UK CLIMATE RISK

TELECOMS AND ICT BRIEFING

Findings from the third UK Climate Change Risk Assessment (CCRA3) Evidence Report 2021

TELECOMS AND ICT

This briefing summarises how telecoms and information and communications technology (ICT) have been assessed in the latest UK Climate Change Risk Assessment (CCRA) Technical Report, and what types of action to adapt to the relevant climate change risks would be beneficial in the next five years.

The full assessment looks at risks and opportunities for the UK under two climate change scenarios, corresponding to approximately a 2°C or a 4°C rise in global temperature by 2100. It answers three questions, for 61 different risks or opportunities using available published evidence and analysis:

1. **What is the current and future level of risk or opportunity?**
2. **Is the risk or opportunity being managed, taking account of government action and other adaptation?**
3. **Are there benefits of further adaptation action in the next five years, over and above what is already planned?**

The main findings from the full assessment related to telecoms and ICT are summarised below, together with the adaptation actions that would be beneficial over the next five years. Each risk or opportunity has an identifier code linked to the full analysis, which is available in the CCRA3 Technical Report.

Readers are encouraged to use these briefings to locate the parts of the Technical Report of most relevance to them.

Alternatively, if you would like a summary of the analysis by UK nation, please go to the national summary documents:

• **England** • **Northern Ireland** • **Scotland** • **Wales**

This briefing is aimed primarily at the UK Government, the governments of Scotland and Wales, the Northern Ireland Assembly and their respective departments and agencies responsible for telecoms and ICT. However, it should also be of interest to a wider audience.

Key messages

- Telecommunication and ICT infrastructure assets represent a key element of the UK infrastructure system and underpin the operation of most other forms of infrastructure.
- There is increasing available evidence of the impacts of weather-related events on ICT and telecoms, including damage to assets, power failures, and poorer performance due to heavy rainfall or temperature extremes and fluctuations.
- While direct outage incidents to ICT networks and services from weather-related incidents are not currently of high concern, quantitative projections assessing how climate change will affect the frequency and magnitude of future interruptions are lacking.
- The risk of telecoms and ICT infrastructure being directly affected by flooding is lower than the risk to other infrastructure types such as energy assets, but disruption caused by flooding of the latter could indirectly cause telecoms and ICT outages. High temperatures are of greater concern.
- There are also risks to sub-surface infrastructure, such as underground cables, with damage potentially becoming more frequent in future due to subsidence, though the risk is not thought to be large.

Risks, opportunities, and benefits of further action

More action needed

Further investigation

Sustain current action

Maintain a watching brief

Average UK wide scores

I13. Risks to digital from high and low temperatures, high winds, lightning (I13)

I1. Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures (I1)

I2. Risks to infrastructure services from river, surface water and groundwater flooding (I2)

I3. Risks to infrastructure services from coastal flooding and erosion (I3)

I7. Risks to subterranean and surface infrastructure from subsidence (I7)

1. Risks to digital from high and low temperatures, high winds, lightning (I13)

As well as local outages, failure of telecommunications and ICT infrastructure networks can lead to reduced capacity in a wide range of other essential services.

Climate-related impacts on the sector include: mobile base station power failure because of extreme weather including high winds and lightning; ground shrinkage leading to failure of electricity, gas and water pipes, thereby damaging co-sited ICT infrastructure; high summer temperatures and rapid fluctuations in temperature and humidity posing challenges to data centres which need to be kept cool to operate; poorer performance of radio systems due to heavy rainfall; and greater international communication disruption due to increase sea temperatures.

Currently, outage incidents to ICT and telecoms networks and services from weather-related incidents are considered minimal relative to other causes. Between 2016 and 2017, only 1% (five out of 648) of incidents were caused by severe weather (flooding, storms or snow).

Quantitative projections assessing how climate change will affect the frequency and magnitude of future interruptions are, however, lacking. Summer operation of some facilities is already being affected and this will be exacerbated by projected increases in summer temperatures.

The magnitude of risk is considered low at present, rising to medium by the 2050s across the UK.

Beneficial actions in the next five years include:

- **Further attention to the climate resilience of this sector and quantitative information on current and future risks under different climate change scenarios, to better assess its vulnerability and exposure, alongside incorporating digital infrastructure into existing infrastructure climate adaptation plans.**
- **Recognise the importance of ICT provision in underpinning the operation of most other forms of infrastructure. The ownership of a large proportion of ICT infrastructure, particularly data centres, base stations and network connections, are spread across the private sector.**

Further details on this risk: Infrastructure Technical Chapter, risk I13

The UK is expected to experience **warmer, wetter winters** and **hotter, drier summers** as the climate changes. **Sea levels** will also continue rising.

2. Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures (I1)

Vulnerabilities on one infrastructure network can cause problems on others, and telecoms and ICT infrastructure represent a significant part of this system.

Recent research conducted to support the CCRA has indicated that the vulnerability of interconnected systems may be significantly underestimated. The risk of network failures is already high, potentially affecting hundreds of thousands or millions of people per year, particularly in urban areas.

There are many examples that show how telecommunications are an integral part of this interconnectedness, with a particularly strong connection with the energy sector given that all ICT and telecoms systems are reliant on electricity supply, as well as underpinning the energy sector itself along with transport and water.

Examples include the loss of electrical power at a major exchange in Birmingham in 2011 which led to the loss of broadband connection to hundreds of thousands of customers in the UK, and the flooding of a substation in Lancaster following Storm Desmond in December 2015, leaving the city without power for more than 30 hours, resulting in mobile network, internet and digital radio downtime.

There is also an increase in dependence on ICT for all systems coupled with a gap in knowledge around the location of ICT infrastructure and the criticality of its function. As a result of such analysis, the overall risk of cascading failures is of high magnitude now and in future.

Beneficial actions in the next five years include:

- **Improving resilience to a single infrastructure sector (such as protecting electricity substations from flooding) can result in much wider benefits when considering the cascading impacts that are avoided.**
- **Using common formalised standards of resilience, such as the new ISO 14091 standard, across different infrastructure sectors including telecoms and ICT to help build systemic resilience across the whole infrastructure system.**

Further details on this risk: Infrastructure Technical Chapter, risk I1

The UK's annual average temperature has **increased by 1°C** above the pre-industrial period.

3. Risks to infrastructure services from river, surface water and groundwater flooding (I2)

River and surface flooding is a perennial risk to UK infrastructure, with each season adding new evidence to underpin the significant magnitude of the threat.

Ofcom requires all telecoms sites to be protected from flooding and assets are generally located away from flood zones or at elevation. However, flooding and associated power failures can have significant implications on the UK's telecoms and ICT infrastructure (as shown in risk I1).

Energy infrastructure is especially at risk from flooding, with 178 power stations and 575 substations currently at risk from surface water flooding and 67 power stations and 234 substations at risk from river flooding.

The risk increases significantly from surface water flooding to energy assets in the future, potentially doubling the risk in a 4°C warming scenario.

The magnitude of the risk to infrastructure as a whole is considered high now and in the future.

Beneficial actions in the next five years include:

- **Developing consistent indicators of resilience to flood risk across all critical national infrastructure sectors and networks, including telecoms and ICT.**
- **Consistent indicators of resilience across sectors and for different sources of flooding would allow for improvements to be better measured over time, building on improvement in local hazard information, such as the Cabinet Office's Resilience Direct platform which provides street-level surface water flood forecasts to authorities and category 1 and 2 responders.**

Further details on this risk: Infrastructure Technical Chapter, risk I2

Later this century more of the rain in summer will come from **short lived high intensity showers.**

4. Risks to infrastructure services from coastal flooding and erosion (I3)

Sea levels are currently rising and the rate of rise is accelerating, including around the UK.

Current projections show the likely change to be between 0.27 and 1.12 metres by the end of the century. Coastal flood and erosion risk to infrastructure services, including those associated with telecoms and ICT, will therefore grow.

The consequences of coastal flooding have been tempered over time due to improvements in flood defences, together with advances in flood forecasting, warning and emergency response and spatial planning. Despite this, notable coastal flooding incidents have still occurred that have significantly impacted infrastructure, and assets remain located in low lying coastal areas which will be threatened in the event of a defence failure. However, telecom assets are also generally found to be located away from coastal flood zones or at elevation, therefore the greater risk from coastal flooding to telecoms could be the failure of energy infrastructure, which is at greater risk from sea level rise though generally well protected (particularly nuclear power stations that are all positioned along the coast).

The magnitude of the risk to infrastructure as a whole is considered medium now and in the future across the UK.

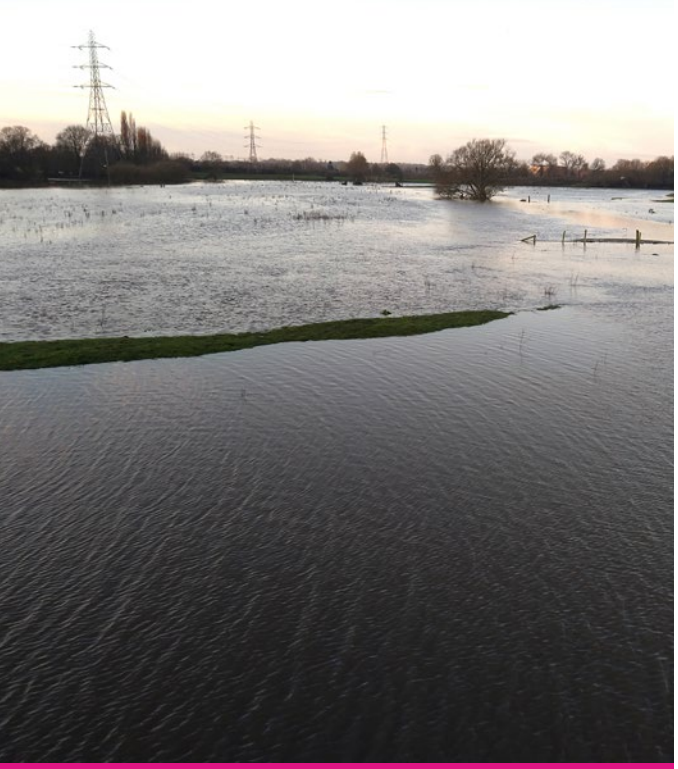
Beneficial actions in the next five years include:

- **The use of adaptation pathways for the long-term planning of flood risk management, first used in developing the Thames Estuary 2100 flood risk management strategy, has been shown to be a promising technique that can be applied more widely in the UK.**
- **Given the uncertainties around sea level rise, 'what if' planning for high coastal risk scenarios can help with understanding what could be done in the event of very high rates of change.**

Further details on this risk: Infrastructure Technical Chapter, risk I3

The chance of **extreme maximum daily temperatures** will increase.

5. Risks to subterranean and surface infrastructure from subsidence (I7)



Damage to infrastructure due to subsidence often occurs as a direct result of shrinking and swelling of clay soils due to changes in soil water content. This form of subsidence is regarded as the most damaging geological hazard in Britain today.

Buried and surface infrastructure is vulnerable to damage and disruption due to climate change driven subsidence effects. 15% of small (<50m) telecommunication masts are in areas that are highly susceptible to subsidence.

Underground cabling may often be located in areas of subsidence, though as it is more flexible than other types of buried infrastructure (e.g. gas pipelines) it is less vulnerable to minor earth movements.

The magnitude of the risk to infrastructure as a whole is considered low currently, rising the medium across the UK by the 2050s.

Beneficial actions in the next five years include:

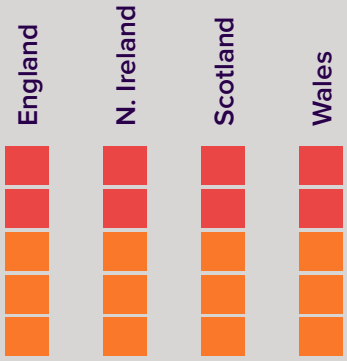
- **Production of more accurate and consistent data for understanding the linkages between subterranean and other types of infrastructure, and understanding potential adaptation strategies, which is mainly limited to monitoring at present.**
- **Quantifying the uncertainty in soil properties.**
- **Increased ground and weather monitoring and the use of real-time decision support tools as a potential method to mitigate the risks of shrink-swell subsidence.**

Further details on this risk: Infrastructure Technical Chapter, risk I7

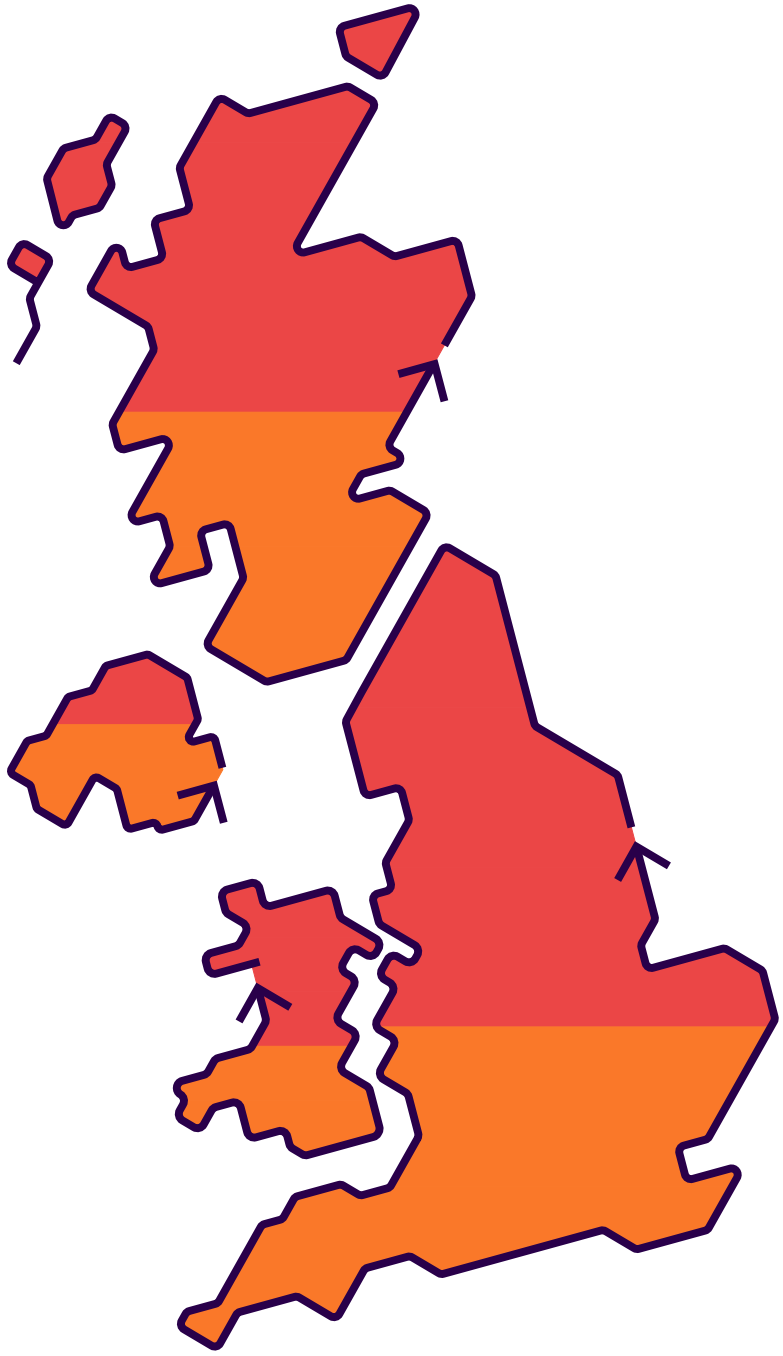
Variations across the UK

Key

- More action needed
- Further investigation
- Sustain current action
- Maintain a watching brief



Risk or opportunity	England	Northern Ireland	Scotland	Wales
Risks to digital from high and low temperatures, high winds, lightning (I13)	●	●	●	●
Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures (I1)	●	●	●	●
Risks to infrastructure services from river, surface water and groundwater flooding (I2)	●	●	●	●
Risks to infrastructure services from coastal flooding and erosion (I3)	●	●	●	●
Risks to the viability of coastal communities from sea level rise **(H4)**	●	●	●	●



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Background

The UK Government is required by the UK Climate Change Act 2008 to assess the risks and opportunities from climate change to the UK every five years and respond to the risks via a National Adaptation Programme, covering England. The devolved administrations also publish their own adaptation programmes in response to the risk assessment.

For this third UK Climate Change Risk Assessment, the Government's independent advisers on climate change, the Climate Change Committee (CCC), have been asked to prepare an independent risk assessment setting out the latest evidence on the risks and opportunities to the UK.

Over 450 people from more than 130 organisations have contributed to preparing the assessment. The risks have been assessed using the latest climate projections for the UK which were updated in 2018 by the Met Office. These briefings summarise some of the key topics that are assessed through the Technical Report, to enable readers to understand the key messages and where to find more detail.

Where to find more detail

Each risk or opportunity in this briefing has an identifier code linked to the full analysis, which is available in the CCRA3 Technical Report. Readers are encouraged to use these briefings to locate the parts of the Technical Report of most relevance to them.

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