


# Case study

## Preliminary assessment of 5G networks in EU/EEA: cost and benefits

 *An overview of the study carried out for the European Commission  
by Axon Partners Group Consulting*

AXON 

## Case study

### The project

In recent years, operators in the EU/EEA have started deploying 5G networks. In most cases this process is still at an early stage. But can we make an early estimate of the potential cost and benefits of providing 5G services? This was what the EC commissioned Axon Partners Group Consulting to find out.

Axon carried out this preliminary assessment of 5G networks in 2021. The objective was to provide both a high-level understanding of recent and expected developments in 5G networks – as well as to assess the associated economics.

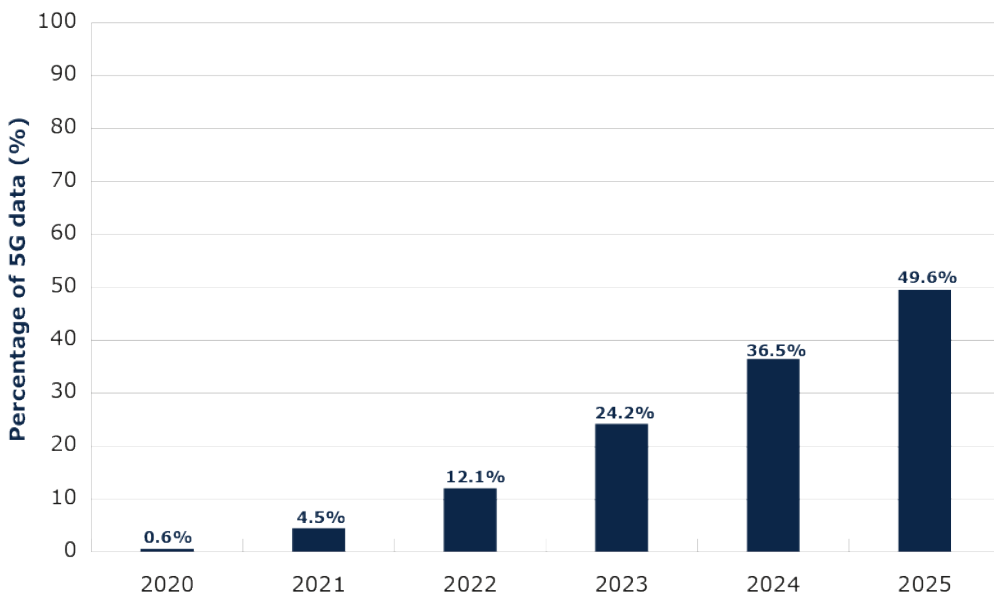
This assessment began in May-June 2021 with a data-gathering process based on a voluntary questionnaire. This collated information from 21 member states over a total of 30 countries belonging to the EU/EEA Area. A number of operators and regulators of EU/EEA countries were involved.

While a more detailed summary, including supporting graphs, is available, this case study takes a look at the headline results – many of which, we believe, offer some encouragement to regulators and operators assessing the cost-benefit impacts of 5G.

### Broadband data: growth and usage

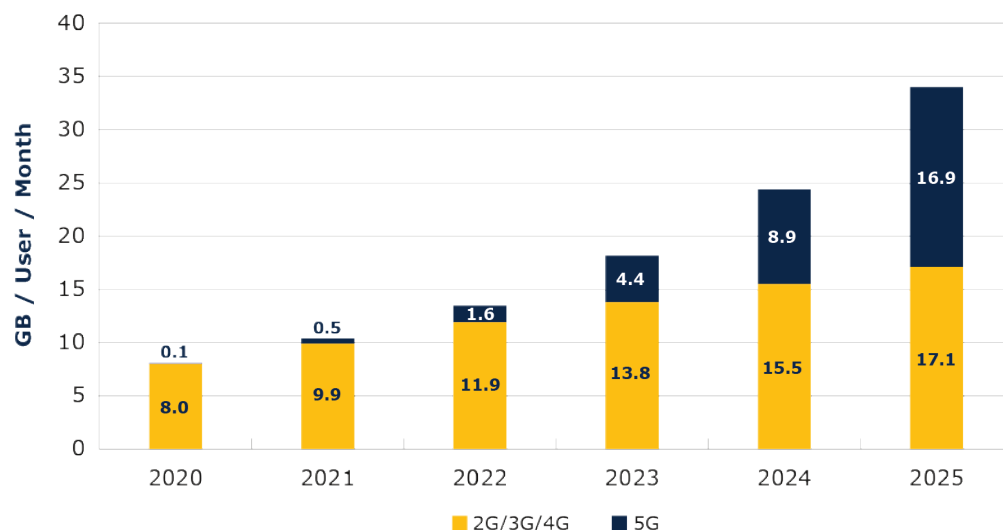
For example, let's look first at the percentage of broadband data handled by 5G technology compared to total broadband data at country level. This, we estimate, will grow across all member states. In fact, by 2025, the percentage of 5G traffic is expected to be in the range of 35%-70% for the majority of countries. The figures also indicate that around one half of data traffic will be handled by 5G networks in the year 2025.

**Percentage of broadband data handled by the 5G technology over total broadband data as EU/EEA average**



And average consumption per user in 5G networks is also expected to increase in the coming years. In fact by the year 2025 overall data consumption forecasted per user is around 34 GB per user per month, with traffic over 5G representing around one half of this.

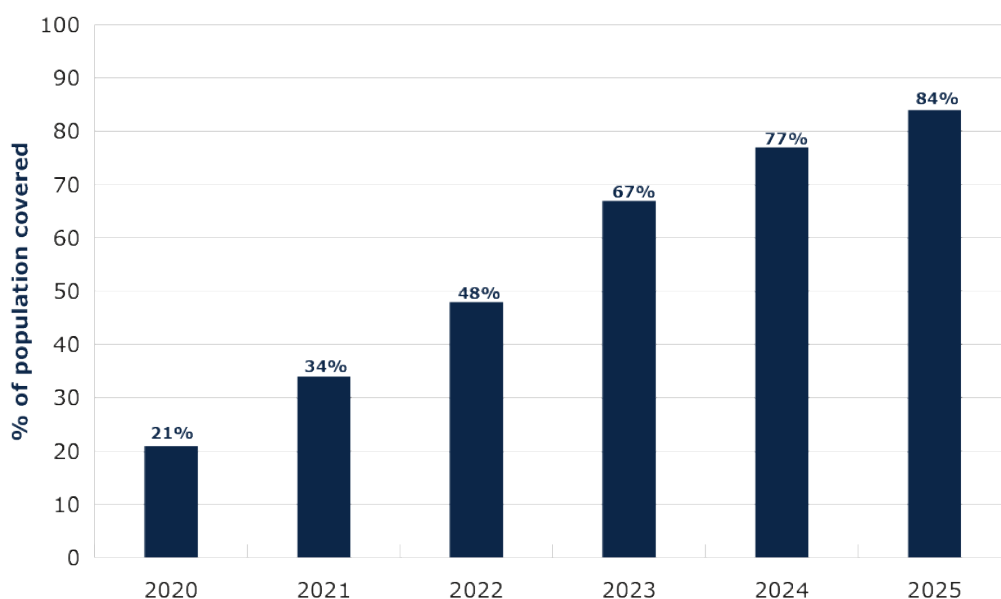
**Split of monthly broadband data consumption per technology as EU/EEA average**



### 5G coverage

What about coverage – that is the percentage of population covered by 5G networks at country level? Our findings here were again quite positive: most member states should exceed 80 % 5G network coverage by 2025. In fact the percentage of population covered by 5G networks as an EU/EEA average will rise from 21% in 2020 to 84 % in 2025. This increase will be helped by the availability of the 700 MHz band across all member states.

Percentage of population covered by 5G networks as an EU/EEA average



### Spectrum planning

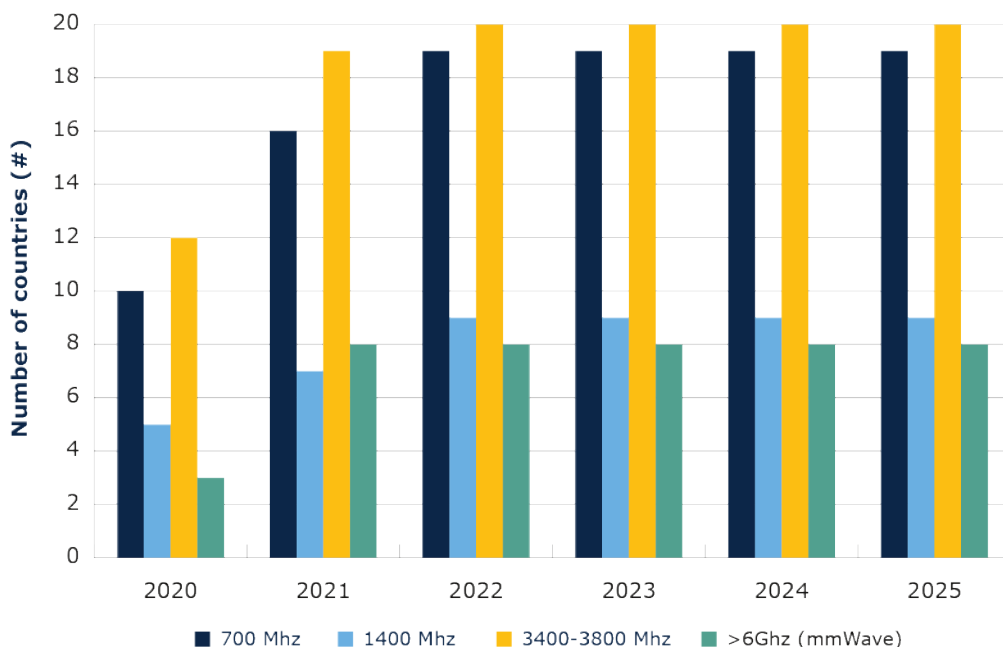
Spectrum planning will be relevant to future development, so we asked about the number of countries with currently available spectrum bands for 5G as well as their future spectrum plans. While some member states still do not have a clear plan for some spectrum bands, the 700 MHz and 3400-3800 MHz bands have been or will be made available in 19 and 20 countries respectively before the year 2025.

By contrast 1400 MHz as well as the mmWave bands (over 6GHz) are less widely available among member states. In fact, for certain spectrum bands, some member states do not yet have a clear plan.

However, when it comes to available bandwidth per spectrum band range at country level by 2025, the >6GHz (mmWave) band range presents the highest bandwidth available, with typically between 1 GHz and 3 GHz. This bandwidth will be key for permitting operators to comply with capacity constraints arising from the high traffic expected for 5G data.

By contrast, the 700 MHz band, despite its lower available bandwidth (typically 60 MHz), is already playing a key role in the initial roll-outs of operators thanks to its reach, which allows greater coverage levels.

**Number of countries with available spectrum bands**



### 5G site evolution

How will 5G sites manage change? We learned that the vast majority of sites incorporating 5G technology will involve an upgrade of the existing 2G, 3G and 4G sites, though there will be a small portion of macro sites newly deployed already incorporating all technologies (2G, 3G, 4G and 5G).

Few operators have revealed plans for deploying 5G-only small cell sites in the short term.

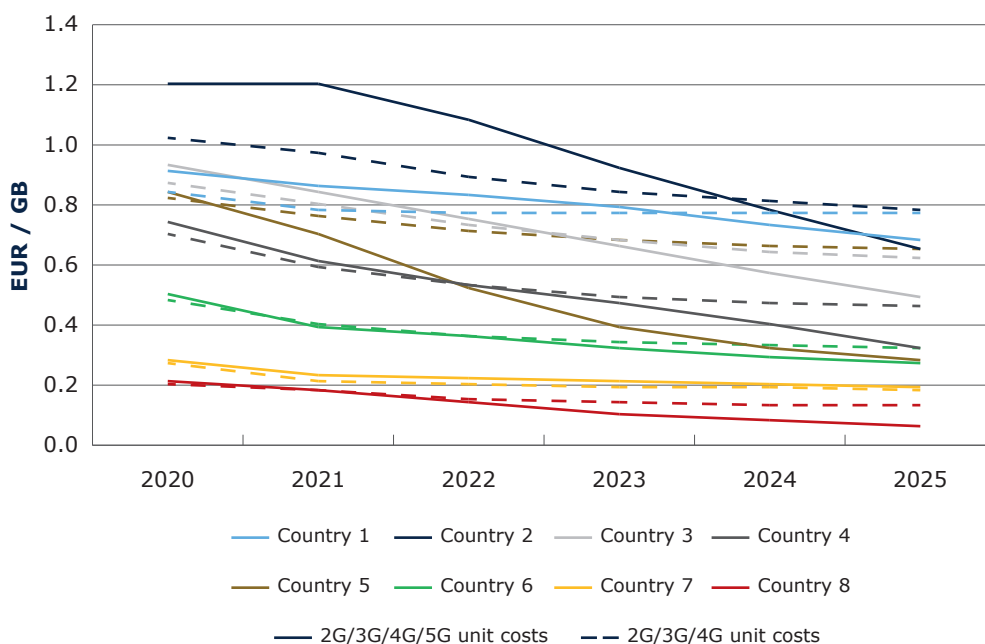
### Service provision costs

Turning next to the economics of rollout, we assessed how 5G technology will affect the costs of service provision in the coming years. It should be noted that the main focus of this assessment was on new and additional investment or costs required for 5G. Reused network elements already in place for 2G, 3G and 4G have not been estimated in this exercise.

The list of network elements considered in the calculation of new investments required for 5G includes the upgrade of sites to 5G (only active elements), 5G backhaul elements, 5G core upgrade, 5G spectrum, and 5G small cells (active and passive elements). All of these elements were used to calculate the additional unitary cost of 5G services for 2025, when 5G technology is expected to be broadly established in most of member states.

The good news is that at the end of the period, the inclusion of 5G technology underlines its better cost efficiencies, leading to a lower unit cost per GB.

Unit cost per GB at country level



As for the consumer impact, additional monthly cost per subscriber related to the new 5G elements in 2025 at country level ranges from 0.4 to 3.5 EUR, depending on the country.

**Additional monthly cost per subscriber related to the new 5G elements in 2025 at country level**



We also looked at a split of unit cost per GB related to the new 5G elements in 2025 at country level. In this case the largest portion of cost per GB is generally attributed to the active elements located in the access network. This effect is mainly derived from the upgrade of existing sites to incorporate the 5G technology.

In both the subscriber cost and unit cost per GB calculations, the costs of passive elements in macro-sites and previously existing spectrum bands are not considered, as these elements are expected to be mostly reused for 5G from existing 2G, 3G and/or 4G technologies.

## Conclusions

The detailed findings of the report are available [here](#) but our broad conclusions are as follows.

Firstly, operators who participated in this survey plan to have achieved 5G coverage levels of more than 80% by the year 2025. This indicates a rapid roll-out of 5G networks.

When looking at the different approaches to 5G deployment, operators expect to mostly rely, in the initial stages at least, on the upgrade of 2G, 3G and 4G technologies to incorporate 5G technology. By contrast, in operators contributing to the study, small cell solutions will only represent a small portion (2%) of new 5G sites deployed until 2025.

As for costs, the largest portion of unit cost per GB related to the new 5G network elements can generally be attributed to the active elements located in the access network.

In addition, when assessing the impact of 5G on the services' provisioning costs, 5G shows better cost efficiencies at the end of the analysed period (especially in years 2024-2025).

As we noted earlier, 5G network deployment is still at an early stage in most EU/EEA countries – too early perhaps to make definitive judgements on the efficacy of 5G. However, as this study shows, the early indications seem to be positive.

*A longer report, expanding on this case study, outlining background, context and methodology and including detailed charts that break down the study's findings, is available at <https://digital-strategy.ec.europa.eu/en/library/study-preliminary-assessment-5g-networks-impact-operators-eu-and-eea>*