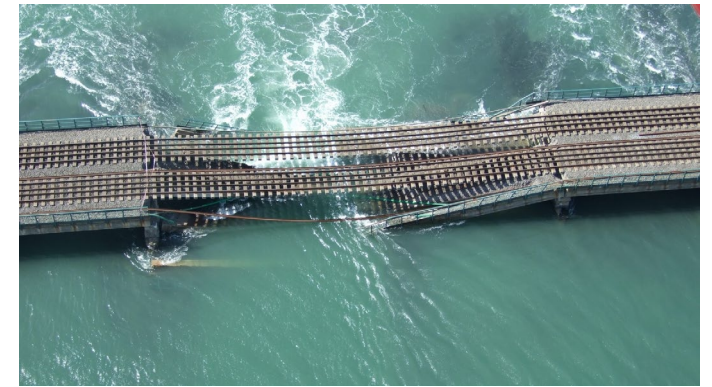
- Sea Level Rise
- Storm Surge
- Flood
- Fog
- Erosion



Transport

Inland Waterways / Bridges:

- Storm Surge
- Prolonged Rainfall
- Flood
- Drought
- Frost
- Soil Shrinkage
- Changes in Wind Direction
- Scour Patterns



Transport

Tunnels:

- Flood



Communications

ICT infrastructure is sensitive to climate effects in a number of ways.

These fall into two classes:

- Fast Acting Issues

Communications

ICT infrastructure is sensitive to climate effects in a number of ways.

These fall into two classes:

- Fast Acting Issues
- Slow Acting Issues

Water

Water infrastructure is directly affected by climate change

Water

Water infrastructure is directly affected by climate change

- Changes in precipitation will change the quality of raw water and increases in rainfall intensity will lead to increased water pollution incidents.



Water

Water infrastructure is directly affected by climate change

- Increases in the intensity of severe rain events will lead to an increase in the frequency and severity of flooding



Water

Water infrastructure is directly affected by climate change

- Increased sea levels will lead to failure of or damage to flood defences in coastal and estuary areas.
- It will also cause saline intrusion into coastal aquifers and sewers.
- Planning and implementation of managed retreat for some communities and agriculture will be required





Water

Water infrastructure is directly affected by climate change

- Dry periods in combination with floods could change erosion and deposition patterns on river and canal banks, impacting on navigable waterways
- Changes in coastal erosion patterns could affect maritime navigation.
- Inland waterways are also directly affected by changes in water level due to drought and flood



Water

Water infrastructure is directly affected by climate change

- Hotter, drier summers will lead to changes in demand, including increased need for irrigation



Water

Water infrastructure is directly affected by climate change

- Higher mean water temperatures affect biological treatment processes and drinking water quality in distribution networks.
- Increased evaporation will lead to reductions in available yields in reservoirs, lakes and rivers

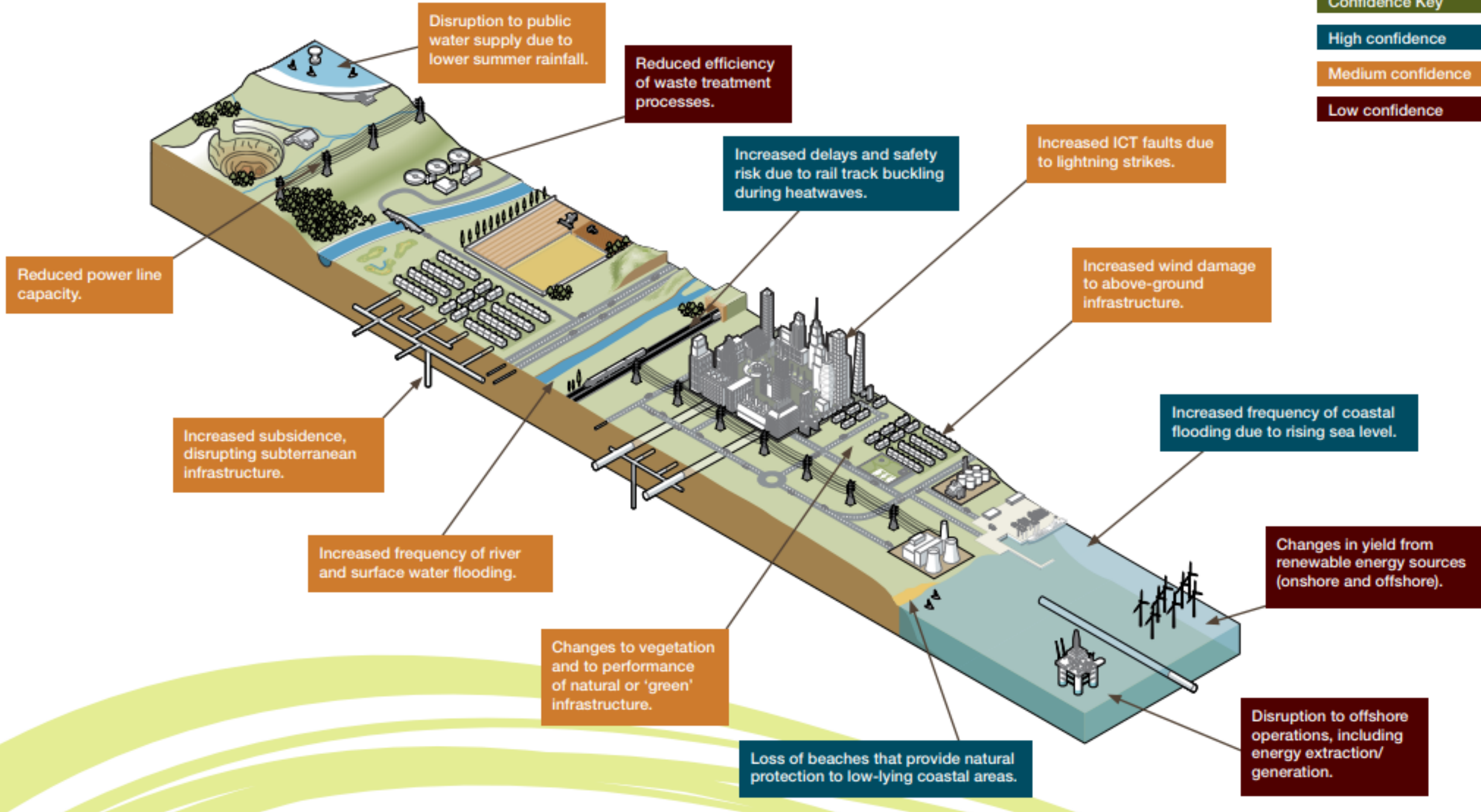


Confidence Key

High confidence

Medium confidence

Low confidence



Infrastructure sector

Rail transport

Road transport

Inland waterway transport

Ports & marine transport

Potable water

Waste water & sanitation

Flood & coastal erosion management

Information & communication technology

Solid waste

Nuclear, coal, oil & gas energy

Renewable energy generation

Power systems, transmission and distribution

Energy demand

Climate impact

Sea level rise				Rainfall							Temperature					Other factors				
Damage or disruption from coastal flooding	Tidelocking	Saline intrusion	Coastal erosion	Damage or disruption fom river flooding	Damage or disruption from pluvial flooding	Droughts and low precipitation	Altered capability or efficiency	Biological processes and/or disease	Stability of earthworks	Severe heat	Severe cold, snow and ice	Altered capacity or efficiency	Subsidence and /or dessication	Biological processes and/o/r disease	Demand for service	Lightning strike	Humidity	Solar radiation	Fog	Storminess and wind damage
X			X	X	X	X	X		X	X	X	X	X		X	X	X			X
X			X	X	X		X		X	X	X	X	X		X		X		X	X
X	X			X	X	X			X	X	X	X	X		X					
X	X		X	X	X	X	X	X		X	X	X	X	X	X				X	X
X	X	X		X	X	X		X		X	X	X	X	X						
X	X		X	X	X				X	X			X	X						X
X				X	X	X	X			X	X	X				X	X			X
X			X	X	X	X		X	X	X		X		X						X
X				X	X	X	X					X						X		X
X				X	X					X		X				X				X
X				X	X	X				X	X				X			X		

Decision

Costs

Upfront and ongoing financial costs of hard engineering measures

Ongoing financial costs of soft measures

Environmental costs, such as use of materials

Social costs, such as noise and disruption

Benefits

Avoided costs

Immediate cost of repairs

Lost revenue

Compensating customers

Social, safety and environmental costs

Wider economic costs

Passenger delays

Freight delays

Disrupted movement of staff

Lower transport demand

Impact on local businesses

Reduced employment

Impact on local tourism

Reduced spending power for transport users

Reduced spending power for transport operators and owners

Indirect benefits

Increased employment

Increased private investment

Lower unemployment benefit payments

Increased transport efficiency