Report for Ericsson and Qualcomm

Costs and benefits of 5G geographical coverage in Europe

Janette Stewart, Chris Nickerson

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Contents

Analysys Mason Limited
St Giles Court
24 Castle Street
Cambridge CB3 0AJ
UK
Tel: +44 (0)1223 460600
cambridge@analysysmason.com
www.analysysmason.com
Registered in England and Wales No. 5177472

1 Abstract

This study was commenced in November 2020 and completed in February 2021.

Our objective was to quantify 5G investment and coverage for each European market under three deployment scenarios, and to calculate the costs and benefits of full-5G coverage across 13 key use cases. The study builds on a previous report prepared together with Ericsson and Qualcomm on the costs and benefits of fully virtualised, standalone 5G deployment in Europe to deliver a range of new use cases (beyond mobile broadband).

This latest study quantifies:

- The cost and extent of 5G coverage provided by commercially led 5G mobile broadband deployments using a combination of new 5G pioneer and legacy mobile bands. The calculation is undertaken for each market and time frame (2023, 2025 and thereafter) and covers consumer-driven 5G mobile broadband deployments. This is Scenario A – the 'base case'.

- The additional investment beyond the base case needed to deliver near-universal geographical coverage per European market. We have assumed a single multi-use network using 700MHz spectrum, which would be funded by public subsidy. This is the 'low-frequency 5G case' i.e. Scenario B.

- The additional investment needed to extend mid-band coverage beyond the base case to cover road, rail and rural use cases (fixed-wireless access (FWA), smart agriculture). We assume that this investment would be done on a commercial basis where we estimate that it is viable to do so, and publicly funded elsewhere. This is the 'full-5G mid-band coverage case' i.e. Scenario C.

- The incremental costs and gross-domestic-product (GDP) benefits that full-5G brings to 13 key use cases (including the use cases covered by the full-5G mid-band coverage case as well as several others).

- The targeted public funding needed, if any, to support full-5G coverage for each of these 13 use cases.

The study has been developed in collaboration with the 5G policy and technology teams at Ericsson and Qualcomm. A further study focussing on mmWave spectrum if forthcoming.

2 Executive summary

Building on a previous study prepared for Ericsson and Qualcomm in September 2020 on the costs and benefits of full-5G deployment in Europe, the purpose of this study has been to model 5G investment in Europe, and the associated costs and benefits, under three deployment scenarios, and for 13 different use cases. The study was seeking to consider:

- The cost and extent of commercially led 5G enhanced mobile broadband (eMBB) roll-out in different European markets (using a combination of new 5G pioneer plus legacy mobile bands), which we refer to as the 5G 'base case' (Scenario A).

- The additional investment needed to deliver near-universal geographical coverage using a low-frequency 5G layer (700MHz), referred to as the 'low-frequency 5G case' (Scenario B).

- The additional investment needed to extend 3.5GHz mid-band coverage beyond the base case to cover road, rail and rural use cases (including fixed wireless access into homes and businesses, and smart agriculture), referred to as the 'full-5G mid-band coverage case' (Scenario C).

- The cost and benefits of delivering 13 different industry-specific use cases – both the use cases covered by Scenario C as well as several others – within the context of a full-5G portfolio built upon base-case 5G roll-out.

The 13 use cases for which we have estimated the incremental costs (i.e. cost in addition to the base case) and benefits (in terms of gross domestic product, or GDP) that full-5G brings are as follows:

- urban high-capacity locations ('urban hotspots')
- construction
- broadband into homes and offices delivered via 5G fixed-wireless access (FWA)
- agriculture
- road
- rail
- smart factories
- mining
- ports
- airports
- energy and utilities
- healthcare and hospitals
- municipal buildings.

The full-5G mid-band coverage model (Scenario C) reflects a lowest-cost roll-out scenario: we assume that a single 3.5GHz network infrastructure could serve multiple use cases (e.g. road and rail). Likewise, for full geographical coverage we assume deployment of a single 700MHz network. As well as modelling the extent and cost of coverage that we expect to be delivered commercially, we explore the potential public-sector intervention required to deliver the coverage to support use cases outside of the commercially viable footprint.

Description of the eMBB base-case model

Our 5G eMBB base-case models the cost and extent of commercial deployment using the three 5G pioneer bands identified for initial deployment at the European level (700MHz, 3.5GHz and 26GHz). We also assume that other mobile bands, used today for previous generations of mobile technology (i.e. bands such as 800MHz, 900MHz, 1800MHz and 2.1GHz) will be deployed for 5G use either through re-farming or via dynamic spectrum sharing (DSS)-based technologies (i.e. re-using sites, hardware and spectrum between mobile technologies on the same band, enabling 4G/5G sharing[1]).

Our assumption is that 700MHz spectrum is rolled out across all existing sites in each European market, such that population coverage achieved in the long term matches that achieved by 4G once fully rolled out. For the 3.5GHz band, we assume roll-out across all urban and suburban macro sites, which we model to be areas above a population density of 600 people per square kilometre, per European market. We also assume deployment of 26GHz radios alongside 3.5GHz based on market demand.

Furthermore, we assume existing mobile bands (800MHz, 900MHz, 1800MHz and 2100MHz) are deployed on all existing mobile sites and will be used for 5G progressively across the 5G roll-out (starting with the 1800MHz band, followed by 2100MHz and then 900MHz). Our modelling assumes that the 800MHz band continues to serve 4G traffic into the longer term. Finally, we have assumed deployment of 2.6GHz, 1400MHz and 2300MHz spectrum for 5G on a portion of existing sites (60% of sites, from different points in time in the network, starting with 2024 for 2.6GHz, then 2025 for 2300MHz and 2026 for 1400MHz). Deployment is phased across 2–3 years from the initial date specified. The model considers cost and extent of 5G deployment from 2020 to 2040. The assumed roll-out profile for 5G in each European market is based on the typical roll-out profile for 4G (such that 100% of commercial roll-out is achieved after five years of 5G launch).

Total macro sites per country are based on estimates for each European market; we model coverage per market corresponding to the aggregate footprints of all mobile networks in that market. We have used detailed population distribution data for each market split into grid squares (commensurate with cell size) to define roll-out. Squares in the grid are ranked by population density to calculate a population-area curve, and to determine urban/suburban/rural site classifications.

Macro sites required for coverage in each geotype are then calculated. Remaining macro sites (for capacity) are distributed across the coverage grid according to population. We assume 5G radios using 700MHz are rolled out across all sites (coverage, and capacity) starting from areas with highest population density, to lowest population density (i.e. urban to rural). Likewise, 5G using 3.5GHz is

1 https://www.ericsson.com/en/portfolio/networks/ericsson-radio-system/radio-system-software/ericsson-spectrum-sharing

assumed to be rolled out from highest population density, up to a certain number of sites/population density threshold.

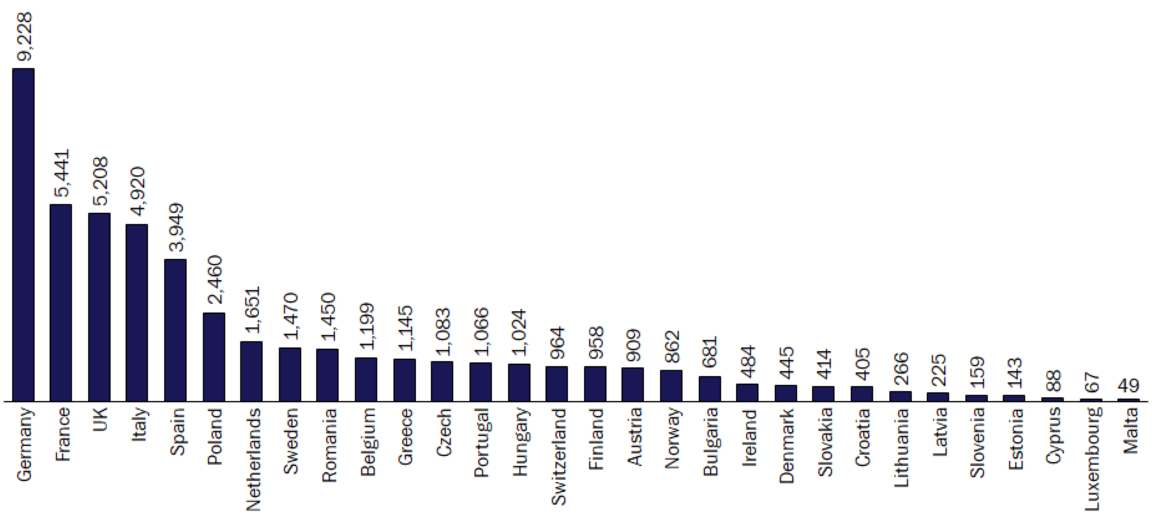
Results from modelling on cost and extent of 5G eMBB roll-out (Scenario A – base case)

Our modelling suggests that when 700MHz is deployed across the entire grid in all countries by 2026, this typically achieves more than 99% population coverage and more than 80% geographical coverage (individual percentages vary per European market). By contrast, 3.5GHz – including massive MIMO (mMIMO) antenna deployments – typically covers 30–60% of the population (generally less than 10% of the geographical area) through commercial investment alone. 700MHz is deployed on all sites, while 3.5GHz mMIMO is deployed on 30–60% of sites.

Most base-case (eMBB) roll-out costs are incurred by 2025/2026. Replacement capex is then assumed from 2030 over the remaining period of the model, to 2040. We estimate the total 5G eMBB base case cost per network is EUR4–10 billion for the largest European markets (Germany, the UK, France, Italy and Spain), as illustrated in Figure 2.1. Cost generally scales with number of sites (which generally scale with total population). It is noted that Germany has three mobile network operators (MNOs), whereas France/UK/Italy/Spain are four-MNO markets. This explains why the cost per mobile network in Germany is significantly higher than in France/UK/Italy/Spain in our modelling.

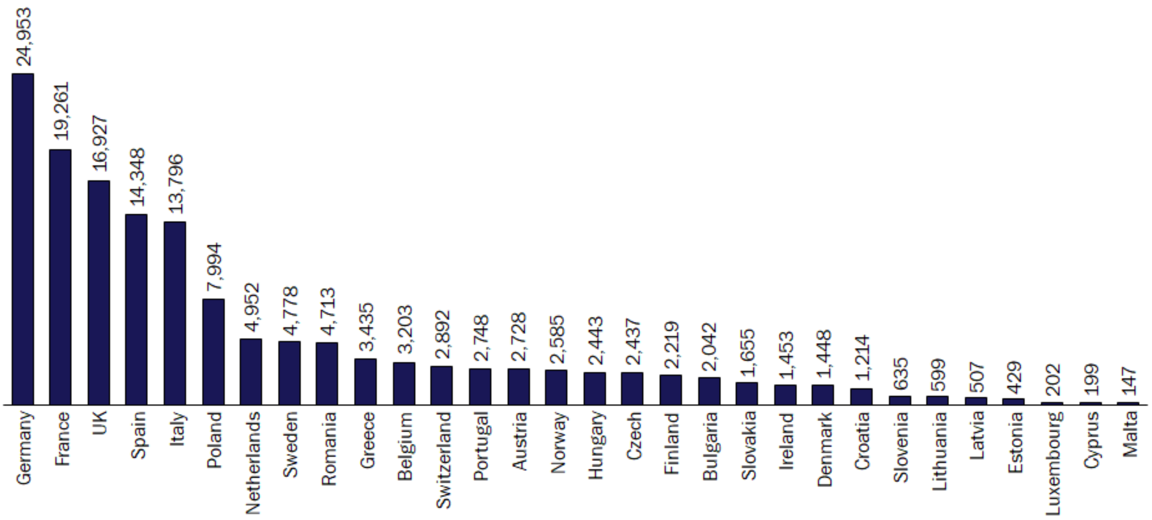
The values shown represent the cost of commercial deployment in the 5G base case per mobile network in each market.

Figure 2.1: Present value of 5G eMBB costs (EUR million, 2020) for the modelling period (2019–2040), per mobile network per European market [Source: Analysys Mason, 2021]



Aggregating across all mobile networks and all European markets suggests a total Europe-wide 5G eMBB base-case investment (cost) of EUR150 billion, as shown in Figure 2.2. This estimates the aggregate cost that would be incurred by all MNOs, adjusted for any network sharing we are aware of in that market (for 4G or 5G), based on publicly available information.

Figure 2.2: Present value of 5G eMBB costs (EUR million, 2020) for the modelling period (2019–2040), across all MNOs per European market [Source: Analysys Mason, 2021]



For each European market, we have illustrated the base-case coverage we have modelled, using mapping software. These maps are shown in Annex A.

Results from modelling on near-universal geographical coverage via low frequency (700MHz) (Scenario B)

From our modelling, we have estimated that Europe-wide, the additional cost of building new low-frequency macro sites beyond the base-case footprint to achieve full geographical 5G coverage is around EUR4 billion. This assumes deployment of a single 700MHz infrastructure (i.e. with active sharing between MNOs in that market).

We have assumed that building greenfield sites in rural areas might have very high unit costs (due to difficulty of installation, cost of providing power, etc.). In addition to the active equipment costs in our model, we include cost for the new tower, installation and power connection to sites in rural locations, such that the total cost of ownership (TCO) per site over a 20-year period (2020–2040) is roughly EUR1 million.

Figure 2.3: New macro sites required and cost to extend low-frequency 5G coverage beyond the base-case low-frequency 5G footprint to 100% geographical coverage [Source: Analysys Mason, 2021]

Country	Percentage of land mass not covered by 5G base case/Scenario A	Estimated total sites required to provide coverage	Cumulative present value of costs (EUR million)
Austria	14%	121	88
Belgium	-%	-	-
Bulgaria	11%	134	97
Croatia	14%	83	60
Cyprus	15%	9	6

Country	Percentage of land mass not covered by 5G base case/Scenario A	Estimated total sites required to provide coverage	Cumulative present value of costs (EUR million)
Czech Republic	4%	36	26
Denmark	-%	-	-
Estonia	19%	90	66
Finland	5%	166	121
France	10%	561	408
Germany	13%	497	362
Greece	5%	69	50
Hungary	9%	88	64
Ireland	13%	94	68
Italy	25%	779	567
Latvia	1%	10	7
Lithuania	1%	7	5
Luxembourg	2%	1	0
Malta	-%	-	-
Netherlands	2%	9	6
Norway	10%	321	234
Poland	2%	77	56
Portugal	14%	126	92
Romania	21%	508	370
Slovakia	15%	77	56
Slovenia	9%	19	14
Spain	13%	662	482
Sweden	16%	732	532
Switzerland	24%	104	76
UK	5%	130	95
Total	**11%**	**5509**	**4008**

Note: in Belgium, Denmark and Malta, full low-frequency geographic coverage is achieved in Scenario A, meaning that no further macro sites are required in Scenario B.

Results from modelling on 3.5GHz mid-band coverage beyond the base case covering road, rail and rural (Scenario C)

In this scenario, we have modelled the extent and cost of additional 3.5GHz deployment beyond the deployment indicated in the base case, with an assumption that FWA, agriculture, road, rail and construction use cases outside of the eMBB footprint might drive demand for additional 3.5GHz sites. This is because low-frequency 5G bands (e.g. 700MHz) are not expected to be able to deliver the functionality required by the FWA/agriculture/road/rail/construction use cases (due to latency/capacity limitation, etc.)

We assume that these full-5G use cases require 3.5GHz capacity with mMIMO, equivalent to the deployment assumed in existing sites in the 5G eMBB base case in urban and suburban areas.

The full-5G capacity required for individual agriculture/road/rail/construction use cases is expected to be a few hundred Mbit/s or less, per site. We note that the capacity required for FWA could be higher, and this capacity might be provided using an additional frequency layer (e.g. 26GHz) in selected locations (our cost estimates below therefore include additional 26GHz deployments specifically for the FWA use case).

As such, we have modelled the costs of additional 3.5GHz sites to simultaneously serve the use cases of agriculture/road/rail/construction and suburban/rural FWA, outside of the commercial eMBB footprint for 3.5GHz modelled in Scenario A. We note there might be reasons (societal, policy, market structural or other) for having dedicated deployments for rail coverage, and/or for road coverage. In this case, costs would be significantly higher than we have modelled for the assumed multi-use architecture. It should be noted that, in this scenario in the model, sites are shared by use cases but not necessarily shared between MNOs (unlike in Scenario B where we assume a single network roll-out to the most rural locations). Indeed, we assume that each network operator builds its own multi-use case 3.5GHz network where it is commercially feasible to do so. Commercially viable locations are likely to be along major transport links, and we proxy this by assuming commercial deployment along all rail links within the base-case 700MHz footprint. Beyond these areas, commercial investment alone is unlikely to deliver the required coverage/functionality, and public subsidy is required.

The total public subsidy (i.e. the initial capex requirement for 3.5GHz coverage outside of the base-case 3.5GHz footprint and further commercial areas – proxied by rail links) is split between the FWA/agriculture/road/rail/construction use cases in proportion to a cost allocation calculation. This calculation is used to split the additional 3.5GHz network cost between these use cases, and assumes a deployment profile beginning in 2025.

At this point, the 5G eMBB base-case roll-out is nearing completion in most countries (though there will be some overlap between the base-case roll-out and the additional full-5G use-case roll-out in some cases). We assume deployment of the additional 3.5GHz infrastructure over a five-year period (commensurate with the time frame assumed for the base-case roll-out). Unlike the base-case deployment, we assume a linear roll-out, which we believe is more realistic for rural areas, reflecting public subsidy funding.

We have developed a cost allocation key (which varies by country) based on:

- the total ‘amount’ of coverage needed for each use case (i.e. length of road/rail, area of agricultural land, and size of FWA market)
- a weighting to account for the differing bandwidth requirements of the different use cases.

We have found that the level of geographical coverage required to cover road, rail and agricultural areas per European market is high, typically greater than 95%.

Figure 2.4: Geographical coverage required to cover road, rail and agricultural areas [Source: Analysys Mason, 2021]

Country	Geographical coverage required to cover...						
	Major roads	Minor roads	All roads (major and minor)	Rail	Majority of road plus rail	Agricultural areas	Road plus rail plus agricultural areas
Austria	74%	48%	84%	48%	78%	90%	95%
Belgium	94%	99%	99%	68%	95%	98%	100%
Bulgaria	29%	87%	90%	35%	47%	88%	96%
Croatia	82%	88%	97%	43%	86%	78%	98%
Cyprus	55%	96%	100%	N/A	55%	95%	100%
Czech Republic	68%	96%	98%	71%	83%	97%	99%
Denmark	70%	93%	97%	47%	77%	98%	99%
Estonia	71%	16%	74%	16%	73%	87%	92%
Finland	39%	67%	77%	14%	42%	46%	80%
France	75%	52%	89%	39%	79%	96%	98%
Germany	86%	87%	99%	64%	91%	98%	100%
Greece	41%	96%	96%	14%	44%	91%	98%
Hungary	32%	98%	99%	62%	68%	98%	100%
Ireland	63%	91%	96%	20%	67%	94%	99%
Italy	84%	56%	93%	43%	86%	91%	97%
Latvia	25%	80%	83%	27%	36%	93%	98%
Lithuania	27%	72%	79%	24%	43%	96%	99%
Luxembourg	84%	99%	99%	70%	90%	98%	99%
Malta	100%	100%	100%	N/A	100%	96%	100%
Netherlands	93%	64%	96%	54%	94%	95%	98%
Norway	27%	61%	68%	11%	30%	61%	72%
Poland	53%	85%	94%	48%	69%	98%	100%
Portugal	70%	34%	77%	24%	74%	96%	98%
Romania	57%	72%	87%	38%	65%	93%	96%
Slovakia	61%	88%	95%	54%	72%	91%	98%
Slovenia	56%	98%	98%	46%	66%	88%	98%
Spain	59%	65%	87%	21%	63%	94%	98%
Sweden	33%	33%	52%	23%	40%	36%	61%
Switzerland	74%	73%	89%	60%	78%	44%	90%
UK	86%	81%	93%	45%	87%	91%	97%

Our modelling suggests the geographical coverage achieved from the 3.5GHz base case (i.e. Scenario A) and additional 3.5GHz commercial deployment (i.e. commercial component of

Scenario C) varies by country, as shown in Figure 2.5 below. The net difference between the coverage needed as shown in Figure 2.4, and the 3.5GHz coverage commercially achieved in Figure 2.5, is the additional 3.5GHz coverage requirement which would require public funding (i.e. the publicly subsided component of Scenario C).

Figure 2.5: Coverage achieved by 3.5GHz base-case deployment + commercial 3.5GHz use case deployment [Source: Analysys Mason, 2021]

Country	Population	Area	Agricultural area	Minor road	Major road	Total road	Total rail
Austria	85%	48%	61%	61%	70%	68%	100%
Belgium	89%	68%	70%	74%	80%	77%	100%
Bulgaria	70%	35%	44%	40%	64%	44%	99%
Croatia	75%	41%	55%	50%	49%	49%	96%
Cyprus	62%	8%	8%	9%	25%	15%	N/A
Czech Republic	91%	71%	76%	72%	87%	77%	99%
Denmark	79%	47%	46%	52%	66%	57%	100%
Estonia	68%	16%	21%	49%	26%	30%	97%
Finland	68%	14%	27%	23%	35%	27%	100%
France	77%	39%	41%	37%	59%	51%	98%
Germany	86%	59%	59%	59%	74%	67%	95%
Greece	66%	15%	24%	16%	35%	19%	100%
Hungary	86%	60%	60%	65%	89%	69%	97%
Ireland	58%	21%	25%	28%	33%	30%	100%
Italy	80%	40%	50%	45%	58%	54%	94%
Latvia	71%	27%	29%	32%	72%	40%	99%
Lithuania	56%	25%	25%	36%	39%	37%	100%
Luxembourg	91%	70%	70%	72%	91%	76%	100%
Malta	83%	55%	56%	72%	55%	65%	N/A
Netherlands	84%	55%	51%	69%	68%	68%	100%
Norway	61%	11%	37%	24%	34%	26%	100%
Poland	76%	48%	47%	54%	67%	58%	100%
Portugal	70%	22%	23%	37%	39%	38%	92%
Romania	82%	38%	46%	45%	58%	50%	97%
Slovakia	80%	51%	61%	58%	76%	65%	96%
Slovenia	76%	45%	53%	51%	71%	55%	99%
Spain	73%	21%	26%	24%	42%	34%	97%
Sweden	81%	23%	45%	36%	57%	47%	99%
Switzerland	93%	55%	95%	78%	82%	80%	95%
UK	90%	45%	53%	57%	68%	64%	99%

Benefits of full-5G use cases

Europe-wide, we estimate the total GDP benefit for the 13 5G use cases modelled in the study is c.EUR250 billion, as shown below. The cost of infrastructure to deliver each use case is also shown. The total cost across all use cases is c.EUR42 billion, while the cost of infrastructure for use cases in Scenario C only (shown in the red box) is c.EUR20 billion. We also show the estimated public funding needed for selected use cases, where it is expected that the infrastructure cost (or some component of the infrastructure cost) will not be paid for on a purely commercial basis.

Figure 2.6: Full-5G use-case costs and benefits [Source: Analysys Mason, 2021]

Use case	Cost (EUR billion)	Benefits (EUR billion)	Cost-benefit ratio	Public subsidy (EUR billion)
Urban hotspots	0.1	1.5	10.1	0.0
Construction	3.0	26.9	8.9	No subsidy
5G FWA	2.9	29.9	10.2	1.2
Agriculture	5.7	45.9	8.0	2.4
Road	5.8	35.2	6.1	2.4
Rail	2.5	6.0	2.3	1.0
Smart factories	10.5	67.1	6.4	No subsidy
Mining	7.6	13.7	1.8	No subsidy
Ports	0.3	2.0	6.8	No subsidy
Airports	0.5	4.4	8.7	No subsidy
Energy and utility	0.4	1.9	5.2	No subsidy
Healthcare and hospitals	0.8	5.4	7.1	0.8
Municipal buildings	1.2	10.7	9.1	1.2
Total innovation platform	**42**	**251**	**6**	**10**

Overall results

Overall, our modelling suggests that investment in 5G in Europe could total c.EUR150 billion for population-led eMBB coverage with a further c.15% investment to achieve a wider footprint.

Figure 2.7: Summary of costs and benefits per scenario [Source: Analysys Mason, 2021]

	A: 5G eMBB base-case roll-out costs (new 5G bands – 700MHz/3.5GHz/26GHz + legacy mobile bands)	B: ... additional cost if low-frequency (700MHz) 5G coverage is expanded beyond the base case to give near universal geographical coverage	C: ... additional cost if 3.5GHz coverage is extended where needed to cover road/rail and agricultural areas (plus further deployment of 26GHz)
Cost per network (for largest European markets)	EUR4–10 billion	We have modelled a single rural network per European market	We have modelled additional 3.5GHz deployed by multiple networks in commercially viable locations + single network beyond this. We have also modelled some further deployment of 26GHz
Cost per market (for largest European markets)	EUR14–25 billion	EUR400–600 million	EUR1.5–4.0 billion
Total investment in roll-out across all European markets	EUR150 billion	EUR4 billion	EUR20 billion

Conclusions

The study has shown that assumptions on market structure underpin estimates of the additional investment needed for a wider 5G coverage, but, based on the assumptions we have used, it is possible to deliver additional 3.5GHz infrastructure (Scenario C) meeting additional full-5G use cases at a total cost of just under EUR20 billion. To provide near-universal coverage using low-frequency 5G, our modelling suggests a further EUR4 billion investment (for a single network infrastructure) is needed.

A summary of the conclusions from the study is as follows.

Figure 2.8: Conclusions and recommendations from the study [Source: Analysys Mason, 2021]

Scenario	Conclusions	Recommendations for Europe
eMBB roll-out – Scenario A	• Commercially driven eMBB roll-out by multiple MNOs is assumed as a base case, which uses a mix of frequency bands (700MHz, 3.5GHz, 26GHz and legacy bands). Our modelling suggests investment totalling EUR4–10 billion will be made per network in the largest markets, which amounts to around EUR150 billion across Europe as a whole • Our modelling suggests MNOs will deploy 3.5GHz on a commercial basis to achieve c.30–60% population coverage	• European policy makers should accelerate 5G pioneer band spectrum assignments and reduce 5G infrastructure deployment obstacles to speed up and extend commercial 5G deployments • Access to mid-band spectrum is critical for realising the full benefits of extended mid-band coverage, and the 700MHz, and 26GHz, bands will be used as a complement in specific terrains/locations, respectively
Delivering full geographical coverage	• Extending 5G coverage to near-universal geographical coverage (beyond the >80% achieved by the	• Governments and the private sector should work together to develop effective solutions for full-5G

Scenario	Conclusions	Recommendations for Europe
(700MHz) – Scenario B	base case) using 700MHz might result in an additional single network cost of EUR4 billion • This is a best-case estimate, assuming co-operation between industry and policy makers to achieve a roll-out structure minimising duplication of network build	coverage in areas where commercially led solutions are not viable. A single network using different spectrum bands can provide the full benefits of 5G to harder-to-reach areas
Cost/capacity for full-5G use cases – Scenario C	• Coverage and capacity needs will vary for industry-specific applications compared to eMBB – with a total additional investment of EUR20 billion across Europe needed to cover road, rail and agricultural areas (also providing coverage for FWA and construction site use cases) • We assume the same 3.5GHz 5G infrastructure can be shared by these use cases (while meeting the specific requirements of each use case) and that a single multi-use case network would be shared by operators outside of commercial areas • 26GHz deployment alongside 3.5GHz will be especially useful for 5G FWA use	• In addition to the deployment of 3.5GHz as part of the eMBB base case, operators are likely to further deploy 3.5GHz commercially to serve specific full-5G use cases in profitable areas. However, beyond this, intervention funding would be needed (i.e. to serve the remaining unprofitable areas for full-5G use cases) • The benefit-to-cost ratio of full-5G deployments represents a compelling case for targeted recovery funding to bridge remaining 5G coverage gaps

Annex A Base-case coverage maps for each European market

The following maps show the modelled level of long-term low-frequency and 3.5GHz 5G coverage in the base case (Scenario A).[2] The key used in the maps is shown below:

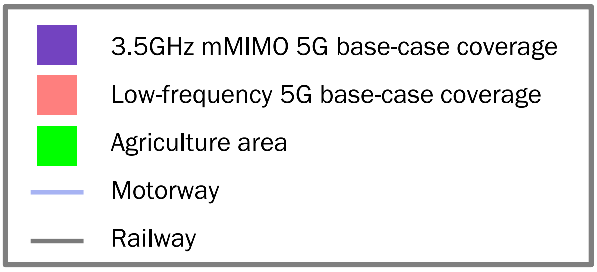


Figure A.1: Map key [Source: Analysys Mason, 2021]

Figure A.2: Base-case coverage – Austria [Source: Analysys Mason, 2021]

Figure A.3: Base-case coverage – Belgium [Source: Analysys Mason, 2021]

2 26GHz will also be deployed according to market demand but the resulting coverage is not shown on these maps.

Figure A.4: Base-case coverage – Bulgaria [Source: Analysys Mason, 2021]

Figure A.5: Base-case coverage – Croatia [Source: Analysys Mason, 2021]

Figure A.6: Base-case coverage – Cyprus [Source: Analysys Mason, 2021]

Figure A.7: Base-case coverage – Czech Republic [Source: Analysys Mason, 2021]

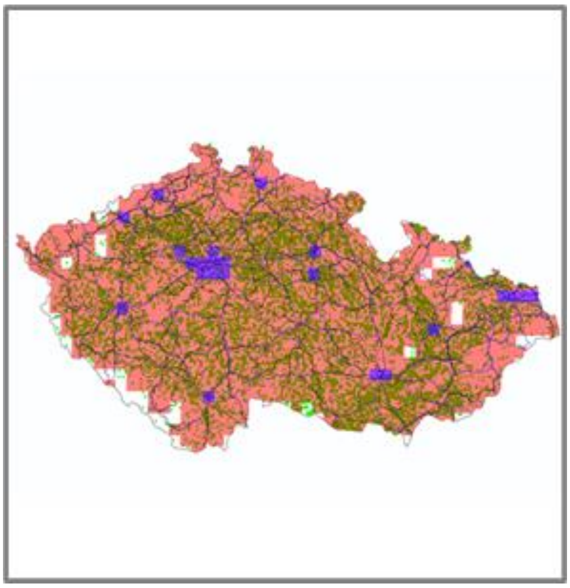


Figure A.8: Base-case coverage – Denmark [Source: Analysys Mason, 2021]

Figure A.9: Base-case coverage – Estonia [Source: Analysys Mason, 2021]

Figure A.10: Base-case coverage – Finland [Source: Analysys Mason, 2021]

Figure A.11: Base-case coverage – France [Source: Analysys Mason, 2021]

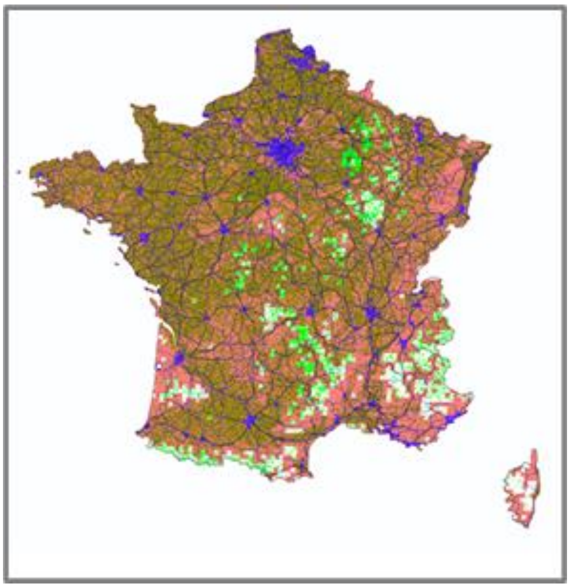


Figure A.12: Base-case coverage – Germany [Source: Analysys Mason, 2021]

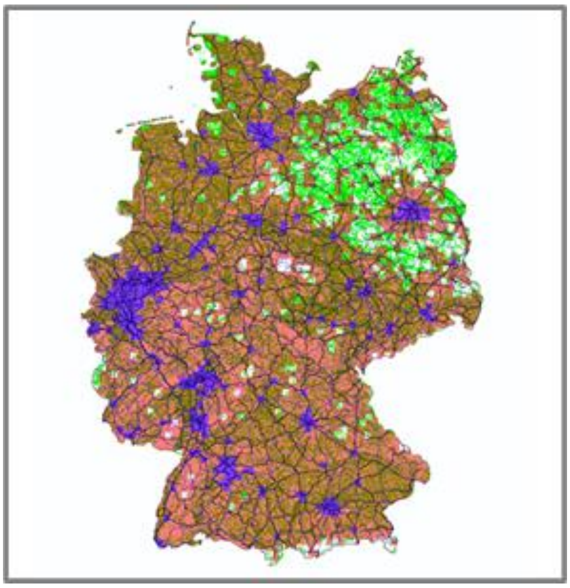


Figure A.13: Base-case coverage – Greece [Source: Analysys Mason, 2021]

Figure A.14: Base-case coverage – Hungary [Source: Analysys Mason, 2021]

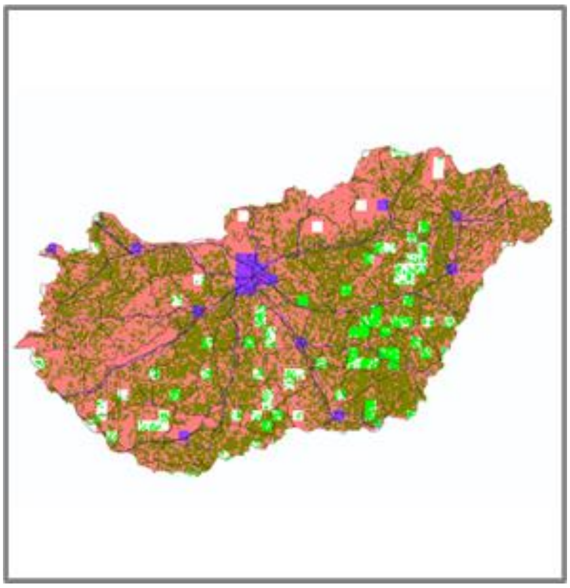


Figure A.15: Base-case coverage – Ireland [Source: Analysys Mason, 2021]

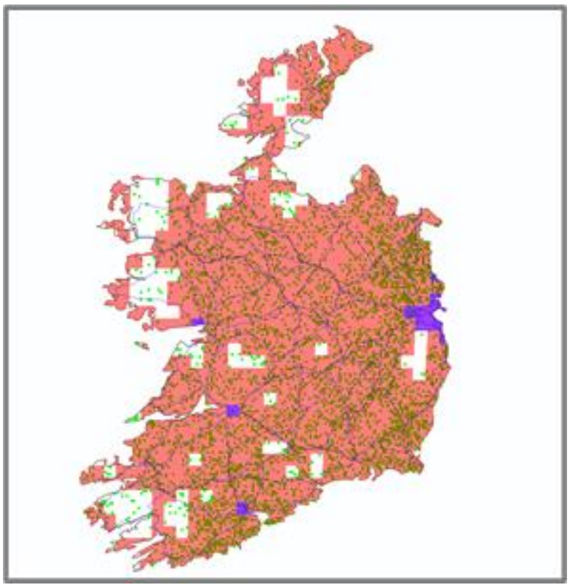


Figure A.16: Base-case coverage – Italy [Source: Analysys Mason, 2021]

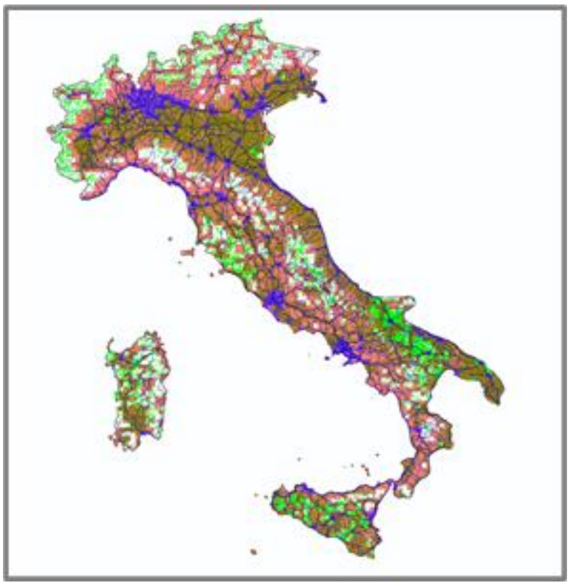


Figure A.17: Base-case coverage – Latvia [Source: Analysys Mason, 2021]

Figure A.18: Base-case coverage – Lithuania [Source: Analysys Mason, 2021]

Figure A.19: Base-case coverage – Luxembourg [Source: Analysys Mason, 2021]

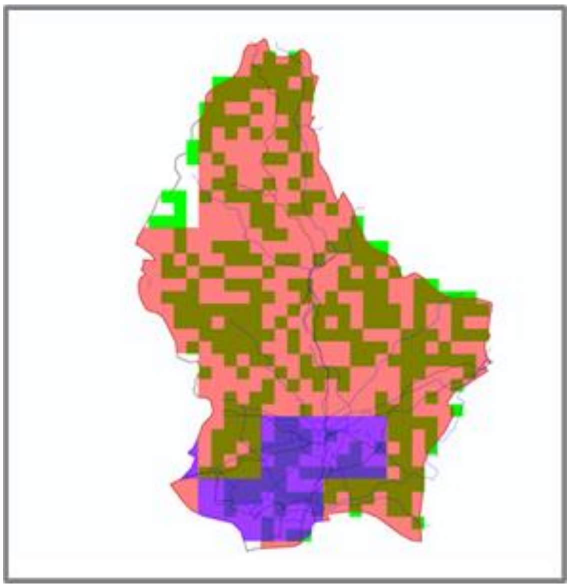


Figure A.20: Base-case coverage – Malta [Source: Analysys Mason, 2021]

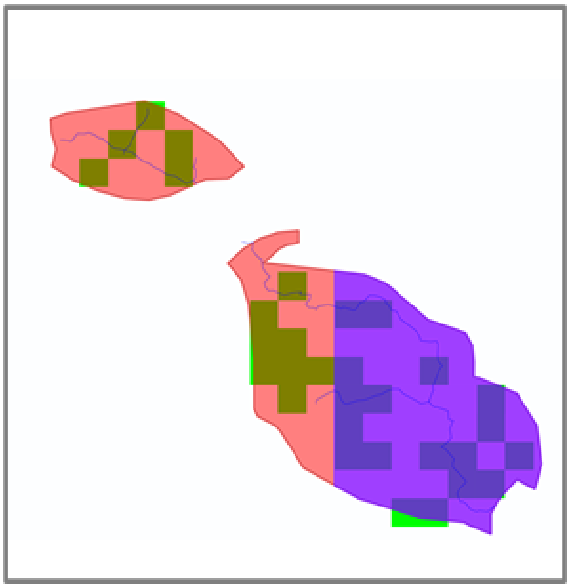


Figure A.21: Base-case coverage – Netherlands [Source: Analysys Mason, 2021]

Figure A.22: Base-case coverage – Norway [Source: Analysys Mason, 2021]

Figure A.23: Base-case coverage – Poland [Source: Analysys Mason, 2021]

Figure A.24: Base-case coverage – Portugal [Source: Analysys Mason, 2021]

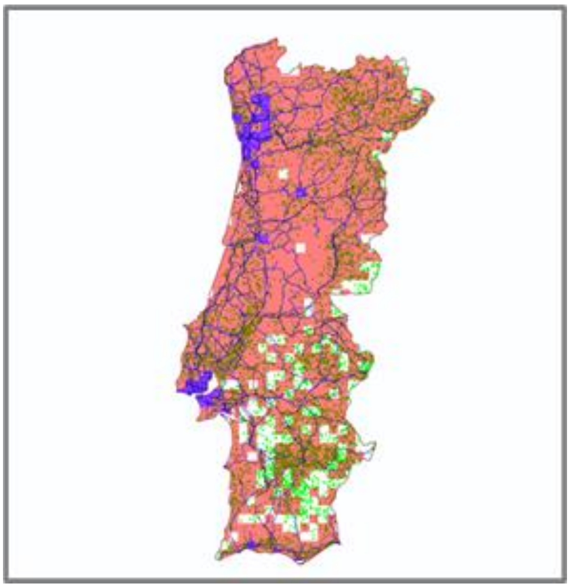


Figure A.25: Base-case coverage – Romania [Source: Analysys Mason, 2021]

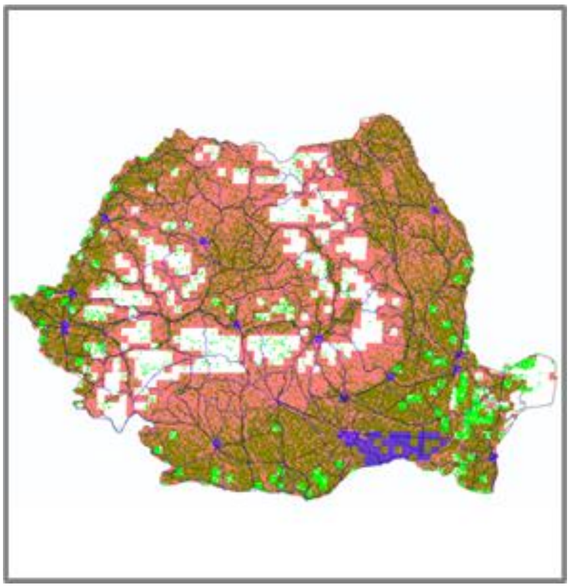


Figure A.26: Base-case coverage – Slovakia [Source: Analysys Mason, 2021]

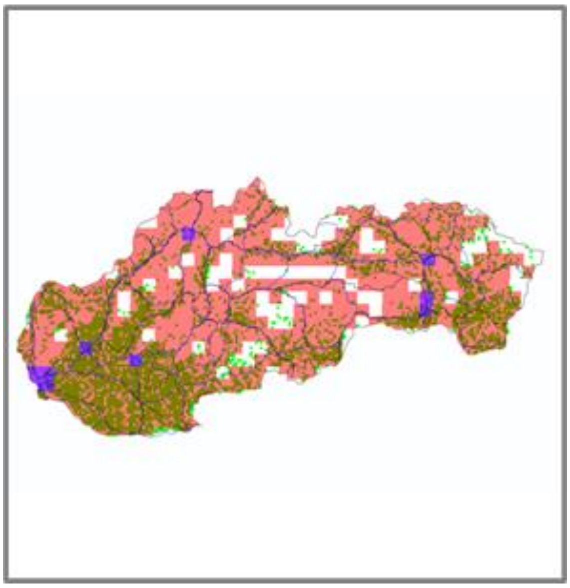


Figure A.27: Base-case coverage – Slovenia [Source: Analysys Mason, 2021]

Figure A.28: Base-case coverage – Spain [Source: Analysys Mason, 2021]

Figure A.29: Base-case coverage – Sweden [Source: Analysys Mason, 2021]

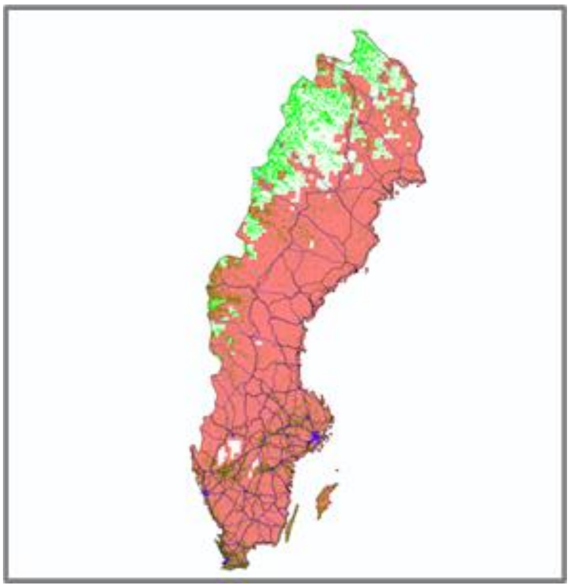


Figure A.30: Base-case coverage – Switzerland [Source: Analysys Mason, 2021]

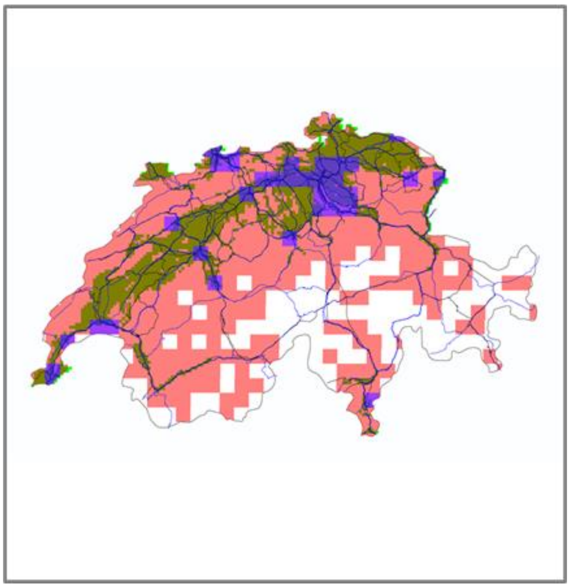


Figure A.31: Base-case coverage – United Kingdom [Source: Analysys Mason, 2021]