

5G: implications for health and the environment

i) 5G and wireless telecommunications have an extremely large carbon footprint:

- internet traffic is set to triple over the next five years. ⁽¹⁾
- 5G base stations require three times more power than 4G base stations, equivalent to the needs of 73 typical homes. ^(2, 3)
- Combined needs of base stations, data centres and devices are predicted by Huawei analyst Dr Anders Andrae to cause the telecommunications industry to consume over 20% of the world's electricity by 2025. ⁽⁴⁾
- This compares with the global aviation industry which produces 2.5% of the world's greenhouse gas emissions: it is possible that 5G could create almost ten times that by 2030. ^(5, 6)

ii) Telecommunications companies have proposed mitigating measures including the following:

- improved energy efficiency of base stations ⁽⁷⁾
- more efficient cooling systems at base stations and data centres
- less wattage per bit of internet use (5G can be one tenth that of 4G)
- use of renewables such as solar power
- improved full-link efficiency with 'intelligent' technology
- improved construction efficiency
- 'sleep mode' for masts/cells at night
- 5G can facilitate smart cities, enabling optimised power consumption
- smart technology to modulate domestic and industrial energy use
- intelligent energy storage and voltage boosting
- software with energy-saving features
- increased teleconferencing and reduced travel for business

However, legal firm **Client Earth** and telecoms consultants **Strand Consult** have expressed concerns about greenwashing by providers. ^(8, 9)

Telecommunications firms and the UK government appear not to have considered the following factors:

iii) 5G adds to 4G rather than replacing it, whilst 4G usage is increasing. ⁽¹⁰⁻¹²⁾

Therefore, energy use can only grow even if 5G becomes more efficient. A Greenpeace report shows soaring power requirements and emissions in China as a result of 5G. ⁽¹³⁾

iv) Greater efficiency leads to more use

- Telcos ignore the rebound effect in which increased efficiency leads to increased use (as has been the case with LED lightbulbs and was the case with coal). Mobile industry organisation GSMA warns: '*The concept of 'Bit drives Watt' means that mobile data traffic growth of up to 50% drives an increase in power consumption, despite 5G being more power-efficient on a per-bit basis.*' ⁽¹⁴⁾
- Analysts predict that energy efficiency will be outstripped by an expanding market. ^(15, 16)

iv) Renewables are not zero carbon

- Telco advisers warn that it will take decades for renewables to be a substantial part of the grid. ⁽²²⁾
- Renewables are not zero carbon as they require extractions, manufacture, chemicals, shipping, and batteries.
- 5G will require renewables which can then not be supplied to other industries.
- 'Energy credits' allow large technology corporations such as Amazon and Netflix to claim they are using renewables despite their data centres being powered by fossil fuels. ⁽¹⁷⁾

v) Total environmental footprint of 5G

The cradle-to-grave carbon footprint of products needs to be factored in. According to a French High Climate Council report, deploying 5G widely would entail a huge increase in:

- mining and metal processing,
- oil extraction and petrochemicals
- manufacturing and intermediate transports
- public works
- power generation with coal and gas ⁽¹⁸⁾

In addition are high data loads of the backhaul. ⁽¹⁹⁾

Please see the bar charts compiled by engineer Miguel Coma which shows that making and using devices has an exceptionally large emissions footprint. Deploying 5G widely would entail the manufacture of millions of these devices in the UK alone. ^(20, 21)

vi) Environmental impact of satellites

- 5G deployment requires up to 100,000 planned satellites, which need to be renewed every five years. These leave soot, or 'black carbon', and particles of alumina which warm the stratosphere and deplete the ozone layer. ⁽²²⁾
- These are also a safety issue regarding weather forecasting, as has been pointed out multiple times by weather forecasters and will also have implications for astronomers.

vii) Toxic metals and e-waste:

- Billions of gadgets and smartphone upgrades will cause an unprecedented demand for rare metals such as lithium which need to be mined, causing local environmental destruction.
- Producing microchips is highly wasteful, with 32g of raw materials required per 2g chip. ⁽²³⁾
- Heavy metals leach toxic chemicals and are thought to comprise 70% of landfill in the US. ⁽²⁴⁾
- E-waste needs to be shipped across the oceans to landfill sites where it leaches toxins such as cadmium. ⁽²⁵⁾

viii) Harm to wildlife

- Multiple studies indicate that increasing levels of RF radiation (RFR) from 4G and 3G may be seriously harmful to wildlife, including vital pollinators such as bees. ⁽²⁶⁻²⁹⁾
- The British Ecological Society has identified RFR as one of the top emerging issues that could affect global biological diversity and conservation. ⁽³⁰⁾

- The Environmental Health Trust has compiled a list of the latest research showing harm to wildlife. ⁽³¹⁾
- Some researchers believe the increased levels of ‘electrosmog’ 5G will bring could be the final straw for species which navigate electromagnetically, including birds. ⁽³²⁾
- A study in *Nature* showed that higher-frequency RFR as used in 5G is more readily-absorbed by insects than lower frequencies. ⁽³³⁾
- Trees and other vegetation have been found to be adversely affected by RFR (as well as being threatened with mass felling, since trees block high-frequency signals). ⁽³⁴⁾
- Research suggests that base stations can turn pathogenic microbes drug-resistant. ⁽³⁵⁾

ix) Evidence of harm to human health

- The claim by the UK governments and telecoms companies claim that RFR is safe is strongly contested by the world’s leading independent experts in biological effects of RF radiation.
- A referenced article in leading medical journal *The Lancet* states that the idea that ‘non-ionising’ radiation is benign is an outdated myth. ⁽³⁶⁾
- A piece in the *British Medical Journal* calls for a halt to the 5G rollout and outlines reproductive, oncological, neuropsychiatric, immunological, DNA alteration, gene expression and antibiotic resistance risks of RFR. ⁽³⁷⁾
- RF scientists have lobbied the World Health Organisation to categorise RFR as a Class 1 carcinogen. ⁽³⁸⁾
- The UK governments and industry rely on guidelines recommended by ICNIRP, a non-accountable body recently ruled biased by two EU courts and the object of an investigation by two MEPs. ^(39, 40) In August 2021, judges ruled in a US court case that the Federal Communications Commission has ignored evidence of harm. ⁽⁴¹⁾
- PHIRE Medical have produced a consensus statement signed by/on behalf of 3500 medical doctors regarding harm from RF radiation, stating that ‘RFR has been proven to damage biological systems at intensities below ICNIRP guidelines.’ ⁽⁴²⁾
- 5G encompasses both low-frequency RFR (similar to 4G) and high-frequency millimetre waves. The bio-effects from low-frequency RF radiation are well-studied and established, whilst existing research suggests that millimetre waves may damage the nervous system, skin, and eyes. ⁽⁴³⁾

x) Wired solutions could be an effective, safe, more environmentally-friendly alternative

Wired technology is free of RF radiation

Wired technology uses less energy than wireless, is faster and more secure, and could better bridge the digital divide. ⁽⁴⁴⁻⁴⁶⁾

Applications such as telemedicine and smart cities can function on existing technologies. ^(47, 48)

Note that in China, energy needs have been higher than anticipated, and 5G’s benefits have been exaggerated, according to Huawei founder Ren Zhengfei, who suggests broadband as a superior alternative for the majority of the populace. ⁽⁴⁹⁾

Notes

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