



An Coimisiún um  
**Rialáil Cumarsáide**  
Commission for  
**Communications Regulation**

# Climate Change and its Effect on Network Resilience

A study by Frontier Economics on the Impact  
Climate Change and Adaptation have on  
Telecom Networks in Ireland

## Information Notice

**Reference:** ComReg 22/100

**Version:** Final

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# 1 Background

1. Green House Gas (“GHG”) emissions that result from human activities increase the average surface temperature of the earth, leading to global warming and climate change. A report commissioned by the Environmental Protection Agency (“EPA”) on the status of Ireland’s climate<sup>1</sup>, observes that over the last 110 years, the mean annual surface air temperature has increased by approximately 0.8 °C. The resulting effects of global warming will lead to increased frequency, intensity, and/or duration of extreme weather events.
2. With the aim of ensuring that all parts of society are ready to adapt to climate change, Ireland developed and published its first statutory National Adaptation Framework<sup>2</sup> (“NAF”) in 2018, in accordance with the Climate Action and Low Carbon Development Act 2015<sup>3</sup> (“Act of 2015”). Furthermore, in 2019 the Irish Government published a Climate Action Plan (“CAP 2019”)<sup>4</sup>, which was revised in 2021 (“CAP 2021”)<sup>5</sup>. CAP 2021 sets out actions for climate change mitigation and adaptation.
3. A study to “Understand the effects of climate change on telecom networks” is included as Action 63 of CAP 2021<sup>6</sup> and ComReg is designated as the lead body for its delivery.
4. ComReg is also required under the Climate Action and Low Carbon Development (Amendment) Act 2021<sup>7</sup> to: “in so far as practicable, perform its functions in a manner consistent with-
  - (a) the most recent approved climate action plan,
  - (b) the most recent approved national long term climate action strategy,
  - (c) the most recent approved national adaptation framework and approved sectoral adaptation plans,
  - (d) the furtherance of the national climate objective, and

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<sup>1</sup> [Dwyer, N. \(2013\) 'The status of Ireland's climate, 2012. Wexford, Ireland: Environmental Protection Agency.](#)

<sup>2</sup> [National Climate Change Adaptation Framework \(NCCAF\), Department of the Environment, Climate and Communication, published 15<sup>th</sup> December 2013.](#)

<sup>3</sup> [Climate Change Action and Low Carbon Development Act 2015 \(Number 46 of 2015\).](#)

<sup>4</sup> [Climate Action Plan, Department of the Environment, Climate and Communication, published 17 June 2019](#)

<sup>5</sup> [Climate Action Plan 2021, Department of the Environment, Climate and Communication, published 4 November 2021](#)

<sup>6</sup> [Climate Action Plan 2021 – Annex of Actions](#)

<sup>7</sup> [Climate Change Action and Low Carbon Development Act 2021 \(Number 32 of 2021\).](#)

- (e) the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State.”
5. To this end, ComReg commissioned Frontier Economics Limited<sup>8</sup> to undertake a study that considers climate change and its effect on the resilience of telecoms networks (“Frontier Study”). The study aims to:
- identify the vulnerabilities of communication networks to climate change;
  - understand the steps already taken by operators of communication networks to adapt to the effects of climate change; and
  - provide findings on how to further reduce the current and future impacts of climate change to communication networks.
6. Under the NAF and CAP 2019, the Department of the Environment, Climate and Communication (“DECC”) developed the Communications Sectoral Adaptation Plan (2019)<sup>9</sup>. The objectives of the Frontier Study also realise two objectives of Communications Sectoral Adaptation Plan (2019), identify (i) areas vulnerable to impacts of climate change and (ii) measures required to adapt to climate change impacts on vulnerable infrastructure. The objectives of this study also align with the “Sustainability” and “Network Security and Resilience” challenges and trends identified by ComReg in its ECS Strategy Statement for 2021 to 2023<sup>10</sup>.
7. ComReg is pleased to publish the Frontier Study. The study entitled “Climate Change and its Effect on Network Resilience” – published as Document 22/100a is now available on our website.
8. This is the first such study ComReg has commissioned on the adaptation of communication networks in Ireland to the impacts of climate change. It provides a foundation for future and iterative studies in this area, and is an initial baseline against which any future defined adaptation measurements/metrics can be assessed against. Climate change and its associated impacts on communication networks is also an active area of interest amongst communication regulators in Europe, including the Body of European Regulators for Electronic Communications (BEREC).
9. Interested parties are encouraged to read and carefully consider this study, which will help inform interested parties’ views of the impact of climate change with regard to the resilience of communication networks and the requirement for appropriate adaptation.

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<sup>8</sup> Frontier Economics is a microeconomics consultancy providing economics advice to public and private sector clients – see <https://www.frontier-economics.com/uk/en/locations/location-i2381-dublin/>

<sup>9</sup> [Communications Sector Climate Change Adaptation Plan \(2019\)](#)

<sup>10</sup> [Commission for Communication Regulation Electronic Communications Strategy Statement 2021 to 2023](#)

10. We set out in summary below some key messages from the Frontier Study.

## 2 Frontier Economics Study & Findings

10. The Frontier Study presents an overview of climate change and its impact on the resilience of communication networks in Ireland. The study also presents several key findings which stakeholders of the communications sector should explore to further improve the resilience of communication networks in Ireland.
11. The findings are informed by detailed research gathered through engagement with key stakeholders, including operators of fixed and wireless communication networks, international connectivity providers, infrastructure providers, and operators of communication services. ComReg appreciates their positive engagement and also the invaluable inputs of climate experts in both Climate Ireland and Met Éireann.
12. The study presents both the historical trends for climate (wind, precipitation, temperature) in Ireland and the long-term climate projections for Ireland's climate. Much of the long-term climate projections are drawn from the EPA sponsored study, Nolan and Flanagan<sup>11</sup>, which projects climate trends at a regional level in Ireland to 2060. This study is also the referenced source for climate projections in DECC's consultation to the update of the NAF in 2022<sup>12</sup>.
13. The study details the vulnerabilities of different aspects of communication network infrastructure with regard to particular weather events. It observes that outages because of wind have historically had the greatest impact on both fixed and wireless communication networks, as captured in user hours lost. The study further notes that the impact of severe wind is, in many cases, exacerbated by wind related outages to power infrastructure, which is also vulnerable to impacts of climate change.
14. Frontier then further considers these vulnerabilities in respect of different aspects of the communication network infrastructure in light of the forecasted climate changes to 2060 to deliver a forward-looking risk assessment.
15. Frontier also gathered details of the measures operators of communication networks currently take to meet both current and future impacts of climate change. This illustrates that operators are already taking positive steps, which are summarised under five main areas:
  - (i) **Redundancy and backup;**
  - (ii) **Preventative maintenance programmes;**

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<sup>11</sup> [Nolan, A.P. and Flanagan, J., 2020. High-resolution Climate Projections for Ireland – A Multi- model Ensemble Approach. \[online\] EPA Research.](#)

<sup>12</sup> [Public Consultation on Review of the Nation Adaptation Framework](#)

- (iii) Upgrade and reinforcement;**
- (iv) Network monitoring;**
- (v) Response to outages.**








16. The study also provides an overview of current and planned activities by operators to improve the power efficiency of their communications networks. While there are many drivers for improving power efficiencies, such activities will also enhance the resilience of communication networks to the impacts of weather-related power outages, particularly if affected infrastructure has a backup power source.
17. The study concludes by presenting several findings which stakeholders of the communications sector can explore to further mitigate the risk of outages in light of current and future impacts of climate change and associated severe weather events. These findings are presented across three main areas of focus:
- (i) Proactive approach to planning for climate related risks;**
  - (ii) Enhancing the resilience of communication network infrastructure to severe weather events;**
  - (iii) Further evolving power resilience in communication network infrastructure.**
18. The infographic set out below, outlines the vulnerabilities of fixed and wireless communication networks to particular weather events and highlights the three main areas of focus for further improving the resilience of communication networks in light of climate change.






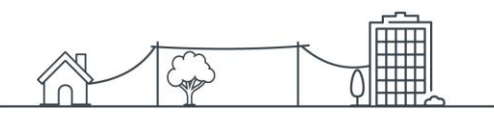


# CLIMATE CHANGE AND NETWORK RESILIENCE

Telecommunication networks are vulnerable to the impacts of climate change and severe weather events

## WIRELESS NETWORKS

 Lightning damage to electrical components	 Wind damage of overhead infrastructure and misalignment of antenna	 Signal loss by ice build-up on dishes
		
 Flooding of underground infrastructure	 Signal loss caused by heavy rain ("Rain Fade")	 Power outage

## FIXED NETWORKS

 Overheating of street cabinets	 Damage to overhead infrastructure by heavy snow	 Wind damage to cables or poles e.g. by falling trees
		
 Flooding of underground infrastructure or street cabinets can cause corrosion or short circuits which degrade the service		 Power outage at exchange or cabinet

## Actions that improve network resilience

### PLANNING FOR CLIMATE CHANGE AND WEATHER EVENTS

- Undertake a climate risks report
- Publish severe weather response plan



### CREATING A MORE RESILIENT POWER SUPPLY

- Ensure sufficient battery backup
- Pilot and integrate renewable energy sources
- Monitor power consumption



### BUILDING MORE RESILIENT NETWORKS

- Fibre links offer more resilience than wireless links
- Act on the findings of a climate risks report

These actions enhance network resilience to the impacts of climate change



**MORE RELIABLE CONNECTIVITY**



**FEWER OUTAGES**