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BEREC input on EC's request for expert views on Regulation (EU) 2022/612 on roaming on public mobile communications networks within the Union

28 March 2025

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Executive summary and main findings

The Body of European Regulators for Electronic Communications (BEREC) is submitting its response to the European Commission's (EC) request for expert views on Regulation (EU) 2022/612 on roaming on public mobile communications networks within the Union ('Roaming Regulation'), in the context of the forthcoming 2025 Review Report. Depending on the conclusions of this review, the European Commission (EC) may undertake an impact assessment and a proposal for an amended Roaming Regulation.

BEREC's input is based on responses gathered through a BEREC survey among stakeholders and National Regulatory Authorities (NRAs) in the European Economic Area (EEA) during the summer of 2024. Additionally, BEREC has utilized data from the *BEREC International Roaming Data Benchmark Report*, compiled annually to provide a comprehensive dataset from operators and NRAs on relevant market developments.

The first part of the executive summary summarises BEREC's assessment of the Roaming Regulation, and the second part includes suggestions for amendments.

Assessment of the Roaming Regulation

BEREC's assessment confirms its previous conclusions that the Roaming Regulation and the implementation of Roam Like at Home (RLAH) has proved to be a clear success in delivering substantial benefits to end users and has been a substantial contribution to the further completion of the single market. Compliance with the Roaming Regulation has been high since its inception, leading to immediate benefits for end users through RLAH. Despite the technological advancements, the need for connectivity and transparency remains essential.

Responses to BEREC's survey indicate that stakeholders, including Mobile Network Operators (MNOs), Mobile Virtual Network Operators (MVNOs), consumer organisations, and regulatory authorities, believe that the Roaming Regulation has effectively achieved its objectives from an end-user perspective. This is also substantiated by the number of complaints received by end users, which is fairly low over time and focused mainly on Rest of World (RoW) roaming. Furthermore, a significant number of operators expressed the view that the introduction of more stringent measures would not be justified, as the existing RLAH obligations, complemented by the Fair Use Policy (FUP), have proven to be effective. However, MVNOs reported concerns regarding the increasing financial losses attributed to the current roaming rules, highlighting the limited effectiveness of the sustainability mechanism in mitigating these challenges.

As regards to the **impact of RLAH on domestic markets** and prices, BEREC can conclude that seven years after the introduction of RLAH, no indications of waterbed effects could be observed. While effects are challenging to measure due to sector complexity and volatility of the sector, the Commission's study[1] on fixed and mobile broadband services indicates that there is a decreasing trend in domestic prices. And even if in some cases, according to BEREC's analysis, average retail revenues per unit (ARRPU) have slightly increased, this cannot be directly attributed to RLAH, but rather to factors such as inflation, spectrum

[1] https://digital-strategy.ec.europa.eu/en/library/mobile-and-fixed-broadband-prices-europe-2022

allocation, national competition, and network rollout. Also, the number of domestic-only subscribers throughout the EEA remains low. Furthermore, BEREC and NRAs have found no evidence of mobile providers exiting the market due to the Roaming Regulation obligations.

With regard to the **retail roaming market**, BEREC's analysis shows a decline in average roaming consumption per roaming subscriber for 2019-2024 (Q1-Q3) for calls made, while an upward trend in mobile data roaming consumption is visible. This trend is consistent with the broader patterns observed in the consumption for these services at domestic level. In addition, BEREC's data indicates that the current FUP measures effectively address the consumption needs of end users travelling in the EEA as only a small share of the total roaming volumes (2.5 % at the most for calls made and 4.7 % at the most for data roaming services for the period Q2 2021 – Q3 2024) are surcharged due to exceeding the FUP, while they are also an essential mechanism for operators against abusive and anomalous usage. Thus, BEREC can conclude that the FUP measures are only relevant for exceptional usage and impact only a small minority of volumes consumed by roaming subscribers, which underscores their effectiveness. However, roaming providers have highlighted the complexities and challenges of implementing various FUP measures such as prepaid mobile plans and the control mechanisms.

To allow all operators to provide RLAH on a sustainable basis, the Roaming Regulation foresees the possibility for a **derogation mechanism**. BEREC's data shows that the number of derogations has steadily declined and only a limited number of MVNOs have made use of this possibility in 2024. One of the reasons for the decline may be because of the further reduction of the wholesale caps (particularly for data). Another reason could be due to the limited effectiveness of the sustainability derogation mechanism in certain circumstances. For example, retail operators applying for a sustainability derogation (e.g., MVNOs) could expose themselves to competitive disadvantage on retail markets by applying higher retail prices for EEA roaming compared to direct competitors who do not need the derogation (e.g., because the latter have the ability to negotiate wholesale prices well below the wholesale caps).

In consideration of the market trends identified and the responses gathered through the call for input, BEREC acknowledges that both mechanisms, FUP and sustainability, have been instrumental and remain necessary for the functioning of RLAH. However, BEREC believes there is room for some simplifications in these mechanisms.

The Roaming Regulation in 2022 also introduced new requirements about **Quality of Service** (QoS), which BEREC deems effective based on low rates of end-user complaints despite some issues reported (only 3 % of all customers complaints are about QoS while roaming). Nevertheless, several factors impact QoS and user experience while roaming, which is also reflected in a recent EC Eurobarometer survey on roaming[2] (July 2023). According to this survey, 80 % of respondents stated that they were able to use their mobile phone in the same manner and with the same frequency as in their home country but 27 % reported experiencing slower internet speeds. At the same time, 26 % noted a lower broadband network standard, which is expected, given the varying degree of 4G/5G availability throughout the EEA. On the wholesale level, compliance with the obligations seems to be high, as no disputes concerning

[2] https://europa.eu/eurobarometer/surveys/detail/2958

QoS between roaming providers (access seekers and access providers) have been reported. **BEREC** considers that the QoS obligations introduced in the Roaming Regulation are a fundamental pillar of the *RLAH* principle, constituting an essential element in empowering end users and fostering the development of the internal telecommunications market. Consequently, BEREC supports maintaining the current obligations without modification.

The 2022 Roaming Regulation also introduced numerous additional transparency requirements to the existing framework. The content of the welcome message has been significantly extended, which may undermine the objective of providing information in a clear and effective manner to the customers. As a result, users may not fully engage with the information delivered, particularly regarding value added services (VAS) and alternative means of accessing emergency communications services (which does not directly rely on operators). Furthermore, it seems that operators give divergent interpretations to the transparency obligations on VAS. Some operators, instead of creating a dedicated page on their web sites, choose to refer to the BEREC database, which saves them from costly developments. A clarification of the relevant provisions would help to ensure the uniform application of the rules. Regarding the means of access to emergency communications services, BEREC shares the view that transparency information should focus exclusively to the single European emergency number '112', as this is the number that should be and actually is predominantly being used in emergency situations. Alternative means of access should focus on other means (e.g., apps designed for users with disabilities) and not for calling services that provide similar services to 112. Regarding roaming services to non-terrestrial networks and to networks outside the EEA, the cut-off limit and the application of the financial or volume limit are efficient and effective measures to prevent bill shocks, although according to the operators' internal statistics, the 100 euro cut-off limit has been rarely used.

In the wholesale roaming market, BEREC observes that, during the period of analysis, the average wholesale rates follow a continuous decreasing trend and remain below the regulated wholesale caps. However, the gap between the actual charged prices and the caps has been narrowing. While average wholesale rates continue to decline and remain well below the regulated wholesale caps, BEREC notes that MVNOs do not seem to benefit from these negotiated prices. BEREC is convinced that the caps remain important and should be set to take into account actual production costs in an efficient and well-maintained mobile network as well as an additional margin for commercial negotiations between operators, as foreseen in the current Roaming Regulation. Regarding the situation for MVNOs, as described in previous opinions (2019[3] and 2021[4]), BEREC has identified that MVNOs face competitive disadvantages when providing RLAH for their customers. A key reason is that MVNOs do not own the network they use and must rely on MNOs for both national traffic and international roaming. In addition, given their generally smaller size, MVNOs also lack countervailing buying power. Previous findings indicate that many MVNOs are not able to negotiate wholesale prices below the level of the regulated wholesale caps. In most cases, they rely on wholesale roaming resale and are paying a significant mark-up to their host providers. So, MNOs selling wholesale resale roaming voice minutes for example have had a yearly gross margin from around 23 % to 36 % over the period examined (2019-2024). The increasing use of data

[3] BEREC opinion on the functioning of the roaming market as input to EC evaluation (europa.eu)
[4] BEREC Opinion on the proposal of the Commission for amending the Roaming Regulation (europa.eu)

roaming exacerbates the situation for MVNOs. BEREC also acknowledges that the sustainability mechanism (derogation) stipulated in the Roaming Regulation does not fully remedy the competitive disadvantages for MVNOs. The sustainability derogation mechanism addresses the symptoms of an underlying problem at the wholesale level; however, it does not address the problem itself. Moreover, it should be also noted that lower wholesale caps would mean that operators have to offer higher data volumes in case of open data bundles, which again might lead to sustainability problems.

BEREC's opinion also analyses the market developments for **machine-to-machine (M2M)/ Internet of Things (IoT) connectivity** when roaming. Based on the findings of the 2024 relevant BEREC Report, BEREC concludes that in light of the current situation of the market no further regulatory measures should be taken as regards permanent roaming and M2M/IoT services. However, BEREC emphasized the importance of monitoring market trends for these services.

BEREC also examined the **technological developments** and their impact on traditional roaming services. With the information available, BEREC considers that the various technologies that could aspire to be substitutes for roaming services in the market, in practice are seen as complementary or specific to projects with well-defined terminal characteristics. The main alternative that puts pressure on operators is the commercialisation of travel eSIMs, but currently they are mostly used for RoW roaming.

BEREC also reviewed the monitoring obligations and practices and concludes that NRAs' and BEREC's practices are effective for monitoring and ensuring a harmonised implementation of the Regulation.

BEREC considers that the findings presented generally demonstrate a high level of compliance with the Roaming Regulation and effective obligations, which ensure high consumer benefits. Nevertheless, BEREC proposes a few, targeted amendments to the Roaming Regulation and the Commission Implementing Regulation that should further clarify the Regulation, simplify the obligations or further improve the competitive situation for MVNOs. BEREC also sees some room for introducing further safeguard rules for RoW and non-terrestrial networks roaming as end users are sometimes unprotected from high charges. However, BEREC would like to note, that any amendment or modification should be approached with caution. Even if BEREC finds room for improvements and simplifications, it is equally important to carefully weigh the investments already made by operators to implement certain provisions before introducing any changes. The following proposals are structured according to the relevant motivation.

<u>Suggestions for amendments</u>

Amendments to simplify and further clarify the Regulation

- FUP provisions:
    - Open data bundle: Considering a further reduction of wholesale caps, the formula used to calculate the fair use volume of data roaming allowances may be revised to moderate the pace of increase in such allowances. This adjustment would ensure an economically sound approach to preserving the

long-term financial sustainability of operators. Furthermore, BEREC recommends that the data roaming allowance should at most correspond to the total data volume included in the customer's domestic offer. Furthermore, BEREC makes a suggestion with regard to the maximum wholesale charges in currencies other than euro. In particular, for currencies other than the euro, the maximum charges are subject to an annual revision starting from 2023, based on the average of the reference exchange rates published on three specified dates in the Official Journal of the European Union. These annually adjusted limits for non-euro currencies take effect from 15 May. Conversely, reductions in the maximum regulated wholesale charges (denominated in euro) come into effect from 1 January. To enhance consistency and streamline the derivation of the fair use allowance adjustments, BEREC recommends aligning both dates to 1 January.

- Control mechanism: The FUP control mechanism is generally considered useful in preventing anomalous and abusive usage, particularly for voice services. However, it appears to be too complex to implement and to communicate effectively to customers, warranting a reassessment. In addition, the EC could reassess whether the two-week warning period, in case of a pending surcharge after abusive or anomalous usage has been proven, remains necessary. For example, it could be evaluated whether a one-off warning about the levying of additional roaming charges – until normal use is re-established – would suffice.
- FUPs for pre-paid and organised resale are quite complex to implement and to communicate to customers. In view of the effort involved and the limited application by operators, these FUP provisions could be reevaluated.

- Sustainability mechanism: While the number of applications is decreasing, the mechanism remains a relevant component of the RLAH framework. BEREC recommends the EC to assess its efficiency and consider redesigning the mechanism to enhance its functionality and adaptability. BEREC, as in 2019, suggests again the following amendments to clarifying the sustainability procedure:
  - Ensuring consistency between the mobile services margin calculation in Article 2 and Articles 7, 8 and 9 of the Commission Implementing Regulation (EU) 2016/2286[5] (CIR);
  - Taking into account the costs for balanced traffic;
  - Incorporating the possibility to provide complementary documentation as requested under Article 6(2);
  - Aligning the volume forecasting methodology of Article 6(1) with the methodology for calculating costs and revenues.

[5] Implementing regulation - 2016/2286 - EN - EUR-Lex

- Transparency measures:
    - Welcome message: Limitation of the frequency (when customers are travelling within EEA) and/or of the content of the welcome message only to essential information directly related to roaming pricing conditions, the single European emergency number 112, the operator's customer service and a link to the operator's dedicated roaming webpage. This webpage should provide customers with more detailed and relevant information, particularly regarding VAS and alternative means of accessing emergency communications services. The detailed information provided in the contracts serves as an important source of information for the customers.
    - VAS: In order to enhance clarity within the Roaming Regulation and prevent potential misinterpretation, BEREC advocates for the inclusion of a specific provision stating that the RLAH principle does not apply to calls made or SMS sent by roaming subscribers towards numbers used for value-added services, such as free-phone numbers. In addition, BEREC will also foresee a review of the database in the future.
    - VAS: simplification of the current regulation requirements. Instead of duplicating the detailed information provided in the BEREC database, BEREC recommends the inclusion of instructive information on operators' websites and via the customer service indicating that VAS might not be charged under RLAH, especially for free-phone numbers, and the provision of a link to BEREC's database, where BEREC could consider to make the information available in all the EU official languages.
    - Emergency services: Clarification regarding calls to emergency numbers about the requirement to have only the single European emergency number '112' to be mentioned (and not other national numbers that offer exactly the same services as 112). The alternative means of access to emergency services should be other means e.g. texting 112, an app designed for users with disabilities, an app designed for cases when calling 112 is not possible.
    - QoS: Restriction of the transparency requirements to the relevant factors that can affect QoS while roaming. Operators should not be required to describe the detailed technical implications of a difference in the QoS in the visited network, which the customers might not understand, and which the roaming provider cannot provide, as it would also depend on the visited operator to deliver the necessary information.
- Data collection: BEREC acknowledges that the level of detail required for data collection presents challenges. Several operators reported difficulties in providing timely and comprehensive responses, citing the substantial resources required for the data submission. BEREC takes these concerns seriously and aligns with the EC's ambition expressed by President von der Leyen to streamline reporting obligations for companies. In this context, BEREC underscores that no additional indicators should be introduced for monitoring purposes. Conversely, opportunities to streamline the data collection process could be carefully explored in close collaboration between BEREC and the EC, ensuring that any modifications effectively reduce unnecessary

burdens while preserving the ability of regulators and policymakers to rely on robust and reliable information. For example, BEREC proposes to lift the differentiation in the wholesale section of the data collection between balanced and unbalanced traffic, resulting in the collection of only aggregated data for both categories. BEREC observes that a significant number of operators face difficulties in accurately reporting disaggregated data for balanced and unbalanced traffic, leading to datasets with questionable quality and reliability.

Proposals for further improvement of the competitive situation especially for MVNOs

- Further reducing the wholesale caps: BEREC considers this has been an efficient and transparent measure to ensure a better level playing field for competition and sustainable conditions for RLAH for MVNOs. BEREC also identifies some room for reduction of the wholesale caps, when analysing the results of the cost model, as long as the caps allow operators to recover their efficient costs plus a margin to enable differentiation of offers and competition. Lower wholesale caps currently also means that operators have to offer higher data volumes in case of open data bundles, which again might lead to sustainability problems. Similarly to the previous review, the most representative scenario of the cost model (excluding outliers where appropriate) should be taken into account when setting wholesale caps.
- Obliging the host MNOs to pass the discounts they get for wholesale roaming services on to the MVNOs: this measure would ensure equal terms for competition between MVNOs and MNOs and it is targeted to the problem identified. It should be noted that this measure would require the definition of a monitoring process by NRAs.
- Making sure that wholesale caps also apply to alternative wholesale roaming solutions like sponsored roaming: This does not prevent providers of such wholesale solutions from charging additionally for other services they offer.
- Further clarifying the wholesale roaming access obligations to give non-discriminatory access to new technologies. For M2M communication services, access providers should meet all access requests in a non-discriminatory manner. The exception for a transition period to implement new technology (recital 27) should not be exploited. For example, NB-IoT and LTE-M can no longer be considered to be new technologies. Both parties to a wholesale roaming agreement should do their utmost to make sure negotiations and technical trials follow efficient and agreed time plans.
- Including measures in the Regulation for incoming roaming calls for MVNOs: The wholesale roaming charge does not include the costs for terminating incoming roaming voice calls. However, any charge in excess of the maximum mobile termination rate in accordance with the Commission Delegated Regulation (EU) 2021/654 adopted pursuant to Article 75 of Directive (EU) 2018/1972 (i.e. Eurorates) is unlikely to be reasonable and should not be accepted.

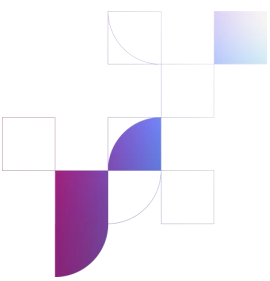
Proposal for new measures for non-price regulated roaming services

- Open data bundle FUP: Allow extension of open data bundles volumes to RoW countries: The FUP volumes for open data bundles are in general quite high so extending it (on a voluntary basis for operators) to cover non-EEA countries will not

result in subscribers not having the volumes they need when they travel to EEA countries. Therefore, BEREC proposes to mention this option explicitly in the regulation.

- BEREC is of the opinion that the Roaming Regulation should introduce a tool enabling roaming customers to opt-out of consuming data roaming services when connected to RoW networks in which RLAH does not apply. In addition, per default unit charges in RoW countries shall apply for customers that have not opted-in for RoW bundles or alternative tariffs.

- Data roaming in non-terrestrial networks should be offered on an opt-in basis.



1. Introduction and objectives of the document

On 30 April 2024, BEREC received a letter from the European Commission (EC) asking for expert views on the Regulation (EU) 2022/612 on roaming on public mobile communications networks within the Union ('Roaming Regulation') in view of the upcoming 2025 Review Report. Depending on the conclusions of this review, the EC may prepare an impact assessment and a proposal for an amended Roaming Regulation.

On 8 April 2022, the recast Roaming Regulation was adopted and subsequently entered into force on 1 July 2022. It brought additional benefits to consumers, businesses and further lowered the regulated wholesale caps. Additionally, on 15 January 2024, the EC published its review report on the Commission Implementing Regulation (EU) 2016/2286 concerning the fair use policy and the sustainability mechanism, concluding that the current mechanisms are functioning effectively and do not require amendments at that stage.

Pursuant to the Roaming Regulation, the EC is required to submit a report on the roaming rules and the functioning of the roaming market to the European Parliament and the Council by 30 June 2025. This report must incorporate a comprehensive set of elements as specified in Article 21(1) and Recitals 66 to 68. Particular attention will be given to the review of newly introduced provisions on QoS and transparency, evaluating their effectiveness and efficiency. Additionally, co-legislators have expressed a specific interest in examining the impact of 5G on the roaming market and the role of roaming in facilitating the market for M2M connectivity and the IoT, including considerations related to cellular connectivity solutions based on unlicensed spectrum. These aspects will be addressed in the review. In conducting this review exercise, the Commission will be required to adhere to the *Better Regulation* principles.

BEREC annually collects and publishes a wide range of data from operators and NRAs on roaming market developments. In addition, to gather the necessary supplementary information for the preparation of its expert views as requested, BEREC launched a call for input addressed to relevant EEA stakeholders, as well as separate questions directed at NRAs. BEREC received input from 37 stakeholders and 19 NRAs. This input, depending on the topic, is summarised in the various chapters of this document.

2. Overall performance of the RLAH rules

This chapter provides a general assessment of the extent to which the objectives of the Roaming Regulation have been achieved and evaluates its effectiveness in fulfilling the expectations of end-users. It also examines the implementation of the transparency measures and QoS provisions introduced in 2022. Additionally, the chapter assesses the coherence of the roaming rules with other EU regulatory interventions.

Furthermore, this chapter includes an evaluation of the efficiency of the provisions of the Roaming Regulation in terms of cost-effectiveness and proportionality of the actual costs relative to the benefits achieved. Suggestions for overall improvements, as received from stakeholders and individual NRAs, are outlined in Chapter 2.2. These suggestions are also considered in light of the analysis presented as well as BEREC's recommendations in subsequent chapters of this document.

2.1. Effectiveness, efficiency and coherence with other EU regulatory interventions

The abolition of retail roaming charges within the EEA marked the introduction of RLAH in June 2017. BEREC maintains the position expressed in previous inputs (e.g., BoR (19)101[6], BoR (20)131[7]), affirming that RLAH has proven to be a clear and tangible success for consumers and of European integration, and a substantial contribution to the further completion of the Single Market to the benefit of mobile end-users.

Compliance with the Roaming Regulation has generally been high from the outset, enabling consumers to benefit from RLAH without delay. This high level of compliance continues today, as further detailed in chapter 3.2 and 3.4.

The results of a recent Flash Eurobarometer Report[8] on roaming reinforce this view, showing that a large majority of respondents across the EU (84 %) feel they benefit from roaming without surcharges. More specifically, 65 % of the respondents stated that they "*definitely*" benefit, while 18 % indicated that they benefit "*to some extent*." Additionally, 80 % of the respondents reported that roaming without surcharges enables them to use their mobile phones in the same way and as frequently as they do at home.

The effectiveness of the RLAH approach is further evidenced by the significant increase in the use of regulated roaming services since June 2017, particularly with respect to data roaming services. Prior to the introduction of RLAH, roaming was perceived as an expensive service, and a significant number of end users switched off data roaming while abroad, relying instead on alternatives such as Wi-Fi. This behaviour has changed entirely since the introduction of RLAH.

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[6] https://www.berec.europa.eu/en/document-categories/berec/opinions/berec-opinion-on-the-functioning-of-the-roaming-market-as-input-to-ec-evaluation

[7] https://www.berec.europa.eu/en/document-categories/berec/opinions/berec-input-on-ec-request-for-the-preparation-of-the-legislative-proposal-for-the-new-roaming-regulations

[8] Flash Eurobarometer 521 on Roaming (https://europa.eu/eurobarometer/surveys/detail/2958)

Despite the fact that RLAH obligations have been in force since 2017 and technological advancements have occurred over the years, the underlying need for connectivity and transparency that led to their adoption remains as pertinent as ever. The Roaming Regulation remains highly relevant and continues to provide significant value to European citizens – not only in terms of cost savings but also in terms of consumer empowerment. In this regard, while certain challenges in implementation, complaints, and instances of non-compliance have been observed, BEREC generally assesses the provisions introduced in the 2022 recast of the Roaming Regulation positively. These provisions include **enhanced transparency obligations** concerning value-added services (VAS) and emergency communications, as well as other non-pricing obligations, such as those related to **QoS**.

With respect to transparency, findings from the Eurobarometer indicate that 71 % of the respondents found the “welcome” text messages received from their mobile operators upon crossing a border to be useful. BEREC underscores the importance of transparency while also cautioning against the risk of excessive transparency requirements, which could lead to information overload. Such an outcome may inadvertently undermine the objective of conveying information in a clear and comprehensible manner to end-users while also imposing undue burdens on operators. A detailed assessment of transparency obligations is provided in Chapter 8.

With regard to QoS obligations, notwithstanding the challenges observed, BEREC reaffirms that the provisions enshrined in Article 4 of the Regulation represent a fundamental pillar of the RLAH principle. These obligations are instrumental in strengthening end-user empowerment and promoting the continued advancement of the internal market. A more detailed examination of this topic is provided in Chapter 6.

In relation to the “**EU added value**” of the Roaming Regulation (i.e. the outcomes achieved beyond what individual Member States could have accomplished independently), it is difficult to envisage how national-level legal instruments alone could have resulted in the current achievements in terms of pricing, quality, and transparency at the EU/EEA level.

The value delivered to end-users by the Regulation, as well as its extension for an additional 10 years, becomes even more evident when analysing both retail prices and wholesale costs for RoW roaming. While average prices for RoW roaming have, in some cases, declined, they remain substantially higher than those applied under the RLAH framework.

With regard to the **wholesale market**, some overarching trends for all services can be noted. Notably, average wholesale rates have continued to decline and have remained below the regulated wholesale caps throughout the entire analysis period. At the same time, the average revenue per unit for wholesale resale access has been higher than the average revenue for all types of wholesale access and the rates have remained close to the regulated wholesale caps. This suggests that the decrease in wholesale rates has not affected all roaming providers at the same pace. More detailed information can be found in chapter 5.

With regard to reporting on **efficiency**, BEREC considers that a quantitative assessment of the total costs of implementation versus the overall benefits for European citizens and businesses stemming from the Roaming Regulation cannot be performed with the available

data in a way that would yield trustworthy results. In its 2020 input (BoR (20) 131)[9], BEREC gathered and reported detailed data from both NRAs and operators regarding the person-days (and, in some cases, financial costs) required for the implementation (or monitoring and supervision) of the roaming rules. The analysis indicated that a large majority of operators at that time required fewer than 40 person-days annually for the implementation of the Regulation. Additionally, 19 out of 27 NRAs reported regulatory costs of fewer than 60 person-days annually. The BEREC Office incurred additional costs amounting to 353 person-days, along with financial expenses related to International Roaming Working Group meetings. These figures can be regarded as providing a broad indication of the current costs, although it should be noted that the 2022 recast of the Regulation introduced changes that are likely to result in both additional costs (e.g., additional transparency measures) and significant simplifications (e.g., consolidating the data collection process from twice a year to a single yearly event). Although BEREC collected cost-related data in 2020, it was unable to compare these cost estimations with the benefit introduced by the rules due to the absence of a methodology to quantify the benefits, either for the regulation as a whole or for specific obligations. Consequently, for this Opinion, BEREC refrained from gathering new detailed data on cost indicators from NRAs and operators as part of its assessment of efficiency. This decision also reflects the recognised need to reduce administrative burden, particularly in relation to reporting obligations, which place excessive strain on companies, regardless of their size or risk profile. Nonetheless, BEREC holds that the regulatory costs associated with the implementation of the roaming rules are unequivocally outweighed by the tangible benefits of the RLAH approach for European citizens and businesses. Importantly, this does not imply that measures aimed at further simplification and a reduction in the implementation burden should not be carefully considered, for instance in the context of the annual data collection process, as described in chapter 3.1., as well in the context of simplifying some transparency obligations and some FUP provisions (see chapters 4 and 8 for more details).

With regard to the **coherence with other EU regulatory interventions**, BEREC has not identified any significant contradictions between the roaming rules and other EU legal acts. However, as highlighted in the BEREC Opinion (BoR (24) 180)[10], *"BEREC considers that harmonisation of end-user categories in terms of their terminology across all frameworks could be beneficial, particularly in areas related to informed choice and contractual relationships".* Since the European Electronic Communications Code (EECC) and the Roaming Regulation use different terms to define the same categories of stakeholders, revisiting the terminology could improve simplicity, clarity and consistency while avoiding disparities.

Aside from this point, no NRA, operator, or other stakeholder has reported any inconsistencies between the Roaming Regulation (including the Commission Implementing Regulation) and other EU legislation.

[9] https://www.berec.europa.eu/en/document-categories/berec/opinions/berec-input-on-ec-request-for-the-preparation-of-the-legislative-proposal-for-the-new-roaming-regulations

[10] https://www.berec.europa.eu/en/all-documents/berec/opinions/berec-opinion-on-the-market-and-technological-developments-and-on-their-impact-on-the-application-of-rights-of-end-users-in-the-eecc-article-123

2.2. Summary of inputs gathered through the call for input

As previously mentioned, in the summer of 2024, BEREC gathered stakeholders' perspectives and recommendations regarding the effectiveness and efficiency of the roaming rules. The vast majority of respondents to the BEREC call for input including MNOs, MVNOs, consumer organisations, and other regulatory authorities concur that the Roaming Regulation effectively fulfills its primary objectives from an end-user perspective. These objectives encompass ensuring fair conditions for roaming within the European Union, enhancing consumer transparency, preventing "bill shocks", and fostering the development of a unified electronic communications market.

Consumers now benefit from greater certainty, knowing that they can utilize their telecommunications services abroad in a manner comparable to domestic usage. Moreover, the Regulation of wholesale roaming – specifically the framework governing the settlement of charges between providers – remains essential to ensuring the successful implementation of retail roaming rules by operators.

A significant number of respondents to BEREC's call for input expressed the view that the introduction of more stringent measures would not be justified, as the existing RLAH obligations, complemented by the Fair Use Policy, have proved to be effective. Conversely, MVNOs reported concerns regarding the increasing financial losses attributed to the current roaming rules, highlighting the limited effectiveness of the sustainability mechanism in mitigating these challenges.

Furthermore, stakeholders responded to BEREC's call for input providing feedback and suggestions for amendments to the Regulation:

- Simplification of the transparency measures and FUP.
- Improvements at wholesale level and introduction of non-discrimonatory QoS obligations.
- Ensuring a level playing field for alternative technological solutions for roaming, such as travel eSIM and satellite-based low Earth orbit (LEO) connectivity.
- Phasing out of the current binding roaming rules.

Additionally, some NRAs submitted proposals, which include the following:

- Providing the option to disable the automatic dispatch of welcome messages in order to mitigate the excessive number of messages received, particularly in border regions, and to ensure a more practical and user-friendly approach.
- Establishing a methodology or guiding principles for NRAs to monitor and verify providers' compliance with the obligation to offer customers the same QoS when roaming as they receive domestically.
- Introducing a mechanism allowing end users to opt in to data roaming when prices per gigabyte exceed a specified threshold while roaming in third countries. Additionally, a free-of-charge roaming-blocking measure for RoW roaming could be implemented, covering data, calls and SMS, without affecting the RLAH traffic.

- Introducing a transparency-related obligation or an opt-in requirement for the activation of services such as international calls or voicemail messages while roaming outside the EEA.

The subsequent chapters will elaborate on these proposals while also presenting BEREC's recommendations for potential amendments to the Roaming Regulation.

3. Compliance, Monitoring and Supervision

3.1. NRAs' and BEREC's monitoring activities

Pursuant to Article 17 of the Roaming Regulation, NRAs, and where applicable, other competent authorities, are tasked with monitoring and ensuring compliance with the Regulation within their respective jurisdictions. A key element of the monitoring and supervisory activities conducted by the competent authorities is the systematic collection of comprehensive market data. In accordance with paragraph 2 of Article 21 of the Roaming Regulation, this data is consolidated by BEREC, which subsequently makes it publicly available in an aggregated form. Additionally, the collected data is notified to the European Commission.

The aggregated data is presented in the *BEREC International Roaming Benchmark Data and Monitoring Report*, which is published annually in the first quarter. This report encompasses data from the first three quarters of the previous year, and the final quarter of the year preceding it. Among other modifications, the Roaming Regulation of 2022 reduced the frequency of data collection from biannual to annual. Stakeholders who responded to BEREC's call for input conducted in the third quarter of 2024, were nearly unanimous in their positive assessment of this reduction in frequency. BEREC concurs with this view, recognising that consolidating the data collection into a single annual event reduces the operational burden for operators and NRAs, while maintaining the timeliness and adequacy of the information collected.

For the purpose of data collection, a questionnaire is prepared by BEREC and distributed by NRAs to roaming providers (i.e., MNOs, MVNOs, and MVNEs), with a mandatory response requirement for those with a market share exceeding 0.5 %.

The questionnaire is divided into two main sections.

- The "*data questionnaire*", which focuses on quantitative information, aims to monitor various aspects, including but not limited to developments in retail and wholesale charges for regulated roaming services, the evolution of domestic-only tariffs, and patterns in machine-to-machine roaming and IoT devices.
- The "*transparency questionnaire*", which is more descriptive in nature, serves to monitor compliance with transparency obligations, the application of fair use policies, and key aspects related to wholesale roaming agreements, among others.

Additionally, further information is collected through a separate questionnaire directed to NRAs, which focuses particularly on developments in consumer complaints and the application of sustainability mechanisms.

The breadth of the monitoring exercise necessitates the inclusion of a diverse array of indicators to ensure the comprehensive oversight mandated by the Roaming Regulation. Certain metrics and levels of detail have also been incorporated at the request of the European Commission. Notably, following the 2022 recast and previous amendments to the Regulation, new indicators have been introduced, steadily increasing the complexity and scope of data collection. Consequently, the data collection is highly extensive: the "*data questionnaire*"

encompasses 958 entries, while the "*transparency questionnaire*" includes an additional 340, although not all are mandatory.

BEREC asserts that an extensive data collection enables a thorough understanding of relevant market dynamics, equipping NRAs and other competent authorities to effectively fulfil their monitoring and supervisory responsibilities. Furthermore, this data forms a critical component for the review of the Roaming Regulation, as required under Article 21. Nevertheless, BEREC acknowledges that the level of detail required for data collection presents challenges. Several operators have reported difficulties in providing timely and comprehensive responses, citing the substantial resources required for the data submission. BEREC takes these concerns seriously and aligns with President von der Leyen's ambition to streamline reporting obligations for companies.

While strict oversight at a particularly high level of detail was indispensable during the initial years of application to evaluate the Regulation's functioning, the legal act has now attained a certain degree of maturity, characterised by high levels of compliance and well-established practices. In this context, BEREC underscores that no additional indicators should be introduced for monitoring purposes. Conversely, opportunities to streamline the data collection process could be carefully explored in close collaboration between BEREC and the European Commission, ensuring that any modifications effectively reduce unnecessary burdens while preserving the ability of regulators and policymakers to rely on robust and reliable information. Potential measures that could be considered include the following:

- Removing indicators, both in the *data questionnaire* and in the *transparency questionnaire*, that are seldom or never utilised in subsequent analyses and do not provide significant value or essential insights. BEREC considers that, in some cases, the potential for streamlining does not necessarily require amendments to the Regulation.
- Expanding the observation periods for certain indicators, transitioning from intervals of three months to longer intervals such as six months or a year, where appropriate, meaning that the same indicators would provide one or two data points per year instead of the current four. In this context, it could additionally be considered whether aligning the data collection with the calendar year would be suitable.
- Lifting the differentiation in the wholesale section of the *data collection* between balanced and unbalanced traffic, resulting in the collection of only aggregated data for both categories. BEREC observes that a significant number of operators face difficulties in accurately reporting disaggregated data for balanced and unbalanced traffic, leading to datasets with questionable quality and reliability. It should be noted, however, that this measure would require an amendment to the Regulation.

In general, BEREC considers it essential to recognise that operators have already adapted their internal systems to gather and report the required information in compliance with the current framework. Modifying the templates or structure used for data collection may impose additional burdens on these operators. Accordingly, BEREC underscores the importance of conducting comprehensive consultations with stakeholders prior to implementing any proposed changes. Such consultations are crucial to ensuring that the changes fulfil their

intended purpose of reducing the burden on companies rather than introducing additional complexity, while also facilitating a seamless and efficient transition.

Additionally, in the context of the data collection, BEREC wishes to express caution regarding viewing the roaming data collection exercise mandated by Article 21 of the Regulation as an opportunity to gather additional data on aspects not explicitly covered by the Regulation itself. This is currently exemplified by the collection of data on roaming usage in the Western Balkan region. While BEREC acknowledges the EC's legitimate interest in collecting supplementary data to facilitate the assessment of potential future measures and legislative proposals, it underlines that data beyond the scope of the Regulation can only be collected on a voluntary basis. This may result in incomplete or partial insights into the market under investigation. Moreover, the voluntary nature of such data collection introduces a significant risk of variability in both the total number and identity of respondents, which may undermine the reliability of comparisons over time and, ultimately, the robustness of any conclusions drawn.

Moreover, taking into account current consolidated practices, BEREC deems it necessary to provide further clarification in Article 21 of the Regulation with respect to: (i) the entities responsible for notifying the collected data to the EC, and (ii) the entity responsible for making these data public.

Finally, BEREC and NRAs remain firmly committed to the continuous refinement of the data collection process. This encompasses providing greater clarity on information requirements where necessary and offering support to operators in accurately interpreting definitions and comprehending the information requested. Furthermore, BEREC will persist in its efforts to strengthen mechanisms for detecting implausible or inconsistent data, thereby ensuring the overall quality and reliability of the collected information.

3.2. NRAs' activities to supervise and ensure compliance with the Roaming Regulation

In addition to the comprehensive data collection outlined in the preceding subchapter, and pursuant to Article 17 of the Roaming Regulation, NRAs and, where applicable, other competent authorities, are empowered to implement additional measures to monitor and supervise compliance with the Roaming Regulation. Such measures may include formal investigations, requiring undertakings subject to the Regulation's obligations to provide all relevant necessary information to verify compliance with roaming rules. Nevertheless, due to the extensive scope of the aforementioned data collection, the necessity to request supplementary information from specific providers is generally limited.

The Appendix provides a country-by-country overview of the monitoring and supervisory activities reported by NRAs to BEREC.

A combination of reactive and proactive approaches implemented by NRAs can be observed. Among the reactive approaches, end-user complaints are of particular significance, often serving as critical inputs for supervisory activities by helping to identify potential areas requiring further investigation and enforcement action.

Proactive supervision measures encompass periodic reviews of operators' offers, including their terms and conditions. In this context, some NRAs conduct online monitoring (e.g.

reviewing operators' websites), while in other Member States procedural mechanisms have been established. For instance, operators may be required to notify the NRA in advance of introducing new offers or modifying existing ones.

Additionally, certain NRAs have developed structured supervisory strategies and plans, incorporating periodic reviews that focus on specific areas of interest. Furthermore, some authorities integrate random testing into their supervisory frameworks to ensure comprehensive compliance monitoring.

With regard to other competent authorities, BEREC is aware of a single instance, in Spain, where an entity distinct from the NRA is entrusted with overseeing and supervising adherence to the roaming rules. This responsibility lies with the Spanish Ministry for Digital Transformation and Civil Service (*Ministerio para la Transformación Digital y de la Función Pública*)[11].

Pursuant to Article 17, where a NRA or, where applicable, other competent authorities determine that a breach of the obligations established by this Regulation has occurred, they shall be empowered to require the immediate cessation of such a breach.

Table 6 in the Appendix provides a comprehensive overview of instances of non-compliance with the provisions of the Roaming Regulation identified by NRAs since 2022, of which BEREC is aware. It includes detailed information on how these breaches were identified and subsequently addressed.

The majority of non-compliance cases pertain to transparency and safeguard rules as stipulated under Article 13 and 14 of the Roaming Regulation. These include, notably, deficiencies related to the content of the "welcome" SMS, the implementation of the default financial limit, the issuance of 80 % and 100 % usage notifications linked to this limit, the inclusion of accurate roaming-related information in terms and conditions, and the provision of cost-free access to a webpage offering details about services that may incur additional charges, including value-added services.

In most cases, non-compliance was promptly addressed following notification by the relevant authority, and any negatively impacted subscribers were duly compensated. This demonstrates that a collaborative approach between authorities and operators is often employed to ensure adherence to the provisions of the Roaming Regulation.

3.3. Overview of consumer complaints

In the broader context of the data collection outlined in chapter 3.1, BEREC gathers extensive data on consumer complaints from NRAs. Although the level of detail provided by national

[11] The Ministry is responsible for overseeing: (i) compliance with the requirements and conditions set forth in the Roaming Regulation regarding end- user access to voice calls, SMS, and data roaming electronic communications services within the European Union, (ii) the proper provision of regulated retail roaming services, (iii) the accurate application of retail tariffs for regulated roaming services, (iv) the exclusion of surcharges, along with their relevant conditions and transparency mechanisms, as well as the proper implementation of the fair use policy by roaming operators for the consumption of regulated retail roaming services, (v) the resolution of disputes between end- users and operators concerning the provision of roaming services, and (vi) the monitoring and supervision of inadvertent roaming in border areas.

authorities in response to the questionnaire may vary, the data available to BEREC enables a comprehensive assessment of consumer complaints. This information is particularly valuable for monitoring the current state of implementation of the Roaming Regulation and identifying potential issues.

During the most recent annual reporting exercise, the majority of NRAs reported fewer than 50 consumer complaints. Even in the most populated countries, where the highest numbers were recorded, the reported figures consistently remained below 300. While every complaint should be treated with due consideration, these relatively low numbers suggest that the existing framework has been largely effective in ensuring high levels of compliance across the EU/EEA region.

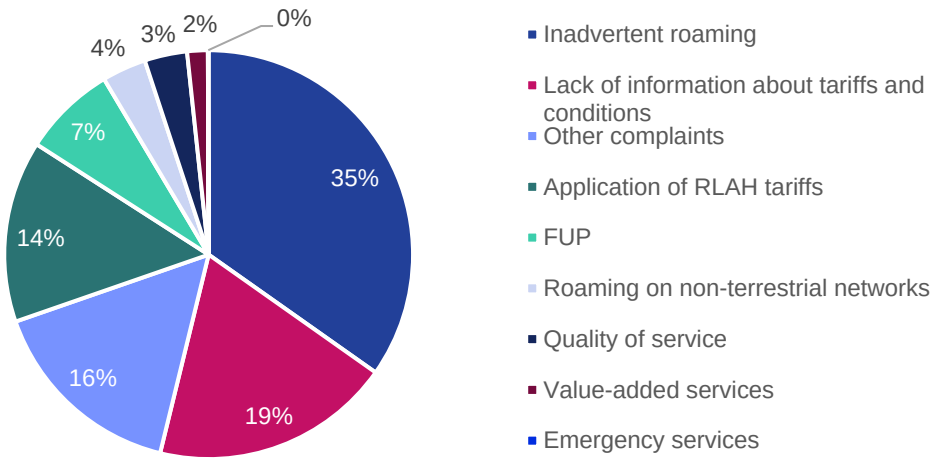


Figure 1: Types of consumer complaints

Figure 1 presents the proportions between different categories of consumer complaints, according to the data conveyed by NRAs to BEREC during the last two data collection periods, covering the timeframe from Q4 2022 to Q3 2024. The figure clearly illustrates that the most common subject of consumer complaints is inadvertent roaming (35 %), followed by insufficient information about tariffs and conditions (19 %). The least frequent categories of complaints pertain to roaming on non-terrestrial networks (4 %), QoS (3 %), and value-added services (2 %). According to data available to BEREC, complaints submitted to NRAs regarding the **use of emergency services when roaming** are rare, with only two instances reported during the two-year timeframe covered by the most recent data collections.

With regard to complaints concerning **inadvertent roaming**, it is noteworthy that almost half of these were submitted by end users who inadvertently roamed on a non-EEA network while remaining within EEA territory, as illustrated in Figure 2.

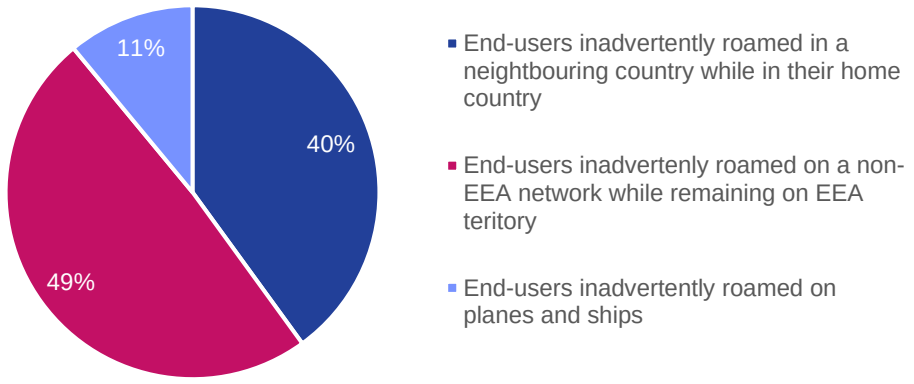


Figure 2: Inadvertent roaming – Distribution of types

3.4. BEREC's assessment of overall compliance and of the supervision and monitoring framework

This chapter provides a comprehensive overview of the monitoring, supervision, and compliance with the Roaming Regulation.

BEREC considers that the findings presented generally demonstrate a high level of compliance with the Roaming Regulation, effective practices for monitoring and ensuring its implementation, and consistently elevated levels of end-user satisfaction. This is particularly evidenced by the relatively low number of customer complaints and the results of the EC's 2023 Flash Eurobarometer on Roaming[12], which revealed that 84 % of travelers across the EU benefit from the roaming rules. These findings support the conclusion that RLAH is a European success story, not only in terms of end-user empowerment but also as a proof of the effective cooperation between NRAs, through BEREC, and the EC.

Nevertheless, the analysis conducted in this chapter has identified two areas that, in BEREC's opinion, merit further attention and potential measures:

- BEREC identifies some potential for simplifying and **streamlining the current data collection process**, as detailed in chapter 3.1. A thorough evaluation of the proposed measures, combined with stakeholder engagement, could effectively reduce unnecessary burden while maintaining the ability of regulators and policymakers to rely on robust and reliable information.
- BEREC observes that a specific category of consumer complaints appears to be overrepresented, namely cases of inadvertent roaming, particularly on non-EEA networks. BEREC considers that measures to address this issue could be explored, as further elaborated in Chapter 9 of this paper.

[12] https://europa.eu/eurobarometer/surveys/detail/2958

4. Retail Roaming market

The EC has formally requested BEREC's input on roaming consumption trends and their evolution over the period 2019-2023. In response, this chapter presents a comprehensive assessment of the functioning of the retail roaming market and its developments. Additionally, the effectiveness of RLAH measures has been evaluated in relation to the consumption patterns and needs of consumers travelling within the EU and EEA.

Furthermore, the EC has sought input on domestic tariff structures, the fair use policy, and the sustainability mechanism. In this context, the analysis examined whether operators have modified their domestic retail tariff portfolios and whether any waterbed effects have emerged. Moreover, a comprehensive evaluation of FUP and sustainability-related issues has been carried out, including an assessment of the effectiveness and efficiency of FUP and derogation measures. Finally, BEREC has also explored potential areas for improvement in the current relevant framework.

4.1. Analysis of the roaming consumption and evolution over time

The analysis of the roaming consumption for the period 2019-2024 (Q1-Q3) indicates that, following peaks in Q2 and Q4 in 2020 and another peak in Q1 2021, the average number of roaming minutes made per month per subscriber with active RLAH services in the EEA has declined significantly from 47.05 minutes in Q1 2021 to 13.57 minutes in Q3 2024. The peaks can largely be attributed to the impact of the COVID-19 pandemic, during which travel restrictions were imposed in many countries. BEREC considers that one potential factor for these peaks could be the impact of the above restrictions to the number of days spent abroad while travelling.

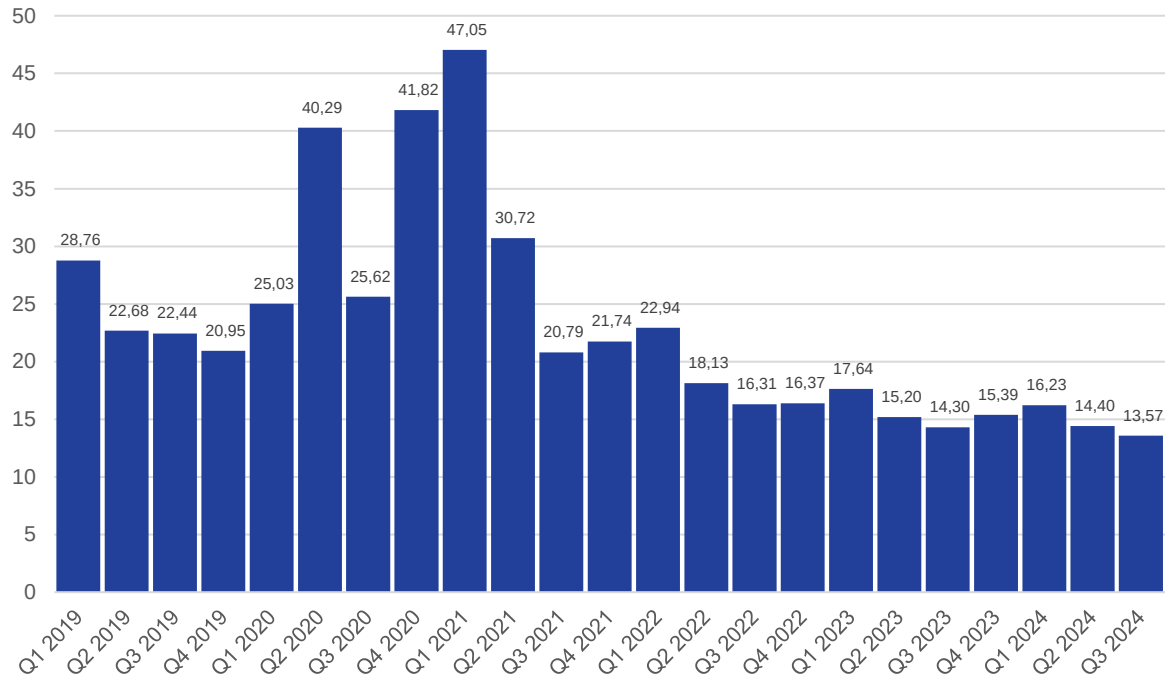


Figure 3: EEA average: Number of RLAH minutes (calls made) per month per roaming subscriber with active RLAH services

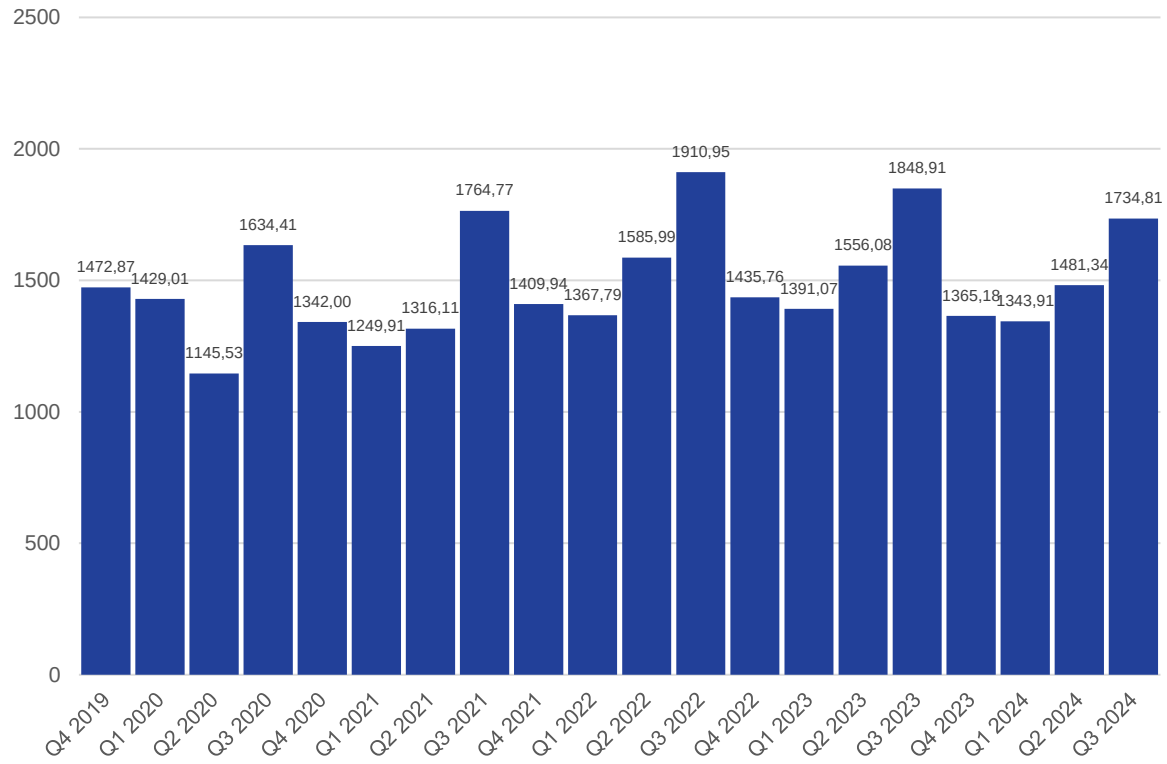


Figure 4: Total RLAH minutes (calls made) per month (millions)

SMS sent per month per roaming subscriber with active RLAH services in the EEA has decreased since 2019 but during the period 2021-2024, the average number of SMS sent per month per roaming subscriber with active RLAH services in the EEA has remained relatively stable. A recurring seasonal pattern can be observed, with SMS usage peaking in the third quarter of each year, while overall SMS volumes have remained relatively constant.[13]

This trend is in line with the overall decline in SMS usage, which can be attributed to a large extent to an increasing reliance on OTT messaging services.

[13] See: https://www.berec.europa.eu/en/all-documents/berec/reports/31st-berec-international-roaming-benchmark-data-and-monitoring-report, Figure 6

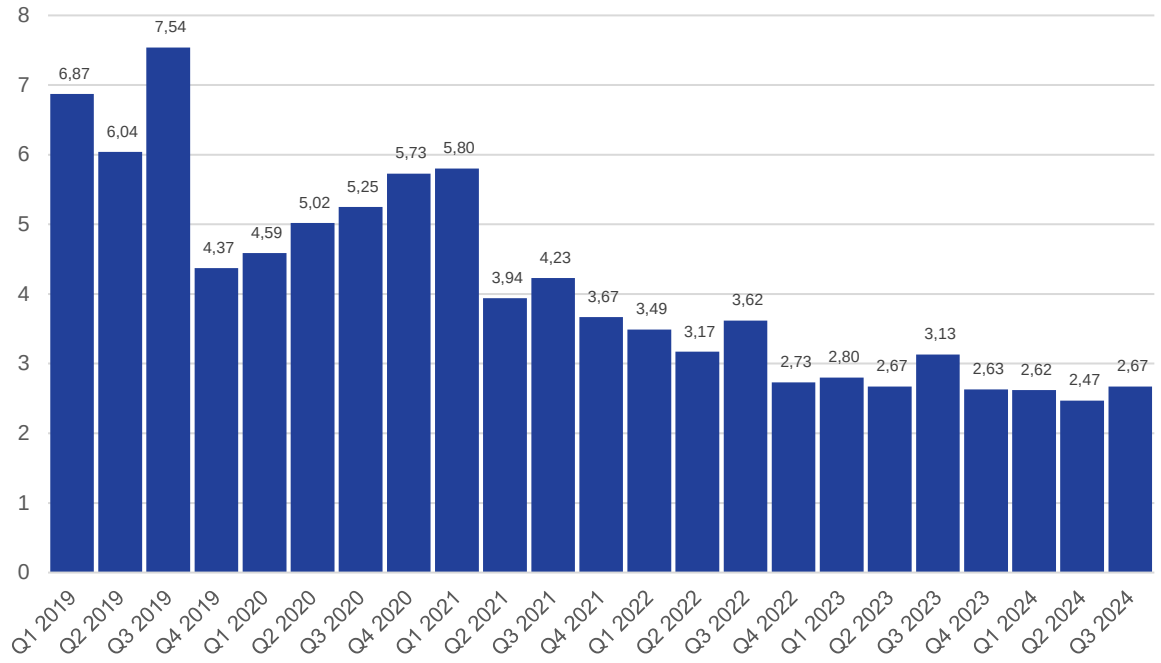


Figure 5: EEA average: Number of RLAH SMS per month per roaming subscriber with active RLAH services

Conversely, mobile data roaming consumption has been experiencing a continuous upward trend, reaching a new peak in Q3 2024. The average monthly roaming data consumption per user with active RLAH services within the EEA has now risen to 1.97 GB, reflecting also the growing popularity of mobile data services.

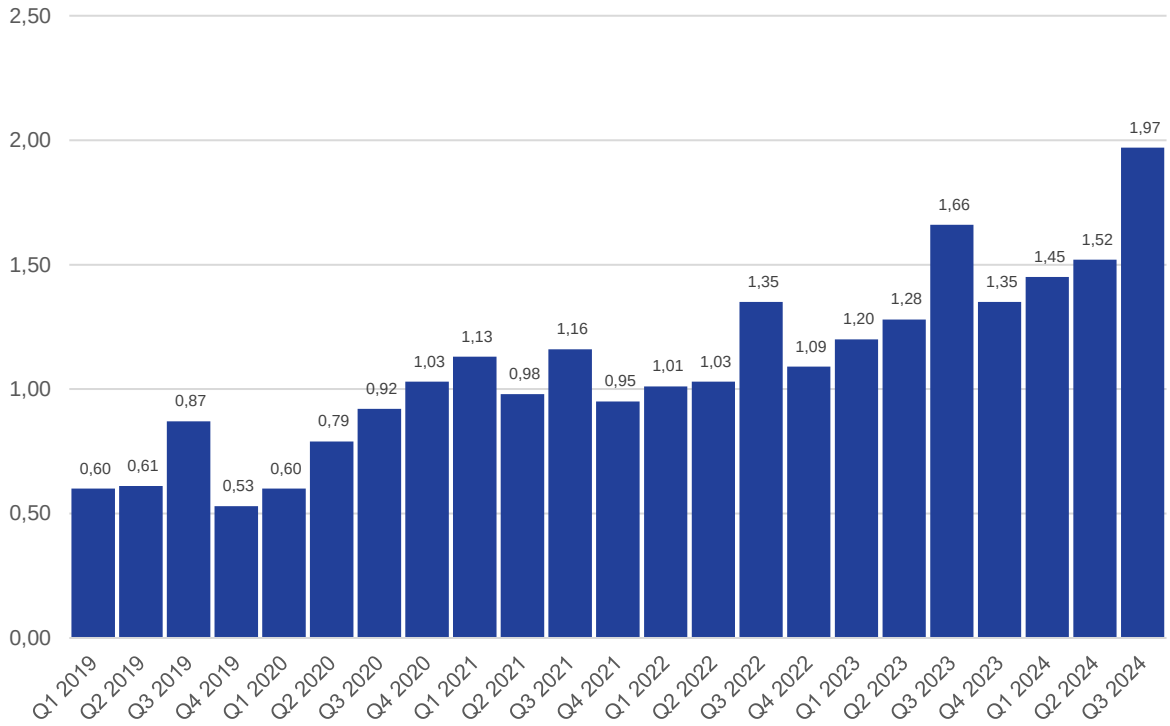


Figure 6: EEA average: Number of RLAH data consumption in GB per month per roaming subscriber with active RLAH services

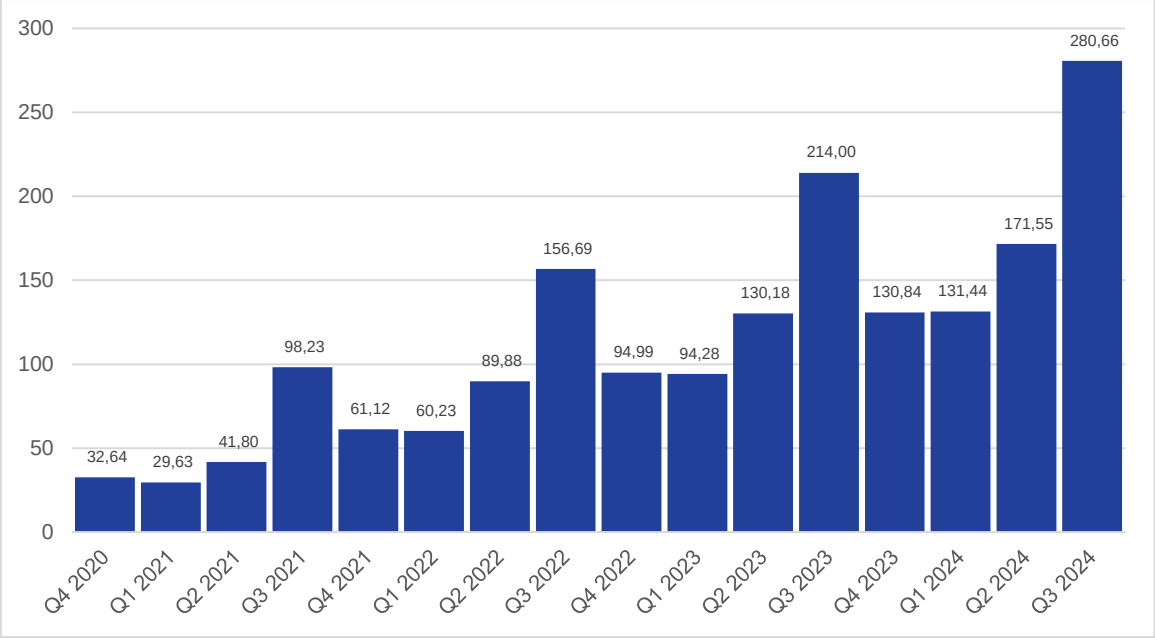


Figure 7: Total data consumption in GB per month (millions)

Overall, BEREC observes a continuous increase in roaming data consumption, accompanied by a decline in roaming calls and SMS volumes. This trend is consistent with the broader patterns observed in the consumption for these services at domestic level.

Assessing the specific impact of the new provisions introduced in the recast Regulation – such as QoS, increased data allowance (due to the decline in wholesale data caps), and reduced surcharges (again due to the decline in wholesale data caps) – on usage volumes is not feasible. Conducting such an analysis would require a *ceteris paribus* approach, which cannot be applied with the available data. Consequently, it is not possible to isolate the effect of each individual factor and derive reliable conclusions.

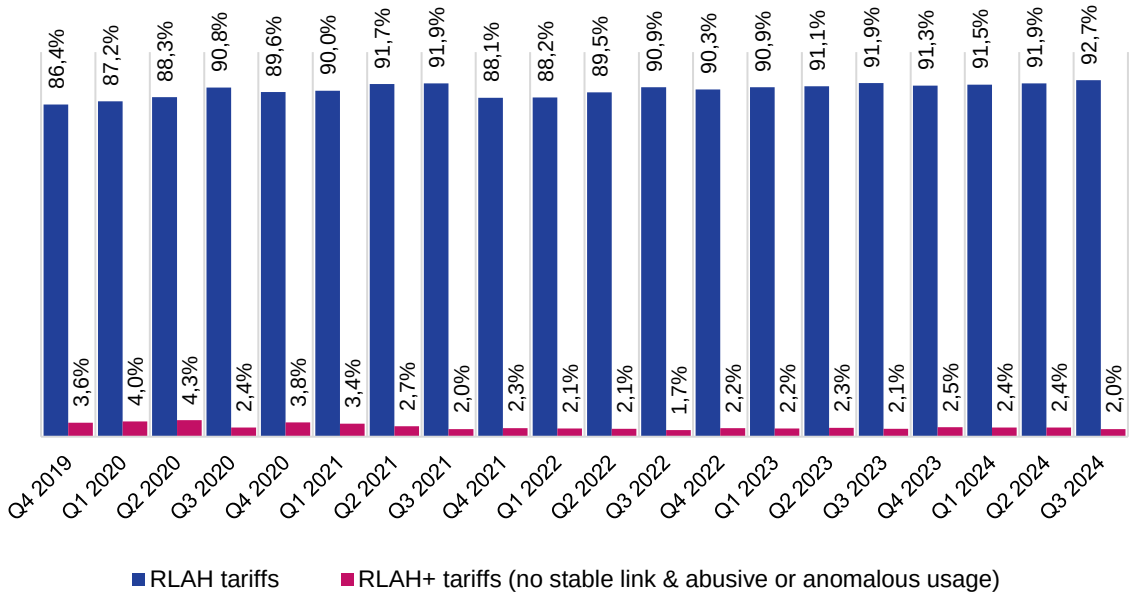


Figure 8: EEA average: roaming calls made by share of tariff (RLAH vs RLAH+ due to non-compliance with FUP)

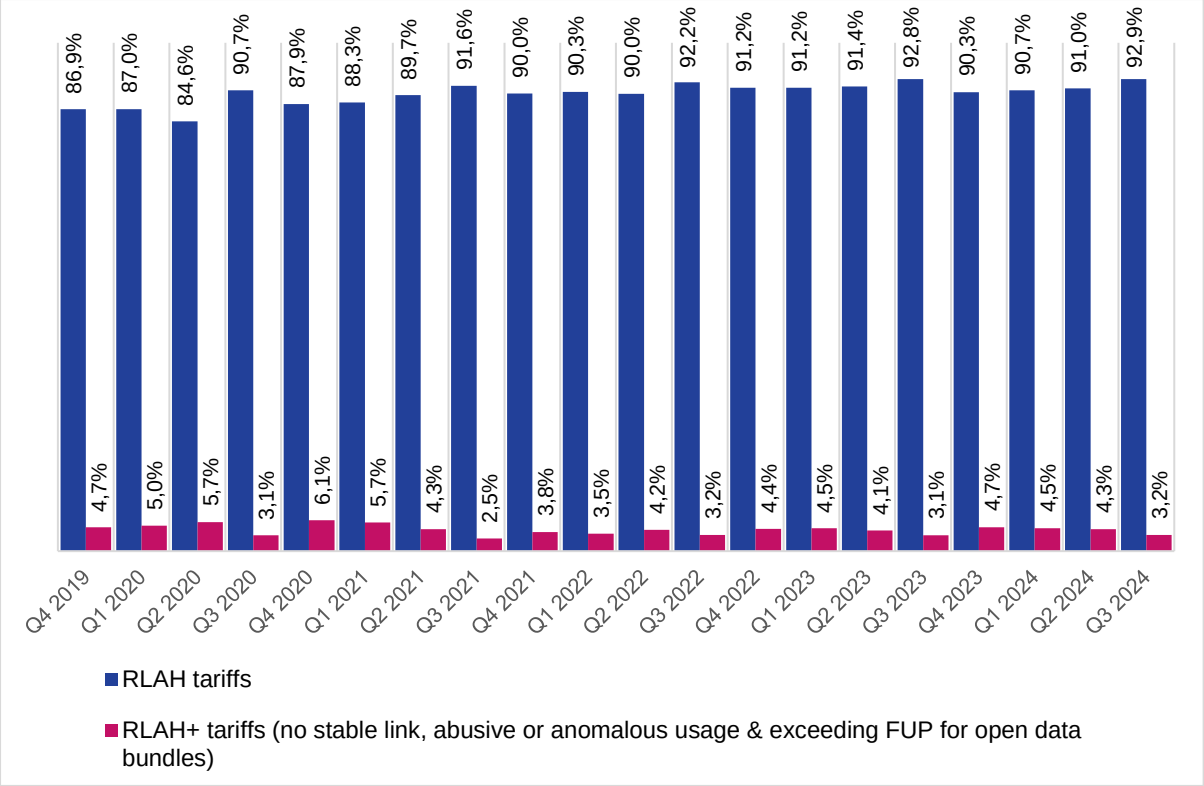


Figure 9: EEA average: retail data roaming services by share of tariff (RLAH vs RLAH+ due to non-compliance with FUP)

The two proceeding figures present the total EEA RLAH volumes (for calls made and data) as a percentage of the total EEA roaming volumes and the total EEA RLAH+ volumes that are surcharged due to the FUP application again as a percentage of total EEA roaming volumes for the period Q4 2019 – Q3 2024. The figures per quarter do not sum up to 100 % because there are some EEA roaming volumes provided with a surcharge because of the derogation mechanism and some EEA roaming volumes that are provided under alternative tariffs.

The current FUP provisions within the Roaming Regulation have been designed to balance consumer protection with market efficiency. Analysis of roaming data consistently shows that only a small share of total roaming volumes incur surcharges due to non-compliance with a FUP. This indicates that the FUP successfully limit excessive use while ensuring that the vast majority (around 90 %) of roaming volumes for both calls and data are provided under domestic terms. For roaming calls since Q3 2021 the percentage of RLAH+ traffic due to non-compliance with a FUP is less than 2.5 %. For data roaming (for which additional FUP measures apply) the percentage of RLAH+ traffic due to non-compliance with a FUP is less than 4.7 % for the period Q2 2021 – Q3 2024. These low percentages could be considered as exceptional usage. The ability of the current FUPs to restrict surcharge-eligible volumes to a small minority underscores their effectiveness, ensuring a fair and balanced approach to domestic roaming usage. This approach supports consumer protection, sustains market flexibility, and fosters continued innovation in service offerings.

During the COVID-19 pandemic period (mainly spanning in Q1 2020 – Q2 2021), which could be considered a force majeure period[14], the RLAH+ percentages were higher but still significantly low (up to 4.3 % for voice services and up to 6.1 % for data services).

Over time, it can be seen that the COVID-19 pandemic has not made any significant changes to the course of the roaming calls that were made and the roaming data consumed. The RLAH+ consumption remained at a consistently low level. Therefore, it could be concluded that the situation of consumers blocked abroad during the COVID-19 crisis was addressed efficiently by the operators.

It should be also noted that no significant number of complaints have been reported by NRAs about FUP. Summing up, BEREC considers that the current FUP measures address effectively the consumption needs of EU consumers travelling in the EU/EEA while protecting operators from anomalous and abusive usage.

4.2. Domestic and roaming tariff structure

With the introduction of RLAH in 2017, concerns were raised regarding the potential occurrence of waterbed-effects – namely, the increase of domestic prices for mobile services to offset the loss of roaming revenues.

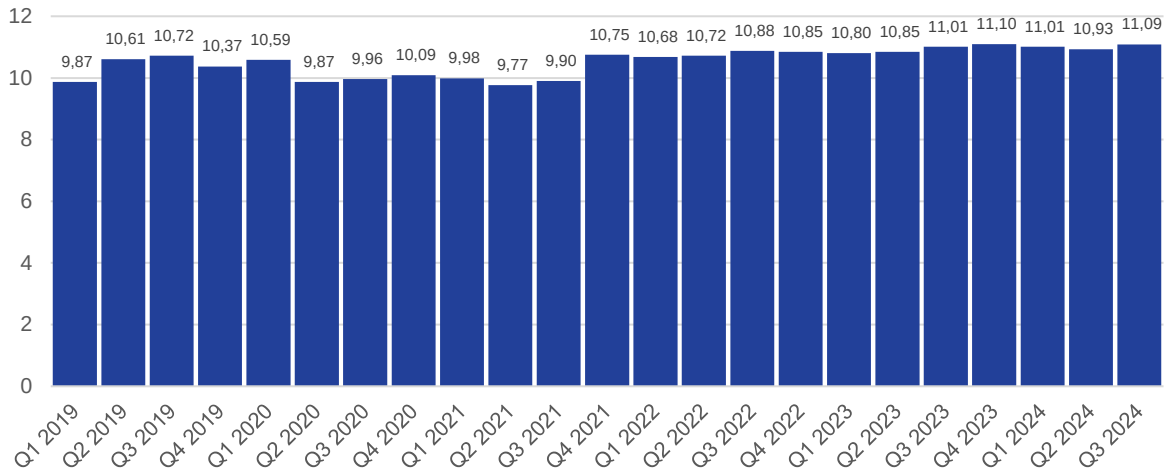


Figure 10: EEA average: Monthly EEA average retail revenue per subscriber

Figure 8 illustrates that the ARRPU has remained relatively stable and has not experienced a significant increase between 2019 and 2024. It can be observed that, while prices have remained constant, services offered have expanded, for example through the provision of larger data volumes to customers. A similar conclusion is reached in the most recent EC reports on mobile and fixed broadband prices (2020[15], 2021[16]), which find that mobile broadband prices in Europe have decreased between October 2020 and October 2021 as well as between October 2021 and October 2022.

[14] No other force majeure situation has been identified since 2019.
[15] See Mobile and Fixed Broadband Prices in Europe in 2021
[16] See Mobile and Fixed Broadband Prices 2022 report.

Nevertheless, BEREC emphasises that even in cases where ARRPU has increased, this cannot be directly attributed to the introduction of RLAH. Instead, the pricing of mobile services is influenced by multiple factors such as inflation, spectrum allocation and awarding processes, national competitive dynamics, and network rollout.

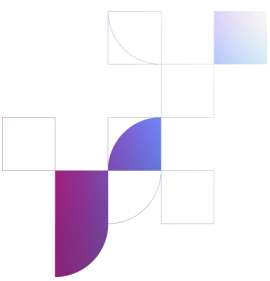
In general, BEREC acknowledges a clear and ongoing trend towards the adoption of unlimited tariff plans across all categories of mobile services. In this context, the FUP for open data bundles represents an essential mechanism to ensure the long-term sustainability of the RLAH framework.

Regarding the impact of the Roaming Regulation on domestic markets, NRAs and BEREC are not in a position to precisely assess its effects. The ECS and ECN markets exhibit significant dynamism, with continuous changes driven by various factors, including technological advancements, shifts in competitive dynamics, legal developments beyond the scope of the Roaming Regulation, and modifications to operators' business models. Consequently, it is not possible to discern with certainty which effects on national markets can be attributed specifically to the Roaming Regulation and which would have occurred independently of it.

BEREC remains committed to closely monitoring the ECN and ECS markets, recognising the complexity of the underlying dynamics. However, neither BEREC nor the NRAs have identified any evidence of mobile providers exiting the market due to the obligations imposed by the Roaming Regulation.

To ensure the sustainability of roaming services, a limited number of MVNOs have made use of the surcharge mechanism, without causing significant market disruption. Overall, respondents reported a high level of market competition. While some respondents noted that the Roaming Regulation may reduce profit margins (e.g., based on higher data volumes to compete on national markets) for smaller MVNOs, there is no indication that it has led to critical market challenges.

Lastly, in consideration of emerging business models and ongoing technological advancements, BEREC inquired whether NRAs had encountered any implementation challenges arising from new types of offerings, such as difficulties in applying FUP measures to multi-SIM subscriptions. The vast majority of NRAs reported that they were not aware of any such implementation issues and that no significant difficulties have been identified concerning the application of FUP measures for multi-SIMs.



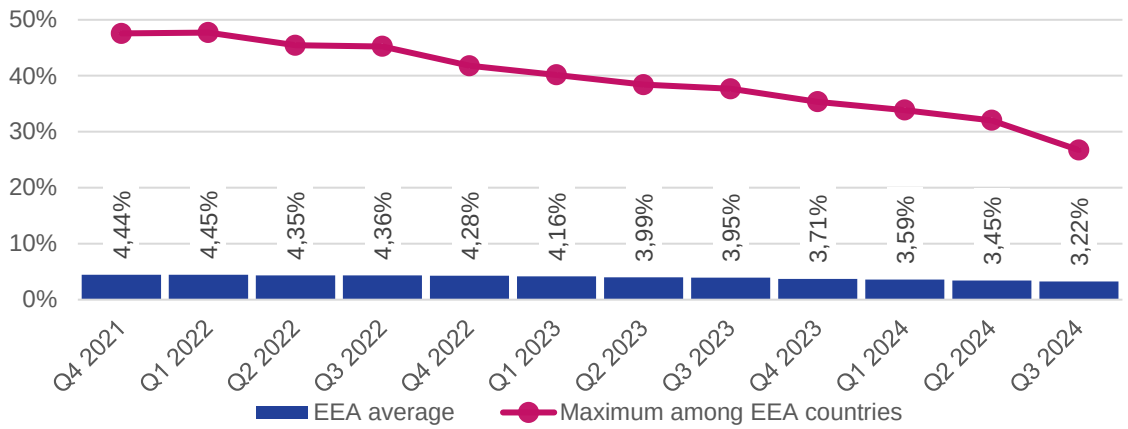


Figure 11: Domestic-only subscribers (% of total subscribers)

Figure 11 illustrates the average distribution of domestic-only tariffs as well as the relevant percentage in the EEA country with the maximum share for each quarter since Q4 2021. Over this period, the average share of domestic-only tariffs has declined from 4.4 % to 3.2 %. This decline is mainly due to one particular country, where the proportion of domestic-only tariffs has experienced a significant decrease, falling from nearly 48 % to less than 27 %.

According to the data available to BEREC, the majority of these plans are data-only, although legacy plans remain in use in certain countries. Despite the overall decline, some countries still exhibit a relatively higher proportion of domestic-only plans, primarily due to regional connectivity needs.

BEREC's data collection for the Roaming Report indicates that these plans are primarily used as fixed-mobile substitutes in areas without fixed broadband access (e.g., due to high connection costs for fixed broadband), as well as for regional applications such as public Wi-Fi hotspots (e.g., in public transportation). This highlights the continued relevance of domestic-only plans in addressing specific connectivity gaps and use cases, while also confirming that such plans are not designed for roaming purposes.

In addition to the standard RLAH tariffs, operators continue to offer alternative tariffs, which require customers to make an active choice when opting for them. Such alternative tariffs may be advantageous for customers travelling outside the EU. BEREC also monitors the use of alternative tariffs. On 30 September 2024, an average of 4.17 % EEA roaming enabled customers subscribed to an alternative tariff.

4.3. Fair use policy

In its call for input, BEREC sought feedback from NRAs and relevant stakeholders, including MNOs and MVNOs, on potential areas for improvement and any persisting challenges in the implementation of provisions related to the FUP and the sustainability mechanism. Notably, in relation to the questions on the FUP and sustainability, an average of 40 % of respondents provided input, while more than half either refrained from commenting or reported no significant issues. Furthermore, the concerns raised in the current consultation appear to be

largely consistent with the challenges identified in previous BEREC opinions[17]. FUP is analysed in this chapter and sustainability in the next one.

4.3.1. Normal residence and stable link concept

As evidenced by the respondents to the questionnaire, certain issues and challenges persist in relation to the FUP, particularly concerning the stable link concept and the observation window (which are presented in chapter 4.3.2). As regards the stable link concept, the main issue reported is the operational burden of this FUP measure: Operators have reported that the implementation of stable link verification is cumbersome, costly and inefficient for roaming providers. The primary challenge lies in the complexity of automated stable link checks, while manual verification is time-consuming, leading to increased operational effort and a higher likelihood of errors.

In light of the above, some operators have put forward a recommendation for a more streamlined and transparent approach to the FUP, which would be easier for consumers to understand and for operators to manage.

4.3.2. Control mechanism

Stakeholders were consulted about the implementation and application of the control mechanism set out in Article 4 of the CIR. Several operators highlighted the complexity of the process and called for simplifications. The main elements reported are:

- Complexity and cost for implementation: According to respondents, the control mechanism is a resource-intensive aspect of the FUP, requiring detailed tracking of usage and presence over a minimum period of 4 months. This process is complex, costly, time-consuming and often requires manual interventions e.g. in cases automated checks were not possible to implement. Roaming providers report that they face technical challenges, especially during peak travel periods, as the control mechanism is difficult to implement.
- Impact on Business Models: Roaming providers may continue to face significant financial challenges due to maintaining RLAH under current FUP conditions, because of the inability to effectively monitor and prevent permanent roaming by means of the observation window. This inability can result in systematic financial losses, in particular for MVNOs.

In light of the above, some operators have asked adopting a simpler approach that would eliminate the requirement for both indicators to be met simultaneously. Instead, they suggest that meeting only one of the two indicators over the four-months period should be sufficient. Additionally, respondents expressed the view that the mandatory 14-day warning period before applying surcharges exacerbates inefficiencies and should therefore be removed. Some stakeholders also suggest reducing the monitoring period from four months to a shorter period and granting roaming providers more flexibility in applying surcharges or developing non-regulated offers. Stakeholders also mentioned that the FUP provisions should be aligned with national law to enable stricter actions, such as service suspension for fraudulent use. To

[17] In particular, see BoR (19) 101, chapter 3.1, https://www.berec.europa.eu/en/document-categories/berec/opinions/berec-opinion-on-the-functioning-of-the-roaming-market-as-input-to-ec-evaluation

conclude, while the FUP control mechanism is essential, it needs simplification to reduce complexity, enhance efficiency and ensure it achieves its purpose of safeguarding RLAH without overburdening operators.

4.3.3. Open data bundles and Prepaid tariffs

Respondents highlighted various challenges concerning the implementation of the FUP for open data bundles under the RLAH framework.

- Excessive usage: The FUP for open data bundles is considered an essential safeguard, enabling operators to manage costs and prevent excessive consumption. However, the annual recalculation of the minimum roaming allowance, necessitated by the decreasing wholesale data cap, is perceived as costly and complex. To address this issue, operators propose extending the recalculation period to every two or three years, thereby reducing implementation burdens.
- High cost and implementation complexity: The current formula, which includes a 2x multiplier linking the domestic retail price to the wholesale data cap, is viewed by roaming providers as economically unsound. This formula may result in providers incurring costs that are twice as high as the revenue generated from retail prices, potentially leading to financial losses. The complexity of implementing and managing this system, particularly in relation to different tariff structures and customer types, is highlighted as a significant burden. Many operators advocate for reducing or eliminating the 2x multiplier to establish a more balanced relationship between retail and wholesale costs. Such an adjustment would enable providers to avoid offering services at a loss while ensuring sustainable business practices. Additionally, there is a call for expanding the scope of the FUP beyond data to include voice and SMS traffic, given that mobile termination rates (MTRs) can be expensive.
- Impact on non-Eurozone providers: Operators in non-Eurozone countries encounter additional challenges due to currency fluctuations, which necessitate rate adjustments. These changes pose operational difficulties and may result in customer churn when rates increase. To mitigate these issues, stakeholders propose aligning the revision date for caps in currencies other than the euro (currently set for 15 May) with the date of application of new maximum wholesale charges (1 January).
- Consumer benefits: While respondents recognise the importance of maintaining competitive roaming data allowances, they argue that the current rules can lead to increased domestic retail prices to offset financial losses, ultimately disadvantaging consumers.
- Prepaid: Roaming providers have highlighted the complexities and challenges of implementing a FUP for prepaid mobile plans under the RLAH regime, which requires real-time monitoring. These complexities render the system costly, inefficient, and resource-intensive, leading some operators to refrain from applying the FUP to prepaid tariffs.
- Need for enhanced safeguards: To more effectively prevent abusive or anomalous usage, operators suggest aligning the Roaming Regulation with national laws, thereby enabling measures such as service blocking in cases of fraudulent use. Additionally,

there is a call to extend the regulatory obligations to eSIM providers, ensuring that those offering comparable services adhere to equivalent regulatory requirements to ensure fair competition.

- General application and comments: The challenges associated with prepaid FUPs resemble those encountered with postpaid plans, as both mechanisms face difficulties in detecting and managing misuse. Additionally, some stakeholders have reported significant challenges related to unlimited tariffs. Overall, respondents acknowledged that while a FUP for prepaid plans serves as a crucial safeguard to protect operators from excessive usage and financial burdens, its current implementation remains complex, costly, and often ineffective in preventing abuse. Consequently, stakeholders have called for regulatory adjustments to enhance its practicality and enforcement.

4.3.4. Organised resale

The respondents of the survey also provided their insights regarding the implementation and effectiveness of the FUP in relation to the organised resale of SIM cards. According to respondents, in some markets, the current surcharges fail to prevent organised resale of EU SIM cards, including via eSIM web shops, to non-EU residents. This practice may lead to significant issues, such as interconnection fraud involving various numbering ranges.

Many operators, who addressed this issue in the questionnaire, emphasised that enforcing these control measures is both complex and resource-intensive. Some respondents reported no evidence of widespread abuse or organised resale, others state that existing mechanisms are functioning adequately. While some providers have not implemented specific controls or observed abuse, others find the current system demanding to apply effectively and lacking in practical enforcement strategies.

4.4. Sustainability mechanism

The sustainability mechanism was introduced with Regulation (EU) 2015/2120, which amended Regulation (EU) No 531/2012, and its detailed rules were further established through Commission Implementing Regulation (EU) 2016/2286. Following the introduction of RLAH, roaming providers in several Member States availed themselves of the procedure for the exceptional approval of roaming surcharges. However, the number of applications has steadily declined over the observed period (see Figure 12), and, in 2024, only 9 operators have been granted a derogation. Between 2022 and 2024, applications for derogation have been received and granted exclusively to MVNOs. This decline may be attributed to the progressive reduction of wholesale caps, particularly for data. However, BEREC considers that this trend may also be due to the limited effectiveness of sustainability mechanisms in certain circumstances.

While operators may legally obtain authorisation from their NRA to apply a surcharge under the sustainability mechanism outlined in Article 6, competitive market dynamics often render the practical implementation of such surcharges economically unfeasible. Operators that attempt to apply surcharges may struggle to compete in a market where the majority of competitors do not apply them.

As a result, the sustainability mechanism appears to be effective primarily in countries with lower levels of cross-border mobility, and where a sufficiently large number of operators are

both authorised and able to apply surcharges without facing excessive competitive pressure. This assessment is supported by past cases in which some operators – mainly MVNOs – were granted the right to impose surcharges after their NRA determined that the costs of providing regulated roaming services jeopardised the sustainability of their domestic pricing models. Nevertheless, these operators ultimately chose not to implement surcharges, as the prevailing competitive conditions did not permit their application.

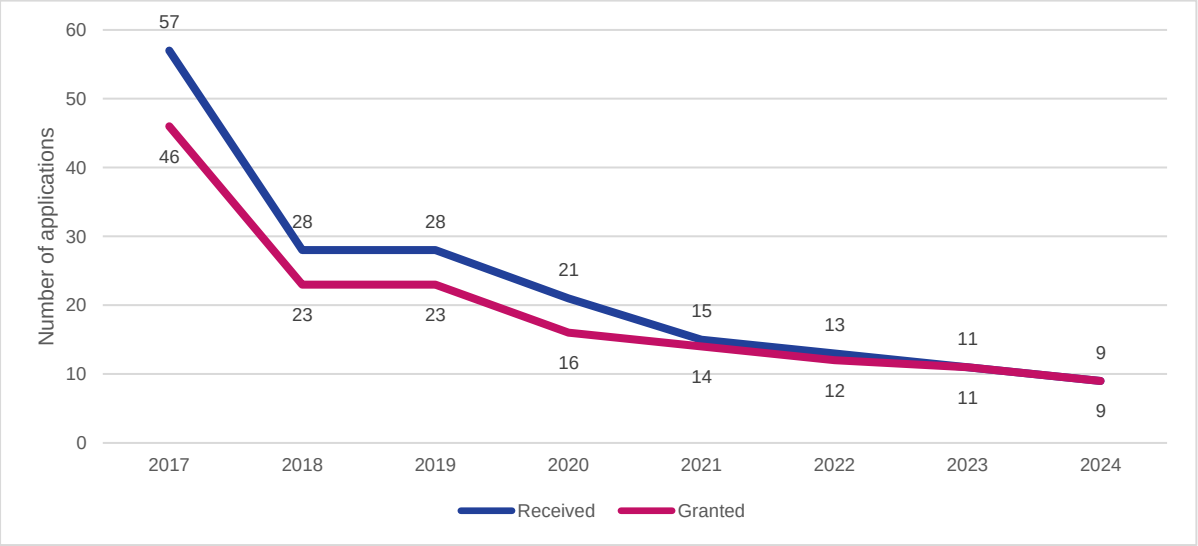


Figure 12: Number of applications for derogation 2017 - 2024

Some respondents to BEREC's call for input, particularly MVNOs, confirmed these limitations of the sustainability mechanism, arguing that it primarily mitigates issues at the retail level without effectively addressing the underlying structural challenges at the wholesale level. However, some stakeholders also highlighted that the sustainability mechanism remains a necessary safeguard for certain operators under specific national circumstances.

Some respondents, who emphasise the partial effectiveness of the current rule, particularly in the context of mitigating financial losses suffered by MVNOs, propose a further substantial reduction of the wholesale caps and the introduction of a sustainability mechanism at wholesale level. This proposal is analysed by BEREC in chapter 5.5.

Other respondents to the call for input further elaborated on the limitations of the current methodology for sustainability assessment, which is perceived as overly complex, time-consuming, and frequently inadequate. The established criteria – such as the requirement of a 3 % negative margin on mobile services to qualify for the application of surcharges – are considered overly restrictive and fail to account for all incurred costs, potentially leading to financial strain for operators. Operators recommend revising the methodology to incorporate all relevant cost factors.

Experiences from various countries further illustrate the difficulties encountered by roaming providers in obtaining sustainability exemptions. The complex application process and the reliance on estimated tariffs rather than precise data complicate approvals, resulting in frequent refusals even when economic conditions justify the need for a derogation, as was observed in the initial implementation phase.

Finally, respondents emphasised that the sustainability mechanism requires significant resources for implementation and is often misaligned with actual market conditions, particularly for operators that are part of pan-European groups. Cross-subsidy practices are also reported as a factor undermining the sustainability of smaller market players.

4.5. Conclusions and BEREC's views

As regards the functioning of domestic markets, BEREC underlines the difficulty to precisely assess the effects of RLAH, due to the volatility and complexity of the ECS and ECN sectors. Indeed, these sectors exhibit significant changes driven by various factors that go beyond the scope of the Roaming Regulation. Nevertheless, seven years after the introduction of RLAH, there are no indications of waterbed effects. The EC studies on fixed and mobile broadband services indicate a decreasing trend in domestic prices. At the same time, the number of domestic-only subscribers throughout the EU remains well below 5 % with a decreasing trend.

In consideration of the market trends identified and the inputs gathered from stakeholders and NRAs, and in order to ensure fairness, efficiency and sustainability of RLAH, BEREC makes the following recommendations regarding the FUP and sustainability mechanism. In doing so, BEREC acknowledges that both mechanisms have been instrumental and remain necessary for the functioning of RLAH. Furthermore, any modifications to the specific rules should be approached with caution. On the one hand, there is room for improvements in the design of the two mechanisms, including simplifications, by adapting or removing certain mechanisms that are hardly used. On the other hand, it is equally important to carefully weigh the investments already made to implement FUP related mechanisms, before introducing any changes that could render such investments obsolete.

- The FUP for open data bundles should be maintained, as it is deemed essential to ensuring the long-term sustainability of the RLAH regime. However, considering the progressive reduction of wholesale caps, the formula used to calculate the fair use volume of data roaming allowances may be revised to moderate the pace of increase in such allowances. This adjustment would ensure an economically sound approach aimed at preserving the long-term financial sustainability of operators. In this regard, it is particularly observed that, in an increasing number of instances, the current calculation methodology results in cases where the minimum FUP-based data roaming allowance exceeds the total data volume included in the domestic plan. BEREC considers that such situations may lead to customer confusion, as users might incur additional costs (i.e. from domestic per-unit charges applied after exceeding the domestic allowance) despite remaining within the FUP allowance. Consequently, BEREC recommends that the data roaming allowance should, at most, correspond to the total data volume included in the customer's domestic offer.[18]
- Maximum wholesale charges in currencies other than euro: For currencies other than the euro, the maximum charges are subject to an annual revision starting from 2023, based on the average of the reference exchange rates published on three specified dates in the Official Journal of the European Union. These annually adjusted limits for non-euro currencies take effect from 15 May. Conversely, reductions in the maximum

[18] This proposal is also in line with the considerations expressed by BEREC in its retail guidelines about add-ons

regulated wholesale charges (denominated in euro) come into effect from 1 January. To enhance consistency and streamline the derivation of the fair use allowance adjustments, BEREC recommends aligning both dates to 1 January.

- Control mechanism: The FUP control mechanism is generally considered useful in preventing anomalous and abusive usage, particularly for voice services. However, it appears to be too complex to implement and to communicate effectively to customers, warranting a reassessment. A drawback of revising the mechanism is the potential for additional costs for operators who have already implemented the current FUP framework.
- FUPs for pre-paid and organised resale are quite complex to implement and to communicate to customers. In view of the effort involved and the limited application by operators, these FUP provisions could be reevaluated.
- Alerting the customer of a pending surcharge: The EC could reassess whether the two-week warning period remains necessary after an abusive or anomalous usage has been proven. For example, it could be evaluated whether a one-off warning about the levying of additional roaming charges – until normal use is re-established – would suffice.
- Sustainability mechanism: While the number of applications is decreasing, the mechanism remains a relevant component of the RLAH framework. The EC should assess its efficiency and consider redesigning the mechanism to enhance its functionality and adaptability. In 2019[19], BEREC had already put forward suggestions in this regard. Specifically, BEREC suggested possible amendments to the Roaming Regulation and/or the CIR to clarify the sustainability procedure, including:
    - Ensuring consistency between the mobile services margin calculation in Article 2 and Articles 7, 8 and 9 of the CIR
    - Taking into account costs for balanced traffic
    - Incorporating the possibility to provide complementary documentation as requested under Article 6(2)
    - Aligning the volume forecasting methodology of Article 6(1) with the methodology for calculating costs and revenues.

[19] https://www.berec.europa.eu/en/document-categories/berec/opinions/berec-opinion-on-the-functioning-of-the-roaming-market-as-input-to-ec-evaluation

5. Wholesale roaming market

BEREC has analysed the overall implementation of the Roaming Regulation at the wholesale level, focusing on wholesale rates and costs, the impact of trading platforms on wholesale markets, and the topic of permanent roaming and M2M. Additionally, and based on reported data as well as input from stakeholders and NRAs, BEREC has conducted an assessment of the competition situation, especially taking into account how MVNOs and smaller MNOs are affected.

5.1. Wholesale pricing

BEREC has analysed the development in wholesale roaming rates since 2019 for this report. The following analysis examines the development in actual wholesale rates charged by MNOs and compares these rates to the regulated maximum prices (caps). The chapter also includes an overview of balanced and unbalanced roaming traffic, wholesale roaming agreements that are not subject to regulated prices, and an evaluation of the relationship between wholesale prices and costs. Additionally, the EC requested BEREC to assess in-group versus non-group traffic and pricing. However, such data is not available to BEREC for this analysis.[20]

5.1.1. Actual wholesale rates charged by the operators

BEREC collects information on revenues per service for wholesale inbound roaming. The assessment of actual wholesale rates charged is based on actual revenues reported by providers of wholesale inbound roaming.

5.1.1.1. Wholesale voice services

The recast Regulation (2022/612) reduced the wholesale price cap for voice calls minutes from 3.2 eurocents per minute (in place since 15 June 2017) to 2.2 eurocents per minute, effective from 1 July 2022, and further decreased it to 1.9 eurocents per minute, effective from 1 January 2025.

Figure 13 illustrates that, since 2019, there has been a general decrease in the actual average rates charged by operators for voice roaming traffic (total traffic, including both balanced and unbalanced traffic). Actual rates have decreased from 2.10 eurocents per minute in 2019 to 1.29 eurocents in 2024 (Q1-Q3 2024). The most significant decrease in actual rates occurred in 2022.

BEREC observes that the actual average prices have remained significantly lower than the wholesale price cap. The difference between the two ranges from a maximum of 41 % (2024 Q 1-3) to a minimum of 34 % (2019). Although the EEA average prices for voice roaming are well below caps, the underlying data indicates variations across countries. Data from Q3 2024 shows that the average wholesale price for voice minutes varies between 0.6 eurocents to 2.13 eurocents for inbound voice roaming (total traffic).

[20] Information on non-group traffic was collected by BEREC for the period from Q2 2007 to Q1 2016. However, there are no data available that distinguishes between in-group and non-group traffic for the relevant time period (2019 – 2023).

The figure also highlights a large difference between actual wholesale roaming rates for voice within EEA, and those charged for wholesale voice roaming in RoW. While the average rates for RoW experienced a sharp decrease since 2020, they remain more than twice as high as EEA rates in 2024. Regarding the price peak observed in 2020, a possible explanation could be the impact of the COVID-19 pandemic, which led to a reduction in wholesale inbound traffic.

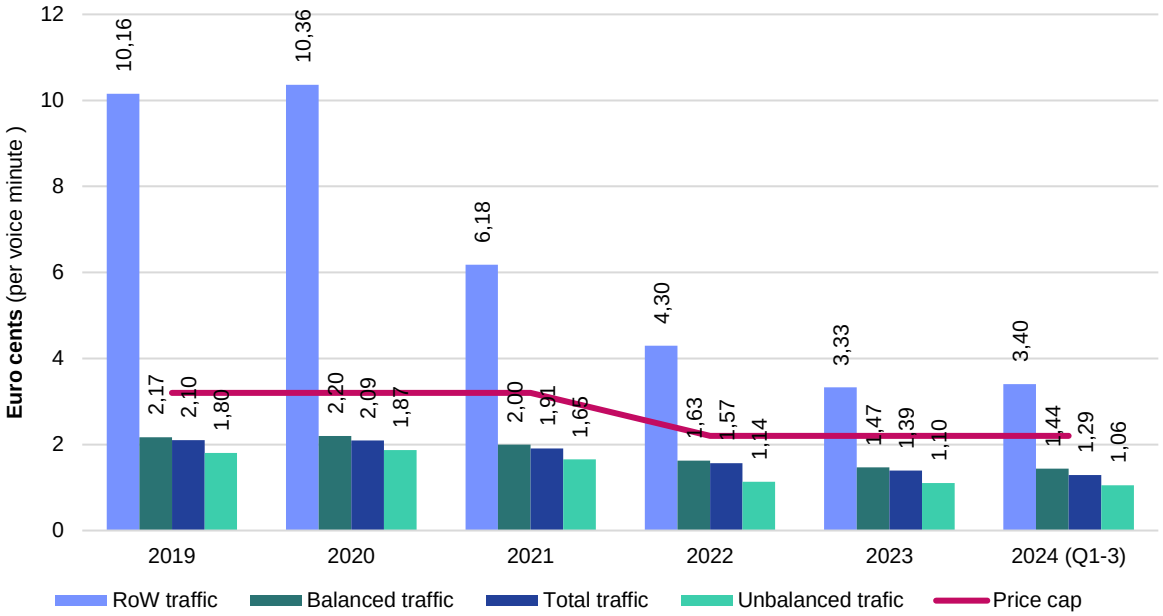


Figure 13: EEA and RoW average wholesale price per voice minute from 2019 to Q3 2024 (Euro cent per minute)

5.1.1.2. Wholesale SMS

The Roaming Regulation (2022/612) reduced the price cap for SMS from 1 eurocent per SMS (in place since 15 June 2017) to 0.4 eurocents per SMS, effective from 1 July 2022, and further decreased it to 0.3 eurocents per SMS, effective from 1 January 2025.

Since 2019 there has been a steady decrease[21] in actual average rates charged by operators for SMS roaming traffic (total traffic covering both balanced and unbalanced traffic). Actual rates have decreased from 0.32 eurocents per SMS in 2019 to 0.13 eurocents per SMS in 2024 (Q1-Q3 2024). BEREC observes that the actual average prices have remained significantly lower than the price cap. The difference between the two ranges from a maximum of 72 % (2021) to a minimum of 60 % (2023)[22].

Although the EEA average prices are well below caps, the underlying data reveals variations between countries. Data from Q3 2024 shows that the average wholesale price for inbound roaming SMS (total traffic) ranged from 0.03 eurocents per SMS to around 0.35 eurocents per SMS.

[21] 2020 is an exception where the average rates showed an increase from 0,32 (2019) to 0,37 (2020).
[22] 2022 cannot be considered for these calculations because the cap changed in the middle of the year.

Significant differences were observed between actual wholesale roaming rates for SMS within EEA and those for RoW traffic. The rates for RoW have decreased rapidly during 2021 and 2022, and in 2024, they were approximately five times higher than the rates in EEA.

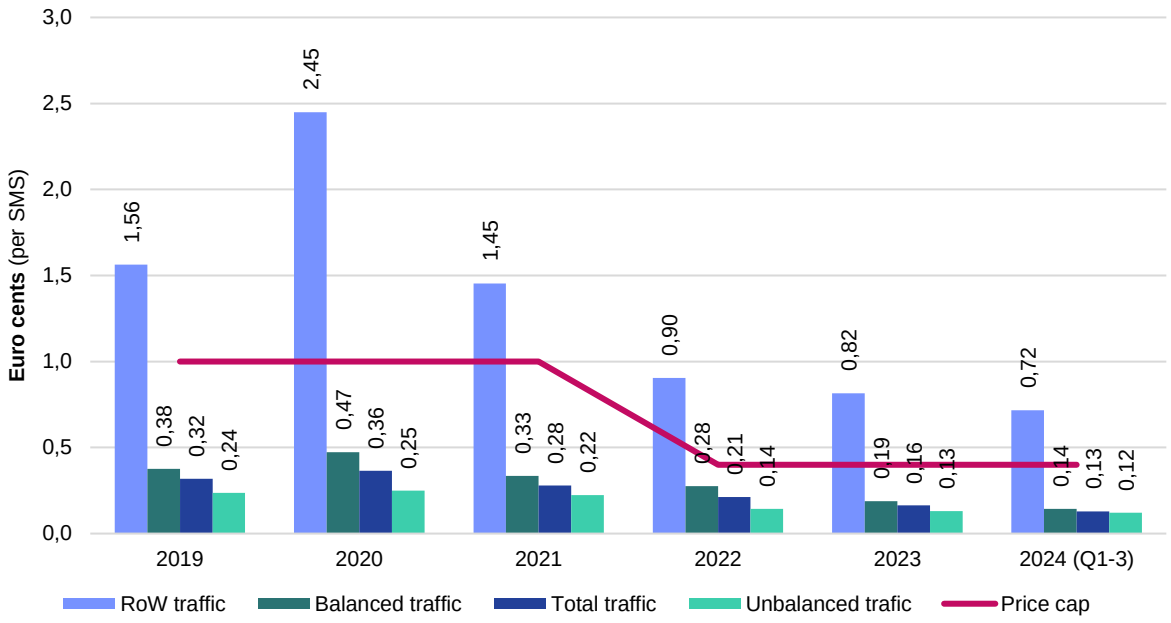


Figure 14 EEA average wholesale price per roaming SMS, (balanced, unbalanced total and RoW traffic) for the period 2019 to Q3 2024. (Euro cent)

5.1.1.3. Wholesale data

The wholesale price caps for data have decreased annually throughout the analysed period, as shown in Table 1.

Year	2019	2020	2021	2022	2023	2024	2025
Price caps per GB (Euro)	4.5	3.5	3	2	1.8	1.55	1.3

Table 1: Wholesale data roaming caps

Under the current Regulation, the price cap for data will continue to decrease yearly from 1 January 2025 until 1 January 2027, after which it will remain at 1 euro per GB until 30 June 2032. Figure 15 shows that since 2019 there has been a steady decrease in actual average rates charged by operators for data roaming traffic (including both balanced and unbalanced traffic). Actual rates have decreased from 1.72 euro per GB in 2019 to 0.68 euro per GB in 2024. BEREC again observes that the actual average prices have remained significantly lower than the price cap. The difference between the two ranges from a maximum of 62 % (2019) to a minimum of 51 % (2022).

Although the EEA average prices are well below the caps, the underlying data shows significant variations between countries. Data from Q3 2024 shows that the average wholesale price for data (total traffic) ranged from 0.14 euro per GB to around 0.89 euro per GB (total traffic).

Additionally, there have been substantial differences between actual wholesale roaming rates for data within the EEA and rest of the world (RoW). The rates for RoW have decreased rapidly during 2021 and 2022, and in 2024, they were around 43 % higher than the rates within the EEA (Q1-3).

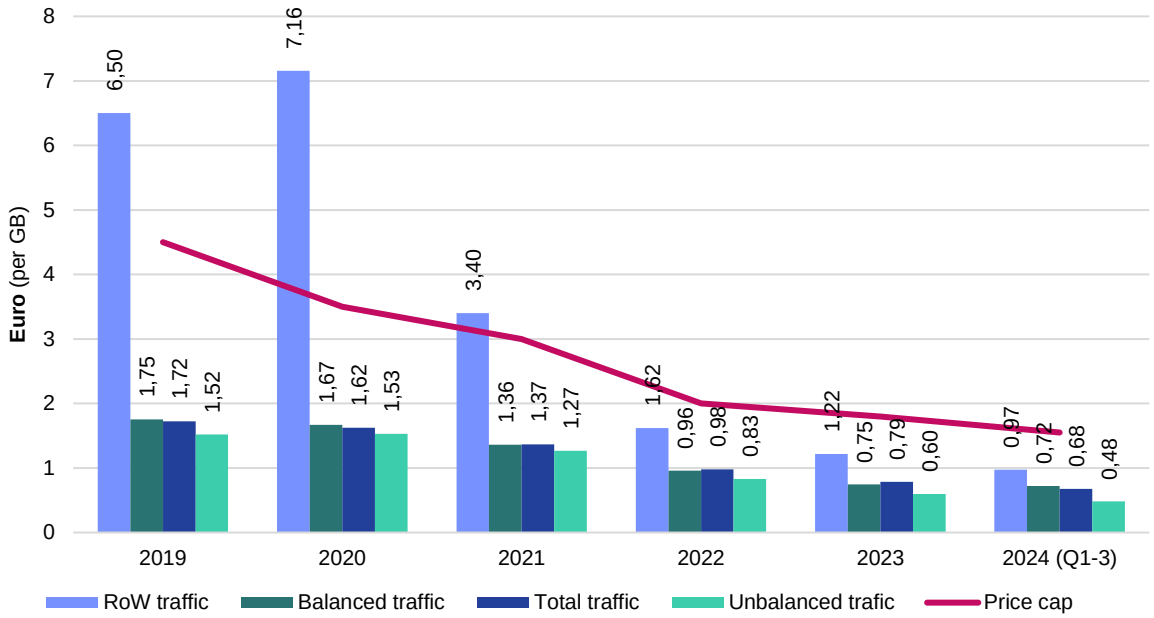


Figure 15 EEA average wholesale data price per GB, (balanced, unbalanced, total traffic, RoW traffic) for the period 2019 to Q3 2024.

5.1.1.4. Summary

In general, it can be concluded that the average actual wholesale rates have continued to follow a decreasing trend over the period analysed and that the average actual wholesale rates have remained below the regulated wholesale caps throughout the entire period. However, the gap between actual charged prices and caps has been narrowing.

Average wholesale rates continue to decline and remain well below the regulated wholesale caps. However, MVNOs typically pay rates above the negotiated prices. BEREC is convinced that the caps remain important and should be set to reflect actual production costs in an efficient and well-maintained mobile network as well as an additional margin, as foreseen in the current regulation. On the other hand, however, lower wholesale caps currently also means that operators have to offer higher data volumes in case of open data bundles, which again might lead to sustainability problems.

In addition, volumes purchased by small MNOs and MVNOs are low compared to volumes purchased by large MNOs. Therefore, the average prices, which are calculated by dividing the total revenues with the total volumes, are more representative of the prices paid by large MNOs. BEREC is aware from previous work that small operators and MVNOs do not achieve discounts on the same scale as large operators do. This aspect is further examined in chapter 5.2.

5.1.2. Impact of balanced and unbalanced roaming traffic

Unbalanced traffic occurs when MNOs sell a higher volume of inbound roaming traffic (i.e. foreign customers visiting their network), than the volume they buy from their roaming partners (due to their own customers periodically roaming abroad). Unbalanced traffic can also be described as the wholesale inbound traffic in excess of the outbound traffic from the point of view of the visited operator. Thus, the unbalanced traffic is the difference between the inbound traffic (generated by visiting end-users) and outbound traffic (generated by the operators' own customers travelling abroad).

The following assessment of balanced and unbalanced traffic is based on the latest available data (Q4 2023 - Q3 2024). Figure 16 illustrates the proportion of balanced an unbalanced traffic for data across the EEA countries. However, this table should be interpreted with caution, as some operators might face challenges in accurately reporting unbalanced traffic.

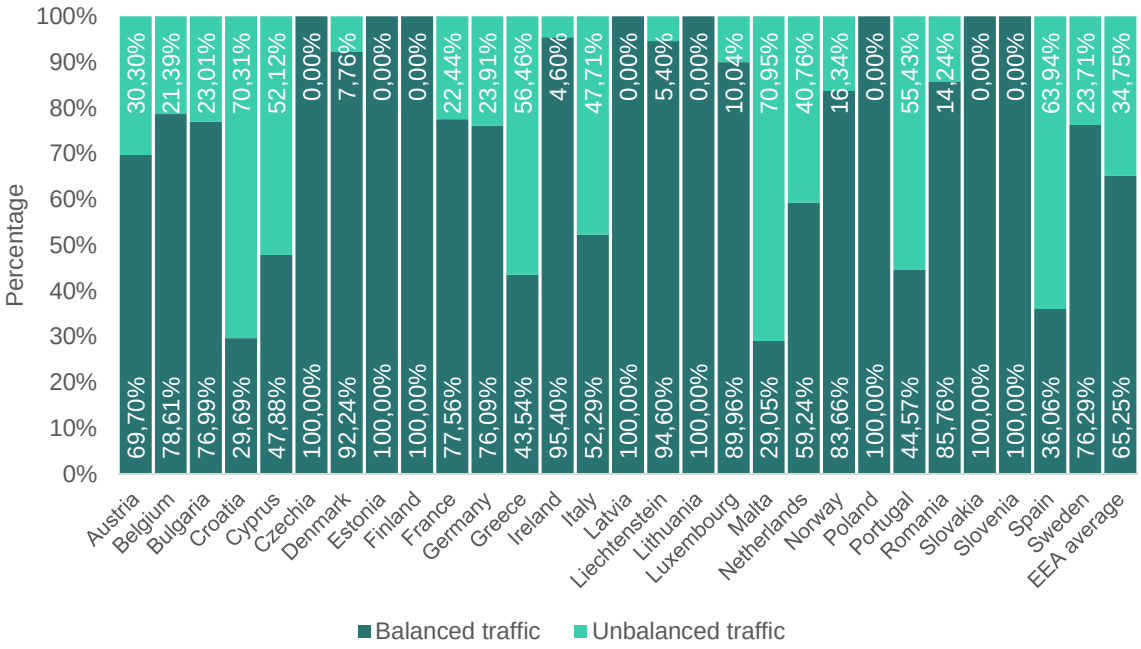


Figure 16: The share of balanced and unbalanced traffic within EEA countries for data services for Q4 2023 - Q3 2024. This value is created by calculating the contribution of the number of balanced and unbalanced GB to the total number of wholesale roaming GB.

According to the data for the period Q4 2023 – Q3 2024, unbalanced traffic is observed to some extent in 21 countries. Within these countries, one or more operators are selling a higher volume of inbound roaming traffic (foreign customers visiting their network) than the volume they buy from their roaming partners. It should be noted that there may be differences between the MNOs of a country regarding whether each of them exhibits an unbalanced traffic profile or not.

In general, prices for unbalanced traffic are lower than those for balanced traffic, as illustrated in Figure 13 - Figure 15. This difference in average prices applies to voice calls, SMS and data, as shown in the figures above. One of the reasons for this difference might that roaming partners negotiate more fiercely on unbalanced traffic than on traffic that is balanced, meaning that both sides buy and sell the same volume of traffic. However, this means that inbound

operators on average receive lower payments for the traffic they provide to visiting partners in excess of the outbound traffic they buy from those partners.

Since the concept of unbalanced traffic is linked to the traffic balance between roaming partners rather than the overall national traffic situation, unbalanced traffic appears for many countries within the reported figures. Still, the figure clearly indicates that some countries are more affected than others. However, BEREC has no clear evidence of specific consequences or impacts of the Roaming Regulation on countries where unbalanced traffic occurs among operators.

Given that operators' individual reporting of unbalanced traffic with partners entails a certain risk of misunderstandings and reporting challenges, and that no specific impacts have been identified over time, BEREC propose to phase out this indicator from the benchmark reporting, as specified in chapter 3.1. This measure will also help reduce the burden for operators related to the reporting obligations.

5.1.3. Wholesale agreements not subject to price caps

BEREC has collected data on the wholesale roaming agreements not subject to the maximum wholesale roaming charges (Article 3(4) of the Roaming Regulation). The figures below illustrate the evolution of average revenue per unit (inbound volume) for each service. The average revenue per service is also compared to that of agreements not subject to the wholesale price caps. It should be noted, however, that over the period from 2019 to 2024, a total of 16 NRAs provided information on the use of wholesale agreements not subject to the wholesale price caps. The figures represent only MNOs.

5.1.3.1. Voice

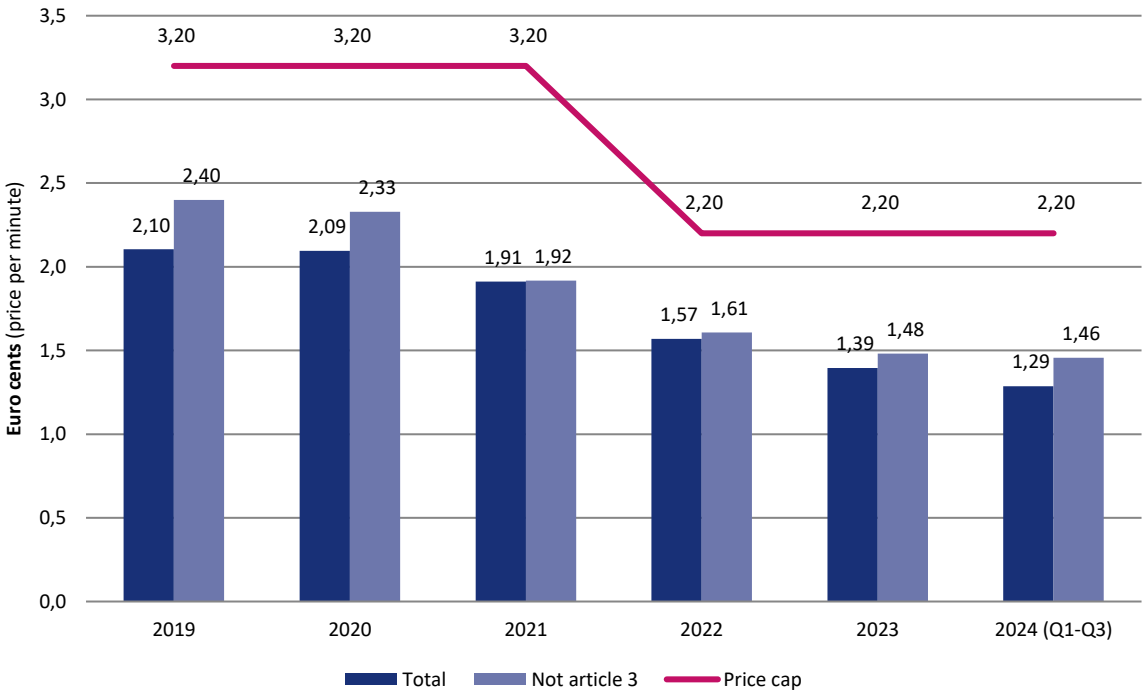


Figure 17: Average revenue per inbound voice minutes from agreements subject to maximum wholesale roaming caps (Total) and from agreements not subject to the maximum wholesale roaming caps (Not article 3) .

The average revenue per minute from commercial agreements (not subject to caps) are slightly above the average revenues from agreements subject to price caps for all years. The difference varies between 14.3 % (2019) to 0.5 % (2021).

5.1.3.2. SMS

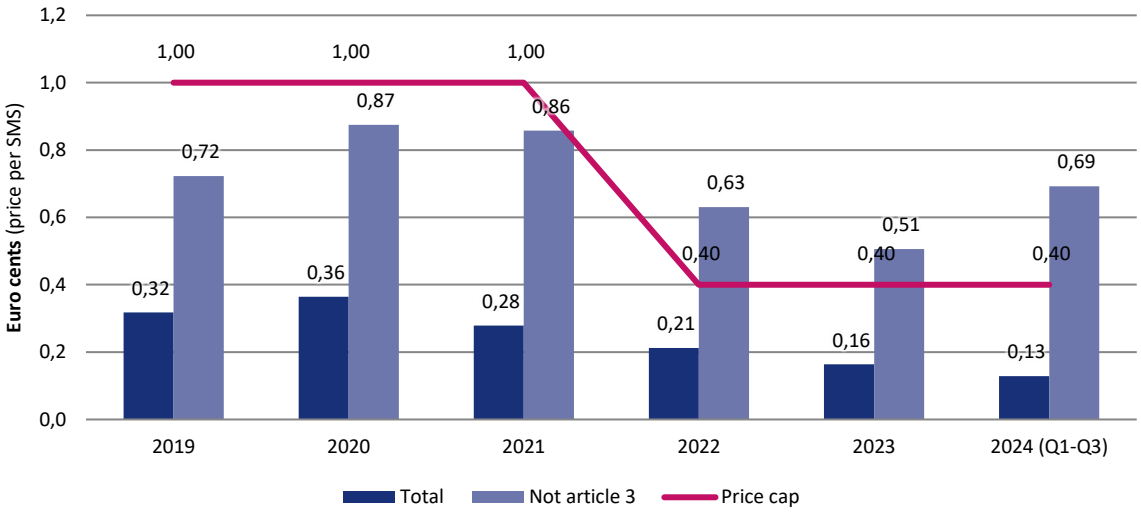


Figure 18: Average revenue per inbound SMS from agreements subject to maximum wholesale roaming caps (Total) and from agreements not subject to the maximum wholesale roaming caps (Not article 3)

For SMS, average revenues from commercial agreements (not subject to caps) have been above the caps since 2022. The average revenue per SMS from commercial agreements not subject to the caps by far exceeds the revenues from agreements subject to price caps.

5.1.3.3. Data

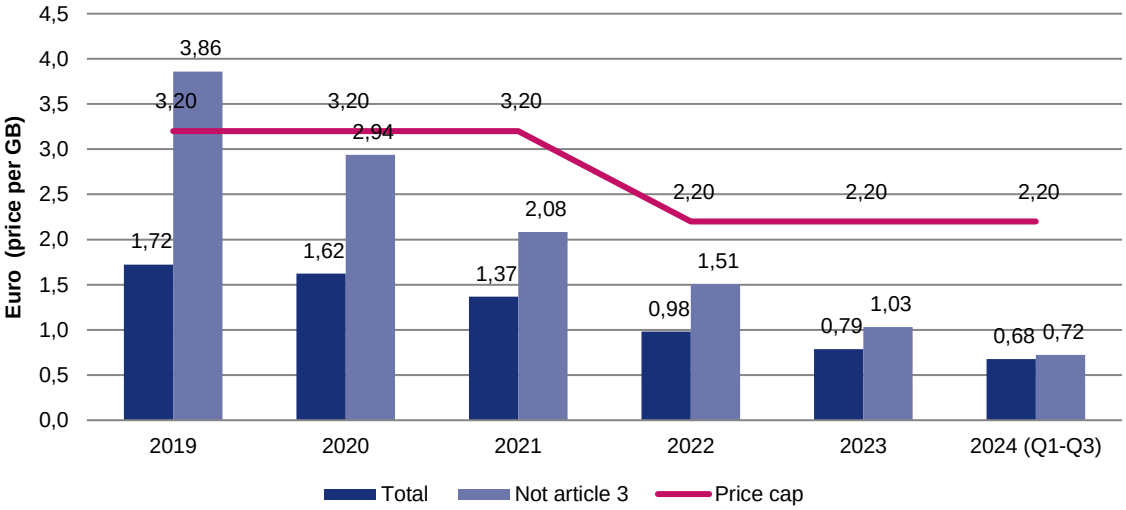


Figure 19: Average revenue per GB (inbound) from agreements subject to maximum wholesale roaming caps (Total) and from agreements not subject to the maximum wholesale roaming caps (Not article 3).

The average revenues per GB have been higher in commercial agreements that are not subject to price caps. The difference has varied between 124 % (2019) to 5.9 % (Q1-Q3 2024).

5.1.3.4. Summary

For wholesale voice and data traffic, the average revenue per service from commercial agreements not subject to the maximum wholesale roaming caps has been below the regulated price cap during the period from 2020[23] to Q3 2024. This outcome is expected, as a precondition for deviating from the price regulation under Articles 9, 10 and 11 is mutual agreement between both parties. For wholesale SMS, however, the average revenue from agreements not subject to the maximum wholesale caps is higher than the caps. This indicates that SMS has not been the main focus of the negotiations between roaming partners. According to the data collected by BEREC for all responding operators, average revenues per service from agreements subject to wholesale price caps are below the average revenues from commercial agreements that are not subject to price caps.

5.1.4. Relation between wholesale prices and costs

The EC requested BEREC to provide an assessment of the relationship between wholesale prices and costs. BEREC conducted this assessment in 2019[24] and repeats this exercise in this document using a similar methodology. In particular, similarly to 2019, in this assessment BEREC uses the output of the EC external study assessing the cost of providing two types of mobile wholesale services in the EU: roaming services and voice call termination rates (CNECT/2022/OP/0065) conducted by Axon Partners Group. The costing exercise was launched in June 2023 and the results, along with all related documentation on the model (e.g., methodology, structure) were published by the EC in December 2024[25].

Similarly to 2019, Axon has incorporated multiple alternatives for a series of parameters and methodological approaches within the model. The output has been published for all possible combinations of parameters/methodological approaches, enabling decision-makers to access a range of unit costs for each modelled service (72 scenarios and 2,160 cost results per year per service).

BEREC's analysis further draws on data collected by BEREC in the context of preparing its annual International Roaming Benchmark data reports for the periods (i) October 2022 – September 2023, and (ii) October 2023 – September 2024.

As noted above, the Axon study does not provide one single result for each type of service, country, and year, but rather presents 72 different scenarios. To illustrate, for roaming voice service in Austria for the year 2025, the model calculates 72 different unit costs, depending on the combination of parameters and methodological approaches applied. BEREC does not present the complete set of results, but instead provides the range of results by using the minimum and maximum unit costs. When comparing the calculated costs with the wholesale price caps, however, it is important to not consider only the results provided by Axon, but also take into account the additional costs that the visited network has to bear. BEREC notes that, in addition to the unit costs derived from the Axon cost study – which models the network costs of an efficient wholesale operator – the following costs must be included in order to ensure

[23] In 2019 the commercial price for data was above the regulated caps.

[24] https://www.berec.europa.eu/en/document-categories/berec/opinions/berec-supplementary-analysis-on-wholesale-roaming-costs

[25] https://digital-strategy.ec.europa.eu/en/library/finalisation-mobile-cost-model-roaming-and-delegated-act-single-eu-wide-mobile-voice-call-0

that the visited network operator can recover its costs (network costs + outpayments) associated with providing the wholesale roaming service:

- an estimate of transit charges paid (for voice and data roaming services) and
- termination costs for voice roaming services.

BEREC compares these results with the wholesale price caps set out in the Roaming Regulation and the reported actual charges operators apply for all roaming services (separately for unbalanced traffic and for total traffic).

In 2019, BEREC applied two methodologies[26] for deriving the minimum/maximum data points and observed that the results from both methodologies for all services do not diverge significantly for the years 2021-2025. Therefore, for the present analysis, BEREC relies solely on methodology 1, as it provides a more precise estimation of minimum and maximum values.

Based on this methodology, BEREC prepared graphs showing minimum and maximum values. In particular, BEREC identified the minimum and maximum unit costs across all scenarios per country, year and service. For each graph included in this chapter showing the unit cost evolution, BEREC only presents the country with the lowest and highest values (separately for the maximum and minimum values) for each service, as well as the average across all modelled countries (separately for the maximum and minimum values). For example, in Figure 24, the country that has the highest value for the *minimum per-country unit cost estimation* for roaming data is Belgium, while Denmark exhibits the lowest value for this metric. In the same graph, Belgium again records the highest value for the *maximum per-country unit cost estimation* for roaming data, while Croatia has the lowest value for this metric. BEREC identified the countries with the highest and lowest values based on the unit cost estimates for the year 2032.

Furthermore, it should be noted that this costing exercise provides results for 23 out of the total 30 countries (EU/EEA) that submitted information during the data collection process. In the graphs presented below the remaining seven countries are not incorporated. The cost model results for the minimum and the maximum unit cost per country are presented in the Appendix.

5.1.4.1. Roaming voice services

This sub-chapter shows the results of the analysis for voice roaming services. The costs shown are the sum of: a) the origination costs in accordance with the Axon bottom-up model, b) the current value of the mobile termination rate, in accordance with the EC Delegated Act, and c) an estimate of transit charges paid, as provided by Axon.

[26] Under methodology 1 BEREC identified the minimum/maximum unit costs of all scenarios per country, year and service. Using methodology 1, a different scenario of the bottom-up cost model for each year/country/service could be used in the identified minimum/maximum unit costs. Under methodology 2 BEREC identified a set of parameters/methodological approaches (i.e. a scenario) with the maximum/minimum unit costs on average for all countries. In order to do this, BEREC calculated the average unit costs of each roaming service for all countries and per scenario, and then identified which scenario yields the minimum and maximum average unit cost per service. In contrast to the values of methodology 1, methodology 2 used one scenario of the bottom-up model per roaming service for all countries and for the whole period.

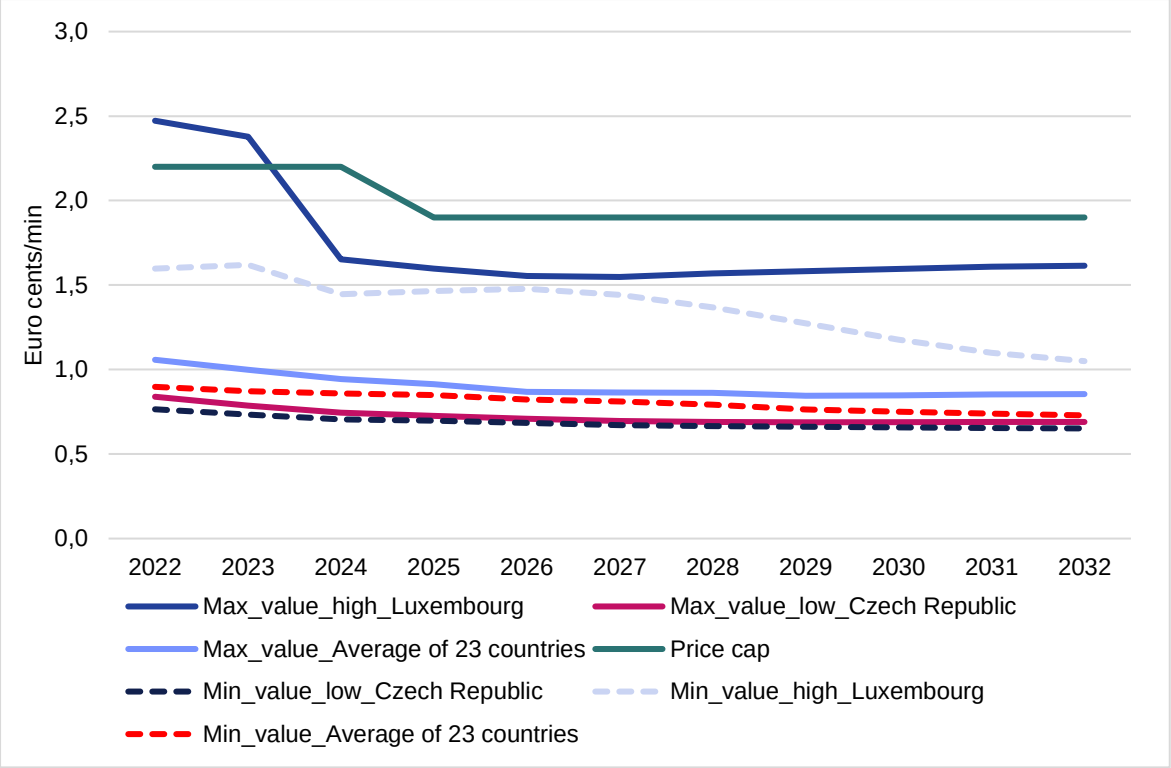


Figure 20: Voice roaming costs per call minute

According to Figure 20, with the exception of the years 2022 and 2023, all per-minute costs calculated using the EC cost model are lower than the price caps introduced by the 2022 Roaming Regulation. In addition, it should be noted that Luxembourg is the only country where the cost per minute exceeds the price cap of 0.022 euro/min for 2022 and 2023. However, this occurs in only 36 out of the 72 scenarios. Additionally, according to the data annually collected by BEREC, Luxembourg's operators, on average, applied rates for 2022 and 2023 that were slightly lower than the minimum unit cost calculated for roaming voice in the country. Therefore, it can be inferred that the price caps established by the 2022 Regulation adequately cover the wholesale costs for providing roaming voice calls, with some margin for a potential further reduction in the price cap.

The following graphs show the comparison between unit costs (minimum and maximum with data derived according to the methodology described above), applied wholesale rates (both unbalanced and total), and the price cap imposed for roaming voice service for 2023 and for Q1-Q3 2024. In these figures, the average unit cost for the 23 countries (for which unit costs were calculated by the Axon model) is determined as the simple average of unit costs per country (separately for minimum and maximum costs).

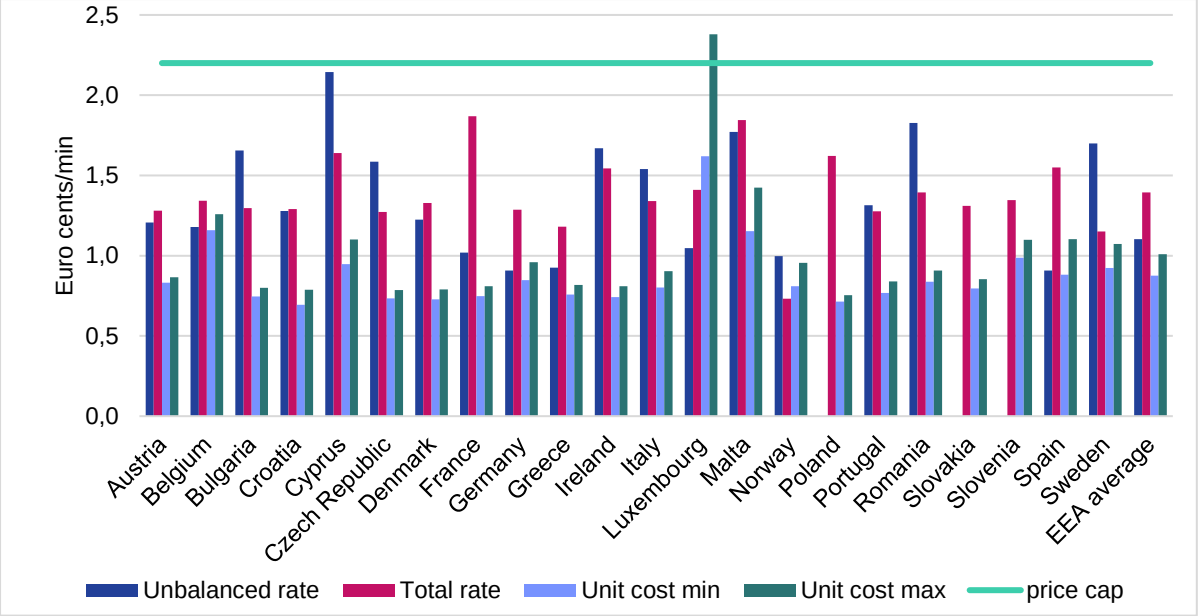


Figure 21: Roaming voice comparison for 2023

Note: Countries for which Axon has not calculated the costs are excluded from the graph. HU is excluded from the graph as per their request for confidentiality.

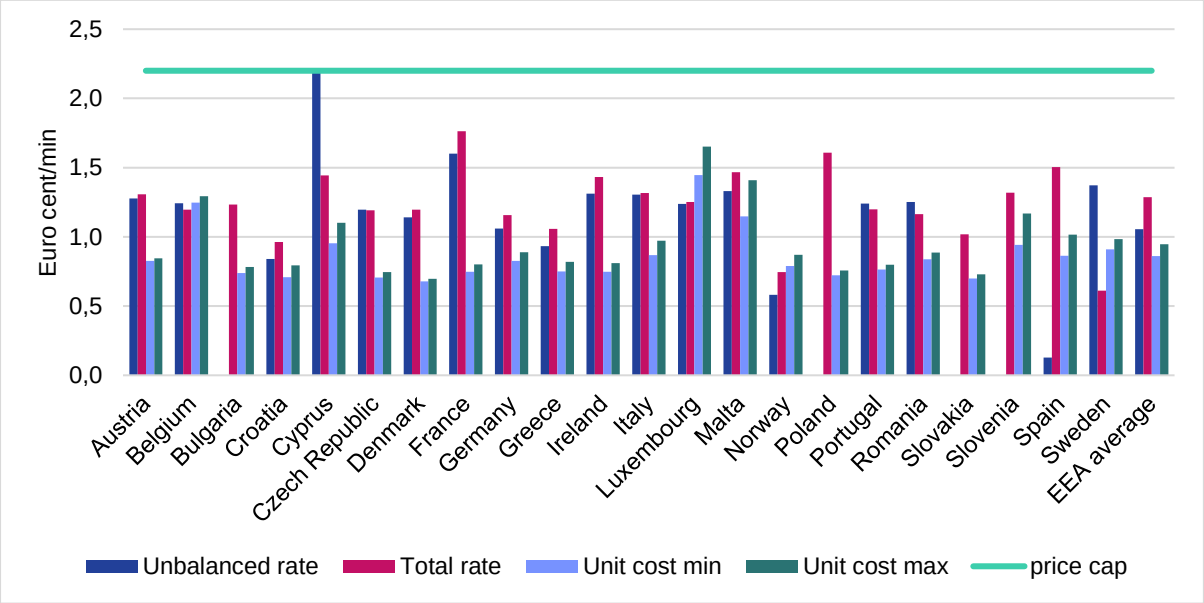


Figure 22: Roaming voice comparison for 2024 (Q1-Q3)

Note: Countries for which Axon has not calculated the costs are excluded from the graph. HU is excluded from the graph as per their request for confidentiality.

From the graphs comparing actual rates with calculated costs, it can be concluded that, on average, no significant divergence between actual unbalanced rates and costs has been observed. In most cases, the rates charged are higher than the cost calculated by the Axon Cost model. In 2023, the average EEA unbalanced rate was 9 % higher than the average EEA maximum cost, while in 2024, this difference is 11 %.

5.1.4.2. Roaming SMS services

BEREC applied the same analytical approach to SMS services as it did for voice services, presenting a range based on the minimum and maximum values. As in 2019, the costs per SMS derived by the Axon model were used for this analysis without the need for any additional cost components.

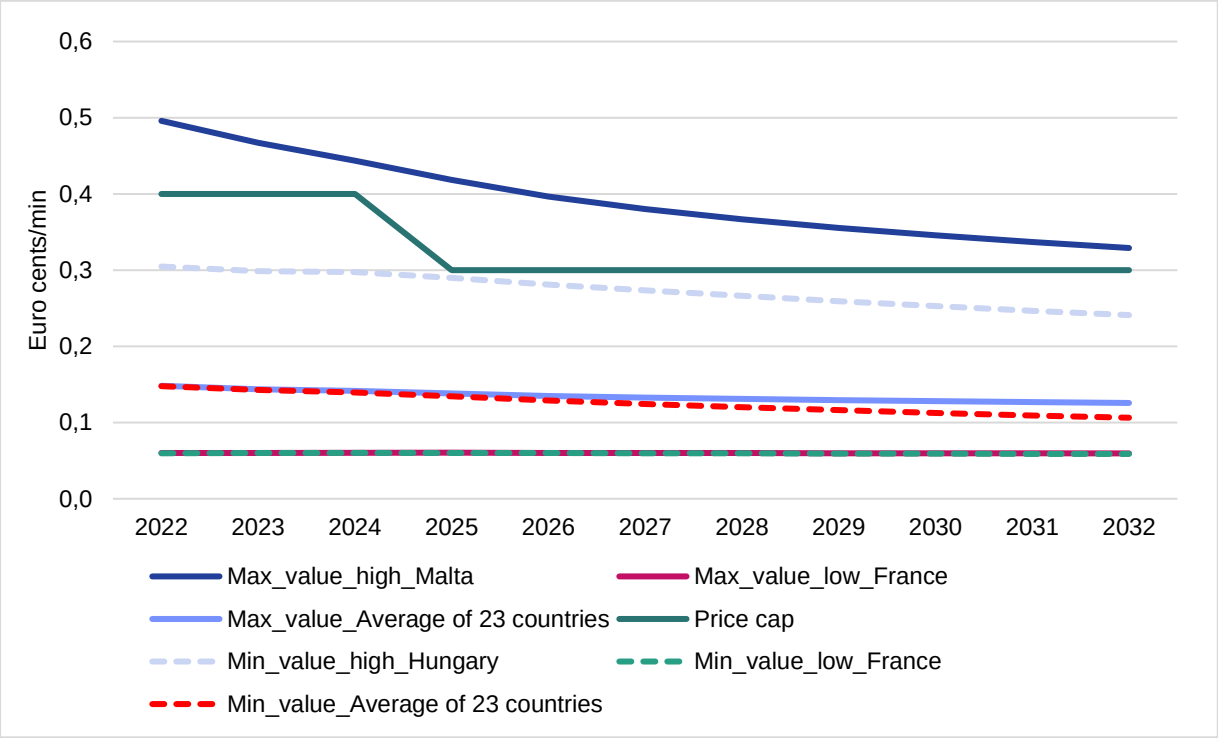


Figure 23: SMS roaming costs – per SMS

According to Figure 23, the SMS price cap is lower than the maximum costs calculated for Malta for all years. It should be noted that for Malta, all 72 scenarios produced unit costs exceeding the SMS price cap for the years 2022-2027. In 2028, 48 scenarios produce higher unit cost than the price cap. For the years 2029-2032 there are still scenarios that produce higher unit costs than the price cap. However, apart from Malta, the model produces costs that are lower than the SMS price cap in all other 22 countries. It should also be noted that, according to the data annually collected by BEREC, Maltese operators, on average, applied rates below 0.003 euro – the price cap applicable from 2025 onwards – during the period 2022-2024. It can therefore be inferred that the price caps of the 2022 Regulation cover the wholesale costs for providing roaming SMS.

5.1.4.3. Roaming data services

For data roaming services, the following costs are considered for the analyses: (i) Origination costs and (ii) transit costs. With regard to (i), BEREC bases its calculations on the results of the Axon costs model. With regard to (ii), BEREC draws on the information published by the EC alongside the Axon model about transit charges paid for data roaming services, which are estimated to be 0.095 euro per GB.

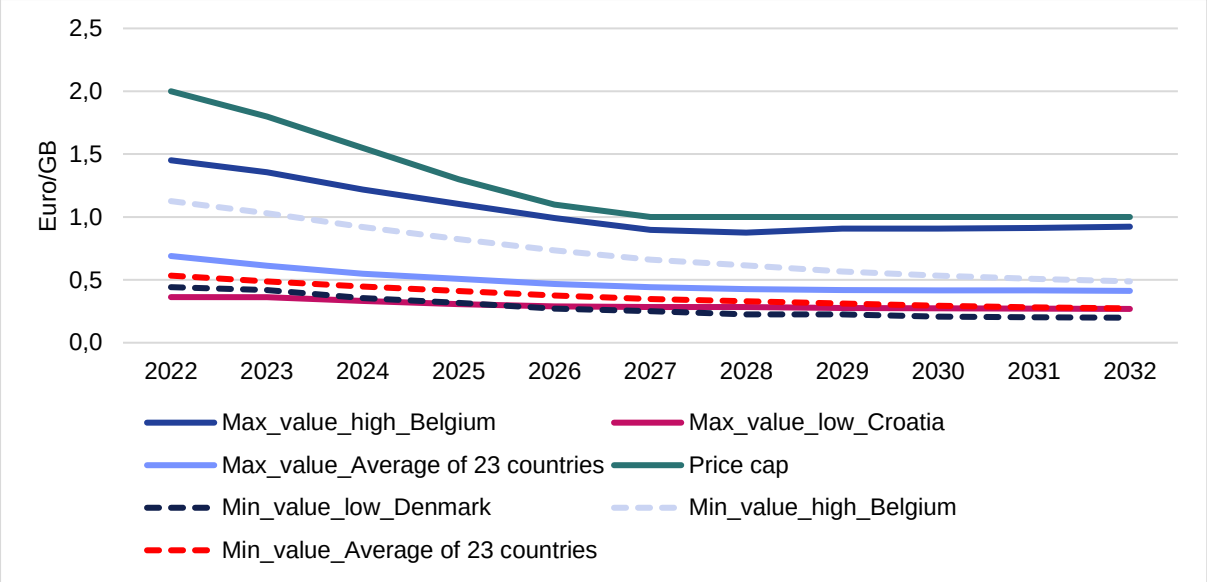


Figure 24: Data roaming costs – per GB

According to Figure 24, the data price cap is higher than all Axon cost calculations for all 23 countries for all modelled years. Although, in the case of Belgium, the maximum data unit costs are close to the price caps set by the 2022 Regulation for the years 2026-2032. This is not the case for the remaining 22 countries (for example for Germany[27], which has the second highest unit cost for these years, there is an average difference of about 45 % between the price cap and the unit cost per GB). Figure 25 compares the unit costs and the caps, excluding Belgium, which could be considered an outlier, for data roaming unit cost calculation.

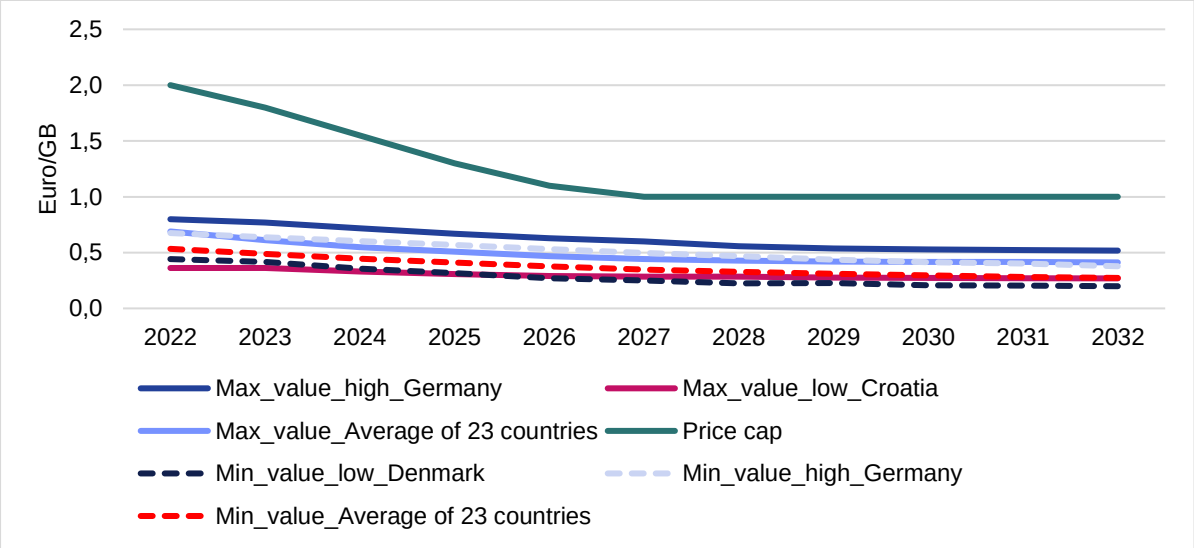


Figure 25: Data roaming costs – per GB (excluding Belgium)

The following graphs show the comparison between unit costs (minimum and maximum with data derived according to the methodology described above), applied wholesale rates (both

[27] The maximum unit cost for Germany for the years 2026-2032 is 0.63 euro/GB, 0.60 euro/GB, 0.56 euro/GB, 0.54 euro/GB, 0.53 euro/GB, 0.52 euro/GB and 0.52 euro/GB respectively per year.

unbalanced and total), and the price cap imposed for roaming data service for 2023 and Q1-Q3 2024. In these figures, the average unit cost of the 23 countries (for which the unit costs are calculated by the Axon model) is determined as the simple average of unit costs per country (separately for minimum and maximum costs).

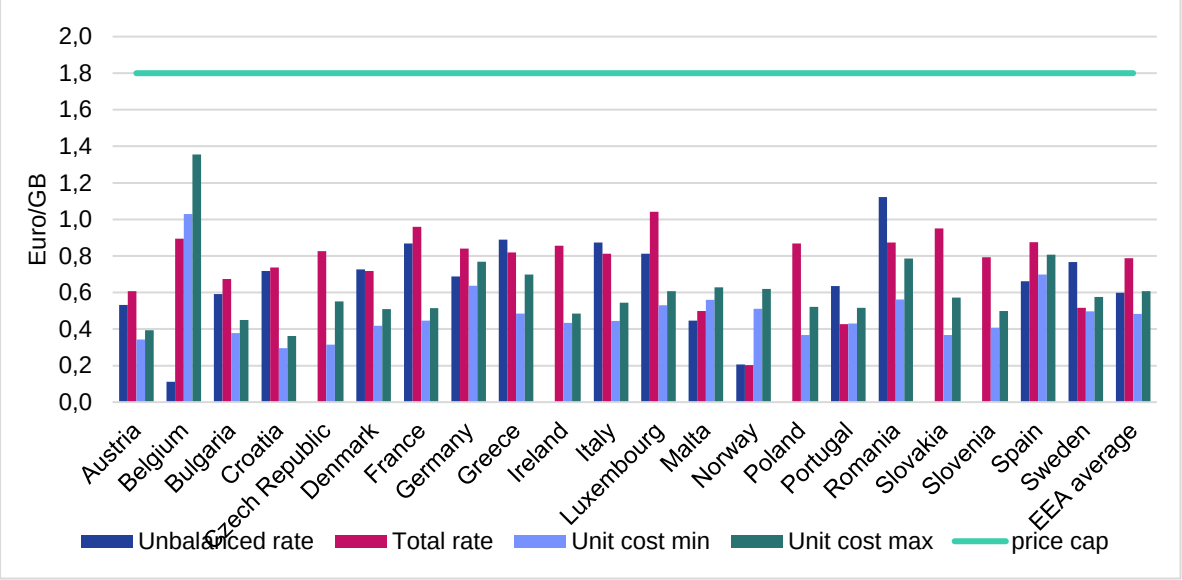


Figure 26: Roaming data comparison for 2023.

Note: Countries for which Axon has not calculated the costs are excluded from the graph. HU is excluded from the graph as per their request for confidentiality. CY and IE (unbalanced) are excluded due to missing data in some quarters.

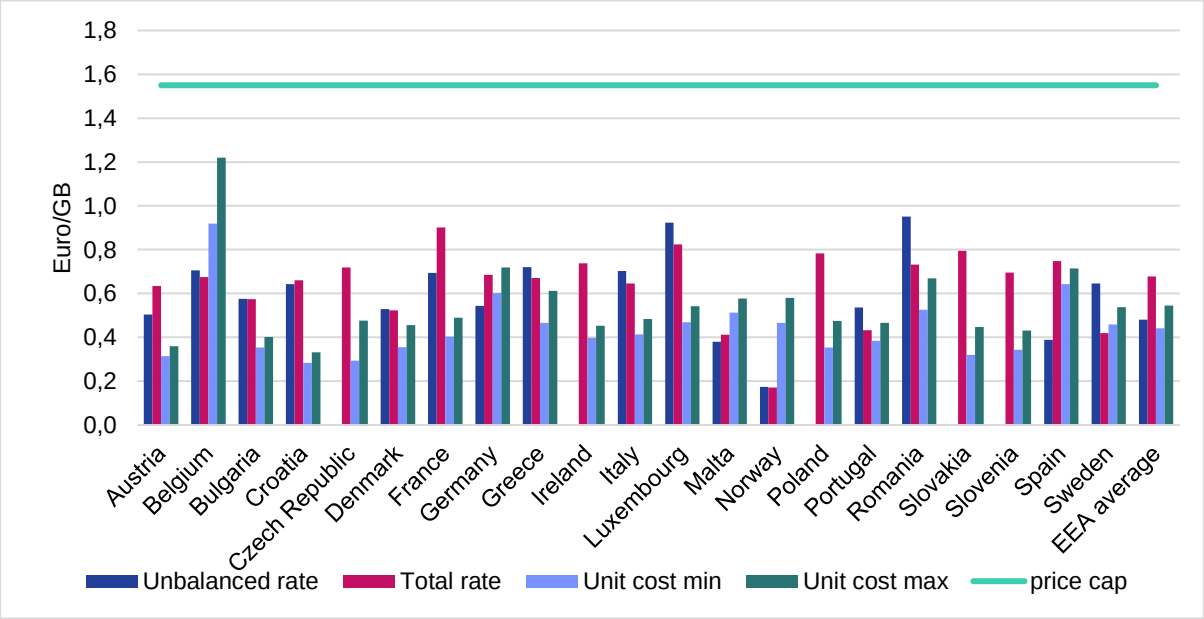


Figure 27: Roaming data comparison for 2024.

Note: Countries for which Axon has not calculated the costs are excluded from the graph. HU is excluded from the graph as per their request for confidentiality. CY and IE (unbalanced) are excluded due to missing data in some quarters.

From the graphs comparing actual rates with calculated costs, it can be concluded that on average no significant divergence has been observed between actual unbalanced rates and costs. In 2023, the average EEA unbalanced rate was almost equal to the average EEA maximum cost, whereas in 2024, the average EEA maximum cost was 12 % higher than the average EEA unbalanced rate.

The Axon model also calculated costs for roaming M2M data services in order to take into account the specificities of M2M services. The relevant comparisons are shown in the graph below. When it comes to maximum values, the M2M costs calculated by Axon are higher, whereas for minimum values, there are only insignificant variances in the average values between M2M and traditional data services. The following two figures present the outcomes of the model with and without Belgium, which again appears to be an outlier. The EC, taking into account the output of the model and depending on any proposal it might bring about updating the wholesale price caps for wholesale roaming data, might also need to consider proposing different wholesale price caps for M2M roaming services.

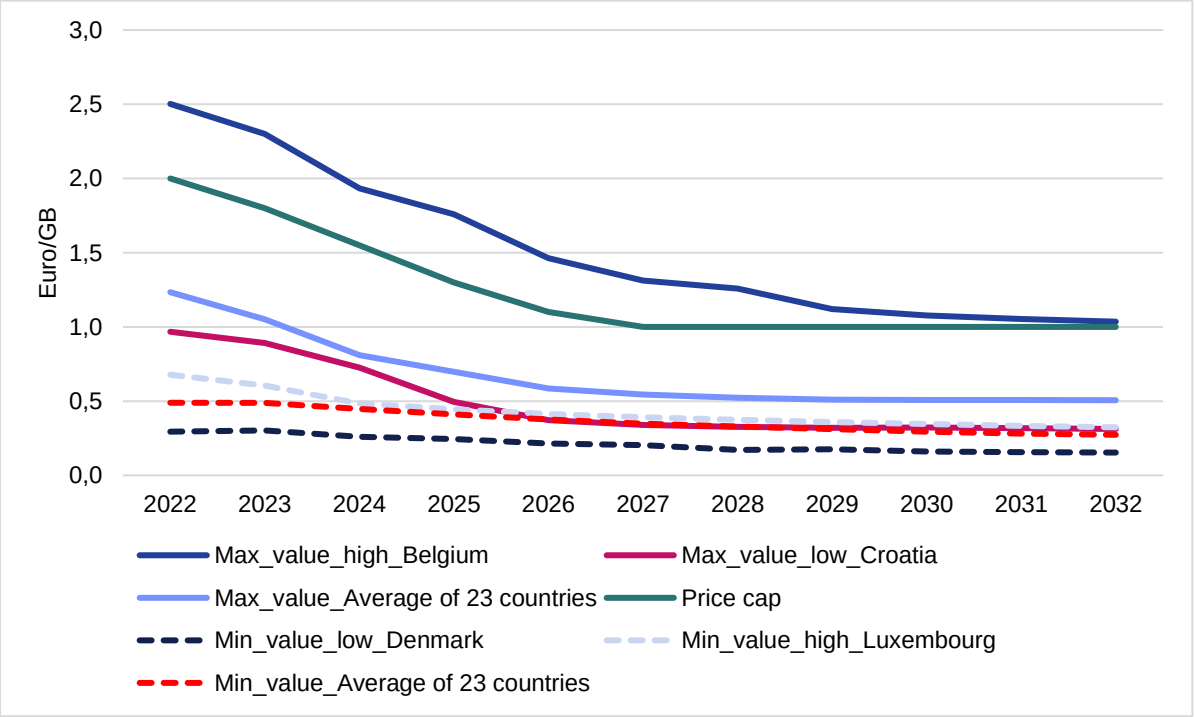


Figure 28: M2M Data roaming costs per GB.

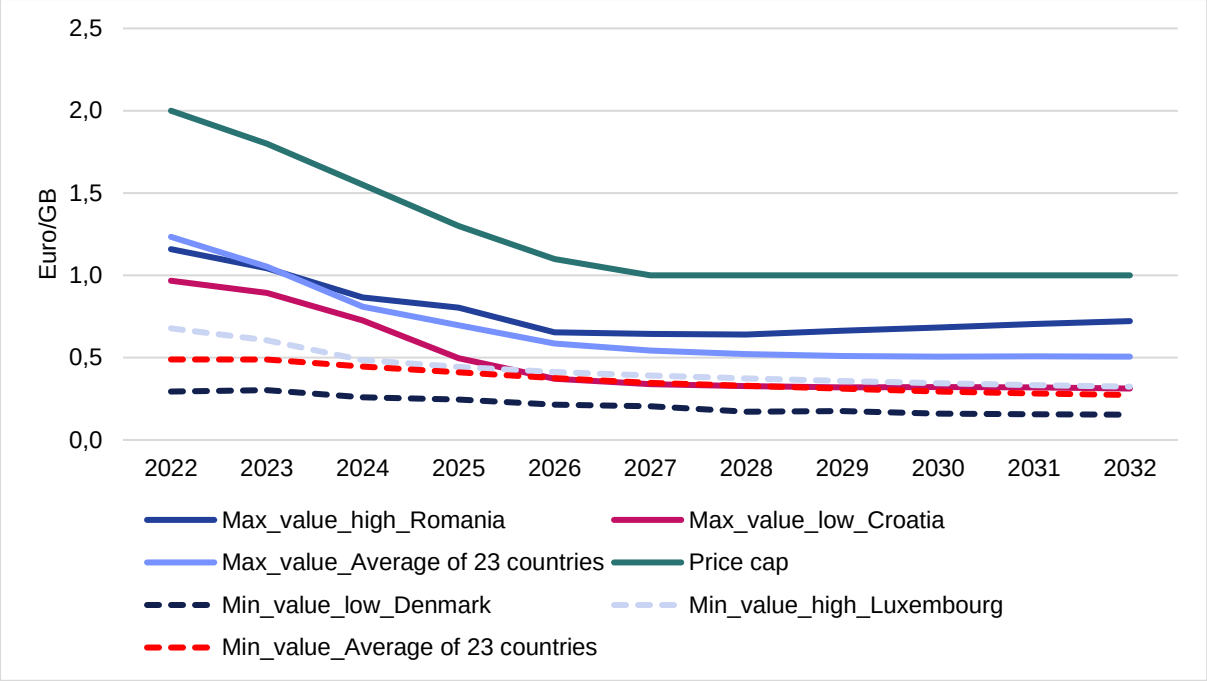


Figure 29: M2M Data roaming costs per GB (w/o BE).

Some findings revealed by the BEREC analysis deserve attention. As explained above, there are some cases, although few, where the unit costs are higher than the price cap in all or at least a large number of scenarios included in the model. As previously stated, for Luxembourg the costs of voice roaming are higher than the wholesale price cap for 2022 and 2023, although only in 36 out of 72 scenarios. Moving on to roaming SMS services, the unit cost for Malta is always higher than the price cap for all scenarios considered in the model. Finally, there is the case of Belgium, where the costs of data roaming services are very high compared to those of other Member States and very close, although lower, to the price cap for the whole period 2022-2032.

BEREC, reiterating what already expressed in its previous Opinion, advises the EC to consider the results of this analysis. BEREC considers it as necessary that the model results are as accurate as possible, even in order to further reduce the price caps compared with those already defined by the EC without this reduction having significant impacts on operators in Member States for which unit costs are high. The quality of the cost model is very important in this respect, in order to ensure that all EEA operators are able to apply the roaming regulation without incurring losses or, in general, that conditions of competition are consistent across the EEA. This will ensure the positive effects of the uniform regulation at EEA level defined by the introduction of common price caps for all operators.

5.2. Competition considerations

The analysis of the wholesale roaming market is complemented by an assessment of competitive dynamics, especially for small, independent and newly established operators (both MNOs and MVNOs). The competitive effects of commercial wholesale roaming agreements are also examined, and BEREC provides insights into the future competitive landscape.

5.2.1. Competitive situation for small, independent or new entrants

As part of the call for input, BEREC invited the NRAs to provide input on their experiences regarding the national competitive situation in the wholesale roaming market for small, independent or newly established operators.

Based on the input received, NRAs reported limited relevant experience concerning the entry of new MNOs, as most MNOs are already well established. One NRA noted that sponsored roaming had been the only feasible solution for the latest entrant MNO during the start-up phase, and it was reportedly used for several years. Establishing direct roaming agreements across the whole EEA would have been excessively time-consuming for a new entrant. However, sponsored roaming proved to be a costly solution since these services were not subject to the regulated price caps and the wholesale prices did not follow the same decreasing path as the regulated caps. While sponsored roaming was the only viable option in the short run, it became increasingly disadvantageous as end users' roaming consumption grew. Over time, the operator gradually established direct agreements; however, this process took several years (7-10 years). No other specific challenges related to providing RLAH for small MNOs were mentioned in the feedback from NRAs.

Regarding the situation for MVNOs, as described in previous opinions (2019[28] and 2021[29]), BEREC has identified that MVNOs face difficulties to compete with MNOs. A key reason is that MVNOs do not own the network they use and mostly rely on MNOs for both national traffic and international roaming. In addition, given their generally smaller size, MVNOs also lack countervailing buying power. Previous findings indicate that many MVNOs can only secure wholesale prices at the level of the regulated caps.

The following comments regarding the competitive landscape were provided by MVNO Europe and other MVNOs in response to BEREC's call for input in July 2024:

"Regulated wholesale caps (for voice/SMS/data) far exceed costs of visited networks, as well as national retail prices, in numerous EU Member States. Consequently, MVNOs, which often effectively make outpayments for wholesale roaming/wholesale roaming resale at or near the level of the wholesale caps, are selling RLAH at a systematic financial loss. These losses are increasing year on year, as end-users' usage of retail roaming increases (days abroad, volumes consumed abroad). In addition, the Fair Use Policy (FUP) volumes which operators can grant to their retail customers are lower than they should and would be if the wholesale caps were reduced to levels corresponding with market reality (sharply declining wholesale costs for visited networks as evidenced by the draft AXON Model output, retail prices often being much lower than wholesale caps, which is not captured by the draft AXON Model output). Improving Regulation 2022/612, by means of a substantial reduction of regulated wholesale caps, is clearly necessary. It will promote the sustainable provision of RLAH and will benefit retail customers."

In response to the call for input, some NRAs reported having received concerns from MVNOs regarding the current functioning of the wholesale market, particularly in light of anticipated

[28] BEREC opinion on the functioning of the roaming market as input to EC evaluation (europa.eu)
[29] BEREC Opinion on the proposal of the Commission for amending the Roaming Regulation (europa.eu)

future trends. They highlighted that MVNOs, as unilateral buyers, are often charged rates close to the established price caps. Given the ongoing rise in international mobility and, notably, the increase in data consumption, the implementation of RLAH has resulted in financial losses for these operators.

NRAs reported differing experiences regarding the effectiveness of the sustainability mechanism in such cases. While the mechanism has proven effective under certain national conditions, in other competitive environments, it risks being entirely insufficient to safeguard the full viability of the domestic charging model – particularly in cases where operators introducing a surcharge are unable to compete effectively with other market players.

The position of MVNOs within national markets appears to be considered relatively stable. However, one NRA reported that, since 2019, no MVNOs have been offering retail mobile services targeted towards the mass market in the national market. Remaining MVNOs are more specialised on IoT or dedicated market segments. A few other NRAs also report about successful MVNOs providing European or worldwide cellular connectivity for M2M and IoT devices, including in-vehicle connectivity.

No NRA reported instances in which MVNOs or smaller MNOs had been significantly or adversely impacted by the Roaming Regulation to the extent that they were forced to exit their domestic market as a direct consequence. In general, NRAs expressed the view that the Roaming Regulation would not be the determining factor in such an outcome.

5.2.2. Outbound Resale roaming access

Resale roaming access from a host provider is a common form of access for light MVNOs for which direct agreements with foreign MNOs is not technically feasible. Consequently, resale roaming access from a host provider is the preferred means of access for light MVNOs. According to information collected from operators to the BEREC opinion in 2019, a large share of full MVNOs also rely on some form of resale access.

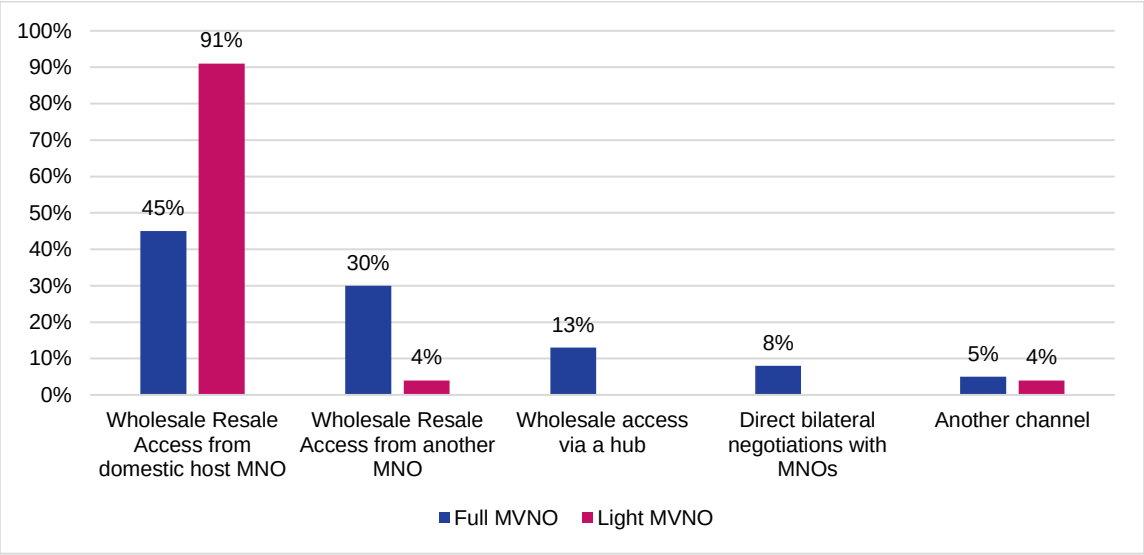


Figure 30: Type of wholesale access for full and light MVNOs. Source: BEREC Opinion on the functioning of the roaming market, as input to the Commission's evaluation (2019).

BEREC has analysed the evolution of the average revenue per unit from outbound resale roaming access provided by MNOs. These figures provide an indication of the wholesale resale prices paid by light MVNOs.

5.2.2.1. Voice

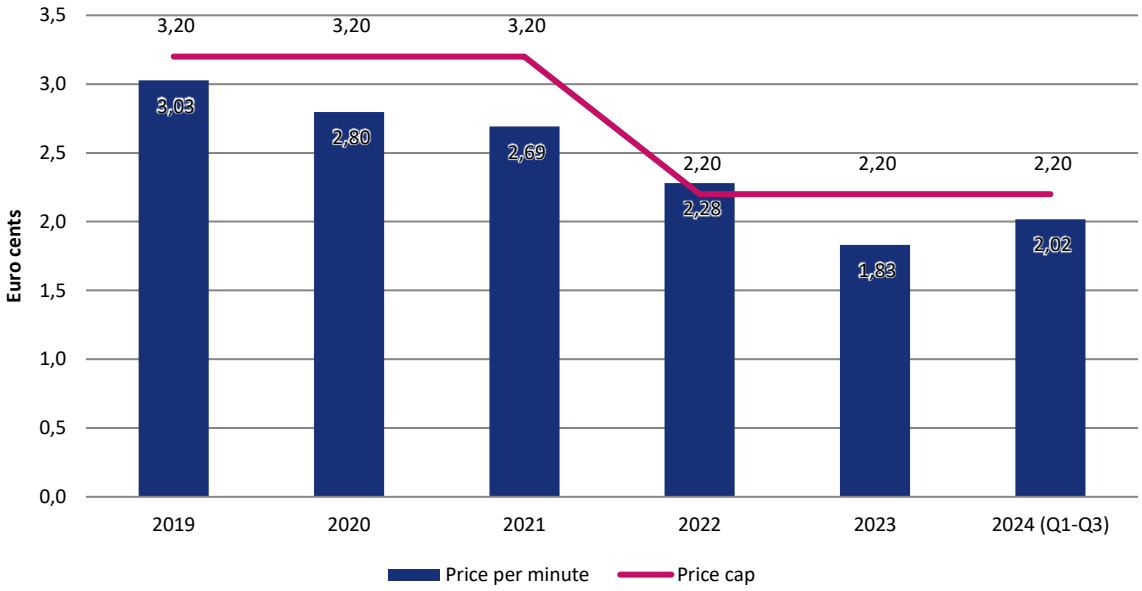


Figure 31: Average revenue from wholesale outbound resale access voice minutes (2019-2024 Q3). Agreements subject to price caps.

The figure illustrates that the average revenue per minute for wholesale resale access has remained close to the regulated caps. The fact that average revenues in 2022 appear above the cap is due to the introduction of new price caps on 1 July 2022.

The wholesale resale revenue per voice minute is well above the average wholesale rates charged for inbound roaming between wholesale roaming partners (direct wholesale access). The table compares the revenue per minute from wholesale resale access with the average wholesale prices presented in chapter 5.1.1, based on inbound revenues from direct wholesale agreements applying price caps.

Voice (eurocents)	**2019**	**2020**	**2021**	**2022**	**2023**	**2024 (Q1-Q3)**
Outbound roaming resale revenues (eurocent per minute)	3.03	2.8	2.69	2.28	1.83	2.02
Average wholesale rates charged between roaming partners (inbound revenue from direct access) (eurocent per minute)	2.1	2.09	1.91	1.57	1.39	1.29
Margin (eurocent)	0.93	0.71	0.78	0.71	0.44	0.73
Margin (%)	30.69	25.36	29.00	31.14	24.04	36.14

Table 2: Outbound resale roaming access – Voice.

Table 2 shows that MNOs selling wholesale resale roaming voice minutes have had a yearly gross margin from 23 – 36 % over the time interval examined.

5.2.2.2. SMS

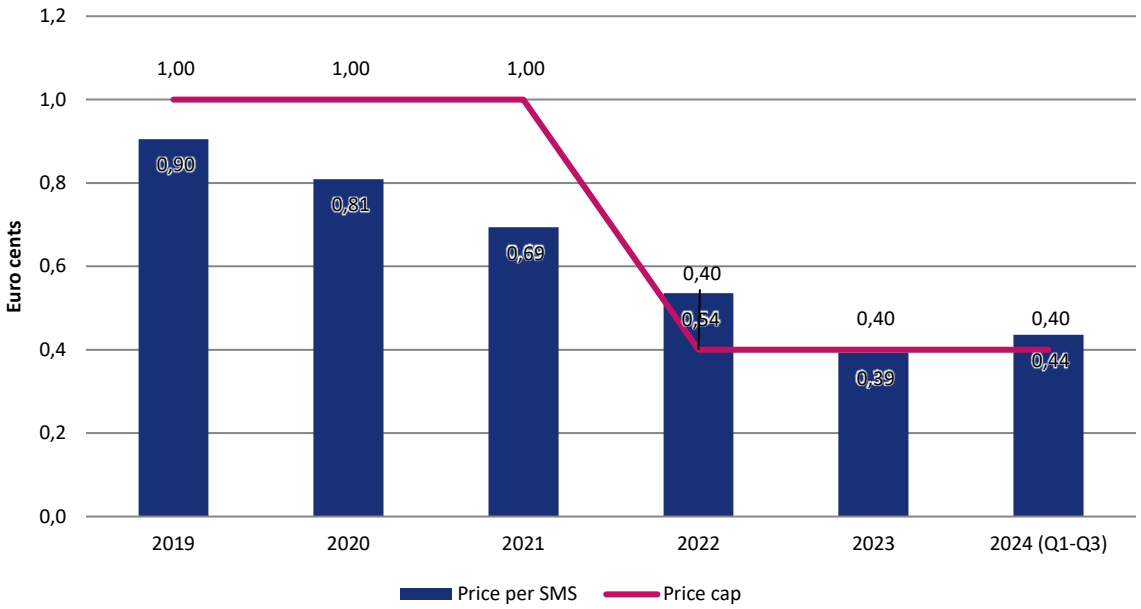


Figure 32: Average revenue from wholesale outbound resale access SMS. Agreements subject to price caps.

Figure 32 shows that the average revenues per SMS for wholesale resale access have been close to the regulated caps since 2022. Like voice calls, new price caps for SMS were introduced on 1 July 2022 explaining why the average revenues in 2022 are above the cap of the second half of that year.

SMS (eurocents)	**2019**	**2020**	**2021**	**2022**	**2023**	**2024 (Q1-Q3)**
Outbound roaming resale revenues (eurocent per SMS)	0.9	0.81	0.69	0.54	0.39	0.44
Average wholesale rates charged between roaming partners (inbound revenue) (eurocent per SMS)	0.32	0.36	0.28	0.21	0.16	0.13
Margin (eurocent)	0.58	0.45	0.41	0.33	0.23	0.31
Margin (%)	64.44	55.56	59.42	61.11	58.97	70.45

Table 3: Outbound resale roaming access – SMS.

Table 3 shows that MNOs selling wholesale resale roaming SMS have had a yearly gross margin from 55 – 70 % with an average of about 61 % over the time interval examined.

5.2.2.3. Data

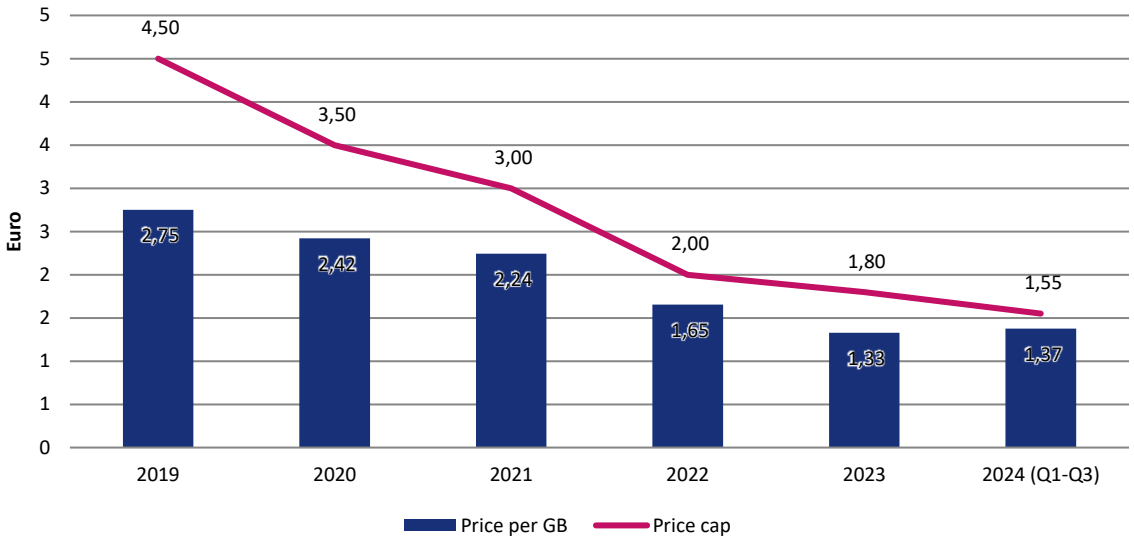


Figure 33: Average revenue from wholesale outbound resale access for data (GB) (2019-2024). Agreements subject to price caps.

Figure 33 shows that the average revenues per GB for wholesale resale access have been relatively close to the regulated caps for years 2022-2024. The resale revenue per GB for MNOs is well above the average wholesale rates paid by MNOs. The table compares the revenue per GB from wholesale resale access with the average wholesale prices from chapter 5.1.1 based on inbound revenues from agreements applying the wholesale caps.

Data (euro)	**2019**	**2020**	**2021**	**2022**	**2023**	**2024 (Q1-Q3)**
Outbound roaming resale revenues (euro per GB)	2.75	2.42	2.24	1.65	1.33	1.37
Average wholesale rates charged between roaming partners (inbound revenue) (euro per GB)	1.72	1.62	1.37	0.98	0.79	0.68
Margin (euro)	1.03	0.8	0.87	0.67	0.54	0.69
Margin (%)	37.45	33.06	38.84	40.61	40.60	50.36

Table 4: Outbound resale roaming access – data.

Table 4 shows that MNOs providing wholesale resale roaming data have maintained a yearly gross margin from 33 – 50 %, with an average of around 40 % over the observed time period.

5.2.2.4. Summary

The figures indicate that the average revenue per unit for wholesale resale access has been relatively close to the regulated caps, especially since 2022. The margin between the average resale revenue per unit and the average wholesale rate presented in chapter 5.1.1 is as follows for the different services:

- For voice services, the margin ranges between around 23 % (2023) and 36 % (2024).
- For SMS services, the margin ranges between around 55 % (2020) and 70 % (2024).
- For data services, the margin ranges between around 33 % (2020) and 50 % (2024).

It appears therefore that operators (mainly light MVNOs) that are dependent on wholesale roaming resale are paying a significant mark-up to their host provider.

5.2.3. Competition effects of commercial wholesale roaming agreements

Referring to chapter 5.1.3, it can be observed that, operators negotiate prices based on wholesale price caps that are below the prices for agreements that are not based on wholesale price caps for all services. This underlines the importance of the caps as a starting point for further negotiations.

In addition, the figures showing average revenues obtained from commercial agreements not based on wholesale price caps are derived from a small part of providers and may not accurately reflect the situation for small, independent and newly established operators as described in 5.2.1. Between 2019 and 2024, a total of 16 NRAs provided information on the use of wholesale agreements not subject to the regulated prices. The figures reported exclusively represent MNOs.

5.2.4. Future competitive conditions in the roaming market

Based on the analysis in chapter 5.1 and 5.2, it appears that most MNOs in the wholesale market are able to negotiate prices well below the caps, particularly for data roaming.

However, BEREC notes that the average values might not capture the full complexity of the market, as significant variations exist between countries and operators. The level of domestic retail prices also influences the impact of RLAH on national operators. Additionally, it should be considered that the Benchmark questionnaire – which serves as the primary data source – does not cover all operators in the EEA. For practical reasons, the smallest operators (i.e. those with a market share of less than 0.5 %) in each country may be excluded, making it difficult to assess their competitiveness in relation to wholesale costs.

When analysing the average costs for operators that rely on wholesale resale roaming services, it is reasonable to expect that the average margin between the wholesale prices reported in chapter 5.1.1 and 5.2.2 places financial pressure on operators which depend on such form of access, notably (light) MVNOs and newly established (or very small) MNOs.

This impact is expected to be especially significant for MVNOs and small MNOs, which have in many instances emphasised the importance of wholesale caps as a crucial reference point in negotiations. Despite a clear downward trend, average wholesale rates for RoW traffic remain substantially higher than those in the EEA. This difference demonstrates that competitive pressure is not sufficient to drive wholesale rates downwards and underpins the continuing necessity of wholesale regulation.

5.3. Trading platforms

The EC is inquiring about the role of trading platforms, the traffic being traded on trading platforms and the usage of similar instruments. Trading platforms for wholesale international roaming services allow mobile operators to sell and buy international roaming capacity to and

from other operators.[30] Although BEREC is seeking information about the usage of trading platforms for the yearly roaming benchmark report, it is only possible to provide little information in relation to trading platforms. As the reports do not provide a distinction of the use of trading platforms or hubs[31], it is important to note that the following numbers refer both to trading platforms and hubs. The number of operators making use of trading platforms or hubs in the period from October 2021 to September 2022 was 13 (one MVNO, the rest MNOs) and decreased to 10 operators (only MNOs) until September 2023. From October 2023 until the third quarter of 2024, BEREC can report 8 operators (MNOs) using trading platforms or hubs. In contrast, more than 70 operators conclude direct roaming agreements with their roaming partners, 6 operators are using the roaming agreements of their host MNO and 4 (5 in 2023) operators use other means to acquire wholesale roaming services. A total of around 92 operators were responding to the inquiry in the period from October 2023 to September 2024. BEREC did not collect data about the use of trading platforms or hubs for the period prior to October 2021. Although BEREC is requesting data about traffic being traded on trading platforms, it is not possible to provide reliable numbers in this regard and therefore no further analysis about trading platforms can be performed.

5.4. Permanent roaming

In its letter to BEREC, the EC requests information on permanent roaming and refers to BEREC's Opinion on the Commission Implementing Regulation (EU) 2016/2286 on Fair Use Policy and the Sustainability mechanism[32].

5.4.1. Permanent roaming in the Roaming Regulation

In its aforementioned Opinion, BEREC considers that the FUP rules[33] are relevant and coherent with the Roaming Regulation and the broader telecom regulatory framework, as they are designed to prevent permanent roaming and its implications. These rules provide the necessary tools for roaming providers to ensure the sustainability of their domestic charging model.

Nevertheless, BEREC notes that it is necessary to distinguish between permanent roaming for mobile subscribers and permanent roaming for connected devices and objects with limited

[30] To BEREC's knowledge, a common platform is Cicada Exchange. Cicada Exchange works as a platform for bilateral deals including a dispute process in case an issue occurs. Operators participating on Cicada Exchange need to have a basic legal roaming agreement and a technical solution in place. MNOs and MVNOs are trading on Cicada Exchange. An operator would have to post a request for quotation, if they want to have roaming capacity in another country for a specific period, which can be monthly, quarterly and yearly (the latter including two upcoming calendar years). The request for quotation is either received from an operator who wants to supply the requested services or that operator could make a counter proposal. There is a risk manager who manages the preferred trading partners in order to ensure that QoS standards are being met, at the same time not revealing who the trading partners are. The Cicada Exchange dashboard does not display the operators for competition reasons.

[31] A roaming hub connects roaming access seekers to roaming partners and typically is managing the whole portfolio of wholesale roaming services including the roaming agreements, signalling connectivity, financial settlement etc. The services portfolio can also include access to the roaming footprint of the hub in case such a hub is a MNO, e.g., Vodafone or Orange.

[32] https://www.berec.europa.eu/system/files/2023-03/BOR%2823~3.PDF

[33] Commission Implementing Regulation (EU) 2016/2286 of 15 December 2016 laying down detailed rules on the application of fair use policy and on the methodology for assessing the sustainability of the abolition of retail roaming surcharges and on the application to be submitted by a roaming provider for the purposes of that assessment.

or no human interaction, despite both involving the use of roaming services over an extended period. The provisions for RLAH included in the Roaming Regulation only apply to cases of periodic travel. When the condition of periodic travel is not met, roaming usage by mobile subscriptions (including those of connected devices and objects) becomes, by definition, anomalous. In case of persistent anomalous roaming, roaming providers would not have an incentive to invest in ensuring high-quality connectivity for end-users, thereby undermining the objectives of the regulatory framework. Consequently, the Roaming Regulation allows operators to include conditions in their reference roaming offers to prevent permanent roaming or the anomalous or abusive use of wholesale roaming access for purposes other than the provision of regulated roaming services[34]. According to Article 3(6) of the Roaming Regulation, the visited network operator may terminate the wholesale roaming agreement unilaterally on grounds of permanent roaming or anomalous or abusive use of wholesale roaming access, but only upon prior authorisation of the national NRA of the visited network operator. Since the introduction of RLAH, no such authorisation for the termination of regulated wholesale roaming agreements has been requested by visited network operators in accordance with the procedure laid down in Article 3(6) of the Roaming Regulation.

Based on the input collected during the preparation of the BEREC M2M report, only two access providers reported having to take legal or technical measures against access seekers to address issues arising from permanent roaming of such devices. These two MNOs either suspended the roaming service in the specific case or referred the matter to the local NRA. In one instance, the issue involved an access seeker using foreign IMSIs for a domestic customer whose M2M-devices were of a fixed nature – and the devices were already covered by an access agreement with another domestic network.

For connected devices and objects, permanent roaming is essential to enable the development of specialised offers. However, regulatory price caps do not apply to those services; instead, roaming providers may set prices tailored to connected objects and devices. Over the past decade, permanent roaming has become increasingly significant for many use cases of M2M/IoT, as many devices remain permanently connected to a network outside their home network or home country. In order to ensure legal certainty for all players involved and in anticipation of the rapid growth of IoT and M2M traffic, BEREC has consistently emphasised the need for greater clarity regarding the applicability of the Roaming Regulation to M2M/IoT connectivity services and the treatment of permanent roaming[35].

Since M2M communications fall within the scope of the Roaming Regulation, they are subject to the limitation of permanent roaming[36]. However, permanent roaming remains a matter of commercial negotiations and may be mutually agreed by two roaming partners within a wholesale roaming agreement. The Roaming Regulation acknowledges in its Recitals that "*in order to allow the development of more efficient and competitive markets for machine-to-machine communications, it is expected that mobile network operators will increasingly*

[34] Article 3 (6) of the Roaming Regulation.
[35] See BEREC Report Enabling the Internet of Things, BoR (16) 39, 12 February 2016; BEREC Opinion on the functioning of the roaming market, as input to the Commission's evaluation, BoR (19) 101, 13 June 2019; BEREC Input on EC's request for the preparation of the legislative proposal for the new roaming regulations, BoR (20) 131, 30 June 2020; BEREC Opinion on the proposal of the Commission for amending the Roaming Regulation, BoR (21) 59, 30 April 2021.
[36] In addition, some transparency requirements do not apply to M2M communications.

respond to and accept all reasonable requests for wholesale roaming agreements on reasonable terms and explicitly allow permanent roaming for machine-to-machine communications."[37]

5.4.2. Stakeholders' views

In October 2023, BEREC organised an online workshop titled "*Internet of Things: perspectives and competition*" to assess the state of the art for the delivery of IoT services, their evolution in recent years in light of technological and regulatory developments, and to discuss whether new competition or provisioning bottlenecks have emerged or if the issues identified in 2016 have been resolved. Overall, participants shared some common views on regulation considerations, but expressed diverse perspectives, particularly concerning the various bottlenecks that MVNOs and MNOs may face in providing IoT services (e.g., permanent roaming or access to satellite connectivity)[38].

To gain a deeper understanding of this rapidly evolving field and to monitor the development of the market for M2M communications and permanent roaming, BEREC launched a call for input in 2023. The feedback received from stakeholders has been summarised in BEREC's Report on M2M and Permanent Roaming[39]. The key insights regarding the M2M market and the related issue of permanent roaming are as follows:

- There has been an increase in the number of dedicated M2M wholesale agreements between access providers and access seekers. However, while half of respondents have entered into agreements under the framework of the Roaming Regulation that include clauses preventing permanent roaming, the remaining respondents indicated that they do not have such clauses. Nonetheless, the number of agreements allowing permanent roaming has been increasing since 2021.
- Different pricing models for wholesale M2M services have been reported, including volume-based charging mechanisms, charging mechanisms based on the number of devices (IMSI fee), or a combination of both, sometimes with minimum financial commitments.
- Contractual clauses restricting permanent roaming: The access seekers that have entered into agreements with clauses to restrict permanent roaming have mentioned clauses that: (i) limit the number of M2M devices in a given month, (ii) limit (for permanent roaming) the total number of M2M devices (or share of M2M traffic) versus total number of devices (or traffic), (iii) apply a different commercial pricing model depending on certain conditions (e.g., the amount of devices) and (iv) other restrictions aimed to prevent the sale of services to domestic customers in the home Member State of the MNO providing access. MVNOs and smaller MNOs have raised a number of competition concerns, such as high minimum financial commitments, high prices per IMSI, restrictions of access to specific M2M technologies, and clauses preventing the sale of services to domestic customers in the home Member State of an MNO acting as access provider.

[37] Recital 21 of the Roaming Regulation.
[38] BoR (24) 37 Summary report of the Workshop in Internet of Things: Perspectives and Competition
[39] BEREC Report on M2M and Permanent Roaming, BoR (24) 96, 05 December 2024.

- From the access providers' side, the clauses included to prevent permanent roaming are (i) the definition of a ratio between M2M/IoT volume versus consumer traffic which should not exceed 10-15 % of the total volume generated by the visiting devices and (ii) commercial penalties such as different pricing when permanent roaming is used for cases other than M2M. An MNO also reported clauses aimed at reducing the impact of signaling, depending on the number of connected devices and their technology.
- Obstacles to negotiate permanent roaming wholesale agreements for M2M have been pointed out by most of the access seekers (mainly MVNOs), for some of them especially in those Member States with MNOs from big groups that have their own IoT business: the lack of definition of permanent roaming and M2M in the Roaming Regulation, high financial commitments, high prices per IMSI, restriction of access to specific M2M technologies such as NB-IoT and LTE-M, and clauses preventing the sale of services to domestic customers in the home Member State of the MNO providing access. For smaller MNOs and MVNOs which have little bargaining power, the wholesale agreements' restrictive conditions imposed by large access providers can prevent them from gaining an EU footprint on the M2M market. On the other hand, access providers and large MNOs want to ensure that the wholesale access requests put forward are realistic and economically viable as in any other commercial agreement. Therefore, they require a minimum of commitment from the wholesale access seekers.
- Need for regulation:

  MVNOs called for the introduction of regulatory intervention covering M2M under permanent roaming and the removal of restrictions on permanent roaming for IoT, on the services to be provided and bandwidth made available (i.e. being less than that of the host MNO's own retail services), on which customers services can be provided under the contract. They also ask for unequivocal wholesale access to all (existing and future) cellular technologies and a prohibition on bandwidth restrictions imposed through wholesale contracts and maximum harmonisation of authorisation, numbering and related compliance and reporting requirements.

  Large group MNOs are against any relevant regulatory intervention and argue for the need for freedom to negotiate commercial M2M permanent roaming agreements which is key from competition perspective as well as from an investment protection angle. These MNOs argue that domestic competition from low-cost MVNOs poses challenges in the context of an expected growth in M2M traffic volumes and devices which may lead to increased signaling costs and low levels of revenue and may potentially hamper network integrity. In addition, some MNOs argue that IoT/M2M are of a very different nature compared to traditional voice and data services. They further ask to explicitly exclude all M2M/IoT services from the scope of the Roaming Regulation, on the ground of differences in usage and business models. They specifically suggest that wholesale price caps are not suitable for business models with very low data volumes but high usage of signaling resources.

5.4.3. BEREC's opinion on M2M and permanent roaming

The Roaming Regulation aims to allow the use of mobile services during occasional travel within the EEA at the applicable national tariff, subject to reasonable use and the possibility of applying for a derogation mechanism for the viability of the abolition of retail roaming charges. These safeguards have been set with the aim of preventing situations in which a customer in a Member State with high national mobile tariffs would purchase services from operators established in another Member State with lower national mobile tariffs with a view to benefiting permanently from roaming in his/her country or residence. Accordingly, the provisions of the Roaming Regulation to date are not intended to govern legitimate use cases that rely on permanent roaming.

However, with a growing M2M market where, for some use cases, permanent roaming is the main technical means of connectivity – other technologies like LoRaWAN and Sigfox being only complementary – BEREC is of the opinion that the issue of permanent roaming for M2M services and more broadly for IoT services in the regulation might need further elaboration. As BEREC pointed out in its 2020 input[40], the widespread use of permanent roaming for any service would blur the lines between the international roaming market and the domestic mobile access and origination markets. The impact of permanent roaming on IoT connectivity services still needs to be analysed given the great variety of services that will be available. While M2M services are mainly based on automated information exchange with no or little human intervention, in IoT services human intervention is an additional possibility depending on the nature of the service concerned. This is relevant for the future Roaming Regulation review as it might not be sufficient to refer only to M2M services. One should also analyse what impact permanent roaming will have on aspects that are more specific to IoT services given the great variety of use cases that will be available and the blurred boundary between human-only services and IoT communication services. Should the EC elaborate further on IoT, there would be an opportunity to clarify the differences in the definitions between M2M and IoT services. However, this would occur only when the Roaming Regulation is evolving to clarify the scope of the provisions on M2M and permanent roaming in light of the different possible interpretations and the extent of the IoT. But at this stage, this still has to be assessed.

Furthermore, depending on the size of MNOs and MVNOs, it seems that the competitive risk could increase with the growth of the market: the largest groups with subsidiaries in Europe will be able to offer permanent roaming offers without too much difficulty and thus further strengthen their position; conversely, smaller MNOs and MVNOs, having a more reduced bargaining power, risk being ousted from these deals.

BEREC invites the EC to further study the market in order to prevent competitive imbalance, if necessary, between large groups and smaller operators across the EEA. A first step could be to clarify the boundaries between permanent roaming and periodic roaming, to explore the difficulties for the operators to provide quantitative data on permanent roaming and include, in the data collection on connected objects, MVNOs which are present on this market segment but have market shares less than 0.5 % in total and to clarify to which extent the Roaming

[40] https://www.berec.europa.eu/en/document-categories/berec/opinions/berec-input-on-ec-request-for-the-preparation-of-the-legislative-proposal-for-the-new-roaming-regulations

Regulation applies to IoT services that cover a broader range of services than M2M services and which could involve interpersonal communications to some degree.

In light of the current situation of the market and of the use of roaming for M2M/IoT connectivity, BEREC is of the opinion that no further regulatory measures should be considered as regards permanent roaming and M2M/IoT services. BEREC underlines the need for continuous and good understanding of the market taking also into account the importance of roaming in ensuring the provision of services.

5.5. Suggestions for improvement of RLAH wholesale provisions

BEREC observes that MVNOs still face a different competitive situation than MNOs when it comes to providing RLAH for their retail customers. MVNOs` lack of a radio network to offer connectivity to inbound roamers, and in general limited resources for managing direct wholesale roaming, makes most of them dependent on some form of resale access. The lack of negotiation power due to size and, for some of them, the dependency on the host, makes it challenging to achieve discounts or better rates than the regulated caps (chapter 5.2.2).

On the other hand, the analysis shows that MNOs' cost of providing wholesale access are below the caps and MNOs also generally agree wholesale charges with their roaming partners that are well below the caps. This makes the competitive situation even more challenging for MVNOs and very different from MNOs. According to data presented in chapter 5.1 and 5.2, MVNOs are more often prone to wholesale charges at or near the regulated caps. Operators that are dependent on wholesale roaming resale are paying a significant mark-up to their host provider.

The increasing use of data roaming exacerbates the situation for MVNOs. BEREC also acknowledges that the sustainability mechanism (derogation) stipulated in the Roaming Regulation does not fully remedy the competitive disadvantages for MVNOs. The sustainability mechanism addresses the symptoms of an underlying problem at the wholesale level; however, it does not address the problem itself. Retail operators applying for a sustainability derogation (e.g., MVNOs) could expose themselves to competitive disadvantage on retail markets by applying higher retail prices for international roaming in the EEA compared to direct competitors who do not need the derogation (e.g., because they have the ability to negotiate wholesale prices well below the wholesale caps).

Therefore, BEREC suggests some measures that could be introduced in any update of the provisions in the Roaming Regulation to increase the competitive strength for MVNOs:

- Further reducing the wholesale caps: BEREC considers this has been an efficient and transparent measure to ensure a more level playing field for competition and sustainable conditions for RLAH for MVNOs. On the other hand, however, lower wholesale caps currently also means that operators have to offer higher data volumes in case of open data bundles, which again might lead to sustainability problems. Similarly to the previous review, the most representative scenario of the cost model (excluding outliers where appropriate) should be taken into account when setting wholesale caps allowing for an additional margin to enable differentiation of offers and

competition[41]. To avoid situations where operators are faced with caps below costs[42], this suggestion could be combined with a sustainability mechanism at wholesale level, i.e. a derogation mechanism for MNOs that are not able to provide wholesale services at costs within the caps. BEREC understands that the outlier costs could be excluded for the definition of the caps, yet such a derogation mechanism should only serve for very exceptional cases and should only be granted subject to providing substantiated proof of higher costs being incurred by the visited network to the extent of justifying the application of higher wholesale roaming prices than determined by the wholesale caps.

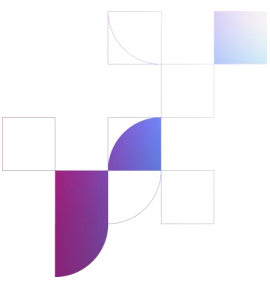
- BEREC notes that a sustainability mechanism would be a change to the current regime and entails a number of drawbacks. Similar limitations as the ones described about the retail derogation can also appear when applying a wholesale derogation (see chapter 4.4). In addition, wholesale derogations would lead to a situation that one country has higher wholesale prices than the rest of the EEA, which leads to an asymmetry of wholesale prices between the operators with authorised surcharges and the rest that might have an impact on the retail provision of roaming services. Furthermore, a sustainability mechanism at wholesale level entails high complexity and administrative burden. In case of wholesale level derogation(s) being granted, all operators, at retail level, would remain prohibited from differentiating surcharges and FUP allowances on a country-by-country basis within the EU/EEA. The sustainability mechanism at retail level would be maintained as a safeguard.
- Obliging the host MNOs to pass the discounts they get for wholesale roaming services on to the MVNOs: this measure would ensure equal terms for competition between MVNOs and MNOs and it is targeted to the problem identified. It should be noted that this measure would require the definition of a monitoring process by NRAs[43].
- Making sure that wholesale caps also apply to alternative wholesale roaming solutions like sponsored roaming. This does not prevent providers of such wholesale solutions from charging additionally for other services they offer.
- Further clarifying the wholesale roaming access obligations to give non-discriminatory access to new technologies. For M2M communication services, access providers should meet all access requests in a non-discriminatory manner. The exception for transition period to new technology (recital 27) should not be exploited. For example, NB-IoT and LTE-M can no longer be considered new technologies. Both parties should do their utmost to make sure negotiations and technical trials follow efficient and agreed time plans.

[41] BEREC understands that this was the approach followed when setting the caps of the 2022 roaming rules taking also into account the most representative scenario of the cost model.

[42] The main risk of establishing a wholesale cap below the costs obtained by the cost model of an efficient operator is that all MNOs in the country in question could be compelled to request the wholesale sustainability mechanism This is because they would not be able to recover their costs nor have the margin to negotiate prices with operators from other countries (such a situation does not seem to follow the current Roaming Regulation principles, see recitals 38 and 42 and Article 21.1.i). In the event that the corresponding NRA authorizes surcharges, the regulation should contemplate up to what level surcharges can be authorized.

[43] In its 2019 opinion, BEREC pointed out that this measure would be very complex to implement and would require the definition of a monitoring process by NRAs.

- Including measures in the regulation for incoming roaming calls for MVNOs.The wholesale roaming charge does not include the costs for terminating incoming roaming voice calls. However, any charge in excess of the maximum mobile termination rate in accordance with the Commission Delegated Regulation (EU) 2021/654 adopted pursuant to Article 75 of Directive (EU) 2018/1972 (i.e. Eurorates) is unlikely to be reasonable and should not be accepted.



6. Quality of Service

This chapter examines the obligations related to QoS at both the retail level (Article 4, paragraph 2) and the wholesale level (Article 3, paragraphs 1 and 3). This analysis is based on data regularly collected by BEREC as part of the annual *International Roaming Benchmark Data and Monitoring Report*, as well as on input received from the call for input conducted in the summer of 2024. Additionally, responses to questionnaires directed to NRAs, particularly concerning end-user complaints, contribute to the evaluation.

With regard to the technologies available to roaming customers, BEREC's annual data collection indicates that 4G data roaming is generally accessible to end-users when roaming within the EU/EEA. Furthermore, BEREC has observed a decline in the availability of 2G and 3G in certain countries, which may be attributed to the phasing out of these technologies. The percentage of roaming providers offering 5G services to their subscribers when roaming within the EU/EEA is illustrated in Figure 34[44].

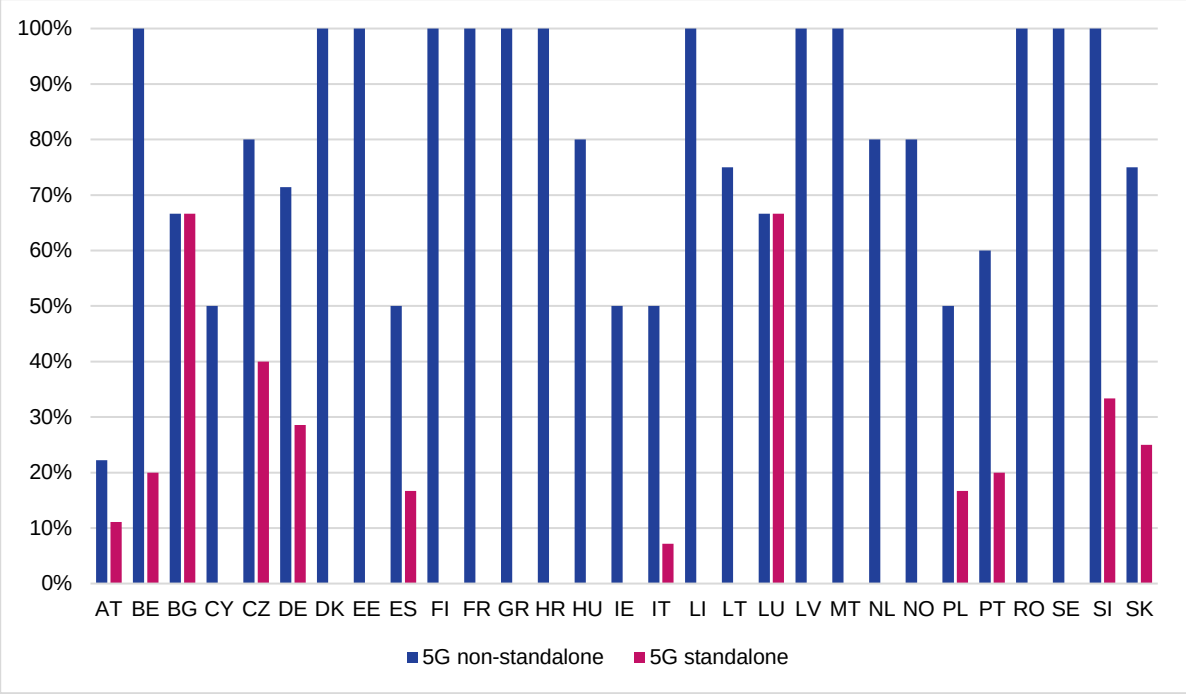


Figure 34: Availability of mobile technologies (4G/5G) – as of Q4 2024.

The figure shows that only in 13 countries, all responding operators (those with a market share exceeding 0.5 %) provide their subscribers with **5G roaming** in the EU/EEA. In the remaining countries, a varying percentage of operators do not offer this service. The number of operators offering 5G Standalone (SA) is significantly lower, as this technology is still not widely available in the EU/EEA.

It is important to note that services not offered in a user's home network are not required to be provided during roaming. For example, subscribers are not entitled to 5G if they are

[44] The graph is based on the data collected during Q4 2024.

customers of an MVNO that does not yet have access to 5G technologies in their home network, or if their domestic subscription does not include 5G connectivity.

BEREC anticipates that as 2G and 3G technologies are phased out and 5G adoption becomes more widespread the number of subscribers able to access 5G while roaming will increase. Simultaneously, the proportion of domestic tariffs without 5G services is expected to decline. 5G Standalone (SA) is expected to be the next evolutionary step, gradually becoming available on networks that have fully implemented this technology and for users with subscriptions that allow domestic access to a 5G SA network.

As outlined in chapter 3.3, end-user complaints to NRAs regarding QoS experienced while roaming are relatively uncommon, accounting for only 3 % of all customer complaints. This data appears to be inconsistent with the findings of the EC's Eurobarometer survey on roaming, published in July 2023, which indicates that 27 % of respondents reported experiencing slower internet speeds while roaming compared to their home country, and 26 % noted a lower broadband network standard. A possible explanation for this discrepancy could be that any perceived decrease in QoS is generally considered minor and/or not significant enough to prompt users to submit formal complaints to NRAs. Furthermore, it should be noted that 80 % of respondents to the Eurobarometer survey stated that they were able to use their mobile phone in the same manner and with the same frequency as in their home country, whereas 18 % responded negatively to this question.

It is important to acknowledge, however, that lower QoS parameters do not necessarily indicate non-compliance with the Regulation. Several factors may contribute to variations in QoS, including the lack of availability of equivalent network generations and technologies on the visited network compared to the domestic network, as well as exceptionally high demand for network resources in certain tourist destinations during peak seasons. QoS is an issue that requires ongoing monitoring and may necessitate further attention and review in the future as well as identifying the factors that contribute to variations.

Many respondents to the call for input, conducted in the summer of 2024, consider that the obligations regarding QoS in the Roaming Regulation are functioning effectively, ensuring that roaming customers benefit from conditions equivalent to those available domestically, where the same generation of mobile communications networks and technologies are available on the visited network. Consequently, these stakeholders advocate against the introduction of stricter QoS regulations applicable to retail roaming providers.

However, other stakeholders have expressed concerns that visited network providers may engage in discriminatory practices, disadvantaging roaming customers compared to domestic subscribers, thereby contravening the principle established in the Regulation. Additionally, some stakeholders have argued that declining profit margins have, in practice, constrained operators' ability to make greater investments aimed at enhancing the quality of roaming services. Finally, some NRAs have reported individual cases where customers have not experienced adequate QoS parameters while roaming.

BEREC considers that the quality of service obligations set out in Article 4 of the Roaming Regulation is a fundamental pillar of the *RLAH* principle, constituting an essential element in empowering end users and fostering the development of the internal telecommunications

market. Consequently, BEREC supports maintaining the current obligations without modification.

BEREC acknowledges that, due to their inherent nature, QoS obligations cannot be subject to full proactive supervision. However, NRAs remain committed to duly addressing all complaints and cases of non-compliance brought to their attention.

It is important to recall that, pursuant to Article 3, paragraph 3, wholesale roaming access (including both direct wholesale roaming access and wholesale roaming resale access) must encompass access to all network elements and associated facilities, relevant services, software, and information systems necessary for the provision of regulated roaming services to customers. Moreover, such access must extend to all available network technologies and generations (including access to the maximum available speeds offered by the visited network on its own domestic market), ensuring that the roaming provider can replicate the retail mobile services offered domestically, insofar as it is technically feasible on the visited network.

In instances, where MNOs refuse requests for wholesale roaming access under the aforementioned conditions without justification based on objective criteria, the access seeker may refer the matter to the NRA for dispute resolution, in accordance with the procedures set out in Articles 26 and 27 of Directive (EU) 2018/1972.

Concerning operators' ability to make investments aimed at enhancing the quality of services, BEREC highlights that wholesale roaming caps are designed to ensure cost recovery, including the recovery of investment costs.

Finally, with reference to delays in handover between networks at internal Union border crossings, BEREC is not aware of any cases of systematic or unreasonable delays. End-user complaints submitted to NRAs in this regard are unknown.

As regards M2M services, QoS does not seem to be a problematic issue at the moment but it is envisaged that demands for QoS requirements will increase in the future for M2M services. See also paragraph 5.1 of the BEREC report on M2M and permanent Roaming[45].

Up to now, NRAs have not reported any disputes between roaming providers (access seekers and access providers) concerning QoS either on regulated roaming services or on M2M roaming services.

[45] BEREC Report on M2M and permanent Roaming BoR (24) 165.

7. Technological Developments

In this chapter, the main technological developments in mobile networks will be presented in order to assess whether they may have an impact on Roaming Regulation, or whether it is still too early to have an impact on the roaming market in the target timeframe of this report.

7.1. New generation mobile communications networks and technologies (5G)

As BEREC highlighted in its Opinion on the functioning of the roaming market[46], the 5G technology provides networks with better performance and easier characteristics when it comes to speed, latency, and virtualisation. One of the novelties brought by 5G is "network slicing", which is very promising in terms of flexibility and configuration of the network for specific purposes. This functionality may create different logical/virtual networks on the same mobile network, thus being able to vary for each network its own key characteristics dedicated to a client's specific need.

Typical examples of clients with such specific needs can be a company requiring services over a virtual private network, an MVNO requesting wholesale access services, or a roaming provider (access seeker) asking for wholesale roaming access services.

Another scenario concerns services that may require seamless connectivity while crossing country borders (such as vehicle to everything services -V2X- that need to roam from one operator to another). In this scenario, the same "slice" configuration must be available on the visited network, as pointed out in the GSMA document on network slicing and its possible business models[47].

This functionality may have a particular impact on the provision of structural measures such as wholesale access or the separate sale of roaming services, because it needs to improve and make more efficient the provision of wholesale services to access seekers. A widespread introduction of slicing in 5G will mean that all (end users, devices etc.) require the same service level when visiting foreign networks as they get in their home network. This means that operators will have to offer slice instances with comparable settings as what the incoming roaming clients have access to in their home network.

From the comments received in the call for input, there is a wide consensus that 5G network slicing is in an incipient state and there are currently very few (perhaps none) roaming agreements in place. It is still premature to speak of network slicing in roaming, as both technical interfaces and the integration of roaming value-added services delivered by third parties need further harmonisation.

In fact, respondents have indicated that the new technology will offer the possibility of distinguishing different qualities of services that are currently being defined to offer specialised

[46] BoR (19) 101BEREC Opinion on the functioning of the roaming market, as input to the Commission's evaluation (13 June 2019).

[47] An Introduction to Network Slicing. GSMA. Page 14, example 6. https://www.gsma.com/futurenetworks/wp-content/uploads/2017/11/GSMA-An-Introduction-to-Network-Slicing.pdf

services. However, they have indicated that configurations may differ from country to country due to national circumstances (e.g., different time of relevant band distribution, available bandwidths or the possibilities of their aggregation which allows for better network capacity and quality parameters, etc.).

A respondent has noted that network slicing is intended to provide specialised services rather than traditional call types. Hence, the roll-out and implementation of network slicing will not have an impact on traditional EU roaming calls, SMS or data services. Several MNOs have indicated that regulation should not require the same quality as at home but conditional on the visited network, at least until the technology is mature and implemented in all Member States. Otherwise, they consider that a mandate of equivalence between domestic and visited networks would essentially require all operators to design, deploy and configure networks in the same way.

To take full advantage of slicing, strong bindings are required between the 5G core network and the 5G radio network (New Radio, NR) and implementation should be widespread in most European networks. However, it is still too early to be able to assess how these services will be configured and how their roaming operation will be defined due to the large number of network parameters and types of wholesale agreements that may arise between access providers and access seekers.

In the absence of wholesale agreements with this technology in the market, BEREC considers that it is still premature to take slicing into account in the next Roaming Regulation review.

7.2. M2M/IoT

Today's mobile networks have technologies designed specifically for M2M/IoT devices such as LTE-M and NB-IoT, with the number of devices growing year by year. With 5G technology, a new standard has been set, known as New Radio Reduced Capability (NR RedCap)[48], which has been designed to let M2M/IoT devices incorporate a sub-set of the 5G capabilities while keeping costs down.

The use cases that motivate the specification work on NR RedCap include wearables (e.g. smart watches, wearable medical devices, AR/VR goggles, etc.), industrial wireless sensors, and video surveillance. These use cases have very different requirements than the low-power wide-area (LPWA) use cases currently addressed by the LTE-M and NB-IoT solutions. For example, the data rates need to be higher than for LPWA.

All these technologies lay the ground for the M2M/IoT market to grow considerably in the coming years. According to a Juniper study[49], "the global number of 5G IoT roaming connections will rise from 15 million in 2023 to 142 million by 2027, representing over 27% of all 5G roaming connections in 2027". The same report forecasts "*that 21% of global 5G IoT roaming connections in 2027 will be found in West Europe, despite only accounting for 5% of the global population. It identified leading efforts from operators in the region to launch 5G*

[48] 3GPP TR 38.865 (Study on further NR RedCap UE complexity reduction), https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3986

[49] https://www.juniperresearch.com/press/global-5g-iot-roaming-connections-grow-800/

standalone networks as key to incentivising IoT users to implement a roaming business model, thus driving growth of IoT roaming connections".

A stakeholder highlights the need for roaming in the IoT ecosystem where it will become more complex as customers require multi-country connectivity. The same stakeholder indicates that satellite communications are supported or are going to be supported natively by cellular devices via the Non-Terrestrial Networks framework established in 3GPP's 5G Release 17, with enhancements due in Release 18 and 19[50]. According to the stakeholder, these tendencies will require new wholesale roaming agreements. This could be partly due to requirements in the specifications[51] that the 5G system shall support service continuity between 5G terrestrial access network and 5G satellite access networks owned by the same operator or owned by different operators.

BEREC considers that the M2M/IoT market will continue to grow and with the signing of permanent roaming agreements, M2M communications providers will not only be able to offer roaming services but will also be able to provide data connectivity services in any Member State by taking advantage of their permanent roaming agreement. Indeed, unlike voice and messaging communications services, data connectivity for M2M communications can be provided regardless of the country of origin. Therefore, the differences between domestic and international markets may diminish, however such M2M communications providers and/or data connectivity service providers would still have to contend with other aspects relevant to such cross-border service provision, such as obligations related to general authorisation and consumer protection.

7.3. Alternative technologies and their developments

As technology improves, the emergence of new technologies or new businesses can put pressure on the roaming market or can be configured to complement roaming services. This is because the latest 3GPP releases[52] have included the possibility of roaming between the mobile network and the satellite network, the possibility for the development of standards focused on M2M/IoT such as LoRaWAN or Sigfox and the flexibility of providing eSIMs making it easy for subscribers to switch among different service providers.

MNOs consider that technological alternatives put competitive pressure on traditional retail roaming in terms of pricing and volumes and are questioning the need to further regulate international roaming services. One MNO suggests regulating non-terrestrial traffic within the EU. Increased competitive pressure is put particularly on smaller operators with lower bargaining power. In relation to the obligations, one MNO argues that these should be the same for all providers as different obligations would be discriminating. However, wholesale roaming costs are still high for non-terrestrial roaming services. One MNO complained that alternative technological solutions reduce the possibility for MNOs to fund further network investments and considered them difficult to monitor and thus creating uncertainty in terms of security. Non-terrestrial networks are considered to be costly and implementing RLAH might

[50] https://www.3gpp.org/technologies/ntn-overview
[51] 3GPP TS 22.261.
[52] Release 17 (June 2022) was the first release with normative requirements for Non-Terrestrial Networks (NTN) in 3GPP specifications. In Release 18, more work is in progress for the extension of terrestrial networks with NTN.

require the application of sustainability surcharges. However, one MNO still advocates for commercial negotiations due to the complexity of the sustainability mechanism.

According to the responses received in the call for input, most of them indicate that travel eSIMs are the most relevant alternative because they offer coverage and quality of service like traditional roaming services thanks to being easy to set up and use. Operators report that this alternative puts in place competitive pressure in terms of price and data volume. Some argue that tech alternatives such as eSIM cause revenues to decrease. However, some respondents point out that travel eSIMs seem to have a bigger impact on the RoW roaming and they leave the domestic operator with no customer revenue when roaming in RoW. One MNO even claims competition from eSIM to be a threat which would have to be monitored closely.

Despite Wi-Fi, LoRaWAN and satellite solutions being alternatives technologies, they are not considered to have a relevant impact on traditional roaming services, because they are used as a complement, or for a specific implementation, and not as a substitute for traditional mobile roaming. They point to the different reach and indoor coverage capabilities of these technologies compared to terrestrial mobile services.

Some respondents pointed out that non-terrestrial networks based on low orbit satellite are an alternative from a technological perspective, but are rather used in places where terrestrial roaming is not available.. As the prices for such access are very high, they do not seem to be a substitute for EU regulated roaming. Another respondent notes that satellite connectivity in general seems to be a good access means in regions with very poor coverage of either a fixed or mobile terrestrial network. To date, satellite connectivity does not seem to be an economically significant alternative for access services and its impact on the EU Roaming market is likely to be at most moderate. The current provisions are considered to work and new measures should not be introduced.

From MVNO Europe perspective, there are no viable alternatives to cellular wholesale mobile roaming to serve the needs of consumers, businesses, and specialized M2M and IoT use cases. MVNOs call upon BEREC to carefully assess any alleged substitutability of technological alternatives.

Form a consumer perspective, BEUC considers technological alternatives to improve markets and deliver solutions that empower consumers, such as bridging the digital divide and ensure that no consumer is left behind. New technological alternatives should respect the regulatory provisions and comply with the competition principles and ensure consumer welfare.

BEREC considers that the various technologies which could aspire to be substitutes for roaming services, are only seen as complementary or specific to projects with well-defined terminal characteristics. The main alternative that puts pressure on operators is the commercialisation of travel eSIMs which however are currently mostly used for RoW roaming.

Indeed, operators have indicated that they view unlicensed spectrum technologies as complementary for certain projects. While these technologies have mechanisms similar to

roaming[53] in the sense that you can move outside your home country, their transmission capacity is for devices with certain transmission requirements, while mobile networks and their various technologies offer a wider range of options.

In this line, non-terrestrial technologies are proposed to provide coverage in areas out of the reach of terrestrial mobile networks or in the event of force majeure (such as natural catastrophe, etc.), but they are not expected to be a substitute for current roaming services in the next regulatory period.

Regarding multi-SIM technology, most NRAs (20 out of 21).have not received any complaints about its use in roaming Only one NRA has received a complaint by a customer whose smartwatch failed to connect while roaming. According to the NRA, the operator attributed the issue to technical reasons. Eventually, the technical problem was solved and the mobile operator adapted its offers making roaming connectivity available for smartwatches through their eSIM option.

Despite the lack of complaints, one NRA has identified that not all MNOs offer international roaming to their customers' smartwatches and another NRA has indicated that one of the operators claimed some technical limitations with regard to multi-SIM registrations for the same phone number while roaming, e.g., on different host networks.

BEREC considers that the future technologies that may have the greatest impact on roaming are the network slicing technologies discussed in chapter 7.1 and the new edge computing capabilities in 5G networks that may enable local break-out of the user-plane in the future. Regarding travel eSIMs, BEREC notes that they may impact RoW roaming tariffs if they become widespread in the market. Security aspects relating to the use of travel eSIM should also be considered[54]. In relation to the use of multi-SIM technologies, BEREC considers that end-users should be able to use their devices with multi-SIM technology in their plans with RLAH, when it is technically feasible. In this respect, roaming providers should inform their customers of any relevant limitations when subscribing to a tariff plan. Nevertheless, BEREC has not observed any limitations that would require modifications in the Roaming Regulation.

[53] https://lora-alliance.org/lorawan-network-coverage/ or https://build.sigfox.com/faq
[54] Embedded Sim Ecosystem, Security Risks and Measures, March 2023, ENISA

8. Transparency measures introduced by the 2022 Roaming Regulation

The Roaming Regulation has included transparency provisions from the outset to protect and raise awareness among end users. The recast Regulation introduced new transparency obligations for roaming providers. This chapter analyses the implementation and effectiveness of these new measures.

8.1. Analysis of the new rules for the consumers

8.1.1. Welcome message

The transparency obligations related to the welcome message have been extended to the following information, which must now be included in the message:

- Information about value-added services (VAS).
- Pricing details applicable to voice, SMS and data roaming services when used by roaming customers while connected to non-terrestrial public mobile communications networks (both national and international);
- A link providing free access to a dedicated webpage that offers information on alternative means of access to emergency services through emergency communications mandated in the visited Member State. Additionally, in Member States where public warning mobile applications are deployed, the message must indicate that public warnings may be received via a public warning mobile application, provided that the visited Member State has reported a link to the application in the database established pursuant to Article 16.

BEREC is aware of complaints from end-users who either receive the automatic message too late or do not receive it at all. In such cases, operators typically attribute the issue to technical defects in the automatic message mechanism.

From the operators' perspective, a few have indicated that the implementation of the automatic messaging system has been completed without significant difficulties or with only minimal issues, and therefore, they do not see a need for improvement at this stage.

On the other hand, several operators have reported various challenges, including:

- Difficulties in the implementation of an extensive set of information requirements in the welcome message, which is seen as undermining the objective of providing clear and relevant transparency.
- The multiplication of automatic messages received by customers on the same day (e.g., when crossing or approaching the border several times), with many end-users unaware of how to deactivate them or considering this option unsuitable.
- Difficulties in providing clear and unique tariff information for the various services due to the evolution of market pricing criteria.
- Concerns about cost efficiency regarding the automatic messaging requirement, as the transmission cannot be guaranteed by the sending operator, who nonetheless

must bear the costs of implementing the message in its systems, signaling, network payload etc.

Several operators believe that while new rules are not necessary, a substantial simplification of the existing ones is required. Several options have been presented:

- Reduction and simplification of the welcome message: Implementing one single, streamlined welcome message focused strictly on essential information, including personalised pricing details conditions, the single European emergency number '112', the operator's customer service contact and a link to a dedicated webpage or app for additional information (navigation on such pages should be free of charge for EU customers roaming within the EEA, but not in non-EEA countries).
- Differentiation based on the type of subscriber: Removing the automatic message requirement when the subscriber is a business and the final user is its employee.
- Reduction of the frequency of automatic messages, for example, when a customer travels to multiple EEA countries within a specific period.
- Removing the welcome message requirement within the EEA when national tariffs fully apply (as customers are now familiar with RLAH). Therefore, the requirement to send a welcome message should be maintained only when the customer is roaming outside the EEA, where national tariffs do not apply. For roaming within the EEA, tariffs information should be only provided before the contract is signed.

Some operators have also emphasised that any change to the welcome message requirements would entail a significant operational burden and substantial implementation costs, particularly in terms of IT system adaptations.

8.1.2. Information requirements for contracts and after conclusion of a contract

According to the Roaming transparency rules added in 2022 the following information that has to be provided in retail contracts and after the conclusion of a contract, in accordance with the BEREC guidelines:

- Clear and comprehensible information on the conditions and the quality of the roaming service when roaming within the Union, including information about the expected level of QoS, information about reasons why the roaming service is potentially offered under conditions that are less advantageous than those offered domestically, and an explanation of the relevant factors that can have an impact on the quality of the roaming service to which the roaming customer subscribes, such as network generations and technologies available to the roaming customer in a visited Member State.
- Information about the types of services that may be subject to increased charges when roaming.
- Information about the complaints procedure that is available when the QoS does not correspond to the terms of the retail contract.
- rom the operators' perspective, the existing measures work well and end users are provided with all the necessary information with regard to roaming upon the conclusion

of their contract. Therefore, the given regulatory provisions should not be amended, nor new measures introduced to avoid unnecessary implementation burdens to operators that do not add meaningful benefits.

Two operators stress that due to the various overlapping regulations (contractual, consumer and user rights, etc.), customers often complain about the amount of information that is too complex in terms of content and admit that they are not interested in reading such an amount of information. They agree that there is no need for new rules but suggest to at least simplify the existing ones. Another operator advocates that information requirements are already provided for under other legislative acts and are implemented either way.

Regarding contract information, one consumer organization reported some issues not specifically related to the new requirements. In particular, it reported shortcomings from operators when it comes to notifying consumers in advance and properly in case of changes as well as complaints about lack of clarity in the contracts regarding the limitations of the use of roaming services within the EEA.

8.1.3. Information to be provided by roaming providers on their websites

The transparency requirements in relation to the roaming providers' websites pertain to QoS, VAS, inadvertent roaming, alternative means of access to emergency services and information about the use of public warning systems when relevant.

One consumer organisation recognises that the information provided on the websites of operators has been generally updated over the past years and mostly contains key information for consumers. However, it points out that a significant information asymmetry between consumers and operators remains due to the difficulty for the consumers of finding the information they actually need. According to them, operators should try to display this information in a timely, clear, distinctive manner, via the means chosen by the consumer. BEREC notes that this difficulty is more related to consumer protection rules rather than the Roaming Regulation.

However, operators assure the information is provided on their websites according to the regulation, and the new measures are being implemented. Operators note having no difficulties in carrying out changes to their websites, but some operators argue that roaming pages have become dominated by roaming content which is rarely accessed by end users. They question the usefulness of the requirements, if cost-efficiency is to be accounted for. Furthermore, they consider that the current measures are effective and sufficient, and that there is no need to amend the existing regulatory provisions or introduce new ones.

Nevertheless, some difficulties were encountered in the transcription and translation of information about VAS and emergency communications services on the dedicated webpages (see chapter 8.1.5 and 8.1.6).

An operator suggests that all information related to roaming and presented to the customers should be allowed to be zero-rated, without being treated as an infringement of the net neutrality rules.

8.1.4. Transparency measures on roaming consumption

As regards the surcharges applying when exceeding the FUP, the consumer organisation reports improvements in the transparency of the information provided to consumers. However, the rules are still mostly described as confusing by consumers who fail to understand when and how they exceed the FUP limit. Consumers' access to their real usage information is also extremely limited. Consumers should be able to see how much data, voice calls, or SMS they have left under their fair use limits. Beyond the current 'fair use' policy transparency measures, operators should clearly disclose not only their standard usage allowances but also their roaming allowances. Currently, such information is often combined, leading to consumers being unaware of their specific usage limits when travelling. This can help prevent "bill shocks" due to increased use. There are also reports of overall lack of clarity about the complaint procedures for consumers.

From the operators' perspective, the implementation of the transparency requirements on the FUP has raised no issues and the current measures are deemed sufficient.

In addition to the notification sent to the roaming customer when the data volume while roaming reaches 80 % of the agreed financial or volume limit, which by default is 50 euro without VAT, the new rules add an additional notification when the roaming customer consumes more than 100 euro in a monthly billing period, excluding VAT, which applies also when connecting to non-terrestrial networks.

For one operator, the implementation regarding non-terrestrial networks has been technically complex. Therefore, the rules must not become more complex as the implementation of the existing provisions is already quite expensive. Another operator considers that using a calendar month is not perfect, but it is working as a safeguard for customers.

Aside from the aforementioned, operators do not report other issues. They generally consider the regime to work well, and no new measures should be introduced that do not add meaningful benefits.

Nevertheless, some operators question the proportionality of the additional second data roaming limit of 100 euro, which added another layer of complexity with unclear evidence that it delivers an appropriate benefit. Customers are already protected by the 50 euro limit and those customers explicitly asking to use roaming beyond 50 euro make a conscious decision and are aware of higher bills. In particular, the usefulness of the financial limit is questioned for prepaid customers, who are inherently protected from bill shock by the remaining credit (which is on average well below the financial limit foreseen by the regulation), and who additionally have a wide choice of bundles with high data FUP in the EU, as well as the availability of specific alternative roaming offers. According to the operators' internal statistics, only a negligible number of customers reach the 50 euro and 100 euro limit, thereby rendering the provision disproportionate. Hence, one operator considers that the introduction of the 100 euro cut-off limit should be removed as not needed and providing for unnecessary additional costs for roaming providers.

Another operator considers that the financial volume limits were sophisticated to implement but ultimately provide end users the well needed financial protection especially when roaming outside the EEA. The financial volume limits provide end users with an added layer of

protection and peace of mind helping them avoid bill shocks when roaming. However, this provision offers minimal benefits to operators. While these rules protect consumers, they can still choose to opt out and continue using mobile data. Operators are unable to prevent roaming customers from opting out and hence accumulating large monthly bills. If end users fail to pay, mobile operators are only left with legal avenues as their only means to recover the outstanding amounts.

8.1.5. Information about VAS

The Roaming Regulation has foreseen the obligation for roaming providers to inform their roaming customers of the potential risk of increased charges due to the use of value-added services, including a link to access, free of charge, a dedicated webpage providing up-to-date information about the types of services that may be subject to increased costs. The list of the value-added services, the numbering ranges in each Member State and, if available, the tariffs, are provided to the operators by the database established and maintained by BEREC.

From the operators' perspective, the zero-rated webpages with content extracted from the BEREC databases on VAS are not fit for purpose. Monitoring the views of these pages shows that customers do not click on the links in the welcome SMS and, consequently, do not access and read the information about VAS. For the operators, the most logical explanation is that there is a lack of interest in the information, which is not essential for customers. Other operators argue that this extra warning to the customers about possible costs leads to too much information which can be perceived as spamming the customer, as frequent warnings about phishing make users hesitant to click on links in text messages.

Furthermore, the information is difficult to understand and confusing for customers and thus fails to meet the objective of increased transparency. For this reason, some operators request the removal of this requirement from the regulation, or at least to simplify the existing rules.

While this information may help avoid higher bills, some operators consider that some of it could mislead end-users about the applicable prices for VAS as the information lists national prices for VAS. An operator notes that VAS may also be charged higher than a domestic call/SMS/data when provided within the home network and believes that this information requirement should be removed as it is not roaming-specific and that the relevant information could be easily provided in the contract instead of the automatic message.

In addition, some operators are requesting clarification of the transparency obligations that relate to providing specific information on VAS, in particular whether a link to the BEREC database on the dedicated webpage would be sufficient, whether the information on VAS had to be translated and whether there was an obligation to make available, on the dedicated web page, the pricing information and additional information available in the BEREC database. From the call for input, it seems that operators do not have the same understanding of the transparency obligations in relation to VAS and that some of them direct their customers to the BEREC database, which saves them from costly developments.

In relation to the BEREC database, operators mention several issues and propose different options for simplification, which are presented in chapter 8.3.

8.1.6. Information about means of access to emergency communications services

The Roaming Regulation requires that the roaming provider must inform the roaming customer on the possibility to access emergency services free of charge by calling the single European emergency number '112', and provide a link to access, free of charge, a dedicated webpage, which provides information on alternative means of access to emergency services through emergency communications mandated in the visited Member State. Like for the VAS, the list of the means of access to emergency services is provided in a database which is established and maintained by BEREC.

If reported by the visited Member States in the database, roaming providers must also include information that public warnings may be received by a public warning mobile application in the concerned Member States.

For a few operators, no major difficulties were found during implementation or, on the contrary, the requirement has been too complex to implement.

Several operators are of the opinion that in the event of an emergency, the affected customer will certainly not remember the provider's welcome-SMS with information about an emergency website. Moreover, most retail customers are aware that the 112 emergency number is available not only in the EU but internationally and rarely opt for alternatives such as applications in urgent situations. Apart from this, the customers do not read the additional information on emergency services behind the weblink. In emergency situations, when faced with the need to communicate quickly, users tend to use 112, since it is a number that is well known and remembered. It is rare that users, in situations of danger or alarm, try to locate other numbers, making it not necessary to introduce new rules, but at least simplifying the existing ones. Hence operators consider that communication about alternative ways to access emergency services undermines the efforts of Member States and the EU to promote the European emergency number 112, which already works effectively.

BEREC agrees that in case of emergency calling the single European number 112 when roaming is the best practice and information on other numbers for calls to emergency services (already covered by 112) might confuse end users. However, BEREC notes that users with disabilities are not considered in this appreciation when it comes to other means (e.g., based on SMS or data services).

One industry organisation also suggests to consider an opt-out possibility for receiving emergency services information. While the Regulation currently allows an opt-out for transparency measures in relation to basic price information, this option is not available for emergency services information. As a result, customers cannot request to stop receiving this information. Additionally, cross-border commuters and people living near borders often perceive these messages as spam. Given the importance of this information, removing the transparency obligation entirely would probably not be appropriate. However, allowing more flexibility including an opt-out option and/or interval of e.g., 10 days for resending the information, would be suitable.

Operators mention some issues with the information contained in the BEREC database and made some suggestions for amendments, which are presented in chapter 8.3 in which BEREC also includes its proposals.

8.1.7. Pricing information for roaming on non-terrestrial networks

Pricing information about voice, SMS and data roaming services provided on non-terrestrial networks has been added as a new requirement in 2022. From the consumers' perspective, despite the purpose of these improvements to bring extra protections for consumers roaming in non-terrestrial networks, some members of the consumer organisation found that information on the pricing is sometimes difficult to find and that automatic warning messages arrive too late or not at all.

From the operators' perspective, the information is necessary and is being provided without any issues. The existing measures are considered to be effective and there is no need to amend the current regulatory provisions nor to introduce new measures that do not add meaningful benefits in order to avoid unnecessary implementation burdens to operators. Nevertheless, one operator mentions that the requirement is a case of over-regulation and that the implementation of the rules for non-terrestrial networks is highly complex.

8.1.8. Information about QoS

The consumer organisation reports that consumers do not always benefit from the same QoS as at home and overall lack information regarding QoS and the reasons why the same quality of service is not available when travelling abroad. From recurrent reports, they believe operators may still be limiting the connection speeds for roaming consumers.

Operators argue that as foreseen by the Regulation, the customers are informed about reasons why the roaming service is potentially offered under conditions that are less advantageous than those offered domestically, mentioning factors that can have an impact on the quality of the roaming service when roaming abroad. No major difficulties have been found during implementation and there is no need for improvement or for new measures so far.

Some operators consider that the information on QoS is essentially irrelevant to end users, as the quality ultimately depends on the network used and external factors such as device-specific circumstances. Furthermore, in relation to quality and reporting obligations, it is complicated for home operators to know and monitor, for the purpose of reporting to their own customers, the quality actually provided by the visited network operators. For objective reasons, operators are not able to provide information on the quality of services in visited networks in a manner analogous to that in the scope of services provided in their own network. Telecommunications networks are constantly evolving – some technologies may be replaced by others, and the parameters characterising the networks (e.g., available speeds or latency) are constantly changing. Roaming service providers have no influence on the development of visited networks and are not able to predict the future parameters of these networks and the technologies available at the stage of concluding the agreement. Therefore, operators consider that any obligations in relation to the scope of network quality should only refer to general issues, leaving out detailed parameters of services or available technologies.

An operator considers that QoS while roaming is not a major concern neither for residential customers nor for businesses as reflected by the fact that following the introduction of RLAH,

the number of consumer complaints in relation to roaming has not increased in most Member States. Another operator suggests that the information should be provided only on the company website.

Furthermore, from the analysis made by one NRA, it has been noticed that providers are hesitant in providing detailed information regarding the expected level of QoS for roaming services. They argue that the quality of the services used when roaming in the EEA depends on the partner network in the visited country and may thus be different from the quality of the services at home. They reason that the QoS in the visited network is depending on a number of factors, such as the availability of certain technologies, the network coverage, signal level, available speeds or other external factors such as topography. This view is considered valid as they have no control over the visited partner's network. Considering the specifics of the mobile network, it is difficult for a provider to maintain an assured level of quality of service in its own network, which makes it even more difficult in a network which they do not control. Additionally, it must be considered that there are many mobile networks with different characteristics within the EU and which are continuously being updated and upgraded, making it very difficult for providers to include information about all possible cases/limitations of the visited networks in the contracts/ on their websites.

8.1.9. BEREC conclusions and suggestions for amendments to the transparency requirements

The 2022 Roaming Regulation introduced numerous additional transparency requirements to the existing framework and the content of the welcome message has been significantly extended, which may undermine the objective of providing information in a clear and effective manner to the customers. As a result, users may not fully engage with the information delivered, particularly regarding VAS and alternative means of accessing emergency communications services (which does not directly rely on operators). The cut-off limit and the application of the financial or volume limit to non-terrestrial networks and to roaming services provided outside the EU/EEA are efficient and effective measures to prevent bill shocks for the customers, although according to the operators' internal statistics the 100 euro cut-off limit has been rarely used. BEREC suggests simplifying the transparency requirements and suggests the following amendments:

- Welcome message: Limitation of the frequency (when customers are travelling within EEA) and/or of the content of the welcome message only to essential information directly related to roaming pricing conditions, the single European emergency number '112', the operator's customer service and a link to an operator's dedicated roaming webpage. This webpage should provide customers with more detailed and relevant information, particularly regarding VAS and alternative means of accessing emergency communications services. The detailed information provided in the contracts serves also as an important source of information for the customers. Regarding the frequency, crossing the borders between different member states should not generate another welcome message, with the exception of cases when the customer is crossing boders with non-EU/EEA countries or generally countries where different pricing applies (e.g. in case of alternative tariffs).
- VAS: In order to enhance clarity within the Roaming Regulation and prevent potential misinterpretation, inclusion of a specific provision stating that the RLAH principle does

not apply to calls made or SMS sent by roaming subscribers towards numbers used for value-added services, such as free-phone numbers[55]. Further improvements related to VAS are suggested in chapter 8.3, especially in relation to the information provided through the BEREC database.

- VAS: Simplification of the current regulation requirements. Instead of duplicating the detailed information of the BEREC database, it would be sufficient for operators to include instructive information on their websites and via the customer service indicating that VAS might not be charged under RLAH especially for freephone numbers which are the VAS more often subject to complaints, and to provide a link to the BEREC database. In addition, BEREC will also foresee a review of the database in the future and could consider making available the information of the database in all EU official languages.

- QoS: Restriction of the transparency requirements to the relevant factors that can affect QoS while roaming. Operators should not be required to describe detailed technical implications of a difference in the QoS in the visited network which the customers might not understand, and which the roaming provider cannot provide as it would also depend on the visited operator to deliver the necessary information.

The transparency provisions of the Roaming Regulation impose requirements that may question the coherence with the EECC's provisions related to end-users' rights. However, the EECC requirements pertain to general consumer protection rules, whereas the Roaming Regulation's provisions are more specific and remain relevant in a roaming context, while some improvements, as stated above, may be necessary to ensure adequate and clear information for the consumers as well as a limited implementation burden for the operators.

8.2. Monitoring and supervision of the new transparency rules

According to the feedback received from NRAs, as described in detail in chapter 3, no substantial issues were pointed out during the monitoring and supervision of the implementation of the new transparency rules (see Appendix). Chapter 3 also includes detailed information about the relevant consumer complaints.

8.3. Assessment of the BEREC databases on VAS and emergency communication services

In response to the call for input, operators raised numerous issues about the information provided in the BEREC database on VAS and its maintenance:

- Being too technical, restrictive, and complex information in the database making it difficult for both end-users and roaming providers to understand it.
- Heterogeneous information provided about roaming tariffs and thus is potentially misleading for the end-users and difficult to process: such information often relates to

[55] Recital 37 of the current Regulation states that "*This Regulation should not apply to the part of the tariff that is charged for the provision of value-added services but only to the tariffs for the connection to such services*."

the pricing applied in the domestic country targeting the domestic caller, while pricing for roaming callers is set by their roaming provider, if available, according to the wholesale agreements set with the visited networks. Therefore, this information is not of any help to the roaming customers and it could create confusion.

- Different definition of the VAS by the NRAs: for operators, VAS are often any services that have higher termination rates than the regulated rates. There are many prefixes which can be found in the wholesale tariffs of the EU operators as VAS, but they are missing in the database because according to national numbering plans they are not VAS. However, these are the ones causing the high charges.
- Inadequate format of the information stored in BEREC database preventing the data to be processed in an automated way required by the MNOs for them to properly construct information for customers.
- Difficulties in the transcription and translation of data on the operators' dedicated web page without the implementation of an automation project (which represents additional costs for the operators).
- Dedicated webpage representing an expensive burden for operators with recurring costs to maintain, translate and update the information, despite its limited use. In addition, requiring all EU mobile operators to undertake similar developments is not the most cost-efficient solution. Additionally, the ongoing maintenance of these webpages and continuous updates to the information at an individual operator level represent avoidable costs.
- Burdensome and lengthy process of updating the information: notifications not received, updates not clearly identified with the consequence that every time there is an update of the database, the provider is obliged to check all the databases of the VAS provided in each Member States, errors in the differences files (the data in csv format should be in one column, but they are currently not, so after dividing the data into columns some information gets lost. The edited data is moved by one row down against the original data). This makes the database useless unless manually processed.

Thus, operators consider the VAS database requires improvements and simplification:

- Clarification of the transparency obligations that relate to providing specific information on VAS, in particular whether a link to the BEREC database on the dedicated webpage would be sufficient, whether the information on VAS had to be translated and whether there was an obligation to make available, on the dedicated web page, the pricing information and additional information available in the BEREC database.
- Quality of information: setting relevant standards and methodology by BEREC for data entry and acquiring necessary information from NRAs, and validation process of the data provided.
- Provision of the information on the providers' websites with a direct link to the BEREC database, which should offer clear and easily understandable information in the languages of the Member States, or at least to the NRAs websites, which are the

original sources of this public data. In this way, customers would always receive correct and up-to-date information, without unnecessary intermediaries.

- Updating process:
    - Providing the difference file in .xls format or removing the comma as separator in the .csv format or providing information about what data the change affects (even if BEREC sends all the information) in order to update database in a more efficient and less time-consuming way. Such an improvement would ensure a way to find out which numbers were edited/removed/added in the VAS database in an easy way. This would save the trouble of checking and changing all data.
    - Setting up a working group between the roaming providers and BEREC in order to find a way to render such updates easier, smoother and automatic in order to alleviate the burden on roaming providers and to provide promptly the updates to the roaming customers.
    - Setting up automation options for managing and updating this information, which would reduce manual effort while still ensuring that the content remains accessible for those who require it.
    - Limiting the updates to once a year at most and not having to manage several changes per year.

In addition, concerning emergency communications services, operators mention:

- The BEREC database contains inaccurate information (links to applications that can only be downloaded from country-specific app stores where applications from other national App Stores do not appear). Furthermore, the realisation of free data traffic to apps for end-users is not possible without having much information about the app and an extended test for each app in each country.
- The content of the database should be limited to the European standardised means of emergency calls or applications (e.g., calling 112).
- The BEREC database contains inconsistent and confusing information (for instance not every NRA has published information about the access in the category “Emergency calls (voice)”, not every emergency application across the Union is entered into the database etc.).

The following additional improvements were mentioned:

- The database could benefit from a better structure, e.g. emergency numbers/apps and their description should not be written in a single text; numbers and their description should be filled in separate columns and each service in a separate row.
- Translations provided by the operators may not be consistent, thus providing the roaming customer with a different set of information. One operator suggests that BEREC requests the Commission to arrange a translation service performed by DG Translation in order to grant that the same set of information is provided to all

customers in each Member States' language, irrespective of the roaming provider they use.

In BEREC's opinion, the transparency obligations on VAS of the Roaming Regulation have been subject to divergent interpretations by operators, some of which do not include detailed information on a dedicated page but refer to the BEREC database accessible in BEREC's website in English. A clarification of the provisions seems necessary in order to ensure the uniform application of the rules.

In addition to the proposals to clarifying the scope of application of the Roaming Regulation and to including a transparency requirement on the operators' website on the general information about how VAS are charged (see chapter 8.1.9), in BEREC's opinion, other measures could be encouraged to simplify the implementation of the transparency obligation on VAS with a more useful effect for customer protection, such as allowing the operators to insert a direct link to the BEREC database, where BEREC could consider to make available the information in the database in all EU official languages, on their dedicated webpage for VAS in order to alleviate the implementation burden of the operators with little added-value for the consumers. If the Roaming Regulation was to be amended, BEREC will also consider working in the future on further improving the database and the information it provides.

Furthermore, as regards the database for emergency services a similar approach could be followed. In addition, the Roaming Regulation could clarify that regarding calls to emergency numbers, only 112 has to be mentioned (and not other national numbers that offer exactly the same services as 112). The alternative means of access to emergency services should be means other than calling 112 (which is the default and is mentioned in the welcome message) e.g., texting 112, app designed for users with disabilities, app designed for cases when calling 112 is not possible.

8.4. Additional measures to prevent customers from inadvertent roaming and surcharges related to non-terrestrial networks

As indicated in the following figure extracted from the 31st Benchmark report, operators have implemented several measures to protect consumers from paying for inadvertent roaming in the EU/EEA. Beside the measure foreseen by the Roaming Regulation related to the information in the welcome SMS about charges, the cut-off limit and its notification, more than 70 % of the respondents indicated that they disable roaming.

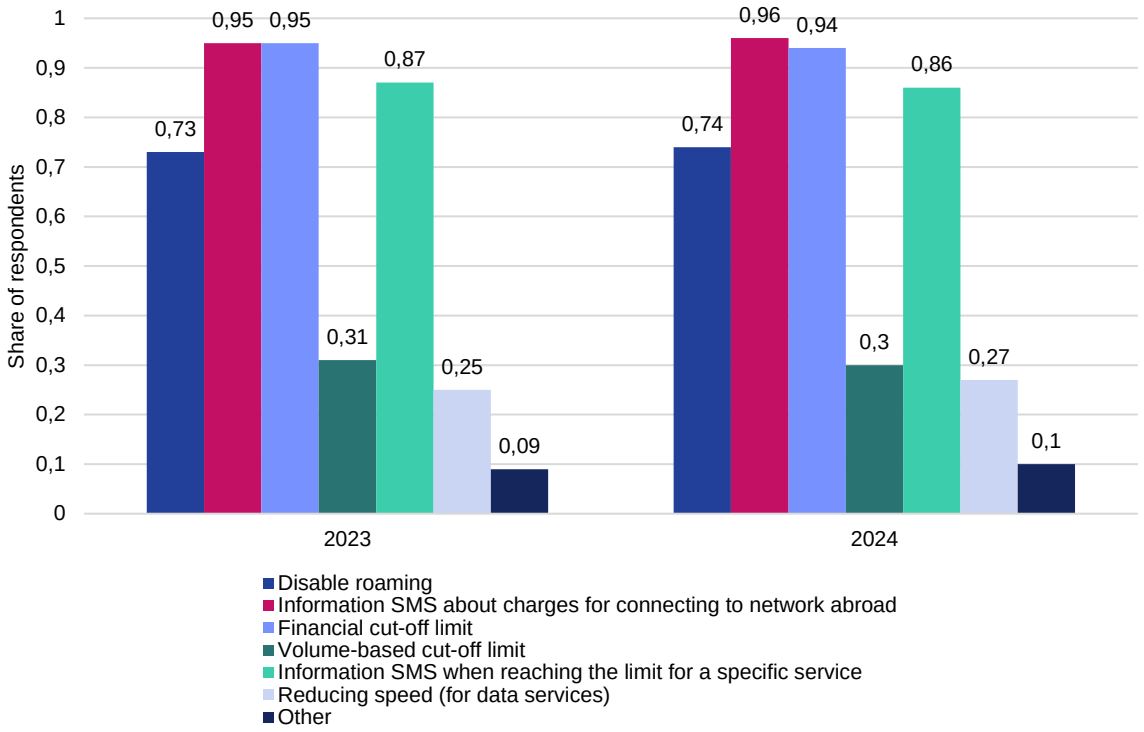


Figure 35: Measures implemented to protect consumers from paying for inadvertent roaming in the EU/EEA in 2023-2024

As confirmed by an operator in the call for input, this measure has been implemented for consumer plans only in order to avoid bill shocks when roaming on non-terrestrial networks, with the possibility to easily opt-in, if required by the customer. Disabling roaming could be also efficient in reducing the charges for non-terrestrial networks.

Recently, a mobile operator also informed an NRA that it is assessing options to minimise its exposure to bad debts while also protecting customers from potential bill shocks from roaming activity. The problem encountered here by the operator did not relate to not being able to implement the financial or volume limits, but that when customers repeatedly opt to continue their usage there are occasions where expenditure reaches thousands of Euros giving rise to high credit risks for operators.

NRAs noted that other measures have been taken by operators: lower or higher cut-off limits, opt out, notification at 80 % of the agreed final volume limit, automatic blocking of the consumption of data services.

In BEREC's opinion, an opt-in system for roaming data services on non-terrestrial networks would be an efficient measure to protect the consumers against bill shocks.

9. Rest of the World roaming

In this chapter, the experiences with roaming in RoW is presented in order to assess the potential impact the EU Roaming Regulation on these roaming services. For this assessment BEREC is using the data it collects on an annual basis as well as the input received from stakeholders and NRAs as a response to the call launched to collect input for the preparation of the BEREC Opinion.

According to the data collected on an annual basis, it can be concluded that the retail RoW roaming prices have been quite stable for voice, SMS and data services since 2021.

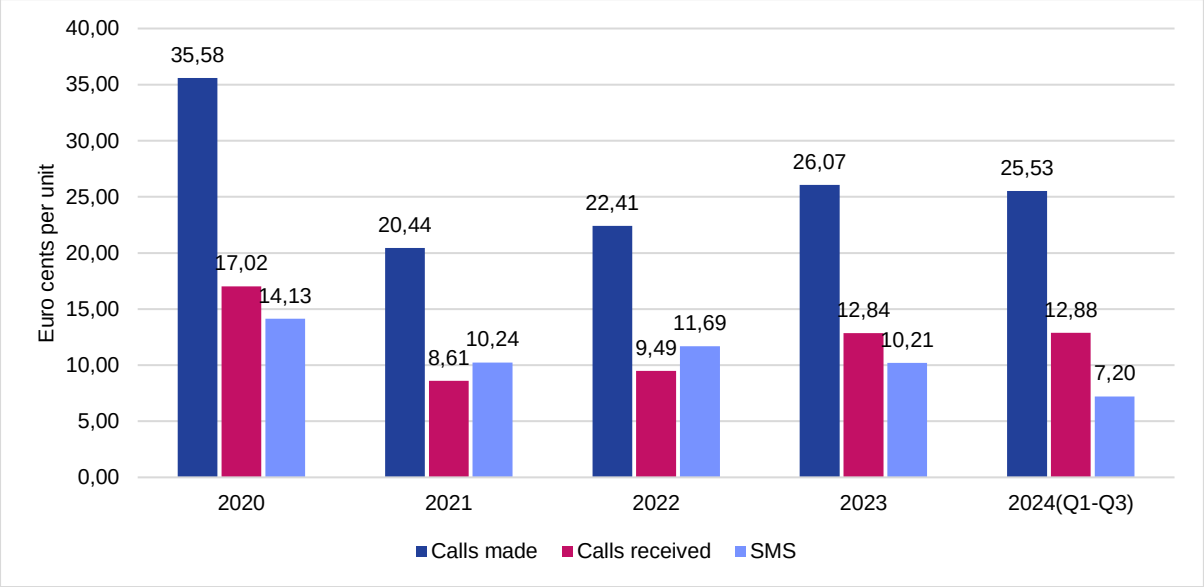


Figure 36. EEA average retail prices RoW roaming services 2020-2024 (Q1-Q3)

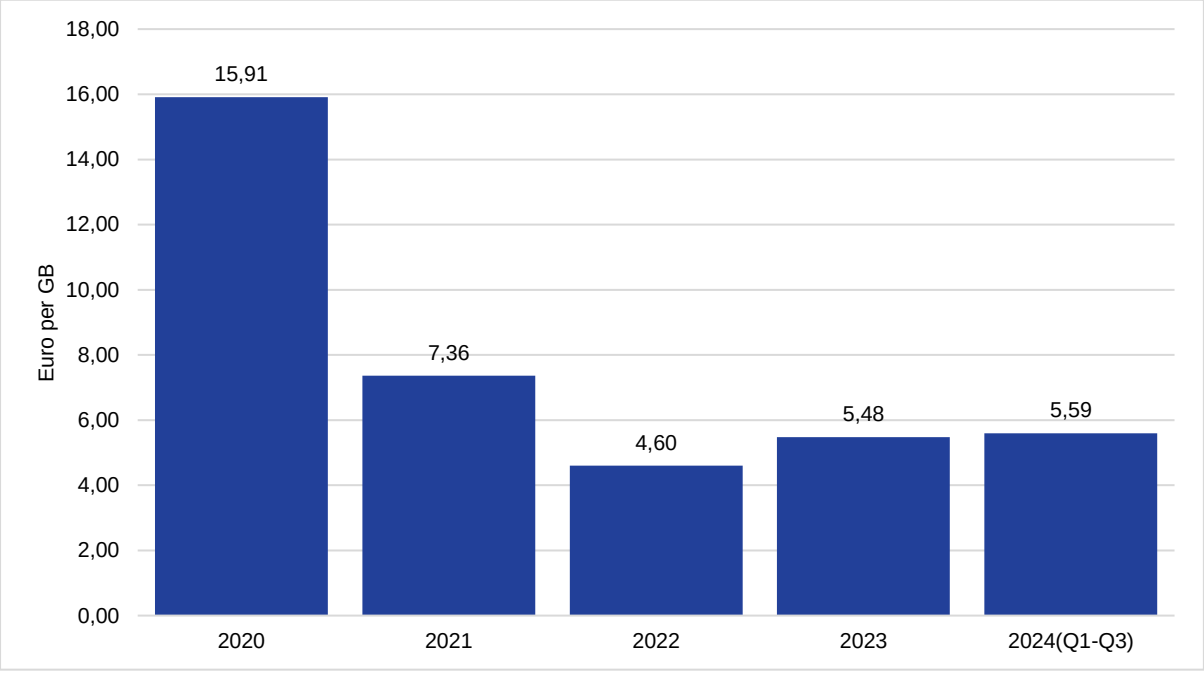


Figure 37. EEA average retail prices RoW roaming data services

After a significant drop of prices from 2020 to 2021, the numbers show a slow increasing trend concerning voice and data prices for RoW roaming during the last 3-4 years. BEREC understands that the current market developments for RoW roaming allow for retail prices that are far above domestic levels. Chapter 5.1 which presents the level of wholesale RoW prices shows that although wholesale RoW prices for data services have fallen significantly during the last years, RoW wholesale prices for voice and SMS services are significantly higher than the EU wholesale roaming prices.

Stakeholders participated in the call for input mention that travel eSIMs are substituting traditional roaming (for example when their retail prices are lower than the ones applied by the domestic roaming provider for RoW roaming) since they provide similar quality of services as traditional roaming and are easily accessible for roamers. Travel eSIMs usually offer certain volumes of data roaming services for a fixed amount and in most cases their users can also buy additional data volumes while roaming. BEREC notes that travel eSIMs might incentivise domestic roaming providers to lower their RoW roaming prices by introducing RoW roaming packages with more attractive prices than the ones that are charged on a per unit basis.

One respondent also mentioned a market trend towards including some RoW destinations in the RLAH footprint by some roaming providers. This is specifically the case for destinations like UK, USA, Canada and China, and results in lower RoW retail roaming prices for the benefit of end users. According to the latest BEREC report 57 %[56] of responding roaming providers include non-EU/EEA destinations in their RLAH FUP. BEREC considers that the voluntary inclusion of non-EEA countries in FUP (e.g. the open data FUP) is for the benefit of end users. The FUP volumes for open data bundles are in general quite high so extending it (always on a voluntary basis) to cover non-EEA countries will not result in subscribers not having the volumes they need when they travel to EEA countries. Therefore, BEREC proposes to mention this option explicitly in the regulation.

Apart from the above, BEREC notes that in the last three years, some EU/EEA operators have entered into voluntary arrangements with non-EU/EEA operators (e.g., from Ukraine, Moldova, Western Balkans) aiming at lowering wholesale and retail roaming charges. In some cases, BEREC has facilitated these agreements and has the task to report on the application of these agreements. These agreements are beneficial but are not endorsed by all EU/EEA operators.

The above-described trends lead to lowering retail prices for RoW roaming mainly on data services. However, the level of RoW roaming prices (see graphs above) remain higher than the domestic RLAH level.

BEREC also notes that complaints were reported in some countries about the use of automatic bundles for roaming outside the EU (RoW). In particular, three NRAs reported about automatic non-EU roaming packages provided by the retail roaming providers while consumers complaining that they cannot use or get per default per unit roaming charges. This can have

[56] See: https://www.berec.europa.eu/en/all-documents/berec/reports/31st-berec-international-roaming-benchmark-data-and-monitoring-report

a significant financial impact especially for consumers that want to keep their phone for limited usage in RoW countries.

For this issue, BEREC is of the opinion that provisions like the ones included in the last subparagraph of Article 8 (1) of the Roaming Regulation should also apply to RoW roaming, but allowing bundles to be offered on an opt-in basis. BEREC notes that there are already transparency rules and bill shock measures applied to RoW roaming that stop data usage when the limit is reached. Therefore, BEREC is of the opinion that automatic packages/bundles for RoW roaming should not be allowed as they would be inconsistent with these transparency/bill-shock measures. Customers should be able to deliberately choose alternative tariffs or bundles including RoW destinations. BEREC suggests that this could be incorporated in Article 8 of the Roaming Regulation.

As regards other issues identified about RoW roaming, three NRAs mentioned inadvertent roaming when traveling near the borders of the EU/EEA on a neighbouring country which is a non-EU/EEA-member or on a non-terrestrial mobile network.

In addition, one NRA reported complaints where roaming users were connected to 4G network even though data roaming was disabled in the handset settings and as a result some small data usage was still billed. Usually this does not lead to problems when roaming in the EEA because of RLAH. Such problems mostly arise when roaming outside the EU/EEA or on a non-terrestrial network.

Another NRA mentioned that main complaints about RoW roaming concerned surcharges that were billed prior to the reception of the welcome SMS. Due to high RoW roaming charges the cut-off limit was reached before the welcome SMS was received.

In order to address these last three issues, BEREC is of the opinion that the Roaming Regulation should introduce tools enabling roaming customers to opt out of consuming data roaming services when connected to RoW networks, without affecting “RLAH” traffic. In such a scenario, customers would have the right to opt out of such data roaming services at any time, in an easy and cost-free manner, and to request the reinstatement of such services if desired. BEREC observes that some operators are already providing such mechanisms on a voluntary basis and assesses that their implementation is not expected to entail excessive costs. According to BEREC, all the above proposed measures will enable the best protection of customers against unsuspected high prices.

10. Appendix

10.1. NRAs' monitoring and supervision activities

Table 5: Other measures taken by NRAs for formal or informal monitoring and supervision of the roaming rules.

AT	Pursuant to Article 133 of the Austrian Telecommunications Act (TKG 2021), providers are required, prior to the commencement of services, to notify RTR of their general terms and conditions and tariff provisions, as well as any amendments thereto. Within six weeks, the regulatory authority may raise objections to the general terms and conditions and tariff provisions, with the exception of nominal tariff amounts, where these fail to comply with the TKG, Art 879 and Art 864a ABGB (Austrian Civil Code) or Art 6 and 9 KSchG (Austrian Consumer Protection Act) or Art 4 of Regulation (EU) 2015/2120.It should be noted that the Roaming Regulation does not constitute a review criterion in the above-mentioned procedure under Article 133, Paragraphs 1, 5, and 6 of TKG 2021. However, through this process, RTR acquires information on any provisions concerning roaming that are included in the contract documents. Should RTR become aware of any infringements of the Roaming Regulation in this manner, it may take action by notifying the Telekom-Control Commission. Any breaches of the Roaming Regulation identified within the contractual terms will be addressed through a supervisory procedure conducted by the Telekom-Control Commission.
BG	The CRC conducts continuous inspections throughout the year, primarily based on consumer reports concerning the use of roaming services. As part of these inspections, the CRC assesses operators' compliance with the applicable roaming regulations.
CZ	The measures undertaken by the CTU include a thorough review of operators' price lists and online information to ensure full adherence to regulatory requirements regarding transparency and pricing.
DK	Since 2022, the Agency for Digital Government has implemented a supervisory strategy regarding international roaming.The supervision primarily operates as reactive oversight, initiated in response to inquiries and complaints from customers or other roaming providers. It is important to note that customer complaints are referred to the Telecommunications Complaint Board for resolution. However, such complaints may prompt the Agency for Digital Government to initiate cases independently against the relevant providers if the issues raised are of a fundamental or systemic nature.In addition to reactive measures, the Agency for Digital Government conducts proactive supervision within selected focus areas. This proactive oversight includes an annual review of at least four providers. To date, the annual reviews have focused on providers' fair use limits and whether these have been appropriately adjusted to reflect the annual reductions in wholesale data price caps. The selection of focus areas varies annually. For example, in 2025, the focus area will be the content of the "welcome message." Proactive supervision also entails the Agency independently initiating cases, including those arising from its own observations of providers' websites. The effectiveness of the supervision is assessed through an analysis of (annual changes in) the number of cases and decisions, as well as any associated complaints. Based on these findings, the Agency determines whether increased information efforts are necessary to address specific issues with providers. These information initiatives may be conducted bilaterally, or disseminated through

	press releases or updates on the Agency's website. The website is regularly updated with targeted information for both end-users and providers.
FR	Informal monitoring and supervision of the correct implementation of the roaming rules have been carried out through ARCEP's dedicated platform, "*J'alerte l'Arcep*", which enables end users to report issues encountered while roaming. Specific indicators related to the new transparency and Quality of Service (QoS) provisions introduced by the Roaming Regulation have been incorporated into the platform to facilitate monitoring of their implementation. Additionally, informal meetings have been held with operators to address these matters.
DE	Any complaint or query received from end users is documented and addressed by BNetzA. This process provides valuable insight into which provisions of the Roaming Regulation are being effectively implemented and which remain partially or insufficiently implemented by providers. Complaints are forwarded to the customer service departments of the respective providers, highlighting instances of non-implementation or incomplete implementation of the requirements set forth in the Roaming Regulation.
IE	ComReg has investigated potential breaches of Roaming obligations, including those in the 2022 EU Roaming Regulation.
MT	As part of its roaming compliance monitoring exercise, the MCA carries out tests on a periodic basis using local operators' SIM cards, mainly in relation to the 'welcome message' notifications. Furthermore, the MCA monitors webpages with roaming related information and reviews terms and conditions for the various tariff plans offered by local MNOs to ensure the correct implementation of the Roaming Regulation.
NO	Nkom has done an informal mapping of information available on the providers' web pages. The aim was to check how the providers present information about QoS for customers that plan to visit other EEA-countries.
PL	UKE implemented a series of measures in connection with the entry into force of the recast Roaming Regulation on 1 July 2022.Firstly, in response to questions addressed to the President of UKE regarding the new provisions of the Regulation and uncertainties surrounding their proper implementation, the President of UKE prepared and presented detailed answers to inquiries from roaming service providers. Following this, a meeting was organized with operators to discuss the most significant questions and to outline the President's position on these matters.Secondly, the President of UKE issued formal requests to roaming service providers, including both MVNOs and MNOs, to verify their compliance with information obligations towards customers in relation to the changes introduced by the Regulation.
PT	ANACOM conducted monitoring and supervision activities to evaluate the correct implementation of roaming rules, particularly with respect to transparency obligations concerning the information to be disclosed: • In the automatic message, regarding value-added services, quality of service, and alternative means of accessing emergency services while roaming. • In contracts, specifically concerning value-added services in the context of roaming. • On operators' websites, in relation to quality of service and value-added services while roaming.

	• On operators' websites, concerning roaming plafonds and the applicability and calculation of the roaming data allowance.
RO	ANCOM has based its monitoring and supervision of Roaming Regulation mainly on end-users' complaints, this does not exclude active ad-hoc screening of operators' websites, information requests or (formal or informal) discussions with them, if needed.

10.2. Cases of non-compliance

Table 6: Instances of non-compliance with the provisions of the Roaming Regulation identified by NRAs since 2022.

AT	In the context of the above-described procedure pursuant to Article 133 of the Austrian Telecommunications Act, RTR became aware that an Austrian mobile network operator (MNO) offered a tariff model transitioning from an initial cost-free phase of three months without roaming to a paid phase with roaming from the fourth month onward. In RTR's view, this practice constituted a violation of Article 4 (1) and (2) of the Roaming Regulation. Consequently, the Telekom-Control Commission initiated supervisory proceedings against the provider, resulting in a formal decision. The MNO was instructed by official order to cease this practice. An appeal has since been lodged against the Telekom-Control Commission's decision, and the proceedings are currently before the court of appeal.
BG	CRC has conducted numerous inspections since 2022, which identified three isolated cases of deviations from compliance with the roaming rules: • One case involved the application of an alternative roaming tariff instead of the RLAH tariff. • Another case concerned a delay in sending the "welcome message," where the message was sent only after the start of the roaming Internet session. • A third case related to non-compliance with the financial limit. In all three cases, the operators rectified the non-compliance, and the affected subscribers were compensated accordingly.
CZ	CTU identified at least one instance of an unwarranted SMS notification informing a customer of alleged abusive use of roaming. This incident was subsequently determined to be the result of a "technical error."
FR	ARCEP observed that the obligations to provide specific information on Value-Added Services (VAS) have been interpreted differently by operators. Some operators included the information from the BEREC database on a dedicated website, while others provided a link to the BEREC database in the welcome SMS or on a webpage dedicated to roaming information. ARCEP has addressed this issue with the concerned operator to ensure the correct implementation of the relevant provisions of the Roaming Regulation.
DE	The majority of non-compliance cases identified by BNetzA pertain to issues related to billing (such as inadvertent roaming in border regions or non-terrestrial networks and lack of proof of connection), terms and conditions, non-receipt of the welcome SMS, the non-application or malfunctioning of the default financial limit, or the application of alternative tariffs.

	In such cases, BNetzA issued communications to the providers, requesting explanations and requiring compliance with the provisions of the Roaming Regulation. Providers subsequently responded to BNetzA, reached agreements with the affected consumers, and took measures to ensure compliance with the Roaming Regulation. In 2023, a MVNO offered a tariff plan that included a daily data flat rate. Contrary to the RLAH principle, roaming customers were limited to only 1 GB of data within the Union for a 30-day period. Following BNetzA's intervention, the MVNO implemented a FUP for the daily flat rate to align with regulatory requirements. In 2024, BNetzA intervened against a roaming provider that automatically applied a daily package for customers traveling outside the Union. The package was activated daily during the customer's stay abroad without providing an option to opt out. After actions taken by BNetzA, the tariff was adjusted to comply with the Roaming Regulation.
MT	During one of the tests conducted in an EU/EEA country, the MCA observed that a local service provider was not offering pre-paid subscribers free-of-charge access to information regarding value-added services, public warning systems, and alternative means of accessing emergency services, as outlined in BEREC's databases. The MCA engaged with the service provider to ensure compliance, and affected pre-paid customers were subsequently refunded. Additionally, following the entry into force of the recast Roaming Regulation, one operator required some time to adapt its systems to comply with the provisions related to the data cut-off mechanism. Subscribers who were negatively impacted as a result of this delay were duly refunded.Other cases concerned the correct and timely implementation of provisions related to welcome SMS messages, the requirement to provide a link granting free-of-charge access to a dedicated webpage with up-to-date information about the types of services that may incur additional costs, as well as roaming-related information in the terms and conditions, to ensure full compliance with the applicable regulatory provisions.
IE	ComReg has conducted investigations into compliance with EU Roaming obligations both prior to and following the entry into force of the 2022 EU Roaming Regulation. These investigations addressed, among other matters, the default financial limit of €50 (excluding VAT) for data roaming charges in a single billing period, as well as the 80 % and 100 % usage notifications. These issues were identified as a result of consumer complaints.In one concluded case, ComReg prosecuted an operator, and on 12 January 2023, the Dublin District Court heard cases related to eight summonses issued by ComReg against this operator. The operator was charged with eight counts of failing to comply with the requirements set forth in Article 15 of the Roaming Regulation.
PT	Although ANACOM concluded that there were no cases of non-compliance, initially it verified that some operators were still not completely complying with some transparency information requirements in the following areas: • Transparency obligations related to the automatic message concerning value-added services, quality of service, and alternative means of accessing emergency services. • Information disclosure requirements within contractual terms. • Transparency obligations regarding the information to be disclosed on operators' websites, particularly concerning quality of service and value-added services in the context of roaming.

	Following notification by ANACOM, these issues were promptly addressed and rectified by the operators. Additionally, during the verification of the applicability and calculation of the roaming data plafond, ANACOM observed that one operator was publishing roaming fair use allowances on its website based on the wholesale tariff from the previous year. ANACOM alerted the operator to this discrepancy, which led to corrections in most cases. However, the adjustment for one specific tariff plan remains unresolved and is currently being addressed by the operator.
RO	• Following complaints received from end users, ANCOM conducted verifications to ensure compliance with roaming regulations. The majority of identified non-compliance cases pertain to:Failure to send a welcome SMS (WSMS) or delays in its delivery. • Non-implementation or delayed implementation of data cost cut-off limits. While fines were imposed in certain cases, in the majority of instances where violations were identified, providers voluntarily adjusted the contested costs raised by users.

10.3. Costumer complaints

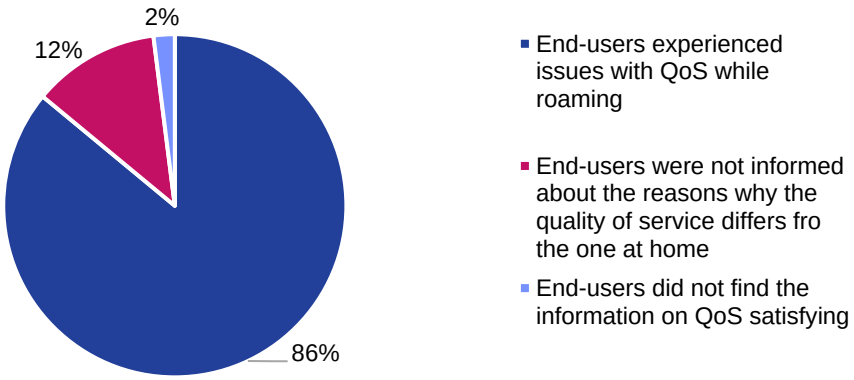


Figure 38: Overview of subcategories of consumer complaints regarding QoS (Quality of Service).

10.4. Cost model results for the minimum and the maximum unit cost per country

A. Minimum unit cost evolution for roaming voice service

Country	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Austria	0.84	0.83	0.83	0.75	0.74	0.73	0.71	0.70	0.69	0.68	0.67
Belgium	1.19	1.16	1.25	1.26	1.10	1.12	1.10	0.78	0.79	0.80	0.80
Bulgaria	0.75	0.75	0.74	0.74	0.73	0.72	0.71	0.70	0.69	0.69	0.68
Croatia	0.69	0.69	0.71	0.71	0.70	0.67	0.67	0.67	0.67	0.66	0.66
Cyprus	0.93	0.95	0.95	0.95	0.95	0.92	0.88	0.86	0.85	0.84	0.82
Czech Republic	0.76	0.73	0.71	0.70	0.68	0.67	0.67	0.66	0.66	0.65	0.65
Denmark	0.81	0.73	0.68	0.68	0.68	0.69	0.68	0.68	0.68	0.68	0.67
France	0.75	0.75	0.75	0.74	0.73	0.70	0.69	0.69	0.68	0.67	0.67
Germany	0.87	0.85	0.83	0.81	0.80	0.79	0.78	0.76	0.75	0.74	0.73
Greece	0.89	0.76	0.75	0.75	0.73	0.72	0.70	0.69	0.68	0.67	0.66
Hungary	0.94	0.82	0.81	0.80	0.78	0.76	0.74	0.73	0.72	0.71	0.70
Ireland	0.74	0.74	0.75	0.76	0.75	0.74	0.72	0.71	0.71	0.70	0.69
Italy	0.82	0.80	0.87	0.86	0.82	0.81	0.81	0.79	0.77	0.74	0.72
Luxembourg	1.60	1.62	1.45	1.47	1.48	1.44	1.37	1.27	1.18	1.10	1.05
Malta	1.14	1.15	1.15	1.16	1.19	1.16	1.10	1.05	1.02	0.99	0.97
Norway	1.01	0.81	0.79	0.78	0.77	0.75	0.73	0.73	0.72	0.71	0.71
Poland	0.70	0.71	0.72	0.72	0.72	0.71	0.71	0.70	0.68	0.67	0.66
Portugal	0.77	0.77	0.76	0.71	0.71	0.70	0.69	0.69	0.68	0.68	0.68
Romania	0.82	0.84	0.84	0.84	0.82	0.79	0.76	0.74	0.73	0.71	0.70
Slovakia	0.82	0.80	0.70	0.70	0.70	0.71	0.70	0.70	0.70	0.70	0.70
Slovenia	0.99	0.99	0.94	0.93	0.92	0.89	0.84	0.80	0.78	0.76	0.75
Spain	0.88	0.88	0.86	0.84	0.72	0.75	0.76	0.75	0.75	0.75	0.74
Sweden	0.94	0.92	0.91	0.87	0.69	0.69	0.70	0.69	0.69	0.69	0.68
Avg of 23 countries	0.90	0.87	0.86	0.85	0.82	0.81	0.79	0.76	0.75	0.74	0.73

B. Minimum unit cost evolution for roaming SMS service

Country	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Austria	0.17	0.16	0.15	0.14	0.13	0.13	0.12	0.12	0.11	0.11	0.10
Belgium	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07
Bulgaria	0.14	0.13	0.13	0.12	0.11	0.11	0.11	0.10	0.10	0.10	0.09
Croatia	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.07	0.07	0.07
Cyprus	0.29	0.28	0.28	0.28	0.27	0.26	0.25	0.24	0.23	0.22	0.21
Czech Republic	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.08	0.08	0.08
Denmark	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.16	0.15
France	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Germany	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Greece	0.11	0.11	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.08	0.08
Hungary	0.30	0.30	0.30	0.29	0.28	0.27	0.27	0.26	0.25	0.25	0.24

Ireland	0.12	0.11	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11
Italy	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Luxembourg	0.27	0.25	0.24	0.22	0.20	0.19	0.17	0.16	0.15	0.14	0.14
Malta	0.50	0.46	0.43	0.39	0.36	0.33	0.30	0.27	0.25	0.23	0.22
Norway	0.10	0.09	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10
Poland	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Portugal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06
Romania	0.16	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13
Slovakia	0.15	0.14	0.13	0.12	0.12	0.11	0.11	0.11	0.10	0.10	0.09
Slovenia	0.16	0.15	0.15	0.14	0.13	0.12	0.12	0.11	0.11	0.10	0.10
Spain	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Sweden	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Avg of 23 countries	0.15	0.14	0.14	0.13	0.13	0.12	0.12	0.12	0.11	0.11	0.11

C. Minimum unit cost evolution for roaming data service

Country	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Austria	0.36	0.34	0.31	0.30	0.29	0.27	0.27	0.25	0.25	0.24	0.23
Belgium	1.13	1.03	0.92	0.82	0.73	0.66	0.61	0.57	0.53	0.51	0.49
Bulgaria	0.42	0.38	0.35	0.32	0.30	0.28	0.27	0.26	0.25	0.24	0.23
Croatia	0.31	0.30	0.28	0.27	0.26	0.26	0.26	0.25	0.24	0.22	0.22
Cyprus	0.58	0.48	0.42	0.38	0.35	0.32	0.30	0.29	0.27	0.26	0.24
Czech Republic	0.35	0.31	0.29	0.28	0.26	0.25	0.24	0.23	0.22	0.21	0.21
Denmark	0.44	0.42	0.36	0.32	0.27	0.25	0.22	0.23	0.21	0.20	0.20
France	0.45	0.45	0.40	0.37	0.34	0.32	0.31	0.29	0.28	0.27	0.26
Germany	0.68	0.64	0.60	0.57	0.53	0.50	0.47	0.44	0.41	0.40	0.38
Greece	0.66	0.49	0.47	0.39	0.35	0.33	0.31	0.28	0.26	0.25	0.24
Hungary	0.62	0.59	0.57	0.54	0.50	0.46	0.43	0.40	0.37	0.35	0.34
Ireland	0.47	0.43	0.40	0.36	0.33	0.31	0.29	0.28	0.27	0.26	0.26
Italy	0.46	0.44	0.41	0.38	0.35	0.33	0.31	0.30	0.28	0.27	0.26
Luxembourg	0.54	0.53	0.47	0.43	0.40	0.37	0.35	0.33	0.32	0.31	0.30
Malta	0.61	0.56	0.51	0.48	0.43	0.40	0.37	0.35	0.33	0.31	0.30
Norway	0.61	0.51	0.47	0.42	0.38	0.34	0.32	0.30	0.29	0.28	0.27
Poland	0.38	0.37	0.35	0.32	0.28	0.26	0.27	0.25	0.24	0.24	0.26
Portugal	0.49	0.43	0.38	0.35	0.32	0.30	0.29	0.28	0.26	0.25	0.24
Romania	0.56	0.56	0.53	0.50	0.46	0.43	0.40	0.37	0.34	0.32	0.31
Slovakia	0.39	0.37	0.32	0.30	0.29	0.26	0.25	0.24	0.23	0.22	0.21
Slovenia	0.46	0.41	0.34	0.31	0.28	0.26	0.25	0.24	0.23	0.22	0.21
Spain	0.77	0.70	0.64	0.60	0.54	0.47	0.45	0.41	0.40	0.37	0.36
Sweden	0.53	0.50	0.46	0.43	0.38	0.35	0.33	0.32	0.30	0.28	0.27
Avg of 23 countries	0.53	0.49	0.45	0.41	0.38	0.35	0.33	0.31	0.29	0.28	0.27

D. Maximum unit cost evolution for roaming voice service

Country	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Austria	0.90	0.87	0.85	0.81	0.77	0.76	0.74	0.74	0.73	0.72	0.71
Belgium	1.33	1.26	1.29	1.34	1.18	1.23	1.25	0.85	0.89	0.91	0.94
Bulgaria	0.82	0.80	0.78	0.77	0.75	0.74	0.74	0.72	0.72	0.73	0.72
Croatia	0.79	0.79	0.79	0.75	0.72	0.72	0.72	0.74	0.75	0.77	0.80
Cyprus	1.13	1.10	1.10	1.07	1.03	1.04	1.00	1.01	1.02	1.03	1.04
Czech Republic	0.84	0.79	0.74	0.73	0.71	0.70	0.69	0.69	0.69	0.69	0.69
Denmark	1.10	0.79	0.70	0.70	0.70	0.71	0.76	0.77	0.78	0.79	0.80
France	0.83	0.81	0.80	0.76	0.75	0.72	0.72	0.72	0.71	0.72	0.72
Germany	0.98	0.96	0.89	0.85	0.83	0.83	0.83	0.80	0.80	0.80	0.79
Greece	0.96	0.82	0.82	0.83	0.81	0.80	0.78	0.78	0.77	0.76	0.74
Hungary	1.00	0.90	0.88	0.83	0.80	0.78	0.77	0.76	0.76	0.75	0.75
Ireland	0.84	0.81	0.81	0.80	0.79	0.78	0.78	0.79	0.78	0.79	0.78
Italy	0.93	0.90	0.97	0.95	0.87	0.96	0.89	0.90	0.90	0.89	0.88
Luxembourg	2.47	2.38	1.65	1.60	1.55	1.55	1.57	1.58	1.59	1.61	1.61
Malta	1.41	1.42	1.41	1.36	1.35	1.24	1.25	1.28	1.30	1.33	1.36
Norway	1.17	0.95	0.87	0.83	0.80	0.79	0.79	0.80	0.80	0.80	0.81
Poland	0.78	0.75	0.76	0.77	0.73	0.73	0.73	0.72	0.72	0.71	0.70
Portugal	0.90	0.84	0.80	0.74	0.73	0.73	0.73	0.74	0.74	0.74	0.74
Romania	0.92	0.91	0.89	0.90	0.87	0.83	0.81	0.80	0.79	0.79	0.78
Slovakia	0.88	0.85	0.73	0.74	0.73	0.76	0.76	0.77	0.77	0.78	0.78
Slovenia	1.19	1.10	1.17	1.06	1.06	0.94	0.95	0.92	0.91	0.91	0.91
Spain	1.09	1.10	1.02	0.90	0.73	0.81	0.83	0.84	0.84	0.85	0.87
Sweden	1.08	1.07	0.98	0.93	0.71	0.71	0.71	0.72	0.72	0.73	0.73
Avg of 23 countries	1.06	1.00	0.94	0.91	0.87	0.86	0.86	0.85	0.85	0.85	0.85

E. Maximum unit cost evolution for roaming SMS service

Country	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Austria	0.17	0.16	0.15	0.15	0.14	0.14	0.13	0.13	0.13	0.13	0.13
Belgium	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Bulgaria	0.14	0.13	0.13	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11
Croatia	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08
Cyprus	0.29	0.28	0.29	0.28	0.28	0.27	0.27	0.26	0.26	0.25	0.25
Czech Republic	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.08
Denmark	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.20	0.20	0.19	0.16
France	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Germany	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Greece	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
Hungary	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.28	0.27	0.27	0.27
Ireland	0.12	0.11	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11
Italy	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Luxembourg	0.27	0.25	0.25	0.24	0.23	0.23	0.22	0.22	0.22	0.22	0.22

Malta	0.50	0.47	0.44	0.42	0.40	0.38	0.37	0.36	0.35	0.34	0.33
Norway	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.10	0.11	0.13
Poland	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Portugal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Romania	0.16	0.16	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.14	0.14
Slovakia	0.15	0.14	0.13	0.13	0.12	0.12	0.12	0.11	0.11	0.11	0.11
Slovenia	0.16	0.16	0.15	0.15	0.14	0.14	0.13	0.13	0.13	0.13	0.12
Spain	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08
Sweden	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Avg of 23 countries	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13

F. Maximum unit cost evolution for roaming data service

Country	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Austria	0.42	0.39	0.36	0.34	0.33	0.32	0.32	0.31	0.32	0.31	0.31
Belgium	1.45	1.36	1.22	1.10	0.99	0.90	0.88	0.91	0.91	0.91	0.92
Bulgaria	0.54	0.45	0.40	0.35	0.33	0.33	0.31	0.30	0.29	0.29	0.29
Croatia	0.36	0.36	0.33	0.31	0.29	0.28	0.29	0.28	0.27	0.27	0.27
Cyprus	0.80	0.64	0.53	0.49	0.46	0.44	0.42	0.41	0.40	0.40	0.40
Czech Republic	0.72	0.55	0.48	0.48	0.37	0.34	0.32	0.31	0.32	0.35	0.31
Denmark	0.55	0.51	0.46	0.41	0.39	0.37	0.34	0.34	0.37	0.37	0.34
France	0.56	0.51	0.49	0.46	0.40	0.39	0.37	0.37	0.36	0.38	0.36
Germany	0.80	0.77	0.72	0.67	0.63	0.60	0.56	0.54	0.53	0.52	0.52
Greece	0.95	0.70	0.61	0.55	0.53	0.49	0.47	0.45	0.44	0.44	0.45
Hungary	0.76	0.67	0.63	0.60	0.55	0.52	0.50	0.47	0.46	0.45	0.45
Ireland	0.53	0.48	0.45	0.43	0.41	0.39	0.39	0.39	0.39	0.39	0.40
Italy	0.60	0.54	0.48	0.46	0.43	0.41	0.40	0.39	0.39	0.39	0.39
Luxembourg	0.61	0.61	0.54	0.51	0.49	0.46	0.45	0.45	0.46	0.46	0.48
Malta	0.71	0.63	0.58	0.53	0.50	0.47	0.45	0.44	0.43	0.43	0.43
Norway	0.72	0.62	0.58	0.54	0.50	0.47	0.45	0.43	0.42	0.41	0.41
Poland	0.53	0.52	0.48	0.47	0.40	0.38	0.37	0.37	0.37	0.37	0.37
Portugal	0.57	0.52	0.47	0.43	0.41	0.39	0.38	0.37	0.36	0.36	0.36
Romania	0.87	0.79	0.67	0.61	0.55	0.53	0.52	0.51	0.51	0.51	0.52
Slovakia	0.74	0.57	0.45	0.39	0.36	0.35	0.32	0.31	0.30	0.31	0.30
Slovenia	0.57	0.50	0.43	0.39	0.36	0.34	0.34	0.33	0.33	0.33	0.33
Spain	0.89	0.81	0.72	0.68	0.59	0.54	0.55	0.51	0.52	0.49	0.49
Sweden	0.62	0.58	0.54	0.50	0.46	0.44	0.43	0.45	0.41	0.41	0.41
Avg of 23 countries	0.69	0.61	0.55	0.51	0.47	0.44	0.43	0.42	0.42	0.42	0.41