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29th BEREC International Roaming Benchmark Data and Monitoring Report

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1. Structure of the Report

BEREC (Body of European Regulators for Electronic Communications) Report on International Roaming BEREC Benchmark Data and Transparency and Comparability Report of international roaming tariffs (the "Report") contains five parts and three annexes. While this chapter describes the **Structure of the Report**, chapter 2 is an **Introduction** to the BEREC Report and describes BEREC's work on roaming based on the Roaming Regulation (EU) 2022/612[1] (hereinafter "Roaming Regulation").
The key findings of this Report are included in chapter 3 "**Main findings of the roaming benchmark data**" and chapter 4 "**Main findings on the transparency of roaming tariffs**". The fifth chapter "**Charts**" presents the latest available data on the domestic mobile market and international roaming mobile market, also an overview of the transparency and comparability of retail roaming tariffs. "**Annex I: Methodology for the data collection**" provides a detailed description of the methodology for the current data collection. "**Annex II: Regulatory evolution**" outlines regulatory measures taken to reduce price levels for roaming services within the EU. "**Annex III: List of respondents**" includes the list of operators that provided data for this Report. The Report is accompanied by a spreadsheet file enabling access to the data included in the Report (published together with the Report) as well as additional data on roaming.

2. Introduction

The Roaming Regulation has brought several new obligations for roaming providers but also for national regulatory authorities (NRAs) and BEREC with regard to the data collection[2]. Besides the requirement to collect new indicators, the intervals for the data collections have been reduced from two per year to one. Therefore, BEREC had to modify the structure of its data questionnaires and the modalities of its data collection. The International Roaming Benchmark Data questionnaire and the questionnaire for the Transparency and Comparability Report have been combined into one questionnaire with additional new indicators to be collected and new templates for roaming providers and for NRAs have been introduced.

This Report presents the results of this combined data collection on European international roaming services and the transparency and comparability of retail roaming tariffs undertaken by BEREC. The Report covers the period 1 October 2021 – 30 September 2022, i.e. the 4th quarter of 2021, 1st quarter of 2022, 2nd quarter of 2022 and 3rd quarter of 2022. The Report also includes benchmark data and transparency of roaming tariffs from previous rounds of data collection. In the course of revising the questionnaire, the structure of this Report was also reviewed and changed taking into account the new indicators foreseen in the Roaming Regulation and the readability of the document was improved by removing or consolidating various figures. In order to compare, data published in previous years and which have been

[1] Regulation (EU) No. 2022/612 of the European Parliament and of the Council of 6 April 2022, available at: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32022R0612

[2] As it is described in the chapter about the methodology for the data collection, some operators and NRAs with regard to the definition of the indicators for active SIM cards (prepaid, postpaid and corporate) misunderstood the definition. This issue mainly happened due to the new template and the new indicators introduced for the data collection. Unfortunately, BEREC within the deadlines could not solve this issue. This means, that some respondents did not report the corporate customers also under prepaid and postpaid SIM cards. This circumstance leads to misleading conclusions for some countries (increase of volumes per subscriber, ARRPUS, etc.), as the denominator for active SIM card was underestimated.

removed from the Report, remain available in the .xls file, published on the BEREC website. The earliest data in this Report is from the 1st quarter 2017. BEREC has also collected data on connected objects/devices and its related traffic/revenues at retail and wholesale level since the 26th data collection. Despite the technical difficulties faced by many roaming providers in the EEA regarding the provision of information (especially on wholesale level), BEREC analysed the information gathered and presented results in this Report. It should be noted that the charts on connected objects/devices should be interpreted with caution as data in the third data collection is still not quite comprehensive.

The assessment of the international roaming market should be based on the requirements set out in Article 21 (2) Roaming Regulation. In order to assess the competitive developments in the Union-wide roaming markets, BEREC is tasked with regularly collecting data from NRAs on the development of retail and wholesale charges for regulated voice, SMS and data roaming services, including wholesale charges applied for balanced and unbalanced roaming traffic respectively, on the impact of the roll-out and implementation of next generation mobile communications networks and technologies on the roaming market, on the use of trading platforms and similar instruments, on the development of machine-to-machine roaming and IoT devices, and on the extent to which wholesale roaming agreements cover quality of service (QoS) and give access to different network technologies and generations.

BEREC shall also collect data regularly from NRAs on the application of fair use policies (FUP) by roaming providers, the development of domestic-only tariffs, the application of the sustainability mechanisms and complaints on roaming as well as compliance with the QoS obligations. Where appropriate, NRAs shall coordinate with and collect such data from other competent authorities. BEREC shall regularly collect and provide additional information on transparency, on the application of measures on emergency communication, on value-added services and on roaming on non-terrestrial public mobile communications networks.

BEREC shall also collect data on the wholesale roaming agreements not subject to the maximum wholesale roaming charges provided for in Articles 9, 10 or 11 of the Roaming Regulation as well as on the implementation of contractual measures at wholesale level aiming to prevent permanent roaming or anomalous or abusive use of wholesale roaming access for purposes other than the provision of regulated roaming services to roaming providers' customers while the latter are periodically travelling within the Union. On the basis of data collected pursuant to this paragraph, BEREC shall report regularly on the evolution of pricing and consumption patterns in the Member States both for domestic and roaming services, the evolution of actual wholesale roaming rates for unbalanced traffic between providers of roaming services, and on the relationship between retail prices, wholesale charges and wholesale costs for roaming services. BEREC shall assess how closely those elements relate to each other.

BEREC coordinates this process of data collection by pursuing the following objectives:

- simplifying the process not only for NRAs, as BEREC acts as a central point for the data collection, but also for the European Commission (EC), as the data are received from a single source and a following uniform data processing;
- coordinating the procedures of individual NRAs, as a single and commonly agreed-upon data collection model is used for the process of data collection, and the process

is synchronised and based on the same collection periods. BEREC consults the market players and the EC before finalising the data collection templates;

- providing, as far as possible, a common response to the different questions posed during the collection process by roaming providers and NRAs, as BEREC serves as the forum where these questions are commonly debated and addressed.

3. Main findings of the roaming benchmark data

Over 150 operators providing international roaming services submitted information for this Report. This number includes virtually all of the mobile network operators (MNOs) in the EEA, as well as a significant number of mobile virtual network operators (MVNOs) that provide EEA roaming services. BEREC estimates that this report covers around 95 % of mobile customers in the EEA.

Domestic prices for mobile services – Average Retail Revenue Per User (ARRPU)

BEREC analysed the retail domestic prices and found that it is hard to disaggregate the different mobile communications services (voice, SMS and data) since they are often provided in bundle of several services, including intra-EEA roaming communications and, in several cases, also non-mobile services. Operators find it difficult to organise their revenue data by individual service categories (ISCs), such as fixed telephony, mobile telephony, fixed broadband, intra-EEA roaming communications and others, and no common methodology is defined for this purpose. Bundles challenge this practice, as ISCs require allocating bundle revenues to their components. Therefore, BEREC presents data on the evolution of the average retail revenue per user (ARRPU) for mobile communications. BEREC uses the ARRPU for its analysis but notes that the results of it should be interpreted with caution. For this calculation, BEREC used the data pertaining to mobile domestic services submitted by operators.[3] The domestic monthly ARRPU for Q3 2022 varies considerably between the countries, ranging from 4.58 Euros per month to 37.17 Euros per month, with a weighted EEA average of 12.62 Euros (Figure 1).[4]

Intra-EEA roaming consumption patterns

The BEREC data collected for this Report demonstrates the recovery of the roaming market from the Covid-19 pandemic during Q4 2021 – Q3 2022. The ratio of roaming subscribers has increased since the respective quarters of 2020, but it is still less below pre-pandemic levels, which is reflected in this Report (Figure 10). A similar tendency can be observed for the volumes of the roaming calls made (Figure 14). For data roaming traffic, the volumes are above the pre-pandemic period (Figure 24), but roaming data traffic is also impacted by the general trend of increased data consumption which occurs at the domestic level as well.

When addressing variations in intra-EEA roaming consumption patterns, it is necessary to take into account the impact of Brexit. Since Q4 2019, roaming-out traffic concerning the

[3] The monthly ARRPU was calculated per country by dividing retail revenues (i.e. total revenues related to mobile voice, SMS and data traffic, excluding any other type of revenue, such as those originating from mobile devices, subscription fees to services etc.) in the respective quarters by the total number of domestic and roaming subscribers per country within the same period and dividing the result by 3 to arrive at a monthly value.

[4] BEREC would like to add note the caveat that the disproportion between national individual ARRPUs could also be caused by different methodologies used by roaming providers to allocate the revenues between mobile communication services and non-mobile communication services.

customers of UK roaming providers was no longer included in the benchmark, and since Q1 2021, roaming concerning UK providers (at wholesale level) and UK subscribers (at retail level) was no longer included in the 'EEA' category but in the 'Rest of World' (RoW) category.[5]

Rest of the World (RoW) roaming retail prices

With regard to the 'Rest of World' retail prices (Figure 25), EEA-based average prices depicted in Table 1.

Table 1: The EEA average retail prices for Rest of World roaming services:

RoW retail prices (no VAT)	**Q4 2021**	**Q1 2022**	**Q2 2022**	**Q3 2022**
Voice calls made (€c/minute)	19.68	20.54	20.62	20.98
Voice calls received (€c/minute)	9.11	9.31	9.28	9.69
SMS (€c/unit)	10.84	11.88	12.22	12.29
Data (€/GB)	6.07	5.66	4.27	3.54

Non-terrestrial network – retail prices

For its 29th data collection, BEREC has for the first time collected data on non-terrestrial network payments for roaming. The EEA average of retail services by EEA customers (Figure 26) depicted in Table 2.

Table 2: The EEA average retail prices for roaming services on non-terrestrial networks:

Non-terrestrial network payments (no VAT)	**Q4 2021**	**Q1 2022**	**Q2 2022**	**Q3 2022**
Voice calls made (€c/minute)	67.64	80.95	68.73	82.09
Voice calls received (€c/minute)	58.06	50.55	52.63	62.50
SMS (€c/unit)	21.89	21.29	17.14	20.19
Data (€/GB)	129.26	81.39	73.51	70.88

Wholesale roaming rates for outgoing calls

At the wholesale level, the voice roaming charges set between roaming providers have declined below the regulated average caps (Figure 11). The EEA average rate for calls while roaming was 1.82 Euro cents in Q4 2021 and decreased 1.54 Euro cents in Q3 2022 compared to a cap of 3.20 Euro cents for the period Q4 2021 – Q2 2022 and a cap of 2.20 Euro cents for Q3 2022. A reduction in the average EEA wholesale rates for intra-EEA roaming voice calls since 2019 (Figure 11) is observed. The applicable wholesale price caps and the related EEA average prices for calls attributed to totals traffic, balanced traffic and unbalanced traffic during the data collection period depicted in Table 3.

Table 3: The EEA average rates for wholesale calls (total, balanced and unbalanced traffic) and applicable wholesale price caps:

Wholesale voice (no VAT)	**Q4 2021**		**Q1 2022**		**Q2 2022**		**Q3 2022**	
	Price Cap	**EEA Average**	**Price Cap**	**EEA Average**	**Price Cap**	**EEA Average**	**Price Cap**	**EEA Average**
Total traffic (€c/minute)	3.20	1.82	3.20	1.64	3.20	1.55	2.20	1.54

[5] Due to reporting system issues experienced by some operators not all UK data could be removed from the "EEA" category in Q1 2021.

Balanced (€c/minute)		1.99		1.77		1.68		1.65
Unbalanced (€c/minute)		1.51		1.42		1.34		1.34

Wholesale roaming rates for SMS

At the wholesale level, a reduced average EEA rates for roaming SMS (Figure 16) is observed. The EEA average rate for SMS while roaming was 0.25 Euro cents in Q4 2021 and decreased 0.17 Euro cents in Q3 2022 compared to a cap of 1.00 Euro cents for the period Q4 2021 – Q2 2022 and a cap of 0.40 Euro cents for Q3 2022. The applicable wholesale price caps and the related EEA average prices for SMS attributed to totals traffic, balanced traffic and unbalanced traffic during the data collection period depicted in Table 4.

Table 4: The EEA average prices for wholesale SMS (total, balanced and unbalanced traffic) and applicable wholesale price caps:

Wholesale SMS (no VAT)	**Q4 2021**		**Q1 2022**		**Q2 2022**		**Q3 2022**	
	Price Cap	**EEA Average**	**Price Cap**	**EEA Average**	**Price Cap**	**EEA Average**	**Price Cap**	**EEA Average**
Total traffic (€c/unit)	1.00	0.25	1.00	0.19	1.00	0.17	0.40	0.17
Balanced (€c/unit)		0.27		0.22		0.20		0.20
Unbalanced (€c/unit)		0.22		0.17		0.17		0.16

Wholesale roaming rates for data

At the wholesale level, the data cap applicable in the EEA was 3.00 Euro per GB in Q4 2021, 2.50 Euro per GB for the period Q1 2022 – Q2 2022 and finally 2.00 Euro per GB in Q3 2022. The EEA average rate for wholesale data services decreased to 1.30 Euro per GB in Q4 2021 compared with 1.61 Euro per GB in Q4 2020. The EEA average rate for wholesale data services in Q1 2022 fell to 1.02 Euro per GB, compared to 1.37 Euro in Q1 2022. The EEA average rate for wholesale data services remained similar in Q2 2022 at 0.91 Euro per GB and in Q3 2022 at 0.94 Euro per GB (Figure 18).

In the context of the wholesale data roaming rates (Figure 19), the EEA average rate for total traffic, balanced traffic, unbalanced traffic and the applicable wholesale price caps during the data collection period depicted in Table 5.

Table 5: The EEA average prices for wholesale data (total, balanced and unbalanced traffic) and applicable wholesale price caps:

Wholesale data (no VAT)	**Q4 2021**		**Q1 2022**		**Q2 2022**		**Q3 2022**	
	Price Cap	**EEA Average**	**Price Cap**	**EEA Average**	**Price Cap**	**EEA Average**	**Price Cap**	**EEA Average**
Total traffic (€/GB)	3.00	1.30	2.50	1.02	2.50	0.91	2.00	0.94
Balanced (€/GB)		1.44		1.12		1.06		0.97
Unbalanced (€/GB)		1.03		0.85		0.81		0.93

Wholesale roaming agreements (Article 3)

Only few roaming providers submitted data on wholesale agreements based on Article 3 Roaming Regulation. BEREC's Opinion on the functioning of the Roaming Regulation[6] showed that depending on the type of MVNO (full or light MVNO), MVNOs use different ways for accessing wholesale roaming services. The preferred option is to use wholesale resale access from the domestic host MNO. 30% of full MVNOs make use of resale access from other domestic MNOs, and only a few MVNOs use access via a hub or have bilateral agreements with the foreign MNOs. The wholesale rates that MVNOs pay are higher than the total average wholesale rates analysed in the previous four paragraphs and stay close to the regulated caps of the Roaming Regulation (Figure 27 and Figure 28 and Figure 29).

How wholesale costs and rates relate to each other

BEREC compared the lowest[7] wholesale rates for the unbalanced traffic in Q4 2021, Q1 2022, Q2 2022 and Q3 2022 against the estimated unit costs for 2021 and 2022.[8] The estimation of the unit cost per service is based on the Axon Consultants cost model.[9] However, apart from the Axon model's output per country[10]/per service, the unit costs include also an estimation for transit costs (for voice and data services) and an estimation of voice termination costs (for voice service). The Axon study does not provide one single result for each type of service, country and year, but provides 72 scenarios (e. g. for Austria, the model calculates 72 different unit costs for roaming voice service for 2022 depending on the combination of parameters/methodological approaches under which the model is run).

The evidence from the estimates of the EEA wholesale rates for the outgoing calls shows that the EEA average of the maximum unit cost estimates for 2021 and 2022 are lower than but close to the EEA average wholesale rates, while the EEA wholesale rates for the data services indicates that the EEA average of the maximum unit cost estimates for 2021 and 2022 are higher than but close the EEA average wholesale rates. The EEA average wholesale rate for SMS services is around two times the EEA average of Axon's unit cost estimates. (Figure 30).

Further information on unit cost estimates can be found in the BEREC supplementary analysis on wholesale roaming costs.[11]

MNOs and MVNOs[12]

For all quarters (Q4 2021, Q1 2022, Q2 2022 and Q3 2022), roaming consumption was, in general, lower for MVNOs' subscribers than for those of MNOs (Figure 35 and Figure 36). It

[6] https://berec.europa.eu/eng/document_register/subject_matter/berec/opinions/8595-berec-opinion-on-the-functioning-of-the-roaming-market-as-input-to-ec-evaluation

[7] Prices are calculated from the average of 5 lowest unbalanced rates submitted by the operators.

[8] These cost estimates include: 1) the total wholesale roaming costs in MS estimated by Axon (including network costs, roaming-specific costs and the impact of seasonality on roaming costs); 2) an estimation for the termination rate that the visited network operator needs to pay the terminating network operator for terminating a call on its network (only for voice) and 3) an estimation for the transit costs that the visited network operator needs to pay for routing a call to the terminating network operator or to send data traffic back to the home network (only for voice and data services). More information on the approach that BEREC follows to estimate the unit costs can be found in BEREC's document BoR (19) 168.

[9] https://ec.europa.eu/digital-single-market/en/news/finalisation-mobile-cost-model-roaming-and-delegated-act-single-eu-wide-mobile-voice-call.

[10] Please note that the model developed for EC by Axon Consultants does not calculate unit costs for Luxembourg, Iceland and Liechtenstein because the NRAs/operators of these three countries did not provide the required data

[11] BoR (19) 168 BEREC supplementary analysis on wholesale roaming costs is available at: https://berec.europa.eu/eng/document_register/subject_matter/berec/opinions/8756-berec-supplementary-analysis-on-wholesale-roaming-costs

[12] In some cases the data for MVNOs is incomplete so the figures presented are more of an indicative nature.

is also worth noting that payments made by MVNOs to the host operators for wholesale roaming services are in general higher than the average wholesale rates (Figure 37).

4. Main findings on the transparency of roaming tariffs

This part of the Report provides an overview of the transparency of roaming tariffs, meaning the availability of information about prices and conditions for each tariff, as well as simple procedures for customers to switch between tariffs.

In order to understand whether customers face transparent conditions (in the implementation of the RLAH regime), BEREC prepared two questionnaires, one addressed to roaming providers and one to NRAs.

Roaming providers were requested to provide information on the QoS, structure of tariffs for international roaming, alternative tariffs and tariffs without roaming. This questionnaire included questions focused on the availability of roaming tariffs and the conditions applied (price limitations in terms of volumes, geographical area or any other restrictions, as well as any linkages to domestic tariffs, FUPs or derogations). It also included questions regarding the information available to the customers of roaming providers.

NRAs were requested to provide information on end user complaints related to a lack of transparency as well as information on applications for sustainability surcharges.

A total of 29 NRAs and 152 mobile roaming providers operating in the EEA sent their responses to BEREC. Among the roaming providers, 94 of respondents were MNOs and 55 full MVNOs or light MVNOs/resellers, while 3 did not indicate the type.

Quality of Service

In order to understand the impact of network technologies and generations on roaming, BEREC requested information about the network technology offered to subscribers while roaming[13]. On average in the EEA, 96 % of respondents stated that they offer 2G roaming services, and 99% of respondents each offer 3G and 4G. In the period observed, 5G services were already available throughout the EEA. However, the state of the implementation varied greatly at national level. Roaming using standalone 5G was offered by 22 % respondents, whereas roaming via 5G non-standalone technology was offered by 63 % of respondents (Figure 43).

According to the Roaming Regulation, a differentiation between technologies while roaming is possible only if such a differentiation if done at home. For the EEA, an average of 22 % of roaming providers responded that they differentiate between technologies at home, 68 % indicated that they do not have such a differentiation and 9 % replied with “n.a.” (Figure 45).

Application of FUPs

[13] Since 1 July 2022 there is an obligation for operators to offer the same mobile network technology like at home when its technically feasible while roaming.

BEREC observes that the FUP mechanisms foreseen by the Commission Implementing Regulation (EU) 2016/2286 (CIR) have been used by MNOs and MVNOs alike to prevent anomalous and abusive usage of regulated roaming services (Figure 46).
As regards the effectiveness of the FUP measures, it can be observed that the open data bundle is the most preferred FUP measure by respondents. Overall, the usage of different kinds of FUP measures is rather stable over the years.
According to the Roaming Regulation, roaming providers are entitled to apply a surcharge for the provision of roaming services, when exceeding the FUP. Figure 47 and Figure 48 show the share of the respondents, among those implementing different FUP measures, applying a surcharge to their customers for voice and data services.

Regarding the calculation of the minimum data roaming allowance which has to be granted to customers, providers which apply the open data bundle FUP are required to calculate the roaming allowance in accordance with the detailed formula set out in the CIR. In fact, 89% of those providers replied that the limit determined by the CIR calculation is rounded up in favour of the customers.

Regarding FUP-related information provided to customers, Figure 49 shows that 69 % of the responding roaming providers applying an open data bundle FUP inform their customers about how the roaming allowance is calculated. Furthermore, 98 % of the roaming providers which established a FUP according to the open data bundle rule provide information for customers about their actual roaming volumes. Figure 50 shows various information channels for providing information about FUP for data bundles. Figure 51 shows where information about limits is located on the provider's website.

Non-EU/EEA destinations

According to the answers received, BEREC has noted that about 56 % of roaming providers deduct in some of their RLAH tariff plans roaming consumption at non-EEA destinations from the total package available to consumers through their RLAH tariff plans (Figure 52).

Alternative tariffs

BEREC has collected information on the type of packages offered as alternative roaming tariff (whether they are daily, weekly, monthly or other tariffs). According to the respondents, 29 % make use of the opportunity to offer alternative tariff plans in parallel to the provision of RLAH plans (Figure 53). Of all responding roaming providers which offer alternative roaming tariffs, 12 offer such tariffs in the form of daily packages, 12 in the form of weekly packages, 33 in the form of monthly packages and 17 in other packages (Figure 54).

Around 67 % of roaming providers inform end users about regulated and alternative tariffs. The most common ways to inform customers about alternative tariffs were call centres and websites, whereas for switching between tariffs, the most common ways were call centres and point of sales (Figure 57).

Roaming providers were also asked how they handle surcharges for alternative tariffs in EEA vs. non-EEA countries. 9 % of respondents indicated that they apply a surcharge for roaming in EU/EEA destinations to some of the alternative tariffs. For these alternative tariffs with a surcharge for EEA roaming, 18 % of the respondents with such surcharges indicated that they include non-EU/EEA destinations with no surcharge or at a reduced rate (Figure 56).

Information and tools for consumers

52 % of respondents provide information to consumers about the differences between different network technologies and generations in a roaming context and 39 % of respondents provide information on QoS while roaming on a per-network basis. Additionally, Figure 58 shows the type of information that is provided to end-users during intra-EEA roaming if the granularity of the information is per visited network.

When asked whether the respondents provide information on prices for calling value-added services (VAS) in a roaming context, 64 % of roaming providers answered that they provided general information, 20 % provide exact VAS charges and 11 % provide other types of information (Figure 59).

Roaming providers must offer at least two cut-off limits by default, at 50 Euro and 100 Euro (or the equivalent in local currency). 93 % of roaming providers provide financial cut-off limits, while 40 % provide volume-based cut-off limits (Figure 61). 78 roaming providers allow end users to individually adjust their cut-off limits (Figure 63). According to the data collected, the most common financial cut-off limit is 50 Euro, as indicated by 75 roaming providers.

Out of a total 152 respondents, 100 roaming providers offer information about how to avoid inadvertent roaming in border regions and 58 offer tools to opt out of roaming in RoW. Regarding non-terrestrial networks, 82 roaming providers offer information about how to avoid connecting to non-terrestrial networks and 57 roaming providers offer tools to opt out from connecting to non-terrestrial networks (Figure 65).

The Welcome SMS is an important instrument for increasing the transparency of roaming charges. However, which kind of information is provided to end users via Welcome SMS varies considerably, both within the EEA (Figure 67) and in a RoW roaming context (Figure 68).

Transparency of wholesale offers

The Roaming Regulation sets out a number of obligations on wholesale level, which now also extend to QoS. As the responses to BEREC's questionnaire show, roaming providers may experience different levels of ease of access to network technologies (Figure 69). In particular regarding the implementation of roaming via different technologies, 39 roaming providers indicated problems with the implementation of VoLTE and 7 expressed difficulties with the implementation of 5G standalone (Figure 70). This could also explain why 68 respondents indicated that less than 20 % of their outbound roaming agreements include operational VoLTE or VoNR services (Figure 71).

73 % of respondents stated that network technologies and generations are not negotiated separately from roaming charges and 91 % of respondents indicated that pricing does not differ according to network technologies (Figure 72). 19 respondents explained that they have faced obstacles when concluding permanent roaming agreements (Figure 75) and 44 respondents indicated that they have special wholesale contracts/agreements for services provided by connected objects/devices (Figure 76).

Regarding the mechanisms used for reaching agreements on roaming prices, 73 respondents stated that they relied on direct agreements, 6 indicated that their host MNO negotiates pricing and 13 responded that they used trading platforms or hubs for these purposes (Figure 73).

Applications for sustainability surcharges

By way of derogation from offering roaming at domestic prices, roaming tariffs may include surcharges based on application of a provider and authorised by the NRA in order to ensure the sustainability of roaming provider's domestic charging model.

Figure 77 shows that the total number of applications received by NRAs is decreasing since RLAH came into force. It is worth mentioning that NRAs did not report increases regarding domestic-only tariffs.

Complaints on transparency issues received by NRAs

Section 5.6.13 provides detailed information regarding complaints received by the NRAs. The type of complaints received most frequently by the NRAs, albeit in low numbers, was related to QoS, while the highest number of complaints received by (a low number of) NRAs was related to inadvertent roaming (Figure 79). However, the number of complaints reported might not give a complete picture of the total number of complaints regarding transparency issues, as in some countries, other bodies than the NRA might handle consumer complaints. This could also explain the fact that as detailed in Figure 89, two NRAs indicated that in their country, other authorities been designated as competent for implementing parts of the Roaming Regulation.

5. Charts

5.1. Analysis of subscribers and those that use roaming services

5.1.1. Domestic average Retail Mobile Revenue per User (ARRPU)

Figure 1: Domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q3 22

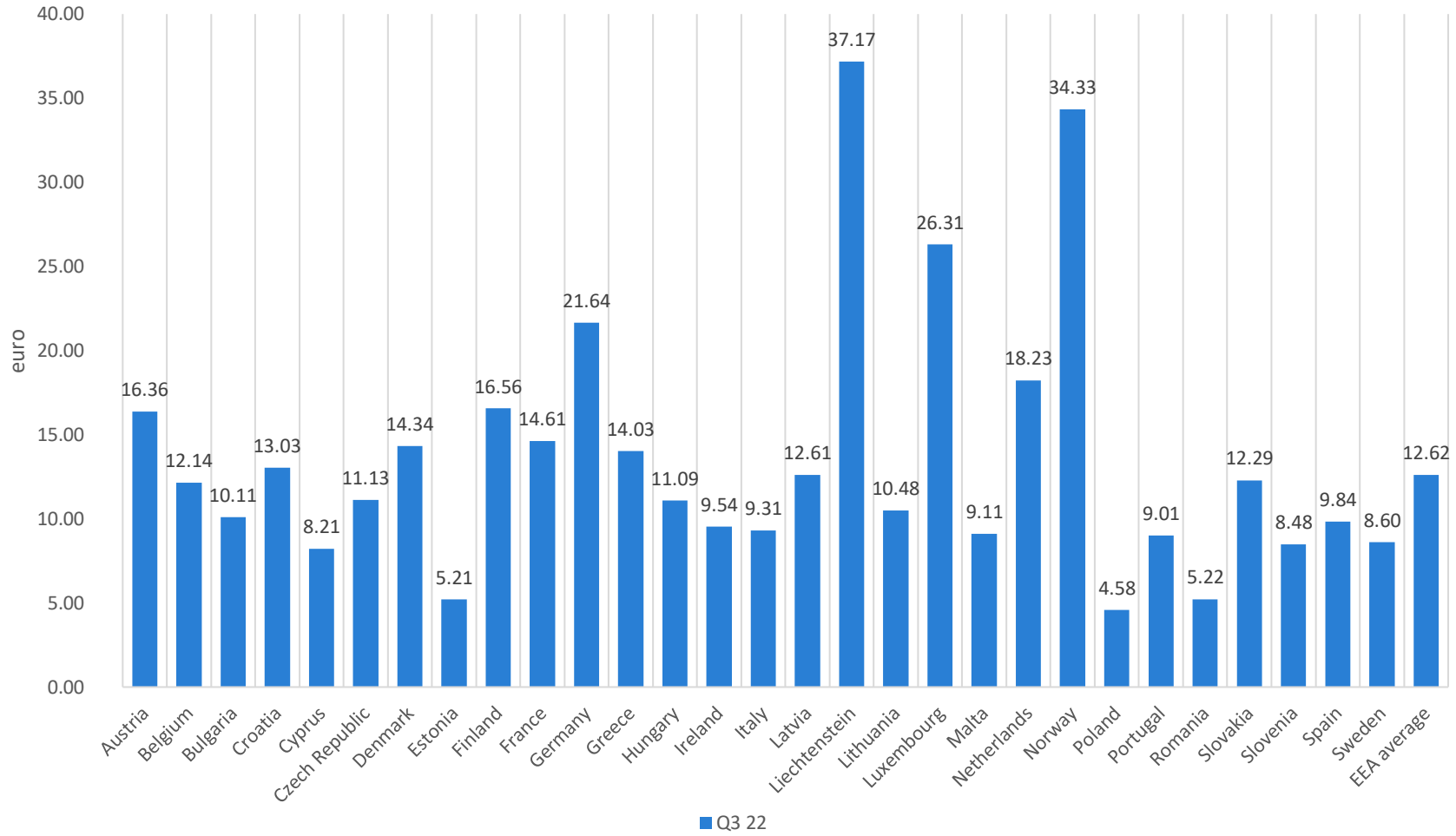


Figure depicts average retail revenue per user arrived at by a division of monthly retail revenue per total number of subscribers for each country, which is then divided by three to arrive at a monthly average for Q3 2022.
In some cases, not all operators provided the data for subscribers, or revenues.

Figure 2: EEA average: domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q4 19 – Q3 22

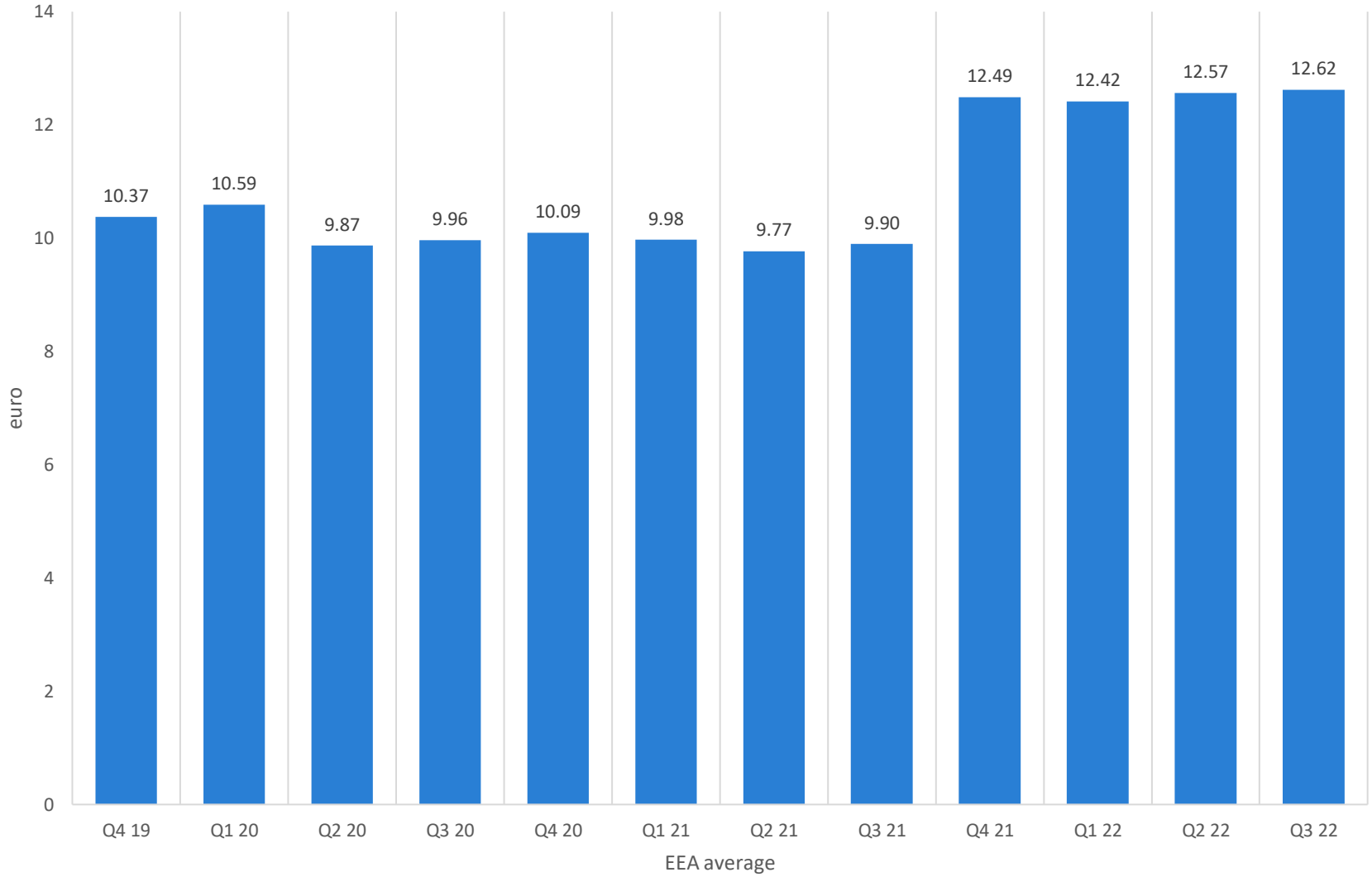


Figure 2 depicts division of monthly retail revenue per total number of subscribers, as an EEA average – average retail revenue per user in EEA, Q4 2019 - Q3 2022. This Report contains corrections for the 25th data collection rounds (Q4 19 – Q1 20).

5.1.2. Consumption patterns for domestic mobile retail services

Figure 3: Domestic data services: average consumption per month per total number of subscribers (GB), Q3 22

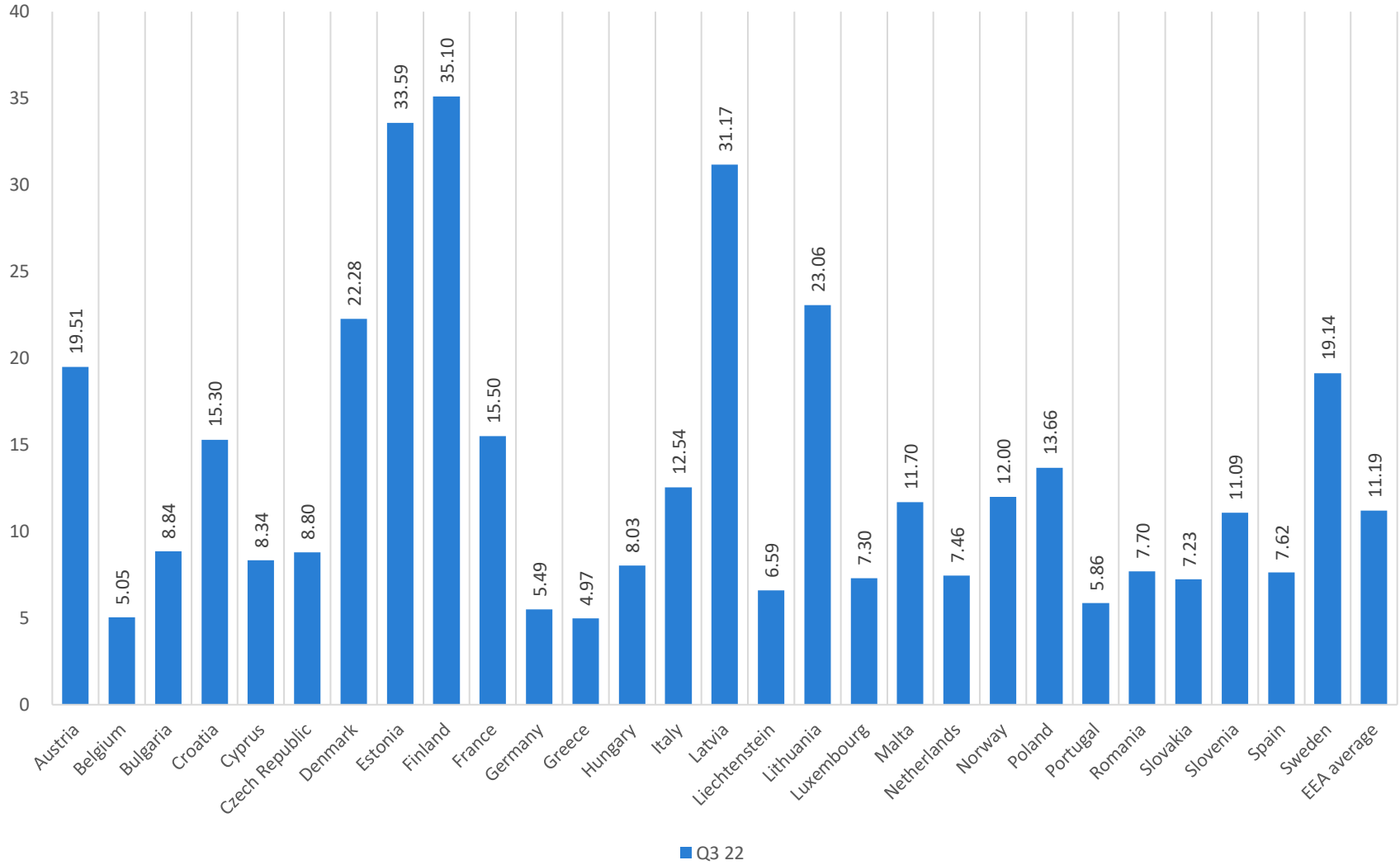


Figure 3 depicts the average data consumption per month, for which the number of GB were divided by the total number of subscribers in each country and subsequently divided by three to arrive at monthly values for Q3 2022.

Figure 4: EEA average: domestic data services: average consumption per month per total number of subscribers (GB), Q4 19 – Q3 22

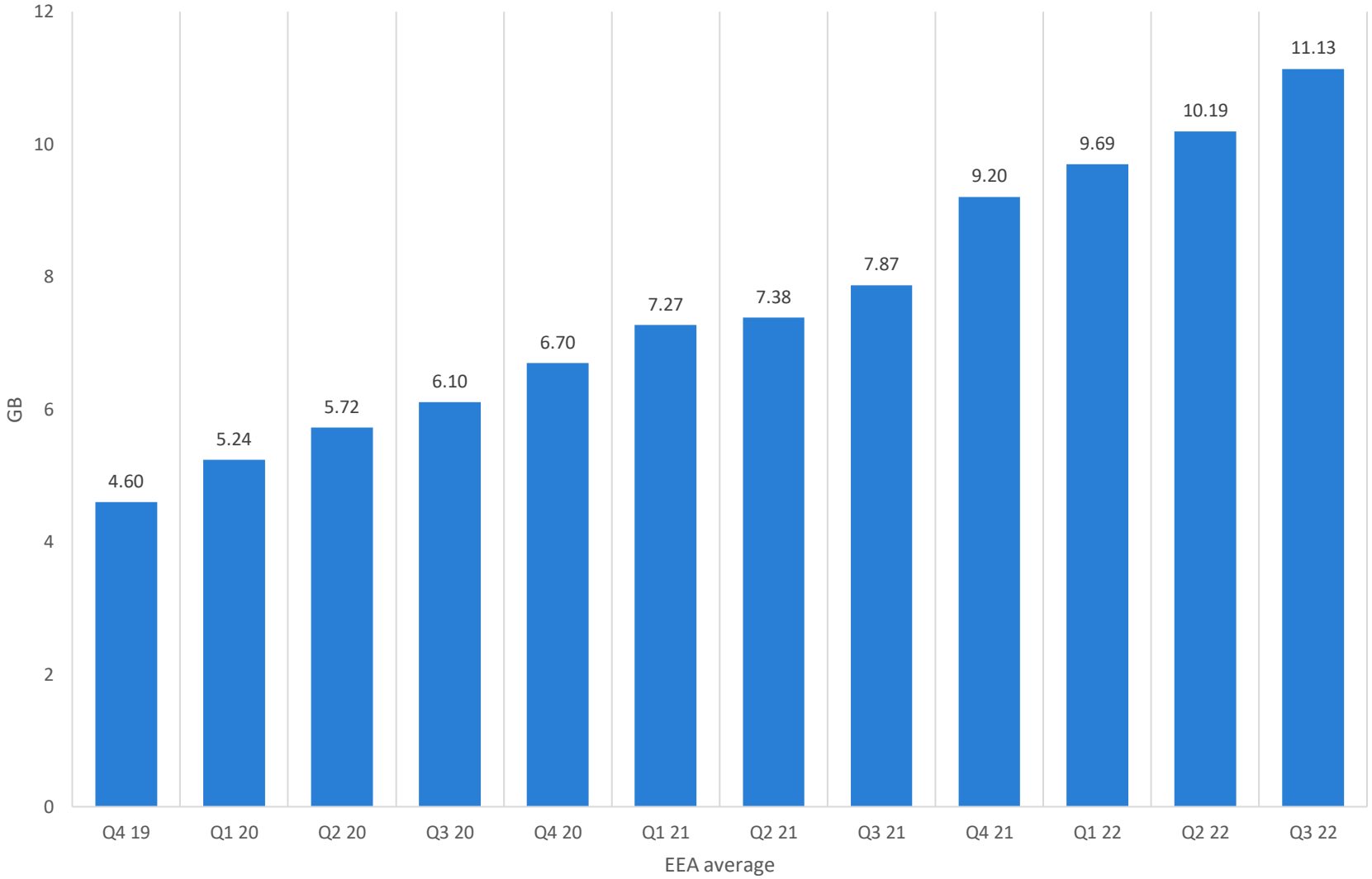


Figure 4 depicts the development of the EEA average data consumption per month (in GB) for Q4 2019 – Q3 2022. For the calculation, see **Error! Reference source not found.**.

5.1.3. Consumption patterns for RLAH services (voice, SMS and data)

Figure 5: EEA average number of RLAH minutes per month per total number of roaming subscribers with active RLAH services, Q4 19 – Q3 22

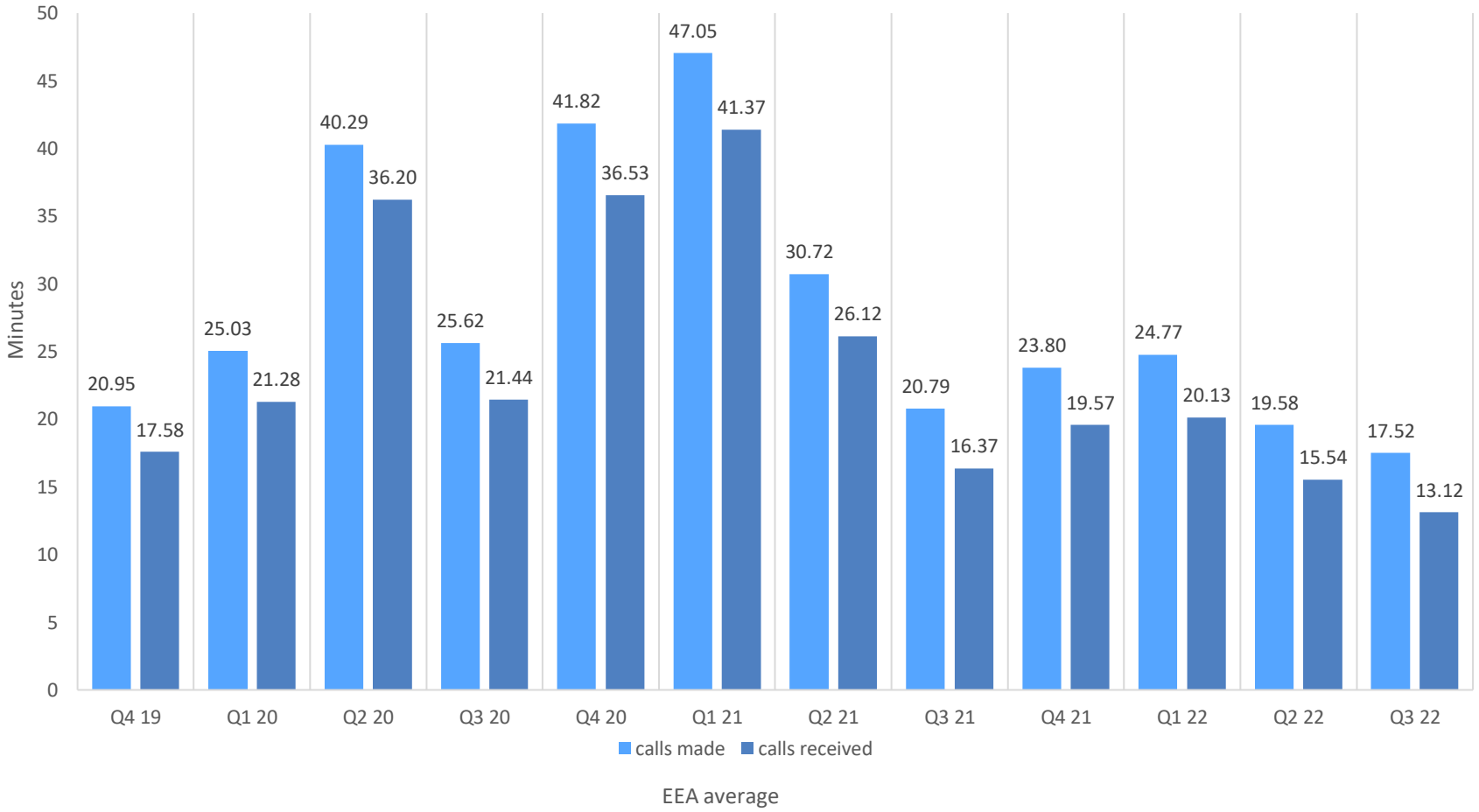


Figure 5 depicts the EEA average of the number of RLAH minutes for calls made and calls received. These averages are calculated, respectively, by dividing the number of roaming minutes by the total number of roaming subscribers with active RLAH services and again by three to arrive at monthly averages for Q4 2019 - Q3 2022.
In some cases, not all operators provided the data for RLAH subscribers.

Figure 6: EEA average number of SMS per month per total number of roaming subscribers with active RLAH services, Q4 19 – Q3 22

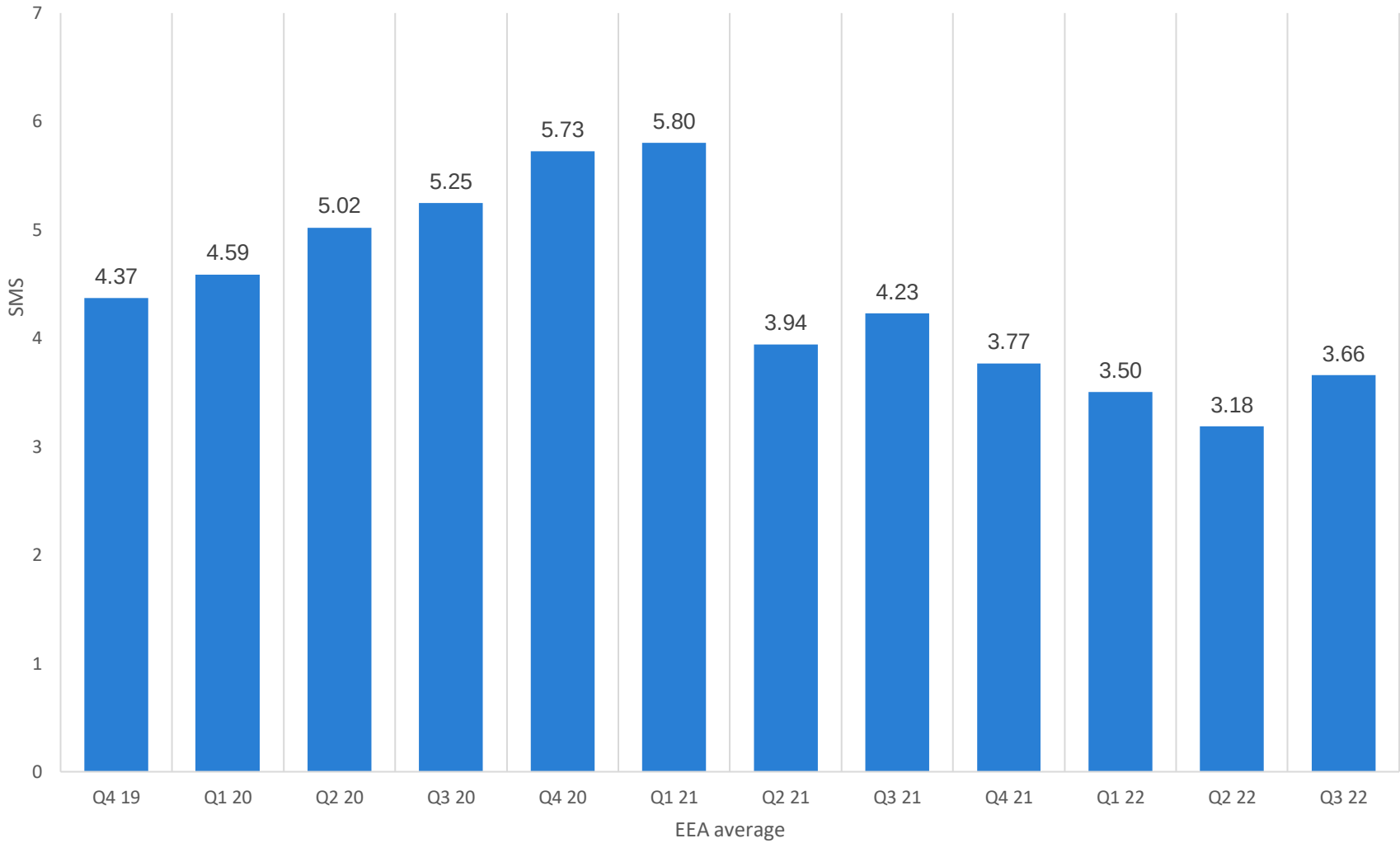


Figure 6 depicts the development of the EEA average of the number of RLAH SMS. This average is calculated by dividing the number of RLAH SMS by the total number of roaming subscribers with active RLAH services and again by three to arrive at monthly averages for Q4 2019 - Q3 2022.
In some cases, not all operators provided the data for RLAH subscribers.

Figure 7: Data services with active RLAH: average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q3 22

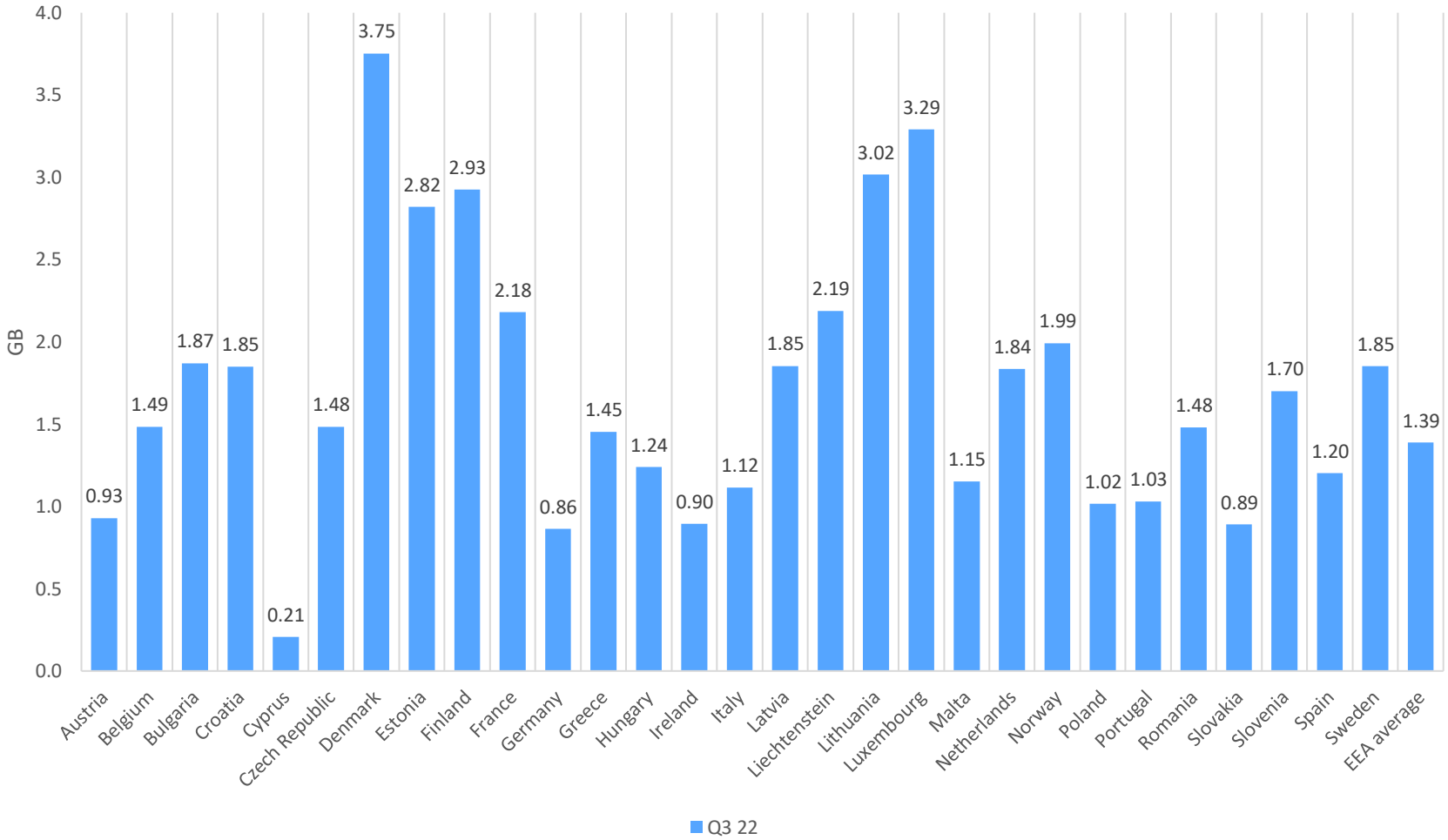


Figure 7 depicts the average RLAH data consumption on a per-country level. This average is calculated by dividing the number of RLAH GB by the total number of roaming subscribers with active RLAH services and again by three to arrive at monthly averages for Q3 2022.
In some cases, not all operators provided the data for RLAH subscribers.

Figure 8: RLAH, data services: EEA average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q4 19 – Q3 22

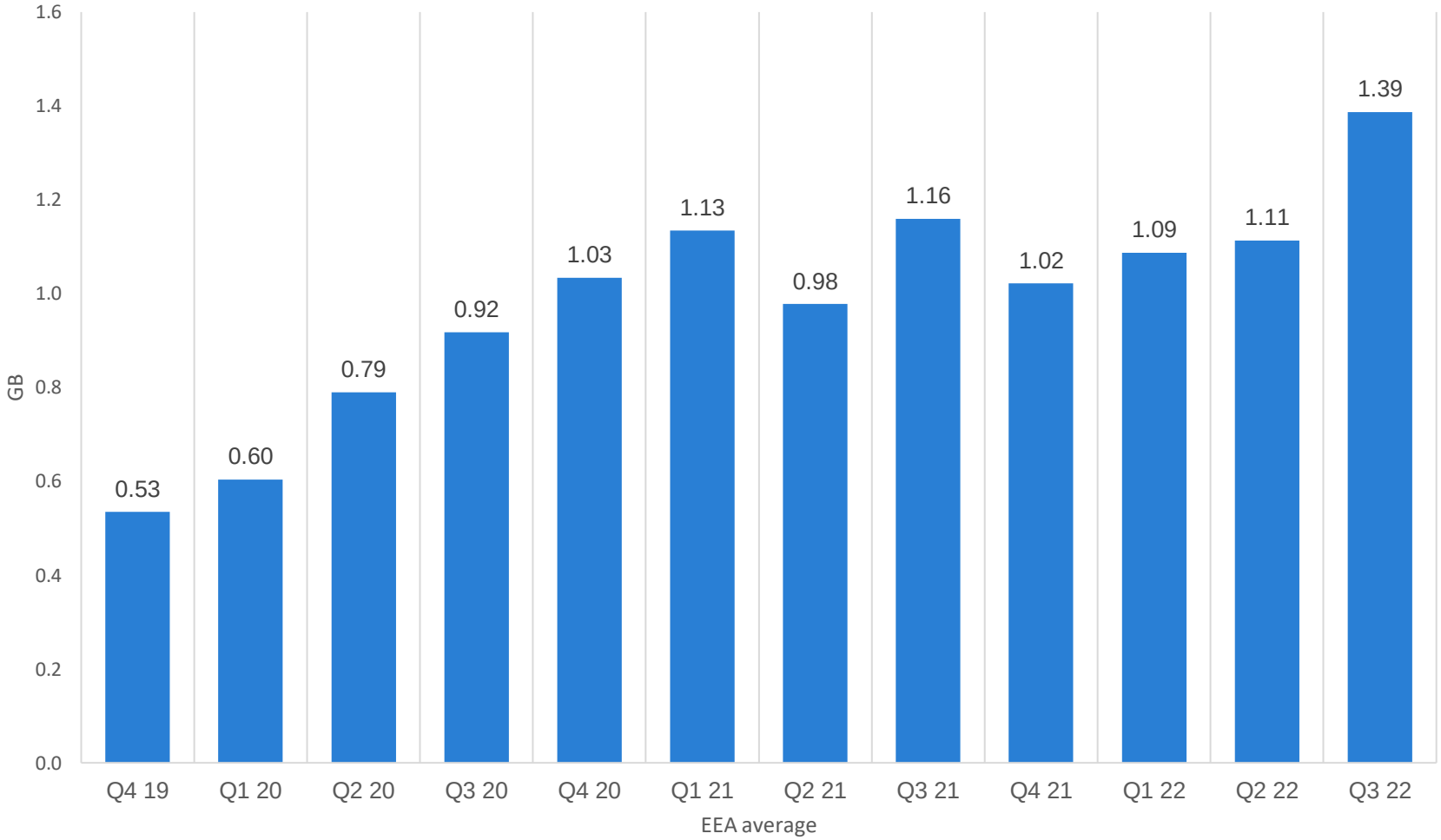


Figure 8 depicts the development of the EEA average number of RLAH data consumption (in GB) for Q4 2019 - Q3 2022. For the calculation of the average, see **Error! Reference source not found.**.
In some cases, not all operators provided the data for RLAH subscribers.

Figure 9: Share of total subscribers with EU/EEA roaming enabled, Q3 22

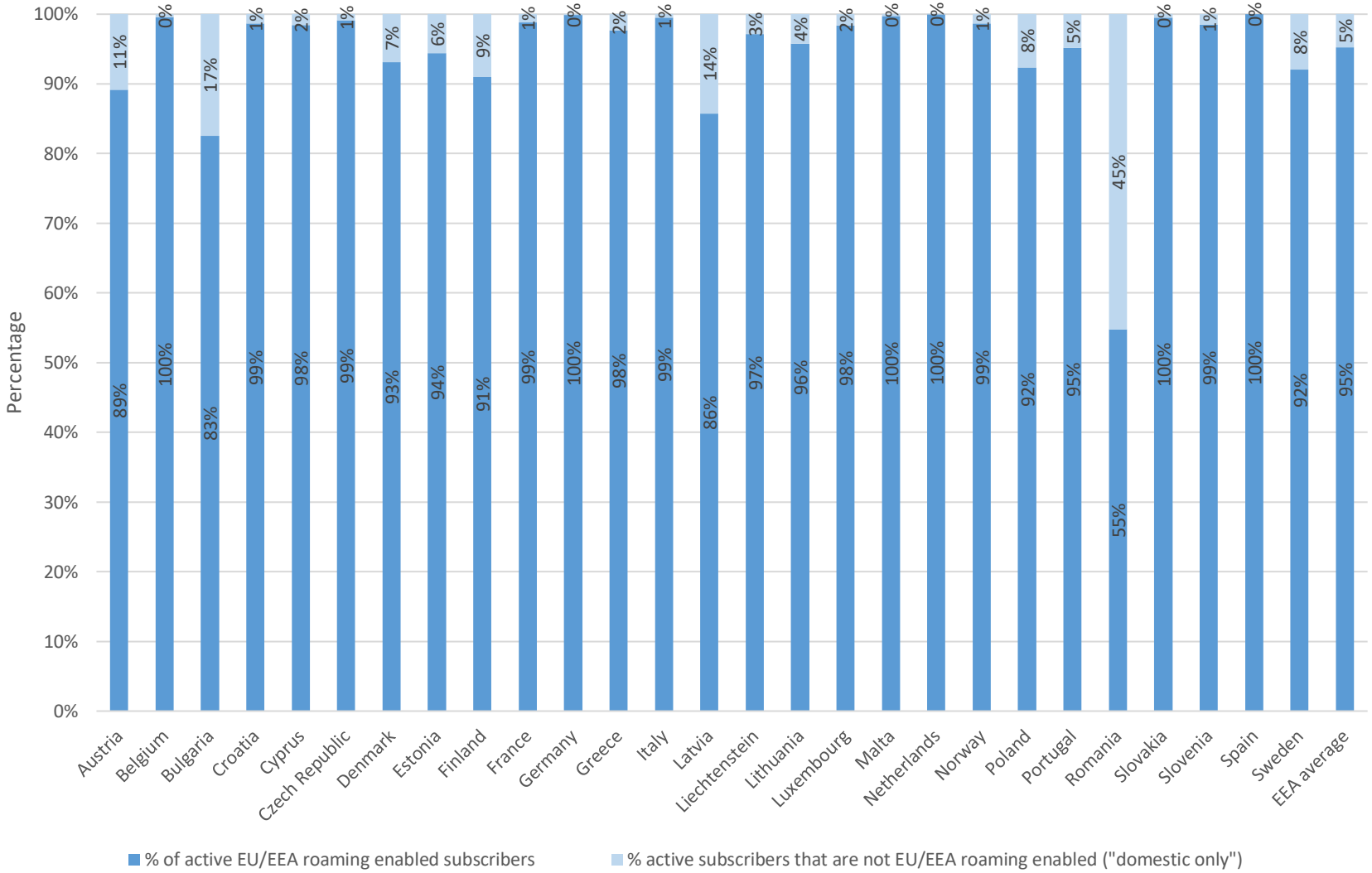


Figure 9 depicts the share of roaming-enabled subscribers per country. This share is calculated by comparing the number of active EU/EEA roaming enabled subscribers with the number of subscribers that are not EU/EEA roaming enabled (domestic only) to arrive at an average for Q3 2022.

Figure 10: Percentage of subscribers that were roaming at least once in the concerned quarter in the EEA, compared to the total number of subscribers who have roaming enabled subscriptions, Q2 17 – Q3 22

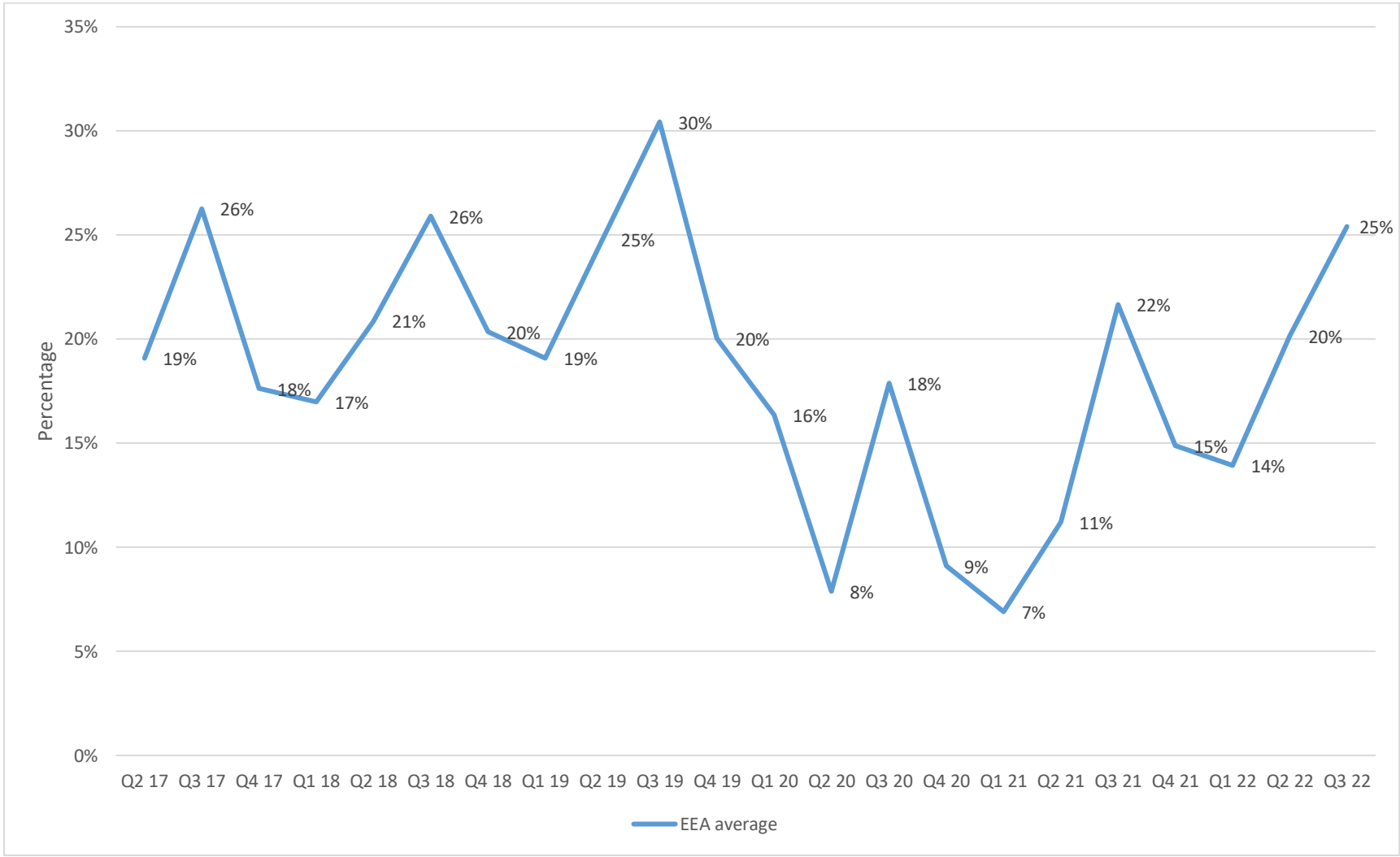


Figure 10 depicts the development of the percentage of subscribers that were roaming at least once in the concerned quarter in the EEA (compared to the total number of subscribers who have roaming enabled subscriptions) for Q2 2017 – Q3 2022. For the calculation of this value, see **Error! Reference source not found.**.

5.2. The development of Roaming Services

5.2.1. Voice roaming services

5.2.1.1 Wholesale rates

Figure 11: EEA and RoW average wholesale rates per minute, Q4 19 – Q3 22 (balanced, unbalanced, total and RoW traffic, and non-terrestrial network payments)

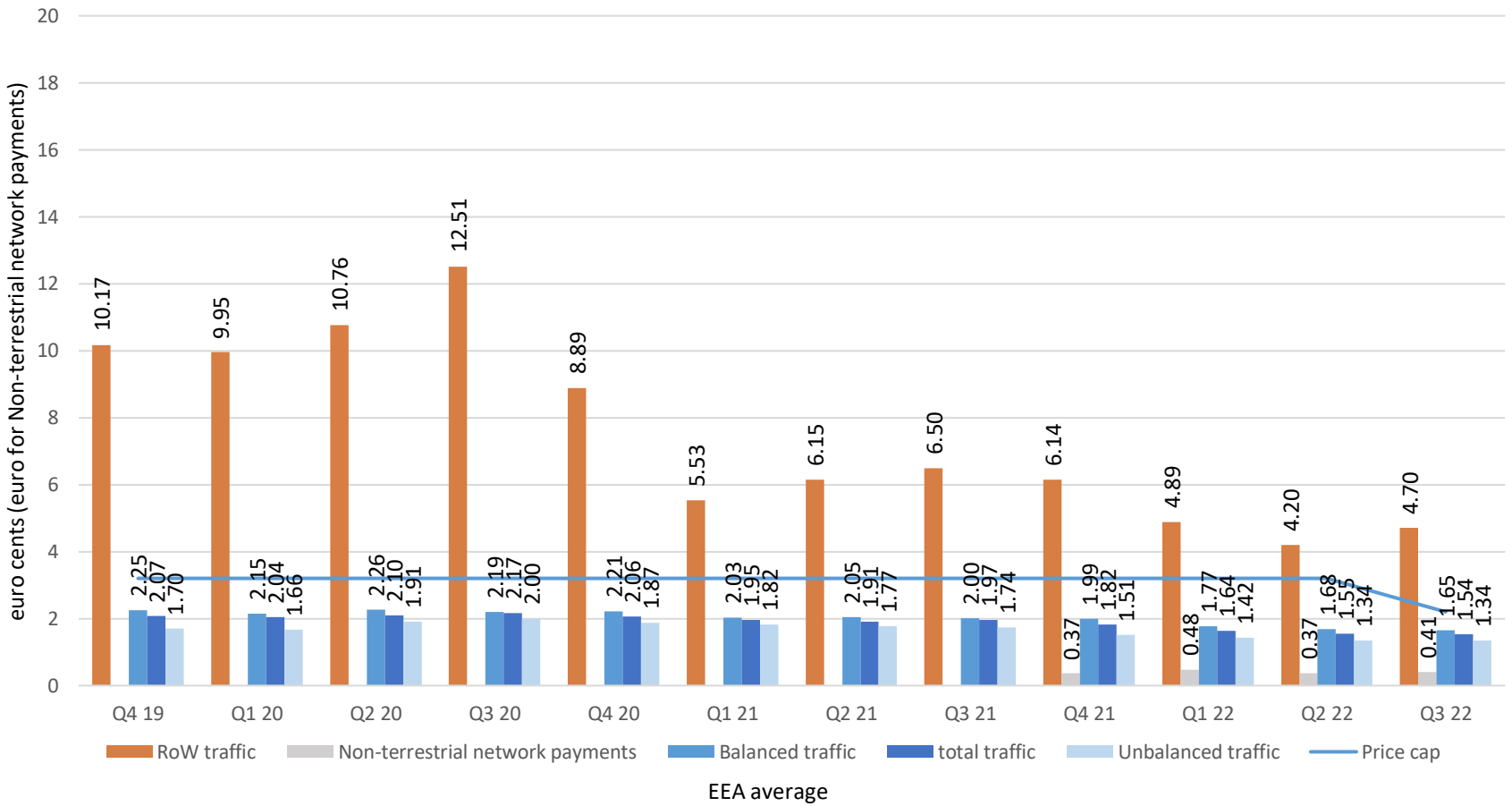


Figure 11 depicts EEA average wholesale rates for voice calls per minute for intra-EEA (balanced, unbalanced, and total), RoW and non-terrestrial network traffic, as well as the wholesale price cap applied. The average was calculated by dividing the wholesale revenues for minutes by the number of minutes in the respective category.
EEA average (Q4 2021, Q1 2022, Q2 2022 and Q3 2022) excludes: Germany.

5.2.1.2 Consumption patterns

Figure 12: EEA average: roaming calls made by share of tariff, Q4 19 – Q3 22

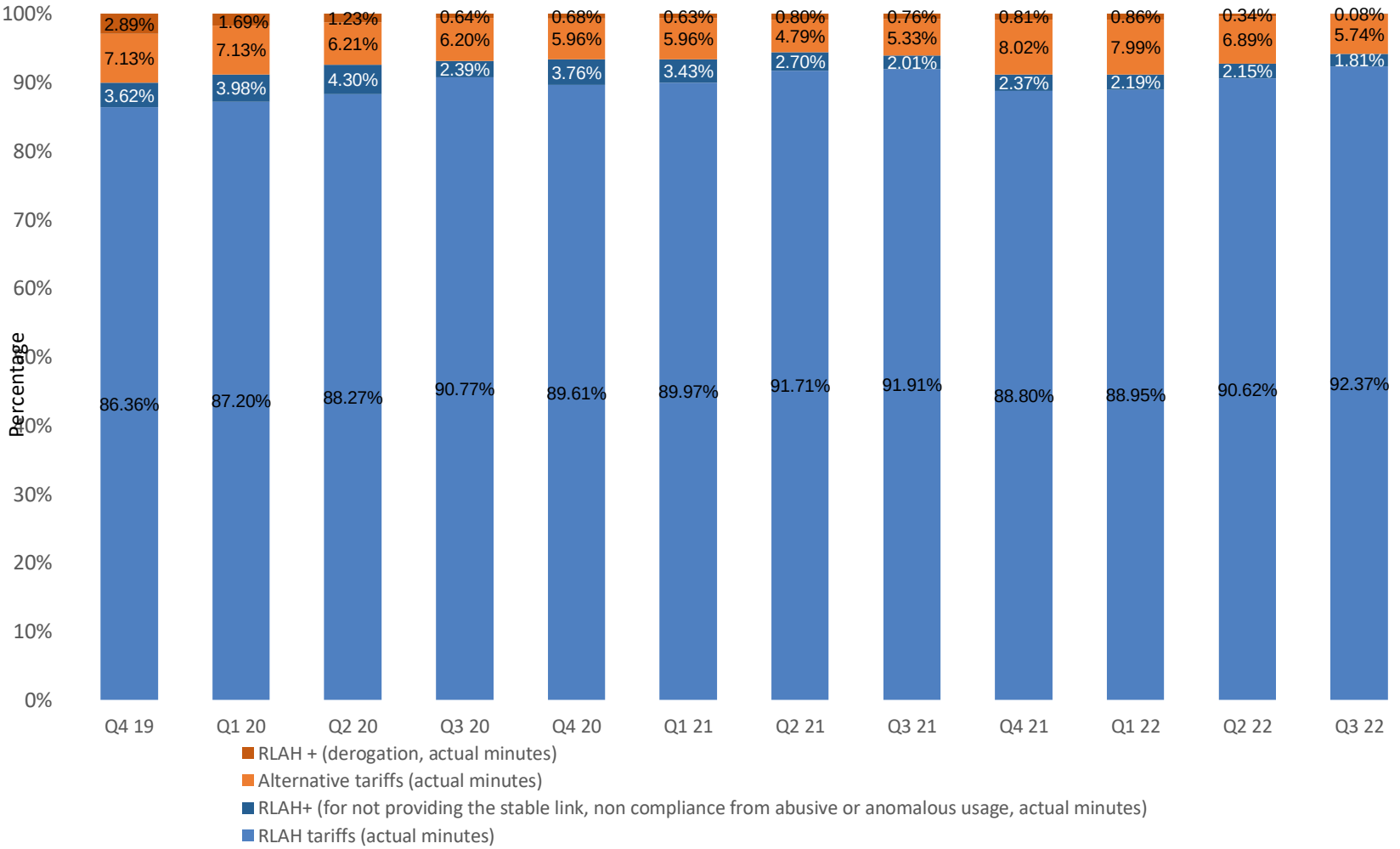


Figure 12 depicts the EEA average of the share of tariffs (RLAH tariffs, RLAH+ (derogation), RLAH+ (stable link, abusive/anomalous usage), Alternative tariffs) used for making roaming calls for Q4 2019 – Q3 2022. This average is created by calculating the contribution of each tariff to the total number of roaming calls made. EEA average (Q2 and Q3 2021) excludes: Poland.

Figure 13: Roaming calls made: EEA average number of minutes per month per total number of roaming subscribers Q4 19 – Q3 22

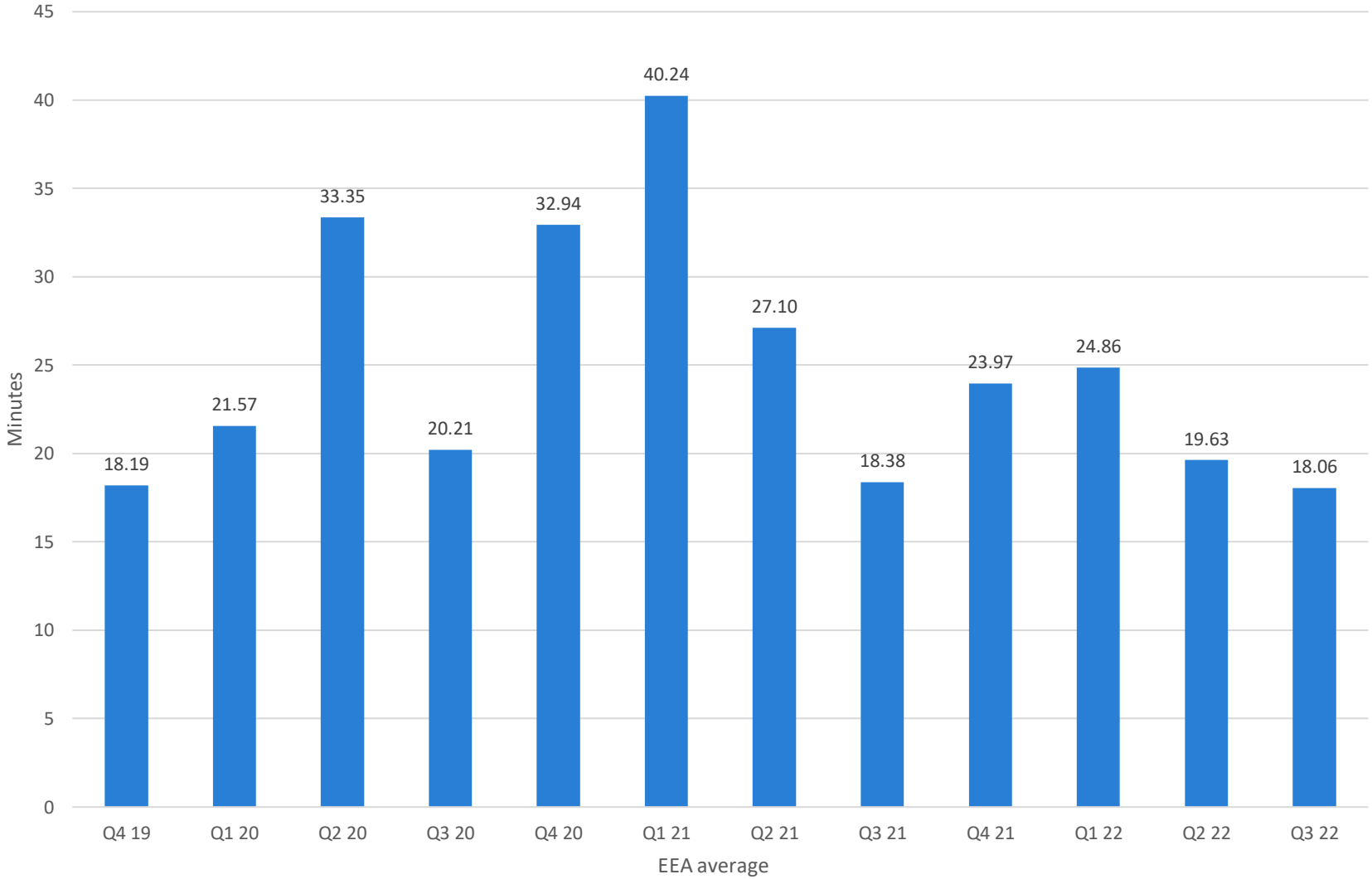


Figure 13 depicts the EEA average number of roaming calls made per subscriber. This average is calculated by dividing the number of roaming minutes by the total number of roaming subscribers and again by three to arrive at monthly values for Q4 2019 – Q3 2022.

Figure 14: EEA average: Roaming calls made, (millions of minutes), Q4 17 – Q3 22

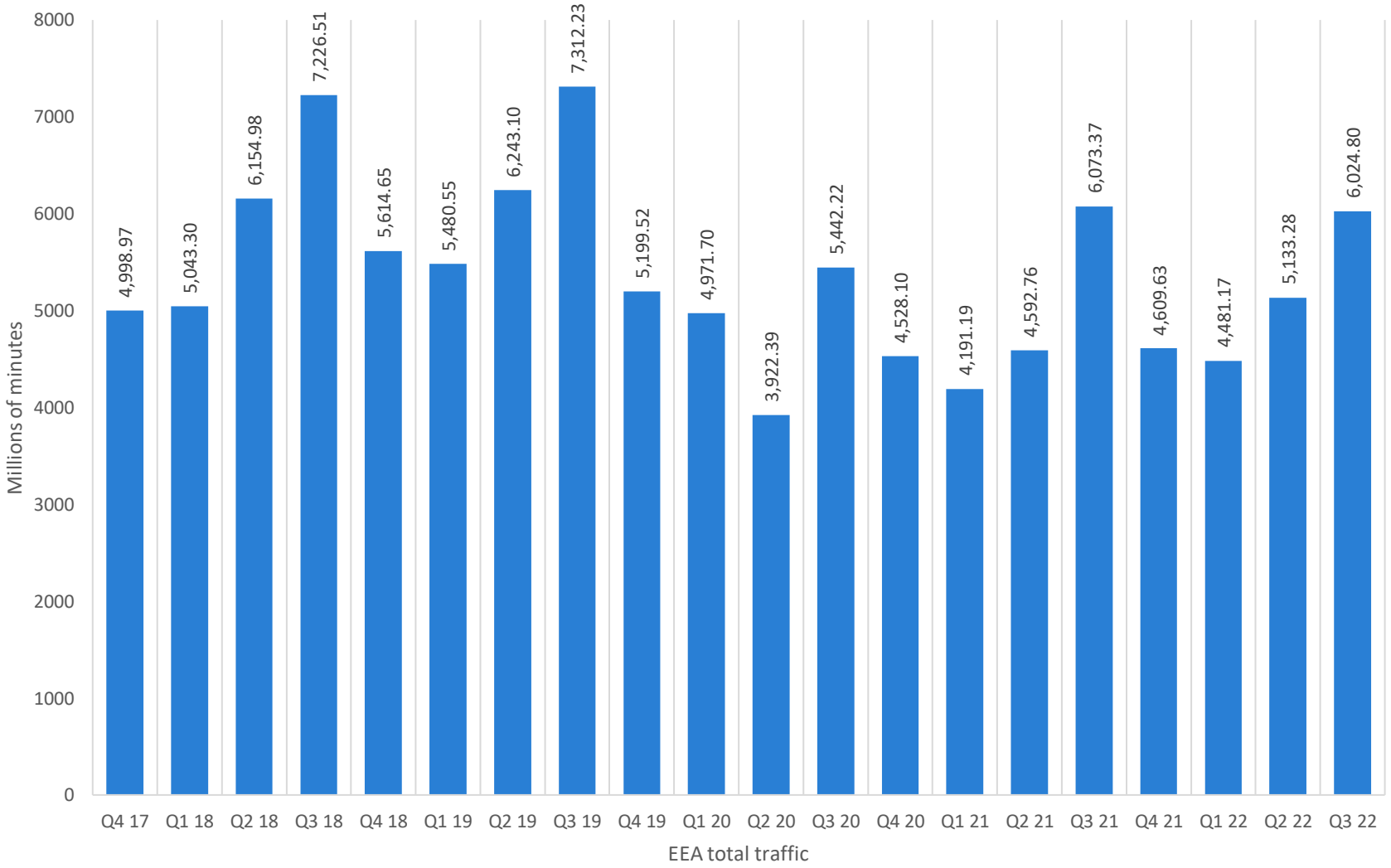


Figure 14 depicts the total number of minutes (calls made) while roaming (including RLAH, RLAH+ stable link, RLAH+ derogation, RLAH+ abusive/anomalous usage, alternative tariffs) in the EEA for Q4 2017 – Q3 2022 (in millions of minutes).
The EEA average includes United Kingdom operators' data until Q3 2019.

Figure 15: EEA roaming calls received, (millions of minutes), Q4 17 – Q3 22

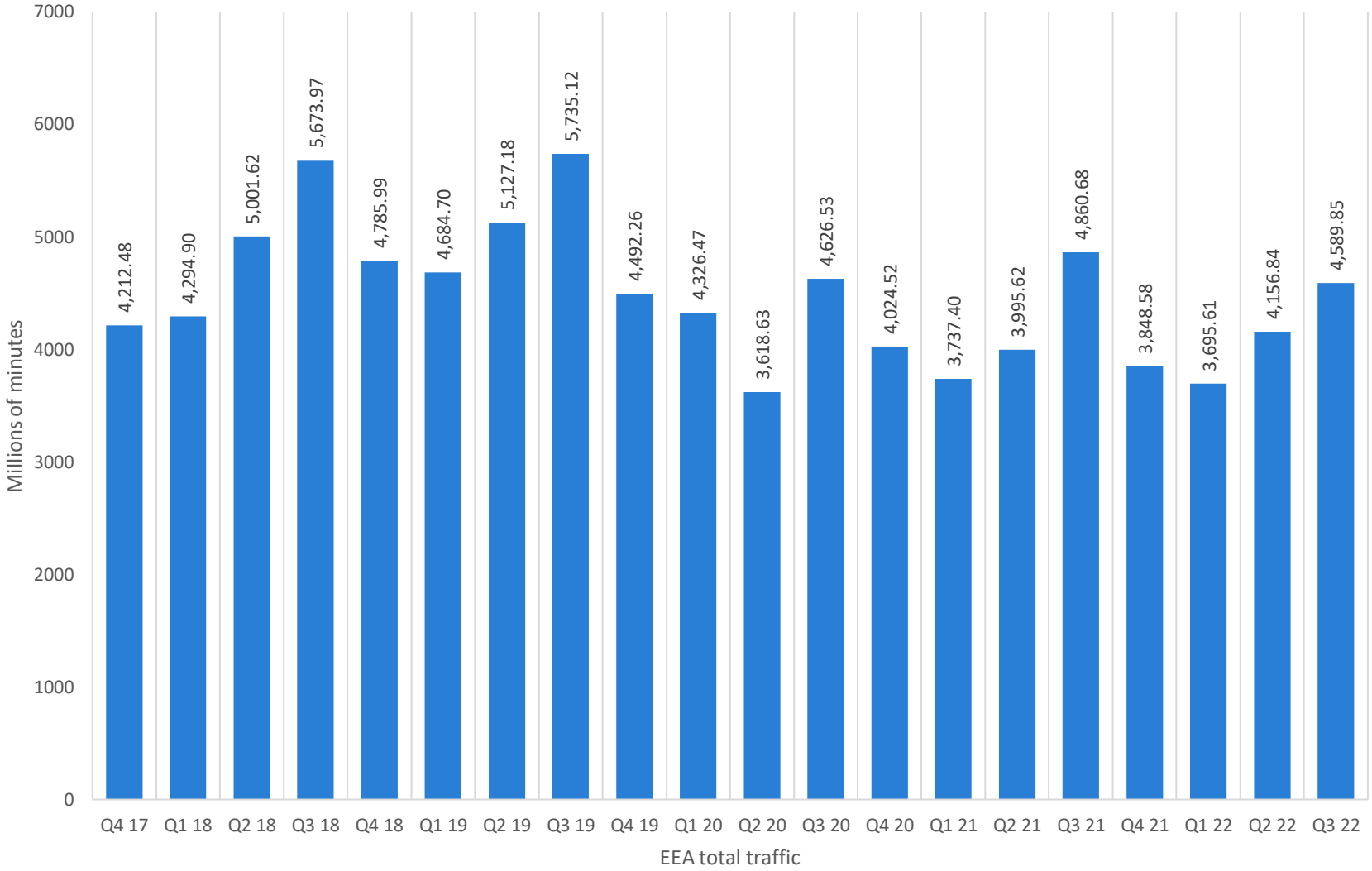


Figure 15 depicts the total number of minutes (calls received) while roaming (including RLAH, RLAH+ stable link, RLAH+ derogation, RLAH+ abusive/anomalous usage, alternative tariffs) in the EEA for Q4 2017 – Q3 2022 (in millions of minutes).
The EEA average includes United Kingdom operators' data until Q3 2019.

5.2.2. SMS roaming services

5.2.2.1 Wholesale rates

Figure 16: EEA average wholesale rates per roaming SMS, Q4 19 – Q3 22 (balanced, unbalanced, total and RoW traffic, and non-terrestrial networks)

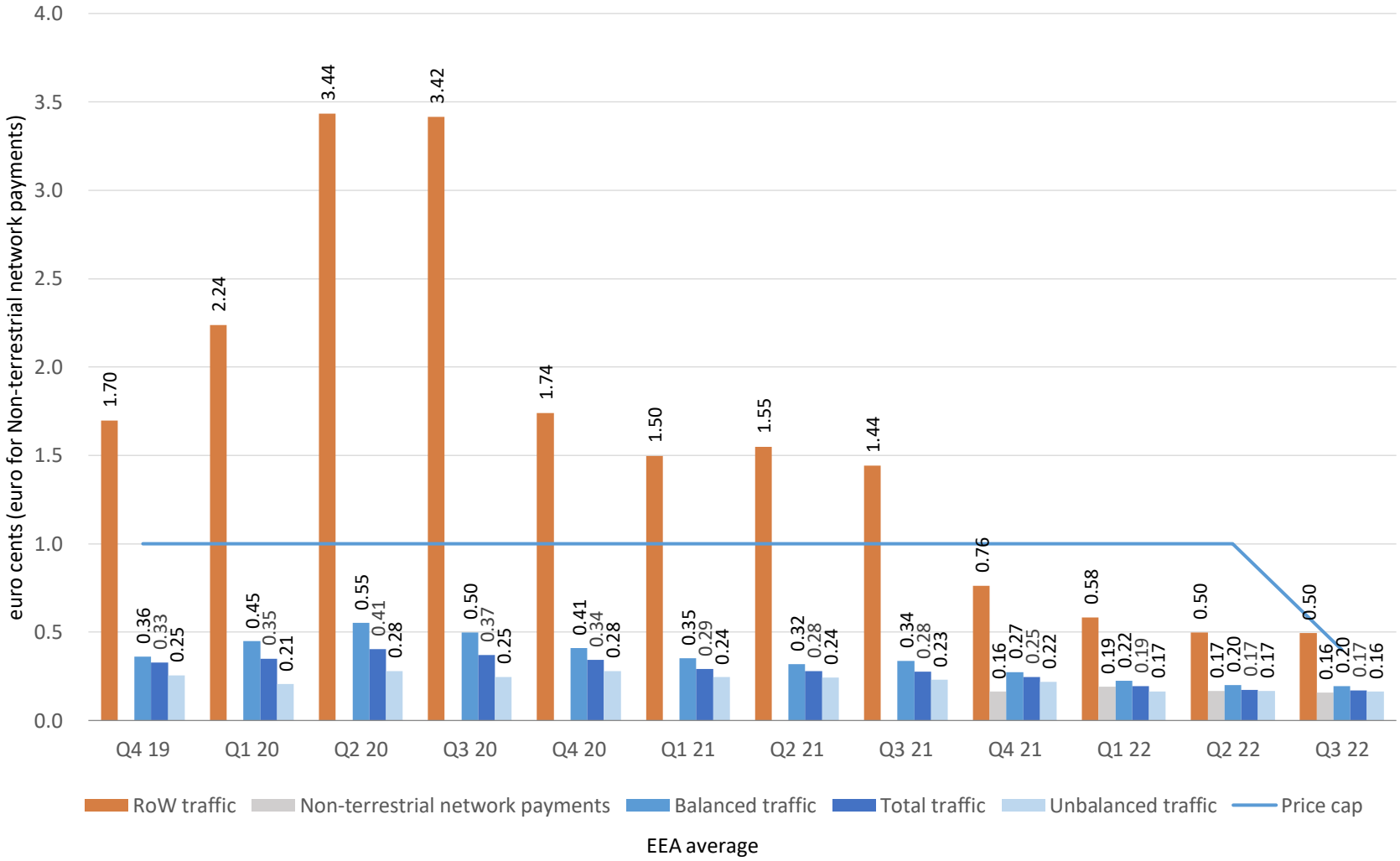


Figure 16 depicts EEA average wholesale rates per SMS for intra-EEA (balanced, unbalanced, and total), RoW and non-terrestrial network traffic, as well as the wholesale price cap applied. The average was calculated by dividing the wholesale revenues for SMS by the number of SMS in the respective category.
EEA average (Q4 2021, Q1 2022, Q2 2022 and Q3 2022) excludes: Germany.

5.2.3. Data roaming services

5.2.3.1 Wholesale rates

Figure 17: EEA average: wholesale roaming rates per GB (balanced and unbalanced traffic), Q4 19 – Q3 22

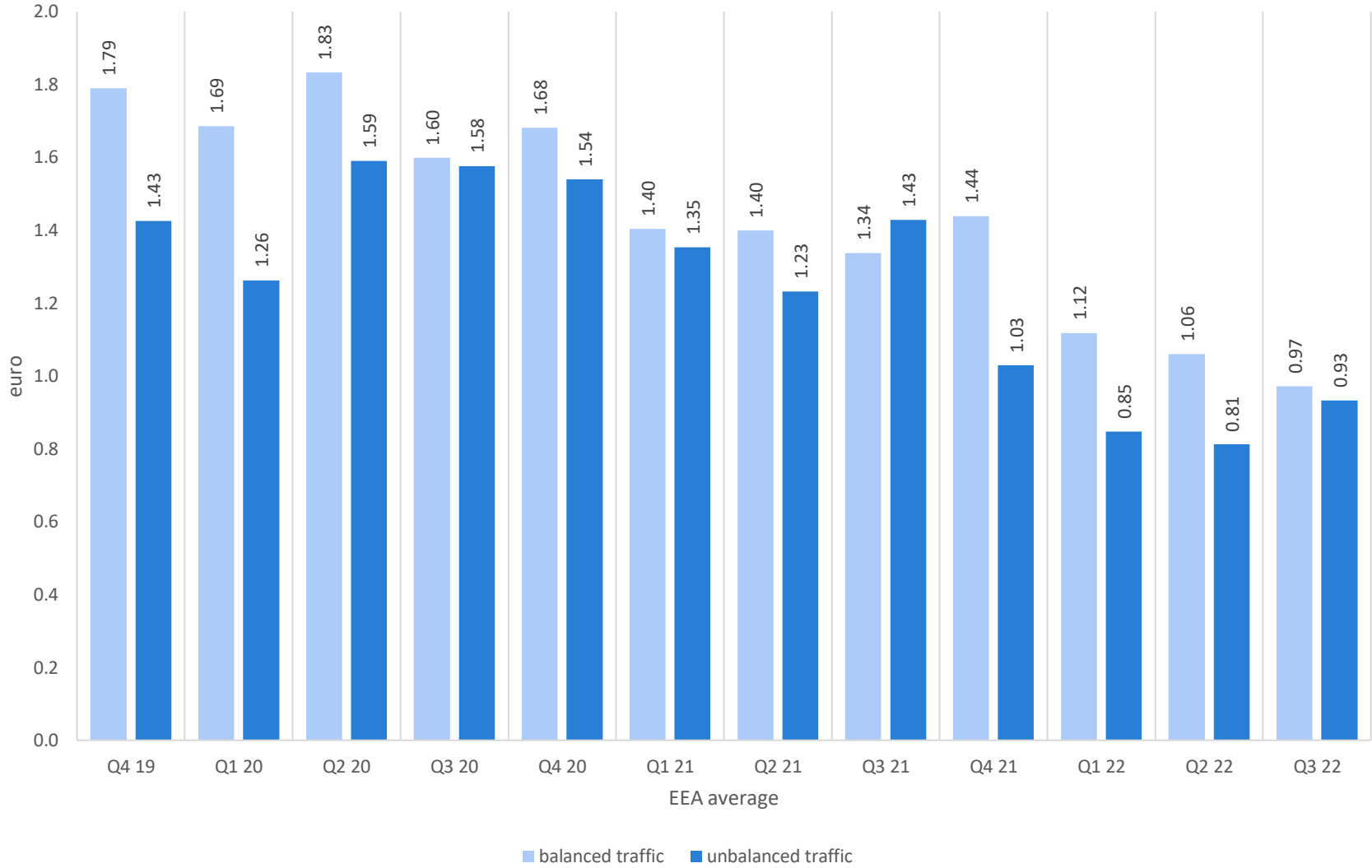


Figure 17 depicts the average wholesale rates per roaming GB for balanced and unbalanced traffic at EEA level for Q4 2019 – Q3 2022. This average is calculated, respectively, by dividing the wholesale revenues by the number of roaming GB in each traffic category.
EEA average (Q4 2021, Q1 2022, Q2 2022 and Q3 2022) excludes: Germany.

Figure 18: EEA average: average wholesale roaming data rates per GB (total traffic), Q4 19 – Q3 22

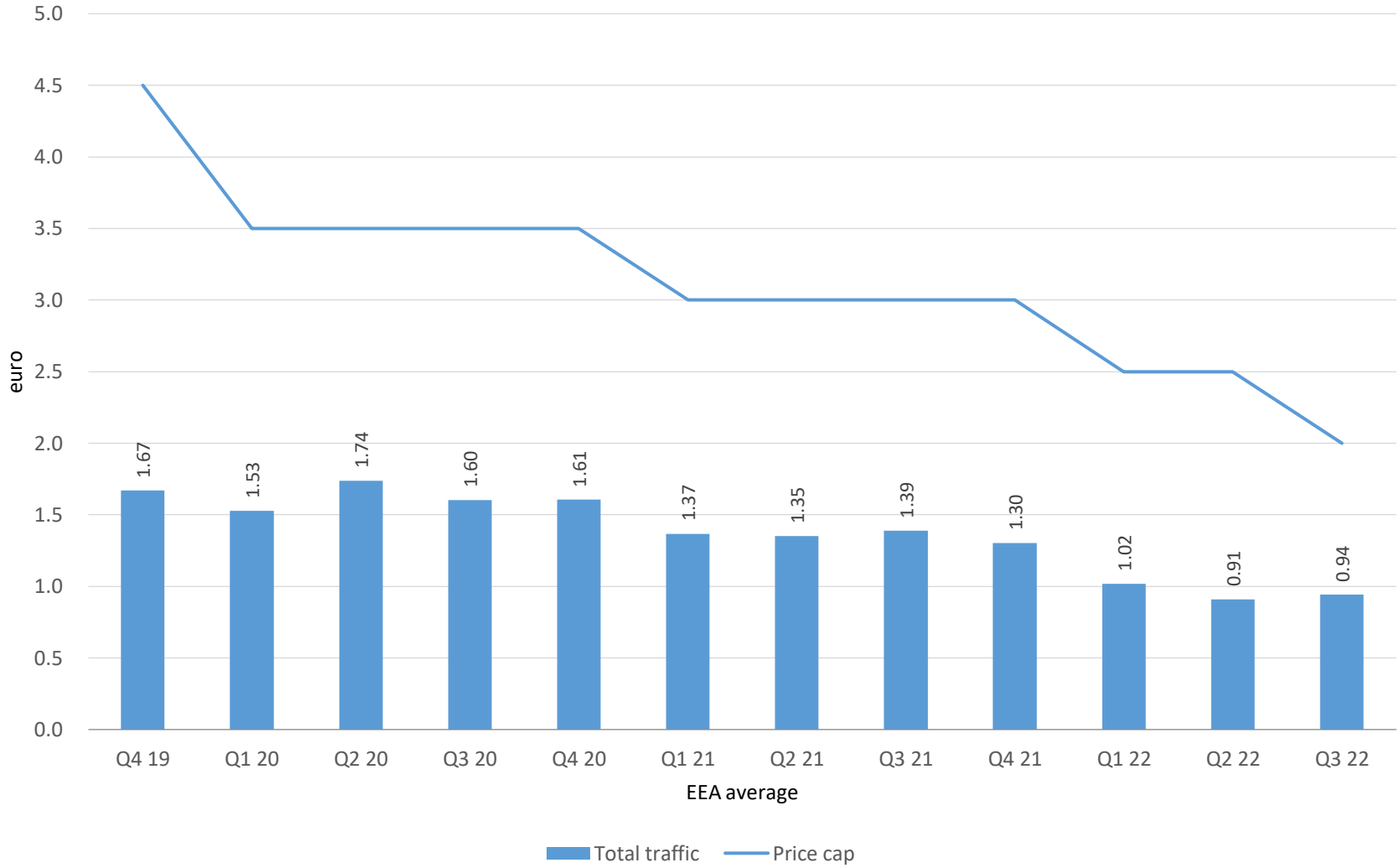


Figure 18 depicts the average wholesale rates for roaming GB of total traffic at EEA level and compares these to the wholesale price caps applied in Q4 2019 – Q3 2022. The average wholesale rates for total traffic are calculated by dividing the wholesale revenues in this category by the number of roaming GB in this category. EEA average (Q4 2021, Q1 2022, Q2 2022 and Q3 2022) excludes: Germany.

Figure 19: EEA average wholesale data rates per GB, Q4 19 – Q3 22 (balanced, unbalanced, total and RoW traffic, and non-terrestrial networks)

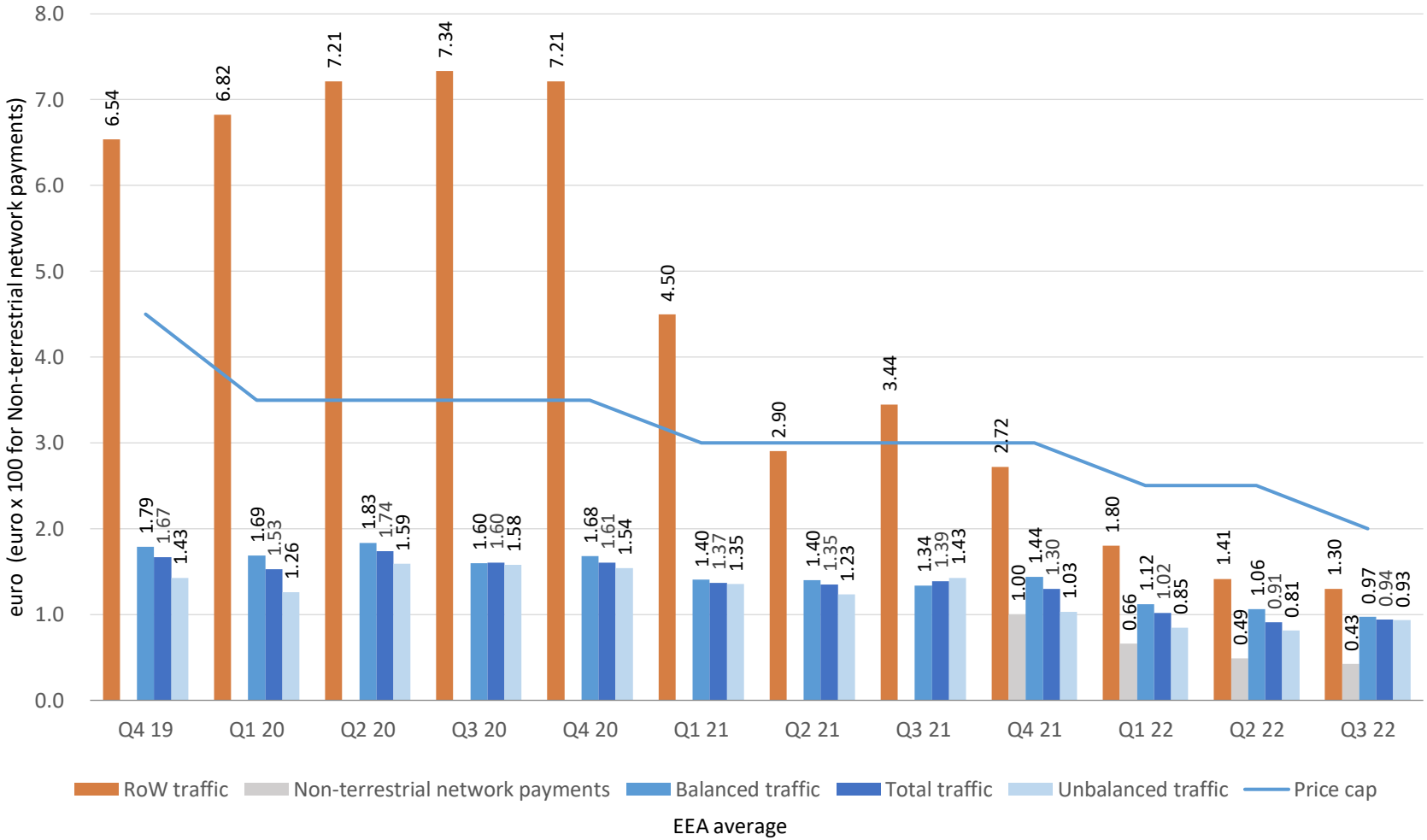


Figure 19 depicts EEA average wholesale rates for data per GB for intra-EEA (balanced, unbalanced, and total), RoW and non-terrestrial network traffic, as well as the wholesale price cap applied. The average was calculated by dividing the wholesale revenues for GB by the number of GB in the respective category.
EEA average (Q4 2021, Q1 2022, Q2 2022 and Q3 2022) excludes: Germany.

Figure 20: Proportion of balanced and unbalanced traffic within EEA countries, data services, wholesale roaming inbound, Q3 22

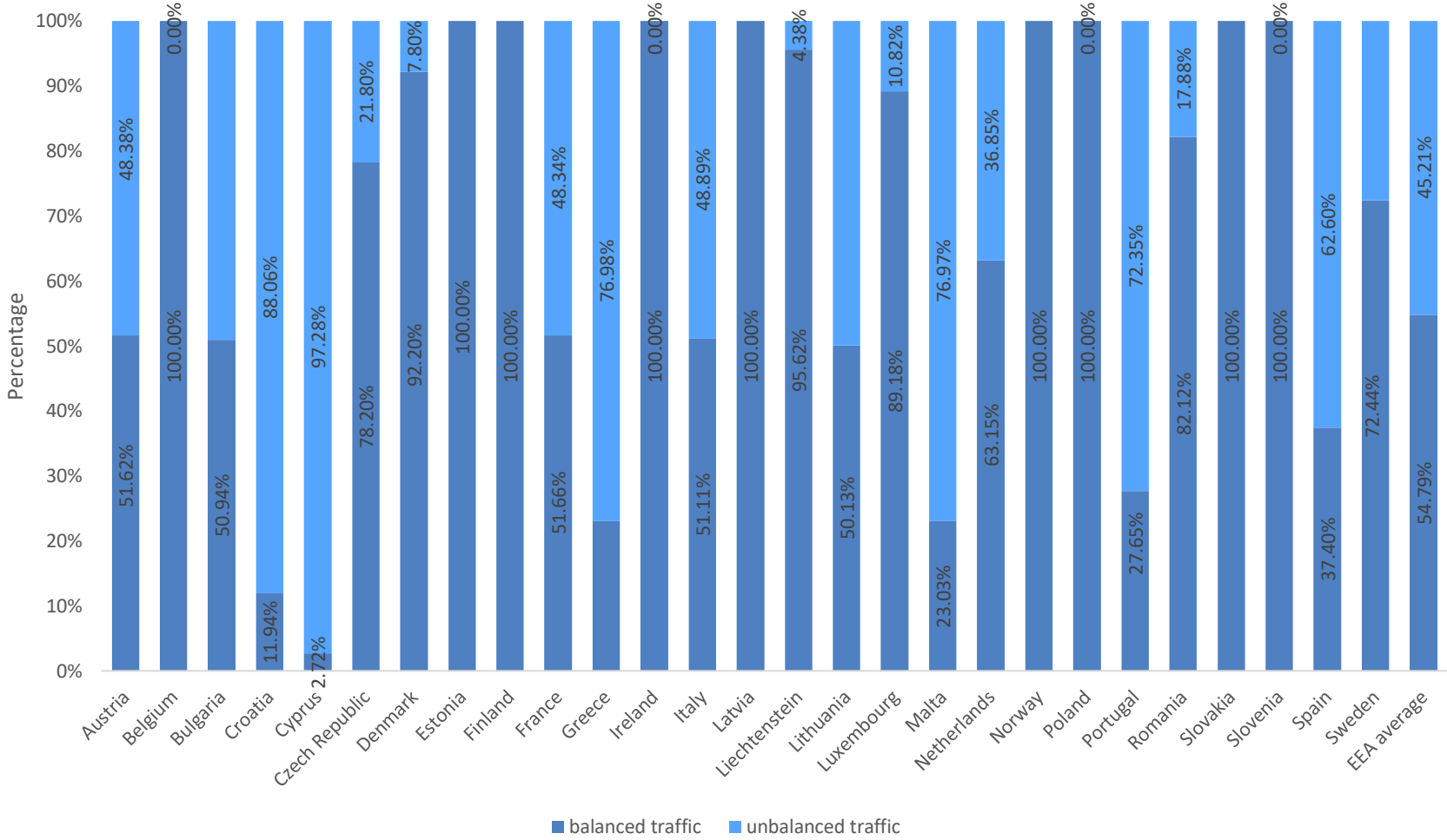


Figure 20 depicts the share of balanced and unbalanced traffic within EEA countries used for inbound data services for Q3 2022. This value is created by calculating the contribution of the number of balanced and unbalanced GB to the total number of wholesale roaming GB.
Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the non-disaggregated estimates.
EEA average (Q4 2021, Q1 2022, Q2 2022 and Q3 2022) excludes: Germany.

5.2.3.2 Consumption patterns

Figure 21: EEA average: retail data roaming services by share of tariff, Q4 19 – Q3 22

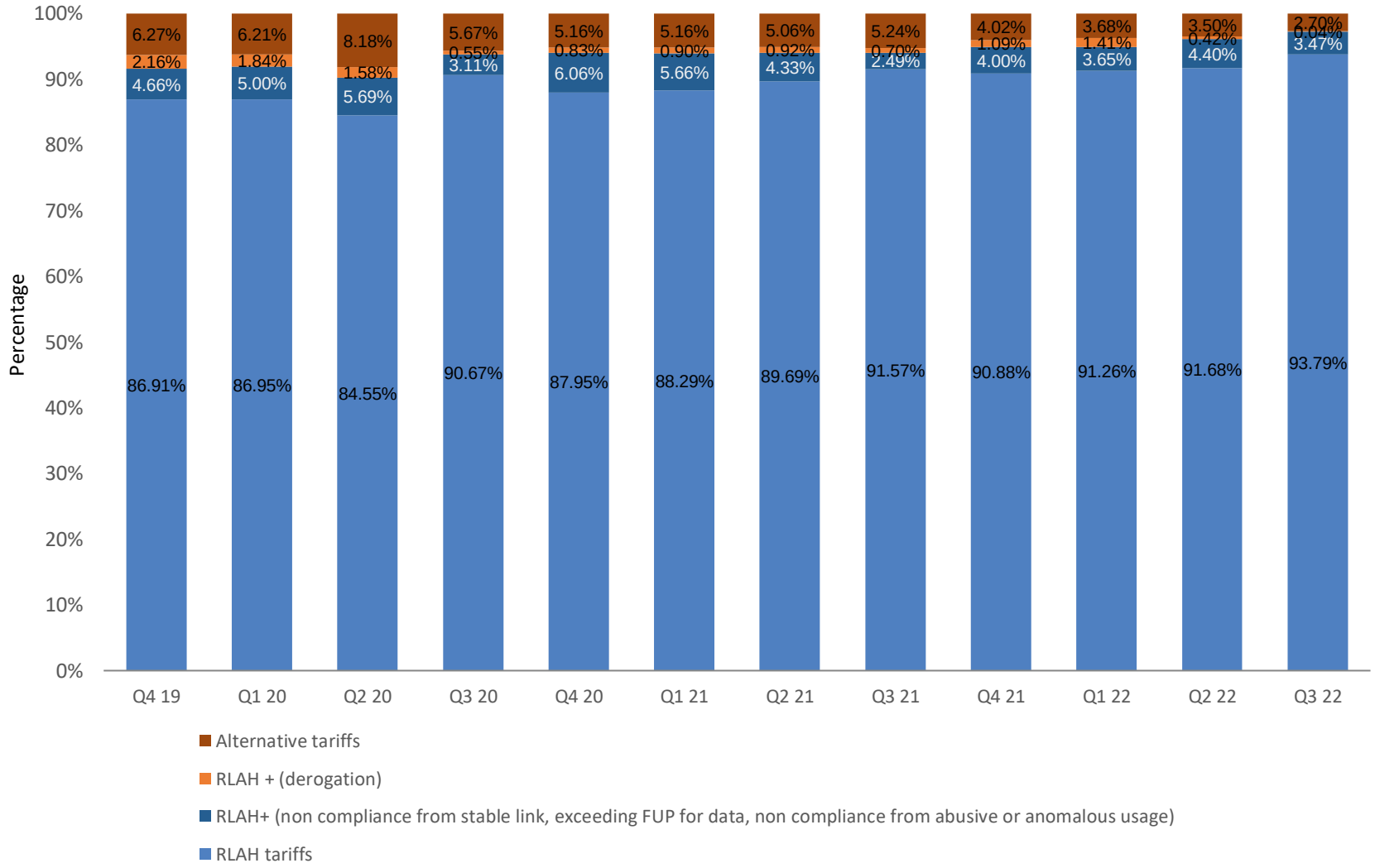


Figure 21 depicts the EEA average of the share of tariffs (RLAH tariffs, RLAH+ (derogation), RLAH+ (stable link, abusive/anomalous usage), Alternative tariffs) used for roaming data services for Q4 2019 – Q3 2022. This average is created by calculating the contribution of each tariff to the total number of roaming data services. EEA average (Q2 and Q3 2021) excludes: Poland

Figure 22: Average data consumption per month per total number of roaming subscribers (in GB), Q3 21 and Q3 22

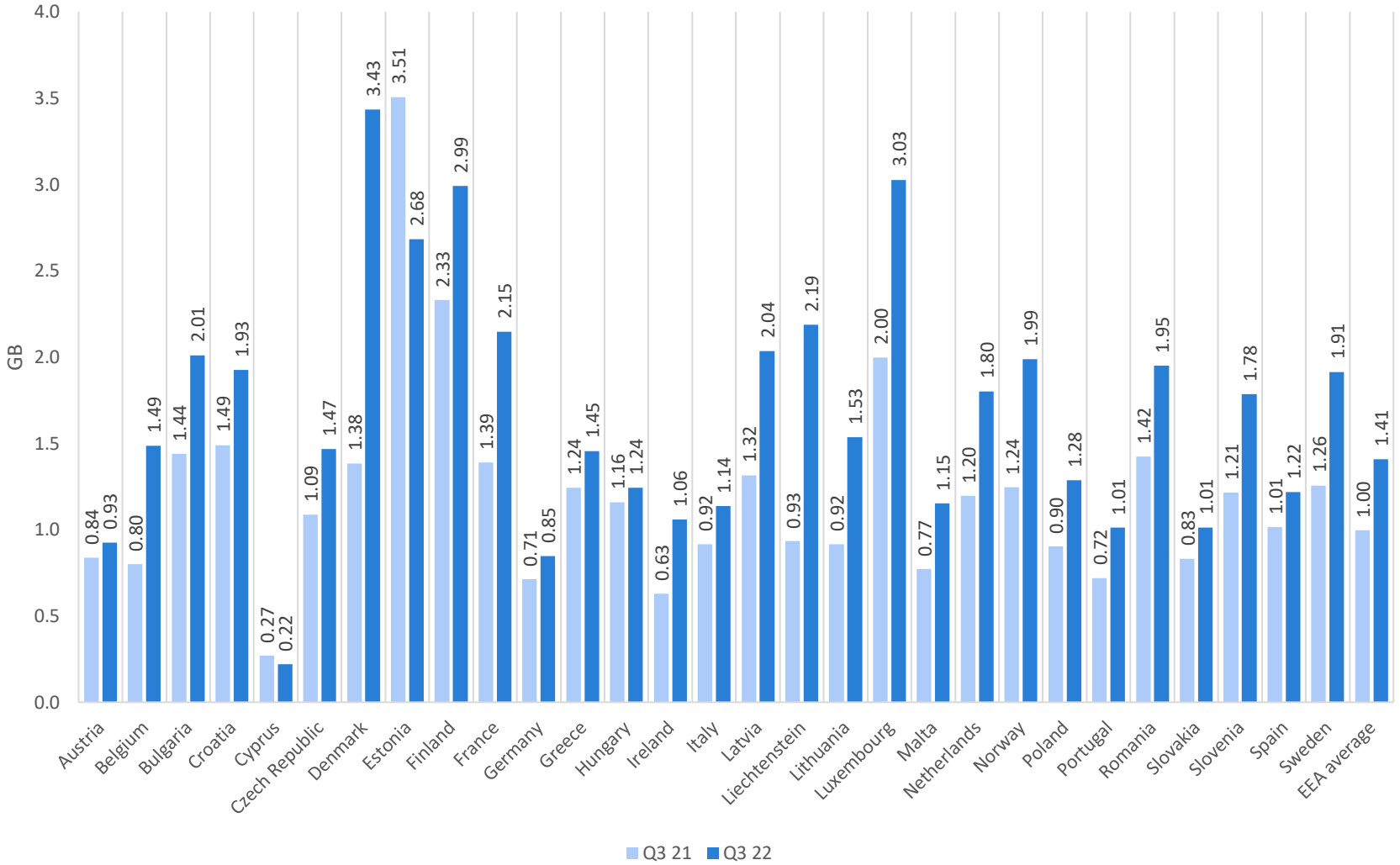


Figure 22 depicts the average number of roaming GB consumed per subscriber on a per-country level. This average is calculated by dividing the number of roaming GB by the total number of roaming subscribers and again by three to arrive at monthly values for Q3 2021 and Q3 2022.
In some cases, not all operators provided the data for RLAH subscribers.

Figure 23: EEA average data consumption per month per total number of roaming subscribers (in GB), Q4 19 – Q3 22

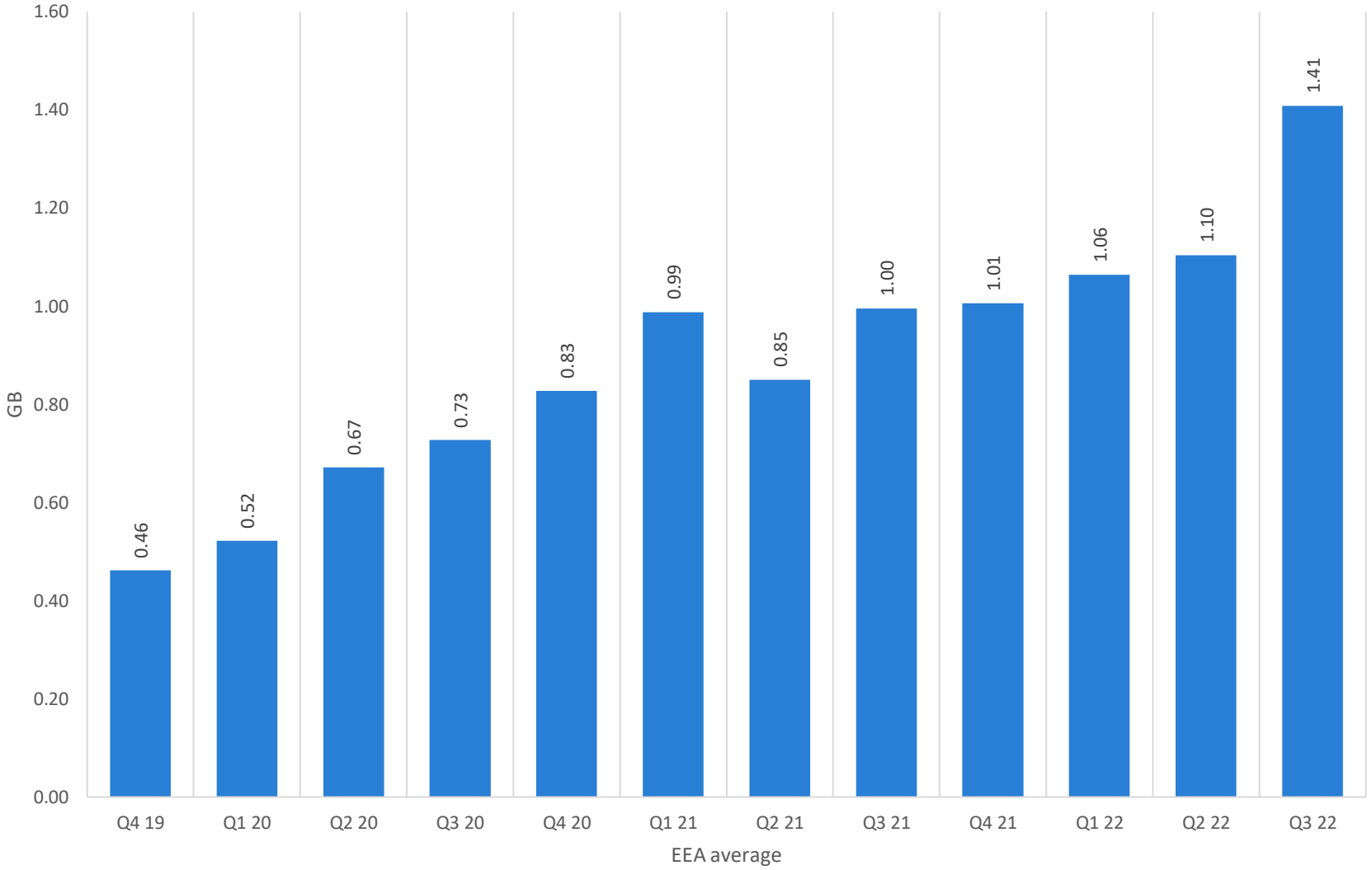


Figure 23 depicts the EEA average number of roaming GB consumed per subscriber. This average is calculated by dividing the number of roaming GB by the total number of roaming subscribers and again by three to arrive at monthly values for Q4 2019 – Q3 2022

Figure 24: EEA retail data, Q4 17 – Q3 22 (millions of GB)

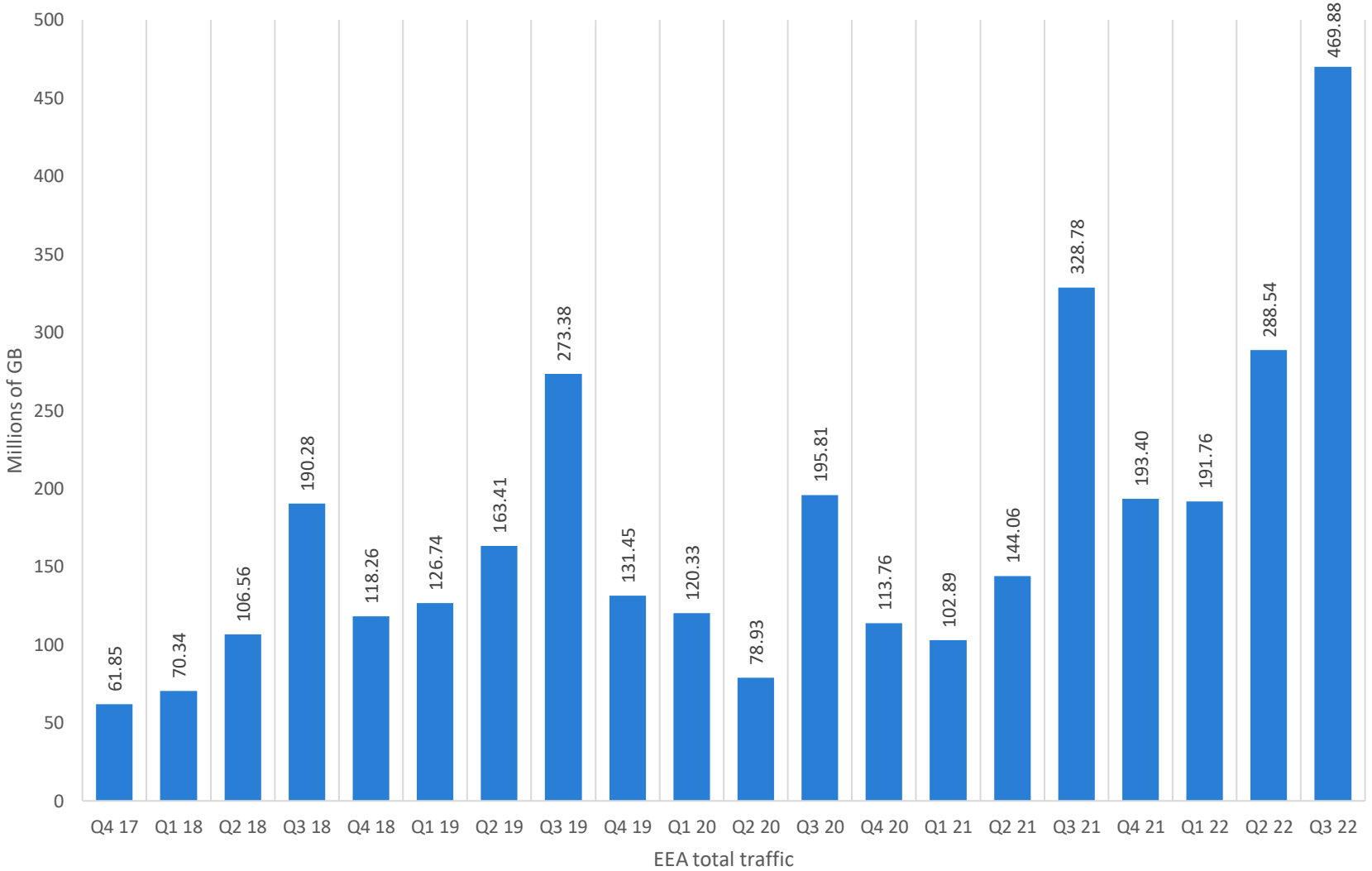


Figure 24 depicts the total number of GB while roaming (including RLAH, RLAH+ stable link, RLAH+ derogation, RLAH+ abusive/anomalous usage, RLAH+ exceeding data FUP, alternative tariffs) in the EEA for Q4 2017 – Q3 2022 (in millions of minutes).
The EEA average includes United Kingdom operators' data until Q3 2019.

5.2.4. RoW retail roaming prices

Figure 25: EEA average retail prices for RoW roaming services, Q4 19 – Q3 22

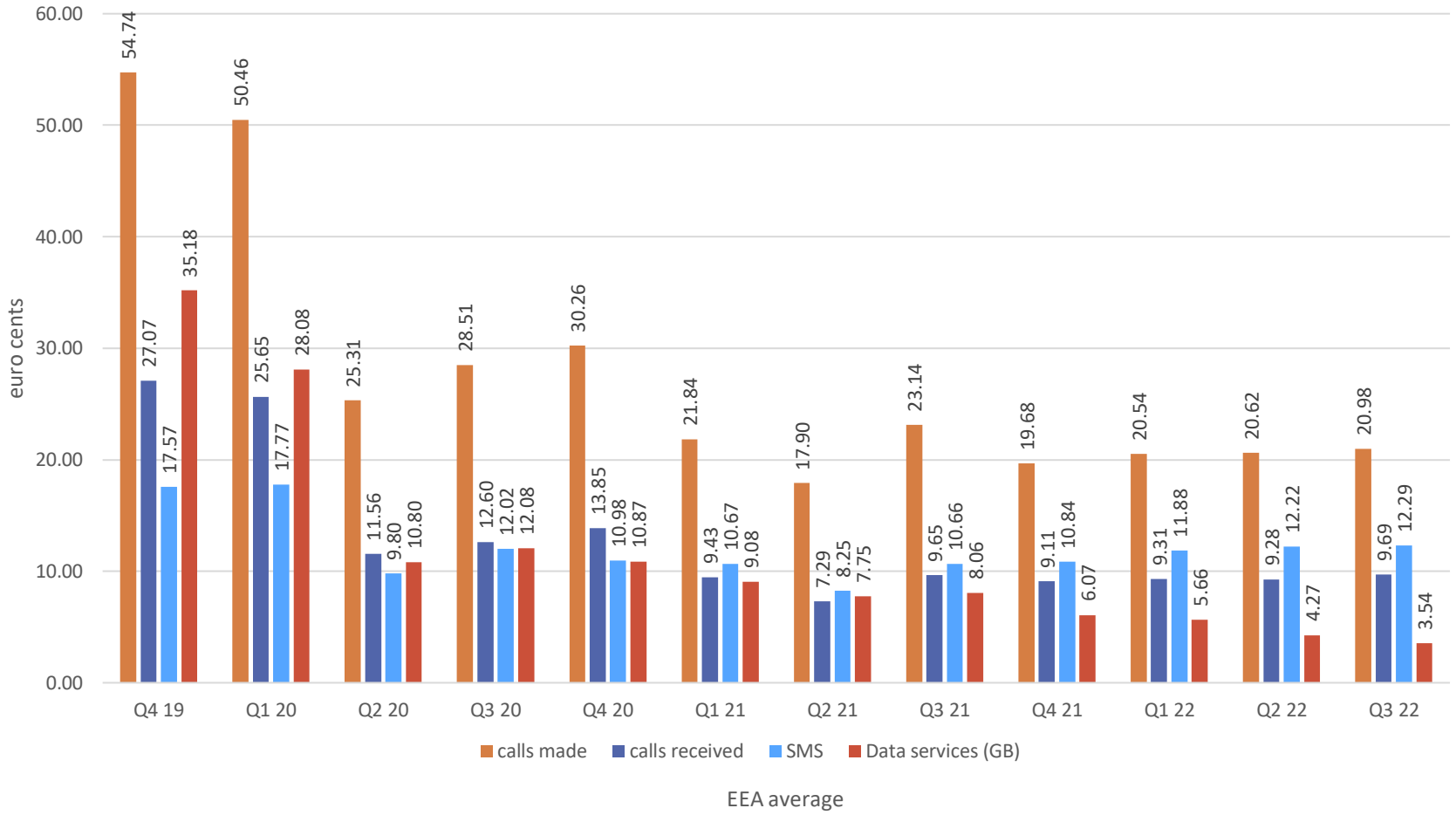


Figure 25 compares the average retail prices in RoW countries for EEA roaming subscribers. To calculate these averages, the retail roaming revenues in RoW countries were divided by the volumes of retail roaming traffic initiated by EEA roaming subscribers in RoW countries (calls made, calls received, SMS and data services) for Q4 2019 – Q3 2022.
Voice and SMS services: prices are expressed in Euro cents.
Data services: prices are expressed in Euro.

Figure 26: EEA average retail prices (in Euro cents) for roaming on non-terrestrial networks, Q4 19 – Q3 22

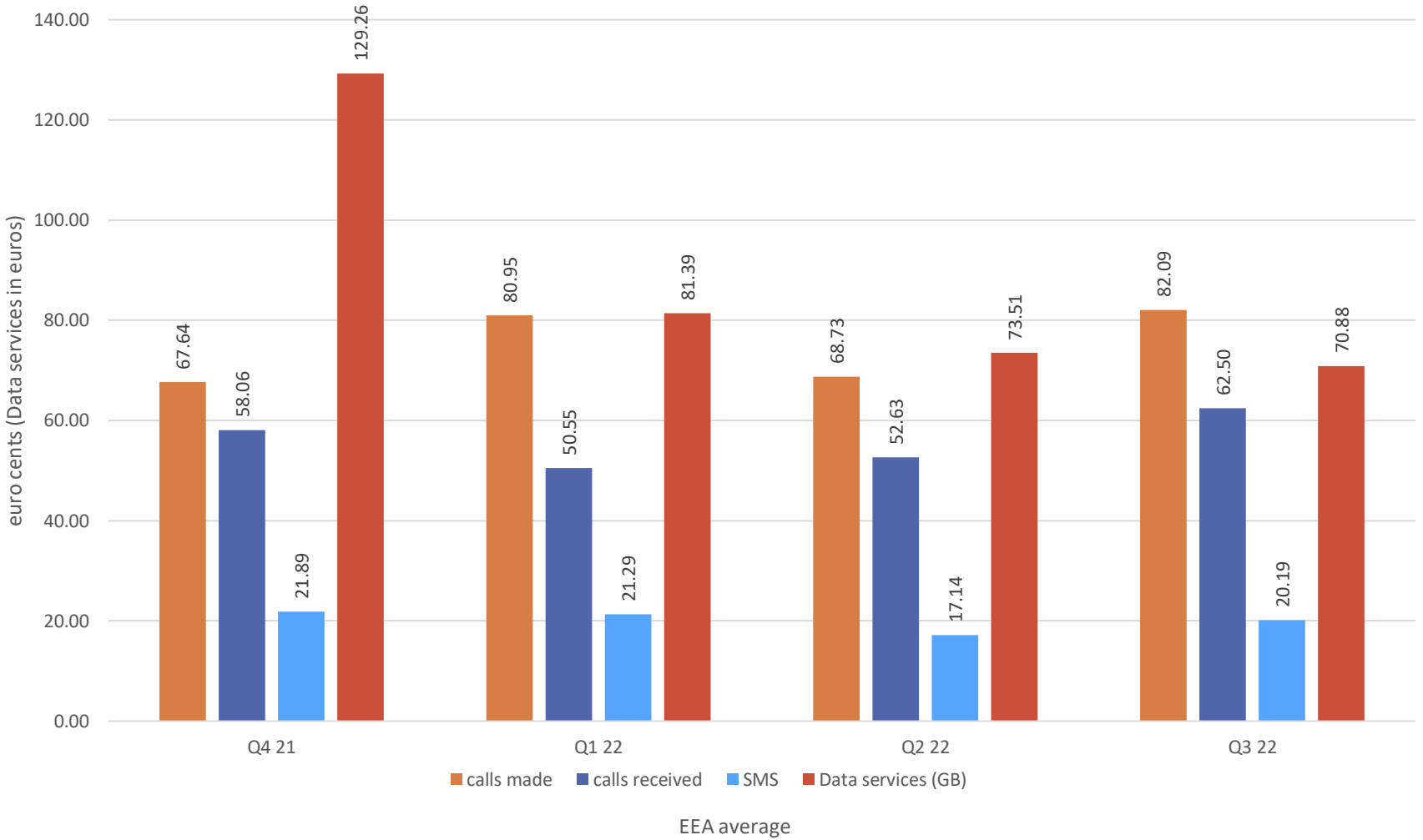


Figure 26 depicts the EEA average retail prices for roaming on non-terrestrial networks. The average was calculated by dividing the retail roaming revenues on non-terrestrial networks by the retail roaming volumes on non-terrestrial networks (separately for calls made, calls received, SMS and data services) for Q4 2021 – Q3 2022.

5.3. Wholesale roaming (outbound) rates per unit for agreements applying Art. 3 Roaming Regulation

Figure 27: Wholesale averages outbound roaming: rate per minute for agreements applying Article 3 Roaming Regulation, Q1 17 – Q3 22

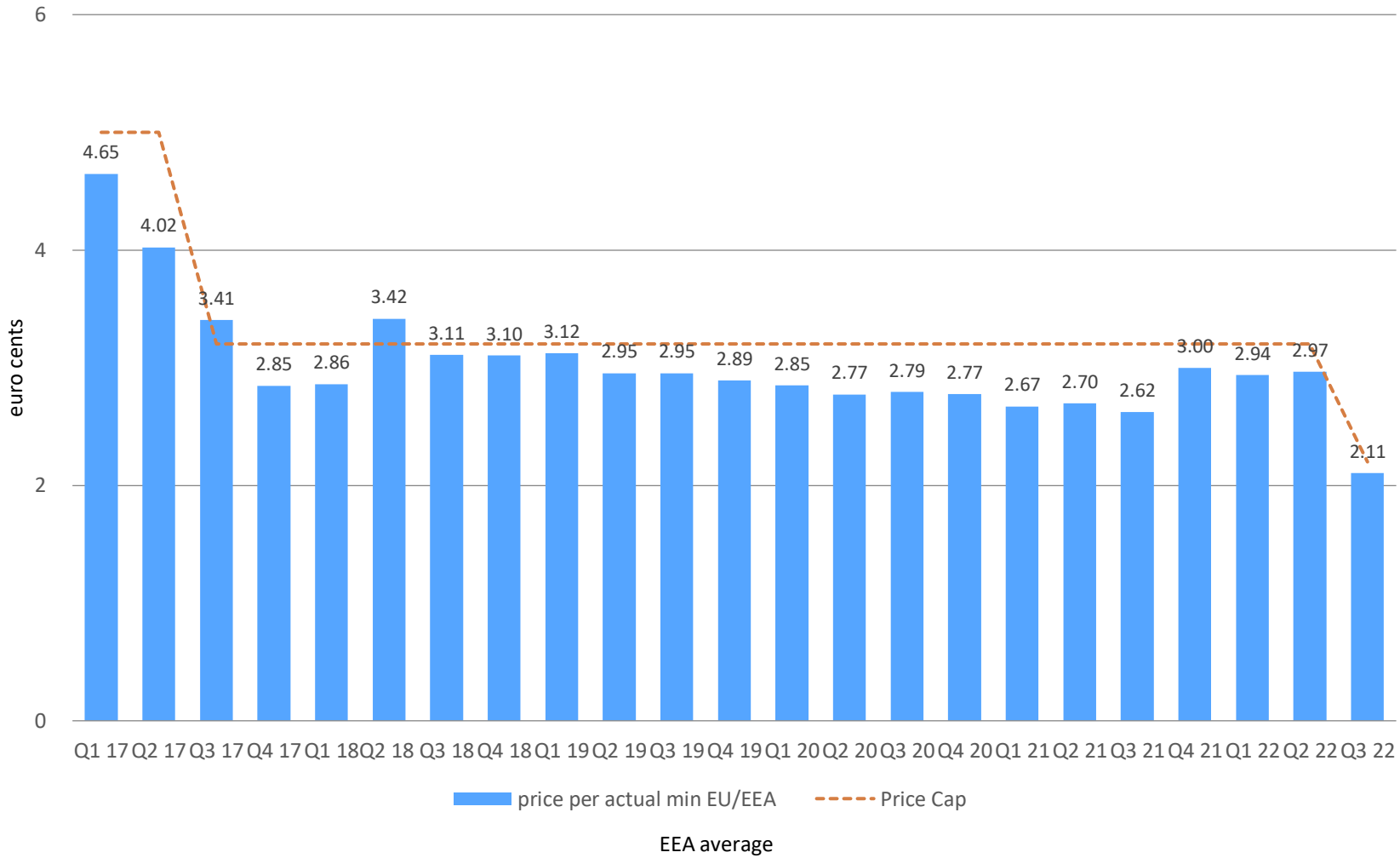


Figure 27 depicts the rate per minute for wholesale outbound resale roaming in the EEA for agreements applying Article 3 of Roaming Regulation and compares it to the wholesale price caps applied. This average is calculated by dividing the wholesale roaming revenues by the number of minutes for Q1 2017 – Q3 2022. The EEA average includes United Kingdom operators' data until Q3 2019.

Figure 28: Wholesale averages outbound roaming: rate per SMS for agreements applying Article 3 Roaming Regulation, Q1 17 – Q3 22

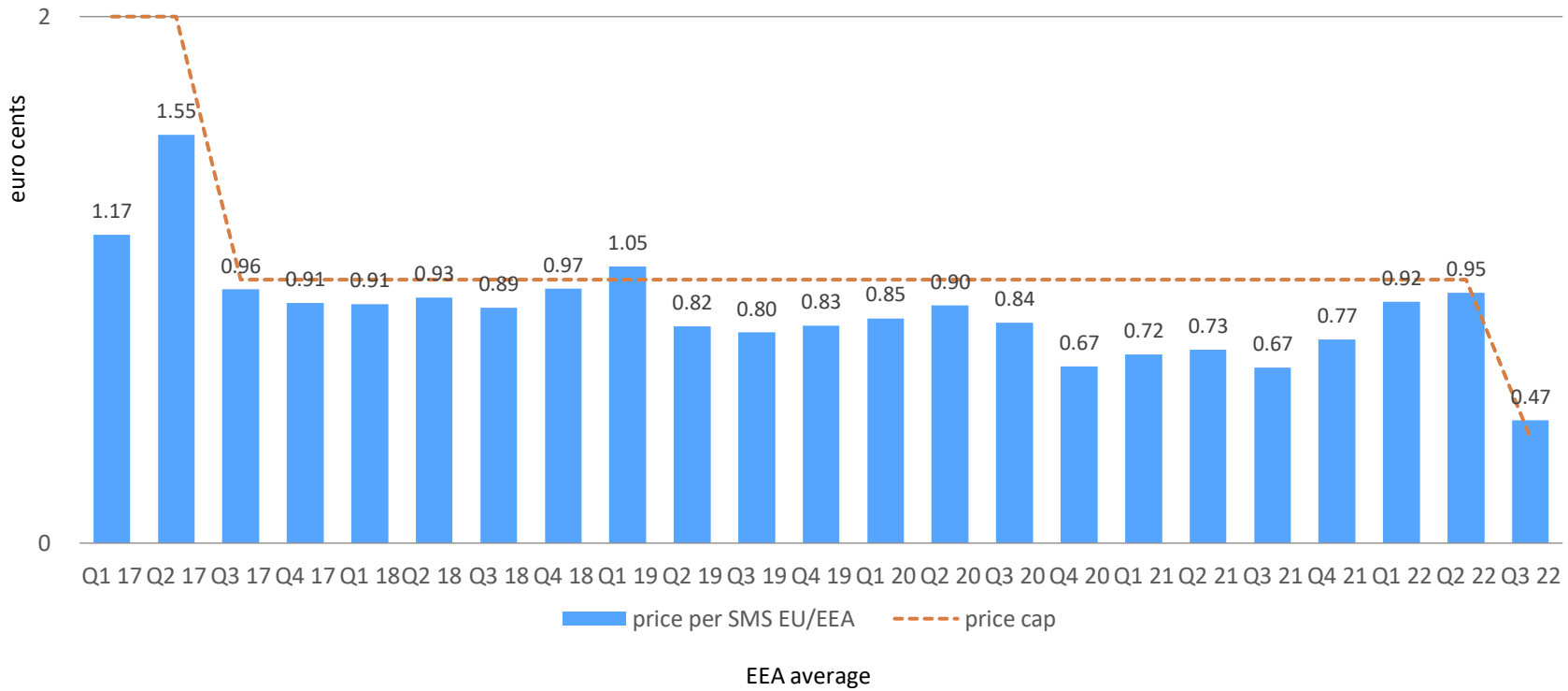


Figure 28 depicts the rate per SMS for wholesale outbound resale roaming in the EEA for agreements applying Article 3 of Roaming Regulation and compares it to the wholesale price caps applied. This average is calculated by dividing the wholesale roaming revenues by the number of SMS for Q1 2017 – Q3 2022.
The EEA average includes United Kingdom operators' data until Q3 2019.

Figure 29: Wholesale EEA average outbound roaming: rate per GB for agreements applying Article 3 Roaming Regulation, Q1 17 – Q3 22

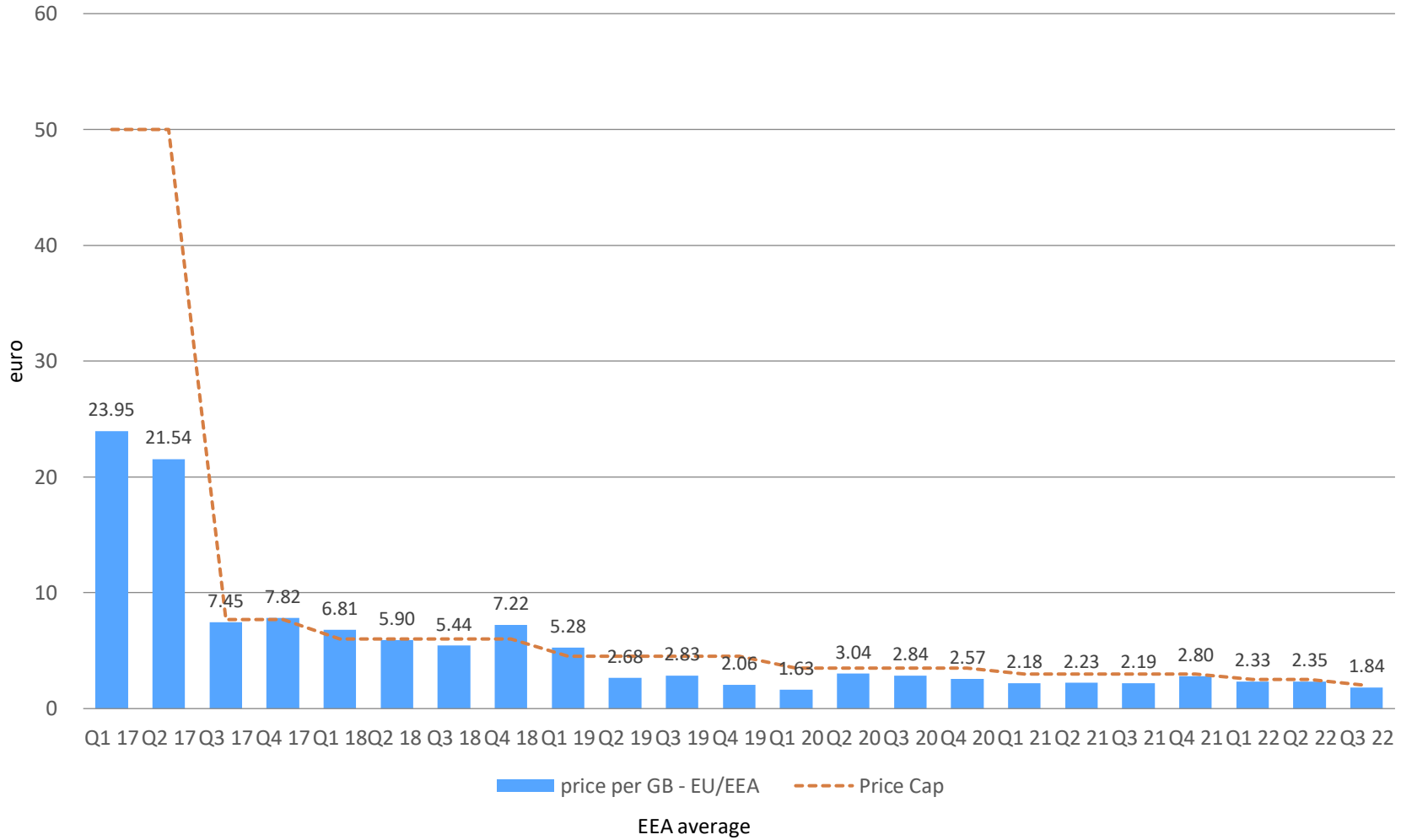


Figure 29 depicts the rate per GB for wholesale outbound resale roaming in the EEA for agreements applying Article 3 of Roaming Regulation and compares it to the wholesale price caps applied. This average is calculated by dividing the wholesale roaming revenues by the number of GB for Q1 2017 – Q3 2022.
The EEA average includes United Kingdom operators' data until Q3 2019.

Figure 30: Relation between wholesale costs and prices (min, SMS, GB), MNOs and MVNOs, Q4 21 - Q3 22

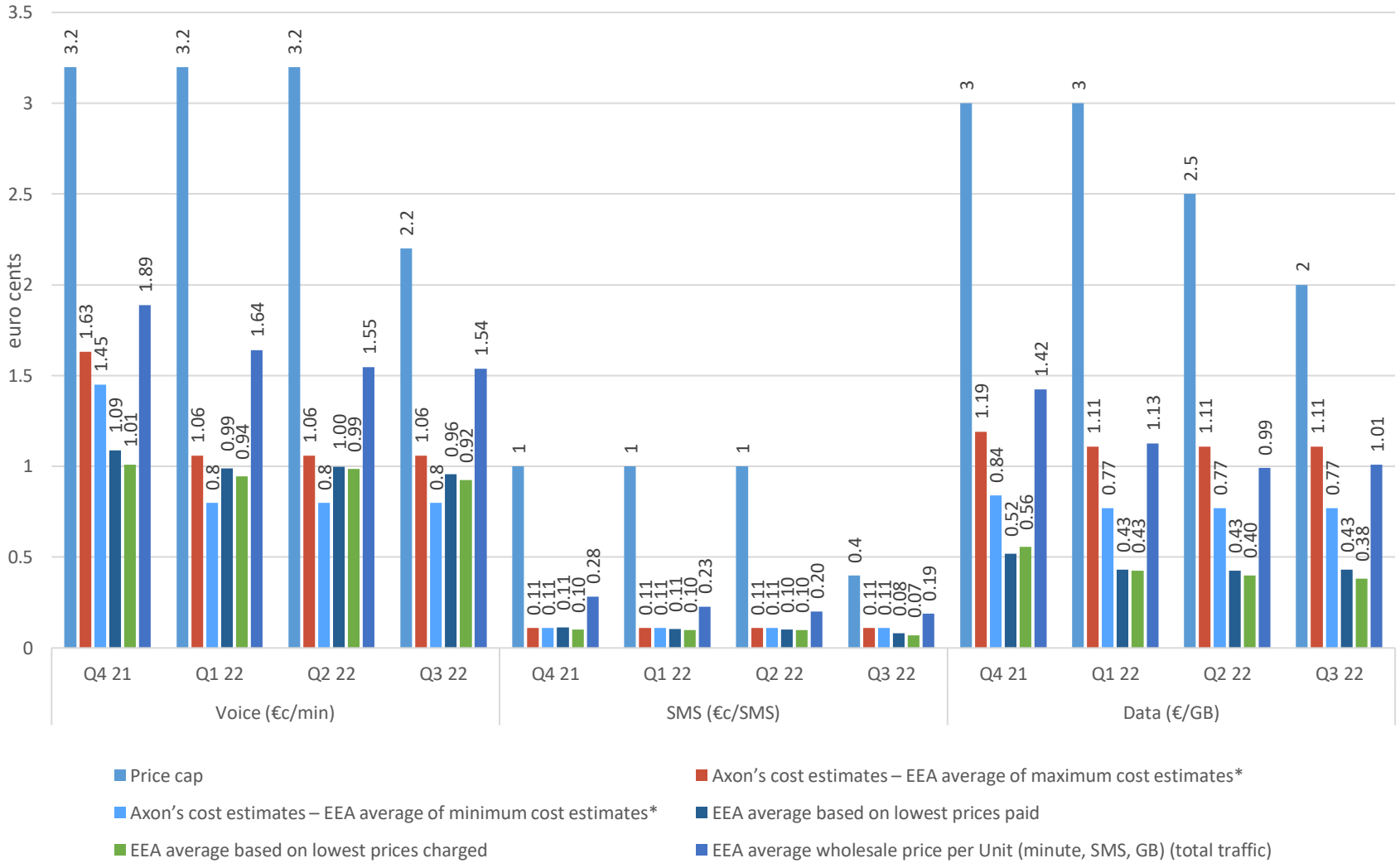


Figure 30 compares average EEA wholesale rates (based on lowest prices paid, lowest prices charged, and wholesale total traffic), Axon's cost estimates and wholesale price caps applied, separately for outgoing calls, SMS and data, for Q4 2021 – Q3 2022. For the calculation of price averages for wholesale total traffic, see **Error! Reference source not found.**.

5.4. MNOs and MVNOs data

5.4.1. Consumption patterns for domestic mobile retail services

Figure 31: Domestic data services, average consumption per month per total number of subscribers (GB), MNOs and MVNOs, Q3 22

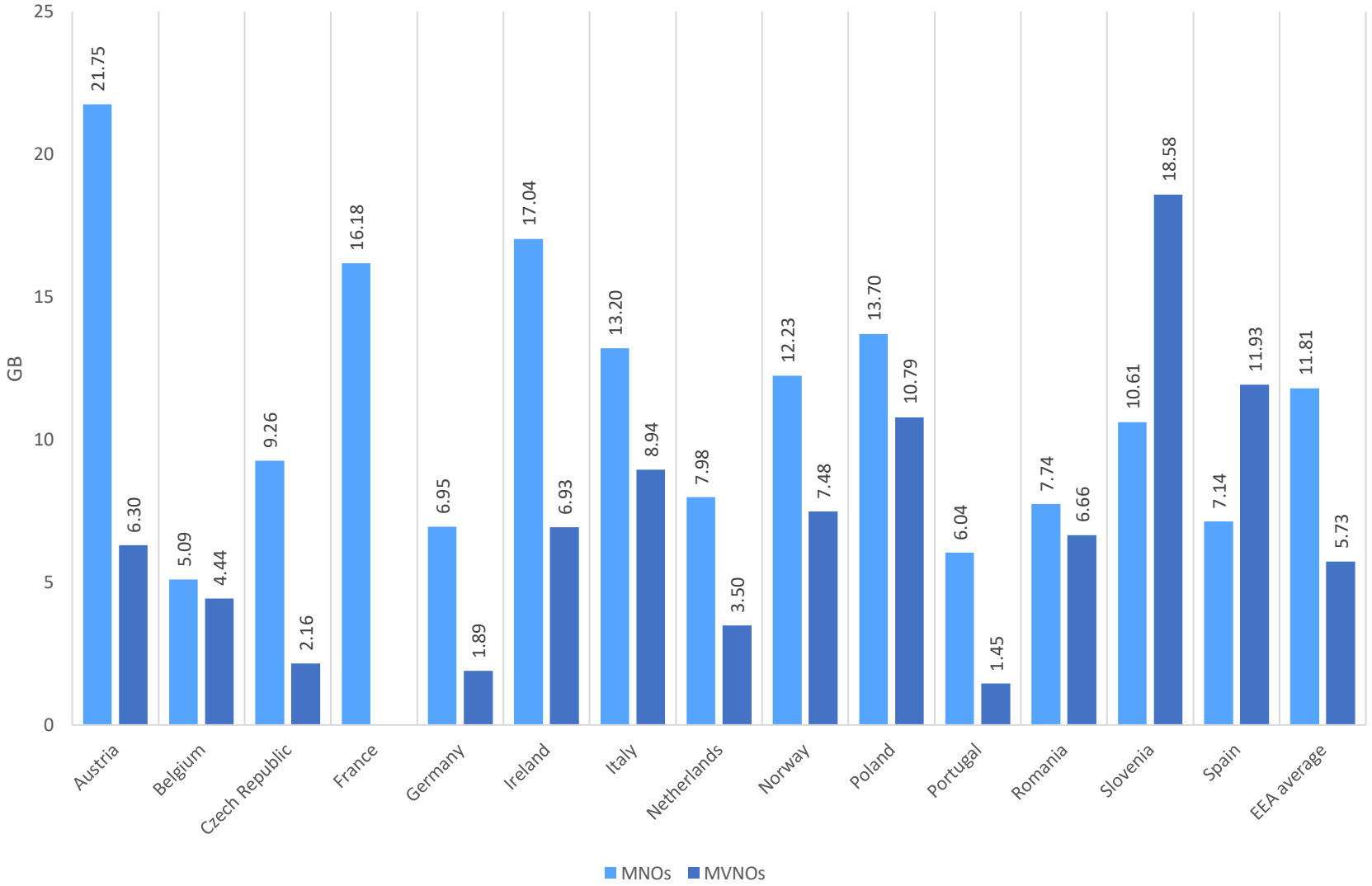


Figure 31 compares the average data consumption in each country (per month per total number of subscribers) of subscribers to different types of roaming providers (MNOs vs MVNOs) for Q3 2022. For the calculation of these averages, see **Error! Reference source not found.**.

Figure 32: EEA average domestic mobile services consumption per month per total number of subscribers, Q4 21 - Q3 22

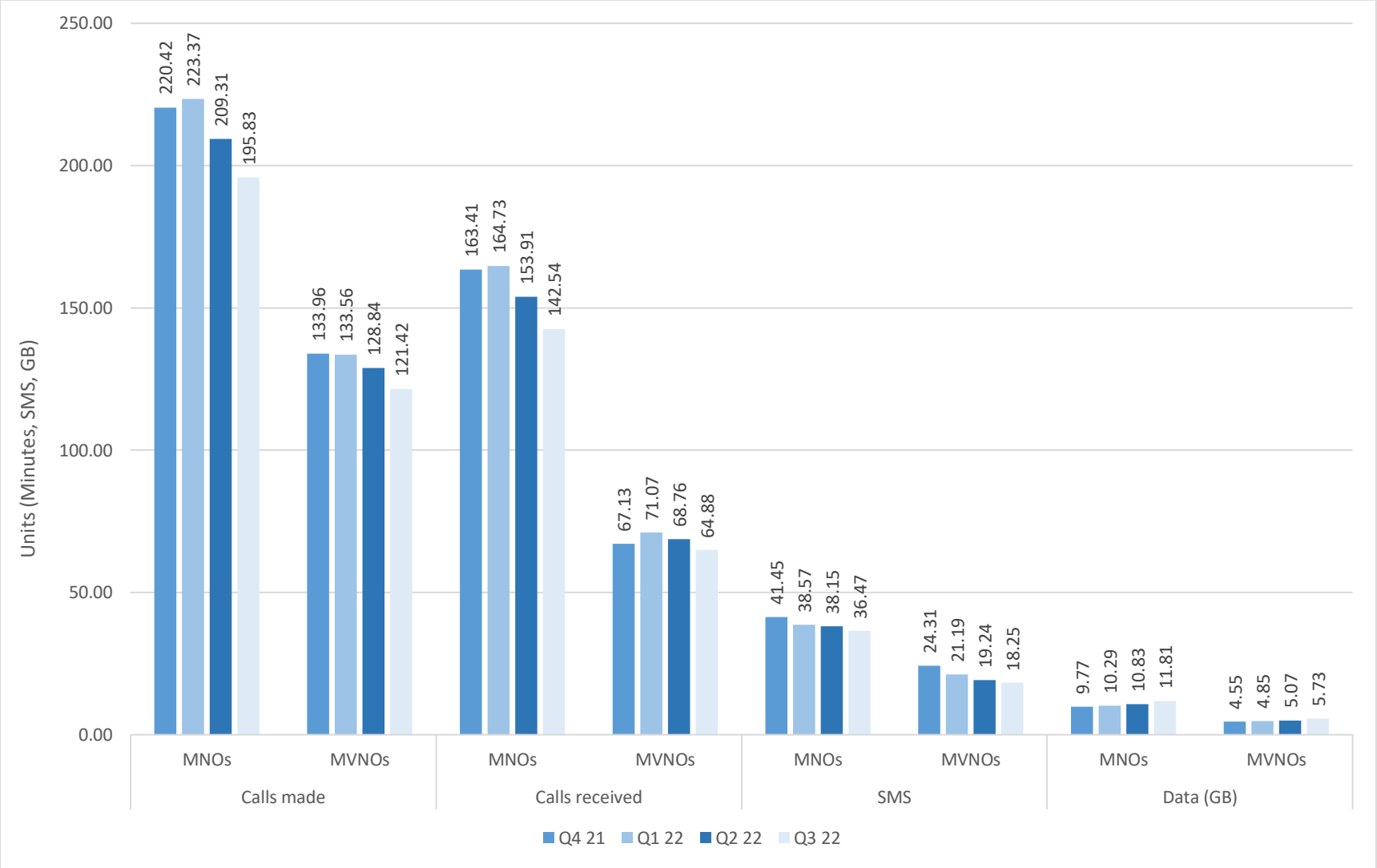


Figure 32 compares the EEA average consumption of mobile services (per month per total number of subscribers) of subscribers to different types of roaming providers (MNOs vs MVNOs) for Q3 2022. For the calculation of these averages, see **Error! Reference source not found.**.

Figure 33: MNOs: share of total subscribers with EU/EEA roaming enabled, Q4 19 - Q3 22

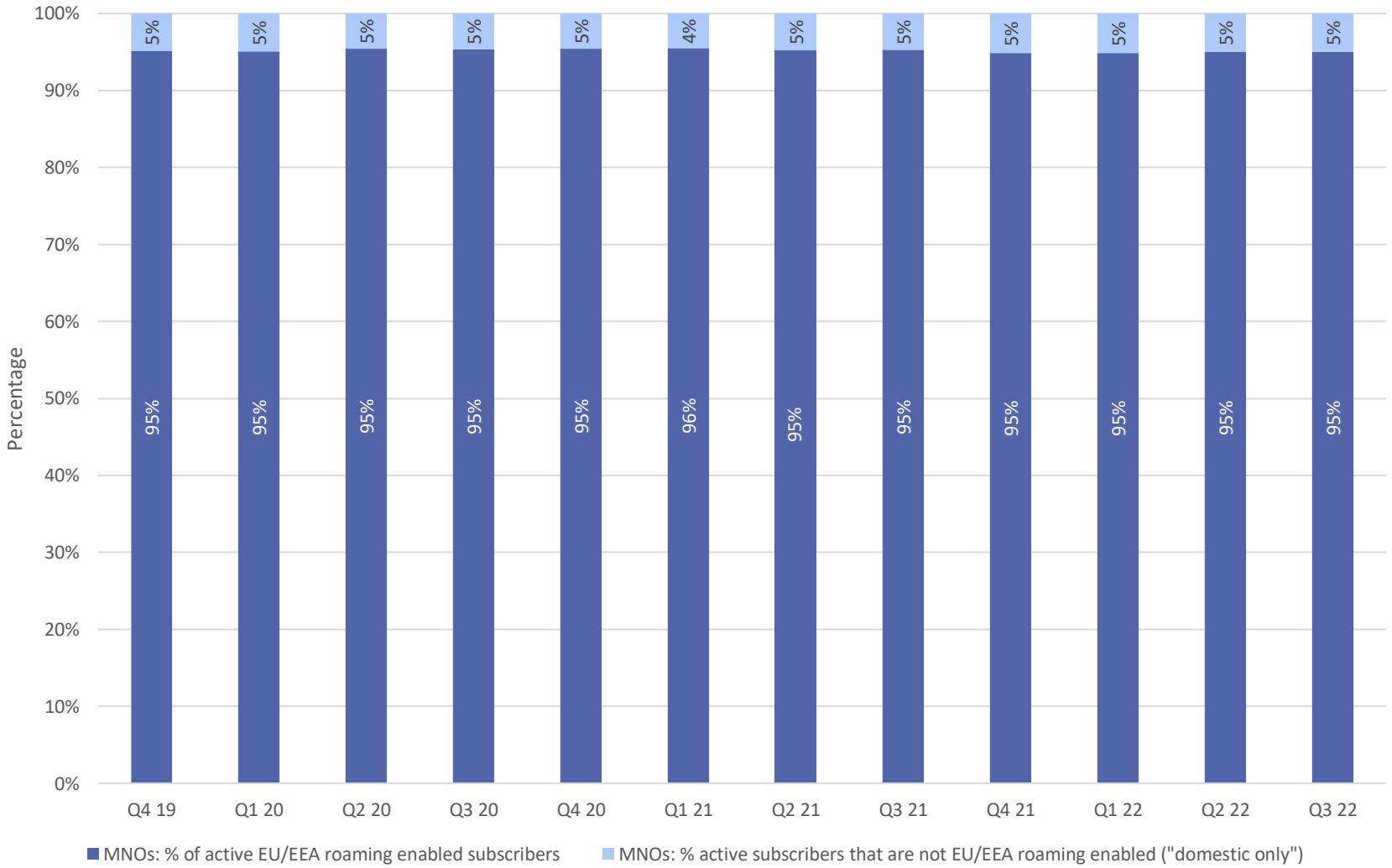


Figure 33 depicts the average share of total subscribers from MNOs only at EEA level, which compares the percentage of active EU/EEA roaming enabled subscribers to the percentage of subscribers that are not EU/EEA roaming enabled (domestic only) for Q4 2019 - Q3 2022. For the calculation of these averages, see **Error! Reference source not found.**.

Figure 34: MVNOs: share of total subscribers with EU/EEA roaming enabled, Q4 19 - Q3 22

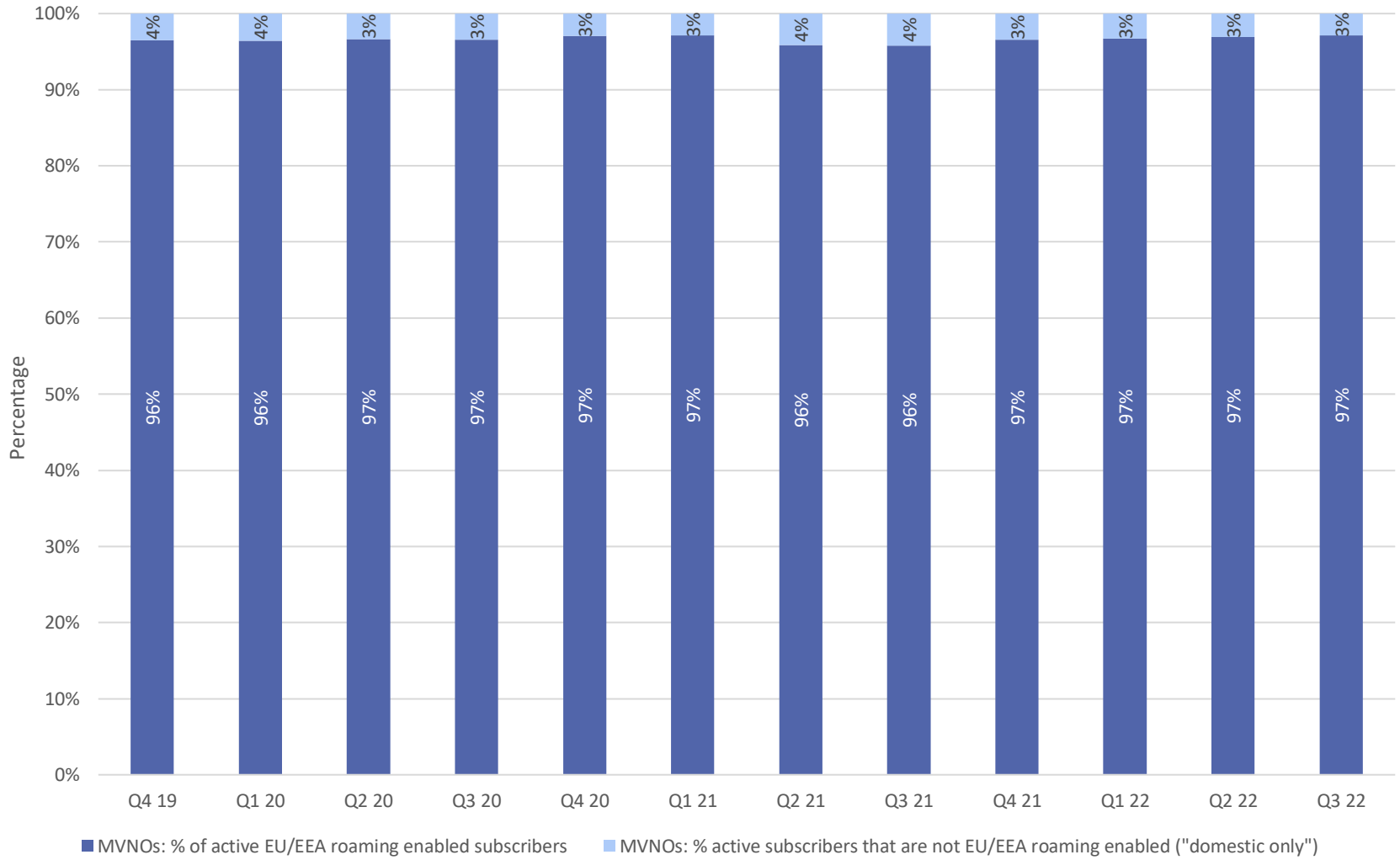


Figure 34 depicts the average share of total subscribers from MVNOs only at EEA level, which compares the percentage of active EU/EEA roaming enabled subscribers to the percentage of subscribers that are not EU/EEA roaming enabled (domestic only) for Q4 2019 - Q3 2022. For the calculation of these averages, see **Error! Reference source not found.**.

5.4.2. Consumption patterns for RLAH services (voice, SMS and data)

Figure 35: RLAH, calls made: EEA average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q4 19 – Q3 22

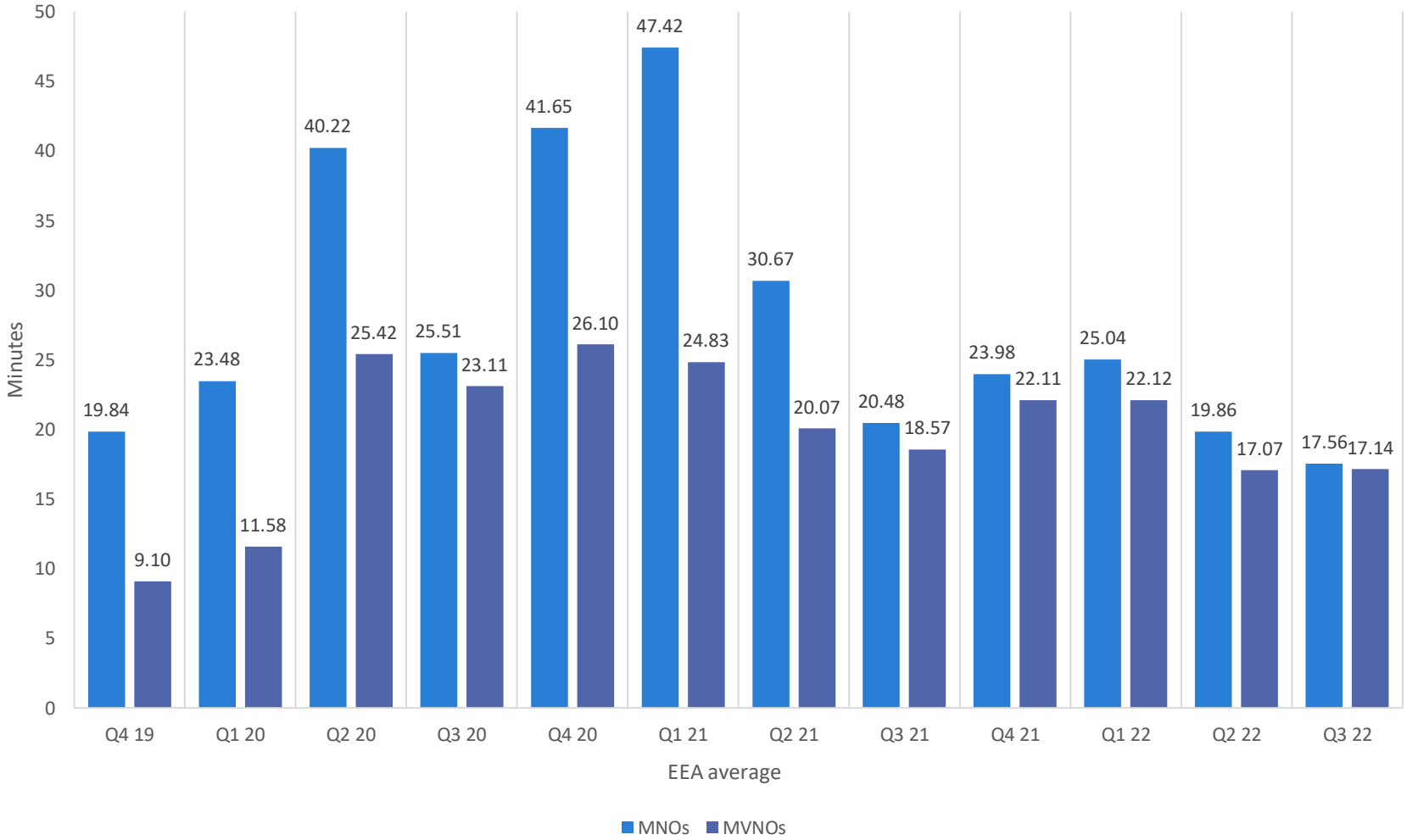
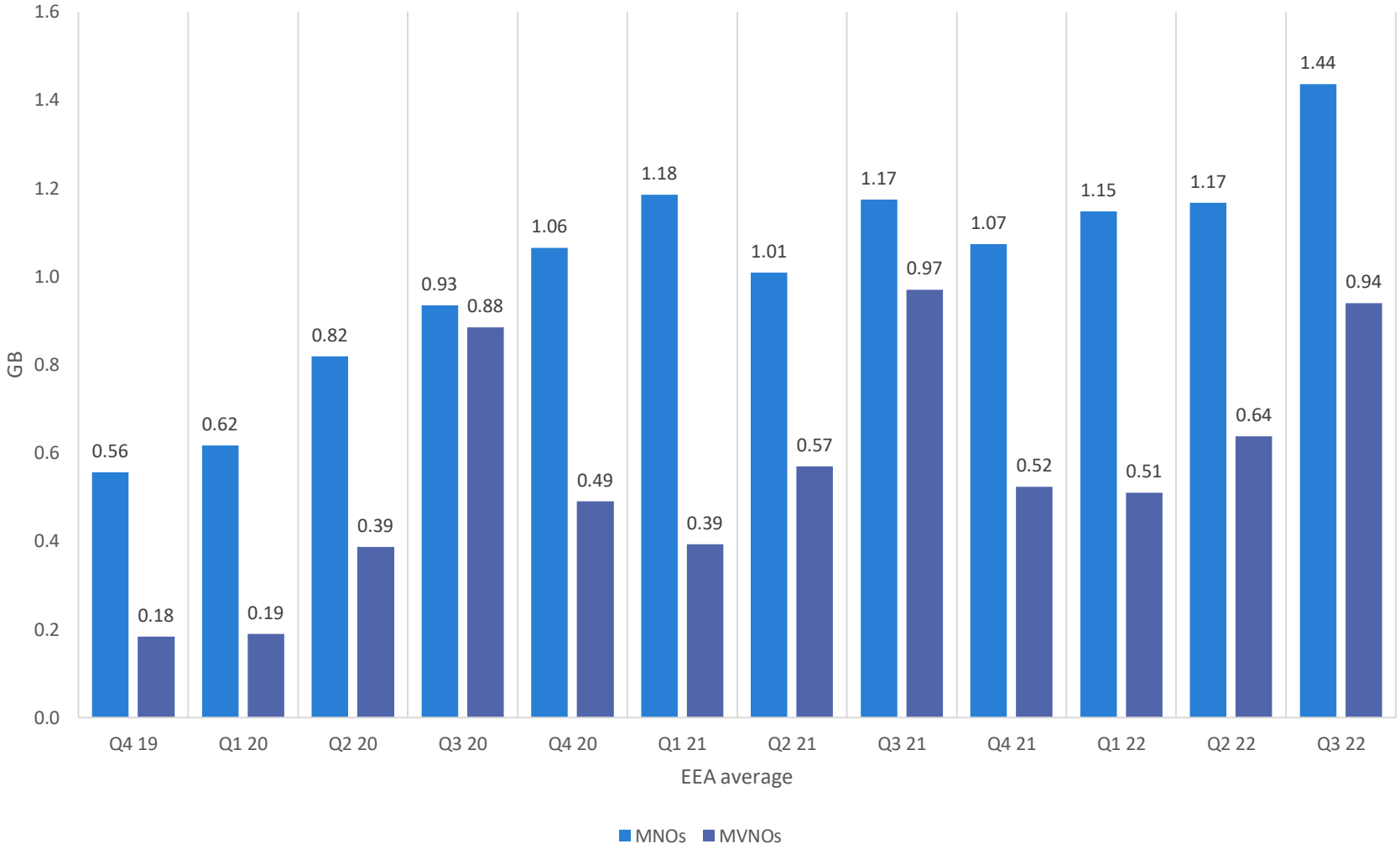


Figure 35 compares the EEA average number of RLAH minutes for calls made (per month per total number of subscribers) of subscribers to different type of roaming providers (MNOs vs MVNOs) for Q4 2019 - Q3 2022.

Figure 36: RLAH, data services: EEA average number of GB per month per total number of roaming subscribers, MNOs and MVNOs, Q4 19 – Q3 22



.Figure 36 compares the EEA average RLAH data consumption (per month per total number of subscribers) of subscribers to different type of roaming providers (MNOs vs MVNOs) for Q4 2019 - Q3 2022

5.4.3. Payment to the host operator for the provision of wholesale international roaming services

Figure 37: EEA average of the payment to the host operator for the provision of wholesale roaming services (per unit), MVNOs, Q4 19 – Q3 22

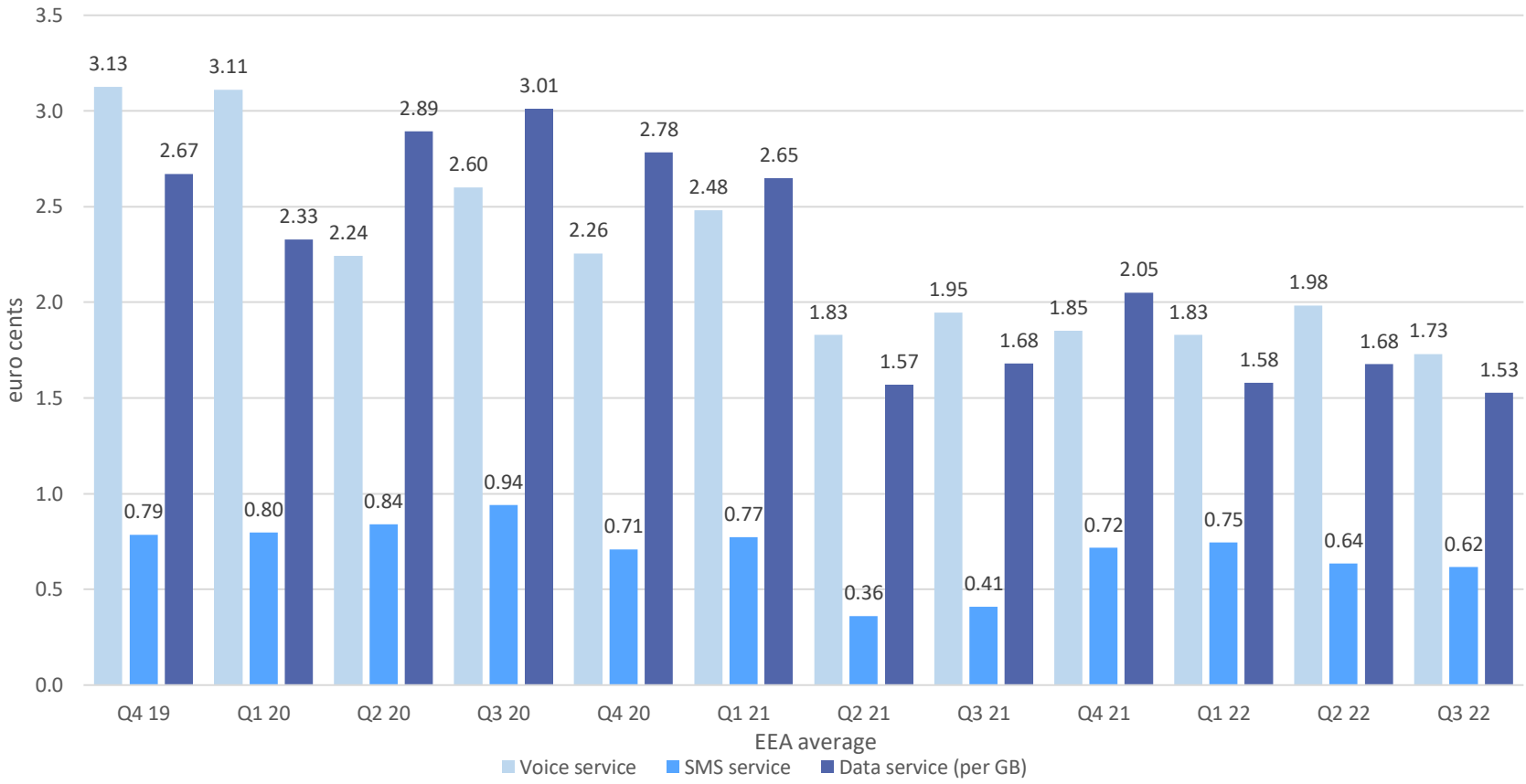


Figure 37 depicts the average cost to the host operator for the provision of wholesale roaming services (per unit) at EEA level. This average was calculated by dividing the payments for wholesale outbound roaming (of each service) by number of wholesale volumes for Q4 2019 – Q3 2022.
Data services: prices are expressed in Euro.
France and Italy excluded for Q4 2021 – Q3 2022.

5.5. M2M data

5.5.1. Connected devices

Figure 38: Total number of active connected objects/devices at EEA level (with roaming enabled or domestic only), Q2 20 - Q3 22

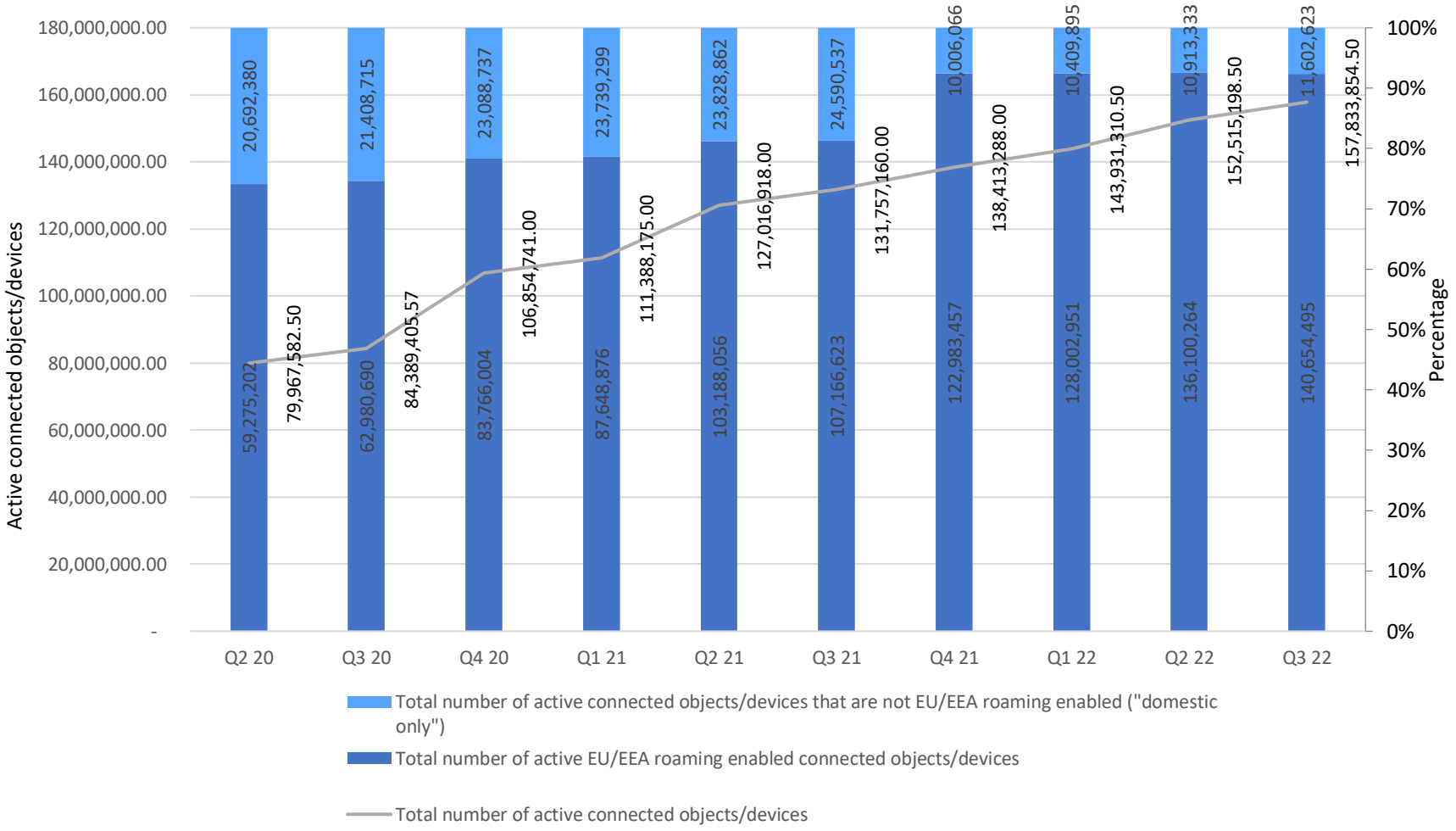


Figure 38 depicts the share of Total number of active EEA roaming enabled connected objects/devices and Total number of active connected objects/devices that are not EEA roaming enabled (domestic only) together with Total number of active connected objects/devices in EEA, Q2 2020 – Q3 2022.

5.5.2. Consumption patterns (voice, data and SMS)

Figure 39: EEA average: share of retail consumption of roaming and domestic data per month from connected devices/objects (in GB), Q2 20 - Q3 22

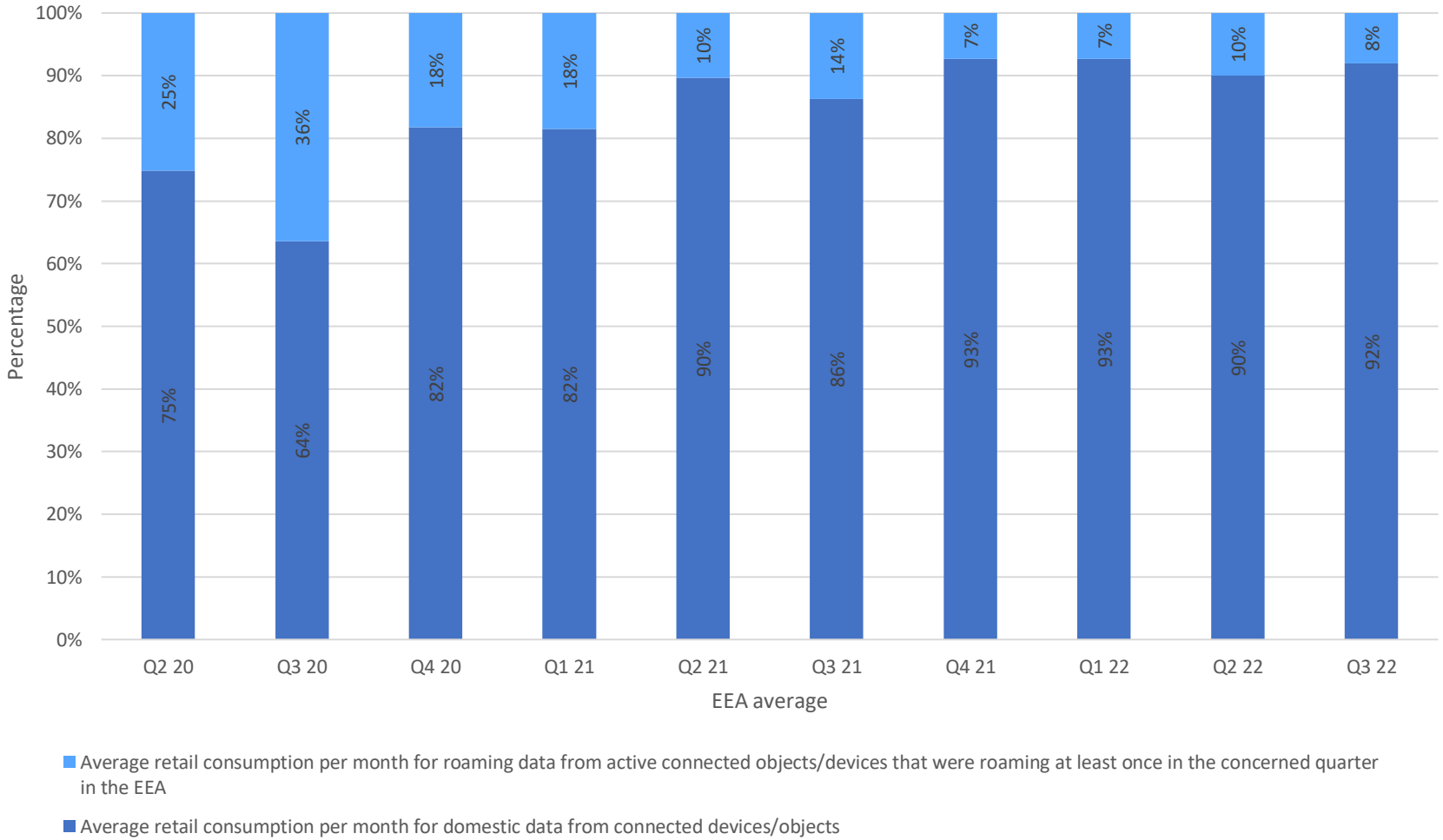


Figure 39 depicts the share of EEA average retail consumption of roaming and domestic data per month from connected objects/devices. This share is calculated by comparing the number of average retail consumption per month for roaming data from active connected objects/devices that were roaming at least once in the concerned quarter in the EEA with the number of average retail consumption per month for domestic data from connected objects/devices to arrive at an average for Q2 2020 – Q3 2022.

Figure 40: EEA average: share of retail consumption of roaming and domestic calls made per month from connected devices/objects (in GB), Q2 20 - Q3 22

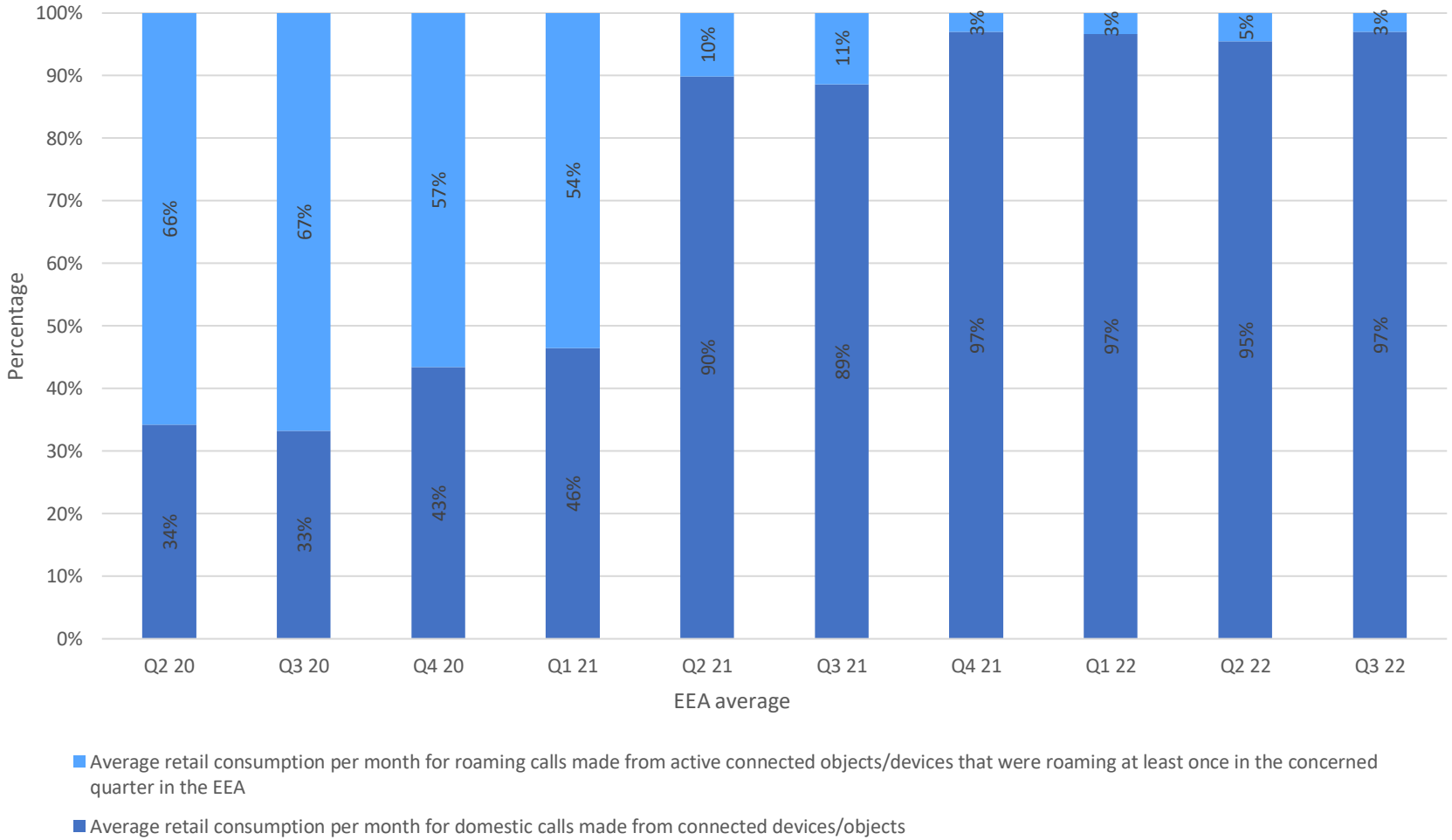


Figure 40 depicts the share of EEA average retail consumption of roaming and domestic calls made per month from connected objects/devices. This share is calculated by comparing the number of average retail consumption per month for roaming calls made from active connected objects/devices that were roaming at least once in the concerned quarter in the EEA with the number of average retail consumption per month for domestic calls made from connected objects/devices to arrive at an average for Q2 2020 – Q3 2022.

Figure 41: EEA average: share of retail consumption of roaming and domestic SMS per month from connected devices/objects (in GB), Q2 20 - Q3 22

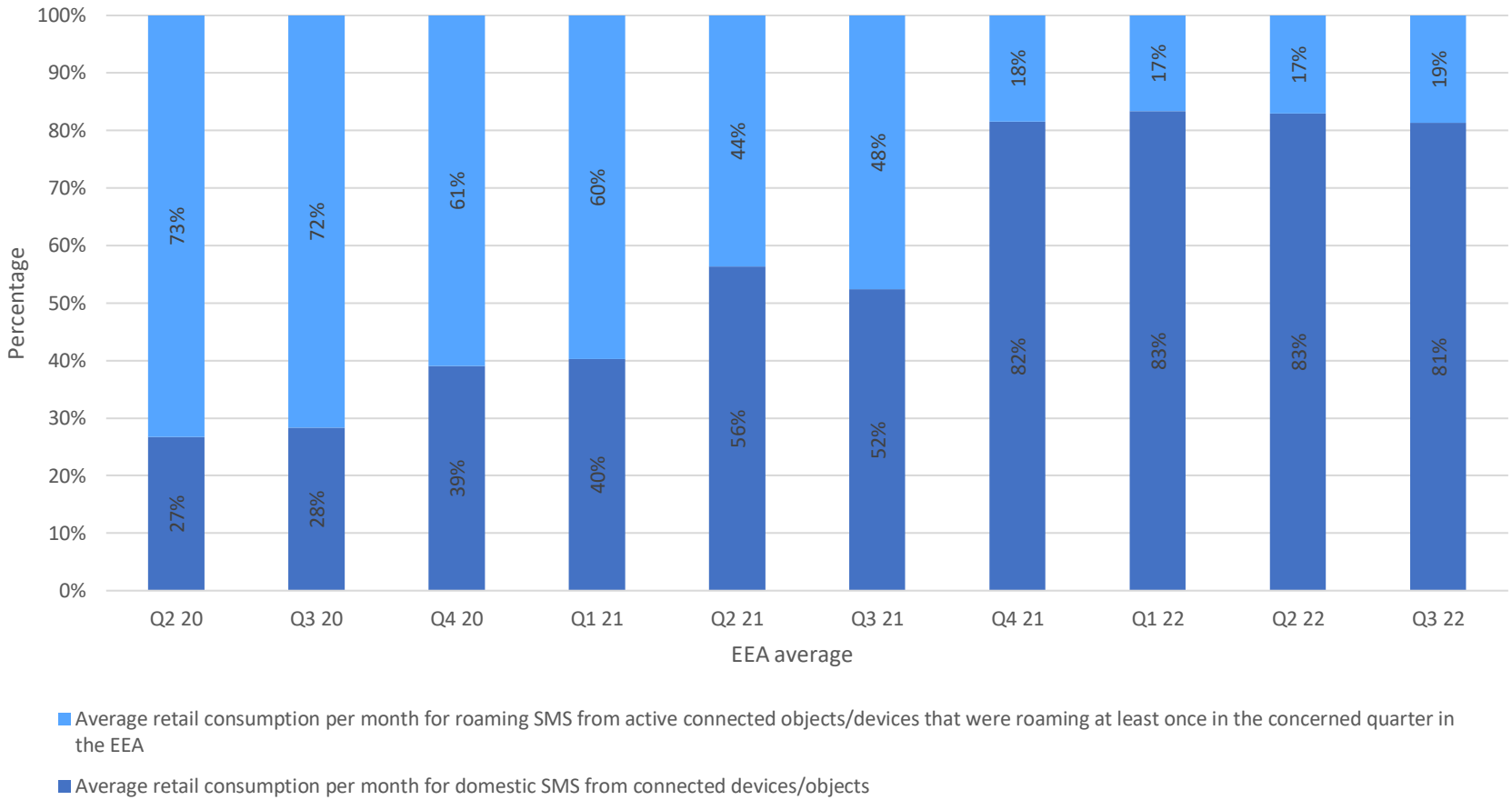


Figure 41 depicts the share of EEA average retail consumption of roaming and domestic SMS per month from connected objects/devices. This share is calculated by comparing the number of average retail consumption per month for roaming SMS from active connected objects/devices that were roaming at least once in the concerned quarter in the EEA with the number of average retail consumption per month for domestic SMS from connected objects/devices to arrive at an average for Q2 2020 – Q3 2022.

Figure 42: EEA average: retail roaming (connected objects) prices for roaming services in the EEA, Q4 21 - Q3 22

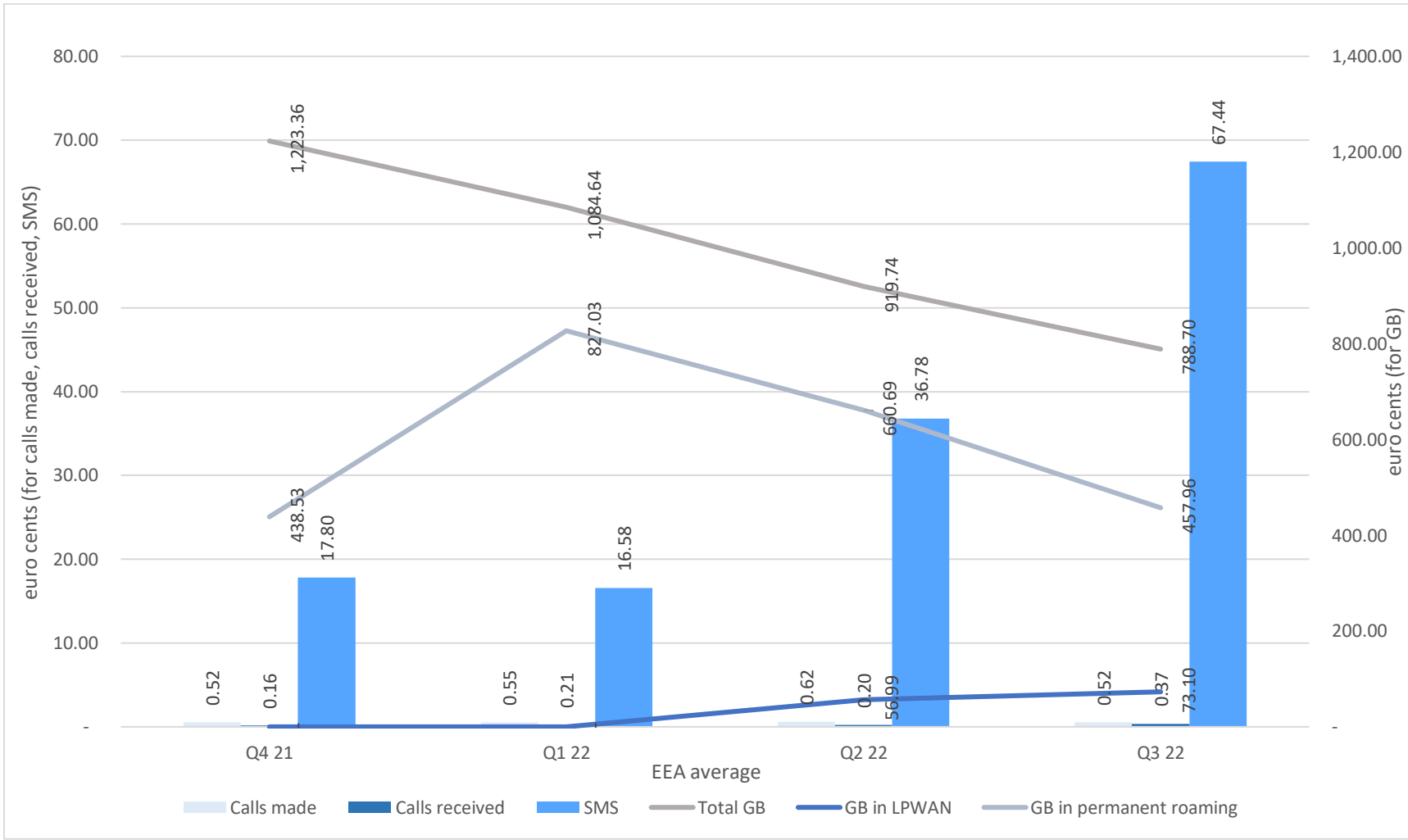


Figure 42 depicts the EEA average retail roaming prices for roaming services of connected objects/devices. These averages are calculated by dividing the retails revenues of connected objects/devices of each roaming services by units of each roaming services, to arrive at averages for calls made, calls received, SMS, data (total GB), GB in LPWAN, and GB in permanent roaming for Q2 2020 – Q3 2022.

Only few NRAs provided data on LPWAN and permanent roaming.

5.6. Transparency and Comparability of Roaming Tariffs

5.6.1. Transparency of retail offers QoS

Figure 43: Percentage of roaming providers offering specific network technologies to their subscribers when roaming in the EU/EEA (total number of respondents Q4 2021 – Q3 2022 = 152

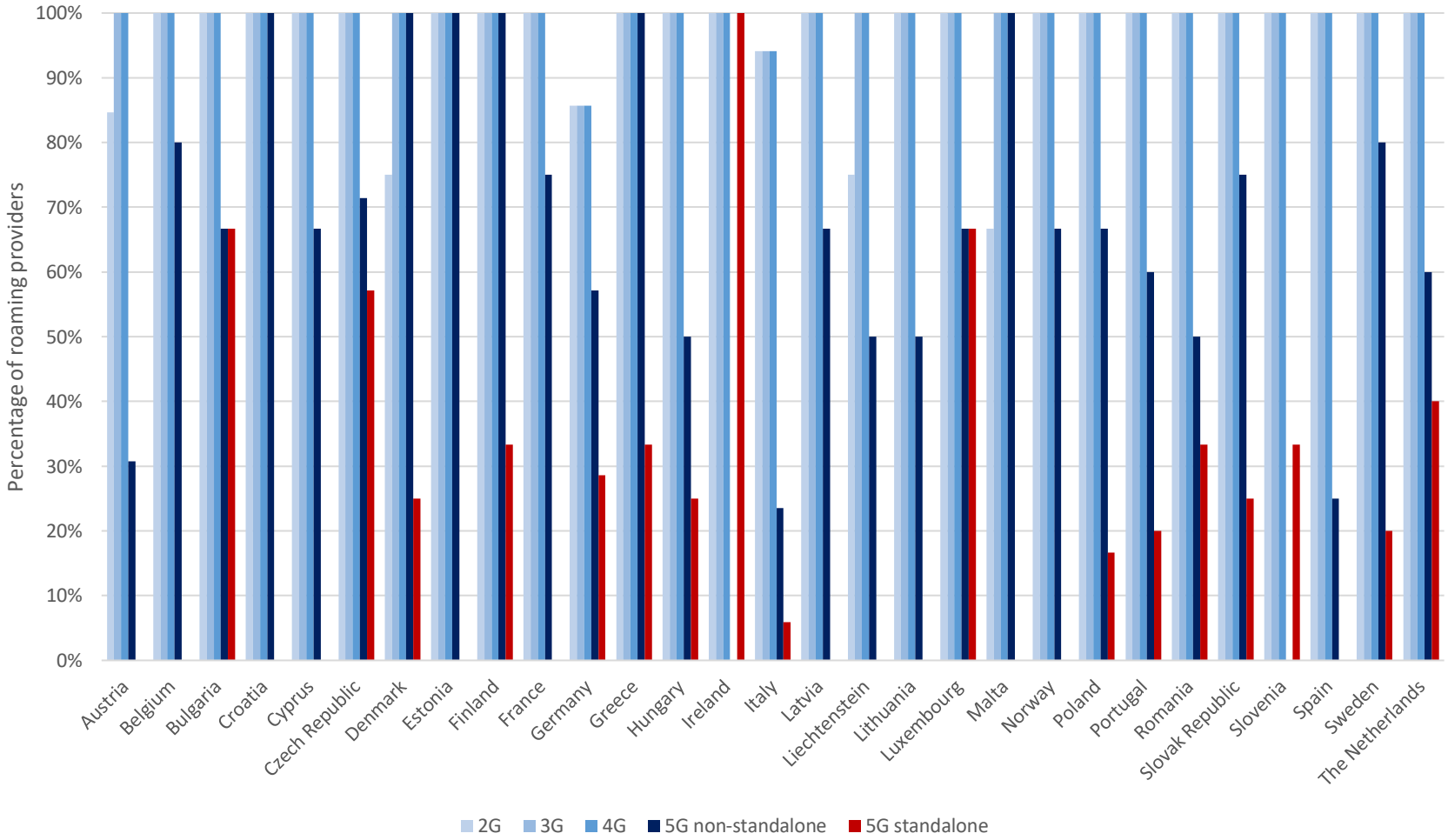


Figure 43 depicts the share of roaming providers (out of total respondents in each country) that are offering certain network technologies to their subscribers when roaming in the EU/EEA. For example, if 100% of roaming providers in a certain country offer 3G, this means that all domestic providers offer 3G services to their subscribers while roaming in the EEA.

Figure 44: Number of international roaming providers offering 5G non-standalone roaming services in different EEA countries (excluding national providers)

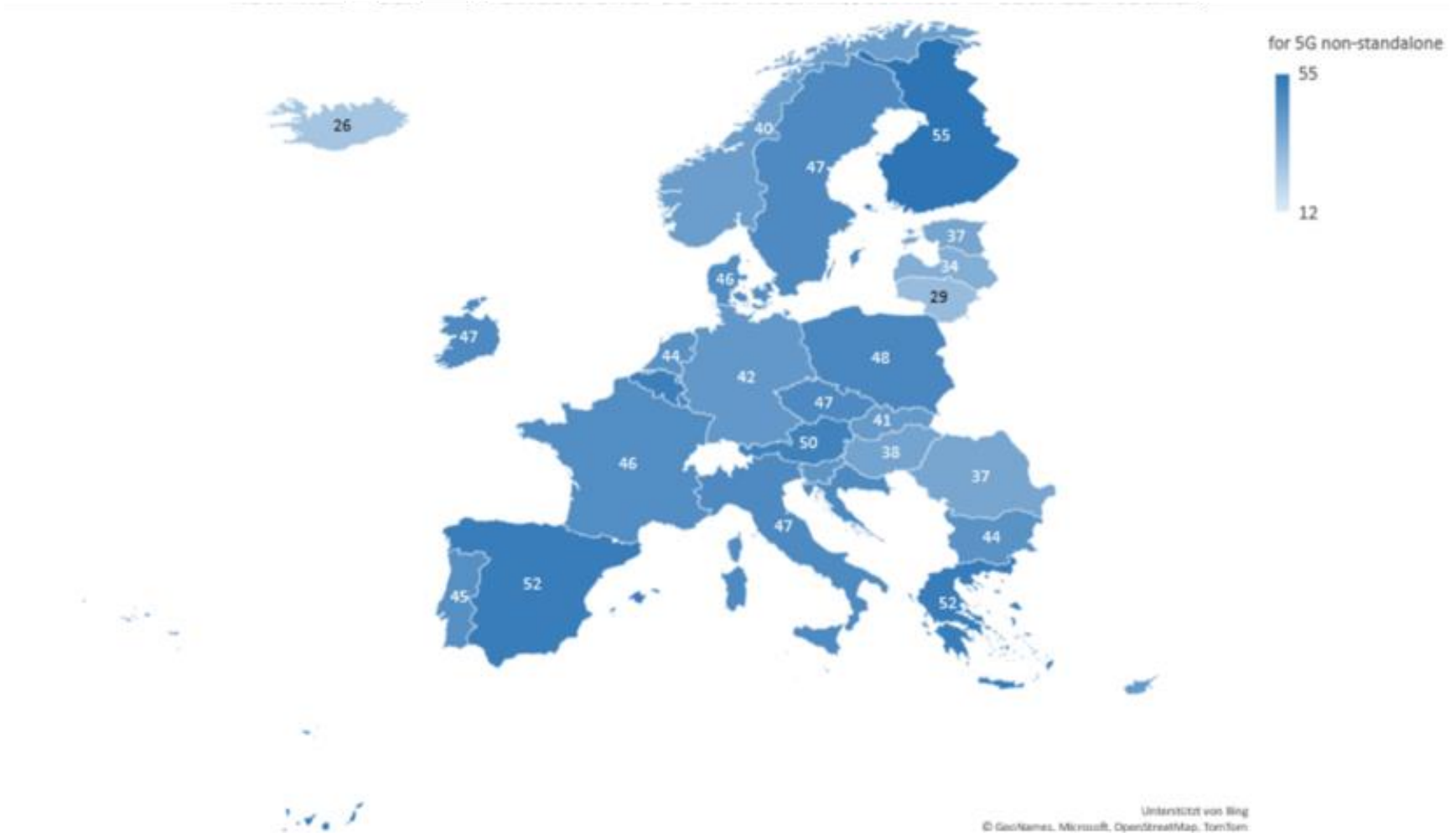


Figure 44 depicts a map of the EEA region which shows how many EEA roaming providers offer 5G non-standalone roaming services in each EEA country to illustrate the state of implementation of 5G roaming. For example, if 55 roaming providers offer 5G non-standalone roaming services in Finland, this means that 55 roaming providers from all over the EEA have reached agreements with Finnish providers allowing their subscribers (e.g. from Austria, Belgium, …) to use 5G non-standalone services while roaming in Finland.

Figure 45: Percentage of roaming providers differentiating between technologies when offering services at home (total number of respondents Q4 2021 – Q3 2022 = 152)

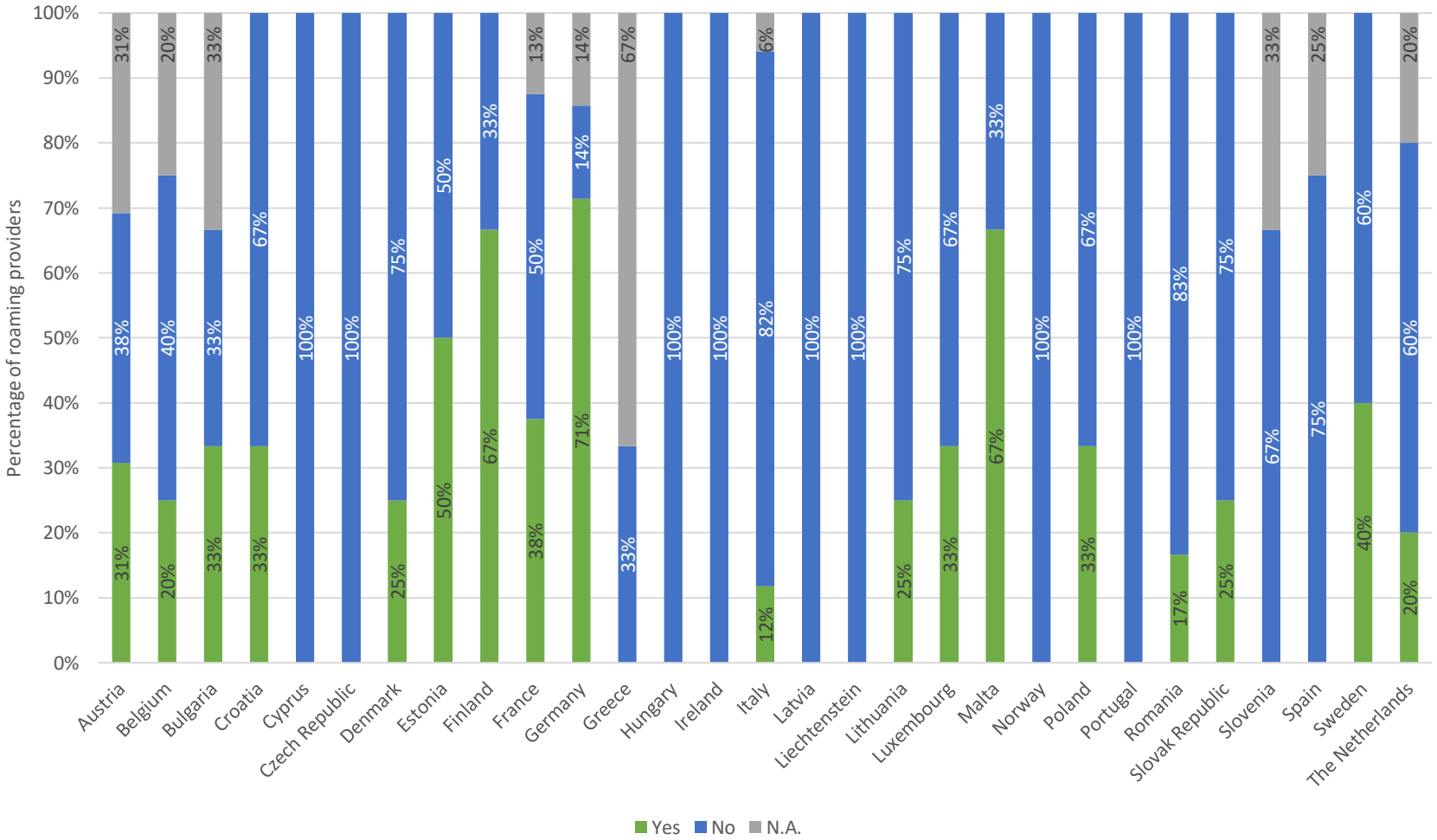


Figure 45 depicts the share of roaming providers (out of total respondents in each country) which differentiate between technologies when offering services at home. For example, if 100% of respondents in one country selected “Yes”, then this means that all domestic providers in this country differentiate between technologies when they offer services domestically.

5.6.2. Application of FUPs

Figure 46: Number of MNOs and MVNOs using different types of FUP measures (based on data collected by BEREC for TACR report in 2018 – 2022; total number of respondents Q4 2021 – Q3 2022 = 152)

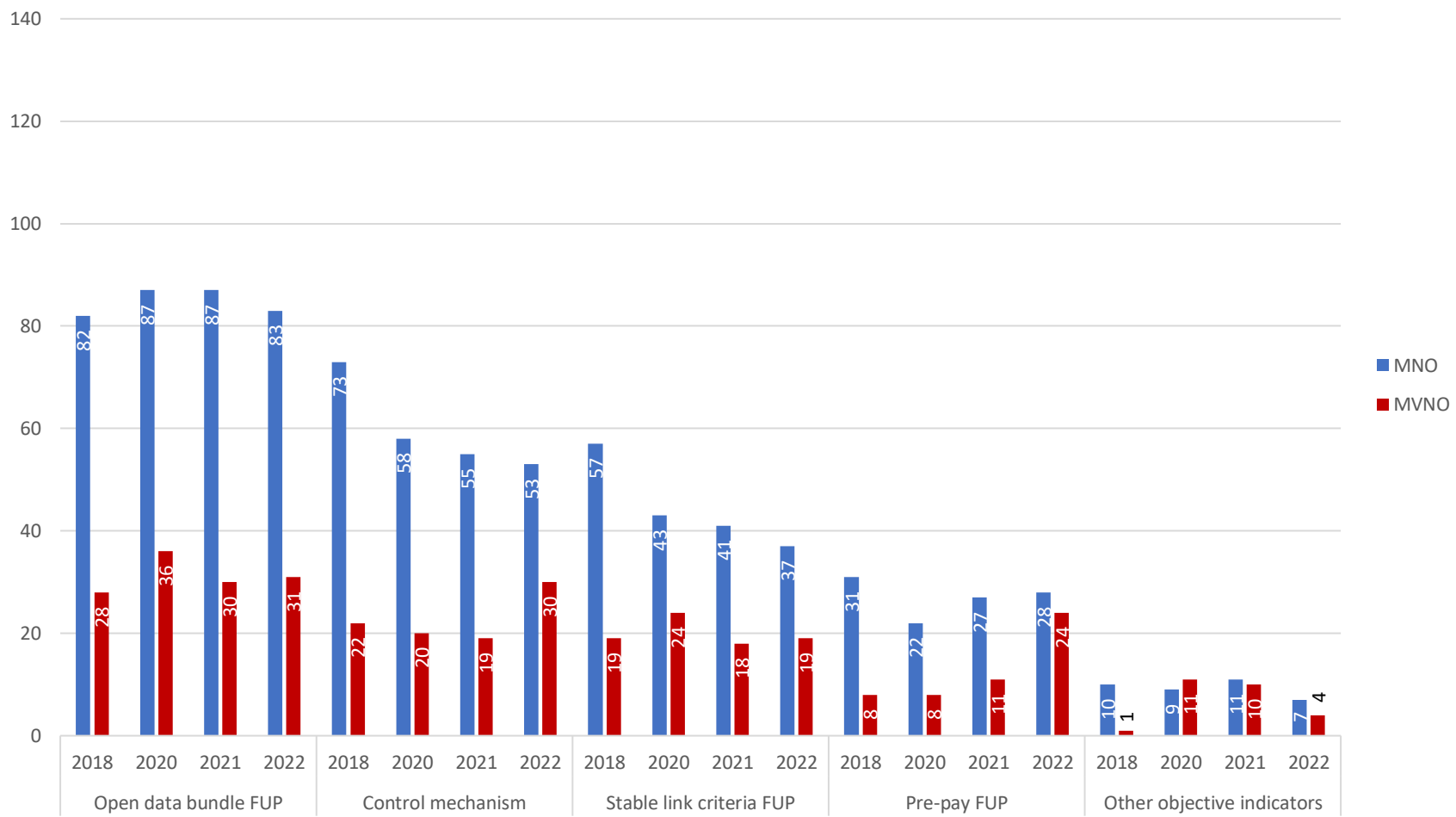


Figure 46 depicts the number of MNOs and MVNOs using different types of FUP measures over the period between 2018 and 2022. In 2019, the questionnaire did not feature a comparable question; therefore, there is no available data for that year.

Figure 47: Surcharges levied by MNOs and MVNOs for voice services when exceeding the FUP (total number of respondents Q4 2021 – Q3 2022 = a) 79 b) 100 c) 57 d) 56 e) 41)

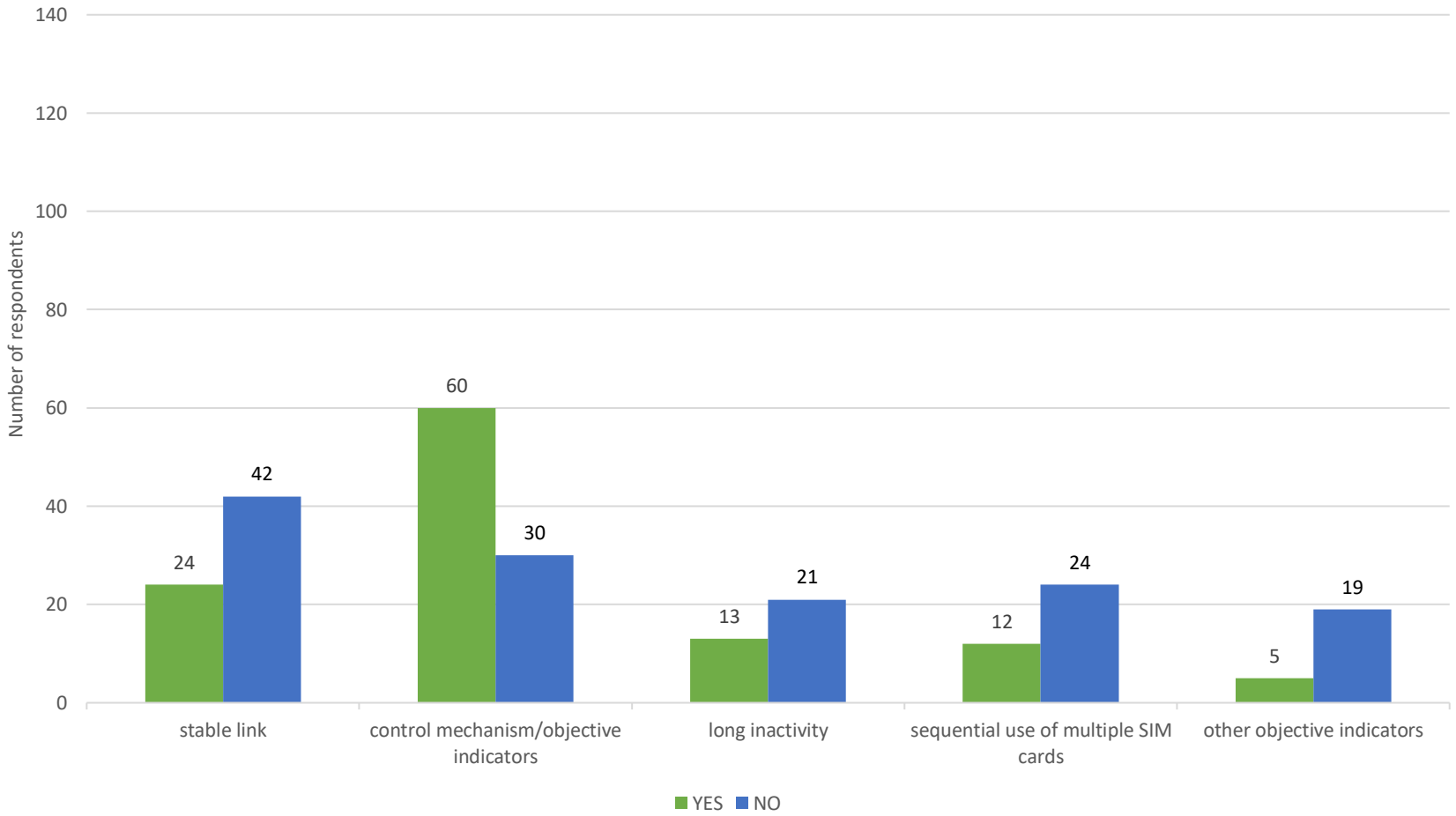


Figure 47 depicts the number of MNOs and MVNOs that levied surcharges for voice services when exceeding different types of FUP

Figure 48: Surcharges levied by MNOs and MVNOs for data services when exceeding the FUP measures total number of respondents Q4 2021 – Q3 2022 = a) 76 b) 107 c) 96 d) 54 e) 53 f) 39 g) 68)

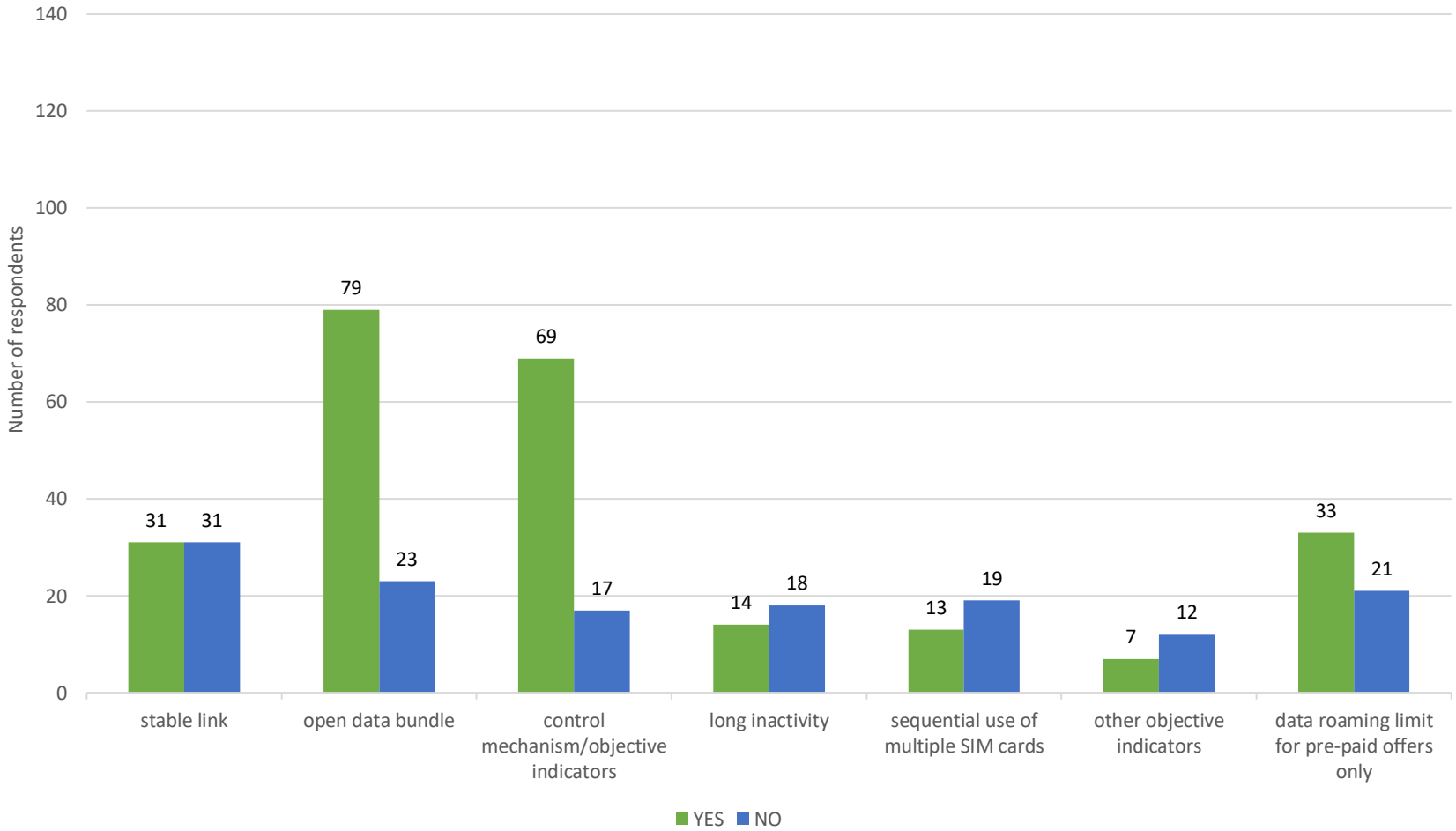


Figure 48 depicts the number of MNOs and MVNOs that levied surcharges for data services when exceeding different types of FUP

5.6.3. Information and tools for consumers

Figure 49: Information provided to subscribers with an open data bundle FUP about roaming limits (total number of respondents Q4 2021 – Q3 2022 = 121)

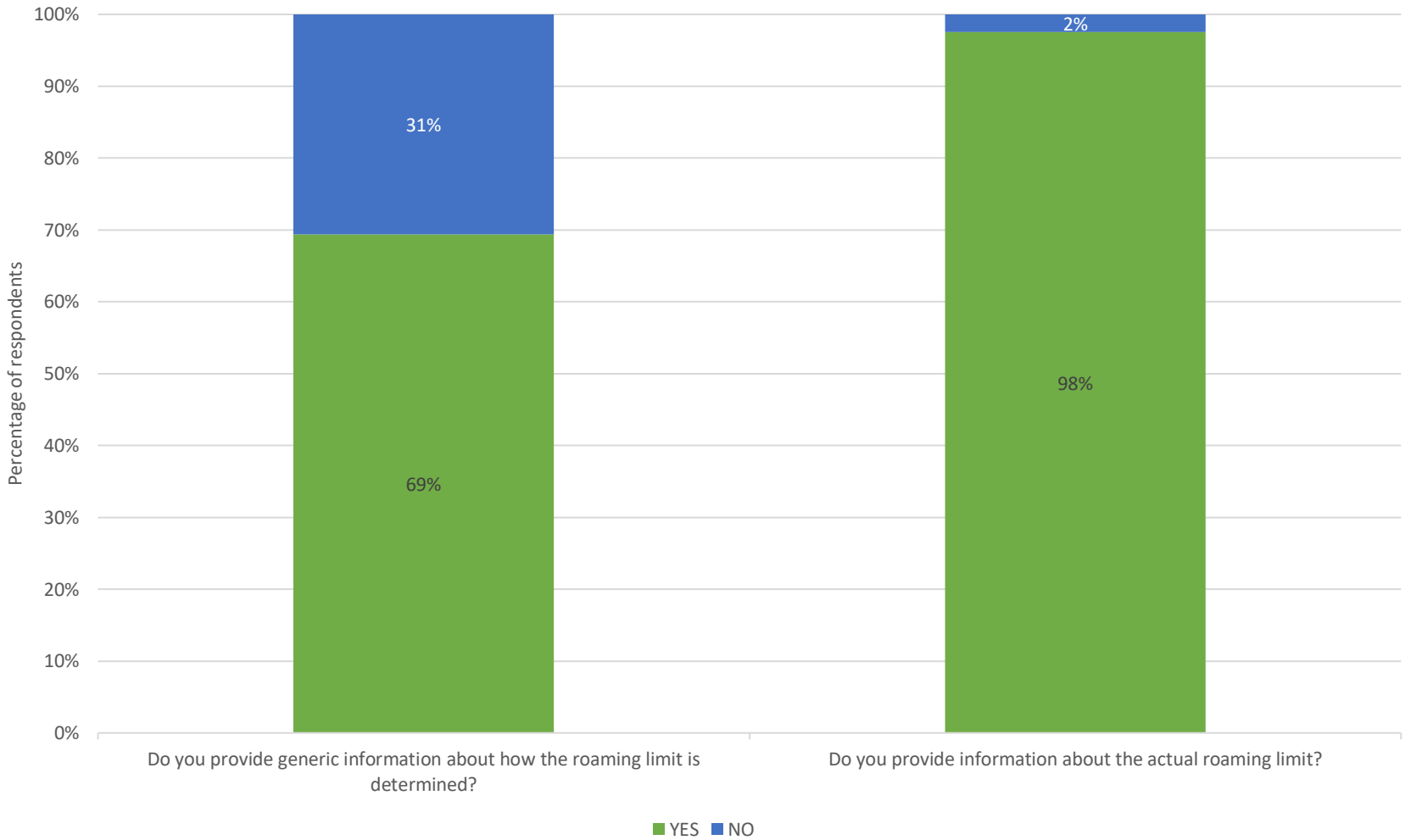


Figure 49 depicts the percentage of MNOs and MVNOs that provide information about how the roaming limit is determined and about the actual roaming limit to subscribers with an open data bundle FUP.

Figure 50: How information about roaming limits is provided to subscribers with an open data bundle FUP (total number of respondents Q4 2021 – Q3 2022 = 152)

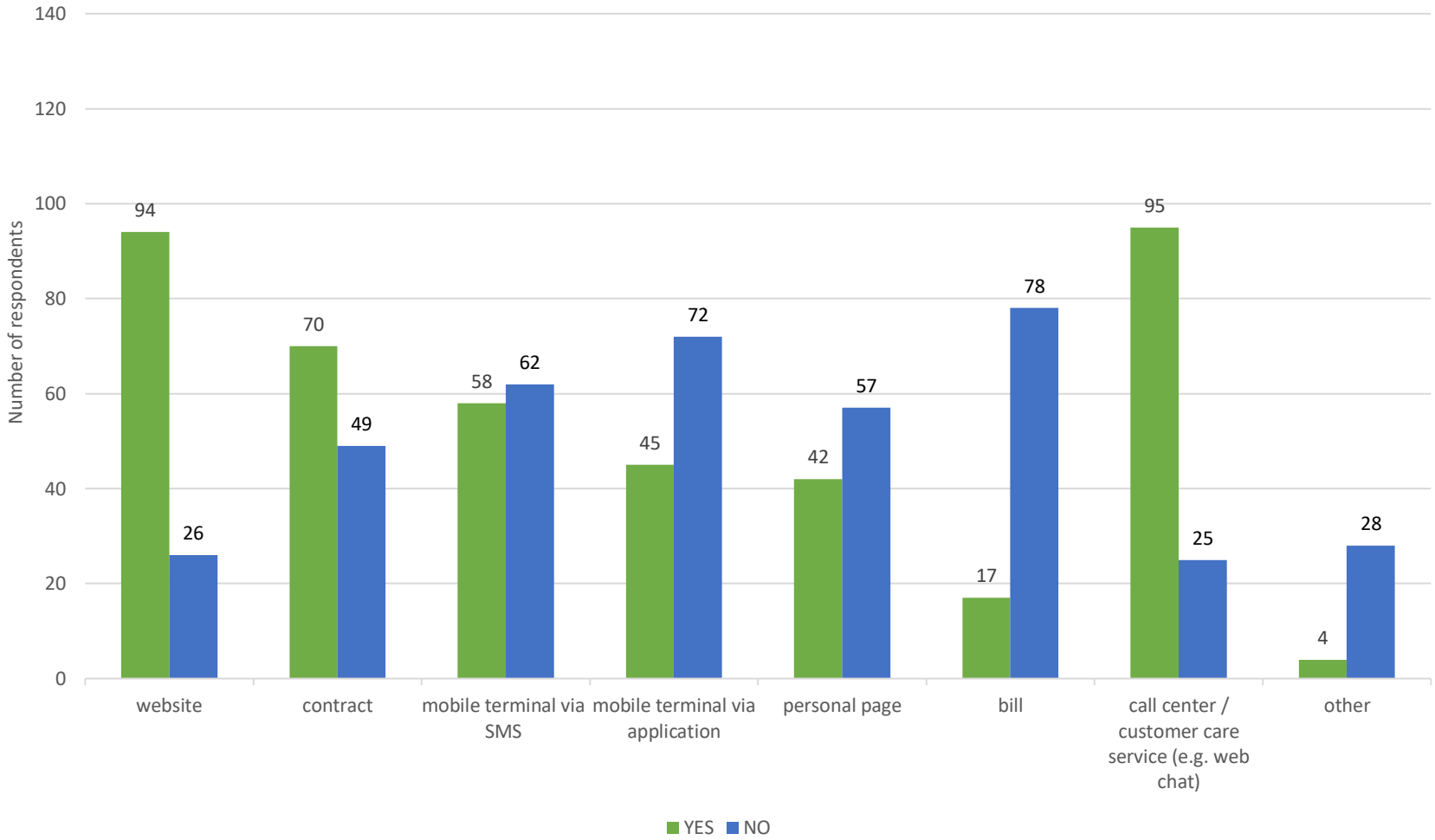


Figure 50 compares how many respondents use different channels to provide information about roaming limits to subscribers with an open data bundle FUP.

Figure 51: Where information about roaming limits is provided on websites (total number of respondents Q4 2021 – Q3 2022 = a) 100, b) 119)

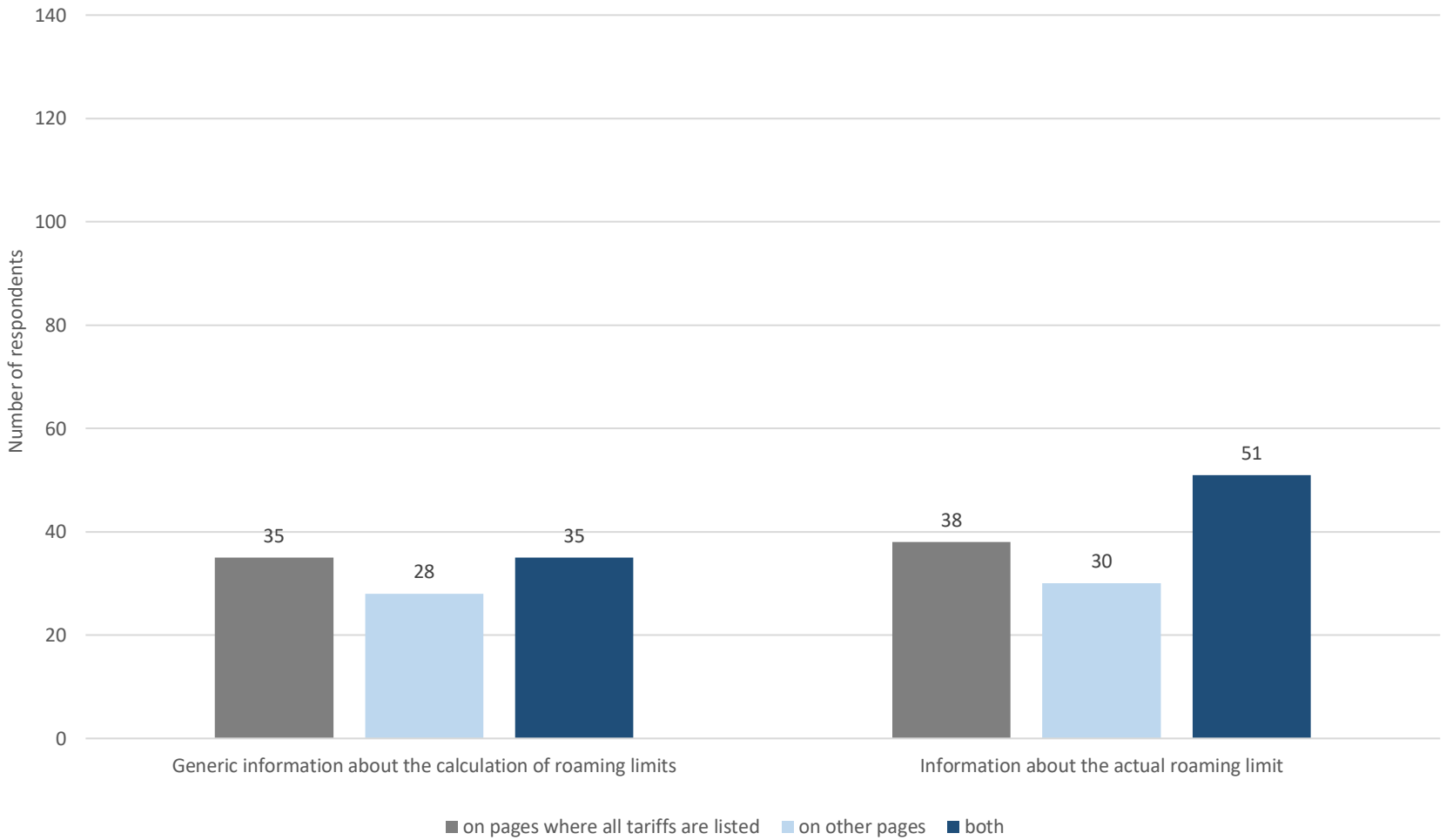


Figure 51 compares the number of respondents that provide information about roaming limits either on dedicated pages where all tariffs are listed or on other pages on their website, or on both types of pages.

5.6.4. Non-EU/EEA destinations

Figure 52: Inclusion of consumption in non-EU/EEA destinations as part of the RLAH FUP (total number of respondents Q4 2021 – Q3 2022 = 136)

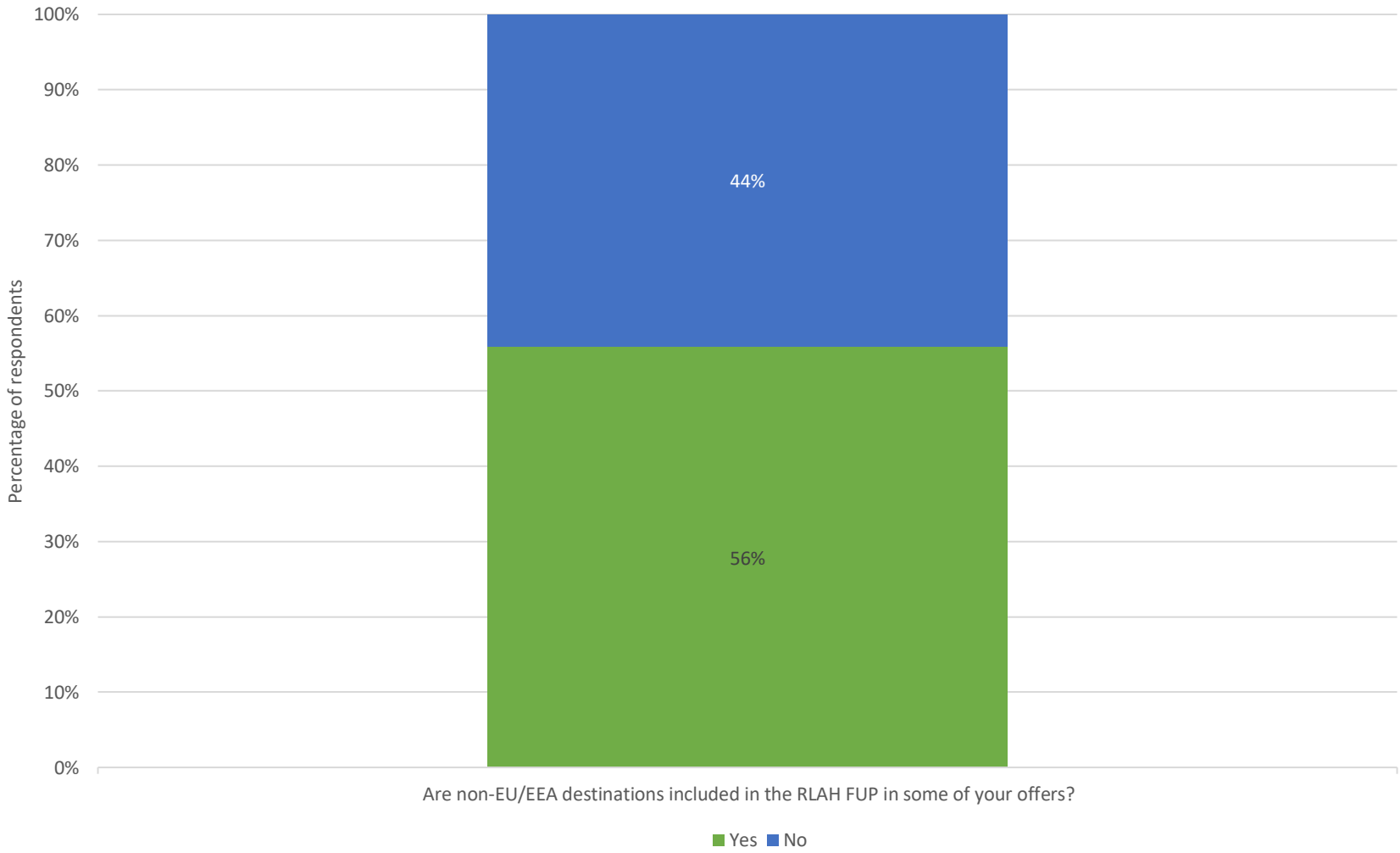


Figure 52 depicts how many respondents include the consumption of subscribers in non-EU/EEA destinations as part of the RLAH FUP in some of their offers. For example, for those providers responding "Yes", if their subscriber has a FUP for 10 GB and consumes 5GB while roaming outside the EEA, this subscriber only has 5GB left before exhausting their FUP for roaming in the EEA.

5.6.5. Alternative tariffs

Figure 53: Percentage of roaming providers offering alternative tariffs (based on data collected by BEREC for TACR report in 2018 – 2022; total number of respondents Q4 2021 – Q3 2022 = 128)

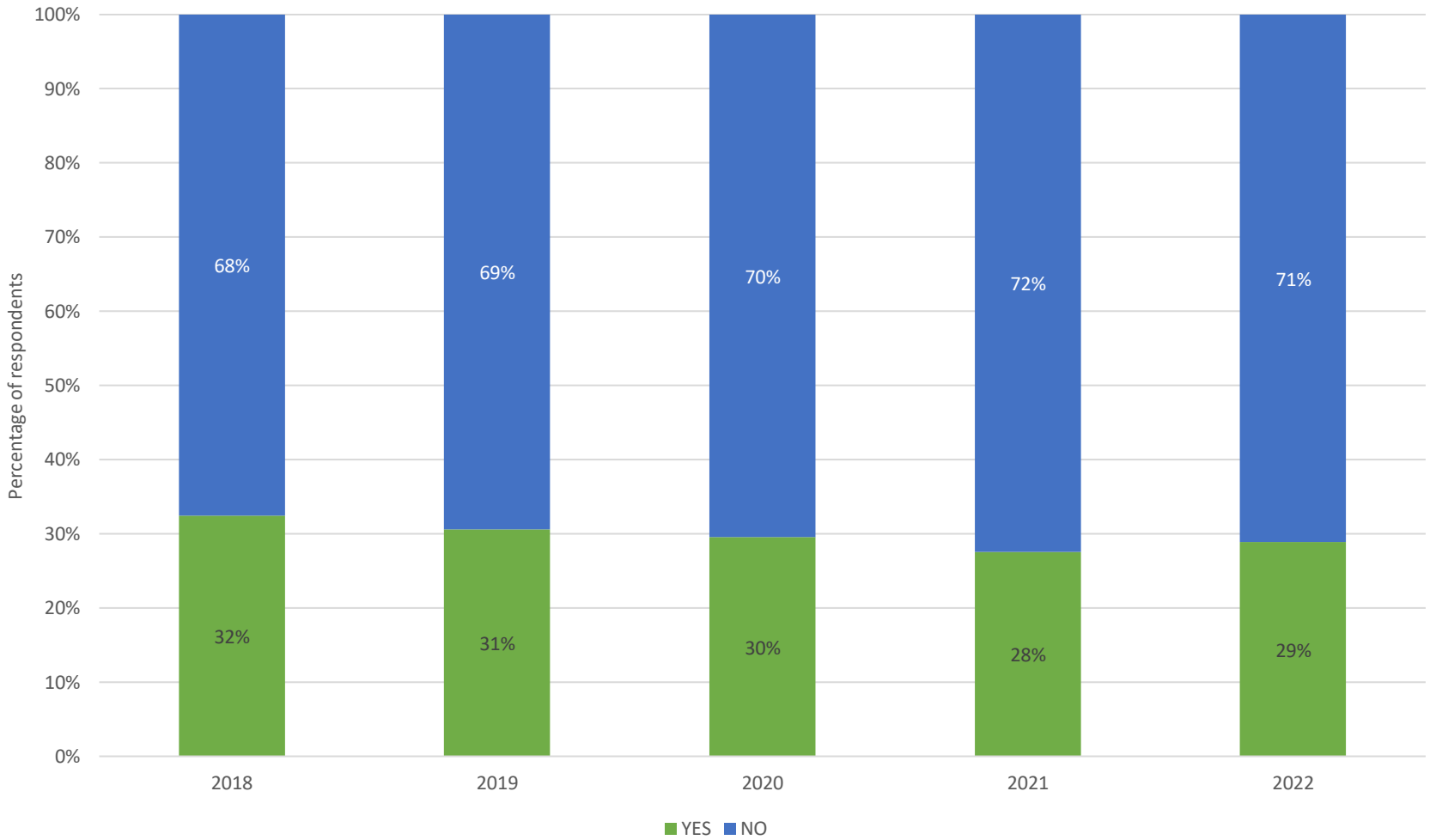


Figure 53 depicts the percentage of respondents offering alternative tariffs between 2018 and 2022.

Figure 54: Types of roaming packages (daily/weekly/monthly/other) offered by respondents (based on data collected by BEREC for TACR report in 2018 – 2022; total number of respondents Q4 2021 – Q3 2022 = a) 91, b) 89, c) 92 d) 77)

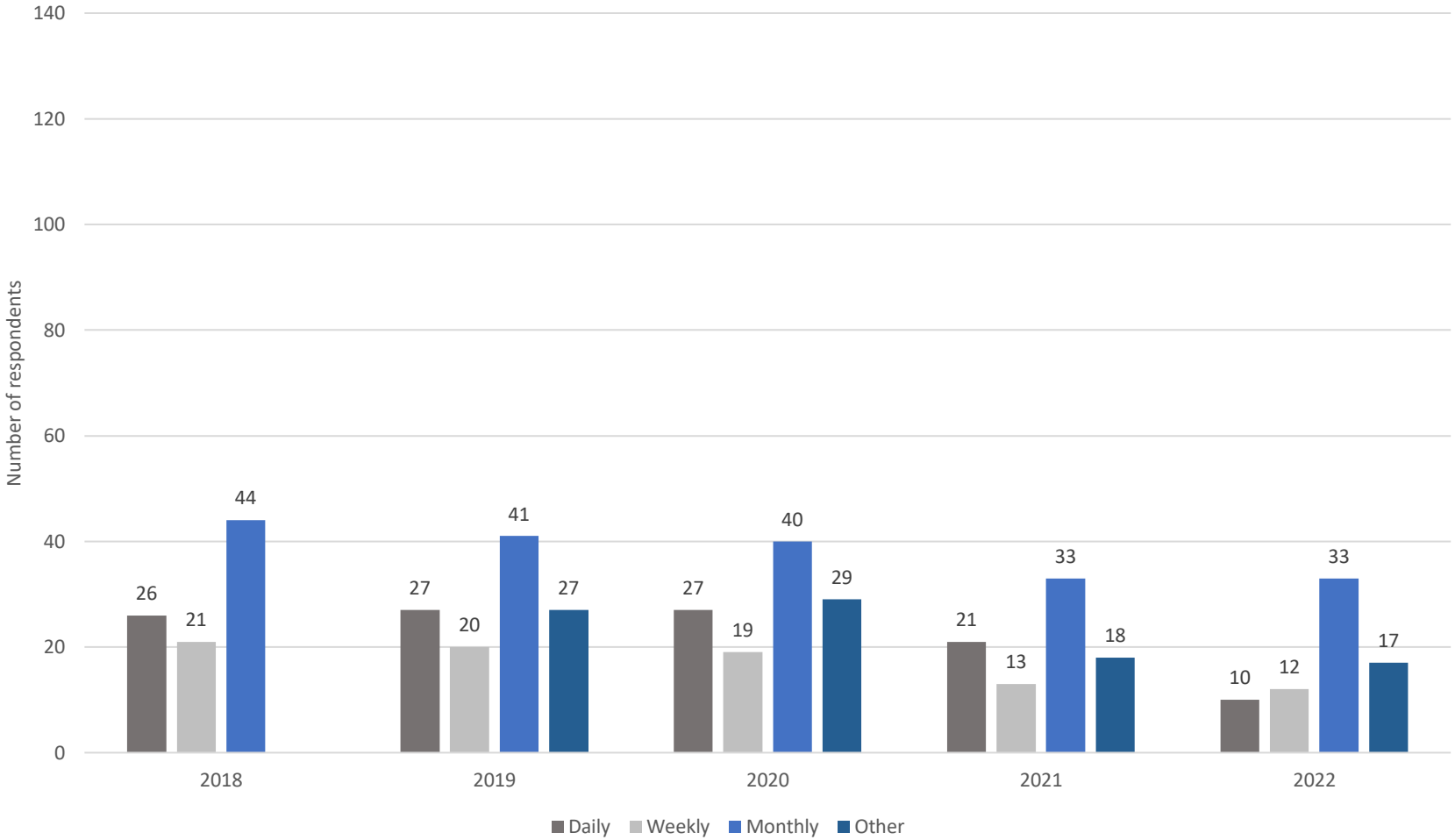


Figure 54 depicts the number of respondents offering daily, weekly, monthly or other types of roaming packages between 2018 and 2022.

Figure 55: Number of roaming providers that inform end users with alternative tariffs about the different issues (total number of respondents Q4 2021 – Q3 2022 = a) 90, b) 90, c) 92, d) 91, e) 64)

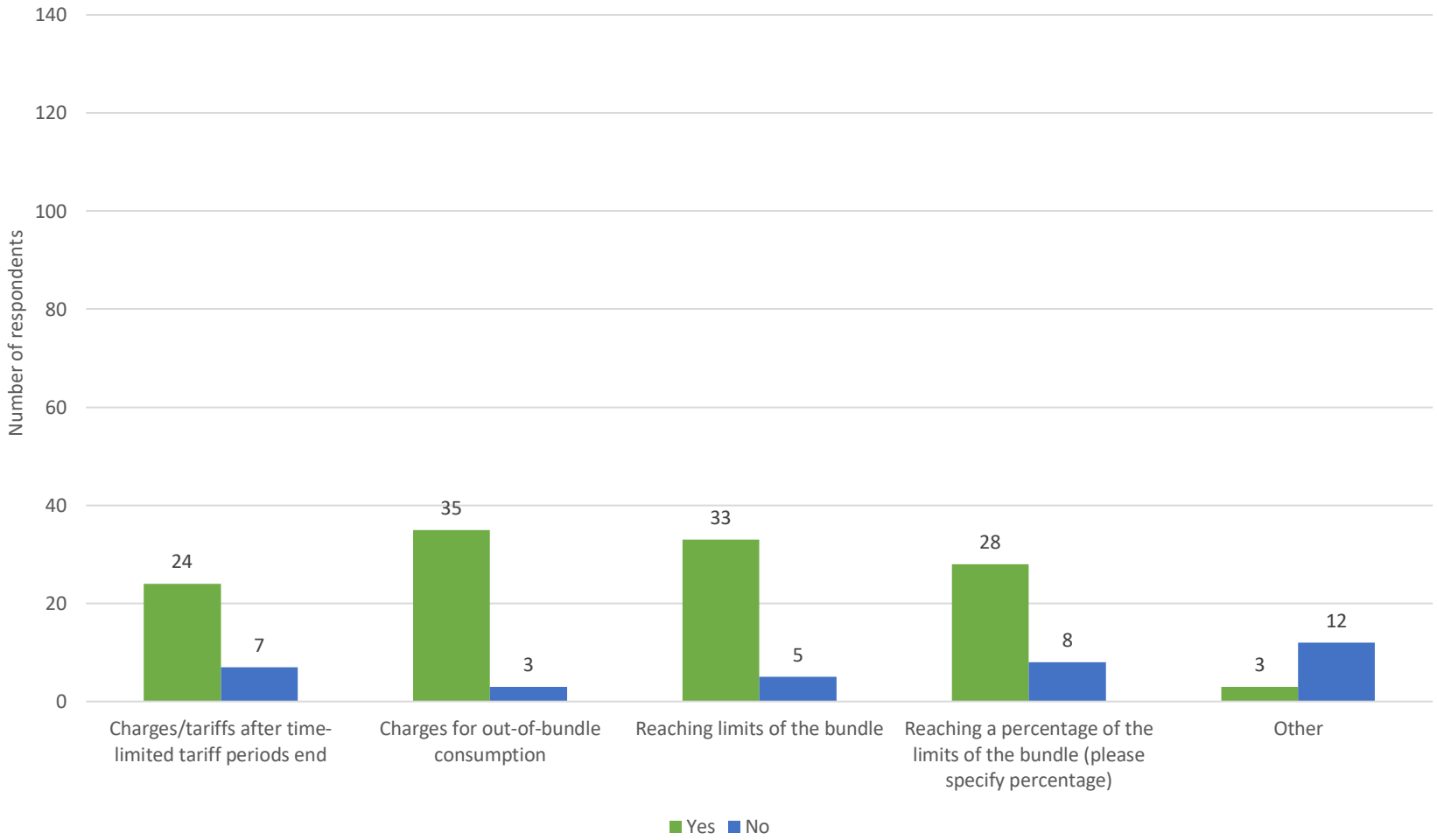


Figure 55 depicts the number of respondents that inform end users with alternative tariffs about charges, reaching limits, and other issues related to roaming.

Figure 56: Surcharges for alternative tariffs in EEA vs. non-EEA destinations (total number of respondents Q4 2021 – Q3 2022 = a) 93, b) 90)

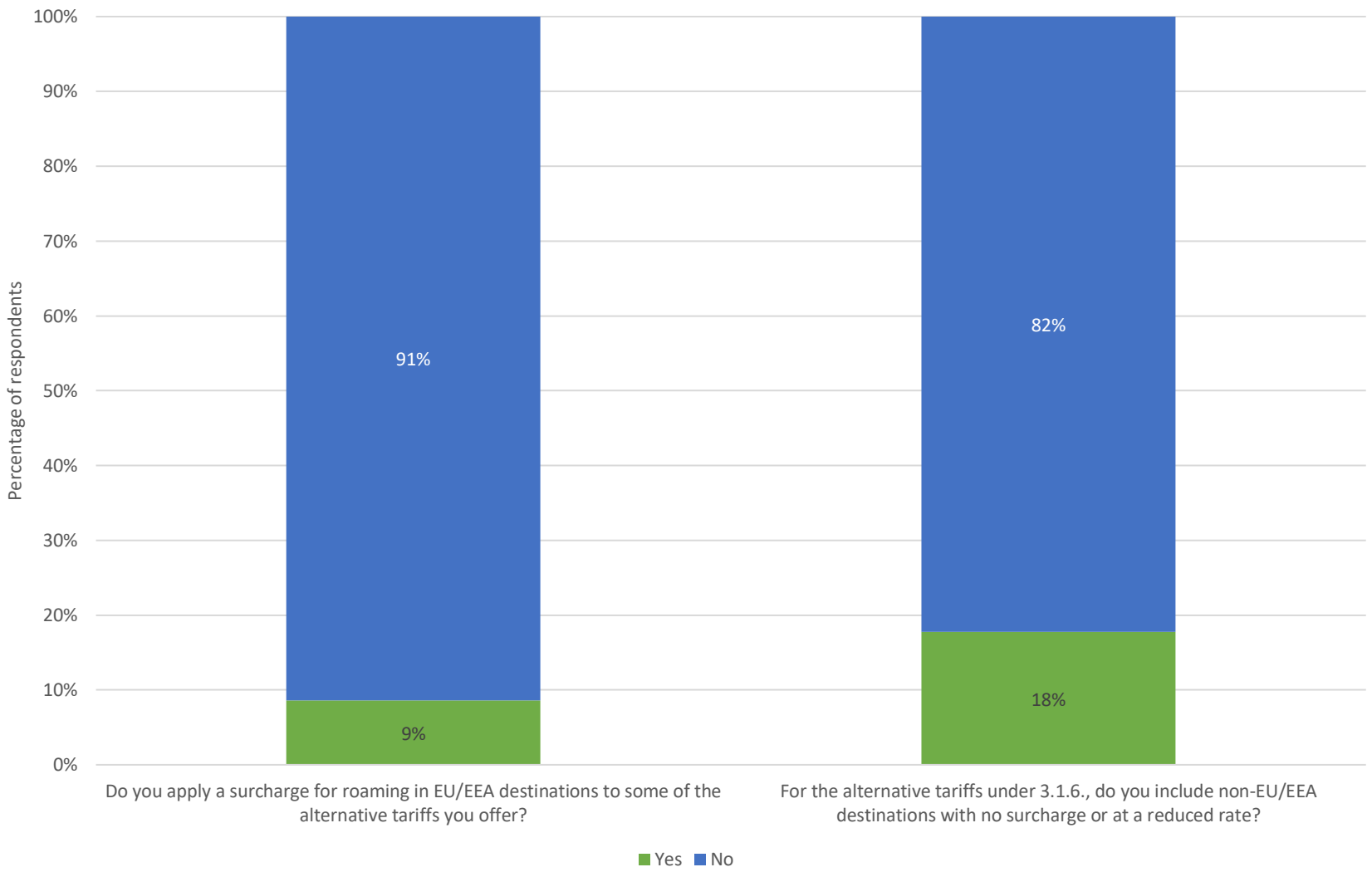


Figure 56 depicts the percentage of respondents that apply surcharges for alternative tariffs in EEA vs. non-EEA destinations.

5.6.6. Information provided

Figure 57: Number of operators that provide information about alternative tariffs/switching between tariffs through different channels (total number of respondents Q4 2021 – Q3 2022 = 152)

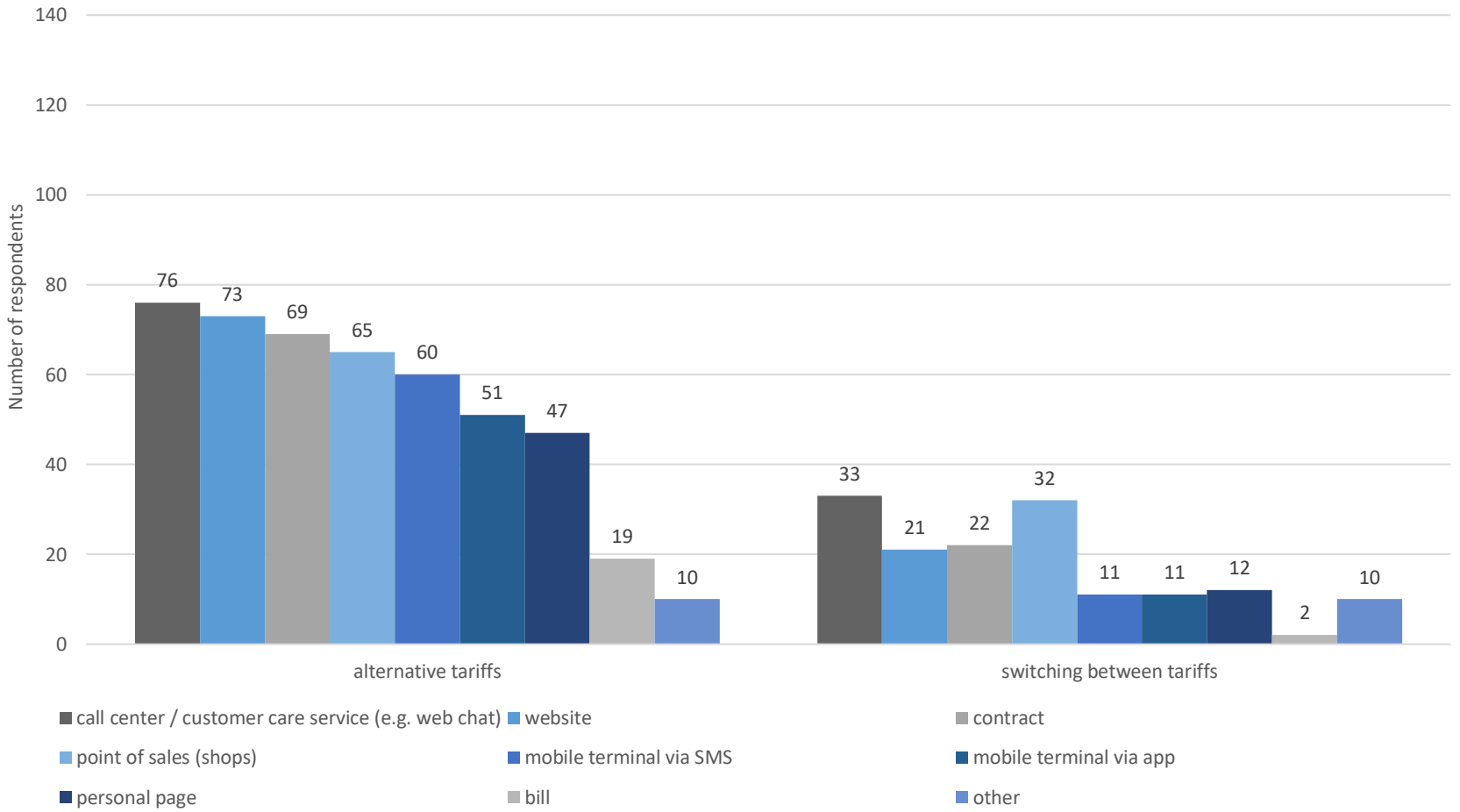


Figure 57 depicts the number of roaming providers (MNOs and MVNOs) that provide information about alternative tariffs/switching between tariffs through different channels.

Figure 58: Number of operators that provide different types of QoS information on a per-network basis (based on data collected by BEREC for TACR report in 2020 – 2022; total number of respondents Q4 2021 – Q3 2022 = 82)

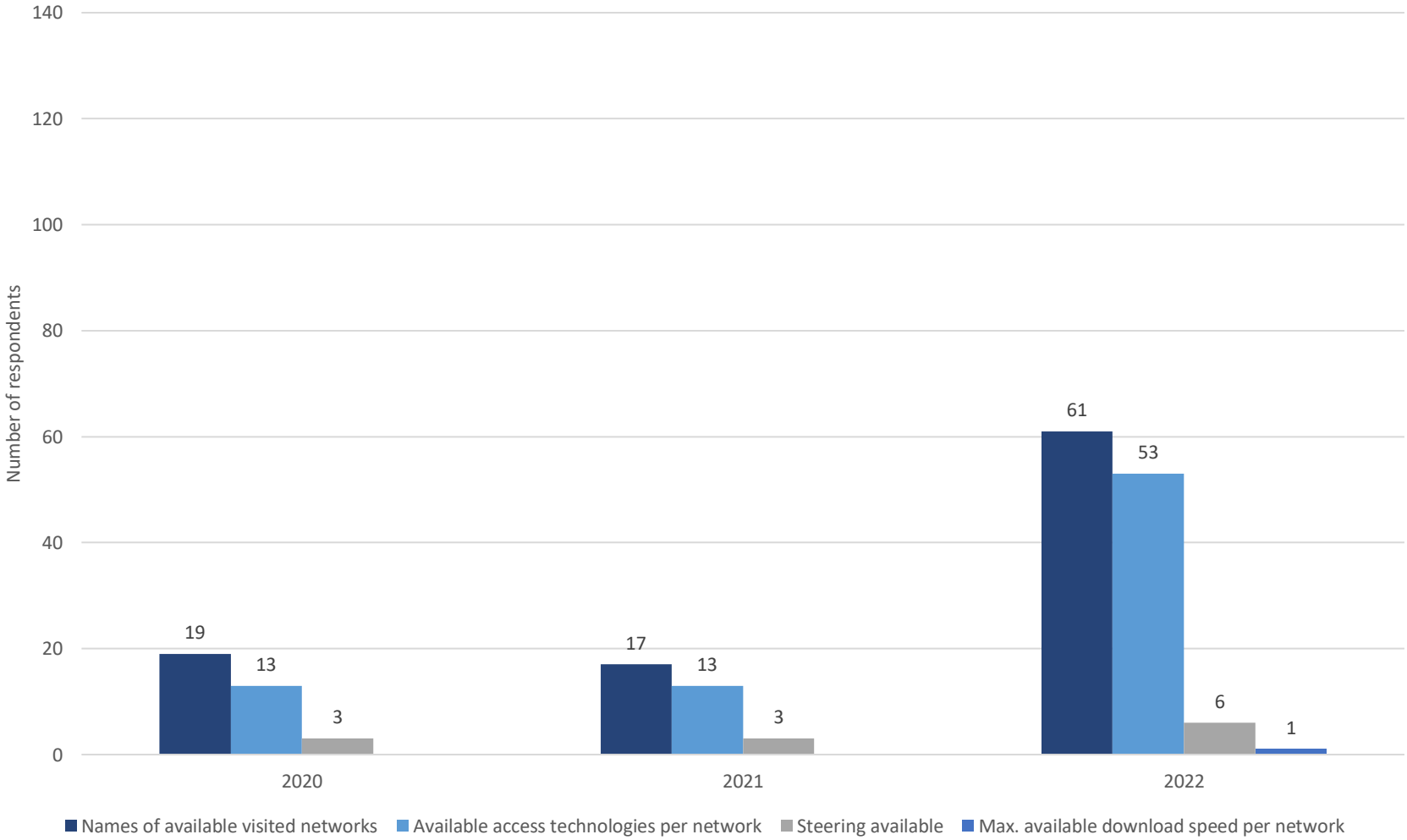


Figure 58 depicts the number of roaming providers (MNOs and MVNOs) that provide QoS-related information within the roaming context on a per-network basis over the period between 2020 and 2022. This includes information on the names of available visited networks, on the available access technologies per network, on the availability of steering and on the maximum available download speed per network.

Figure 59: Type of information provided on VAS charges in a roaming context (total number of respondents Q4 2021 – Q3 2022 = a) 119, b) 122, c) 85)

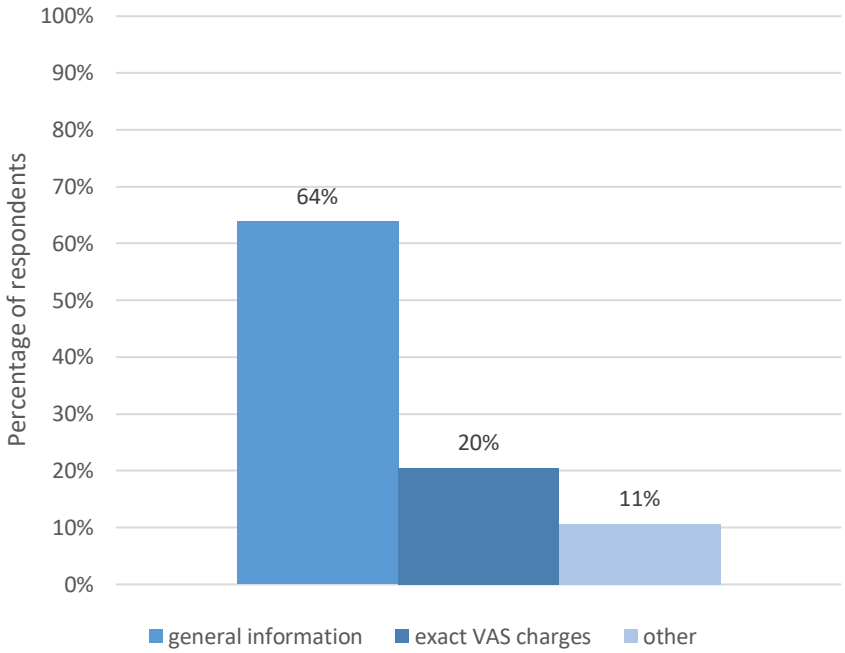
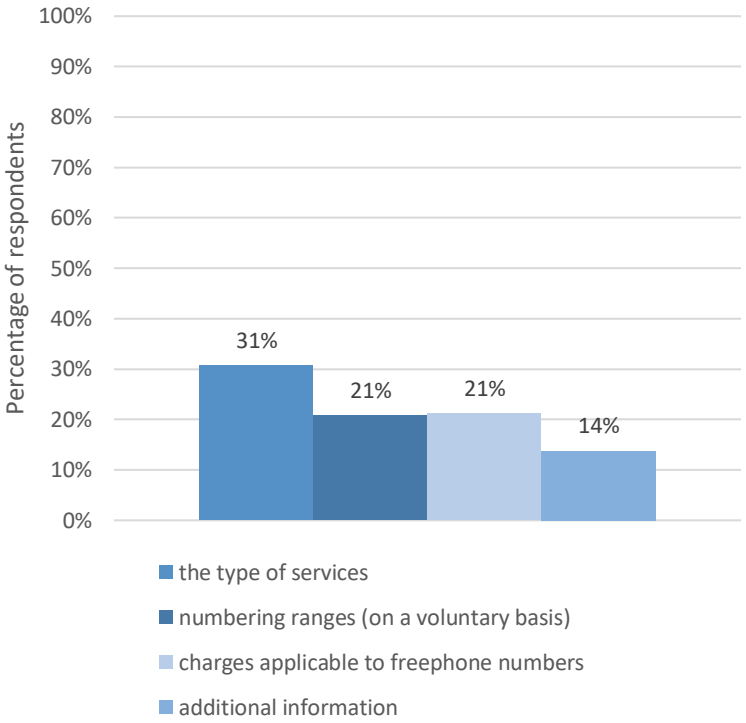


Figure 60: Type of information not related to charges provided on VAS while roaming (total number of respondents Q4 2021 – Q3 2022 = a) 114, b) 106, c) 102, d) 104)



Figures 59 and 60 represent the percentage of roaming providers (MNOs and MVNOs) that provide different types of information on VAS in a roaming context. This includes the types of information provided on charges (Figure 59) and information on the type of services, the numbering ranges, the charges applicable to freephone information and additional information (Figure 60).

5.6.7. Cut-off limits

Figure 61: Types of cut-off limits offered by roaming providers (total number of respondents Q4 2021 – Q3 2022 = a) 130, b) 128, c) 63)

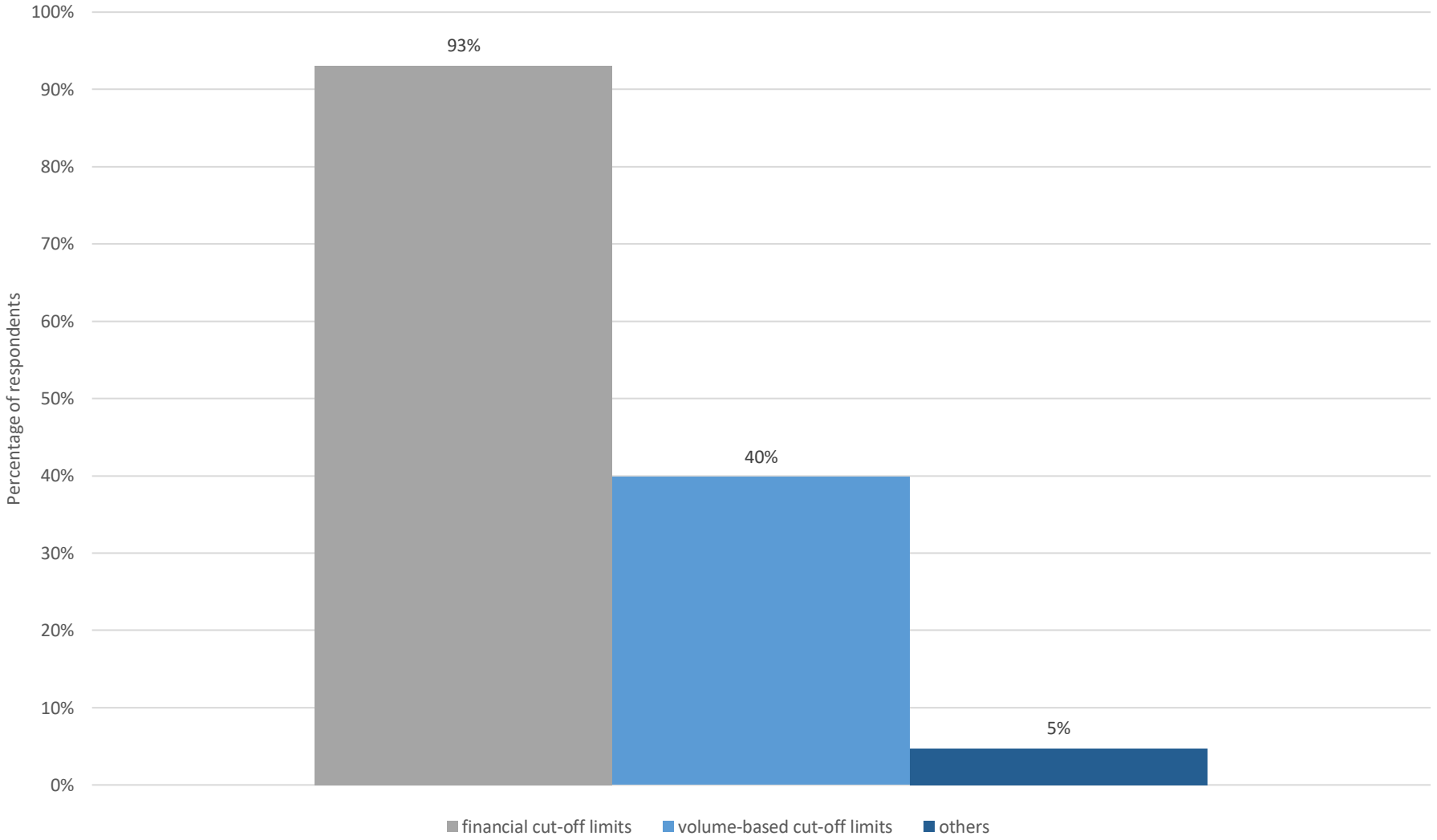


Figure 61 depicts the percentage of roaming providers (MNOs and MVNOs) that offer financial cut-off limits, volume-based cut-off limits or other cut-off limits.

Figure 62: Percentage of roaming providers which provide different types of information on cut-off limits (total number of respondents Q4 2021 – Q3 2022 = a) 134, b) 129, c) 121)

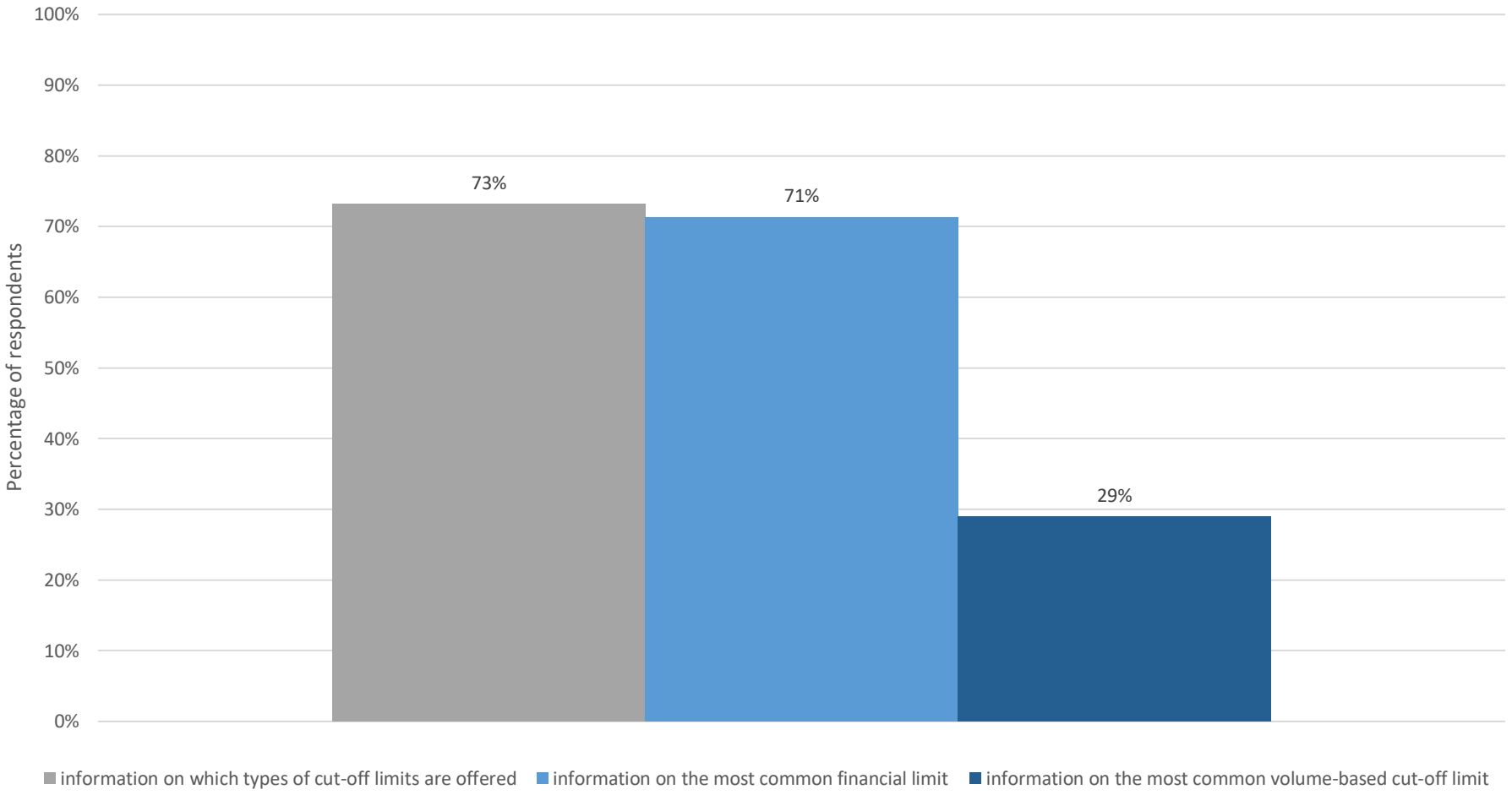


Figure 62 depicts the percentage of roaming providers (MNOs and MVNOs) that provide information on the types of cut-off limits they offer, on the most common financial limit or on the most common volume-based limit.

Figure 63: Structure of cut-off limits (total number of respondents Q4 2021 – Q3 2022 = a) 143, b) 140, c) 132)

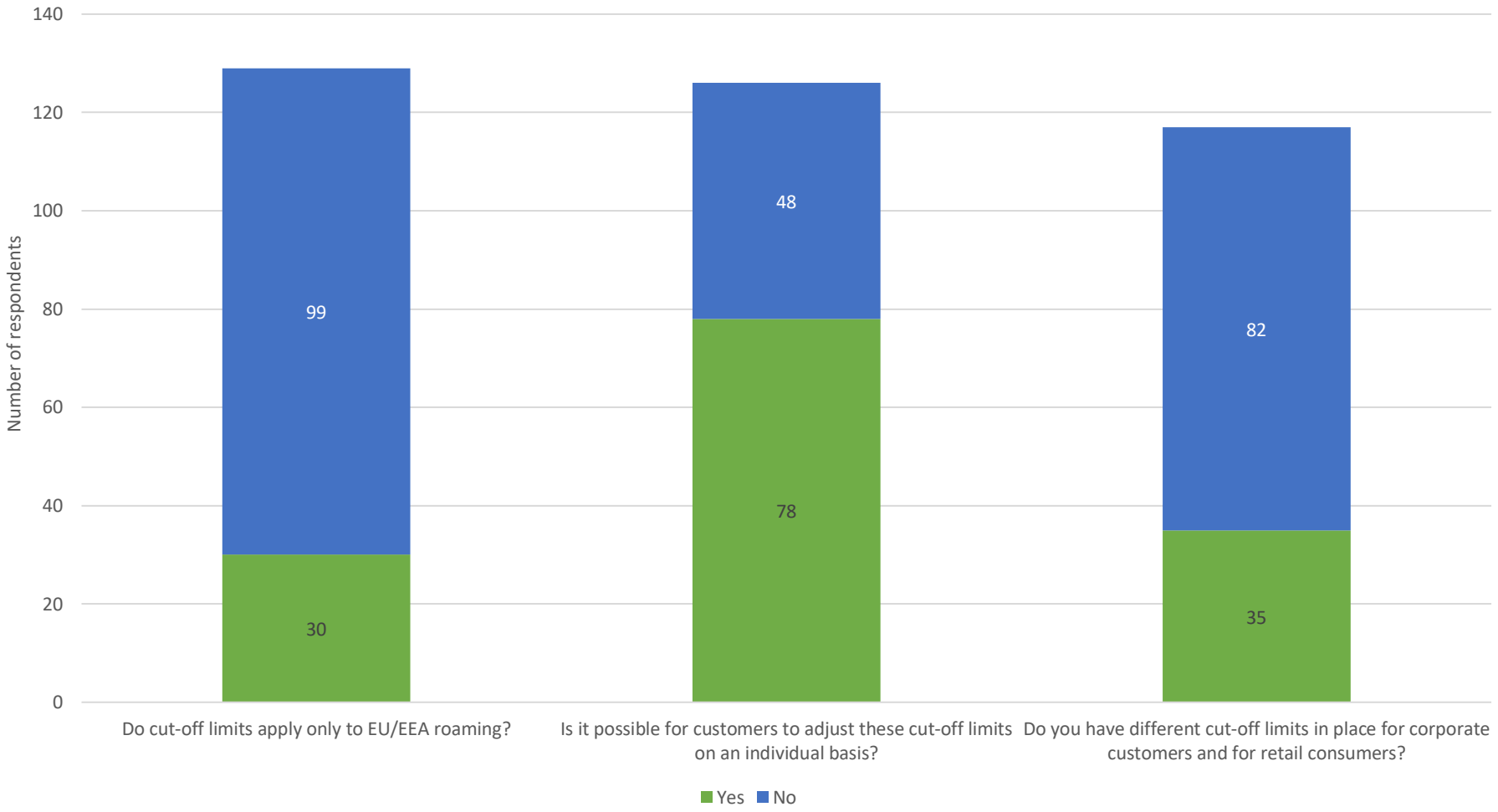


Figure 63 depicts the number of roaming providers (MNOs and MVNOs) that offer cut-off limits, the number of respondents allowing their subscribers to adjust these cut-off limits individually and the number of respondents which have different cut-off limits for corporate customers and retail consumers.

Figure 64: Charges for roaming in non-terrestrial networks included in the financial limits (total number of respondents Q4 2021 – Q3 2022 = 137)

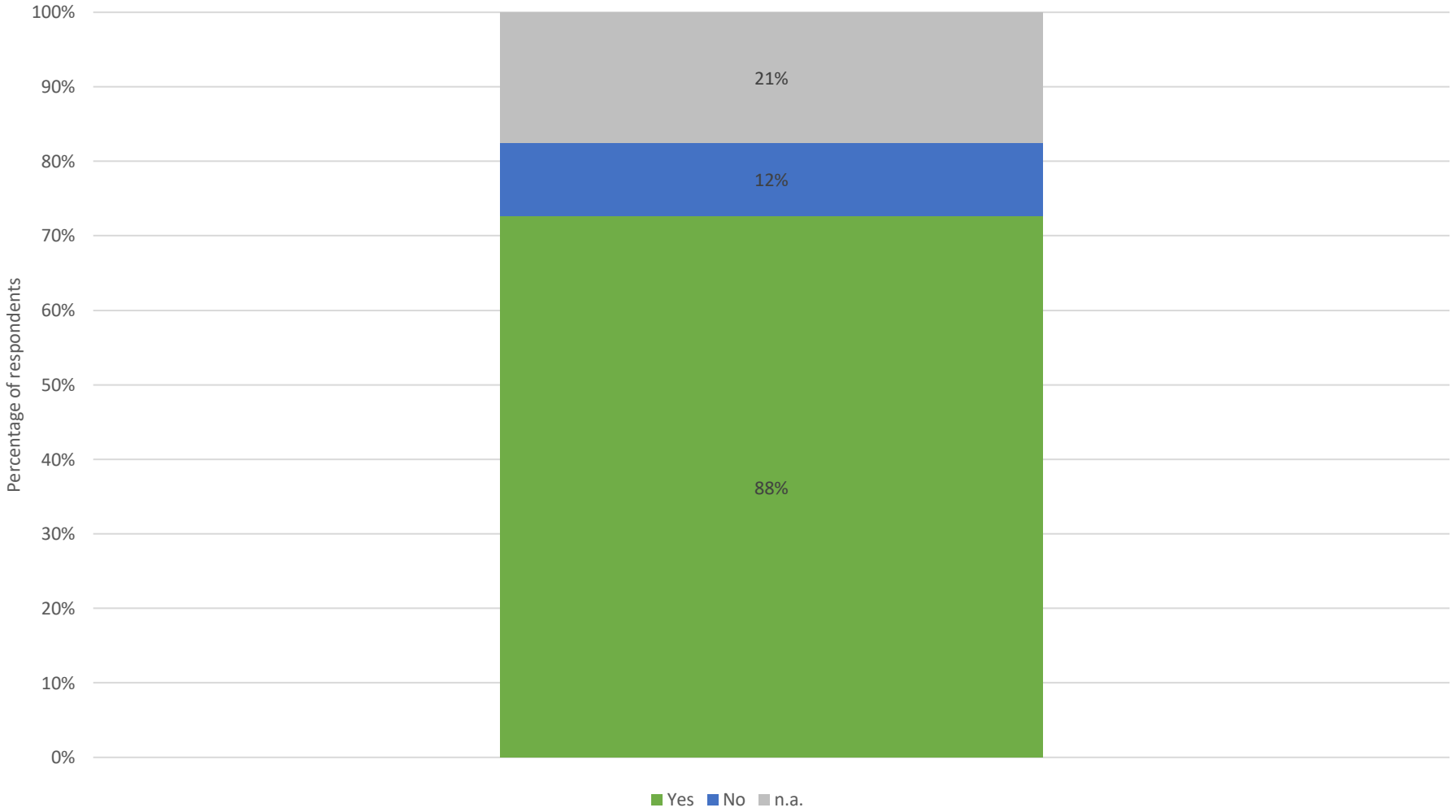


Figure 64 depicts the percentage of roaming providers (MNOs and MVNOs) that include charges for roaming in non-terrestrial networks in the financial limits for roaming.

5.6.8. Non-EU/EEA destinations, inadvertent roaming and non-terrestrial networks

Figure 65: Non-EU/EEA destinations, inadvertent roaming and non-terrestrial networks (total number of respondents Q4 2021 – Q3 2022 = a) 139, b) 127, c) 127, d) 137)

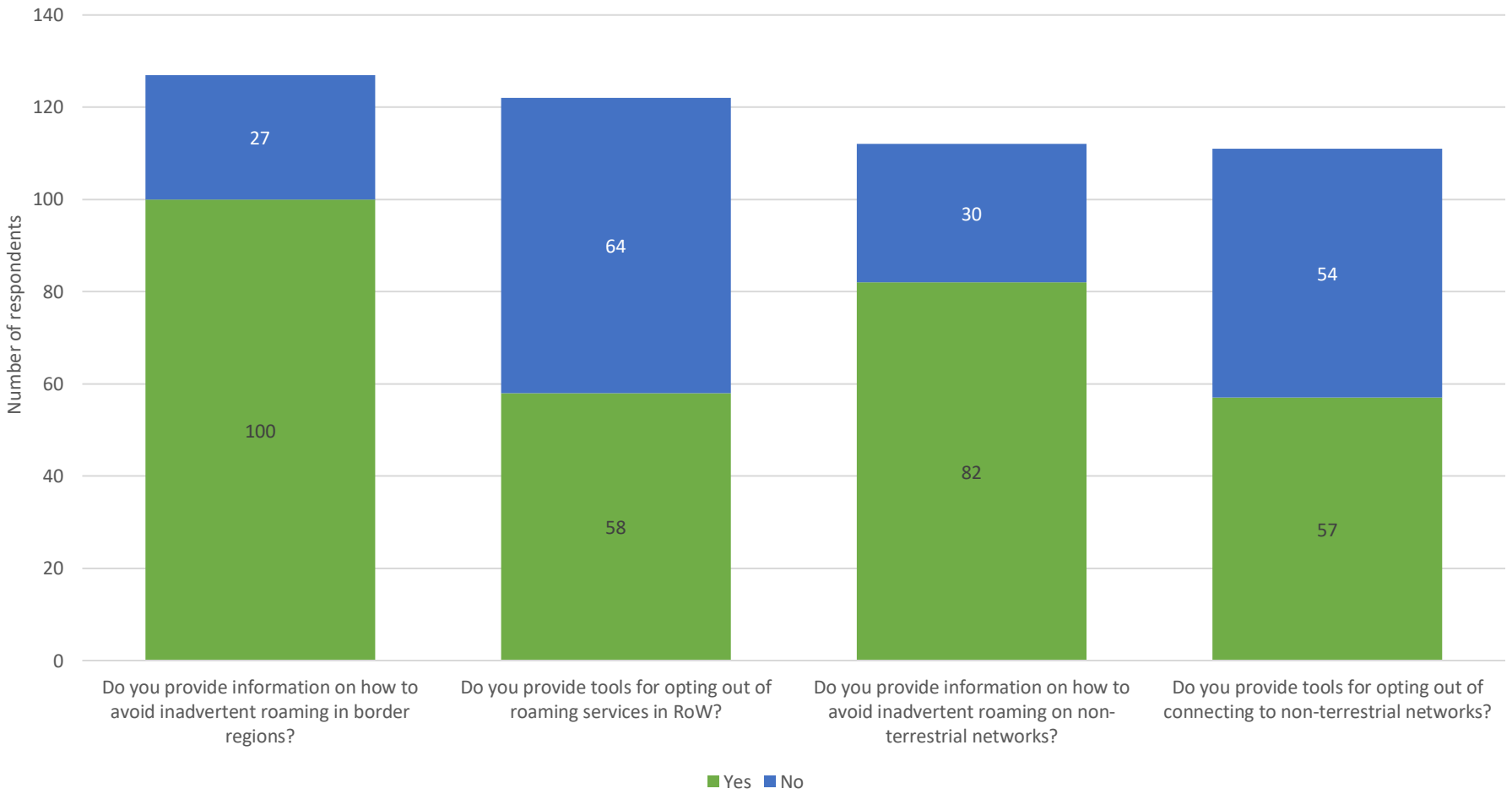


Figure 65 depicts the number of roaming providers (MNOs and MVNOs) that provide information and tools to help customers avoid inadvertent roaming outside EU/EEA and via non-terrestrial networks

Figure 66: Measures implemented to protect consumers from paying for inadvertent roaming in the EU/EEA (total number of respondents Q4 2021 – Q3 2022 = 152)

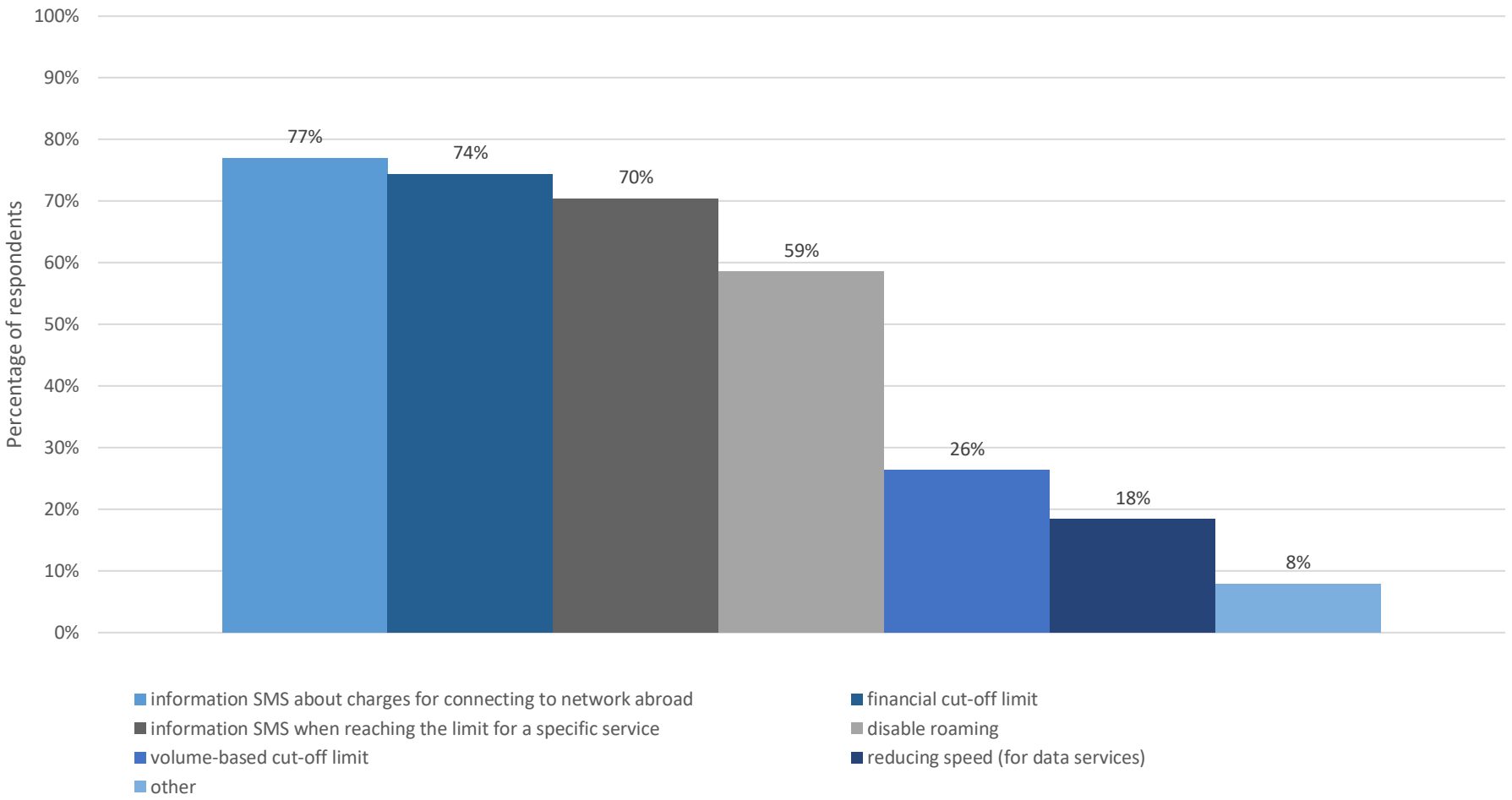


Figure 66 depicts the percentage of roaming providers (MNOs and MVNOs) that have implemented different types of measures to protect consumers from paying for inadvertent roaming in the EU/EEA. These measures include information SMS about charges or limits, volume-based or financial cut-off limits, the possibility to disable roaming, reduced speed for data services and other measures.

5.6.9. Welcome SMS

Figure 67: Share of providers offering different types of information in the EU/EEA Welcome SMS (total number of respondents Q4 2021 – Q3 2022 = 152)

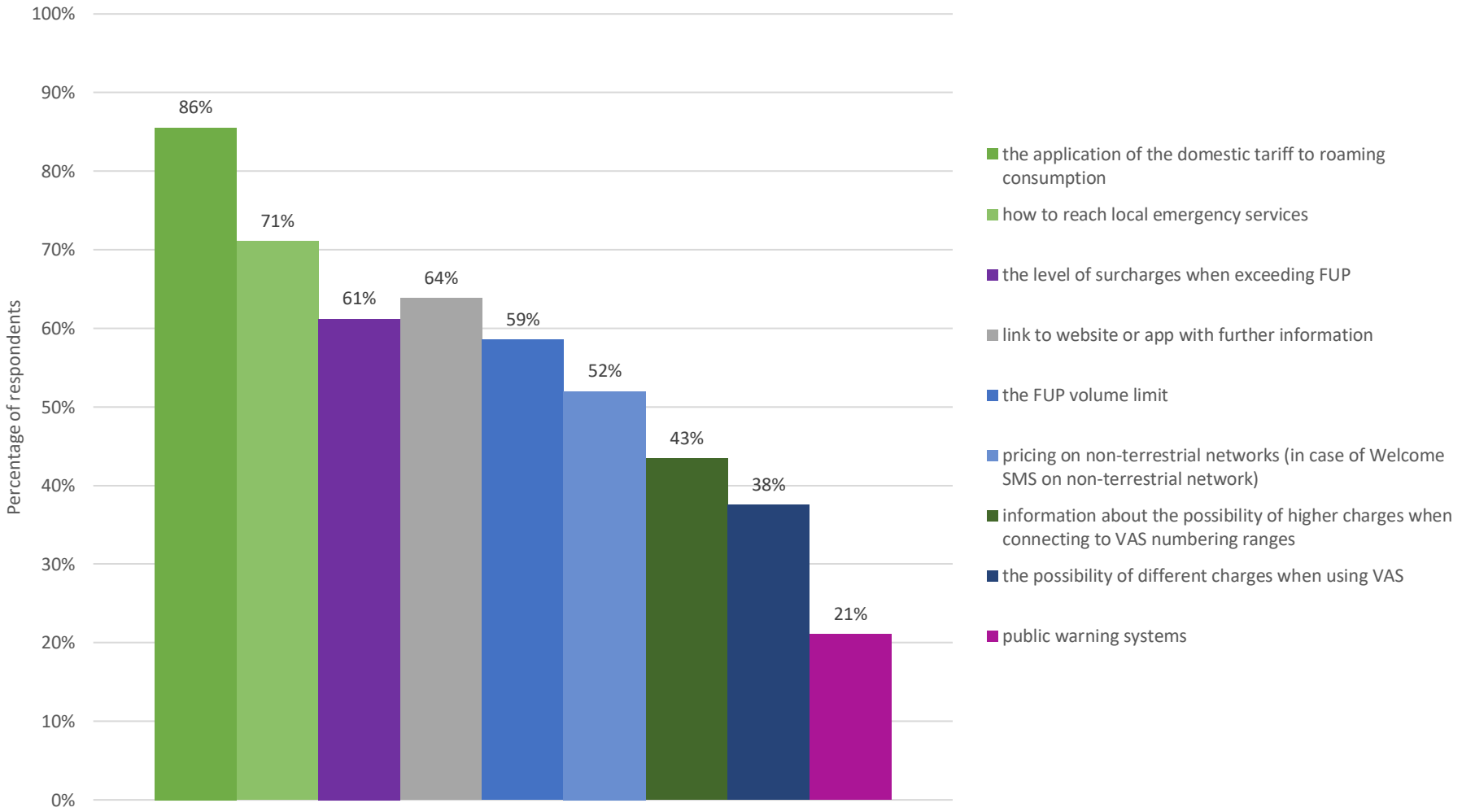


Figure 67 depicts the percentage of roaming providers (MNOs and MVNOs) offering different types of information in the EU/EEA Welcome SMS, e.g. related to charges or accessing emergency services.

Figure 68: Share of providers offering different types of information in the RoW Welcome SMS (total number of respondents Q4 2021 – Q3 2022 = 152)

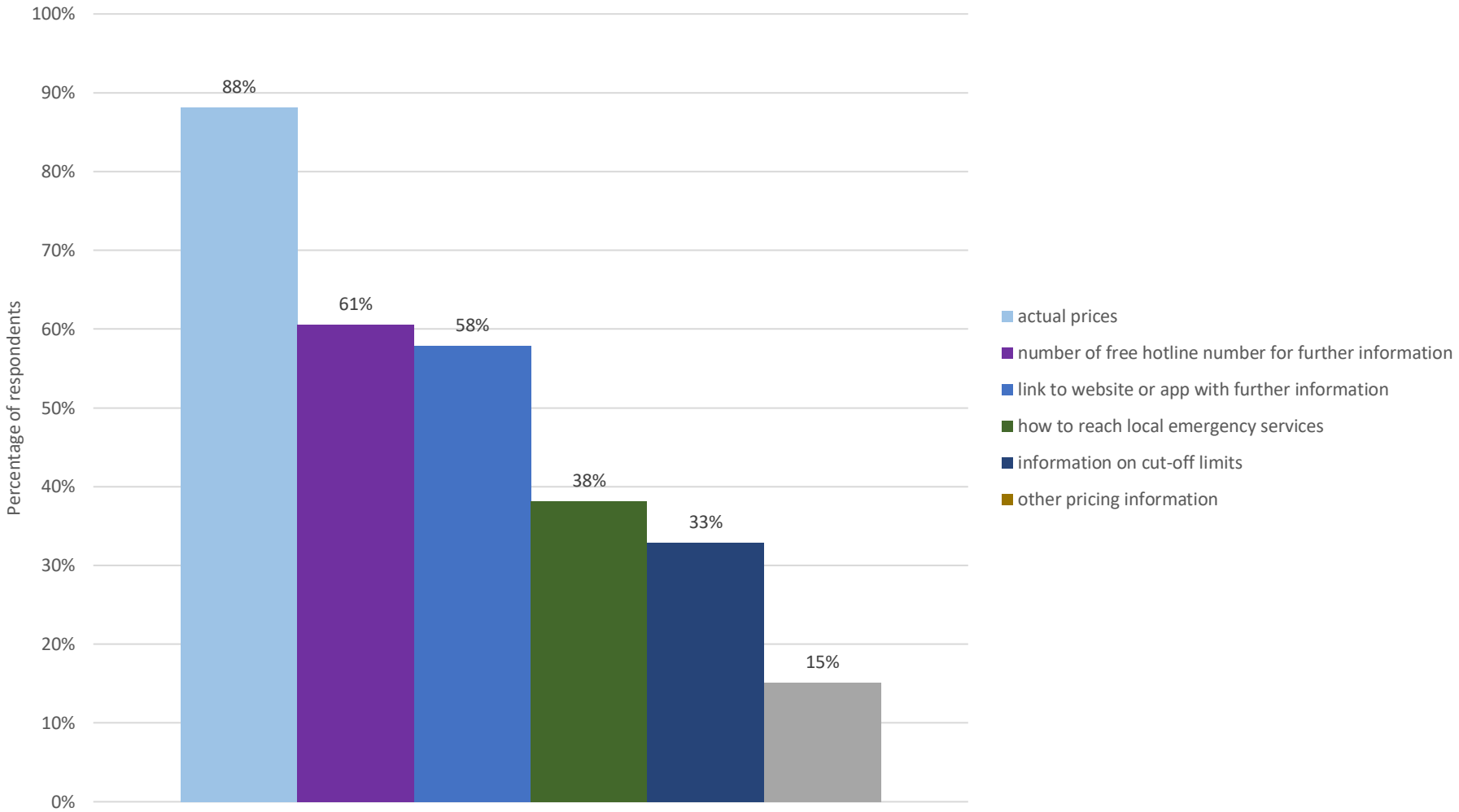


Figure 68 depicts the percentage of roaming providers (MNOs and MVNOs) offering different types of information in the RoW Welcome SMS, e.g. related to charges, the possibility to obtain further information, or emergency services.

5.6.10. Transparency of wholesale offers regarding QoS

Figure 69: Problems of access seekers with gaining access to network technologies for roaming offers (total number of respondents Q4 2021 – Q3 2022 = a) 114, b) 115, c) 88)

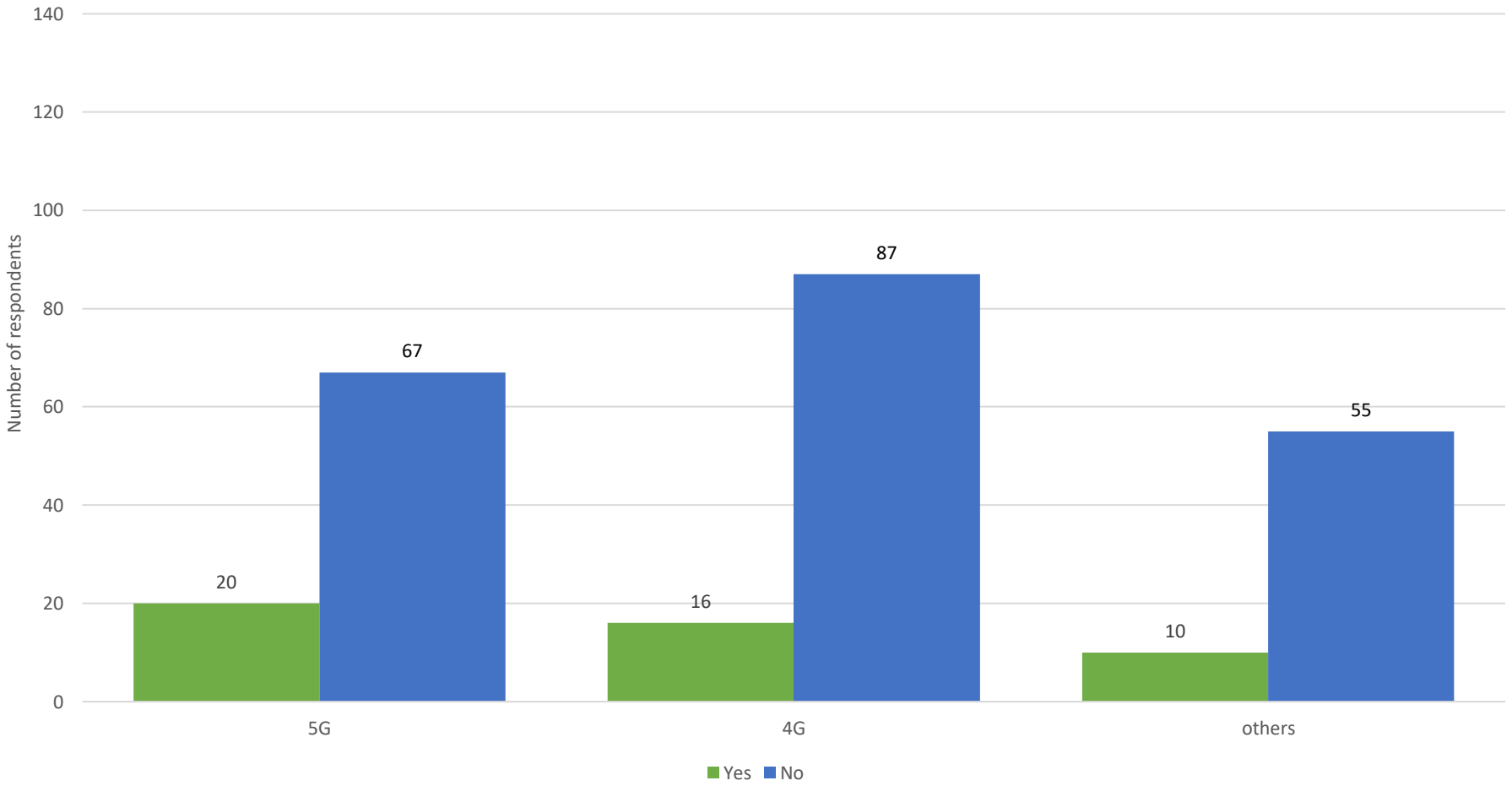


Figure 69 depicts the number of roaming providers (MNOs and MVNOs) that have encountered problems with gaining access to different network technologies (5G, 4G or others) for roaming offers.

Figure 70: Implementation problems of access seekers with network technologies for roaming offers (total number of respondents Q4 2021 – Q3 2022 = a) 114, b) 113, c) 113, d) 80)

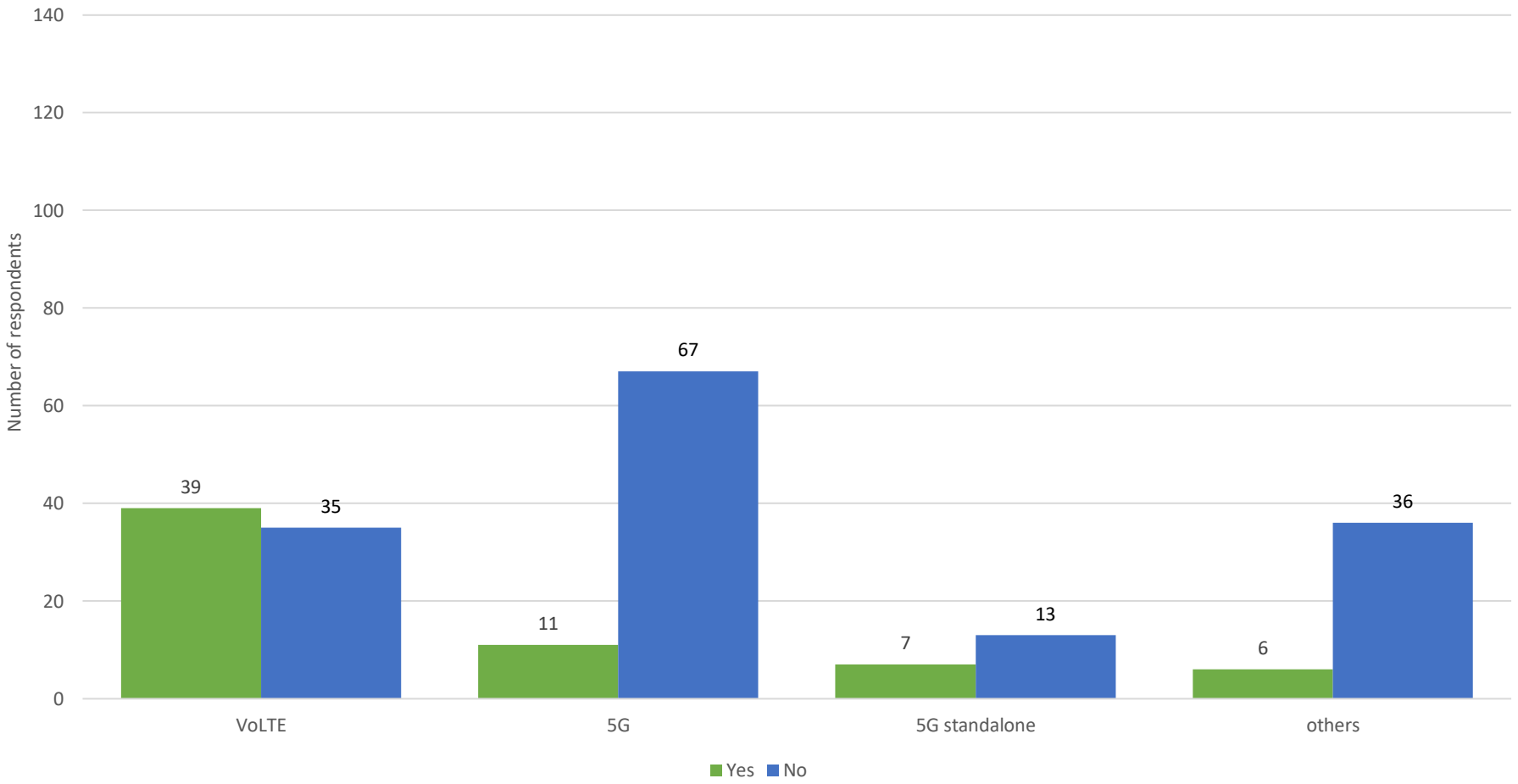


Figure 70 depicts the number of roaming providers (MNOs and MVNOs) that have encountered implementation problems with VoLTE, 5G, 5G standalone, and other network technologies.

Figure 71: Number of respondents with a certain percentage of EU/EEA outbound roaming agreements including operational VoLTE or VoNR services (total number of respondents Q4 2021 – Q3 2022 = 78)

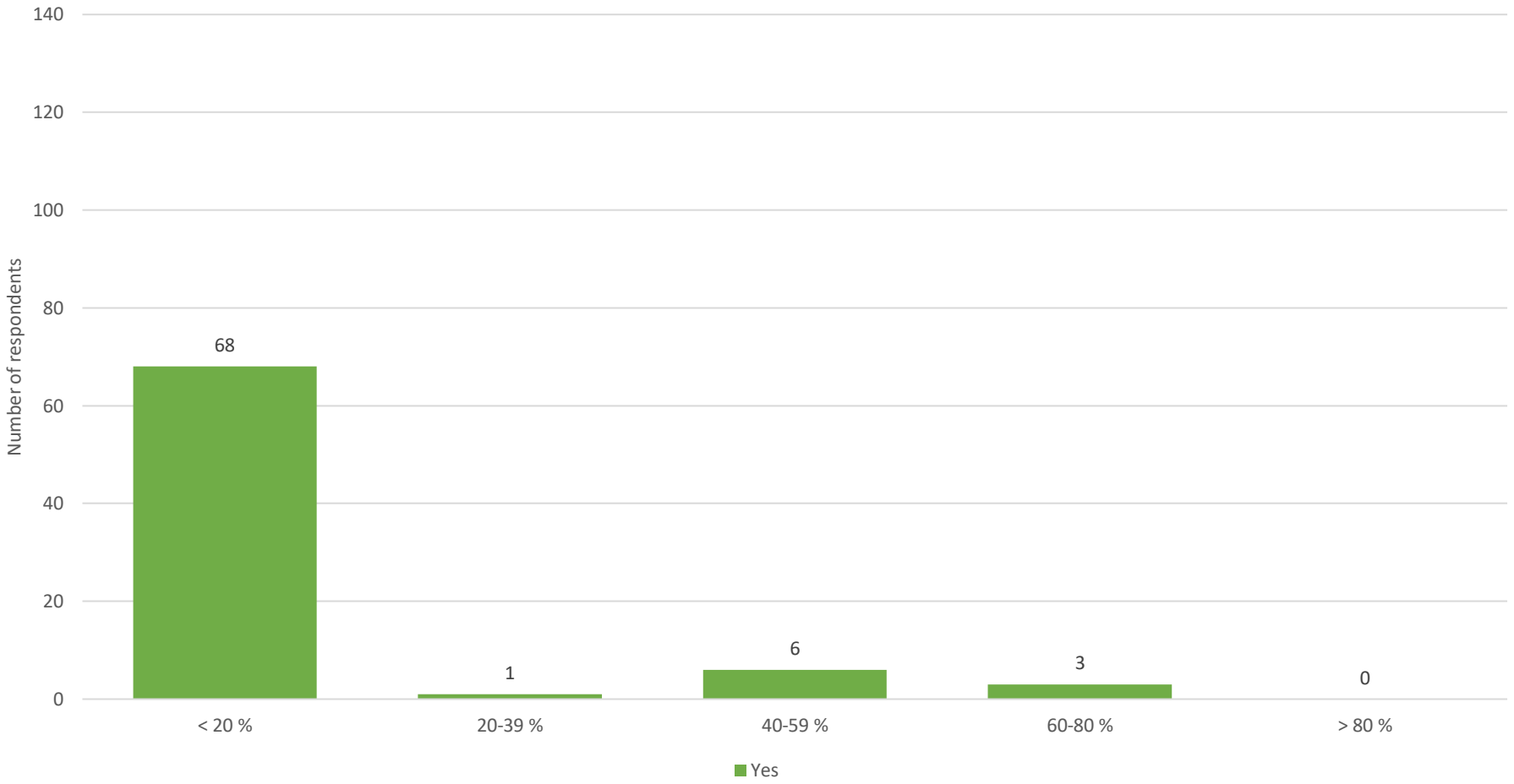


Figure 71 depicts the number of roaming providers (MNOs and MVNOs) whose outbound roaming agreements include operational VoLTE and VoNR services up to a certain threshold (< 20%, 20-39%, 40-59%, 60-80%, > 80%).

5.6.11. Agreements on pricing

Figure 72: Agreements on technology and pricing (total number of respondents Q4 2021 – Q3 2022 = a) 90, b) 97)

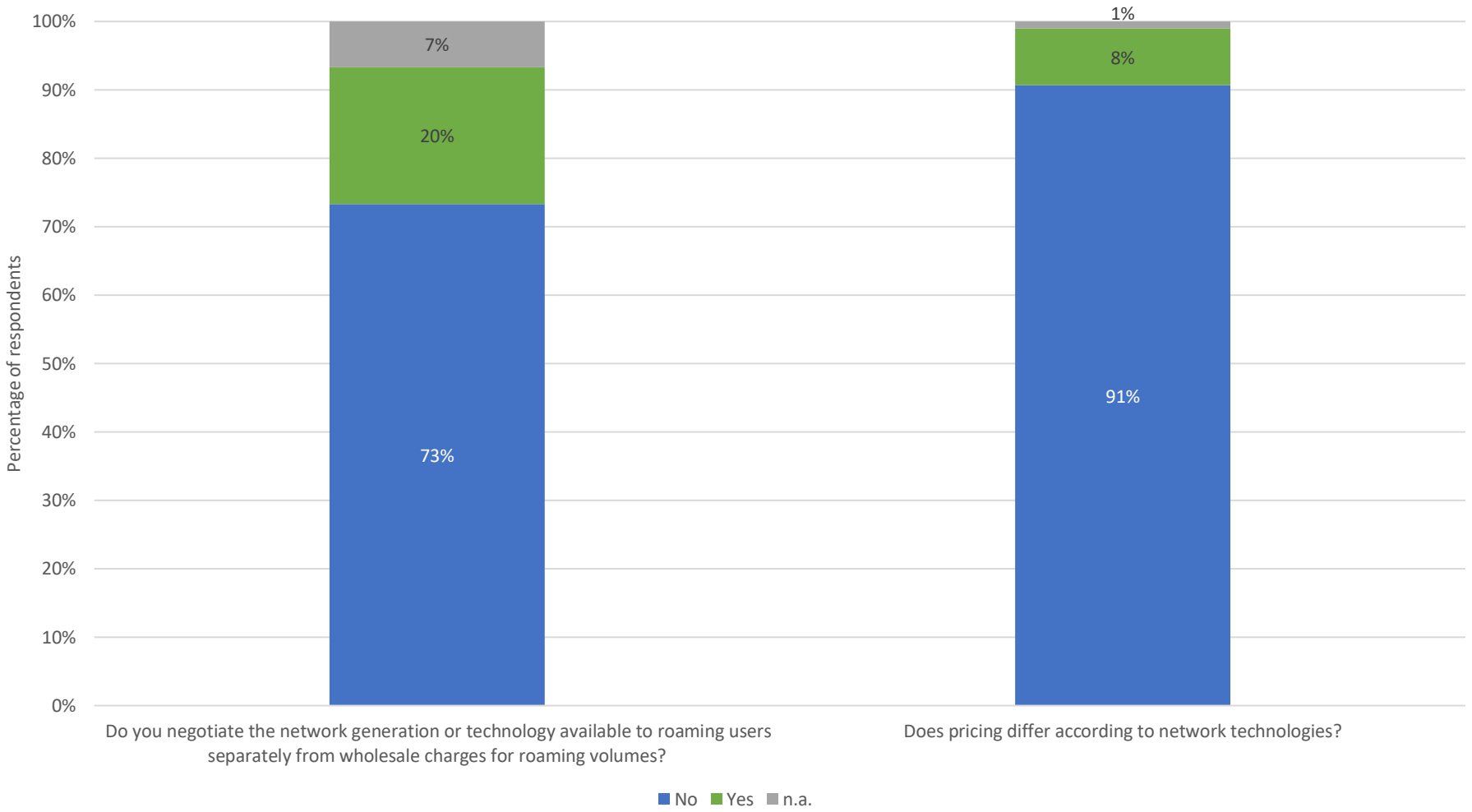


Figure 72 depicts the percentage of roaming providers (MNOs and MVNOs) that negotiate the network generation and technology agreements separately from wholesale charges agreement for roaming volumes. It also represents the percentage of operators that indicate differences in pricing according to the network technology.

Figure 73: Mechanisms used for reaching agreements on roaming prices (total number of respondents Q4 2021 – Q3 2022 = 96)

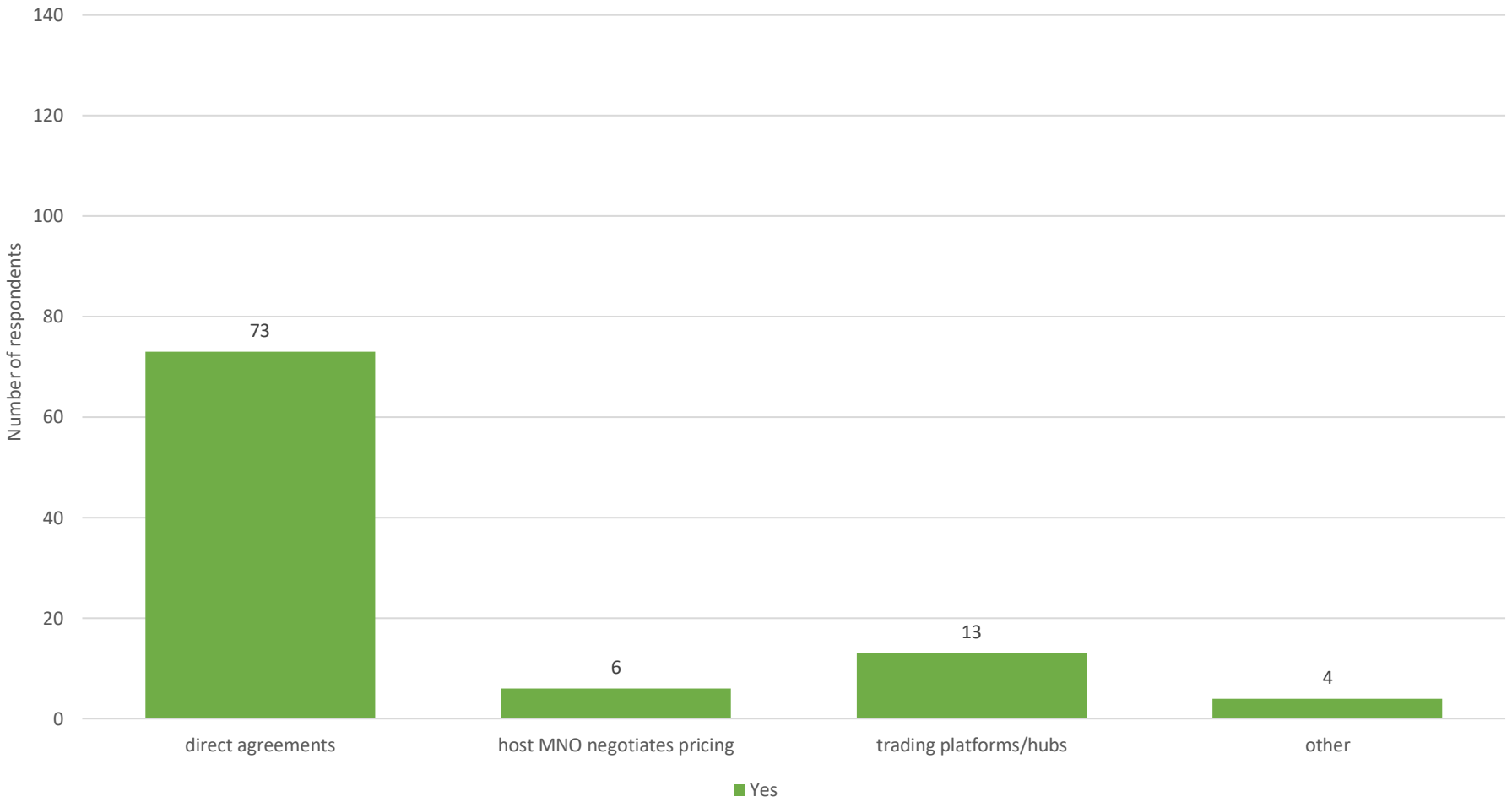


Figure 73 depicts the number of roaming providers (MNOs and MVNOs) that use direct agreements, trading platforms/hubs or other mechanisms, or rely on their host MNO to reach agreements on roaming prices.

Figure 74: Other pricing schemes used by respondents (total number of respondents Q4 2021 – Q3 2022 = a) 89, b) 88, c) 85, d) 82, e) 52)

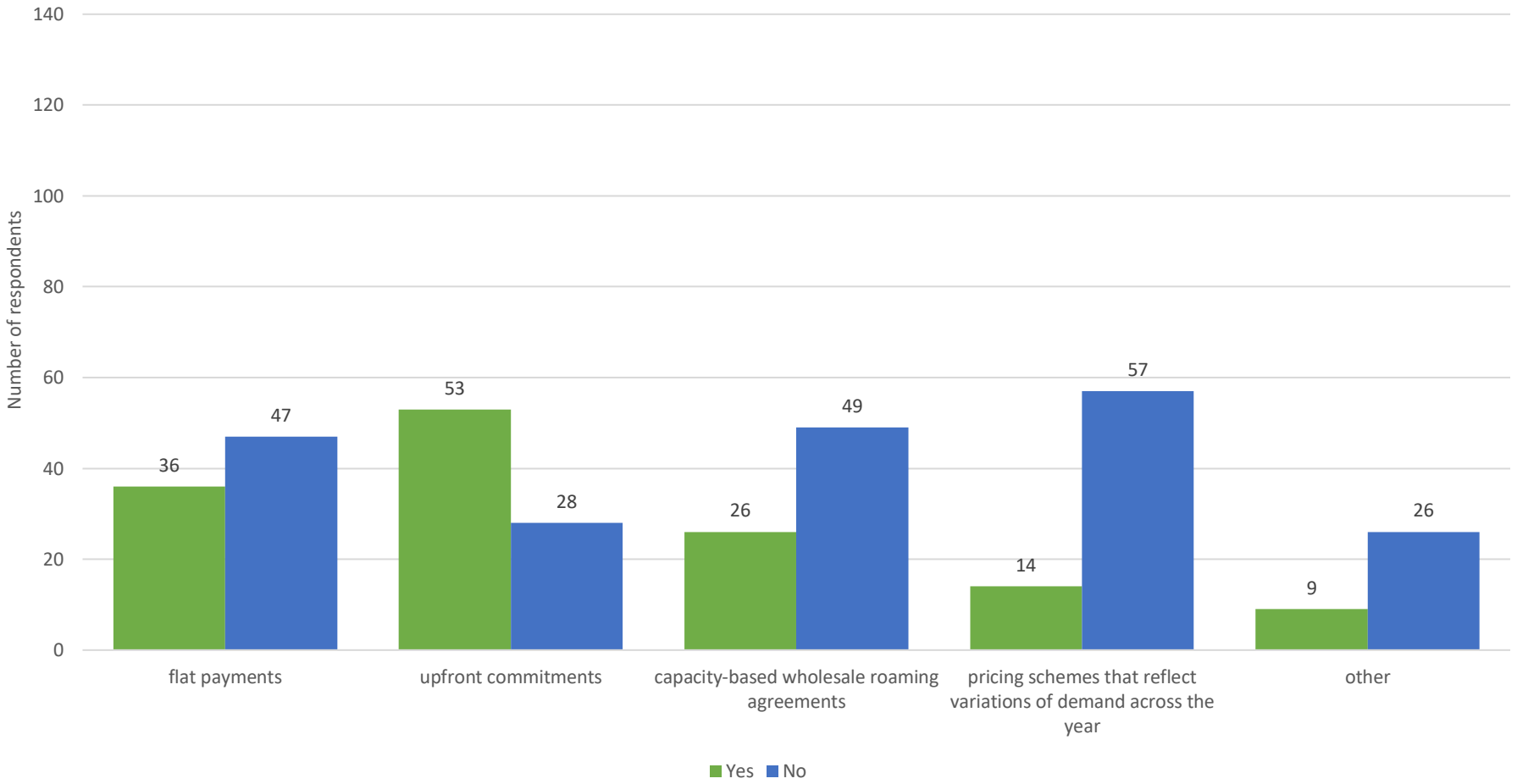


Figure 74 depicts the number of roaming providers (MNOs and MVNOs) that use different types of pricing schemes. This includes flat payments, upfront commitments, capacity-based wholesale roaming agreements, pricing schemes that reflect variations of demand across the year, or others.

Figure 75: Obstacles encountered at a wholesale level (total number of respondents Q4 2021 – Q3 2022 = a) 98, b) 102)

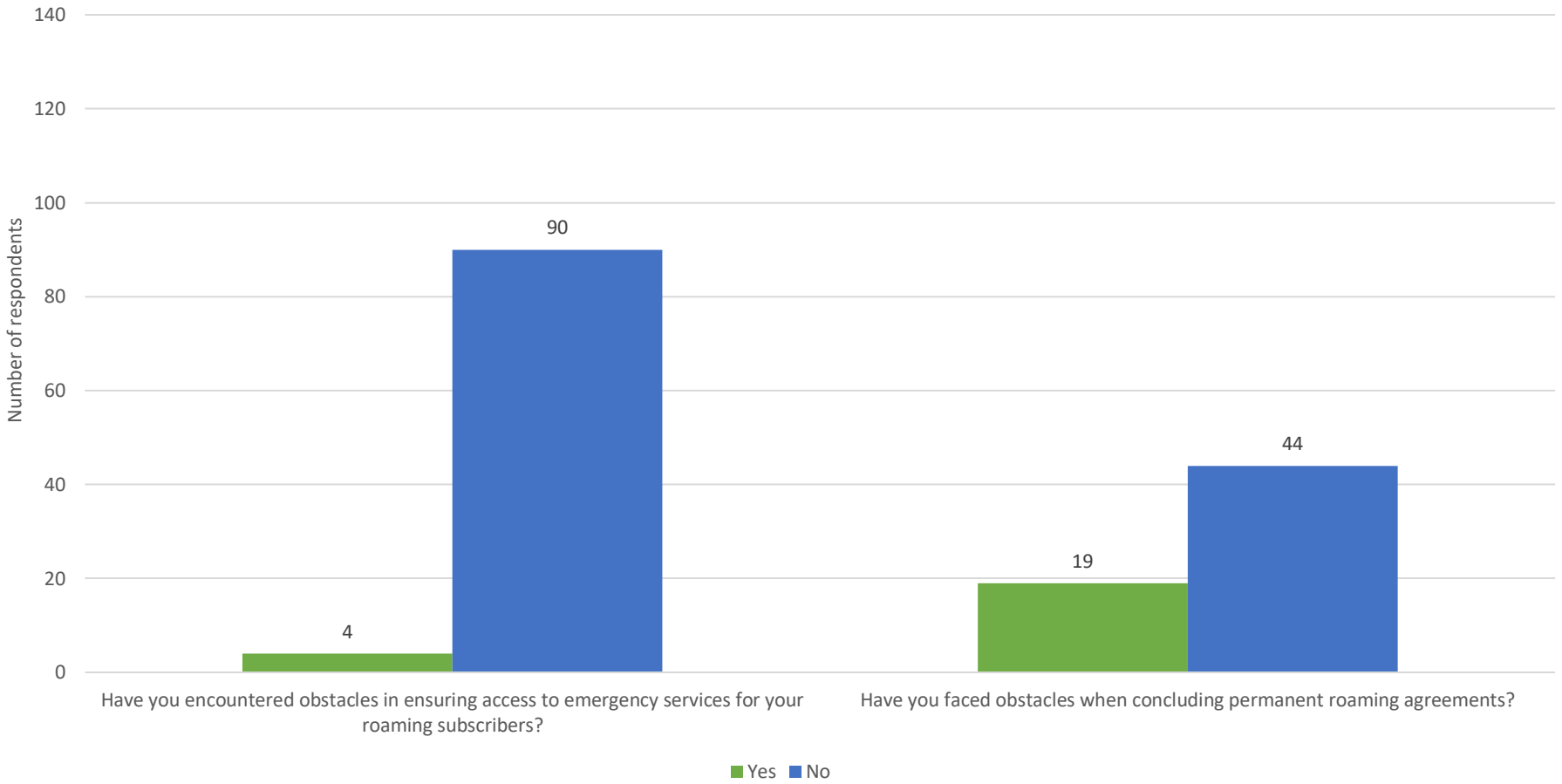


Figure depicts the number of roaming providers (MNOs and MVNOs) that have encountered obstacles in ensuring access to emergency services for their subscribers as well as when concluding permanent roaming agreements.

Figure 76: Special wholesale contracts/agreements for services provided by connected objects/devices (total number of respondents Q4 2021 – Q3 2022 = 109)

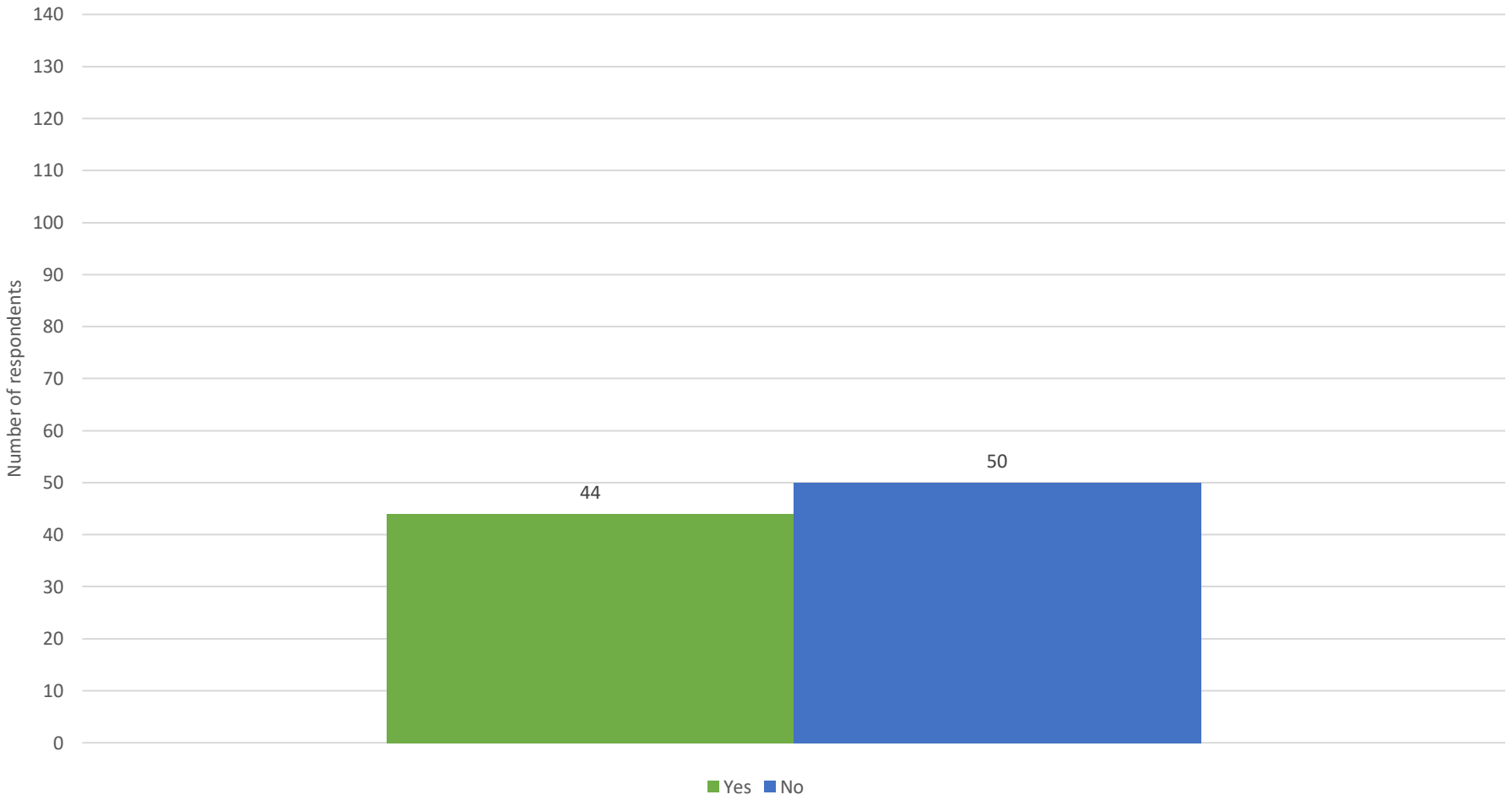


Figure 76 depicts the number of roaming providers (MNOs and MVNOs) that have special wholesale contracts/agreements for services provided by connected objects/devices.

5.6.12. Applications for sustainability surcharges

Figure 77: Applications for sustainability surcharges received and granted by NRAs, (total number of respondents Q4 2021 – Q3 2022 = 29)

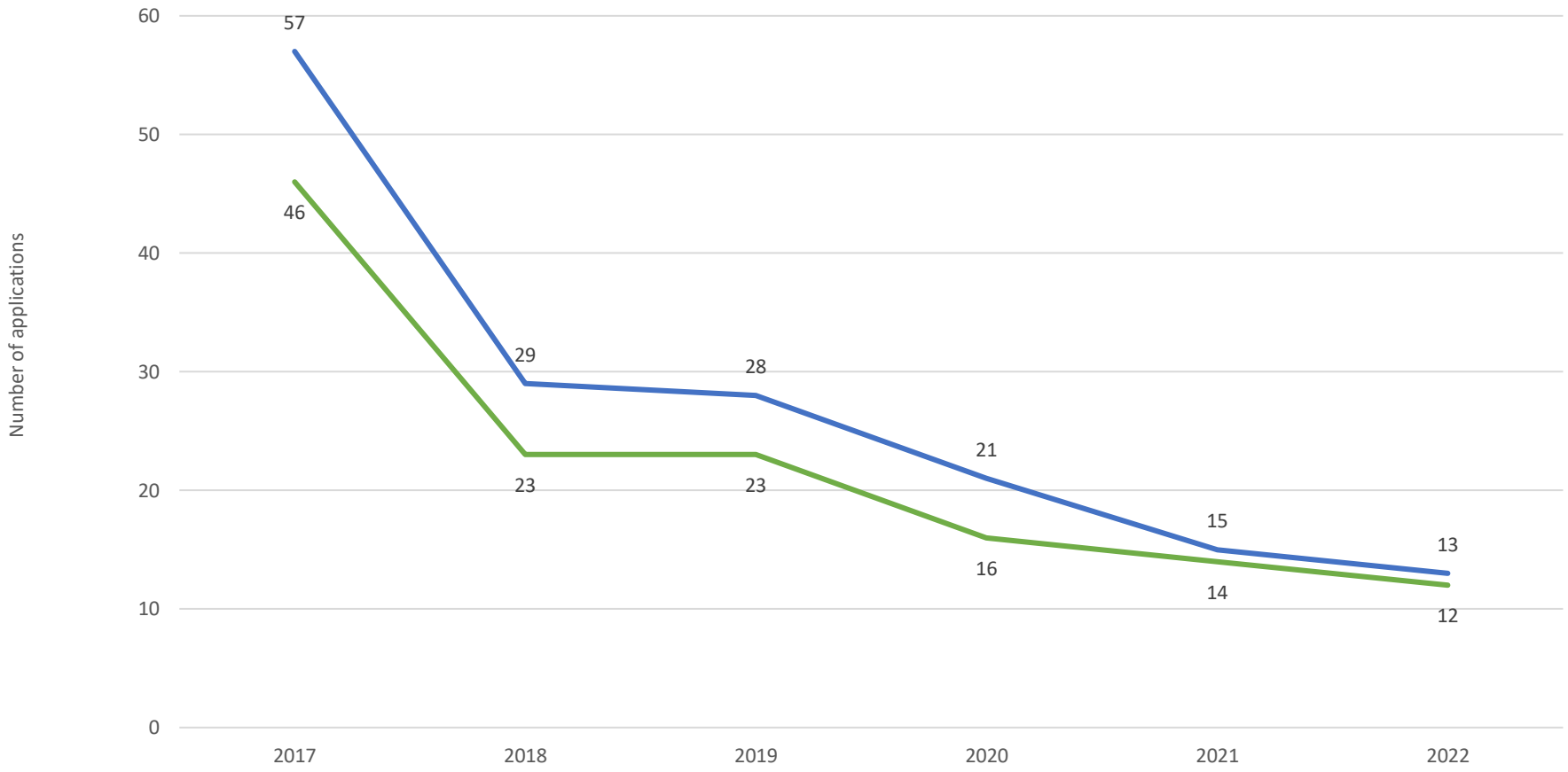


Figure 77 depicts the number of applications for sustainability surcharges received and granted by NRAs over the period between 2017 and 2022.

5.6.13. Complaints on transparency issues received by NRAs

Figure 78: Number of complaints received by NRAs per country (total number of respondents Q4 2021 – Q3 2022 = 29)

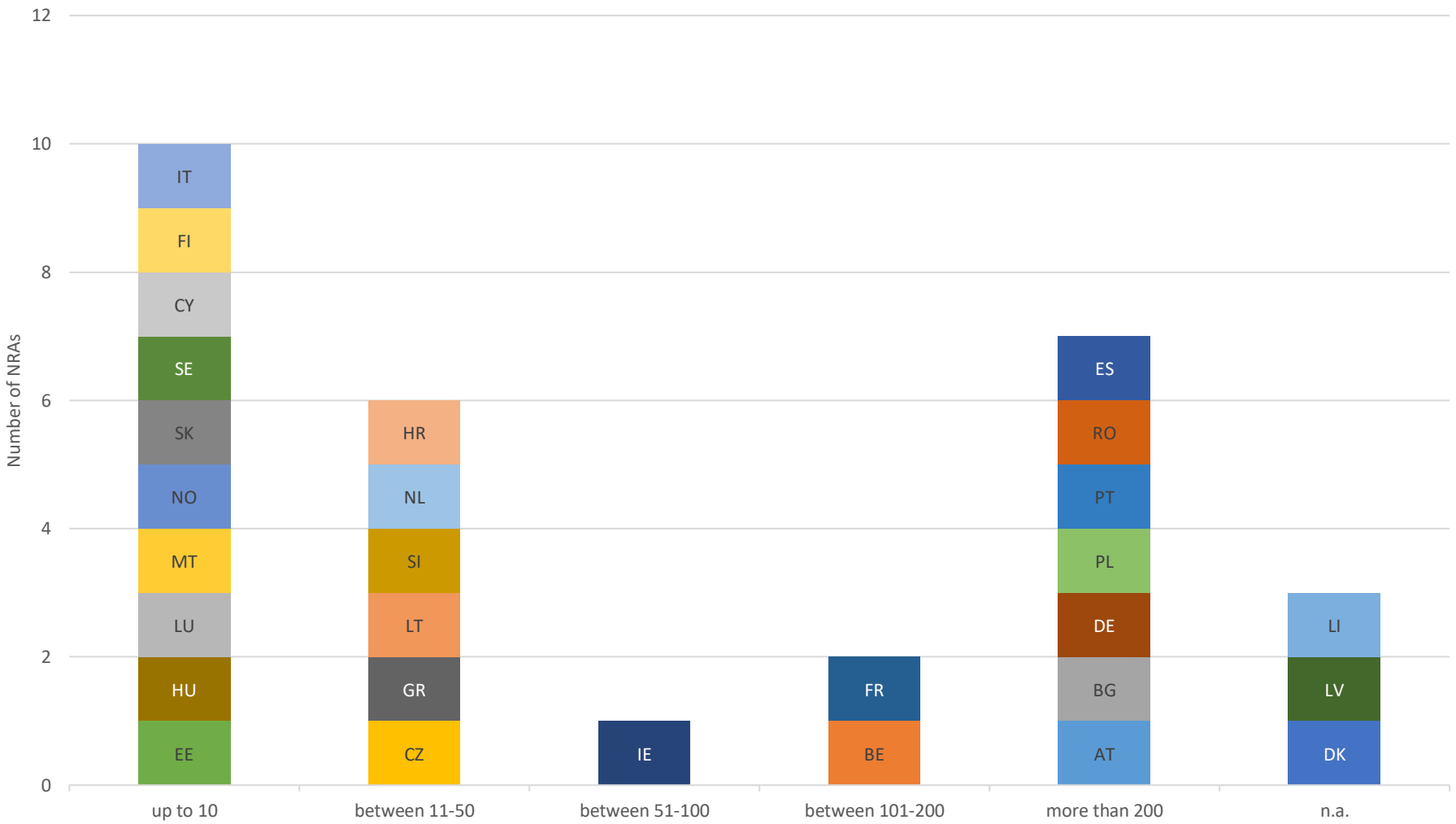


Figure 78 shows which NRAs received complaints within a certain range during the reporting period Q4 2021 – Q3 2022.

Figure 79: Number of NRAs that received complaints from end users on specific issues (total number of respondents Q4 2021 – Q3 2022 = 29)

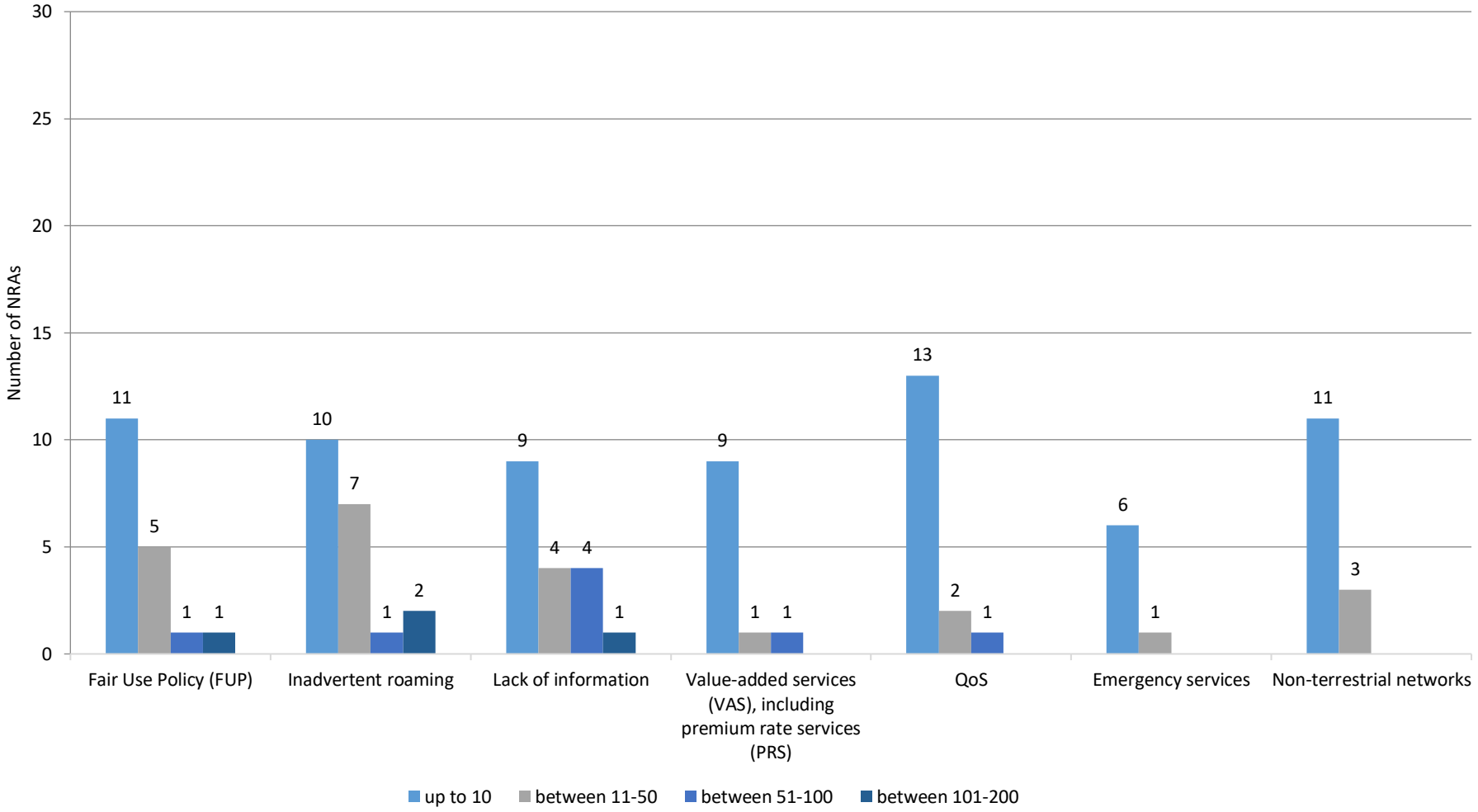


Figure 79 depicts the number of NRAs that received complaints on different issues within a certain range (up to 10 complaints, between 11-50 complaints, between 51-100 complaints or between 101-200 complaints).
AT: The number of complaints could not be attributed to individual complaint categories

Figure 80: Complaints from end users received by NRAs regarding FUP related issues (total number of respondents Q4 2021 – Q3 2022 = 29)

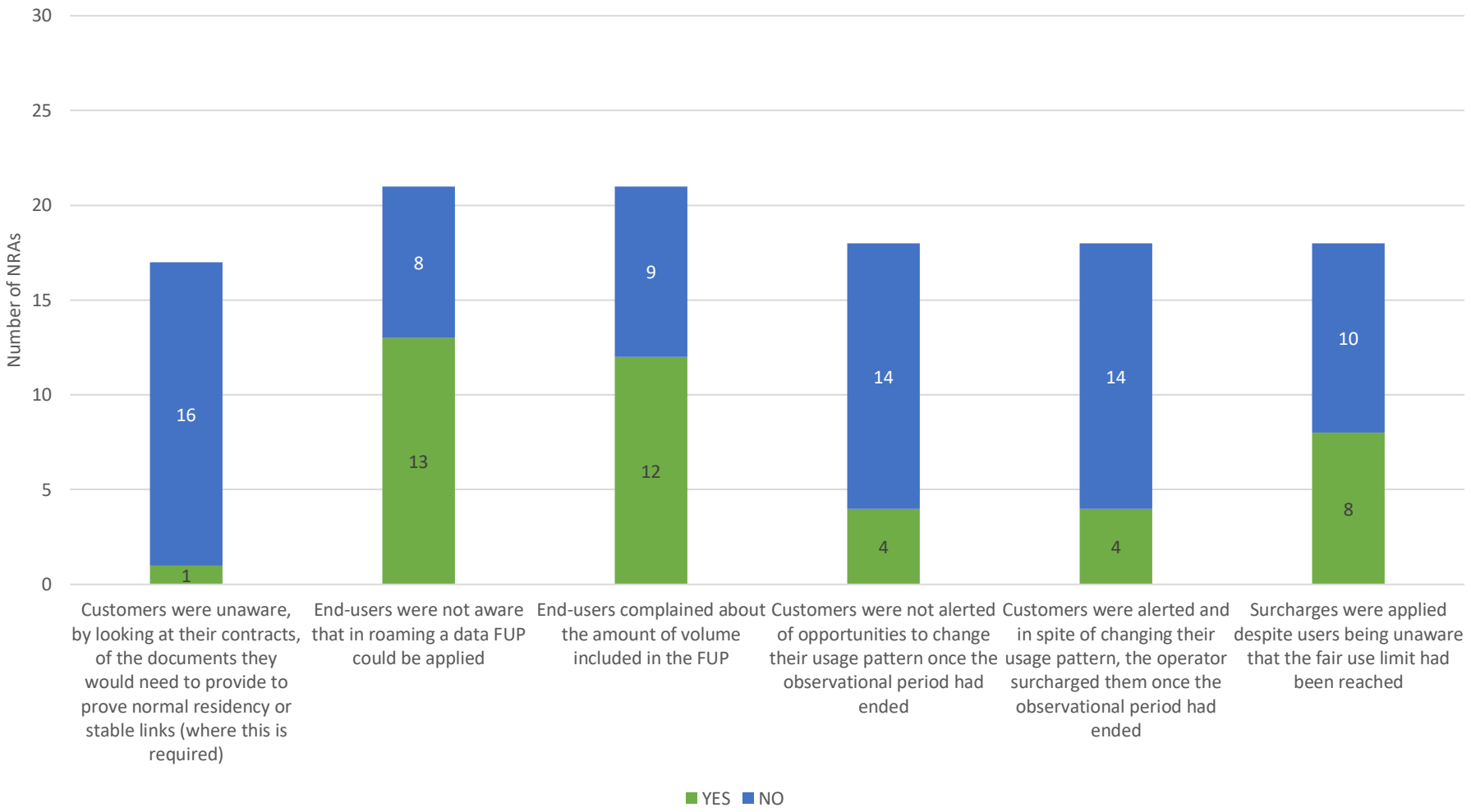


Figure 80 depicts the number of NRAs that received complaints on different FUP related issues.

Figure 81: Complaints from end users received by NRAs regarding inadvertent roaming (total number of respondents Q4 2021 – Q3 2022 = 29)

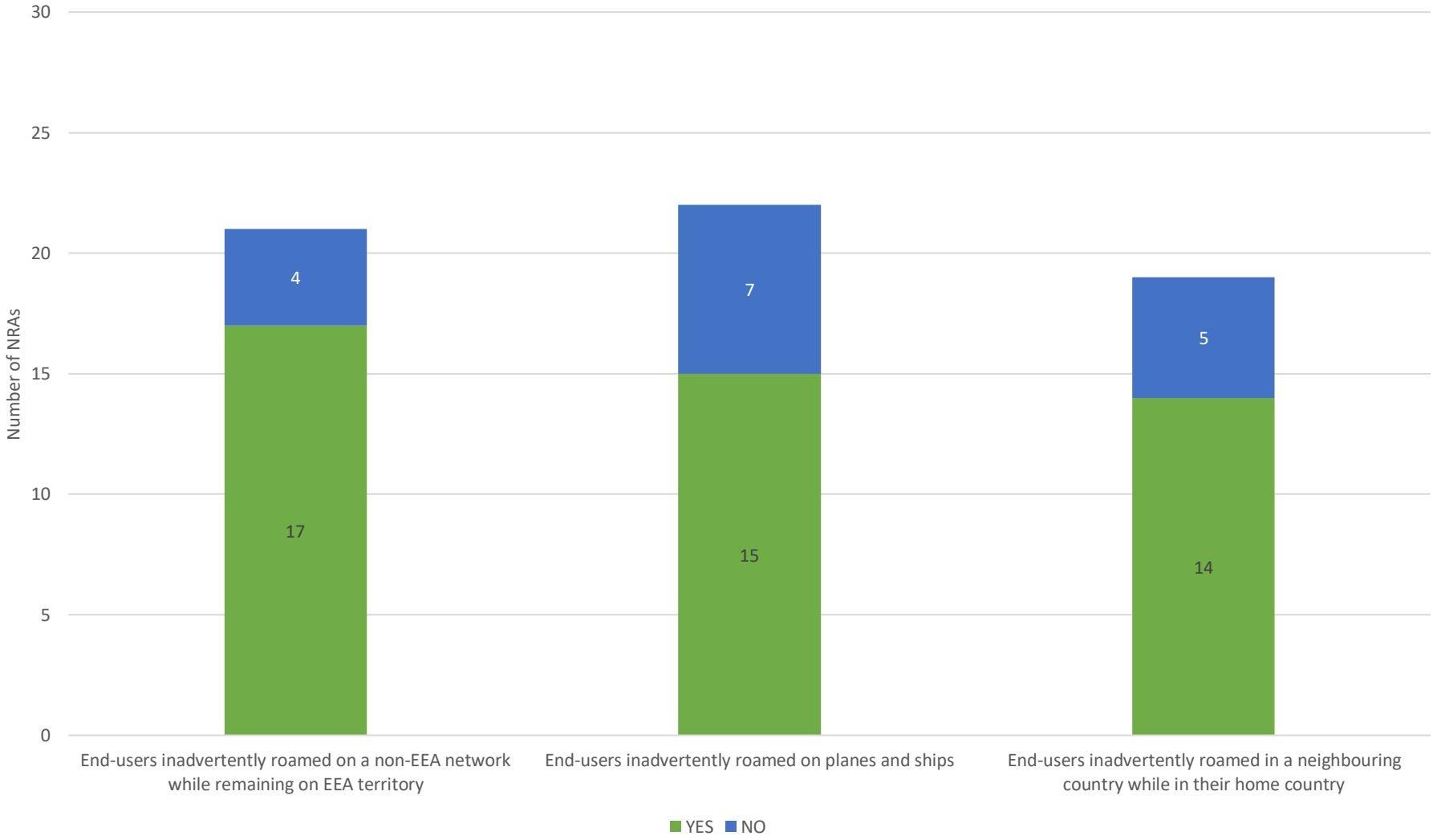


Figure 81 depicts the number of NRAs that received complaints regarding inadvertent roaming

Figure 82: Complaints from end users received by NRAs regarding a lack of information about tariffs and conditions (total number of respondents Q4 2021 – Q3 2022 = 29)

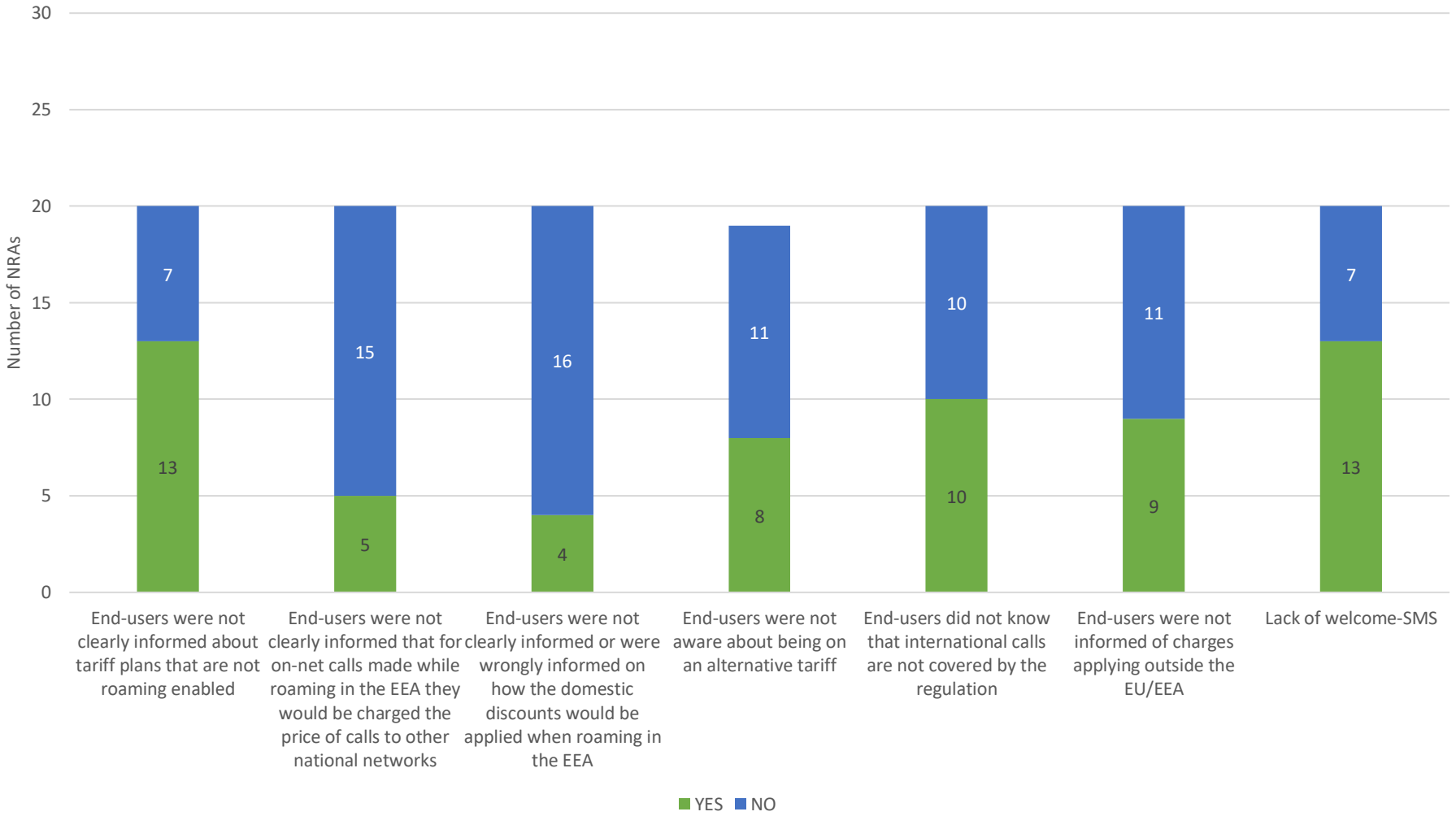


Figure 82 depicts the number of NRAs that received complaints regarding a lack of information about tariffs and conditions.

Figure 83: Complaints from end users received by NRAs regarding the application of RLAH tariffs (total number of respondents Q4 2021 – Q3 2022 = 29)

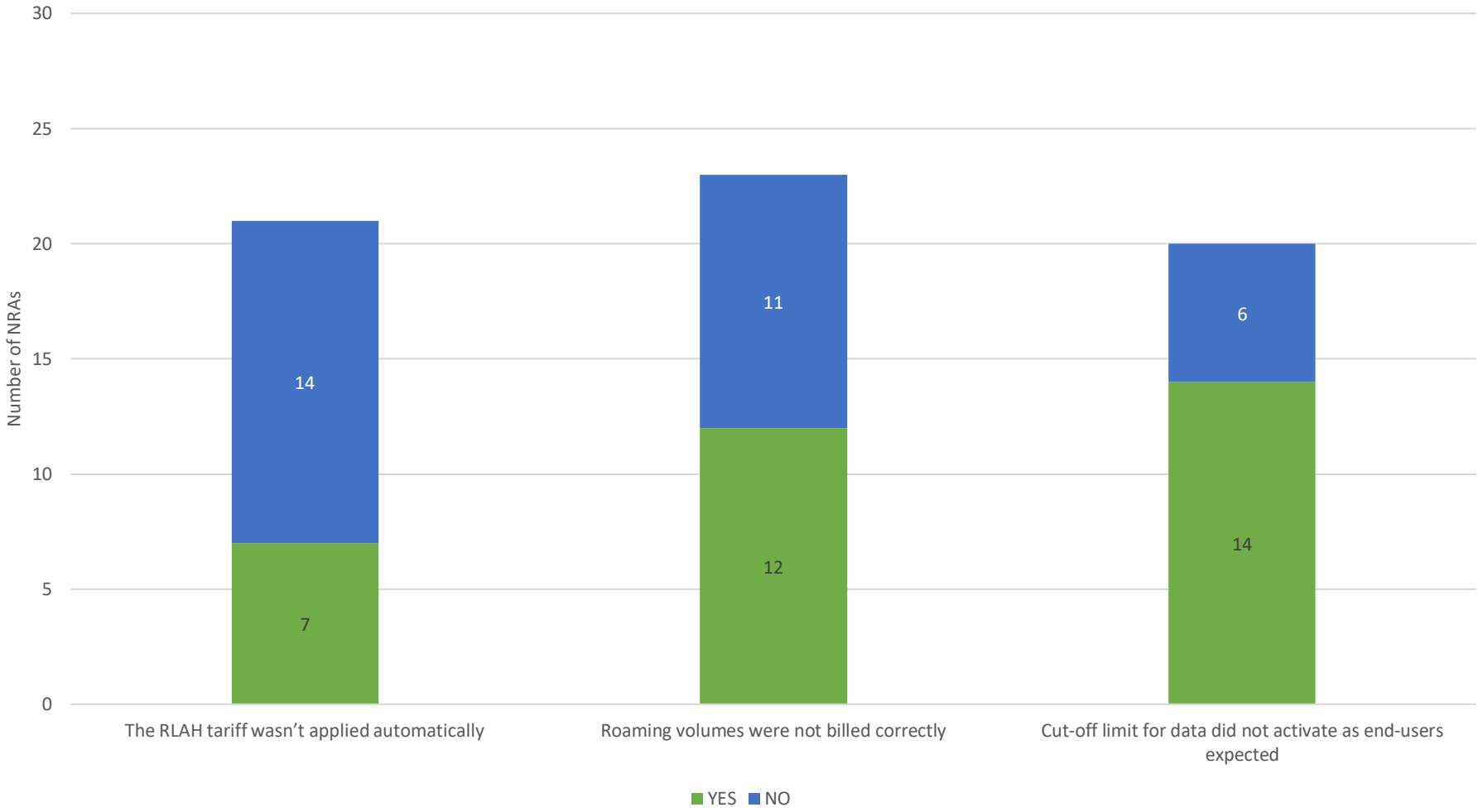


Figure 83 depicts the number of NRAs that received complaints regarding the application of RLAH tariffs.

Figure 84: Complaints from end users received by NRAs regarding VAS (total number of respondents Q4 2021 – Q3 2022 = 29)

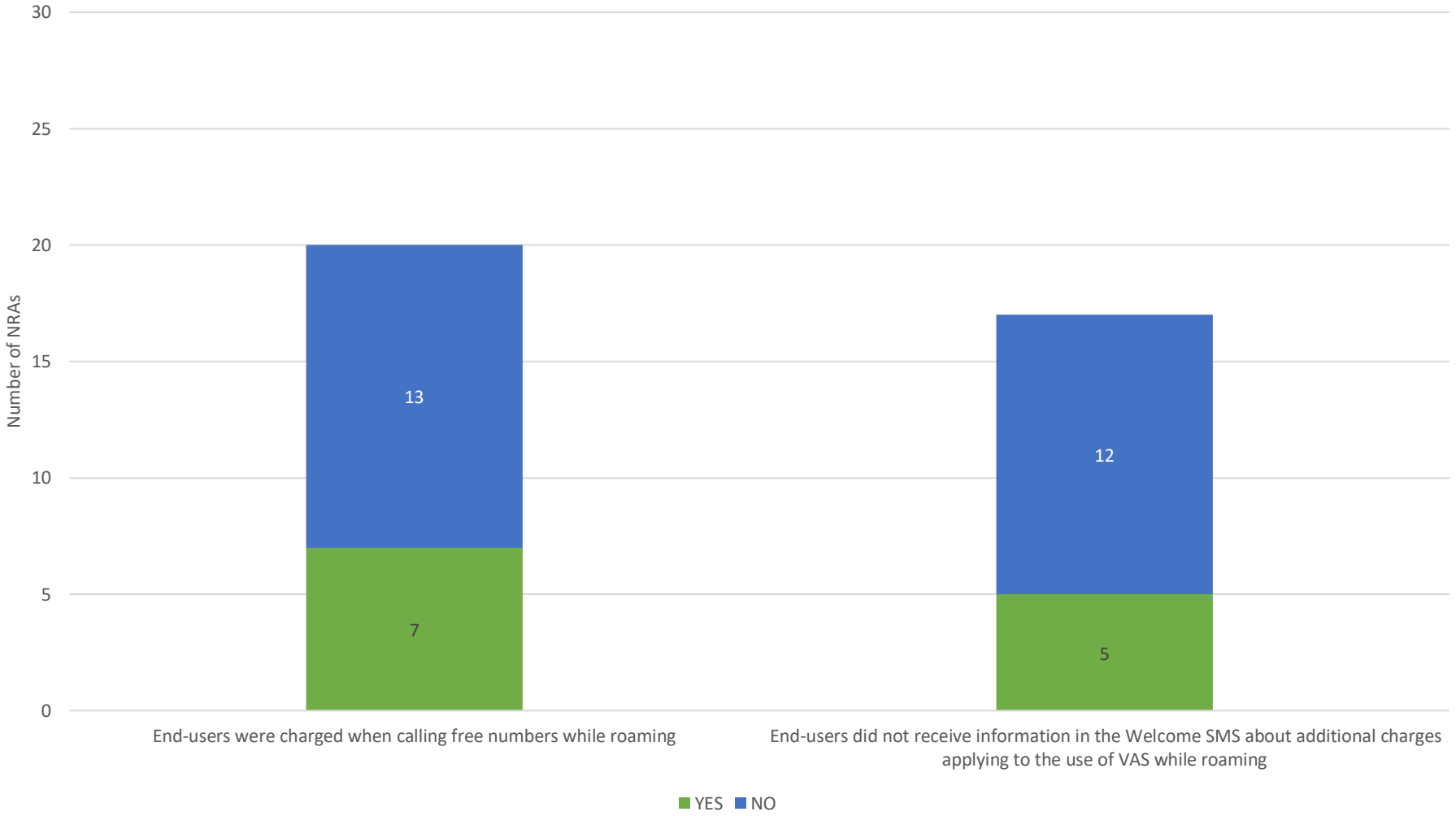


Figure 84 depicts the number of NRAs that received complaints regarding Value Added Services (VAS).

Figure 85: Complaints from end users received by NRAs regarding roaming on non-terrestrial networks (total number of respondents Q4 2021 – Q3 2022 = 29)

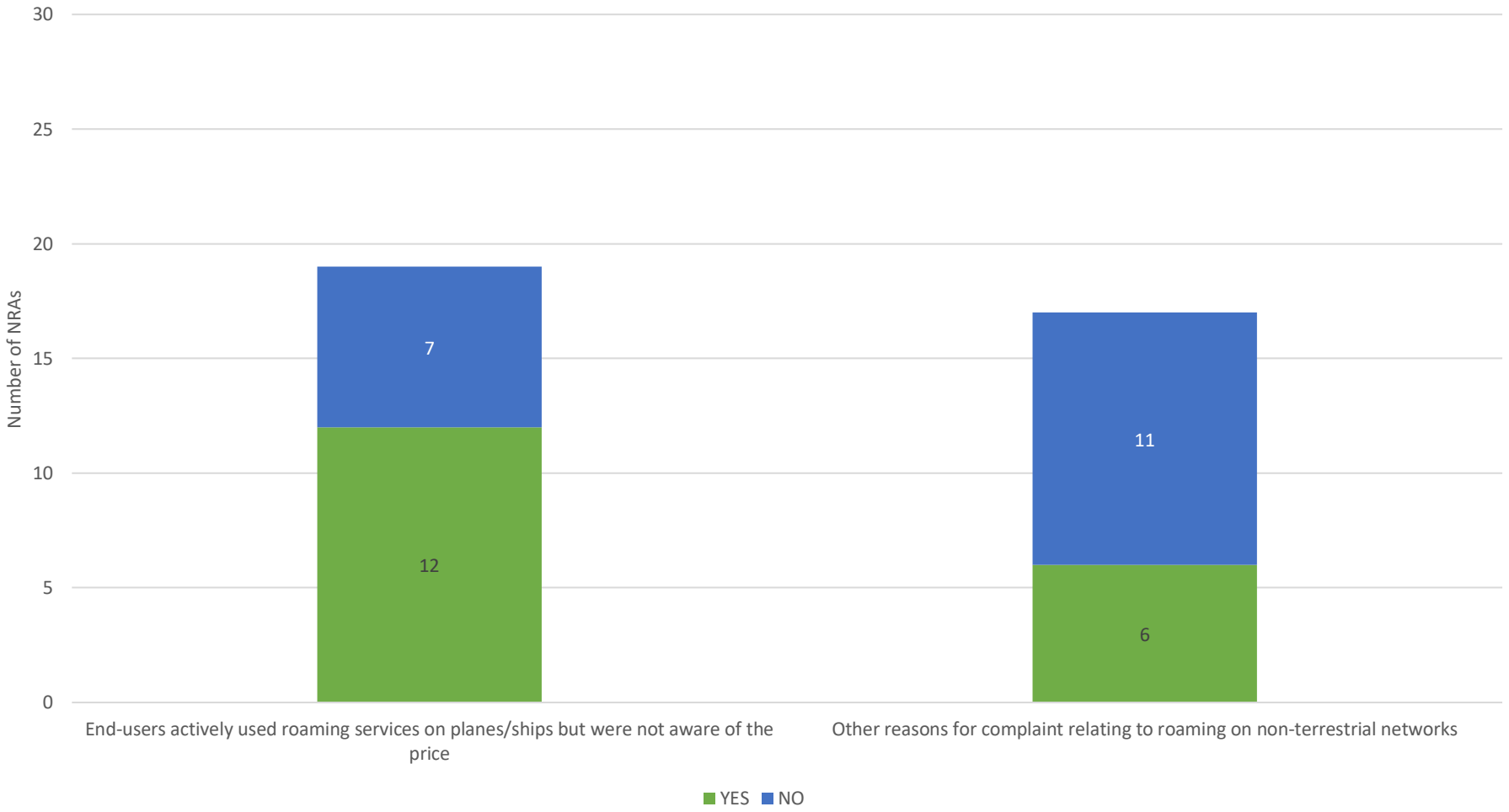


Figure 85 depicts the number of NRAs that received complaints regarding roaming on non-terrestrial networks.

Figure 86: Complaints from end users received by NRAs regarding QoS (total number of respondents Q4 2021 – Q3 2022 = 29)

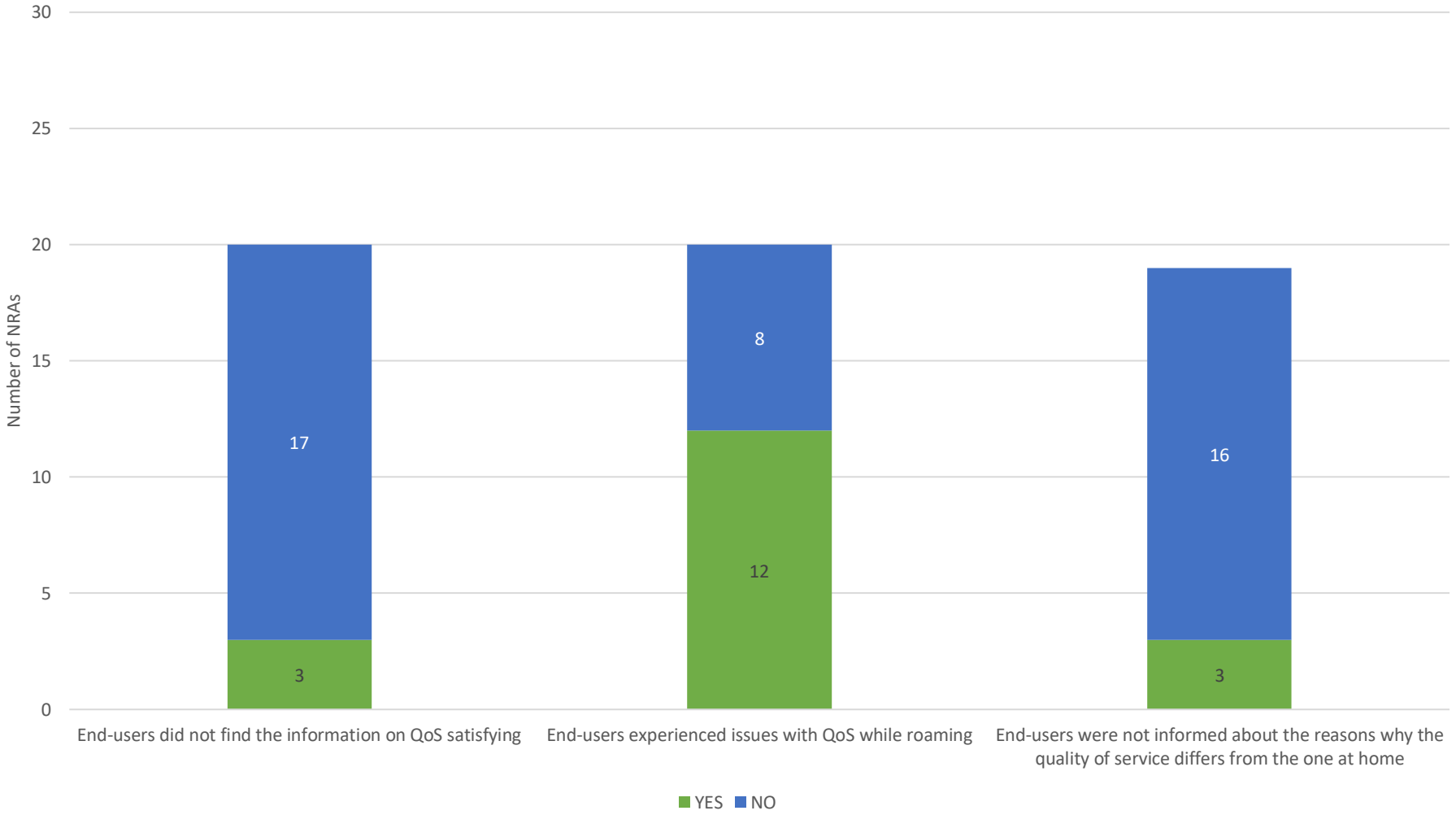


Figure 86 depicts the number of NRAs that received complaints regarding QoS related issues.

Figure 87: Complaints from end users received by NRAs regarding access to emergency services and other complaints (total number of respondents Q4 2021 – Q3 2022 = 29)

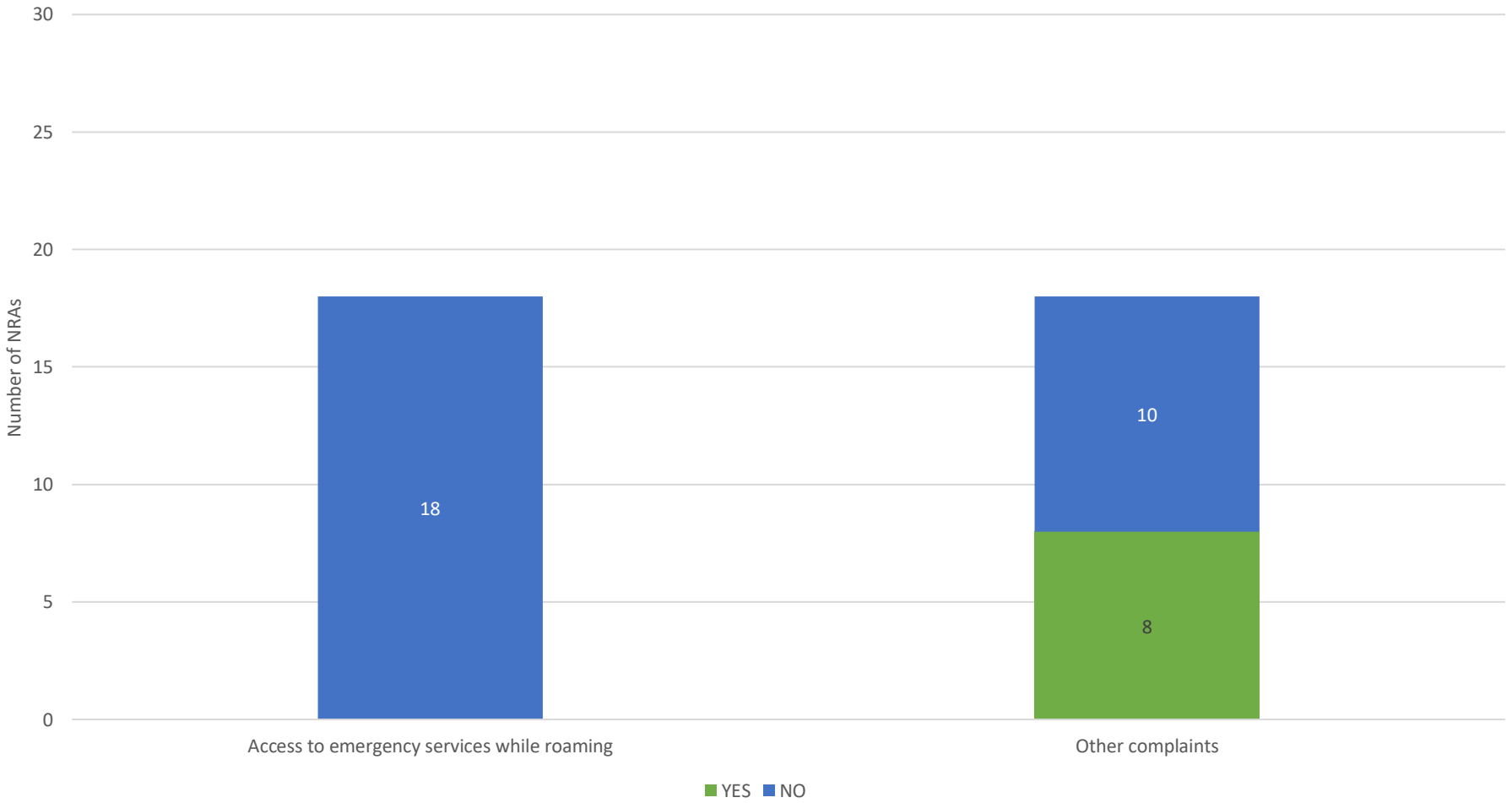


Figure 87 depicts the number of NRAs that received complaints regarding access to emergency services and other complaints that do not fall in to the previous categories.

Figure 88: Complaints received by NRAs from providers related to roaming at a wholesale level (total number of respondents Q4 2021 – Q3 2022 = 29)

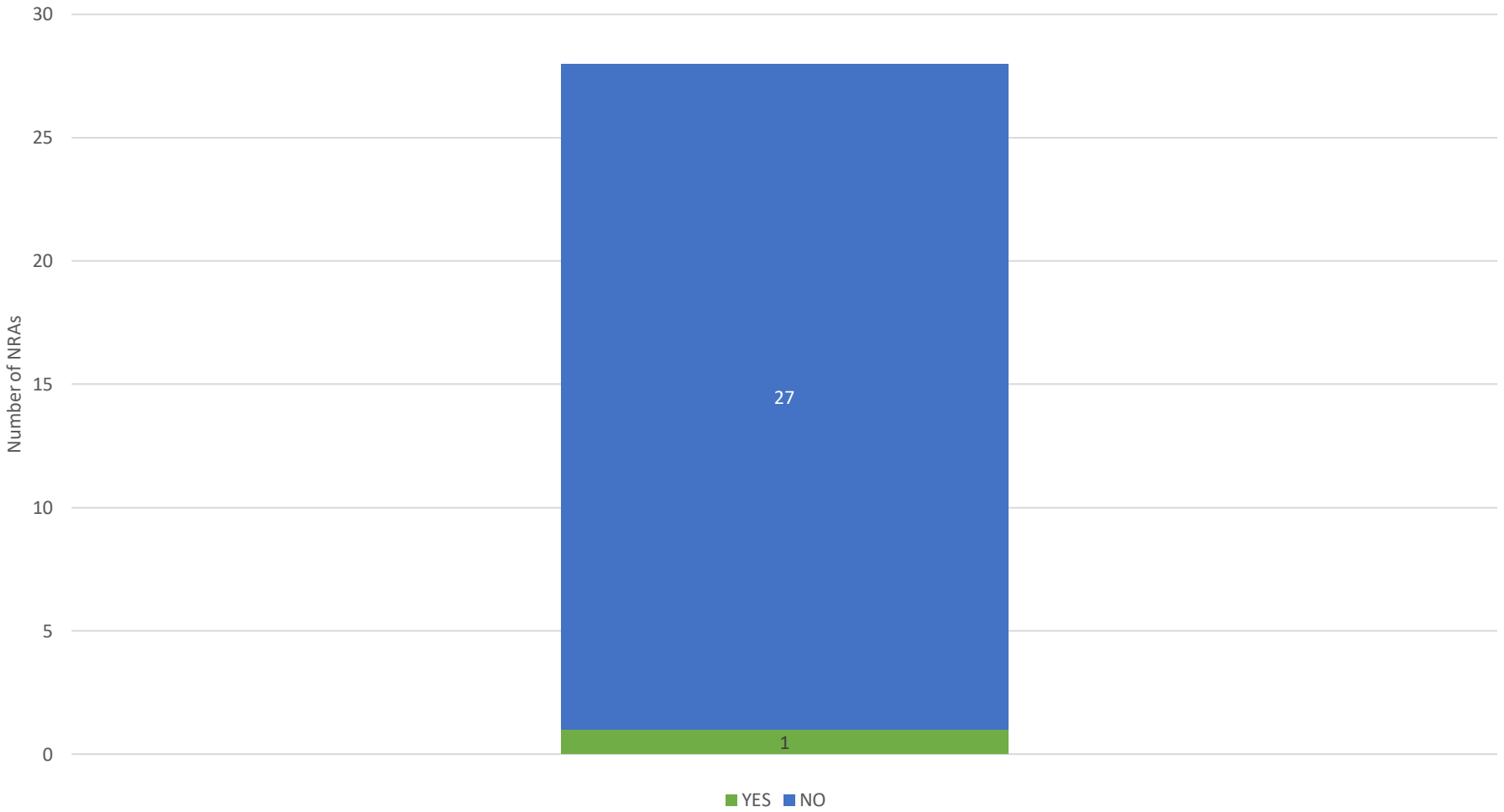


Figure 88 depicts the number of NRAs that received complaints from providers regarding roaming at a wholesale level.

5.6.14. Regulatory practice

Figure 89: NRAs sharing competences for parts of the Roaming Regulation with other competent authorities (total number of respondents Q4 2021 – Q3 2022 = 29)

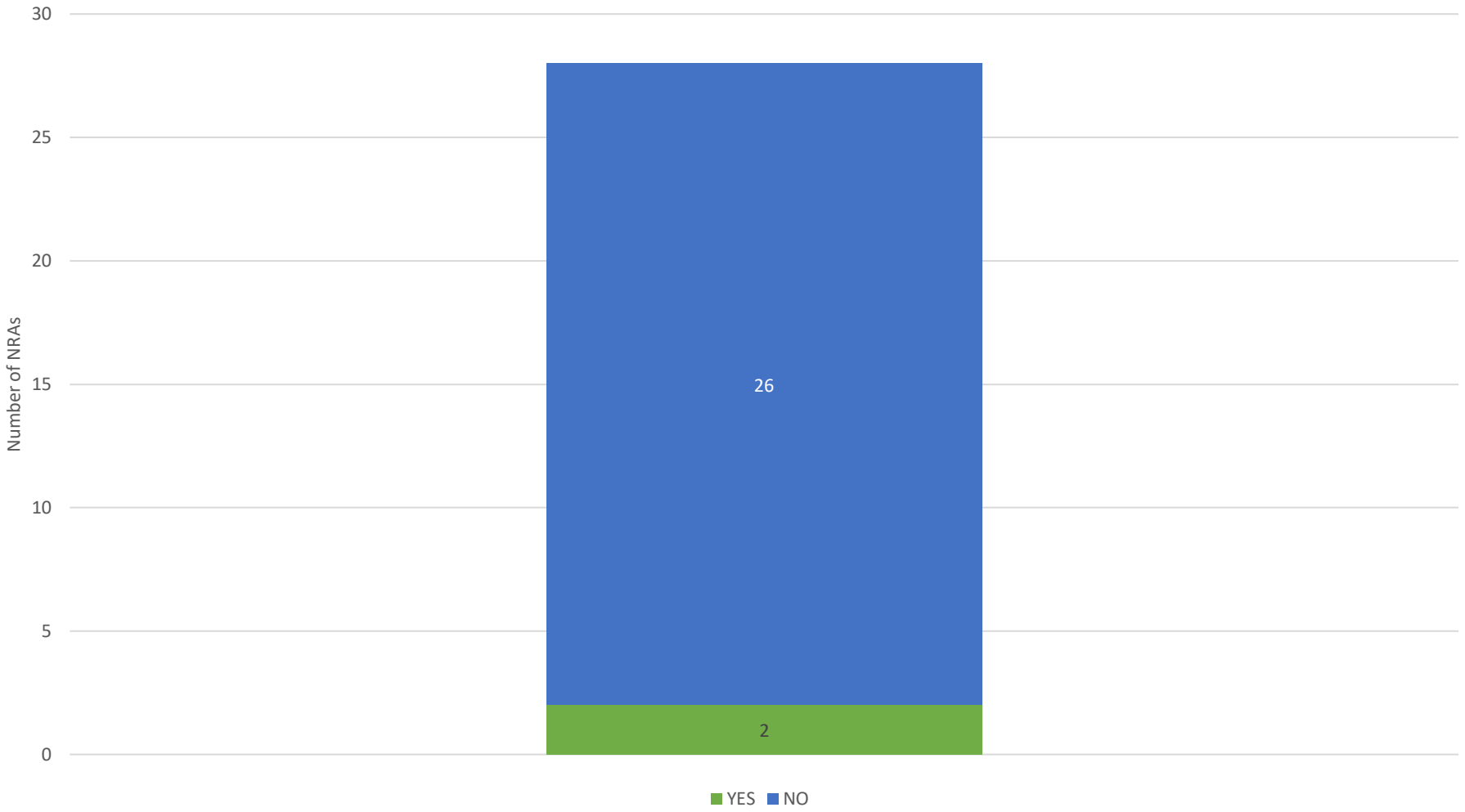


Figure 89 depicts the number of NRAs that share competences for parts of the Roaming Regulation with other competent authorities in their country

Annex I: Methodology for the data collection

Because of the broad scope and complexity of the new requirements stemming from the Roaming Regulation, new key indicators have been developed for the data collection. In addition, while the results are derived from the same questionnaire, the methodology used for some data from these new key indicators can differ between countries or roaming providers for a number of reasons. Particularly relevant are the following reasons:

- Differences in the methods used by roaming providers to allocate volumes for the different roaming services: comparability of data between different tariffs is affected by a number of reporting criteria, including roaming consumption from the volumes in the domestic mobile tariff plan (RLAH), the use of roaming services in excess of the limits of the FUP or if roaming is not periodic (RLAH+, non-compliance from abusive or anomalous usage);

- Difficulties in estimating the actual revenues for the roaming services and the mobile domestic services: as most of the roaming providers provide domestic bundled services, it is therefore difficult to allocate revenues to the different domestic individual services (e.g.: fixed voice, mobile, internet, TV);

- Difficulties in differentiating between domestic-only and intra-EEA: due to the introduction of Roam Like at Home rules, it has become difficult to determine the part of the domestic revenues only relative to intra-EEA roaming communications for these bundled tariff plans. For these tariffs, it is only possible to separate the revenues relative to the roaming surcharge applied (e.g. when the roaming Fair Use Policy is exceeded).

In consideration of these difficulties, the report made use of the following assumptions:

- all revenues resulting from bundles that include mobile services are allocated to domestic services regardless of whether the mobile service is provided in the domestic network (domestic service) or in a visited network (roaming service). Thus, the domestic revenues now include the intra-EEA roaming component from RLAH tariffs. Any other type of revenue (such as those originating from fixed telephone service or fixed internet service, sale of mobile devices, the initial one-time charge for a new/renewed subscription, subscription fees to other non-telecommunication services, etc.) should not be contained, despite the difficulties in allocating the revenues only relative to mobile services. Revenues from international mobile calls/SMS may also be included;

- the retail intra-EEA roaming revenues are only relative to the revenues resulting from the roaming surcharges (the domestic price component of the roaming service is excluded from the “retail intra-EEA roaming revenues)” and were included in the “Retail domestic revenues”).

While the measurement of balanced and unbalanced traffic should include volumes and revenues from all operators per country, such information is currently only available for a limited number of NRAs. For some countries, even if a data set is available, not all operators are included. The results related to the EEA average wholesale prices should be subject to

cautious interpretation, because some countries were not able to submit comparable data on balanced/unbalanced and total traffic.

Considering the aforementioned difficulties in obtaining reliable and comparable data, for some indicators, there is a limited number of countries which have opted for not supplying the data relative to those indicators. This is not at all unusual for a comprehensive data collection of this type. In most cases, the NRA was able to work with each roaming provider to resolve or alleviate the problem. In other cases, where system upgrades are necessary to comply with the new format of the data collection, the roaming provider was asked to provide the best possible estimate currently available and to complete upgrades in time to provide high quality data for the next data collection. Some NRAs expressed major data quality challenges as well as the use of different reporting systems by roaming providers.

At the wholesale level, roaming providers often receive discounts based on variables like volume of traffic, calculated at the end of a 12-month period. When providing data for these reports, roaming providers may estimate the effect of such discounts on data for each quarter. Because the actual discount may vary from the estimate, there may be an apparently 'anomalous' result for the quarter when the discount is actually applied. This should be kept in mind when comparing wholesale figures for different quarters in the same year.

In a few cases, the number of roaming providers changed, which may cause apparent changes in volumes and revenues between quarters. A list of contributing roaming providers is included in the Annex of each Report.

When wholesale prices are above the price caps, in most cases the reason is that the average price to comply with the Regulation is the annual price and not a quarterly one, and in such cases some quarters compensate for others. Another reason may also be inaccuracies in reporting for the data collection itself.

For ease of comparison, the euro is used throughout this Report. Within the EEA, currency fluctuations between the euro and other national currencies are likely to have affected the average prices reported for EEA countries outside the Eurozone.

Conversion of gigabytes to megabytes was done in line with Recital 17 of the Regulation (EU) 2017/920 of the European Parliament and of the Council of 17 May 2017 amending Regulation (EU) No 531/2012, which results in 1 gigabyte (GB) being equal to 1000 megabytes (MB). Operators may apply a different formula, which may slightly affect the accuracy of data.

All retail prices included in the charts exclude VAT. They are an average of prices paid by postpaid and prepaid tariff plan customers. All averages are based on actual minutes of voice calls or actual GB of data, unless expressly stated otherwise.

With regard to wholesale roaming resale access according to Article 3 (4) of the Roaming Regulation, MNOs may charge fair and reasonable prices for components not covered by paragraph 3. Prices may thus be higher than the price caps given in Article 7 (1), Article 9 (1) and Article 12 (1). Some data also include volumes and tariffs coming from roaming in non-EU countries in Europe. It should also be noted that the average wholesale roaming voice tariff for agreements applying Article 3 of the Roaming Regulation might be above the cap because the calculation is based on actual minutes (the Regulation permits to invoice 30 seconds for calls that are shorter).

The EU Roaming Regulation also applies to the EEA EFTA States Norway, Iceland and Liechtenstein and this Report includes indicators from Norway and Liechtenstein.

BEREC notes that some operators and NRAs with regard to the definition of the indicators for active SIM cards (prepaid, postpaid and corporate) misunderstood the definition. This issue mainly happened due to the new template and the new indicators introduced for the data collection. Unfortunately, BEREC within the deadlines could not solve this issue. This means, that some respondents did not report the corporate customers also under prepaid and postpaid SIM cards. This circumstance leads to misleading conclusions for some countries (increase of volumes per subscriber, ARRPUS, etc.), as the denominator for active SIM card was underestimated.

Specifically regarding data on connected objects/devices, it is worth mentioning that roaming providers may draw on different methodologies to differentiate between connected objects/devices and mobile subscribers. In addition, as permanent roaming is defined bilaterally by roaming providers during wholesale negotiations, the data provided for permanent roaming may refer to different types of usage.

As for the data previously included in the Transparency and Comparability Report, it is worth noting that a comparison of different years was introduced for the first time in this Report.

Annex II: Regulatory evolution

The ERG initially worked on the long-standing issue of high prices for international roaming services. Following its creation in January 2010, BEREC took over responsibility for this work from the ERG.

The 2007 Regulation

In 2005, the ERG undertook a study on international roaming that concluded that the EC Regulatory Framework did not provide the necessary tool-kit for NRAs to tackle the problems identified. The ERG wrote to the European Commission in December 2005 highlighting its concerns.

After significant debate, the first Regulation on international roaming services was published on 29 June 2007. The primary provisions capped wholesale and retail charges for voice calls under Eurotariff and set a number of transparency provisions to help ensure that consumers were well informed. The provisions of the Regulation entered into force at different times, with retail and transparency provisions taking full effect by the end of September 2007 and wholesale provisions calculated annually from the end of August 2007[14].

The 2009 amended Regulation

On 22 April 2009, the European Parliament (EP) adopted Regulation (EC) No. 544/2009 at first reading, with a view to amending Regulation (EC) No. 717/2007. Subsequently, on 8 June 2009, the Council of EU Telecoms Ministers formally adopted the new EU roaming rules approved by the European Parliament. The definitive text of Regulation (EC) No. 544/2009 was published in the Official Journal of the European Union on 29 June 2009.[15,16]

In particular, the Regulation introduced measures related to price regulation of voice and SMS roaming services at both retail and wholesale levels, and data roaming services at wholesale level, applicable from 1 July 2009 to 30 June 2012.

From July 2010 to June 2012, additional retail transparency measures to protect consumers from “bill shock” when using data roaming services were introduced.

The 2012 Regulation

On 30 May 2012 the Council of the European Union approved the International Roaming Regulation III,[17] which entered into force on 1 July 2012.[18]

The Regulation introduced the retail and wholesale roaming measures applicable from 1 July 2012, including wholesale and retail price regulation for voice, SMS and data roaming services, with wholesale caps for all roaming services and retail caps for data roaming services

[14] In Norway and Iceland the 2007 Regulation was in force from the end of 2007 to the 2nd quarter 2010.
[15] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:167:0012:0023:EN:PDF.
[16] From the 3rd quarter 2009 to the 1st quarter 2010, Regulation 544/2009 applied in the EU while the first Roaming Regulation (EC) No. 717/2007 remained in force in Norway, Iceland and Liechtenstein, with slightly higher voice caps, no SMS caps and no wholesale data cap.
[17] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:172:0010:0035:EN:PDF.
[18] With regard to the EEA EFTA countries, it must be noted that the Roaming Regulation applies in these countries as from 7 December (Norway and Liechtenstein) and 21 December (Iceland) 2012.

decreasing on an annual basis. In addition, the obligation for mobile network operators (MNOs) to meet all reasonable requests for wholesale roaming access was introduced and the safeguard mechanisms were extended.

The 2012 Regulation as amended by Regulation (EU) No. 2120/2015

On 3 April 2014, the European Parliament took up the position, within the framework of the procedure for the adoption of a Regulation for a European Single Market for Electronic Communications (TSM Regulation), to abolish retail roaming surcharges in order to allow customers to "Roam Like at Home" (RLAH) with a fair use limit.

Regulation (EU) No. 2015/2120,[19] adopted by the European Parliament on 27 October 2015 and published in the Official Journal of 26 November 2015, includes amendments to Roaming Regulation No. 531/2012,[20] the main one being the principle of Roam Like At Home, i.e. requiring roaming providers not to levy any surcharge in addition to the domestic retail price on roaming customers as of 15 June 2017 (RLAH tariffs).

However, there are several cases where the roaming provider is allowed to apply surcharges and the possibility for a roaming provider to apply for authorisation to apply a surcharge was created. Furthermore, similar to the provisions set out in the third Roaming Regulation, roaming providers can also offer alternative roaming tariffs as an alternative to RLAH and customers may deliberately choose those alternative tariffs.

It should further be mentioned that the Roaming Regulation also established a transitional period, from the 30 April 2016 to 14 June 2017, where operators could apply a surcharge in addition to the domestic price for the provision of retail roaming regulated services.

The amendments to the Roaming Regulation resulted in an update of the BEREC Benchmark Report, which from this period onwards included indicators on volumes and revenues for RLAH, RLAH+ (non-compliance with/exceeding the FUP), RLAH+ (derogation) and alternative tariffs offered by operators.

The 2012 Regulation as amended by Regulation (EU) No. 2017/920

Regulation (EU) No. 2017/920[21] adopted by the European Parliament on 17 May 2017 and published in the Official Journal of 9 June 2017 includes amendments to Roaming Regulation No. 531/2012,[22] the main one regarding new wholesale prices for voice, SMS and data services that entered into force on 15 June 2017. Also, its amendments included new provisions for wholesale agreements to prevent permanent roaming and the requirement to collect data about the evolution of actual wholesale roaming rates for unbalanced traffic between providers of roaming services, and on the relationship between retail prices, wholesale charges and wholesale costs for roaming services.

The amendments to the Roaming Regulation resulted in an update of the BEREC Benchmark Report, and from that period onwards, the Report included the lowest charged as proxy wholesale costs for roaming services and those new clauses to prevent permanent roaming

[19] Available at: http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32015R2120.
[20] Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012R0531.
[21] Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32017R0920.
[22] Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012R0531.

introduced in the roaming wholesale agreements. In 2019, an additional section in the questionnaire was introduced which requested data on roaming for connected objects/devices.

Recast of the Roaming Regulation by Regulation (EU) 2022/612

To further reduce the burden of MVNOs and roaming providers in outbound roaming countries, the price regulation of roaming services was extended and a glide path was introduced to further reduce the caps for voice, SMS and data roaming services.

In addition to confirming the measures contained in the previous Roaming Regulation, the 2022 Roaming Regulation on the one hand extended the transparency measures aiming by requiring roaming providers to inform end users when roaming on non-terrestrial networks, as well as including information on potential additional charges which can be incurred when using value-added services. Additionally, the requirement was introduced to offer the same QoS to roaming subscribers as available to them at home, provided the network technologies and generations necessary to do so are available in visited country. Finally, a requirement to provide information about local options in the Welcome SMS was added due to the lack of harmonisation of means of access to emergency services for disabled end users,

With the recast of the Roaming Regulation, the roaming data collection also underwent several changes. In particular, the previously separate International Roaming Benchmark Report (IRBMK) and the Transparency and Comparability Report (TACR) were merged into one report. With regard to the data previously collected for the IRBMK, the distinction between group and non-group wholesale roaming volumes and revenues, billed RoW minutes, local break-out, and roaming volumes on a per-country basis were removed from the scope of the data collection.

In accordance with the requirements of the Roaming Regulation, new indicators were added for corporate subscribers (in addition to prepaid and postpaid subscribers), wholesale volumes and revenues on trading platforms, and retail revenues as well as wholesale volumes and revenues for roaming on non-terrestrial networks. The data on non-terrestrial wholesale charges per unit were included in this report. Other criteria will be included from the next report onwards.

In addition, one section to be completed on a voluntary basis was introduced to allow for monitoring roaming developments in the Western Balkan region. The data provided for this section may be published in the future.

With regard to the data previously collected for the TACR, new sections were added regarding transparency measures on the wholesale level, and the offer of 5G roaming services was requested at a more detailed, country-specific level. Additional questions were introduced regarding, amongst other things, financial cut-off limits, fair use policies, and wholesale offers for connected objects/devices. The questionnaire circulated among NRAs no longer requested data on the availability of information available to end users on the websites of NRAs and on information facilitating the comparison of tariffs. Instead, a section on regulatory practice as well as a section on provider complaints were added.

Annex III: List of respondents

Operators that provided data for the period 1 April 2021 – 30 September 2021:

Austria
A1 Telekom Austria
Cubic Telecom
HoT Telekom
Hutchison 3G Austria
Kabelplus
LTK
Lycamobile
Mass Response
MTEL
Porsche Smart Mobility
RTK
Russmedia
T-Mobile Austria
Vectone Mobile

Belgium
Proximus
Telenet Group
Orange Belgium
Voo
Mobile Vikings

Bulgaria
Vivacom Bulgaria
Yettel Bulgaria
A1 Bulgaria

Croatia
Hrvatski Telekom
A1 Hrvatska
Telemach

Cyprus
Cablenet
Cyta
EPIC
Primetel

Czech Republic
O2 Family
ČEZ Prodej

O2 Czech Republic
Tesco Mobile ČR
T-Mobile Czech Republic
Vodafone Czech Republic
SAZKAmobil

Denmark
Hi3G Denmark
Nuuday
Telenor
TeliaDanmark

Estonia
AS EMT
Elisa Eesti
TELE 2 Eesti

Finland
DNA
Elisa Corporation
Telia Finland

France
Coriolis
Bouygues Telecom
Bouygues Telecom Business Distribution
Free Mobile
La Poste Mobile
Lycamobile
Orange Caraïbe
Orange France
SFR
SRR

Germany
Telekom Deutschland GmbH
Telefónica Germany GmbH & Co. OHG
Vodafone GmbH
1&1
Freenet
Lycamobile

Greece
COSMOTE Mobile
Vodafone Panafon

Wind HellasTelecommunications

Hungary
Yettel Magyarország Zrt.
Magyar Telekom Nyrt.
Vodafone Magyarország Zrt.
Digi Kft.

Ireland
Eircom Limited
Hutchison 3G Ireland
Lycamobile Ireland Limited
Tesco Mobile Ireland
Vodafone Ireland
Virgin Media Ireland Limited

Italy
Digi Italy
ERG Mobile
Illiad
Fastweb
Tre (Windtre)
Kena Mobile
Lycamobile
Nextus
Noitel
Optima
Poste Pay
Tim
Tiscali
Vodafone
Wind (Windtre)

Latvia
Bite Latvia
LatvijasMobilaisTelefons
Tele2

Liechtenstein
Salt (Liechtenstein)
Telecom Liechtenstein
Swisscom (Schweiz)

Lithuania
Bite Lietuva
Eurocom
Telia Lietuva
Tele2

Teledema

Luxembourg
POST
Proximus Luxembourg
Orange Communications Luxembourg

Malta
Melita Mobile,
Mobisle Communications (GO Mobile)
Epic Communications Ltd Malta

Netherlands
KPN
Lebara
Lycamobile Distribution
Tele2 Netherlands
T-Mobile Netherlands
Vodafone Libertel

Norway
Ice
Fjordkraft
Lycamobile
Telenor
Telia Norge

Poland
P4
Polkomtel
T-Mobile Polska
Orange Polska
Lycamobile
Premium Mobile

Portugal
NOS Comunicações, S.A.
MEO – Serviços de Comunicações e Multimédia, S.A.
Vodafone Portugal – Comunicações Pessoais, S.A.
NOWO Communications, S.A.
Lycamobile Portugal, Lda

Romania
Orange Romania Communications
RCS&RDS
Vodafone Romania

Lycamobile
Telekom Romania Mobile Communications
Orange Romania

Slovak Republic
O2 Slovakia
Orange Slovensko
Slovak Telekom
SWAN

Slovenia
TELEKOM SLOVENIJE, D.D.
A1 Slovenija d.d.
TELEMACH D.O.O.
T-2 d.o.o.
IZI mobil, d.d.
HOT mobil, telekomunikacije in storitve d.o.o.
Mega M d.o.o.
SoftNET d.o.o.

Spain
Digi Spain Telecom, S. L.
Euskaltel, S. A.
Orange Espagne, S. A. Unipersonal
Telefónica Móviles de España, S. A. Unipersonal
Vodafone Espana, S. A. Unipersonal
Xfera Móviles, S. A. Unipersonal (Yoigo)

Sweden
Hi3G Access
Telenor Sverige
Telia Company
Tele2 Sverige