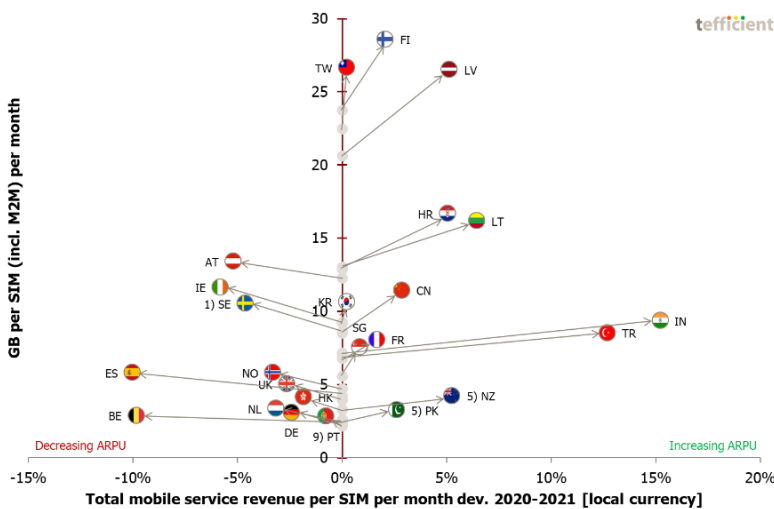


Industry analysis #1 2022

Mobile data – full year 2021

Usage growth decelerates after COVID – but monetisation improves



tefficient Tefficient’s 33rd public analysis of the development and drivers of mobile data compares 46 countries from all regions of the world.

In our previous reports for [2020](#) and [1H 2021](#) we could see that the pandemic drove mobile data usage – contrary to the belief that all that time we spent at home would offload mobile data traffic to Wi-Fi and fixed broadband.

But the usage backlash is here: During the second half of 2021 the demand for more mobile data slowed. If comparing countries where usage is available for both the first and the second half of the year, most experienced decelerating growth. There were even two countries with a decline in absolute usage: Austria and Bahrain.

The country with the fastest growth in usage was – once again – Peru with 53%. Bahrain, Austria and Japan experienced unusually slow growth rates of 15% or less in 2021.

Data-only continues to define the average mobile data usage although the share of base is limited.

Using mobile data has never been cheaper but the erosion in the revenue per gigabyte slowed compared to previous reports. It was again Spain that had the fastest erosion, 35%, while it was Turkey that overtook the position with the slowest erosion – 9%.

The good news: ARPU developed much more favourably compared to previous reports. Although mobile data usage grew slower, a larger share of countries could improve ARPU. Our famous Christmas tree graph shows a majority of branches going right. It has not happened in a long time.

Data usage is still growing y-o-y in every single country

Figure 1 shows the development of mobile data usage for 46 countries where regulators¹ report mobile data traffic. The usage is shown per SIM per month – and in Figure 1 we are including all² SIMs, also M2M/IoT SIMs.

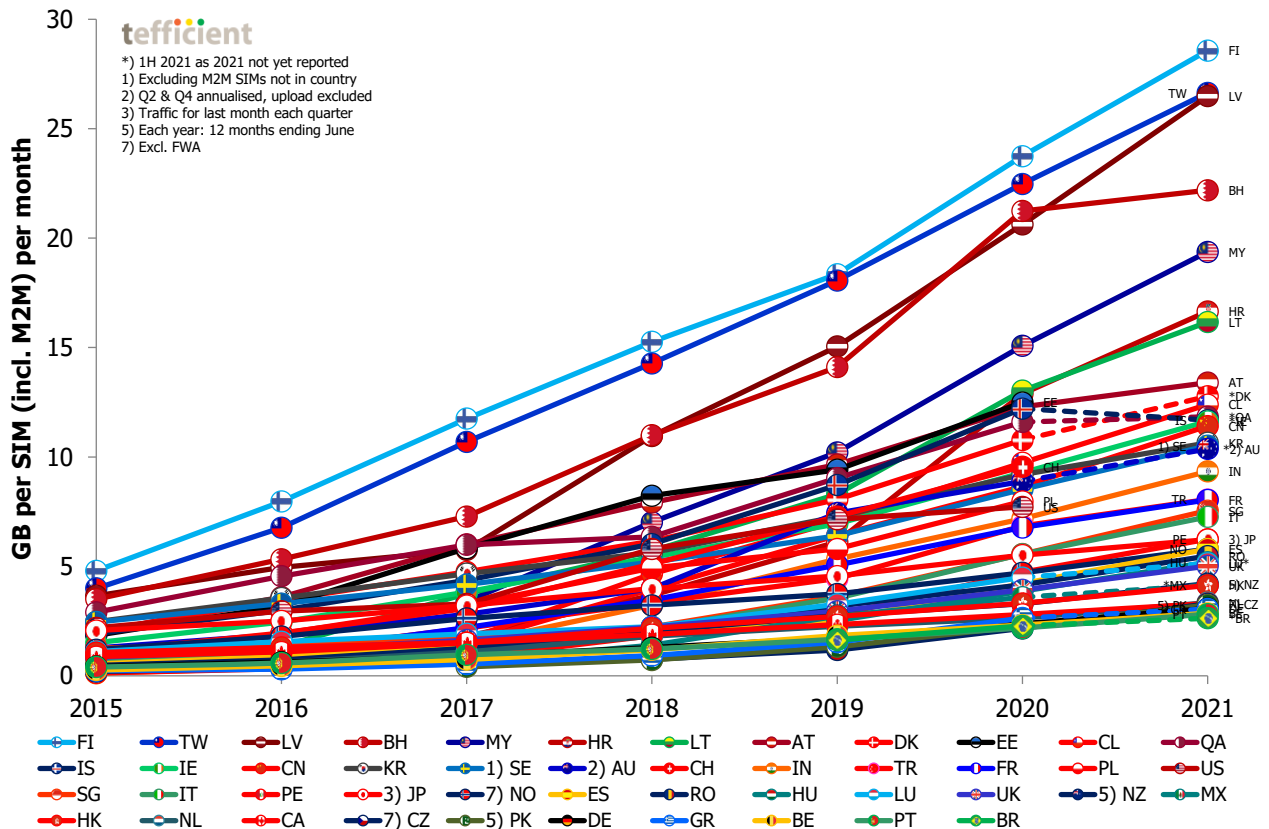


Figure 1. Development of mobile data usage per SIM (incl. M2M) per month – the legend shows the ranking³

Starting from the top of the chart, **Finland** is defending the world number one position when it comes to mobile data usage. In 2019, **Taiwan** was on the verge of overtaking Finland, but Finland managed to put more distance between itself and Taiwan since. **Latvia** is now challenging Taiwan for the number two position. The Baltic country overtook **Bahrain** during 2021 when Bahrain’s strong growth in 2020 led to a recoil in 2021.

¹ Exception: USA, where the data is from the industry body CTIA

² All SIMs in a market included; even the SIMs that usage no or little data. We think it provides a better comparison than usage per ‘mobile broadband subscription’ even if it lowers the average mobile data usage numbers somewhat.

³ Denmark, Qatar, Iceland, Australia, Luxembourg, Mexico, Greece and Brazil have not yet reported 2021. Estonia, Switzerland, Poland and USA have not yet reported 2021 (annual reporting).

The average Finnish SIM card carried **28.6 GB** of data per month in 2021 (+4.8 GB vs. 2020). **70%** of the Finnish SIMs (M2M included) had **unlimited data volume** in December 2021. If excluding M2M, 82%. If excluding also voice-only SIMs, 87%. No other country is as unlimited as Finland.

The average Taiwanese SIM carried 26.6 GB per month (+4.2 GB). Unlimited is behind **Taiwan's** usage development as well. The Taiwanese operators – there are five MNOs – have tried to cool off the market by attempting to move the unlimited price points upwards while discontinuing unlimited for customers that have run out of binding. It worked so-so, but the relatively late (mid-2020) introduction of 5G provided the Taiwanese operators with the tool they needed to turn the ARPU erosion curves around. Unlimited is still very much a standard, but with 5G it comes with a tiered premium.

Latvia's usage grew 5.9 GB in 2021, ending at 26.5 GB. Unlimited is offered as a premium option in regular mobile but, as we will show in the analysis, the high usage is to a large extent explained by data-only subscriptions.

Bahrain (22.2 GB) had slow growth (+0.9 GB) in 2021. **Malaysia's** usage increased 4.3 GB to 19.4 GB and Malaysia hence defends its number 5 position.

The M2M reporting dilemma

Regulators' reporting of M2M/IoT SIMs continues to create a challenge for the comparability between countries. A growing problem is international M2M SIMs that are registered in one country but used somewhere else. Sweden is a good example. The country regulator, PTS, reports 19.9 million M2M SIMs – a figure that more than doubles the total SIM base if added to the regular SIM base of 14.4 million. We are therefore happy that PTS now reports the number M2M SIMs that are active in Sweden; 4.9 million, i.e., just 24% of the total M2M base. This has allowed us to recalculate a more representative mobile data usage figure for Sweden when including M2M.

The same issue emerges in Austria where Deutsche Telekom group registers many of its international M2M SIMs. The number of 'Austrian' M2M SIMs as reported by RTR grew 35% in 2021 – to 8.4 million. Similar to how it was for Sweden previously, Austria's average mobile data usage per SIM thus looks lower when including M2M SIMs than what it realistically is. Luckily Austria's regulator is one of those breaking out M2M SIMs in its reporting allowing a like-for-like comparison of mobile data usage per *non-M2M* SIM, see Figure 2 and Figure 4.

Figure 2 is a variant of Figure 1 but with M2M SIMs *excluded*. As the M2M SIMs typically carry significantly less traffic than the regular SIMs, this makes the usage figures look higher.

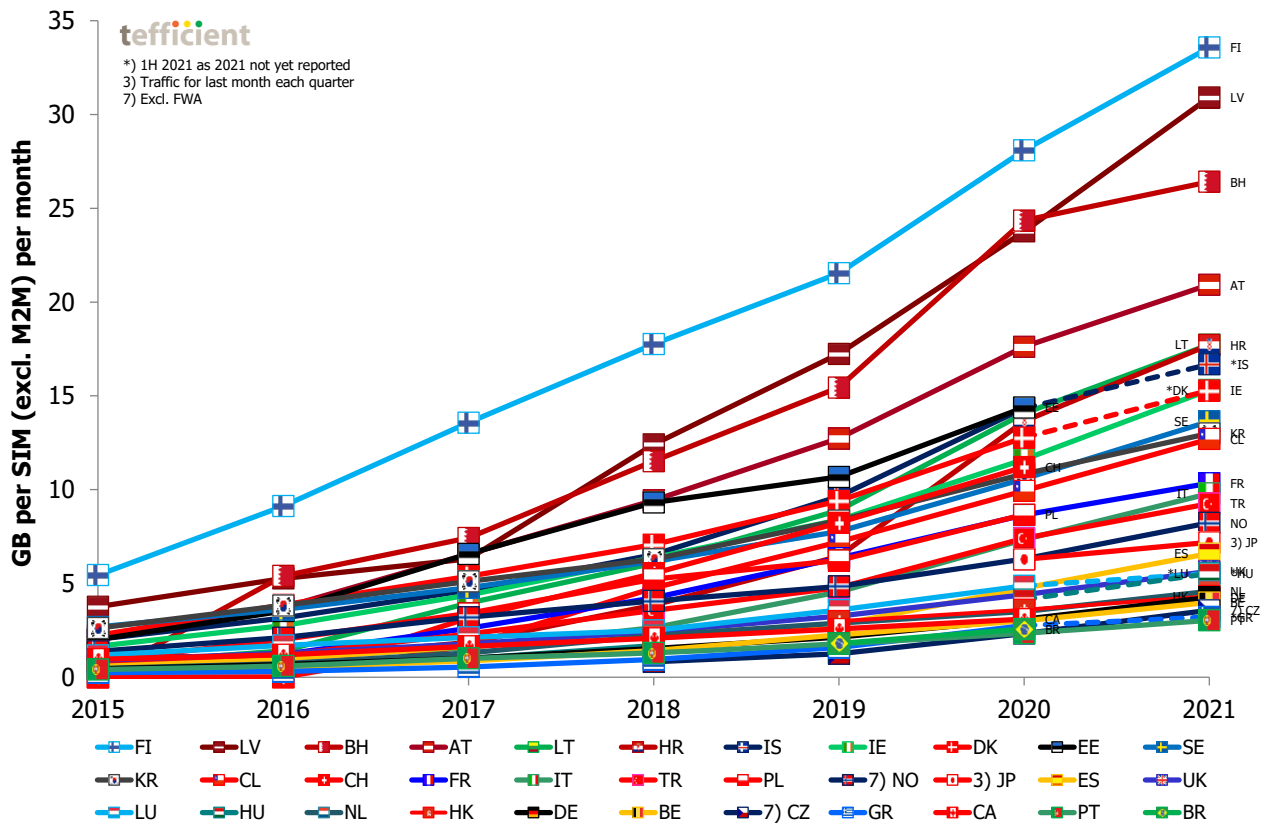


Figure 2. Development of mobile data usage per SIM (excl. M2M) per month – the legend shows the ranking⁴

Since only a fraction of the countries separate out the data traffic associated with M2M SIMs in their reporting (kudos to Norway, Sweden, Czech, Bahrain and Greece), the assumption for most of the countries in Figure 2 is that the M2M data usage is zero. This is of course not correct and as we could expect M2M/IoT SIMs to carry more traffic in future, we think that Figure 1 provides the most accurate comparison.

With **33.6 GB** per non-M2M SIM per month (+5.5 GB in 2021), **Finland** tops also Figure 2. **Latvia** follows with 30.9 GB (+7.1 GB) and **Bahrain** with 26.4 GB (+2.1 GB). Taiwan and Malaysia have disappeared from the top five here as the M2M SIM number isn't broken out in these countries.

The legends of Figure 1 and Figure 2 show the ranking of the 46 studied countries. But since it's difficult to spot them all, Figure 3 and 4 offer an easier visualisation. First including M2M:

⁴ Countries for which the regulator doesn't break out the M2M SIMs have been excluded

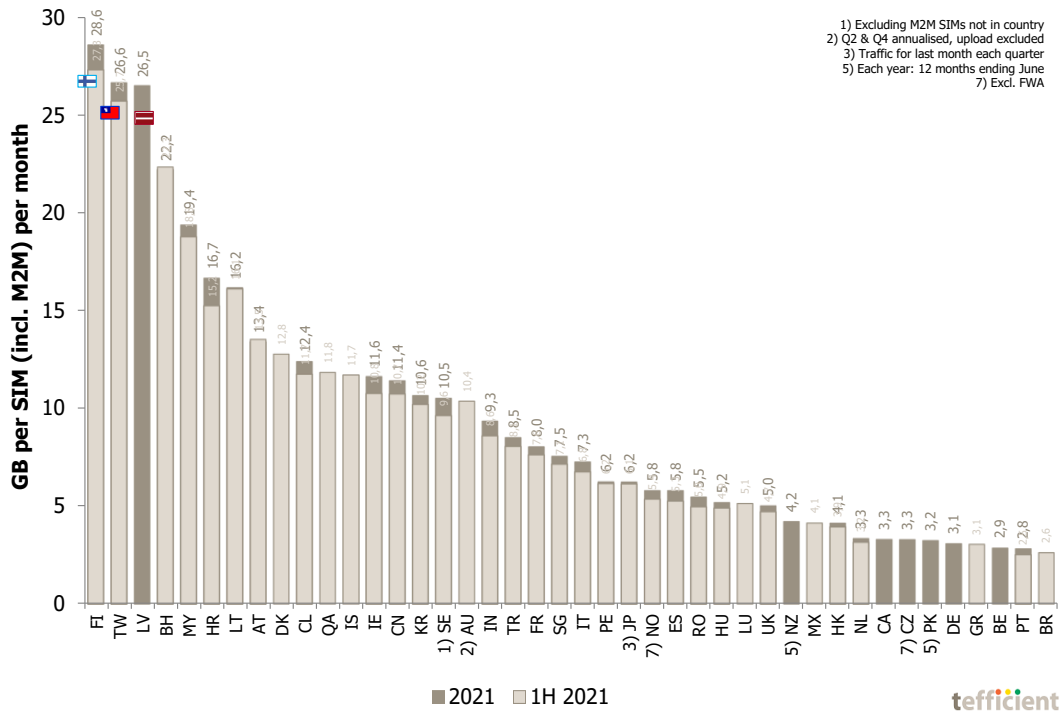


Figure 3. Mobile data usage per SIM (incl. M2M) per month, 2021 and 1H 2021

And in Figure 4 excluding M2M:

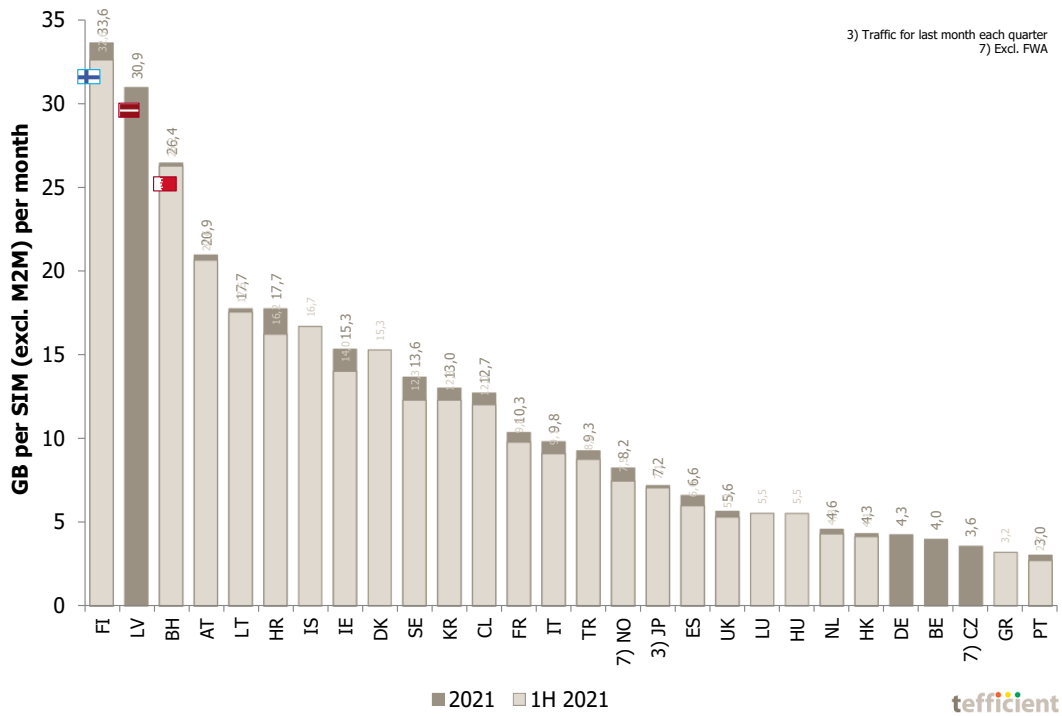


Figure 4. Mobile data usage per SIM (excl. M2M) per month, 2021 and 1H 2021

In comparison to previous reports, there's not much dark grey on top of the 1H 2021 light grey bars which shows that for most markets, there was little usage growth in the second half of 2021.

The countries with the lowest data usage in Figure 3 and Figure 4 are **Brazil, Portugal, Belgium, Greece, Germany, Czech Republic⁵ and Pakistan.**

Figure 5 is a zoom-in on the lower end of Figure 1.

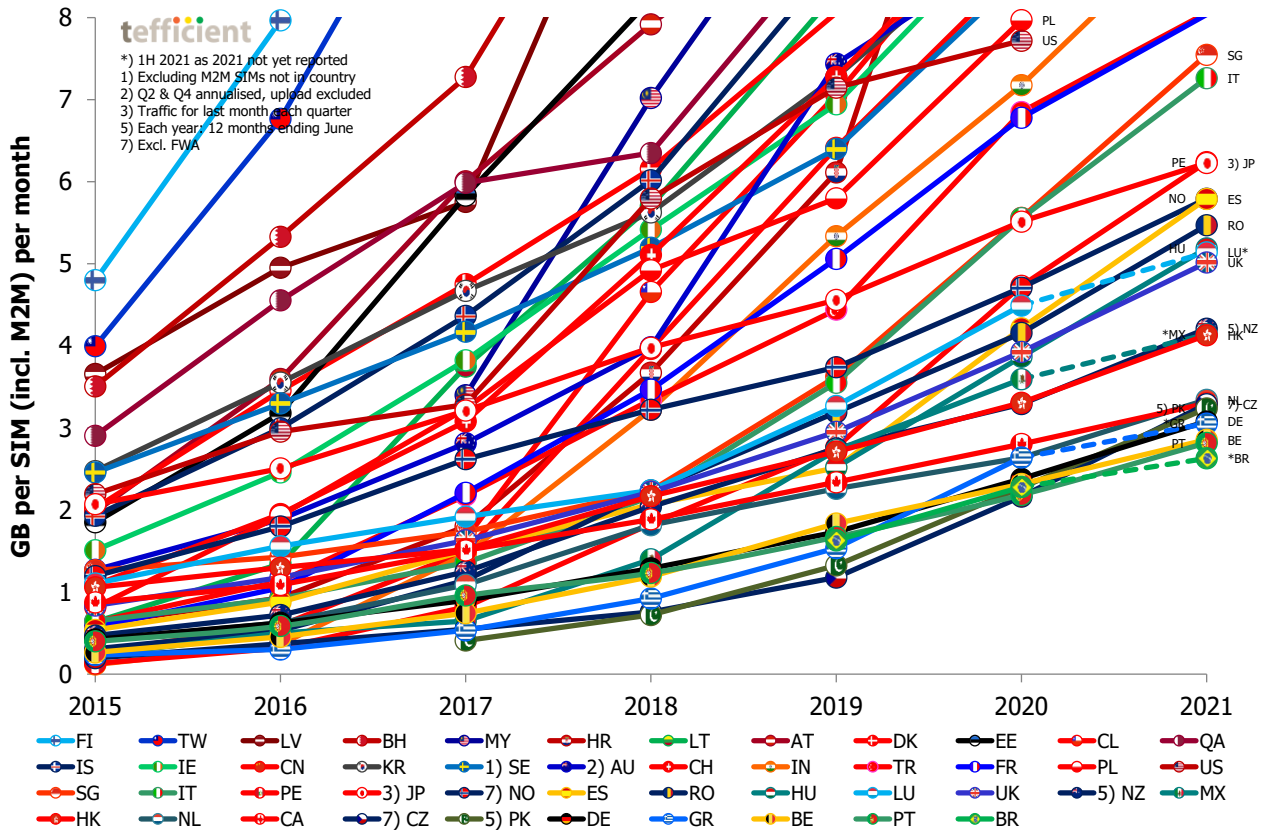


Figure 5. Development of mobile data usage per SIM (incl. M2M) per month [zoom-in on low end]

Albeit in the lower usage range, **Portugal, Belgium, Germany, Canada, the Netherlands, Hong Kong, New Zealand, Norway and Japan** had quite modest year-on-year usage growth (13-29%) in 2021.

⁵ Note that FWA (fixed wireless access) traffic is excluded in the reported mobile data traffic of the regulator CTU. To make it comparable with other markets, we could have added it, if only CTU reported it.

Data usage growth fastest in Peru

Figure 6 shows the growth in average usage per SIM (incl. M2M) between 2020 and 2021.

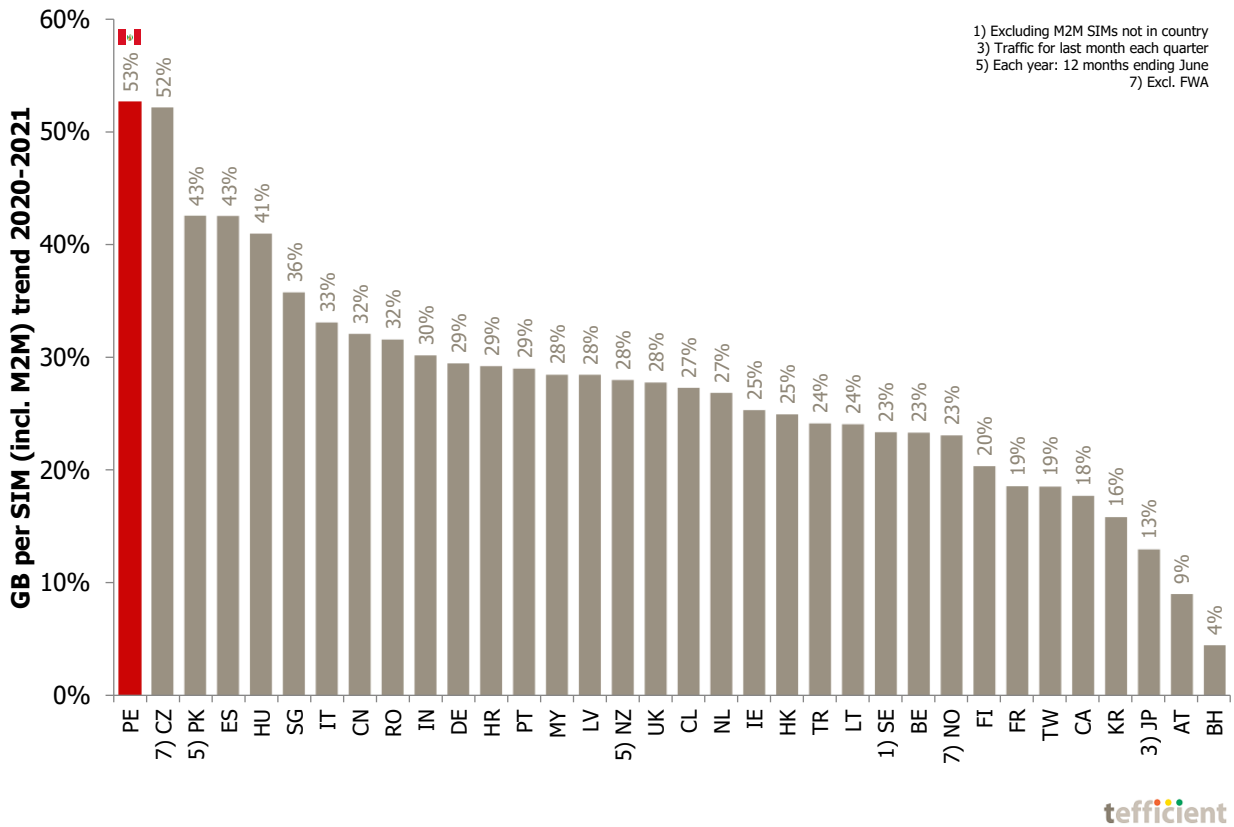


Figure 6. Development of mobile data usage per SIM 2020-2021

Peru again had the fastest growth in mobile data usage. The average Peruvian SIM used 53% more mobile data in 2021 compared to 2020. The usage in **Czech Republic** grew almost as fast, 52%. **Pakistan, Spain** and **Hungary** also had good growth.

The growth laggards in Figure 6 are **Bahrain** (4%), **Austria** (9%) and **Japan** (13%).

Bahrain, Austria and Japan had the slowest usage growth

Data-only rarely more than 20% of base, but defines usage

Although **fixed wireless access** (FWA) seems to experience a renaissance with 5G, using mobile networks to substitute fixed broadband is hardly something new. In some markets, like Finland and Austria, this has been around for long. The take-up can be significant if the FWA/data-only offers are reasonably charged and without usage caps. It also helps if the fixed broadband offering is weak with much DSL is the mix.

In the second half of 2021, the Finnish regulator, Traficom, started to report also fixed data traffic, allowing a comparison with the mobile data traffic it has reported for long, see Figure 7.

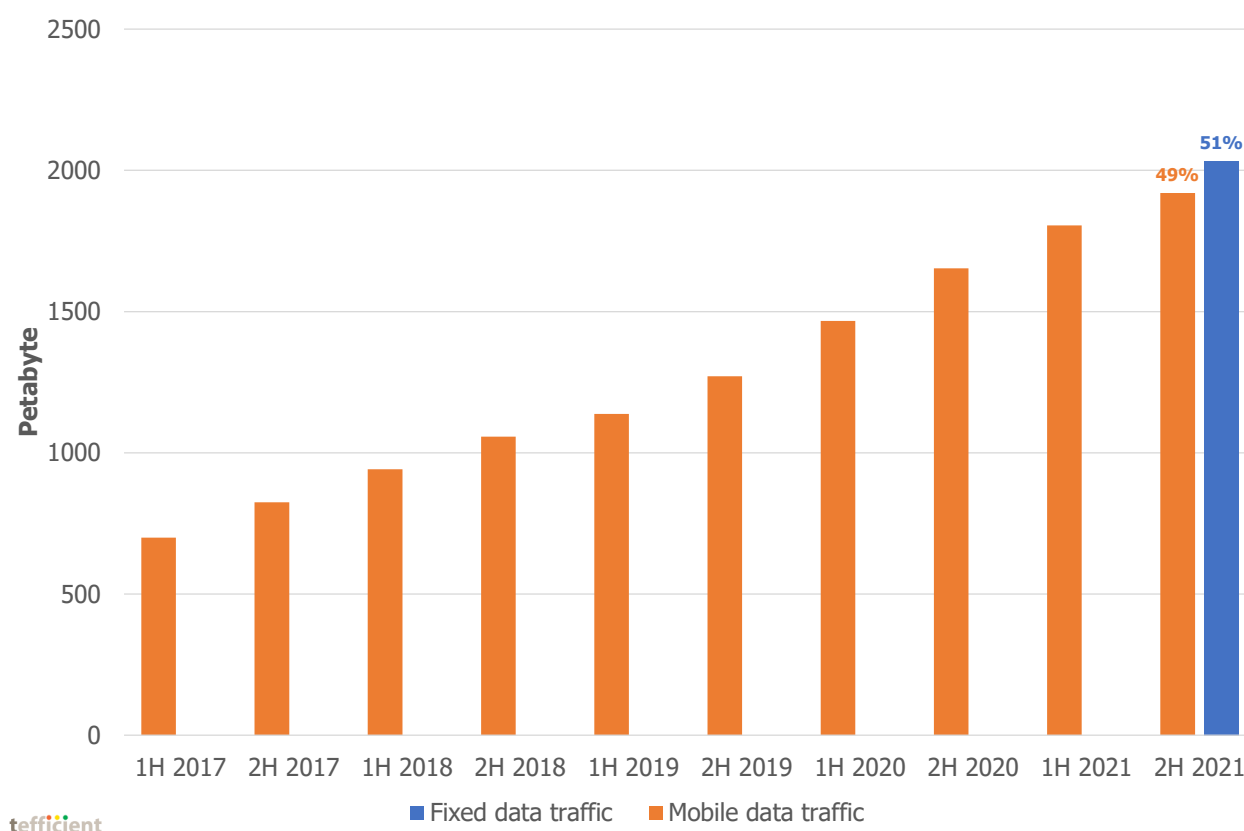


Figure 7. Development in reported mobile and fixed data traffic in Finland, 1H 2017-2H 2021

The mobile data traffic represented **49%** of the total data traffic in Finland in 2H 2021. It's likely the most even distribution between fixed and mobile networks among our 46 markets. Austria, in comparison, had 63% of the traffic over fixed vs. **37%** over mobile in 2H 2021.

This takes us to Figure 8. It plots the average data usage per SIM vs. the data-only share of a country's SIM base.

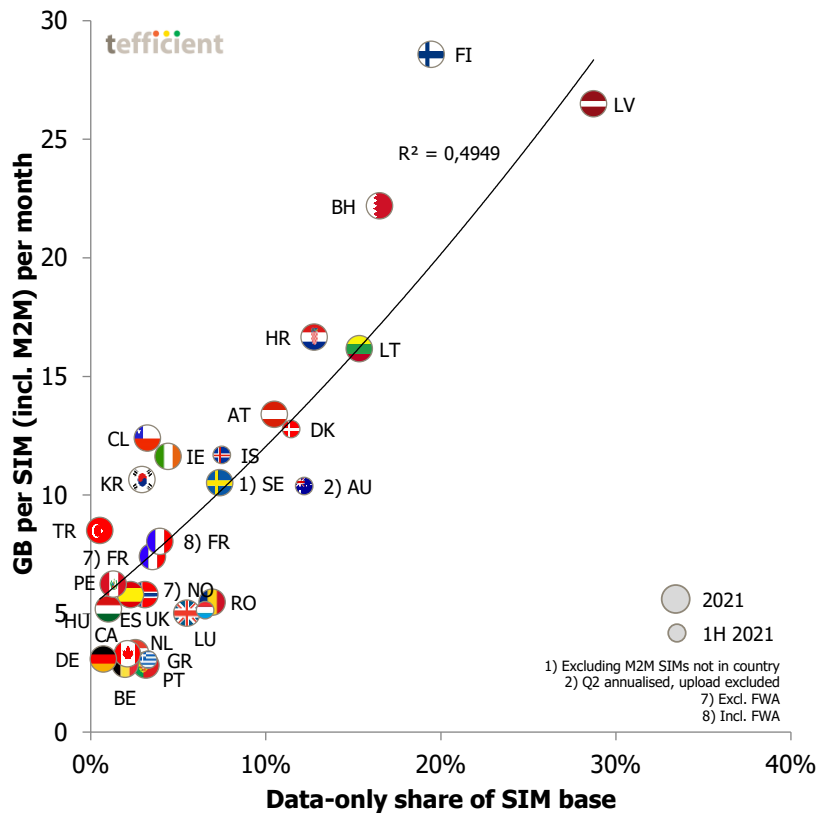


Figure 8. Mobile data usage vs. data-only share

In December 2021, **29%** of the SIM base in Latvia was data-only. That makes **Latvia** the clear leader in data-only share of base – and the average mobile data usage is also very high. In **Finland** data-only represented 19% of the base but the usage is even higher than in Latvia. **Bahrain** had a high data-only share too – 17%. There are seven countries forming a central cluster between 7% and 15%: Sweden, Iceland, Austria, Denmark, Australia, Croatia and Lithuania.

The adherence to the regression line is relatively strong. As in all previous reports we therefore conclude that **data-only penetration is a significant driver of the average mobile data usage.**

The easiest way for low-usage countries to grow data usage and expand the mobile market would be to **start addressing and monetising the data-only segment.** This seems to be effective particularly in markets where fast fixed broadband networks (FTTH, FTTB or HFC) aren't already available to a substantial share of the households. The US wireless market leader **Verizon** launched its first **5G** branded service in December 2018 to support a fixed wireless access (FWA) use case. **T-Mobile** has since followed. And it seems to work well sales-wise, see Figure 9.

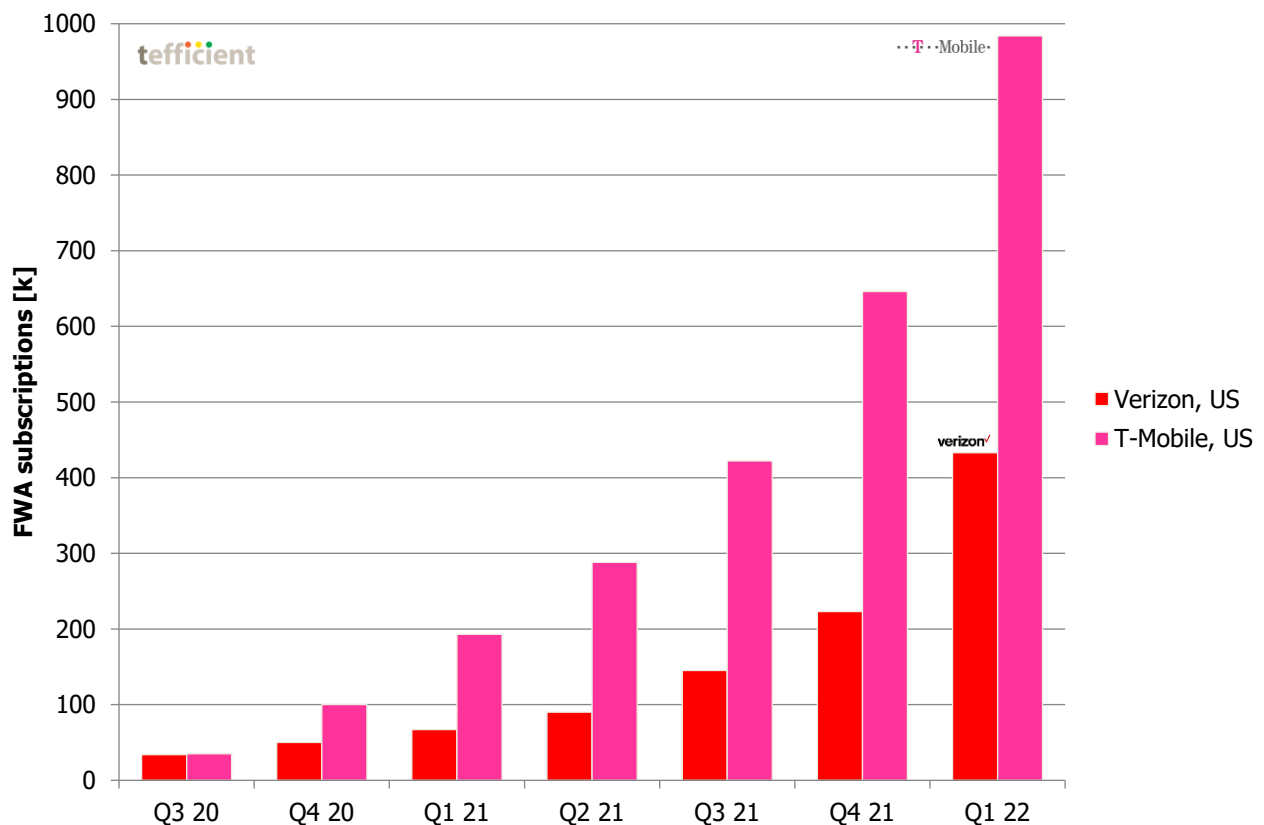


Figure 9. Development in the FWA subscription base of Verizon and T-Mobile USA

In March 2022, T-Mobile had almost accumulated a total of **1 million FWA subscribers** (4G and 5G) across the USA. Since Verizon offers fibre broadband in parts of the country, it doesn't sell FWA everywhere. Verizon had 433 thousand FWA subscribers (again across 4G and 5G) in March 2022, representing **6%** of Verizon's total broadband (fixed+FWA) base.

Telenor in Norway had 110k FWA subscribers in March, representing a yet higher share of their total broadband base: **15%**. It's a pity that the Norwegian regulator, Nkom, doesn't report the traffic generated by Norwegian FWA subscribers as it would be interesting to compare it with e.g. the French FWA traffic.

Figure 8 shows that even a relatively low share of such data-only subscriptions could lift the average data consumption significantly.

Some of the countries in Figure 8 are also reporting the data-only traffic. For these countries, we can compare the data-only penetration of the SIM base to its share of the total mobile data traffic, see Figure 10.

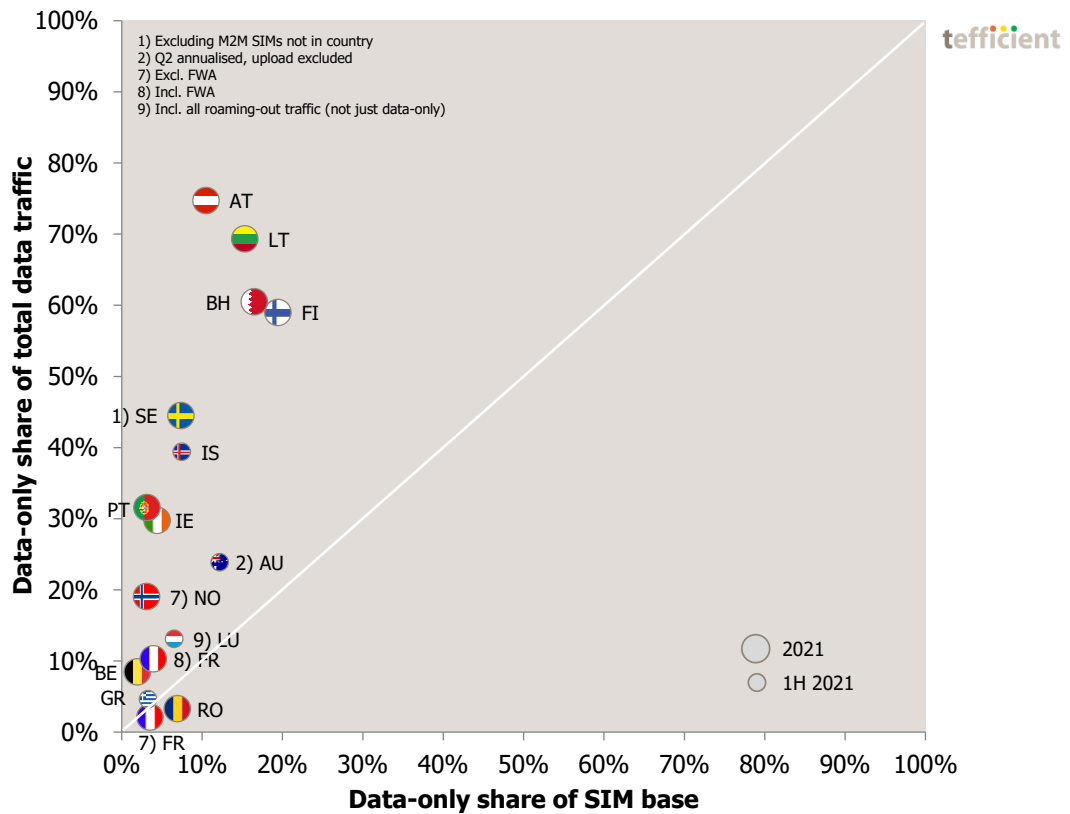


Figure 10. Data-only share of total traffic vs. data-only share of SIM base

Except for Romania, data-only SIMs carry a disproportionately high share of the data traffic:

- Portugal **10.0x** higher traffic per data-only SIM vs. any SIM
- Ireland **6.7x**
- Austria **7.1x**
- Norway (excl. FWA) **6.1x**
- Sweden **6.0x**
- Iceland **5.3x**
- Lithuania **4.5x**
- Belgium **4.3x**
- Bahrain **3.7x**
- Finland **3.0x**
- France (incl. FWA) **2.6x**
- Australia **2.0x**
- Luxembourg **2.0x**
- Greece **1.4x**
- Romania **0.5x**

In addition to the countries in Figure 10, there is one which doesn't report data-only SIM base, but data-only's share of traffic: In **China**, 4% of mobile data traffic wasn't carried over regular mobile phones.

For the countries that are reporting both data-only traffic and the number of data-only subscriptions, we can compare the average usage per *data-only* subscription, see Figure 11.

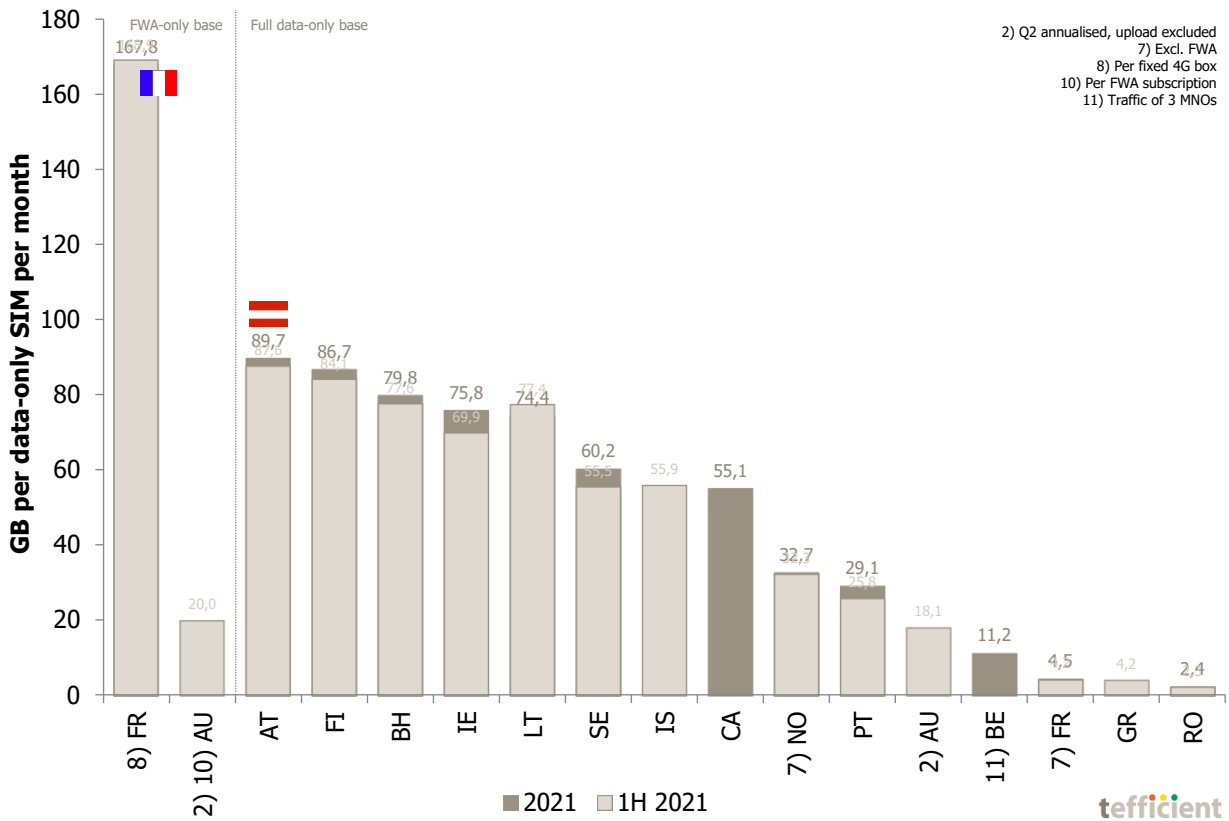


Figure 11. Mobile data usage per data-only SIM per month, 2021 and 1H 2021

Starting from the left, the average '4G box' in **France** carried **167.8 GB** of mobile data per month in 2021. This is significantly higher than for the other FWA-only usage number in Figure 11: In Australia, the usage per FWA subscription was just 20 GB in 1H 2021⁶.

If instead looking at the *whole* data-only base (not just the FWA segment), **Austria** leads with the average mobile data consumption per data-only SIM of **89.7 GB**. **Finland** had 86.7 GB. **Bahrain** follows with 79.8 and **Ireland** as new No 4 with 75.8 GB.

In comparison to previous reports, there's not much dark grey on top of the 1H 2021 light grey bars which shows that for most markets, there was little usage growth in the second half of 2021. In some cases, like Lithuania, the usage even fell in the second half.

The average Austrian data-only subscription consumed 89.7 GB per month in 2021

⁶ There's a major difference in the number of reported FWA subscribers by the regulator, ACCC, and the operators

If **5G** should become the fibre-over-radio solution that T-Mobile, Verizon and Telenor suggest, the data-only FWA usage figure of France gives a taste of the usage that the solution must at least manage. Fixed broadband usage is yet higher – often above 300 GB per month.

5G adoption a driver of data usage – or?

5G has been in commercial operation in more than three years by now and it would be high time to **correlate mobile data usage with 5G adoption**. Too few regulators (and operators for that sake) are however reporting 5G traffic – and 5G base – to make a sensible correlation graph for 5G. We strongly encourage regulators to see to that 5G numbers are reported.

Figure 12 below gathers all 5G information reported for our 46 markets in 2021.

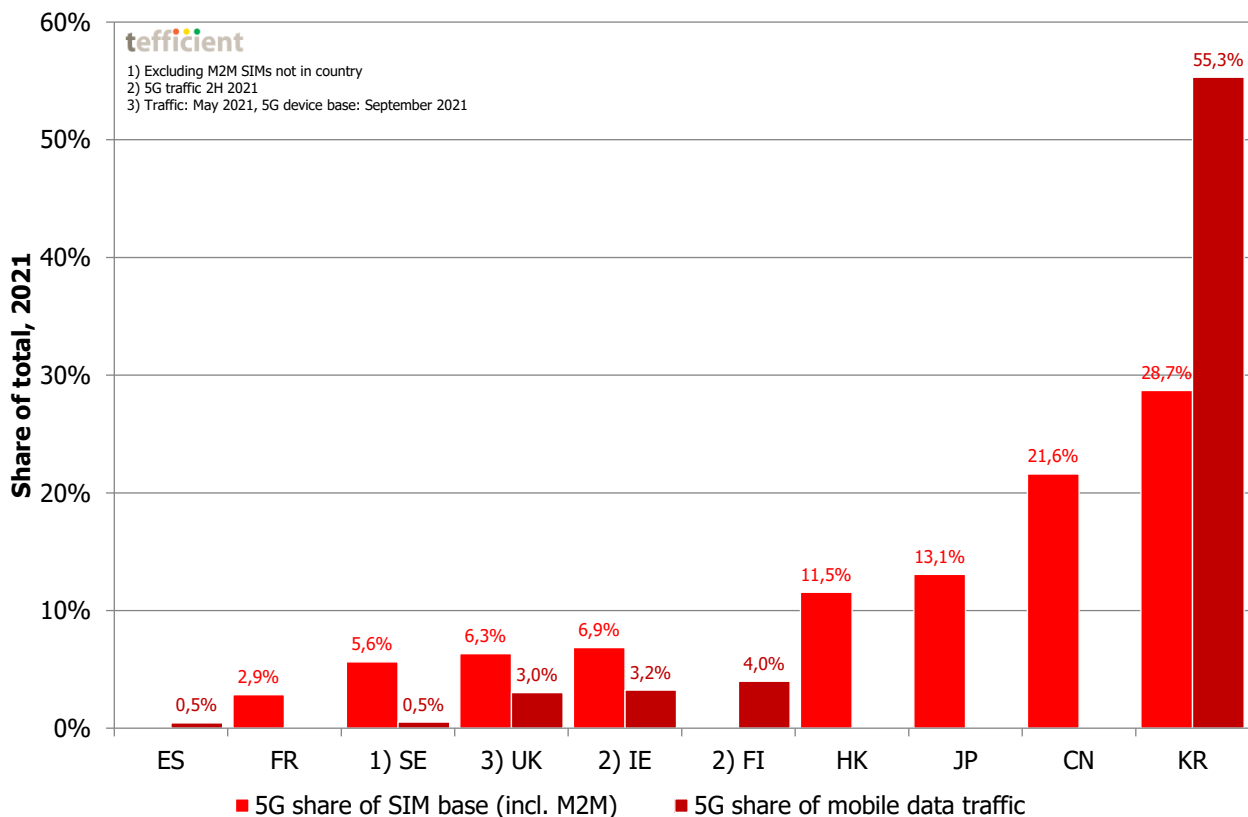


Figure 12. 5G share of base and 5G share of total mobile data traffic – reporting countries

From left in Figure 12: **0.5%** of **Spain's** mobile data traffic was carried by 5G networks in 2021, but the 5G subscriber base isn't reported. In **France**, 2.9% of the subscriptions were 5G in December 2021, but 5G traffic isn't reported. Of the **Sweden's** SIM base, 5.6% was 5G in December 2021, but the 5G traffic in 2021 was just 0.5% of the total. In the month of May 2021, the 5G networks of the **UK** carried 3.0% of the mobile data traffic – and **6.3%** of subscriptions had active 5G devices in September 2021. Similar figures in **Ireland**: 6.9% of subscriptions in December 2021, 3.2% of the traffic in the second half of 2021. With 4% of the traffic in the second half 2021, **Finland** might be the European leader in 5G share of traffic.

The top four markets in Figure 12 are all in Asia: 11.5% of **Hong Kong's** mobile subscriptions were 5G in December 2021. In **Japan**, 13.1%. In **China** yet higher: 21.6%. But highest of all is of course **South**

Korea where 28.7% of mobile subscriptions were on 5G in December 2021. In 2021, 5G subscriptions generated **55.3%** of South Korea’s total mobile data traffic.

Since the Korean government reports monthly stats on 5G, Figure 13 shows the monthly development for the subscriber and traffic adoption.

South Korea: 55% of the mobile data traffic was 5G in 2021

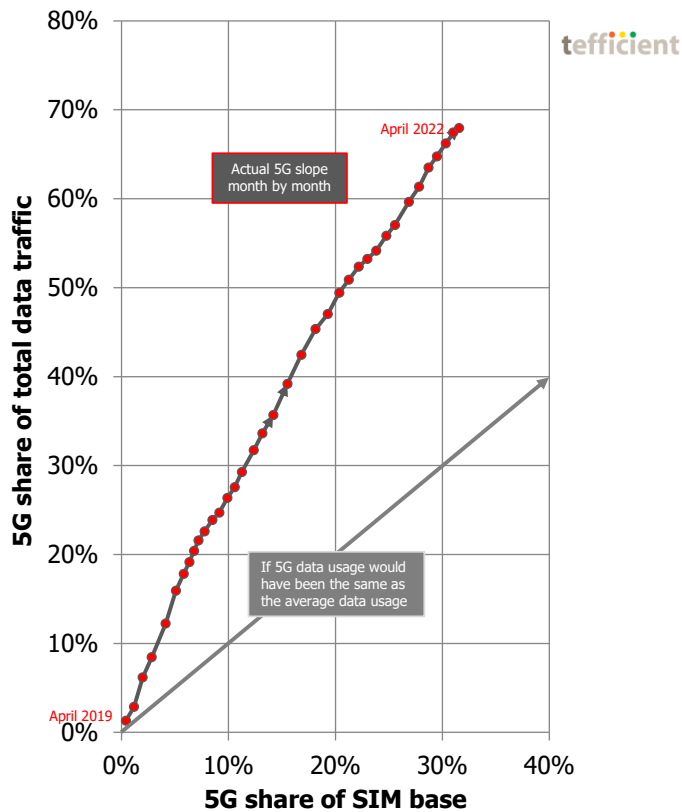


Figure 13. 5G share of total traffic vs. 5G share of SIM base – Korea per month since 5G launch

In April 2022, **68%** of the mobile data traffic in South Korea was 5G. 5G represented 32% of the total SIM base, indicating that the average mobile data usage per 5G subscriber is far higher than for non-5G subscribers in South Korea. The usage figures for April 2022 are:

- 5G: **26.5** GB per month
- 4G: **8.1** GB per month

It’s important to point out that it’s not 5G as such that alone explains the higher mobile data usage in 5G: Korea’s operators are offering **unlimited** data plans more widely in 5G compared to what they did in 4G. But even if comparing apples to apples – unlimited to unlimited – 5G still seems to drive usage.

In March 2022, the average unlimited 5G subscription generated **44.2 GB** whereas the average unlimited 4G subscription generated 17 GB less – **27.0 GB**.

The development in Korea is impressive and bodes well for the industry. It will be interesting to see if **China** and **Japan** – two other countries where operators have started to report 5G customer numbers – will be able to follow the Korean ‘gearing’ curve between base and traffic.

A gigabyte has never been cheaper

Most mobile operators in mature markets aren't attempting to monetise voice and SMS based on usage any longer; they have instead made these allowances unlimited and included them in a flat fee. This means that the last price-defining parameter for most mobile users is **data volume**. Even though more and more operators introduce unlimited propositions, these are often the last step in a tiered data plan⁷ – which means that price still, essentially, is about data volume.

Figure 14 plots the *total* mobile service revenue per consumed gigabyte⁸ against the average mobile data usage per SIM and month.

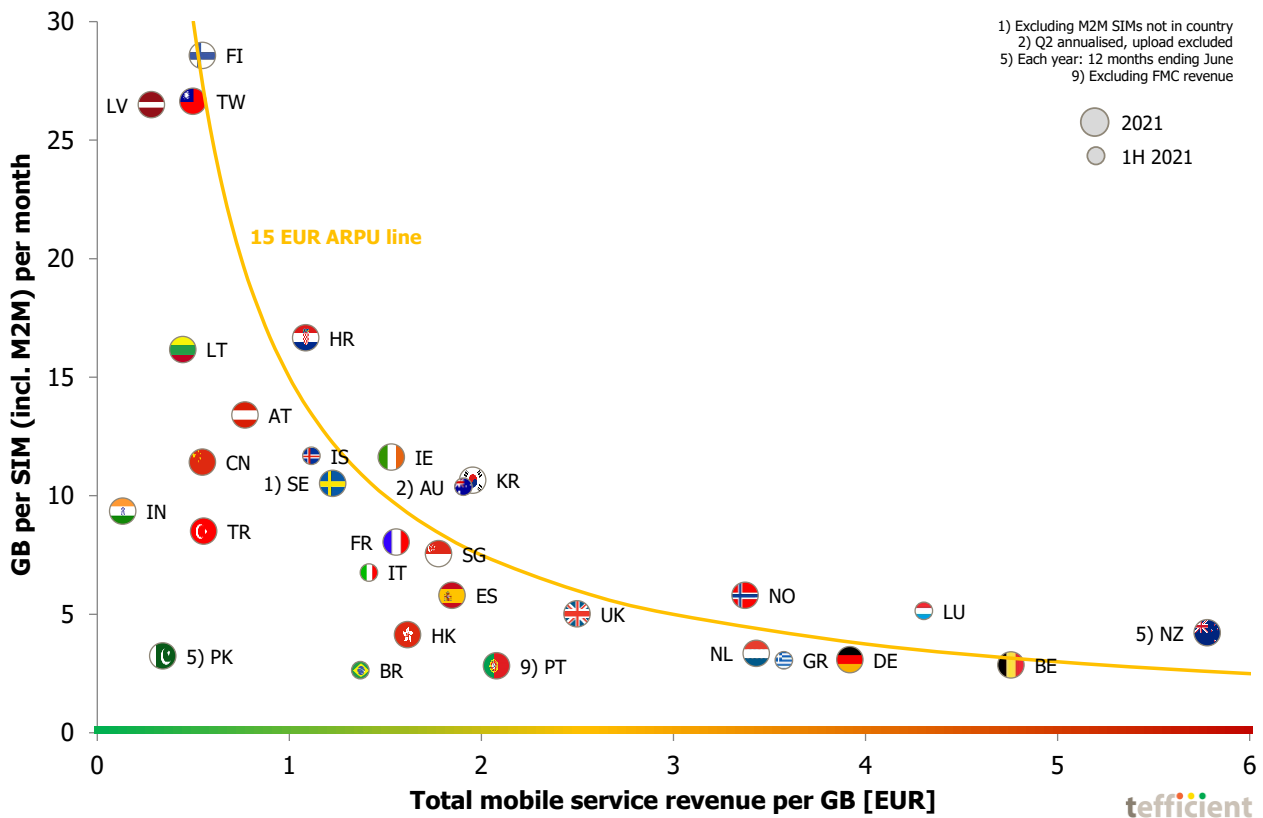


Figure 14. Mobile data usage vs. total mobile service revenue per consumed GB

The amber line shows where **15 EUR of ARPU** is earned. Countries below it had an ARPU lower than 15 EUR, countries above an ARPU higher than 15 EUR.

⁷ There are exceptions to this, e.g. Finnish operators, Swisscom, O2 Germany, Telenor Norway and Vodafone in Spain, the UK and most other European Vodafone markets except Germany, where the price-defining parameter instead is data throughput. There are also operators mixing several parameters such as volume, throughput, policy, zero-rating, video resolution, service bundling etc.

⁸ Attributing zero value to voice and messaging

There are a few countries where operators enjoy very high total revenue per consumed gigabyte: **New Zealand**⁹, **Belgium**, **Luxembourg** and **Germany**¹⁰.

It's important to point out that our analysis looks at what the mobile operator industry *de facto* makes on end-users, not what the best offer on the market currently is. Most users are on old price plans because they are still locked in by a contract – or because they have not bothered to find the best deal.

In the other end of the scale, we find the markets where operators get the lowest revenue per consumed gigabyte: **India**, **Latvia**, **Pakistan**, **Lithuania**, **Taiwan**, **China**, **Finland** and **Turkey**.

Indian operators have the lowest total revenue per GB – New Zealand's operators the highest

Looking at Figure 14 we can conclude – as in all our previous analyses on this topic – the key explanation to high mobile data usage is low effective revenue per gigabyte: **Bigger data buckets lead to lower revenue per GB – which, on the other hand, increases usage**. At least when customers can use those big buckets also within the data-only segment; see Figure 8.

But we also said that a gigabyte has never been cheaper. More correctly put is that operators never had lower total service revenue per gigabyte than what they currently have. Figure 15 shows the revenue erosion from 2020 to 2021.

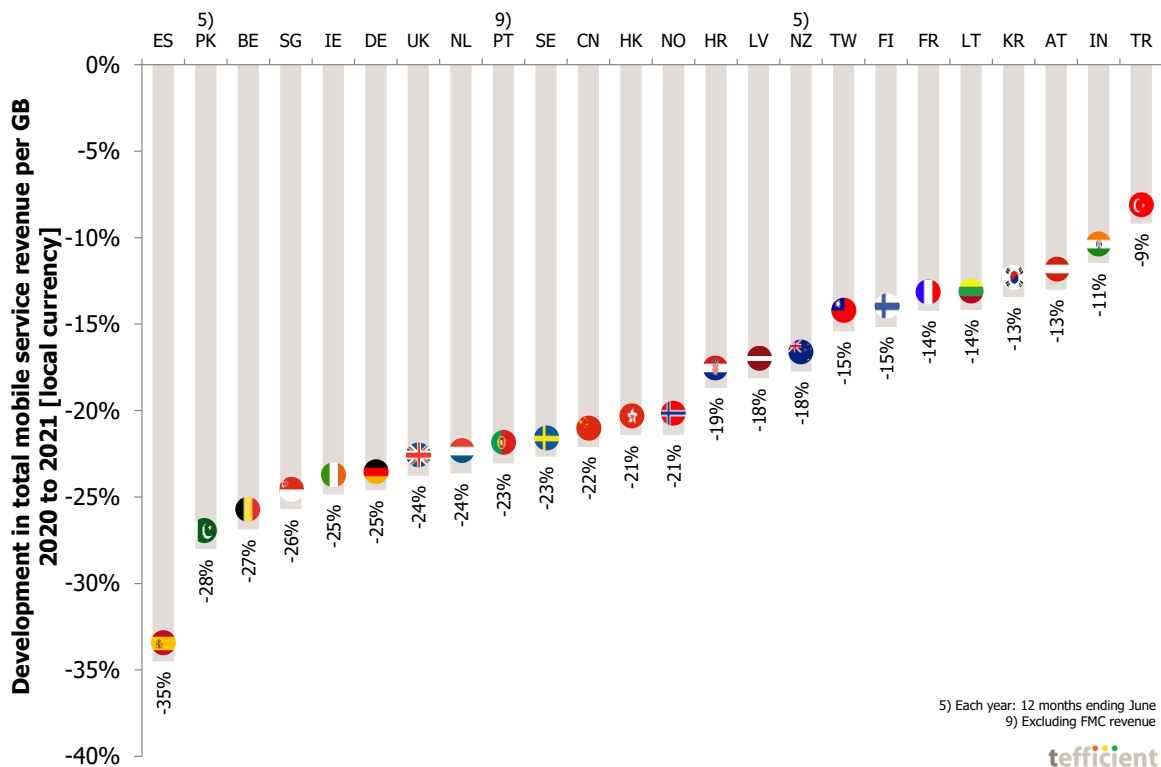


Figure 15. Erosion in total mobile service revenue per consumed GB – 2020 to 2021

⁹ Based on latest available (12 months to June 2021) data

¹⁰ Canada's CRTC has not yet reported revenue figures for 2021

The prerequisite to be in Figure 15 is of course that the statistics have been reported both for 2020 and 2021. Of these markets, **Spain** had again the fastest revenue erosion, 35%. **Pakistan** had 28%, **Belgium** 27% and **Singapore** 26%. In comparison to previous reports, the erosion had generally slowed down.

Turkey is now having the slowest erosion, 9%. **India** had 11% and wasn't slowest this time.

No correlation between data usage and ARPU

Figure 16 is a variant of the revenue per GB chart – it plots the usage against the average revenue per SIM, i.e. the ARPU.

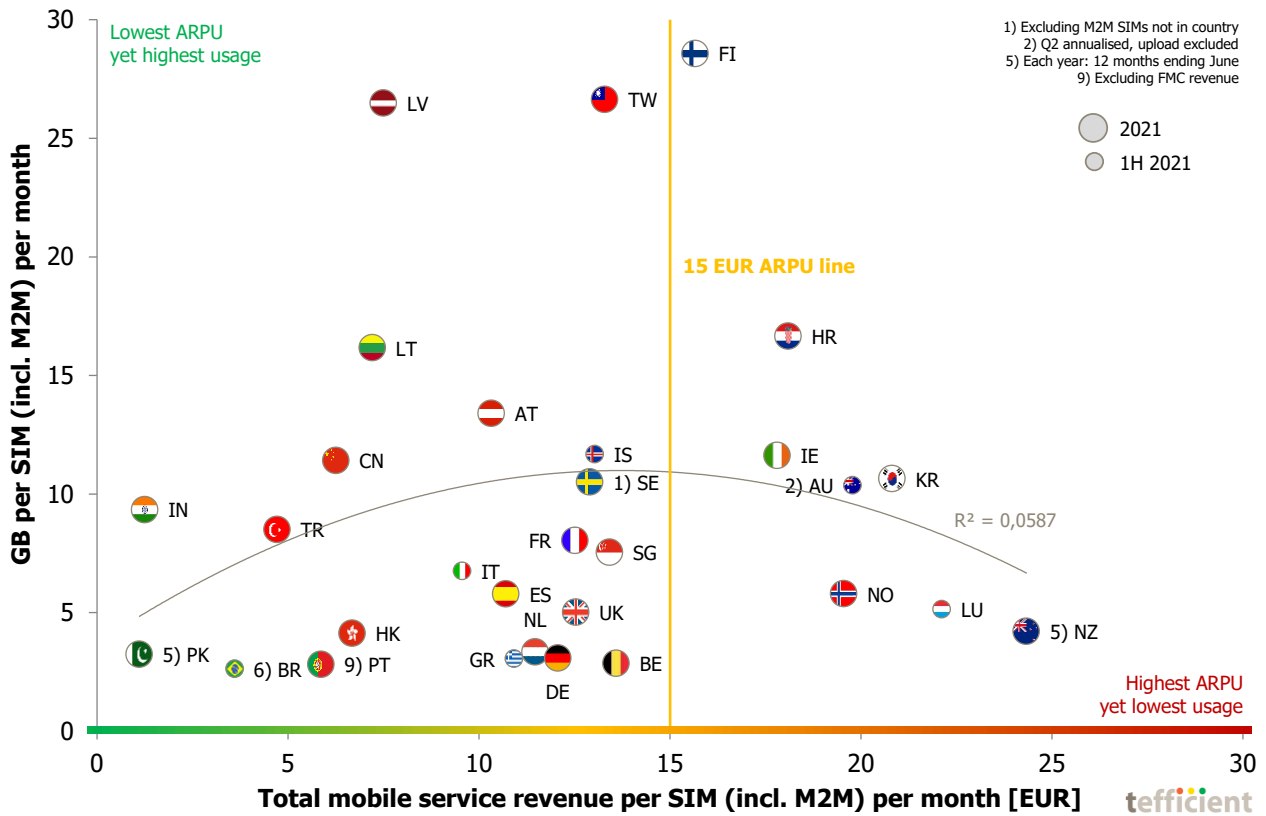


Figure 16. Mobile data usage vs. total mobile service revenue per SIM

With USA and Canada¹¹ not yet having reported 2021 revenues, it is instead **New Zealand, Luxembourg, South Korea, Australia** and **Norway** where operators derive higher ARPUs than elsewhere.

Operators in the upper left corner – **Finland, Taiwan, Latvia, Lithuania** and **India** – are being the most generous with mobile data considering their ARPU. These countries form a nice imaginative trend line suggesting that operators could expect to get rewarded with higher ARPU as usage grows.

But that's regrettably not to overall trend: The adherence to the grey regression line is weak but it's not pointing in the north-easterly direction one would like to see – with more usage leading to higher ARPU.

¹¹ Switzerland can no longer be shown as Sunrise UPC after the merger no longer reports mobile service revenue – and since BAKOM's revenue reporting does not historically match the sum of the operators and depicts a very different trend, it is not used here

Dressing the Christmas tree based on ARPU development

Now to our Christmas tree graph. It's the graph were we ideally like to see the branches stretch to the right since that means that the ARPU grew in the past year. That would demonstrate that the operators of a country have been able to monetise the growth in data usage.

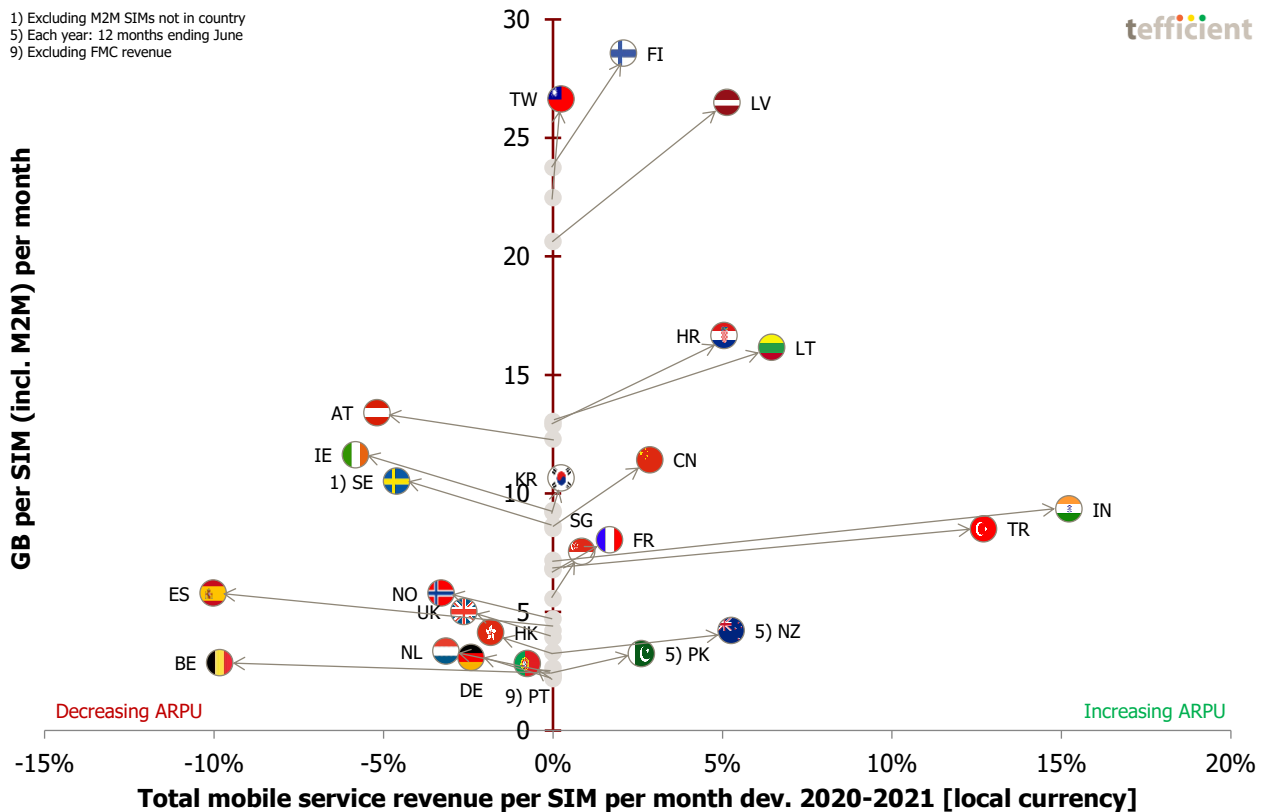


Figure 17. Development in mobile data usage vs. the development in ARPU – 2020 to 2021

The branches stretch right in **13 of 24 markets**¹² (54%). These are – from the top – **Finland, Taiwan, Latvia, Croatia, Lithuania, China, South Korea, India, Turkey, France, Singapore, New Zealand** and **Pakistan**. In 11 markets (46%), the branches stretch left meaning that even though data usage grew, ARPU fell. This time, the ARPU erosion in Spain and Belgium is the fastest; 10%.

When comparing to our previous reports we can see that the 2021 Christmas tree represents an improvement with a larger share of countries to the right. The pandemic initially damaged the Christmas tree, but after a rough 2020 and an improving first half of 2021, the year of 2021 ends in optimism with regards to our industry's ability to monetise an increase in mobile data usage.

¹² The 24 markets for which regulators to date have reported the necessary underlying stats

Is **5G** behind the improvement from 2020 to 2021? Some of the leading 5G markets in Asia, **South Korea**, **China** and **Taiwan**, moved from the left to the right of the chart which could be promising for other countries not yet being as advanced in 5G. The ARPU development in Finland, France and Singapore have also improved following the introduction of 5G.

Conclusion

With few exceptions, the mobile data usage is still growing – even if comparing the first half of 2021 to the second half of 2021 – but the growth rate decelerated.

Finland tops the charts – with 28.6 GB per average SIM per month in 2021. If excluding M2M, the usage was 33.6 GB per month. But despite **82%** of non-M2M SIMs being **unlimited** and three 5G networks covering at least 64% of the population by end of 2021, the data usage growth rate wasn't particularly high in Finland – 15%. Usage in **Peru** grew 53%.

Our analysis shows strong correlation between the **data-only share** of a country's SIM base and the average data usage. **Latvia, Finland and Bahrain** are the data-only powerhouses of the world. Official Finnish statistics show that mobile networks carried 49% of the total data traffic in the second half of 2021 – fixed networks just 51%.

5G – or the monetisation model changes associated with 5G – seems to drive data usage in countries where operators have rolled out much 5G on dedicated frequency bands. Such as South Korea. Here 5G traffic surpassed the 4G traffic in March 2021 and has represented a **majority of the mobile data traffic** ever since April 2021. The data consumption per 5G subscription was 26.5 GB per month in April 2022 – about **3.3 times** that of the average 4G subscription. Alongside China and Taiwan, South Korea moved from the left to the right in our Christmas tree graph, meaning that ARPU now increases. 5G was instrumental in this.

Regardless of technology, data usage could be elevated by an increased data-only penetration through fixed-line substitution. But a prerequisite for this – and for high data usage in general – is that the **total revenue per gigabyte** is low.

This is the case in **India, Latvia, Pakistan, Lithuania, Taiwan, China, Finland and Turkey**. **New Zealand, Belgium, Luxembourg and Germany** represent the other end.

Low usage doesn't necessarily mean low ARPU, though. Market ARPU is uncorrelated with usage. **New Zealand, Luxembourg and Norway** have much higher ARPU than other countries without having high usage.

What is good news is that **13 of 24 markets could grow ARPU** on the back of the data usage growth. That's a majority of the markets and it represents a strong improvement compared to the start of the COVID period.