

BEREC Opinion on the functioning of the roaming market, as input to the Commission's evaluation

13 June 2019

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BEREC Opinion – Executive Summary

The European Commission (EC) is set to publish a review of the Roaming Regulation by the end of 2019¹. The Body of European Regulators for Electronic Communications (BEREC) herewith provides its opinion based on input from national regulatory authorities (NRAs) and operators (MNOs and MVNOs/resellers). The input is mainly based on responses to a survey jointly launched by BEREC and the EC in March 2019. BEREC also took into account data published in its BEREC International Roaming Benchmark Reports and the BEREC Transparency and Comparability of Retail Roaming Tariffs Report.

The abolition of retail roaming charges in the European Economic Area (EEA) that marked the introduction of Roam Like at Home (RLAH) in June 2017 proved to be a clear success and a substantial contribution to the further completion of the single market. As the results of the surveys show, the compliance with the Regulation was very high and consumers could benefit from RLAH with Fair Use Policy (FUP) without delay. This is backed by the fact that usage of regulated roaming services has significantly increased since June 2017. While roaming was still perceived as an expensive service by end-users before the introduction of RLAH and a significant number of customers switched off data roaming while being abroad, this behaviour seems to have completely changed. In fact, the EEA average roaming consumption of data services increased by 600 % from Q3 2016 to Q3 2018 (from 60 MB per month to 440 MB per month per subscriber).

In addition, BEREC analysed the developments of consumer complaints and concludes that the majority of operators and NRAs reported very low numbers – which did not increase with the introduction of RLAH.

The results of the BEREC analysis show that operators generally comply with the legal provisions when applying a FUP and a vast majority of the operators (95 % of MNOs and 78% of MVNOs) actually implemented a FUP.

In the legislative process during the Roaming Regulation negotiations, many stakeholders including BEREC voiced concerns about potential impacts on domestic and rest of world (RoW) roaming prices. However, as the BEREC analysis shows, the introduction of RLAH had no major impact on prices or consumption patterns for both domestic and RoW services. Furthermore, there is currently no indication that RLAH has any serious impact on the availability of domestic offers, which is further corroborated by the evidence available to BEREC that the overall domestic tariff structure remains in most cases unchanged. However, BEREC notes that there are some changes to domestic tariff plans (some of which were observed before RLAH was introduced, anticipating the changes that would occur) and a high share of subscribers with domestic-only tariffs was reported by some countries. This is mainly due to operators offering cheap tariff plans without the possibility to roam.

While the general conclusion on the impact of RLAH is altogether positive, BEREC acknowledges that the situation is more complex for MVNOs and resellers where RLAH to a certain extent seems to have negatively impacted them. Since MVNOs have no radio network

¹ Regulation (EU) 531/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile communications network within the Union.

over which to offer connectivity to inbound roamers (therefore no possibility to balance traffic), and in general limited resources for managing direct wholesale roaming, most of them are dependent on some form of resale access. The lack of negotiation power due to size (and less traffic volume) and, for some of the MVNOs, the dependency on the host MNOs make it challenging to achieve discounts or better rates than the regulated caps.

The derogation mechanism foreseen in the Roaming Regulation to deal with such problems turns out to not always be a useful tool for MVNOs. Besides the complex procedure accompanying the application for a derogation due to the amount of data requirements, operators in very competitive markets with low retail prices seem to refrain from applying for a derogation, as an additional surcharge on top of the domestic price would put them at a competitive disadvantage.

BEREC analysed the situation for MVNOs and resellers and assessed various potential measures suggested by the operators to address their challenges. BEREC considers possible measures that the Commission could take into account in their review to increase the competitive strength for MVNOs:

- Reducing wholesale caps, taking into account that MNOs need to recover their efficiently incurred costs to provide wholesale roaming services. This is considered an efficient and transparent measure.
- Obliging the host MNOs to pass the discounts they get for wholesale roaming services on to the MVNOs. Although this measure would ensure equal terms for competition between MVNOs and MNOs, BEREC considers that this measure is very complex to implement and would require the definition of a monitoring process by NRAs.

Apart from the above two, additional measures could be considered in any update of the Roaming provisions to improve the situation for MVNOs.

The Quality of Service (QoS) during roaming transpired as a further issue in the course of the analysis. Some end users raised complaints about lower speeds while roaming in the EEA. Certain cases were reported where operators restrict speed or technologies (only 3G available despite vast majority of operators in the EU offer 4G services) when customers are travelling abroad. One of the reasons to reduce the speed or restrict the quality is to reduce data traffic (and thereby wholesale costs). The intention of the Roaming Regulation is to allow roaming customers to use the service like at home. Even though the Roaming Regulation does not provide any obligations in terms of QoS requirements, BEREC is of the view that domestic operators should not purposely lower the QoS than the one offered at home. In addition, operators should be transparent towards the customers in terms of QoS in a roaming situation (e.g. website, contracts, etc.). Therefore, BEREC suggests the EC could further investigate imposing more specific obligations in this regard in any potential update of the Roaming Regulation. If so, the Roaming Regulation could be updated so as to enable all operators, in particular small operators, to offer the same quality of service as at home in a sustainable way. BEREC will in any case further monitor these developments and will further discuss if the BEREC net test could be used for this purpose in the future.

In this opinion, BEREC also examines the impact of 5G and other technological changes on roaming. BEREC finds that it is too early to make strong conclusions, but suggests closely

monitoring the market and follow up this assessment at the next biennial report. However, BEREC would like to point out that the implementation of 5G in particular might require new regulatory approaches as well as different charging mechanisms to better suit the peculiarities of M2M and IoT.

BEREC identified some problems with fraud/misuse of roaming and with premium rate services, namely abusive usage of SIM cards for voice and/or SMS roaming communications in the EEA (which cannot be mitigated by the tools foreseen in the Roaming Regulation) and lack of transparency related to value-added services and premium rate services (both at retail and wholesale level). These problems became more important with the introduction of RLAH and cause high losses for operators.

To conclude, BEREC is in general satisfied with the functioning of the Roaming Regulation and the supporting Commission Implementing Regulation (CIR²), however offers proposals for consideration in any review of the legislative provisions. These are:

- An improvement of the situation for MVNOs and resellers, by means of a further reduction of the wholesale caps, as long as it ensures efficient cost recovery by the MNOs (amendment if necessary of glide-path currently in place) and/or by passing the discounts they get for wholesale roaming to the MVNOs taking into account the complexity. These measures could be implemented in combination with other measures.
- Any update of the Roaming Regulation could include specific amendments regarding QoS requirements for the home network operator.
- BEREC also suggests some amendments to the derogation procedure in the CIR to facilitate the assessment for NRAs and operators.
- With regard to the FUP, BEREC identified a few issues to be considered:
 - BEREC considers it necessary to clarify the rules applicable when the formula for calculating a FUP for open data bundles yields a higher roaming allowance than the domestic allowance. For such cases, BEREC recommends the rule to set the roaming allowance to be equal to the domestic allowance.
 - BEREC suggests that further guidance for zero-rated offers and the possibility to apply a FUP on tariff plans including zero-rated options is necessary. However, this issue could be tackled through an update of the BEREC Guidelines.
- BEREC suggests specific measures for the EC to consider that enable operators to tackle the problem of fraud and misuse as well as problems with premium rate services. In particular BEREC suggests:

² Commission Implementing Regulation (EU) 2016/2286 of 15 December 16 laying down detailed rules on the application of a FUP 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.

- making it compulsory to apply the wholesale termination rates to all numbering resources for the conveyance part of the calls
- a European database with VAS/premium number ranges to be made available or disclosed
- to include additional transparency measures to protect consumers as regards value-added/premium rated communications in roaming
- making the registration/identification of subscribers of pre-paid offers available for roaming compulsory. However, before imposing such obligation, the proportionality of this measure needs to be examined as well as national circumstances pertaining especially in countries that have not yet implemented such a measure.

1. Introduction

In its letter from 1 October 2018, the EC asks BEREC for input for the review of the roaming rules until 19 June 2019. This input shall cover the lists of elements that are laid down in Article 19 (3) of the Roaming Regulation as well as serve as an input to amending the CIR.

1.1. Data sources

The analyses in this report are mainly based on the following data sources:

- Joint BEREC and EC survey for NRAs and operators
- International Roaming BEREC Benchmark Data
- BEREC Transparency and Comparability of International Roaming Tariffs

The last two data sources are secondary data sources and were previously analysed in depth in the biannual International Roaming BEREC Benchmark Data Report and the annual BEREC Report on Transparency and Comparability of International Roaming Tariffs. The joint survey launched in Q1 2019 was sent out to NRAs and operators specifically for the purpose of this review and the analysis based on the answers received is not presented in any another BEREC reports.

1.1.1. Surveys for the BEREC Opinion on the functioning of the roaming market

In Q1 2019, BEREC together with the EC launched a survey to obtain information to be used by the Commission in its 2019 review of the roaming rules mandated by the co-legislator and by BEREC for drafting this opinion. Separate surveys were designed for NRAs, MNOs and MVNOs. While some survey questions were the same for MNOs and MVNOs, some questions varied to reflect the differences in their situation on the market.

A total of 210 responses were received from NRAs and operators, namely:

- 30 responses from NRAs,
- 91 responses from MNOs from 30 countries, and
- 89 responses from MVNOs from 28 countries.

The results of these surveys are presented in this report.

1.1.2. International Roaming BEREC Benchmark Data

In order to assess the competitive developments in the Union-wide roaming markets, BEREC regularly collects data from national regulatory authorities on the development of retail and wholesale charges for regulated voice, SMS and data roaming services, including wholesale charges applied for balanced and unbalanced roaming traffic respectively. BEREC also

collects data on the wholesale roaming agreements not subject to the maximum wholesale roaming charges provided for in Articles 7, 9 or 12 and on the implementation of contractual measures at wholesale level aiming to prevent permanent roaming or anomalous or abusive use of wholesale roaming access. BEREC presents the collected data biannually in the International Roaming BEREC Benchmark Data Report.

1.1.3. Transparency and Comparability of International Roaming Tariffs

In its annual report on Transparency and Comparability of International Roaming Tariffs, BEREC aims to provide an overview of the transparency and comparability of retail roaming tariffs. The report is based on data collected from NRAs and operators. In its latest questionnaire to operators, BEREC also collected information on FUPs implemented by European roaming providers in their RLAH tariffs after 15 June 2017.

2. Development of roaming services

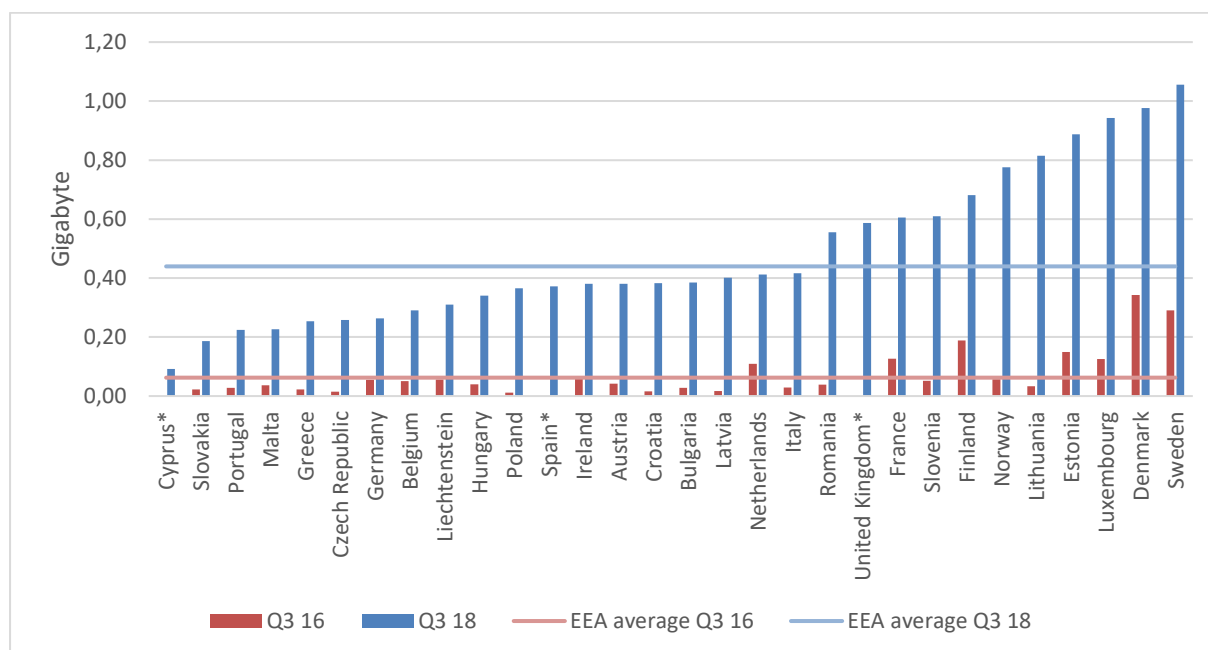
In this chapter, BEREC summarizes the development of roaming services on retail and wholesale level:

- data on the development of roaming volumes on retail level,
- data on the development of roaming volumes on wholesale level, and
- the evolution of retail roaming tariff plans.

2.1. Development of roaming volumes on retail level

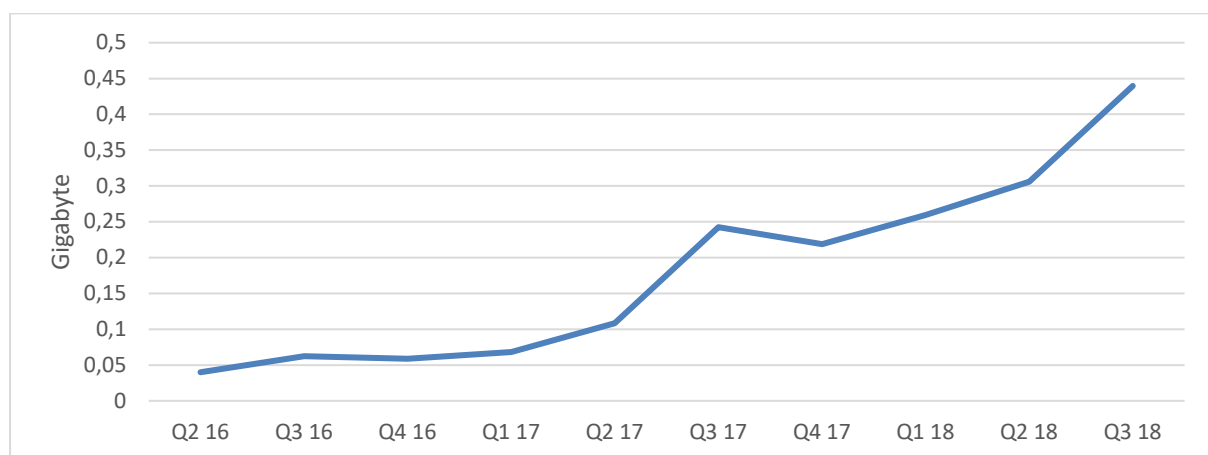
For voice roaming services, the overall trend in consumption has been positive and steadily increasing during the period. For SMS services, the majority of countries experienced a slight decrease or unchanged consumption of SMS services during this period, combined with a few countries with a substantial increase in SMS consumption, which results in the EEA average consumption still increasing. For further information regarding the development on voice and SMS retail roaming services see ANNEX “Analysis of Retail Roaming Developments – Voice and SMS”.

Figure 1 shows the average data consumption Q3 2018 per roaming subscriber per country compared to Q3 2016 as well as EEA averages for the same time period. The EEA average consumption per subscriber has increased from approximately 60 MB to 440 MB. For all countries, the consumption has grown substantially between Q3 2016 and Q3 2018. The highest average consumption per month per roaming subscriber is seen in Sweden, Denmark, Luxembourg and Estonia, with an average consumption 2 to 3 times higher than the EEA average in Q3 2018.

Figure 1: Average consumption per roaming subscriber per month in GB³

The EEA average data consumption per subscriber during Q3 2016 – Q3 2018 is detailed in the figure below. The trend is positive and shows that the EEA average data consumption per roaming subscriber has steadily increased during the period. In addition, the effect of the introduction of RLAH in Q2 2017 is evident, as is the seasonality effect.

Figure 2 EEA average data consumption per roaming subscriber per month in GB



BEREC concludes that the roaming retail market experienced growth in terms of traffic volume for all three roaming services since RLAH was introduced. This growth makes sense considering RLAH enables customers to use roaming like in a domestic situation. The increase in roaming data traffic matches the overall increase in data traffic as now more applications (content streaming etc.) are being offered compared to a couple of years ago.

³ No Q3 2016 data available for countries marked with *.

2.2. Development of volumes on wholesale level

Due to the developments in EEA retail roaming, the overall trend in wholesale roaming voice and SMS volumes is of course positive and increasing. See Annex “Analysis of wholesale roaming services – development – Voice and SMS” for further information.

In Figure 3, volumes of wholesale data roaming services (total traffic) per country in Q3 2018 were compared to Q3 2016. As seen here, wholesale data roaming volumes during this period have increased substantially.

Figure 3 Wholesale data volumes (total traffic) per country⁴

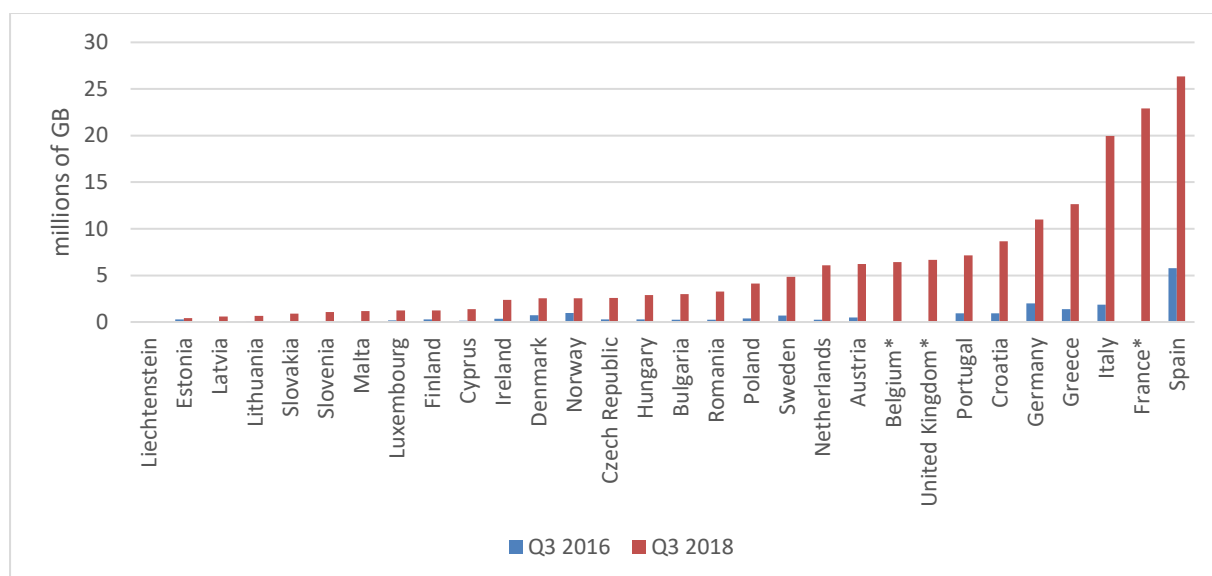
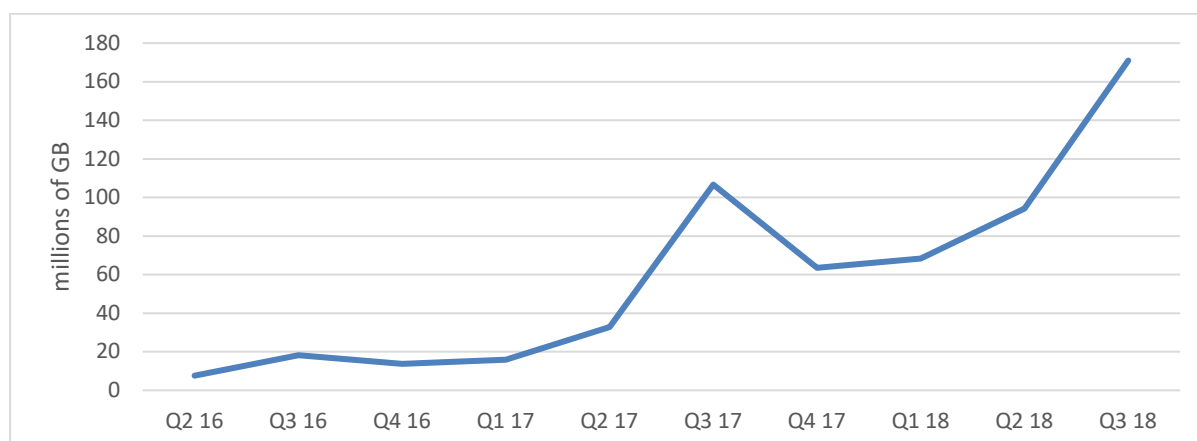


Figure 4 shows the trend over time for EEA wholesale data roaming volumes. The effect of the introduction of RLAH in Q2 2017 is obvious, as is also the seasonality effect due to Q3 being the most prominent summer holiday period each year.

Figure 4 EEA wholesale roaming data volumes



⁴ No Q3 2016 data available for countries marked with *.

To summarize, the data clearly shows that consumption of retail and wholesale roaming services has grown substantially, in particular for data services during the period of Q3 2016 to Q3 2018. This indicates that the overall objective of the RLAH regulation has been a great success and that it has fulfilled its purpose in helping EEA citizens to take advantage of electronic telecommunications and their possibilities while traveling within EEA countries.

2.3. Evolution of retail roaming tariff plans

The implementation of RLAH combined with retail services being offered mainly as bundles poses difficulties in the reporting of the evolution of retail roaming tariff plans. BEREC has collected information from operators regarding the application of default regulated tariffs, pursuant to Articles 6a and 6b of the Roaming Regulation. The results of this survey can be found in the BEREC Transparency and comparability of retail roaming tariffs report from 2018.⁵

In addition to the above-mentioned Report, Figures 14 and 15 of the IR Benchmark Report⁶ conclude that there is no general increase in tariffs without roaming during 2018. However, there are some countries that have a high share of subscribers with domestic only tariffs, for example Romania 45 %, Denmark 25 %, Latvia 18 % and Bulgaria 16 %. This relatively high share of total subscribers with EU/EEA roaming not enabled for Q2 and Q3 2018 is mainly due to operators offering “cheap” alternative subscriptions without roaming included in their offers. Furthermore, Figure 69 of the IR Benchmark Report shows the evolution of the average EEA shares of volumes of different roaming tariffs between Q3 2016 and Q3 2018 compared over time. Since the introduction of RLAH in Q2 2017, the majority of the retail tariffs available consist of RLAH tariffs. The rest (~10 %) are RLAH+ (derogation), RLAH+ (non-compliance from stable links, exceeding FUP and abusive usage) and alternative tariffs.⁷

3. Functioning of the retail market

This chapter seeks to discover the impact of the provisions of the Roaming Regulation on the retail roaming market. The introduction of RLAH may be considered more intrusive than the previous price cap regime and the decoupling measures, as RLAH does in general not allow any surcharges for roaming services. The assessment focuses on the practices of applying any of the FUP set out in the CIR as well as the effectiveness of the FUP applied. Furthermore, taking into account the survey input, suggestions to improving or clarifying the legal provisions in terms of the FUP are included. Moreover, roaming related consumer complaints are analysed. Lastly, this chapter informs about the impact of RLAH on the domestic markets and the rest of the world (RoW).

⁵ For further details see, https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8312-berec-report-on-transparency-and-comparability-of-international-roaming-tariffs

⁶ International Roaming BEREC Benchmark Data Report April 2018 - September 2018, BoR (19) 21.

⁷ International Roaming BEREC Benchmark Data Report April 2018 - September 2018, BoR (19) 21.

3.1. Fair Use Policy

This chapter sets out how operators employ the rules for applying a FUP. A FUP allows operators to limit the application of RLAH where the operator believes customers may abuse RLAH by using it on a permanent basis. Article 6b of the Roaming Regulation enables operators to apply a FUP for RLAH. The detailed conditions for applying a FUP on domestic tariff plans are laid down in Article 4 of the CIR and contain mainly four possibilities for operators:

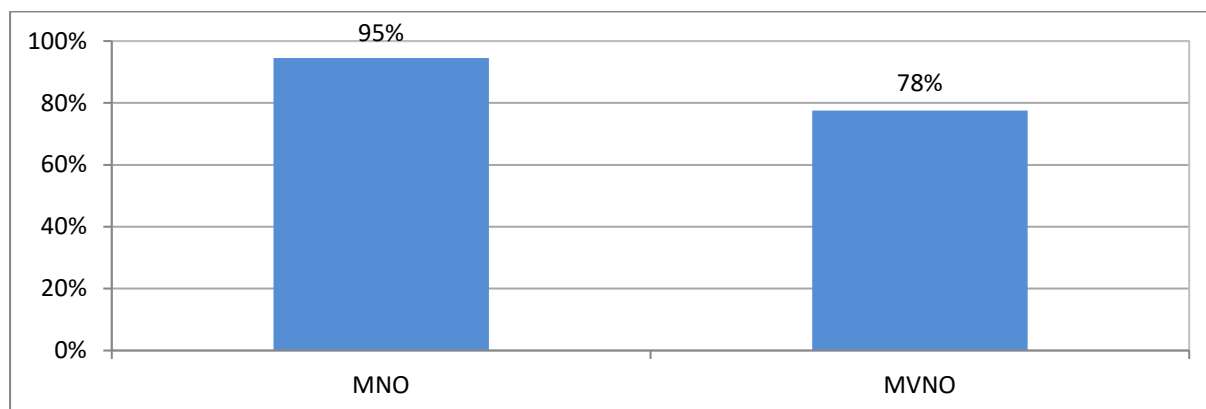
- Stable links/proof of residence
- Control mechanism / objective indicators
- Open data bundles
- Limiting pre-paid offers

BEREC is interested to learn whether and how many operators generally implemented a FUP and which FUP was the most common. The survey also included a request to rate the effectiveness of each FUP that is being applied by the operators as well as whether operators limited or ceased the application of a FUP and the reasons for doing so.

3.1.1. Application of a FUP

The survey reveals that the vast majority of the operators apply a FUP: 95 % of the MNOs and 78 % of the MVNOs responding to the survey (see figure 5).⁸

Figure 5 Operators implementing FUP⁹



The operators largely notified their FUP to the NRA (91 % MNOs and 86 % of the MVNOs¹⁰) and most of them also implemented a simple and transparent procedure for their customers to address complaints. However, 6 MNOs and 3 MVNOs report not to have provided their customers with such a mechanism to receive complaints.

⁸ The figure is not derived from the responses received from the general question whether operators apply a FUP, but based on the responses received from the separate questions about which type of FUP was applied.

⁹ Survey results are presented in percent. Sums may deviate from 100 % due to rounding effects.

¹⁰ 7 MNOs and 23 MVNOs did not respond to the question as to whether they notified the FUP; percentage is based on total number of responding operators.

3.1.1.1. Stable links and /or proof of residence

With regard to the possibility for applying the stable links/proof of residence criteria, the majority of MVNOs do not request proof of residence or stable links (56 % of the MVNOs) and less than half of MNOs (nearly 48 %) do not request a proof of residence or stable links from their customers. Most of these operators do not distinguish by tariff plan, which means that every roaming offer is subject to the stable link FUP. Only a very little number of operators request proof of residence or stable links for certain tariffs (21 % of MNOs and 25 % of MNVOs).

3.1.1.2. Control mechanism / objective indicators

The aforementioned pattern is similar for the implementation of the control mechanism with 43 % of MNOs and 33 % of MVNOs¹¹ implementing it. Operators consider the control mechanism to be too complex to implement, and very few consider it too costly or unnecessary. The operators that make use of the observation window do so for the minimum period of four months. They mostly started already in 2017, except for 12 MNOs that began effectively using the control mechanism in 2018. The mechanism is used for all three services (voice, SMS and data). Only four MVNOs apply the control mechanism only for data roaming and one MVNO for voice and data roaming, whereas 7 MNOs observe data roaming, 3 MNOs voice and data and only one MNO voice and SMS.

Concerning the alerts which roaming operators must send should they detect abusive or anomalous usage and before levying surcharges, nearly all operators apply the minimum two weeks alert period set out in the CIR and 65 % actually have sent an alert. However, not all of those alerted customers were surcharged based on the control mechanism, i.e. 2 MVNOs and 10 MNOs did not levy surcharges after having alerted their customers, whereas, 1 MVNO applied a surcharge without having alerted its customers. Still 27 MNOs applied surcharges.

According to the data provided, only a small percentage of active subscribers received an alert and even fewer were eventually surcharged (MNOs surcharged approximately 1,440,000 and MVNOs approximately 20,300 active subscribers). Concerning the country of origin of the alerted subscribers, the majority of the alerted subscribers from MNOs are from Romania, Poland and Greece. The picture is slightly different for MVNO subscribers, where the majority of the alerted subscribers are from the UK, Romania and Austria.

3.1.1.3. Open data bundles

Operators may also limit the roaming data volumes of certain tariff plans which qualify as open data bundles. The survey shows that the majority offer open data bundles according to the definition set out in the CIR and 78 % of the MNOs and 46 % of the MVNOs apply a limit on them. 58 % of those MNOs apply a FUP on all open data bundles and 42% of those MNOs on some open data bundles. In many cases the applied limits do not exceed the limit set out in the CIR (39 % MNOs and 50 % MVNOs). The reason why some MNOs and MVNOs do not

¹¹ The calculation is based on the number of operators that implemented a FUP;

apply a FUP on their open data bundle tariff plans, is that the minimum roaming allowance nearly equals the domestic allowance.

The following reasons for applying fair-use data limits on open data bundles were provided by the operators: MNOs mainly refer to increased data costs, competition and perpetuating domestic tariff plans with high data volumes. Other reasons were to limit domestic data tariffs with high volumes, lower retail prices compared to the wholesale prices, network congestions or avoiding risks of misuse. MVNOs were for instance considering the underlying wholesale costs of the bundles, the amount of included data in GB, marketing decisions, prices and special purposes or rounding to the nearest available bundle from the host MNO. As to the question when operators started to apply fair-use limits for open data bundles, most of them did in 2017 (87 % of MNOs and 85 % of MVNOs).

As regards zero-rated tariff plans, 91 % of the MVNOs do not offer such tariff plans, making it in total 7 MVNOs that offer zero-rated plans. 5 of them have a FUP limit in place, 3 of them in 2017, the other 2 MVNOs in 2019. On the other hand, 24 MNOs offer zero-rated tariff plans (34 %). The remaining 47 MNOs which have implemented an open data bundle FUP do not offer zero rated plans. Of those 24 MNOs, 3 MNOs with zero rated offers have not implemented a FUP on the zero rated plans. This may mean either that zero-rated offers are not restricted at all when roaming or that offers are available for domestic use only. In two cases the usage of the zero-rated option is restricted to the domestic use while the basic tariff plan is available in according to the RLAH principle.¹² The other 21 respondents report to having also implemented an open data bundle FUP on zero-rated tariff plans. 16 of 21 MNOs have already implemented such a FUP since 2017 and 5 of 21 have done so in 2018.

3.1.1.4. Limiting pre-paid plans

With a view to a FUP on pre-paid tariff plans, the share of MNOs (nearly 29 %) that do not offer such tariffs is lower than the share of MVNOs (70 %). In total 65 MNOs offer pre-paid tariff plans according to the CIR, of which 21 MNOs limit the data consumption via a FUP. The majority of the MVNOs on the other hand do not consider it necessary to apply a FUP data limit. Those that do so, have mostly started in 2017 (7 MVNOs), and only 2 MVNOs in 2018. More MNOs (in total 17) implemented a FUP on pre-paid plans in 2017, 3 MNOs in 2018 and 1 MNO in 2019.

3.1.1.5. Other objective indicators

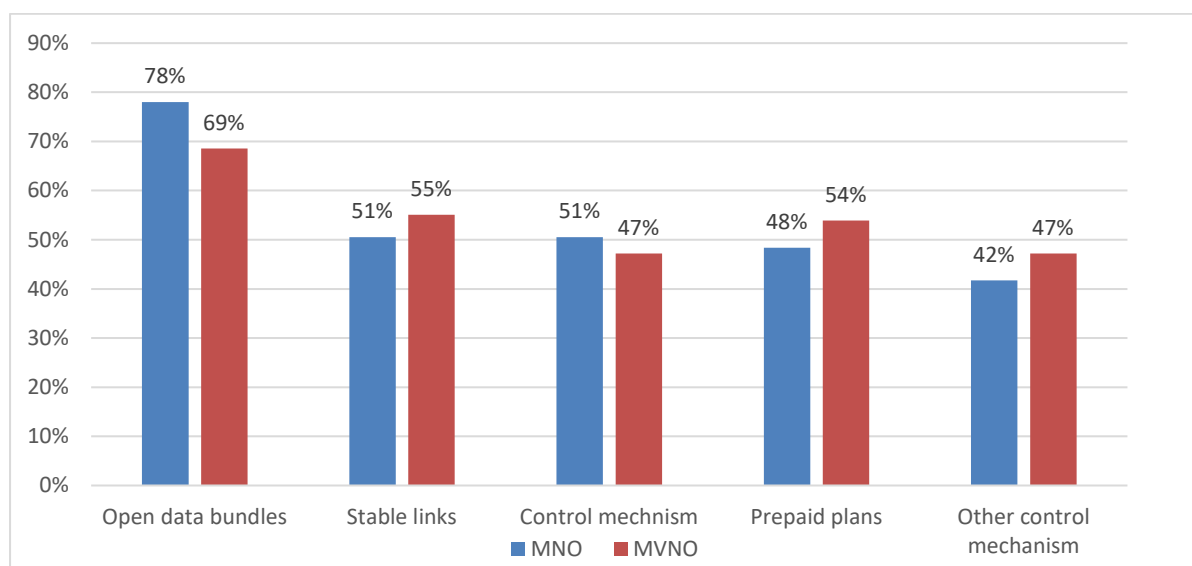
As to the question whether operators implemented other control mechanism linked to the other objective indicators such as long inactivity or subscription and sequential use of multiple SIM cards, the large majority did not implement these other objective indicators (88% MNOs and 93 % MVNOs). Only 11 MNOs and 6 MVNOs use the other objective indicators, where 10 MNOs and 4 MVNOs apply them in general terms and one MNO and 2 MVNOs put them on certain tariffs only.

¹² Pending case in DE; see also chapter 3.3.3 compliance with the rules

3.1.2. The effectiveness of the FUP

Operators were requested to provide their ratings on the effectiveness of any FUP that they apply. The following figure gives an overview about the ratings. The survey reveals that operators consider limiting open data bundles to be the most effective FUP, followed by, the stable links/ proof of residence criteria, the control mechanism, limiting pre-paid plans and the other control mechanism. Slightly more than one third of the operators consider open data bundles, the stable links and the control mechanism to be partially effective, whereas only a small share of operators thinks limiting open data bundles to be ineffective. Interestingly, a large part of the operators believe the control mechanism to be ineffective, followed by the stable links. There are also quite a large number of operators that rate the other objective indicators to be ineffective as well as pre-paid plans limit. Almost one third of the operators believe the other objective indicators to be unnecessary and almost one quarter think pre-paid plans limits are unnecessary.

Figure 6: Assessment by MNOs and MVNOs of the effectiveness of types of FUP – percentage of operators that rate type of FUP as effective or partially effective



As to the further remarks about the effectiveness of any FUP, generally the assessment criteria for the FUP are reported to be difficult to implement due to its complexity. MNOs consider the control mechanism to be unfeasible, the measures to be insufficient and hard to communicate to their customers. Both MNOs and MVNOs are also criticizing the length of the observation period and the alert period where damage is allowed during that period. Some suggested to shortening the window to detect anomalous roaming usage and operators also wish to immediately surcharging customers that misuse roaming services, for instance in a one or two month period. To this end, operators suggested to amend the prevailing consumption and presence criteria in such a way that only one criterion would be necessary to initiate the alerts and the applications of surcharges. Some operators prefer to have consumption as the preferred relevant objective indicator. MNOs also wish to be able to apply surcharges for the whole period in which an abuse was determined, and that in case evidence of the abuse is available for all three roaming services, a surcharge should be applicable regardless of which roaming service was misused.

As to the any remarks about the stable links/ proof of residence criteria, MNOs criticize the heavy documentation to be provided and they wish more guidance from NRAs as they consider the provisions to be too generic. A small number of MNOs report that verifying proof of residence is difficult after signing a contract, because residence may change afterwards. In addition, stable links are difficult to prove with pay-as-you-go (pre-paid) plans in case customers are not required to sign up to those tariff plans.

Furthermore, some MVNOs claim the FUP to be ineffective for preventing fraudulent use also for pre-paid plans, while MVNOs believe it is not possible for post-pay customers to engage in fraudulent conduct such as permanent roaming if the necessary arrangements are made. A small number of MNOs consider it nearly impossible to limit the data volumes of pre-paid plans due to the need for real-time information. In addition, FUP for pre-paid plans are reported to be inapplicable when customers have a monthly allowance and monthly payment plans, and in such a case a fair-use limit could only be calculated based on open data bundles.

As to any other mechanism that operators may have considered implementing to prevent anomalous roaming usage, the vast majority (90 % MNOs and 82 % MNOs) did not give this a thought. One MNO is considering several options not further specified but did not apply them yet, while another MNO implemented an offline margin analysis not further specified. Some MNOs set domestic fair-use limits. One MVNO implemented a FUP based on a daily allowance and daily surcharging. Another MVNO reported monitoring traffic consumption on a monthly basis. Another one is analysing the average consumption via CDRs and limited calls with the same destination and different origins within a short period.

Lastly, the survey seeks to learn whether an implemented FUP was withdrawn by the operators. More than 15 % of the MVNOs but only 3 % of the MNOs are reported to have withdrawn a FUP. The main reason for MNVOs to withdraw was that the potential surcharges to be levied were considered too low. The other reasons relate to the FUP being only included in the terms and conditions but not applied in practice or only offered for pre-paid services. Furthermore, MNOs and MVNOs renounced their FUP due to the complexity. Operators also report the absence of abusive or anomalous usage as a reason for withdrawing a FUP.

3.1.3. Improvements or clarifications concerning FUP

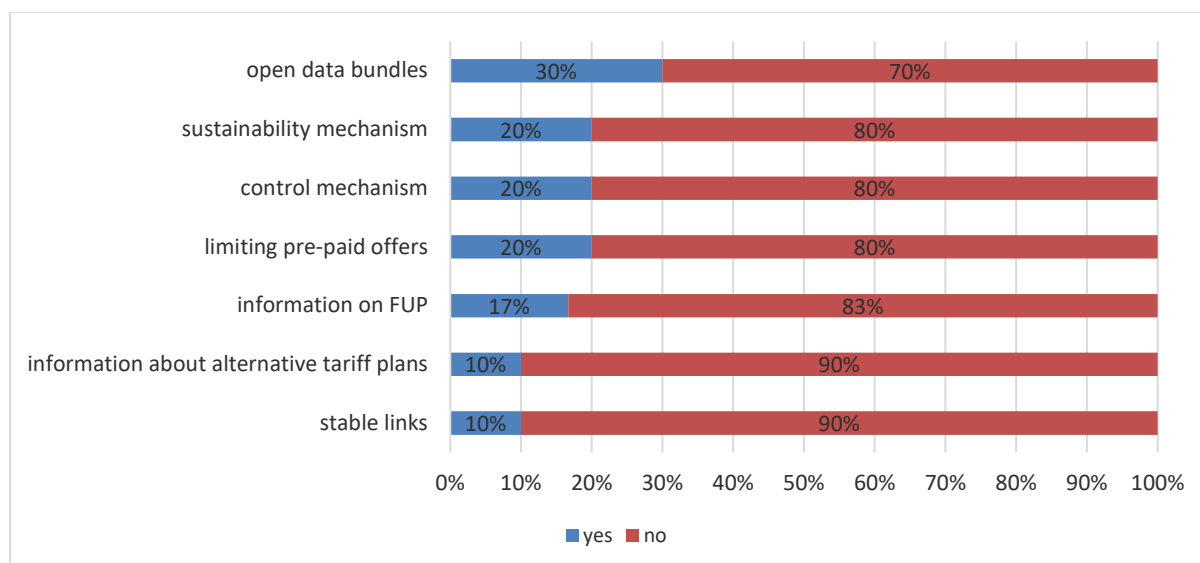
The survey further enquired whether stakeholders and NRAs see the need to clarify or improve the legal provisions in terms of the FUP (stable links, open data bundles, limiting the roaming data volume for pre-paid and control mechanism) and transparency (informing customers about FUP applied and about alternative tariffs).

3.1.3.1. Improvements or clarifications suggested by NRAs

The NRAs were mostly of the opinion that the legal provisions do not require any amendments concerning the aforementioned criteria for applying a FUP. An overwhelming majority also considered no changes to the transparency provisions to be necessary. Some NRAs that consider changes necessary put down several suggestions that were mostly already debated

in previous BEREC discussions during the negotiations of the CIR and the drafting of the BEREC Retail Guidelines.¹³

Figure 7: NRAs need for further improvements or clarifications



In general, regarding any FUP, some NRAs suggested to simplify the rule as it was difficult to use in practice and facilitate the calculation of the fair use limit. One NRA reported massive abusive usage of SIM cards to substitute roaming for intra-EU services. Another NRA considered abolishing the roaming data volume for pre-paid tariff plans as pre-paid tariff plans are per se limiting the allowance, and also suggests removing fair use limits for open data bundles. In addition, it is supported that the definition of stable link does not include specific circumstances such as unemployment where customers may receive financial support. NRAs also recommend to clarify Article 4 of the CIR to prevent the roaming allowance to be higher than the domestic allowance when using the open data bundle formula. In such a case, the provisions should make clear that the roaming allowance should equal the domestic allowance. More guidance is requested on how to assess open data bundles when those are incorporated in zero-rated tariff plans as well as when open data bundles are charged on a weekly basis. Generally, some NRAs expressed their discontent about the lack of rules for assessing zero-rated offers and how to calculate a fair use limit. One NRA also suggests clarifying the provisions with regard to the other objective indicators (long inactivity of SIM cards and subscription and sequential use of multiple SIM) which NRAs may include to identify the risk of abusive or anomalous use of roaming services. The rules about the observation window could also be improved to make clear that it would not actually require operators to restart the observation window once the customer accused of abusive usage logs into the home network for a day (so-called “rolling observation window”).

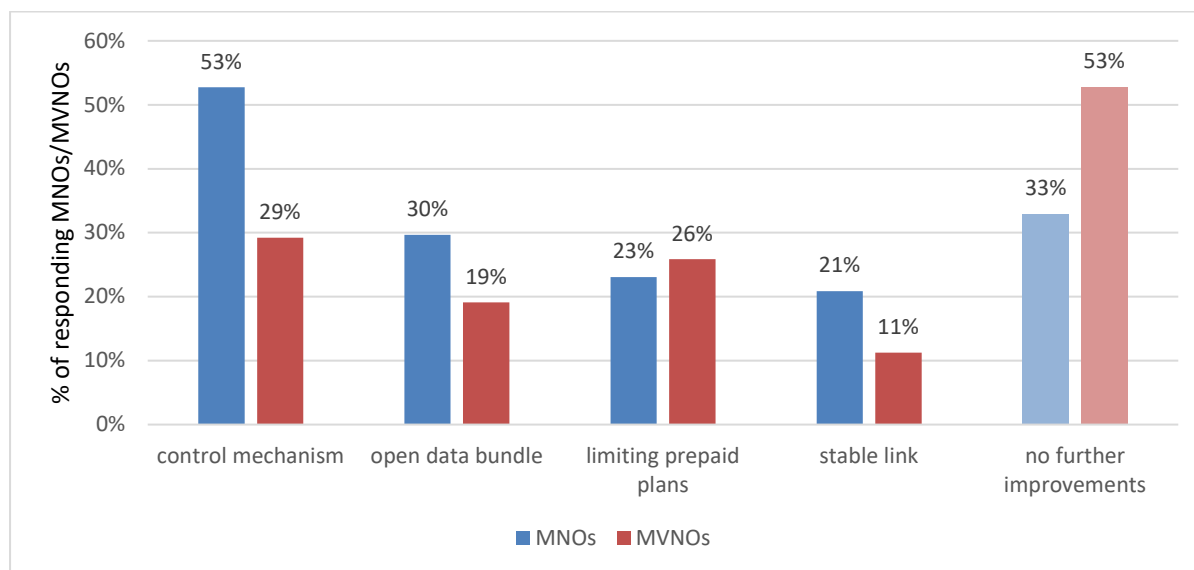
¹³ See: https://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/-guidelines/7005-berec-guidelines-on-regulation-eu-no-5312012-as-amended-by-regulation-eu-no-21202015-excluding-articles-3-4-and-5-on-wholesale-access-and-separate-sale-of-services

The transparency provisions are considered by a number of NRAs to be difficult to comprehend for consumers and it was proposed FUPs to be made more transparent for consumers.

3.1.3.2. Improvements or clarifications suggested by operators

Operators were also invited to offer ideas on improving or clarifying the legal provisions. Figure 8 presents the results.

Figure 8: Improvements and clarifications identified by operators



As the figure shows, 53 % of MNOs and 29 % of MVNOs identified improvements and/or clarification with regard to the control mechanism as necessary: According to mainly MNOs, the observation period in particular has to be shortened (e.g. 1 or 2 month) as well as the associated alert period (2 MNOs). From the point of view of some MNOs it is not mandatory to observe both the presence and the consumption indicator. As an alternative, some suggest that only one indicator should be determined as prevailing to determine anomalous or abusive roaming usage. With a view to surcharging within the control mechanism, it was mentioned that in case a misuse had been detected, immediate surcharging should be possible. It should be possible to apply surcharging to all roaming services, even in cases where only one service was misused. Lastly, it is proposed that surcharges should be retrospectively applicable to the whole period in which the misuse was determined.

With regard to the open data bundle FUP, 30 % of the MNOs and 19 % of MVNOs see room for further improvements. According to some operators, the multiplier of 2 should be deleted from the calculation formula, mainly because, in most cases, this leads to a total wholesale cost for the operator greater than the value paid by the customer. In addition, they consider that in general the formula seems to be complex and difficult to communicate to customers. Furthermore, it was stated that there is a need to include voice and SMS in the open data bundle FUP. One operator suggested the introduction of FUP based on the number of usage days.

Around 23 % of MNOs and 26 % of MVNOs identified clarifications and improvements as necessary with view to limiting the data volumes of pre-paid tariff plans. The main argument raised is that limiting pre-paid plans is too complex from a technical as well as from the customers' perspective. Furthermore, according to 21 % of MNOs and 11 % of MVNOs, the stable link concept has to be revised especially due to its complexity.

24 MNOs made suggestions with regard to identifying any uncertainties or need for clarifications within the wording of the CIR. Operators recommended changing the provisions of the CIR to a more understandable text for roaming providers and especially for roaming customers, as the FUP is quite difficult to communicate to the management, customers and agents. In addition, there seems to be the need for clearer and new definitions such as for alternative tariffs, open data bundles and the application of a FUP on zero-rated offers. On the other hand, most MVNOs (75 %) did not identify any problems in the wording of the EC implementing act concerning the FUP.

The survey also reveals that a majority of operators (53 % of MVNOs and 33 % of MNOs) do not see any need to amend the rules with regard to providing customers with more information concerning the FUP applied or about alternative tariffs. Only 11 MVNOs consider it necessary to amend the legal provisions about informing customers about alternative tariffs. To this end, some MVNOs suggest to clarify the role of alternative tariffs so as to increase their availability. An even smaller number of 8 MVNOs recommend improvements about the way customers are informed about the FUP applied. In this regard, MVNOs suggest simplifying the mechanism as well as simplifying the FUP criteria to facilitate the analysis of traffic data, the alert SMS based on CDR and billing. MVNOs also complain about the level of the wholesale roaming charges (see Chapter 6.4), which are considered too high and the surcharges imposed make offers more complex. One MVNO reports to having reduced data bundles due to the level of wholesale roaming charges. Other MVNOs recommend simplifying the control mechanism so as for instance to prevent customers circumventing the observation window by purchasing new SIM cards when being accused of fraudulent roaming usage. One MVNO recommends amending the prevailing consumption and presence criteria so as to apply only one criterion instead of cumulatively having to observe them. Another MVNO suggests to regulate only consumption based tariff plans and not regulate bundles.

When it comes to the wording of the CIR concerning the FUP, most MVNOs (75 %) have not identified any problems there. Suggestions for improving the wording relate to widening the definition of pre-paid tariff plans, including examples that are easy to understand as the FUP is quite difficult to communicate to the management, customers and agents, simplifying the wording in general, using industry standards for defining the relevant terms and clarifying the definition of open data bundle.

3.2. Consumer complaints and compliance

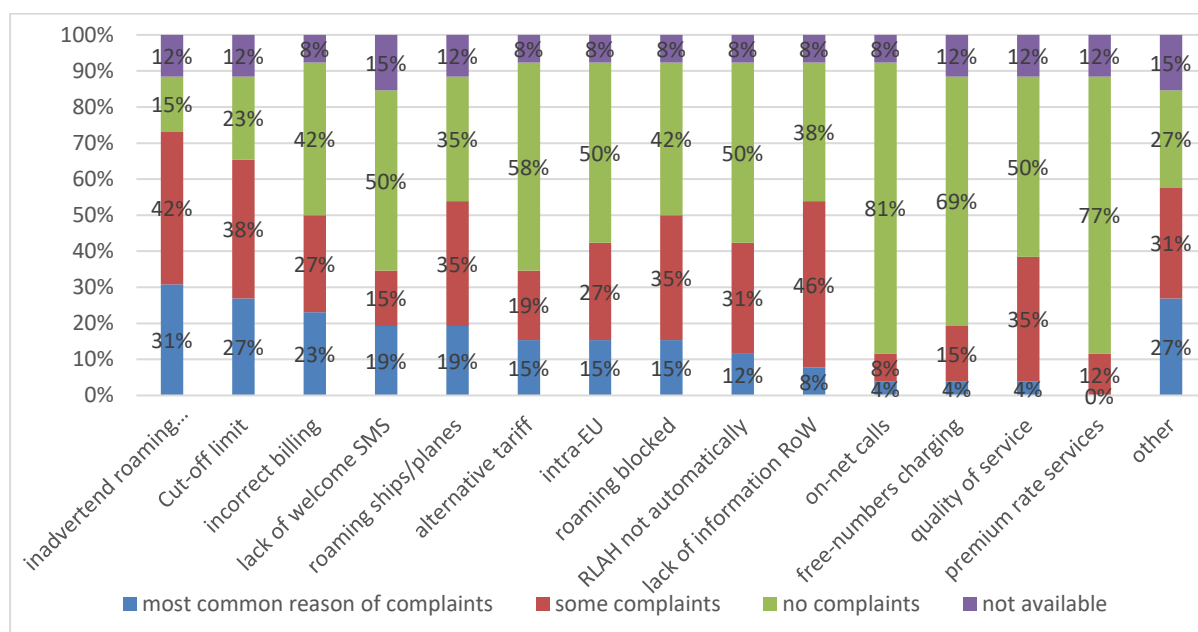
BEREC also considers consumer complaints to be an essential indicator of the functioning of the roaming markets and the legal provisions. The number of consumer complaints does reveal whether consumers face any obstacles when using the retail roaming services, such as receiving poor information about the tariffs in place or the possibility to swap between tariffs etc. Consumers may also be misinformed about the FUP applicable to them, which their

roaming operator may have implemented without having informed them properly. The legal provisions specifically require the roaming providers to put in place transparent, simple and efficient procedures to address complaints related to the application of a FUP. To this end, BEREC enquired whether NRAs have initiated any legal steps against operators in breach of the legal provisions.

3.2.1. Consumer complaints received by NRAs

The survey showed that in 2018, out of 30 NRAs, 26 received a fairly low number of complaints given the total amount of subscribers in the EEA (4028 complaints compared to approximately 504,716,668 active subscribers reported by the NRAs as of June 2018; 0.001 %). The number of complaints was mostly equal to the previous year or even less. Only a few NRAs received more complaints in 2018 than in 2017. However, in one case the number of complaints decreased compared to 2017, but was overall higher than in the previous years.

Figure 9: Reasons of complaints received by NRAs



As to the particular type of complaints listed in the survey (see Figure 10), the main complaints relate to the improper activation of the cut-off data limit, the incorrect billing of roaming volumes, inadvertent roaming in neighbouring non-EU/EEA countries (highest amount) and other issues. Regarding the other types of complaints, NRAs received complaints about the billing of Wi-Fi calls, incorrect information provided about the cost of roaming outside the EU/EEA, deduction of data usage although data roaming was switched off, miscalculation of the FUP, no warning message beyond the FUP, misleading welcome SMS about the cut-off limit when roaming outside the EU/EEA etc.

In addition to some of the aforementioned complaints, a lower number of complaints received by the NRAs refer to the improper information about roaming charges outside the EU/EEA, insufficient quality of roaming services, blocking of roaming services, roaming on ships/planes and no automatic application of the RLAH tariff.

3.2.2. Consumer complaints received by Roaming Providers

In this subchapter, BEREK discusses the number of complaints MNOs and MVNOs have received from their customers about the different FUP options (stable links, the control mechanism, limiting open data bundles, limiting the consumption of data roaming services in case of pre-paid offers and the control mechanism). As requested by the CIR, consumers should have access to transparent, simple and efficient procedures to address complaints, provided by roaming providers. Therefore, roaming providers were requested to provide the number and type of complaints they received due to the implementation of a FUP. In general, according to respondents who almost all implemented procedures, it was hardly possible to assign customer complaints to each FUP. Based on the available data, it can be derived that MNOs received approximately 9,000 complaints and MVNOs about 1,220. In comparison with the number of active subscribers from responding operators this number seems to be rather negligible.

In general, more than half of all MNOs report not to have received any complaints. 6 MNOs and 17 MVNOs provided numbers on complaints related to stable links, 17 MNOs and 1 MVNO reported that they received complaints about the control mechanism. 10 MNOs and 14 MVNOs replied that they received few complaints about open data bundle FUP while 5 MNOs and 2 MVNOs received complaints about the limiting of pre-paid plans. Only a few number of operators (4 MNOs and 1 MVNO) stated that they received complaints regarding other objective indicators.

3.2.3. Compliance with the rules

The Roaming Regulation requires the NRAs to make sure that the roaming operators comply with the legal provisions. For this reason, legal action is necessary should NRAs receive notice of any breach. The survey reveals that half of the NRAs have initiated formal proceedings against roaming operators. The proceedings in total add up to 94, of which 42 proceedings originate from one NRA only.¹⁴ The number of proceedings for other NRAs amounts to between 1 and 9.

Most of the proceedings refer to the application of different charging mechanisms for roaming services than for domestic services and higher prices for roaming services compared to domestic services. Some roaming operators did not include roaming by default, thus making customers activate roaming, for which they were charged different prices. In other cases the price for data roaming exceeding the bundle limit was higher than the domestic price for data. Some operators applied surcharges for roaming services (some only for pre-paid, others for both pre-paid and post-paid tariff plans), which in some cases were disguised, e.g. by forcing the end users to purchase expensive tariffs when they wanted to use roaming or offering tariff plans without roaming that were blatantly less expensive than the one with roaming. Some

¹⁴ According to the national legislation of this NRA, when an administrative violation is established, the penal body shall issue penal provisions which shall impose on the offender a respective administrative penalty. 42 is the total number of the penal provisions issued during the period 15.06.2017 – 18.03.2019 for violations of the Roaming Regulation. The types of violations are 10 (some of the violations repeat).

operators blocked roaming services for pre-paid subscriptions unless additional volumes were purchased.

NRA also investigated a number of cases of incorrect treatment of zero-rated services when roaming abroad. In those cases, data roaming volumes were deducted from the domestic allowance when the customer was roaming abroad. Another case concerned the unlawful use of traffic management practices, such as intentionally slowing down specific traffic when customers were roaming, or restricting tethering.

A lower number of proceedings referred to cases where roaming operators restricted a specific volume of services for domestic usage. Other cases relate to the operators failing to inform the customer about roaming surcharges or failing to notify the application of a FUP.

Furthermore, a relatively high number of proceedings pertained to other reasons than the common reasons pre-set in the questionnaire, to which the aforementioned 42 cases of one NRA belonged. The NRA reported that 34 cases were filed in the first 12 months after RLAH was introduced and observed a considerable reduction of cases (in total 8) in the course of late 2018 until now. Some of those cases concerned the failure of the operator to inform the customer about restrictions to roaming usage in the contract sheet. Operators also failed to notify their customers about the application of a FUP or its specific restrictions. In other cases, the operator did not provide the basic personalised tariff information or did not notify the customer that the financial limit was reached. In some cases, the operator applied an alternative tariff as default tariff. The cases were opened against MNOs, MVNOs, light MVNOs and resellers. In fact, the survey shows that the majority of the cases target MVNOs (29) rather than MNOs (21).¹⁵

3.3. Impact on prices for Rest of World

The introduction of RLAH may also have an impact on the retail prices for roaming services outside the EU/EEA. BEREC used its International Roaming BEREC Benchmark Data Reports from 2016 until 2018 to assess the impact of RLAH on the prices for roaming outside the EU/EEA, thus covering the transition period before the introduction of RLAH on 15 June 2017 and from then on up to December 2018 and analysed the average retail price per minute for calls made/received outside the EU/EEA and the average retail price for data consumption outside the EU/EEA.

The average retail prices for calls made/received outside the EU/EEA increased slightly before RLAH, slightly decreased when RLAH was introduced and increased again to approximately the same level as at the beginning of the transition period. The pattern is similar for the average retail prices for data roaming outside the EU/EEA. Those prices decreased substantially at the end of the transition period, but were on the rise in the course of 2018, partly above the price level of 2016. It seems that we cannot observe a clear correlation of those price movements and the introduction of RLAH.

¹⁵ Please note that these numbers do not include the aforementioned 42 cases.

BEREC is also interested whether operators are applying a FUP for roaming inRoW. BEREC observed that 15 MNOs are also applying FUP to some of the RoW tariff plans/countries (it can be assumed that RoW tariff plans do not include all other third states). The types of FUPs mentioned are stable link concept (1 MNO), the control mechanism (4 MNOs) and open data bundle FUP (7 MNOs). 3 MNOs did not specify which type of FUP they apply to their RoW tariff plans. 10 MNOs implemented a single FUP including both the EEA and RoW. 3 other MNOs implemented a separate FUP for travelling the Union and RoW and 2 further MNOs stated that they apply another FUP. The MVNOs did not apply a FUP for the non-EU/EEA except for one MVNO. This employed the stable links, open data bundles and control mechanism and is also limiting roaming for pre-paid tariff plans. However, it is not clear if one FUP was applied for the EU/EEA and non-EU/EEA, or if two separate FUPs were applied.

3.4. Impact on the domestic markets

The introduction of the RLAH provisions may likewise have an impact on the domestic markets. Just like in the previous chapter, the International Roaming BEREC Benchmark Data Reports from 2016 until 2018 provide a helpful source to see whether changes in the domestic prices occurred with the introduction of RLAH.

During the transition period from 30 April 2016 until 14 June 2017, overall there are no significant changes observed for the average number of minutes of domestic calls made/received except for a few countries, where the number of calls made decreased or doubled. The average number of domestic SMS (pre-paid and post-paid) remained fairly stable. In addition, the average consumption of domestic data services exhibits a significant change. The EEA average domestic data consumption per subscriber has been more than doubled between Q3 2016 and Q3 2018. During the same period, the ARRPU remained de facto stable. It increased significantly only in one country in Q4 2016.¹⁶

Taking into account the above, the introduction of RLAH on June 15 2017 does not entail major changes to the consumption pattern of the average number of minutes of domestic calls made/ received, the average number of SMS and the average consumption of domestic data services. The consumption pattern remained similar after RLAH was introduced. The ARRPU remained overall stable in the shift from the transition period to the introduction of RLAH and beyond. BEREC observed some increases as well as some decreases in a very few countries, but those changes cannot be considered significant.

As one key question regarding the impact on the domestic market relates to the availability of domestic offers and any changes to the structure of domestic offers after the introduction of RLAH, it is important to understand whether the operators are still sticking to their retail domestic tariff portfolio. The survey clearly reveals that RLAH is considered to have almost no impact on the availability of the domestic offers and BEREC concludes that no significant

¹⁶ BEREC already notes in its Benchmark Data Reports that the ARRPU varies considerably between countries, which is likely to be attributed to the diverging data collection methodologies used by the operators. With regard to the shortcomings of using ARRPU, we would like to refer to the remarks in the BEREC Benchmark Report, see https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8468-international-roaming-berec-benchmark-data-report-april-2018-september-2018

changes occurred to the overall structure of the domestic tariffs. Only 14 MNOs out of 91 and 7 MVNOs out of 89 report to have ceased offering certain domestic tariff plans. So, in most cases the overall structure of the domestic offers has not changed with the introduction of RLAH.¹⁷ Changes to domestic tariff plans for instance relate to replacing certain domestic tariff plans with new and slightly more expensive tariff plans. A few operators introduced domestic only tariff plans or continue offering existing domestic tariff plans in light of RLAH, but making those eligible for roaming. Other operators are now offering new pre-paid tariff plans or requiring their customers to purchase an account for using international roaming services. Domestic tariffs that were removed from the market relate to data-only tariffs, certain pre-paid plans, legacy tariffs with unitary roaming prices or tariff plans with high SMS volumes. The main reasons for ceasing those domestic tariff plans were that those tariffs may not be sustainable under RLAH and that the pricing seemed to be complicated.

The occurrence of permanent roaming may also have an impact on the domestic market, which may generate additional costs and may shift revenues from the domestic services to international roaming services. The survey shows that permanent roaming does not seem to be of much concern, although more than two thirds of the MNOs detected permanent roaming, but most MVNOs (78%) did not. Most of the operators that detected permanent roaming actually applied a FUP and the customers of a small number of operators (6 MVNOs) were permanently roaming despite a surcharge. In terms of customers approx. 1 % of all active subscribers from MNOs (approximately 5,300,000) and nearly 0.85 % from MVNOs (approximately 450,000 active subscribers) have used roaming services on a permanent basis. Cases of misuse, where for instance SIM cards are subject to organised resale as opposed to the aforementioned cases of permanent roaming, are described in chapter 6.5.

3.5. Conclusion

The survey shows that operators generally comply with the legal provisions when applying a FUP. However, taking into account the input provided, BEREC sees the need to clarify some rules that relate to the application of a FUP, because the provisions are quite complex to handle when it comes to assessing a FUP notified by operators. BEREC considers that EC could clarify the rules applicable when the formula for calculating a FUP for open data bundles yields a higher roaming allowance than the domestic allowance. For such cases, BEREC recommends the rule to set the roaming allowance to be equal to the domestic allowance.

BEREC can observe an increasing number of zero-rated offers in the mobile market. As shown in practice since the start of RLAH there have been already proceedings against zero-rated offers in some Member States, Although there may still be some uncertainties and final decisions were not made by courts it can be assumed that the existing provisions in the Roaming Regulation give the NRAs tools at hand for the supervision and the enforcement of the provisions with regard to the treatment of zero-rated offers in case of roaming. In view of any uncertainties which may still exist BEREC therefore proposes to revise its Guidelines to facilitate and to have a common approach on the assessment of zero-rated tariffs within the

¹⁷ Please note that 3 MVNOs did not respond, so that the total number of responses used to calculate the percentage rate was reduced from 89 to 86 MVNOs.

EU. The revision of the BEREC Guidelines would have also the advantage to react faster with view to new, amended zero-rated tariff plans.

The BEREC analysis shows that the introduction of RLAH had no major impact on prices or consumption patterns for both domestic and RoW services. Furthermore, there is currently no indication that RLAH has any serious impact on the availability of domestic offers, which is further corroborated by the evidence available to BEREC that the overall domestic tariff structure remains in most cases unchanged. However, BEREC notes that there are some changes to domestic tariff plans (some of which were observed before RLAH was introduced, anticipating the changes that would occur) and a high share of subscribers with domestic-only tariffs was reported by some countries. This is mainly due to operators offering cheap tariff plans without the possibility to roam.

4. Impact of RLAH on quality of service

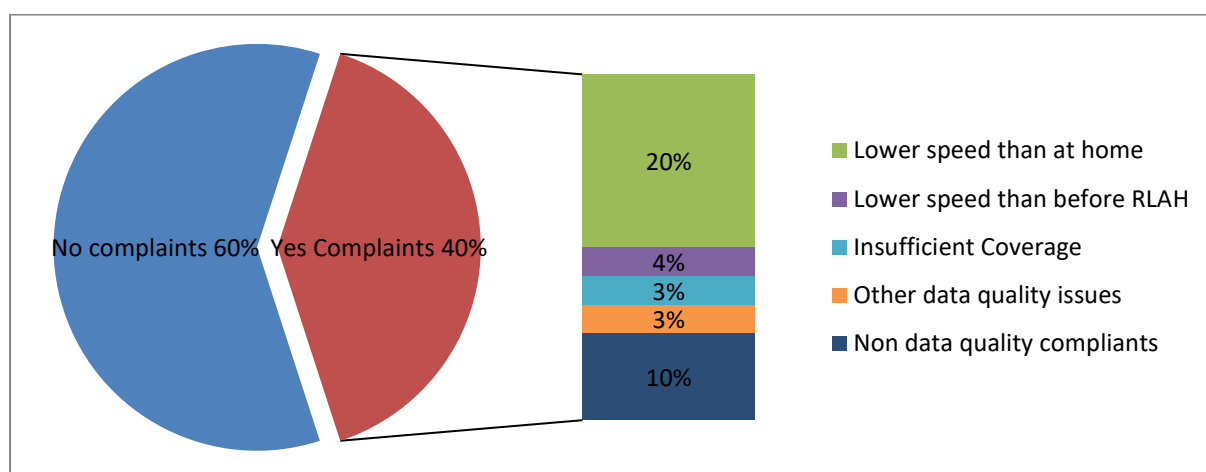
This chapter deals with QoS of roaming services and whether the introduction of RLAH had an impact on this. The analysis is based on the feedback from NRAs and operators about complaints of end-users and information about transparency on QoS and wholesale agreements as well as third-party surveys.

4.1. Impact of RLAH on QoS from NRAs point of view

4.1.1. Complaints received by NRAs on the roaming QoS

40 % of the NRAs reported having received some complaints on QoS while roaming.¹⁸ 10 % of the NRAs reported an increase, 17 % a stable level and 13 % a decrease in the amount of QoS complaints. In the figure below a breakdown of the type of complaints received is shown.

Figure 11 Complaints received by NRAs about the QoS of data roaming services



¹⁸ Number of complaints see also Figure 12 in Chapter 3.3.1

4.1.2. NRAs investigations and third party studies on quality

NRAs mentioned two third party studies on the roaming QoS. The first mentioned third party measurement/analysis is the Monroe Project¹⁹. The study's findings show that Home Routing is the norm for handling SIMs that visit foreign networks. Home Routing has some implications, of which the major being that it introduces delays for the roaming end-users. In addition, the user will appear to the public internet as being connected in the home country. This can have implications concerning content availability.

The second mentioned third party measurement/analysis is the Speedtest study regarding the quality of mobile broadband access. This study concluded that most Europeans experience slower downloads than at home while using 4G roaming²⁰.

3 of the 30 NRAs undertook investigations on the speed of data roaming services. One NRA mentioned that their case concerned an operator offering their customers only 3G roaming in the EU. Another NRA mentioned that they do a yearly check (for 2017 and 2018) of the data roaming quality offered to customers in their country. The third NRA mentioned finding in a GSMA standard a procedure for home operators explaining how to limit access, on customer level, to only 3G services on the visited network.²¹

4.1.3. NRAs information about limitations to only 3G access during roaming

NRAs were asked if their home operators (their 4 largest MNOs and 3 largest MVNOs) limited the speed of data roaming services for their customers while roaming in the EU to 3G access. Their information is mostly based on the information available on the website of the providers. 8 NRAs reported that there is no information about QoS available on the websites of their 4 largest MNOs and their 3 largest MVNOs. 10 NRAs reported that some operators do have roaming QoS information available on their websites, and almost half of those operators have information on their website that they do not impose any limitations regarding QoS while roaming. 5 NRAs reported that some of their operators are transparent about the fact that they limit roaming to 3G access. This limitation could be:

- (i) 3G only availability,
- (ii) 3G only for specific countries or
- (iii) 3G only for specific networks in specific countries.

From the data provided, it can be derived that the operators that inform about the fact that they limit roaming to 3G access are mostly restricting the QoS for specific networks in specific countries. Although only 5 NRAs reported cases where operators apply limitations to 3G

¹⁹ Two nodes were distributed to each of the following countries: Norway, Sweden, Spain, Germany, UK and Italy. In total, SIMs from 16 operators from these countries were put under test. SIM-cards from all the six countries were collected and distributed to the nodes in each of the countries. Then every node had both roaming SIMs as well as a domestic SIMs. In each country, a measurement server was installed. Several tests were run and it was then possible to see whether a SIM gets different treatment depending if it was active in its home network/country or roaming.

²⁰ <https://www.speedtest.net/insights/blog/roaming-in-europe-2019/>

²¹ GSM Association Official Document IR.88 V.16 - LTE and EPC Roaming Guidelines page 33

access while roaming, BEREC would like to note that a large number of NRAs have not provided such information or could not obtain this information from their operators' websites, and therefore the information is not complete.

4.2. Impact of RLAH on quality of retail services from the point of view of operators

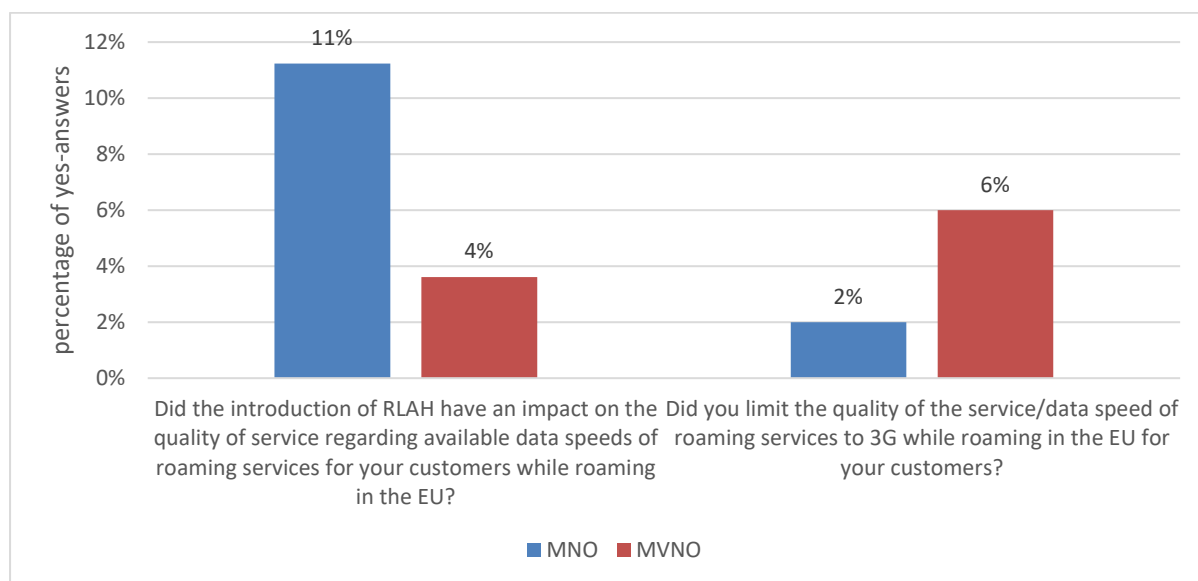
The majority of respondents (89 % of MNOs and 96 % of MVNOs) replied that the introduction of RLAH did not have an impact on the QoS regarding available data speeds of roaming services for their customers while roaming in the EEA.

However, some MNOs reported problems with the QoS regarding available data speeds of roaming services for their customers while roaming in the EEA, specifying that some customers experienced lower data speeds due to poor capacity, overloaded networks during summer time, low data speed, or possible data throttling by some visiting operators. They conclude that 4G speeds might not be similar for their subscribers compared to some other roaming subscriptions in certain cases.

Some MVNOs have experienced problems with QoS regarding data speeds of roaming services for their customers while roaming in the EEA. They reported that higher traffic volumes caused less average download speed.

When it comes to limiting the QoS parameters/data speeds of roaming services to 3G while roaming in the EU for their customers, the majority of respondents (98 % of MNOs and 94 % of MVNOs) replied that they do not limit QoS/data speeds of roaming services to 3G. From those MNOs limiting QoS/data speeds, one reported that they briefly limited data roaming speeds in order to provide a consistent level of service for all customers. From those MVNOs limiting QoS/data speeds, one reported that technically they did not implement 4G roaming. This is because of the high cost of roaming data for them and the fact that more data is used when faster speeds are offered. Therefore, they provided only 3G services to their customers while roaming, although technically were able to activate 4G for roaming subscribers. They are currently monitoring usage patterns and costs, an understanding of which is essential before they activate 4G as this will substantially increase the data usage and subsequent costs, thereby putting pressure on their domestic tariffs.

Figure 12: Impact of RLAH on QoS



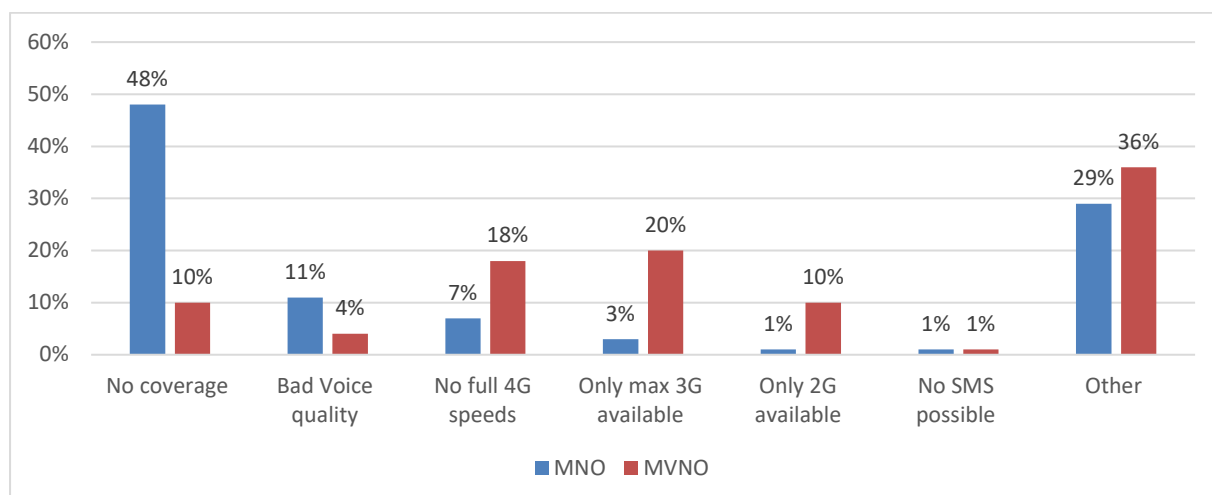
Another MVNO reported that service speed depended on the speed the MVNO partner can get from the selected MNO in each country. No specific limitation is applied by that MVNO. The third MVNO currently limiting QoS said that roaming in 4G will be opened gradually to their subscriber base in 2019. 98 % of all MNOs answered that they do not offer different prices for wholesale roaming access based on the QoS.

Regarding complaints, 32 % of all MNOs and 4 % of all MVNOs reported that information on complaints related to QoS is unavailable to them. Based on the figures submitted by those MNOs and MVNOs reporting an exact number of complaints received for some kind of degrading QoS, the total amounted to 131,231 for MNOs and 15,821 for MVNOs. A division of complaints per complaint type both for MNOs and MVNOs is depicted in the following graph.

For MNOs, the highest number of complaints belonged to category “No Coverage” (62,875), of which 54,924 complaints were recorded by only one operator. This extreme data provided by only one operator is the reason why the total number of complaints for MNOs is high. For MVNOs, the most complaints were of the category “Others” (for MNOs, this category is in second place), but with smaller differences compared to other complaint categories.

Although the majority of MNOs and MVNOs reported that introduction of RLAH did not have an impact on their QoS, the total number of complaints for MNOs and MVNOs of 147,052 complaints is quite considerable. The average number of complaints per MNO amounted to 1,442 and the average number of complaints per MVNO amounted to 176.

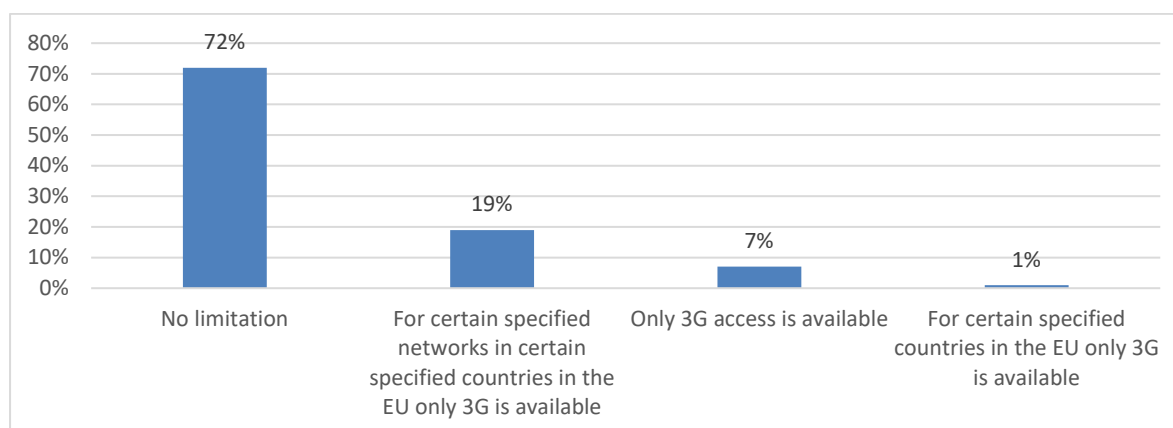
Figure 13: Complaints received with regard to QoS by MNOs and MVNOs



4.3. Wholesale services– from the perspective of MNOs and MVNOs

Almost all MNOs do not differentiate in the QoS/data speeds for roaming services in their reference wholesale agreement for roaming access for operators in the EU. They offer 3G and 4G wholesale roaming access without any price difference between 3G and 4G access. One exception occurs in which the tariffs for 4G access are not part of the reference offer but commercially negotiated. MVNOs reported mostly to have a wholesale roaming resale contract without restrictions towards the quality of data roaming (72 %). This means that 28 % of the responding MVNOs do actually have some kind of data speed limitation in their wholesale resale roaming agreement with their host – see graph for details. Almost all MVNOs reported no price difference between 3G or 4G in their wholesale resale roaming access agreement with their host operator, except for two MVNOs reporting a price difference between 3G and 4G roaming resale access. Those MVNOs consequently only use the 3G wholesale resale data roaming access.

Figure 14: The type of QoS/data speed of roaming services in the EU that an MVNO receive from its host operator according to contractual conditions



4.4. Conclusions

The QoS during roaming transpired as a further issue in the course of the analysis. Some end users raised complaints about lower speeds while roaming in the EEA. Certain cases were reported where operators restrict speed or technologies (only 3G available despite vast majority of operators in the EU offer 4G services) when customers are travelling abroad. One of the reasons to reduce the speed or restrict the quality is to reduce data traffic (and thereby wholesale costs). The intention of the Roaming Regulation is to allow roaming customers to use the service like at home. Even though the Roaming Regulation does not provide any obligations in terms of QoS requirements, BEREC is of the view that domestic operators should not purposely lower the QoS than the one offered at home. In addition, operators should be transparent towards the customers in terms of QoS in a roaming situation (e.g. website, contracts, etc.). Therefore, BEREC suggests the EC could further investigate imposing more specific obligations for the home network operator in this regard in any potential update of the Roaming Regulation. In addition, the Roaming Regulation could be updated so as to enable all operators, in particular small operators, to offer the same QoS as at home in a sustainable way. BEREC will in any case further monitor these developments and will further discuss if the BEREC net test could be used for this purpose in the future.

5. Functioning of the Derogation mechanism

BEREC assessed the cases where MNOs and MVNOs requested a derogation from RLAH and analysed whether the mechanism provided by the regulation was working effectively to achieve the sustainability of the roaming market.

5.1. Evaluation of status quo

In June 2017, a total of 30 derogations had been granted by NRAs. For the period 15 June 2017 to 14 June 2018, 17 NRAs received applications for sustainability surcharges. In total 57 applications were received, 46 of which were granted and 11 of which were refused in this period. For the period 15 June 2018 to 14 June 2019, only 10 NRAs received applications for derogation. In total 37 applications were received, all of which were granted.

Overall, this means that only a small percentage of operators active on the market made use of the derogation mechanism. Moreover, these derogations concern essentially smaller MNOs and MVNOs which have a very low share of a given market. Four countries (Poland, Finland, Estonia, and Lithuania) are an exception in that matter, as derogations were granted to major operators due to very low retail prices and high wholesale traffic asymmetry compared with other Member States.

MVNOs are the primary users of the sustainability derogation given their specific situation on the wholesale roaming market. Over the first year of RLAH, about two-third of the derogations have been granted to MVNOs (30 vs 14). The table below presents the number of derogations in place as of Q1 2019 per country, split by type of operator (MNO and MVNO) and shows that nearly 2/3 of the derogations concern MVNOs.

Table 1: Sustainability derogations in place as of Q1 2019, split by MNOs and MVNOs

	MNO	MVNO	Market share
AT	0	2	~ 1 %
BE	0	1	<5 %
EE	3	0	100 %
FI	3	1	100 %
FR	0	6	3 %
IT	0	3	2.7%
LT	3	1	~100%
PL	4	8	100 %
RO	1	0	13 %
SI	0	1	2,6 %
Total	14	23	

Regarding the use of the derogation granted, in a majority of the cases, the derogation was not applied to all tariff plans. A diverse scheme of use cases was in place:

- 11 operators reported derogations applying to all tariffs
- 1 operator applied his derogation only to low-cost offers, 4 operators applied their derogation to prepaid tariffs
- 3 operators applied a surcharge only after a certain fair use
- 5 operators reported applying a surcharge only on data consumption
- 3 operators specifically targeted old tariffs, whereas 7 operators applied their derogation to new customers

Overall, this indicates that operators granted a derogation still strive to apply RLAH as far as possible in order to remain competitive in the market.

Some NRAs have already started to assess derogation renewals for the next yearly period. It is expected that the number of derogations for the next periods will decrease: Approximately 30 derogations to be granted in 2019 and approximately 20 derogations in 2020.

5.2. Feedback from NRAs and operators with regard to the sustainability procedure

Several NRAs identified issues with the wording of the provisions of CIR regarding sustainability applications. The CIR (EU) 2019/296 of 20 February 2019 correcting certain language versions of CIR (EU) 2016/2286 already addressed some of these concerns.

Nevertheless, according to some NRAs, the Roaming Regulation and the CIR include some provisions regarding sustainability that could be amended in order to eliminate possible difficulties in their implementation. In particular:

1. The definition in Article 2 (f) for the mobile services margin should specify that the roaming costs and revenues to be excluded for the calculation of the mobile services margin should be estimated according to the methodology included in the CIR. A proposal

would be to add the phrase “calculated according to articles 7, 8 and 9 of the CIR” at the end of the definition. The current wording could oblige operators to calculate the EBITDA for roaming services, which is not consistent with Articles 7, 8 and 9.

2. In Article 7, which deals with the roaming specific costs, payments for balanced traffic are not taken into account. However, the provision of balanced traffic entails some costs for the operators. In particular, network costs for providing balanced traffic should be considered as costs related to roaming services. In other words, for the case of balanced traffic, there is an assumption that there is no net payment for the operator, but in practice, the operator has to bear some network costs in order to offer the balanced traffic that will allow its customer to use roaming abroad.

3. Article 6 (2) refers to financial commitments, which in general should be incorporated in financial accounts. However, there might cases (e.g. because of a new regulation) that were unknown and unforeseen when preparing the financial statements. BEREC would propose to amend this specific provision to providing detailed documentation for justifying this deviation.

4. In the event of updates to the application being submitted by operators, Article 6 (1) sets out the methodology of updating projected volumes of regulated roaming services on the basis of domestic mobile services, multiplied by the observed number of roaming customers and the time they have spent in visited Member States in the previous 12 months. It appears that currently the average roaming consumption, even without sustainability surcharges, is still much lower than the domestic one. Therefore, when comparing projected updates according to Article 6 (1) with actual data, this could lead to an artificial gap affecting the projected costs and revenues, which may lead to an overstated forecast of a negative margin.

In addition, BEREC has received little feedback from MNOs and MVNOs with regard to the sustainability procedure. MVNOs mostly complained about the complexity of the procedure, which seems to be demanding for small operators to follow. There were also questions on how to deal with new entrants and the specific information they could be able to provide on their offers. Moreover, there is a concern among certain operators that applying a surcharge on existing contracts might be leading to base opening, which would make the derogation measure only partially effective for the concerned operators. However, the majority of operators granted a derogation did not seem to have issues with the sustainability procedure.

5.3. Conclusions

The derogation mechanism concerns a small and shrinking part of the market in most Member States. However, this mechanism remains a tool for some operators to achieve the overall sustainability of the RLAH principle (especially for MVNOs and operators from markets with low retail ARPU, markets with a high level of unbalanced traffic). Taking into account the feedback from NRAs, BEREC suggests possible amendments to the Roaming Regulation and/or CIR that could clarify the sustainability procedure:

- Making the mobile services margin calculation in Article 2 consistent with Articles 7, 8 and 9 of the CIR
- Taking into account costs for balanced traffic
- Incorporating the possibility to provide complementary documentation requested by article 6 (2)
- Aligning the volume forecasting methodology of Article 6 (1) with the methodology for calculating costs and revenues

Another noticeable trend is the strong competitive pressure on operators, which prevents them from extensively applying the surcharges even after they have obtained the derogation.

6. Functioning of the wholesale roaming market

In this chapter, BEREC analyses the wholesale roaming market presenting an analysis of the wholesale average prices for balanced and unbalanced traffic, inbound and outbound volumes and seasonality aspects. BEREC further examines the effectiveness of the structural measures foreseen in the Roaming Regulation and analyses the competitive situation of smaller operators (MVNOs/resellers). Later this year, BEREC will also provide its analysis on the relationship between wholesale costs and prices.

6.1. Analysis of developments in the wholesale roaming market

6.1.1. Average prices and lowest prices

The EEA average wholesale prices in Q3 2018 were 2.04 Eurocents per minute for roaming voice calls, 0.28 Eurocents per roaming SMS and 2.21 Euro per GB.²² Some differences between prices for balanced and unbalanced traffic were observed, with the highest relative difference for voice calls (average prices for balanced traffic 27 % higher than for unbalanced; the difference was lower for SMS and data, both around 15 %). The following table summarises wholesale prices in Q3 2018, showing the EEA average as well as the average of the three lowest and three highest country values for balanced, unbalanced and total traffic.

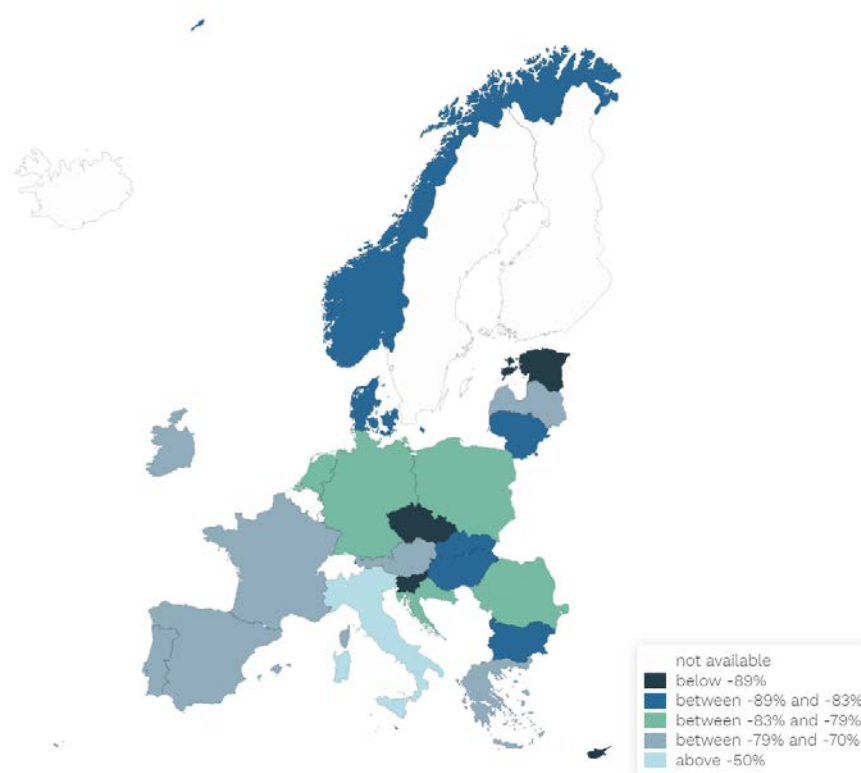
²² International Roaming BEREC Benchmark Data Report April 2018 - September 2018.
https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8468-international-roaming-berec-benchmark-data-report-april-2018-september-2018

Table 2: Wholesale prices in Q3 2018

		Voice (minute) - in Eurocent	SMS - in Eurocent	Data (per GB) - in Euro
Unbalanced traffic	EEA average	1.76	0.31	2.14
	Average of lowest 3	0.97	0.16	0.74
	Average of highest 3	3.15	0.80	3.25
Balanced traffic	EEA average	2.23	0.26	2.41
	Average of lowest 3	1.25	0.15	1.48
	Average of highest 3	3.25	0.72	3.24
Total traffic	EEA average	2.04	0.28	2.21
	Average of lowest 3	1.16	0.10	1.20
	Average of highest 3	2.84	0.65	3.14

Looking at the evolution of wholesale roaming prices between Q3 2016 and Q3 2018, the EEA average wholesale price (total traffic) per GB decreased 77 % from 9.90 Euro in 2016 to 3.96 in Q3 2017 and 2.21 Euro in Q3 2018. The highest decrease was 90.9 % in Estonia and 90.7 % in Slovenia (both starting at a relatively high level above 18 Euro per GB) and the lowest was 48.7 % in Italy (starting from already relatively very low price of 5 Euro). In most countries, the decrease of average prices was well above 70 %. In general, the decrease was higher where the wholesale price at the starting point was high. As an effect of the price decrease, the standard deviation (indicating how close the data are to the mean) has shrunk from 8.1 to 0.8 Euro.

Figure 15: Evolution of wholesale roaming prices (total traffic) per GB between Q3 16 - Q3 18



The table below shows the EEA average of the lowest wholesale roaming prices charged and paid by operators in Q3 2018 (calculated on the average of the five lowest unbalanced rates provided by MNOs).

Table 3: EEA average of lowest wholesale prices in Q3 2018²³

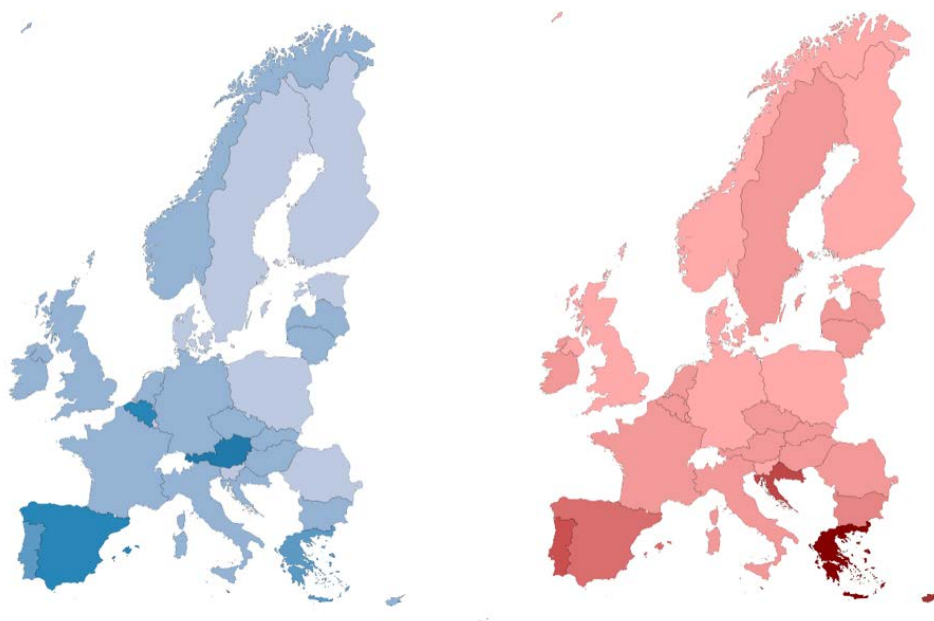
	Voice (minute) - in Eurocent	SMS - in Eurocent	Data (per GB) - in Euro
Average charged	1.41	0.39	1.19
Average paid	1.52	0.39	1.16

When analyzing the data, no close relationship between the proportion of inbound traffic and wholesale prices was identified.

6.1.2. Inbound and outbound traffic

Seasonality effects appear when considering the analysis of the ratio between inbound traffic and outbound traffic, as the figure below shows. In Q1 2018, the countries with the highest ratio (most inbound traffic in relation to outbound traffic) were Malta (5.5 times more inbound than outbound data traffic), Austria (4.1), Belgium (2.9), Liechtenstein (2.8) and Spain (2.6) and the lowest having an almost balanced inbound and outbound ratio – Denmark (0.3) and Estonia (0.2). In Q3 2018, the inbound traffic moves south, with the highest ratio in Q3 2018 in Greece (22 times more inbound than outbound), Cyprus (15.4), Malta (9.3), Croatia (8.3) and Portugal (4.4) and the lowest being Estonia (0.3) and UK (0.2), see Figure 2 and Figure 4. While we only present the ratio for data traffic, voice and SMS show a similar picture.

Figure 16: Ratio of inbound / outbound data traffic in Q1 2018 (blue) and Q3 2018 (red). Colour intensity correlates with higher ratio of inbound traffic.



²³ The table below shows the EEA average of the lowest wholesale roaming prices charged and paid by operators in Q3 2018. While the values shown in Table 2 are based on country averages, the following values are calculated on the average of the five lowest unbalanced rates provided by individual MNOs.

6.1.3. Impact on RoW prices

The average wholesale prices for RoW show a strong decrease. The largest decrease in prices (minus 66 %) can be seen for data services. There is no indication of waterbed effects. The table shows the EEA averages and the lowest and highest country values for Q3 2016 (Q3 2017 for SMS) and Q3 2018.

Table 4: Average wholesale price for RoW

		Voice (minute) - in Eurocent	SMS - in Eurocent	Data (per GB) - in Euro
Q3 2016 / *Q3 2017	EEA Average	14.3	2.43*	31.8
	Lowest	0.6	0.65*	10.1
	Highest	76.9	6.51*	190.6
Q3 2018	EEA Average	10.4	1.57	10.8
	Lowest	1.8	0.3904	4.3
	Highest	29.0	3.65	27.1

6.2. Relation between prices and costs

The current wholesale price caps were determined on the basis of a study that was commissioned by the EC to TERA consultants prices and was delivered in 2016. Currently, an updated costing study is under development by Axon consultants and is expected to be published in July 2019. Taking into account the output of this study, BEREC will draft this section of the Opinion during the summer of 2019 with the aim to submit it to the EC by mid-September 2019.

6.3. Structural Measures

This chapter summarises the answers of NRAs, MVNOs and MNOs regarding the implementation of structural measures according to Article 3 and 4 of the Roaming Regulation. Structural measures according to Article 3 and 4 Roaming Regulation are:

- The obligation to publish a reference offer
- The right of NRAs to impose changes to reference offers regarding specific measures that the visited network operator may take to prevent permanent roaming or anomalous or abusive use of wholesale roaming access
- The option to include conditions to prevent permanent roaming or anomalous or abusive use of wholesale roaming access in their reference offer
- The right to unilaterally terminate the wholesale agreement by the visited network on grounds of permanent roaming or anomalous or abusive use of wholesale roaming access upon prior authorization of the visited network operator's NRA
- The obligation to gain access to reasonable requests for wholesale roaming access
- Separate sale of regulated data roaming services (some considerations on technological developments and their possible impact on roaming and the regulatory perspective are presented on separate sale of regulated data in chapter 7).

6.3.1. Imposed changes to reference offers

According to Article 3 (6) subparagraph 11 of the Roaming Regulation, the NRA shall, if necessary, impose changes to reference offers, including as regards the specific measures that the visited network operator may take to prevent permanent roaming anomalous or abusive use of wholesale roaming access, and the objective criteria on the basis of which the visited network operator may take such measures, to give effect to obligation laid down in this Article. NRAs were asked in the survey whether they have imposed such changes. Only 2 NRAs (CY, LT) stated that they had imposed changes to reference offers.

6.3.2. Conditions included in reference offers to prevent permanent roaming or anomalous or abusive use

38 % of all MNOs (35 out of 91) have included conditions to prevent permanent roaming or anomalous or abusive use of wholesale roaming access in their reference offers: 9 of the 35 (26 %) explicitly foresaw measures of Art 3 (6) subparagraph 3 to 5 of the Roaming Regulation, as requesting information and even the suspension or termination of the contract in case of no cease of permanent roaming, upon the NRA's authorisation of the termination. Among those 9, 2 MNOs detail the procedure to request the information step by step with several time sets for the provision of information by the home network operator/access seeker before terminating (according Art 3 (6) of the Roaming Regulation), and at least one MNO has introduced requirements for the access seeker to provide information how it technically ensures that EU regulated access will not be provided to non-EU/EEA customers and how any misuse is prevented.

3 MNOs referred to the application of GSMA standard agreements or PRDs for Wholesale Roaming Access. Another 3 MNOs considered that wholesale roaming access as set forth under their Reference Offer is not intended to substitute domestic wholesale offerings for the provision of domestic services on their network and that the agreements aim allowing roaming customers resident in an EU Member State to use mobile communication services while temporarily travelling in a visited network.

2 MNOs established conditions regarding permanent roaming under the discount agreements (excluding permanent roaming for these discounts or negotiating it with its own conditions). In two other cases, MNOs mentioned other economic consequences: One of them intended to apply a monthly penalty in addition to the monthly invoice in case fraudulent or unauthorised use is observed and suspected, and another to reserve the right to claim damages for negligence.

Finally, 1 MNO included specific clauses aiming to oblige partners to give each other transparency in case of conscious permanent roaming, and 1 MNO noted the necessity of (implementing) control systems against abusive usage.

6.3.3. Termination of wholesale roaming agreements upon prior authorization

The Roaming Regulation stipulates the possibility of the visited network operator to terminate the wholesale roaming agreement unilaterally on grounds of permanent roaming or

anomalous or abusive use of wholesale roaming access, only upon prior authorisation of the visited network operator's NRA (Art 3 (6) subparagraph 5 of the Roaming Regulation).

To the question if NRAs have received any request for authorization to terminate a wholesale roaming agreement according to Art 3 (6), 3 (Norway, Sweden and Germany) of 30 NRAs answered that they received a request for authorisation to terminate a wholesale roaming agreement. Among these, 2 NRAs (Norway and Sweden) named "permanent roaming" as the reason for the operators' request for authorising the termination, 1 NRA (Germany) stated that the case concerned other facts that did not need NRAs authorisation since it was a case of an ordinary contract termination. Norway reported that the request for termination of the wholesale roaming agreement due to permanent roaming was approved on 6 March 2019.

7 % of the MNOs (6 out of 91) have experienced cases of termination of wholesale agreements because of permanent roaming or abusive or anomalous use. Four of them indicate that their partners pretend to exclude the IoT devices from their discount agreements or tried to charge them in additional ways. 1 MNO describes a case where they have detected abusive usage of regulated wholesale tariffs for customers from outside the EU, and finally, 1 MNO registered permanent activity on (foreign) SIM cards and considered that the access seeker did not have customers located in its registered home country with a predominant usage in that country.

Regarding MVNOs, 1 of 89 respondents has experienced a case of unilateral termination of the wholesale agreements because of permanent roaming or abusive or anomalous use. On another note, 12 % of the MVNOs (11 out of 89) allude to the existence of disputes with their wholesale provider after signing the access agreement. Among those 11, 6 MVNOs refer to problems with prices and charges applied to roaming services, including two cases with rates for voice calls and SMS that are above the regulated wholesale rates for roaming in the EEA.

There is 1 MVNO informing of the refusal from their MNO to provide them 4G services due to the M2M services offered by the MVNO. Furthermore, this MVNO mentions that their MNO have asked them for bank guarantees. At last, 1 MVNO indicates that their MNO added to their wholesale agreement, some provisions about the liability of the MVNO when an abusive usage of roaming subscribers is detected, forcing them to cover the costs of the abusive use.

Due to the absence of a clear correlation between the nationality of the MNOs and MVNOs that describe most of the disputes and the procedures for authorisation to terminate a wholesale roaming agreement reported by the NRAs, those disputes may refer to disagreements with other operators that have not become formal procedures.

6.3.4. Roaming wholesale access conflicts

In accordance with Article 17 of the Roaming Regulation, in the event of a dispute between undertakings providing electronic communications networks or roaming services in a Member State, the dispute resolution procedures laid down in Articles 20 and 21 of the Framework Directive should be applied fully (see Guideline 44 in the Wholesale roaming Guidelines, BoR (17) 114).

In response to the question whether NRAs have received information about any roaming access conflict, 4 NRAs gave a positive answer. The remaining 26 NRAs received no notice

of roaming access conflicts. These 4 NRAs mentioned that mainly the reasons for the disputes were wholesale access, wholesale prices and permanent roaming.

One NRA adjudicated on two roaming access disputes which were solved by a binding determination²⁴, another NRA responded that the wholesale access disputes origin concerned mere wholesale access, permanent roaming and wholesale prices and this NRA obliged the access provider in one case to submit a contract according to Article 3 (1) and (5) Roaming Regulation. A third NRA reported that one pan-European MVNO (based in its country) was not granted regulated access to an EEA visited network and the case is handled by the NRA of the country of the visited network. A fourth NRA pointed out that no official complaint or dispute was received, but complaints regarding problems with direct wholesale access were raised: this NRA reported that the dispute is not solved, as the operator still faces difficulties to get direct wholesale access agreement with in the market of a neighbouring country.

Although it has not become a conflict, several MVNOs have indicated that different techniques of delays on the part of their hosts in providing roaming services have been encountered, and this is discussed in more detail in chapter 6.4.

6.3.5. Conclusion

The fact that in only two cases NRAs had to intervene and impose changes to reference offers shows that operators mainly comply with the respective provisions of the Roaming Regulation regarding the obligation to publish a reference offer and the conditions therein. The possibility to include conditions against permanent roaming or anomalous or abusive use of wholesale roaming access in their reference offer is only partly used (only 10 % of the operators). It can therefore be assumed that most operators see no necessity to include specific conditions to prevent permanent or anomalous or abusive usage of wholesale roaming access in their reference offer. Although the possibility to include such clauses is not widely used, it is relevant to highlight that operators who have detected businesses based on permanent roaming have decided to pursue commercial agreements with access seekers rather than deny access, which would have led to a dispute with the relevant NRA.

Furthermore, only 3 NRAs out of 30 respondents received a request for authorisation to terminate a wholesale roaming agreement according Art 3 (6) of the Roaming Regulation. In addition, it doesn't seem to be a clear correlation between the nationality of the MNO and MVNOs and the reported cases by the NRAs as regards the cases of unilateral termination of the wholesale agreements because of permanent roaming or abusive or anomalous use. This might be the case because those disputes may refer to disagreements with other operators that have not become formal procedures. In summary, it can be noted that BEREC considers that the Roaming Regulation sufficiently prevents permanent roaming or anomalous or abusive usage on wholesale level with the measures provided. Although only 4 NRAs have received disputes regarding wholesale roaming access, several MVNOs have indicated that is more challenging for MVNOs to compete on the wholesale roaming market (see Chapter 6.4). However, BEREC is of the opinion that the measures foreseen by the Roaming

²⁴ See links <https://www.comreg.ie/publication-download/cloud-9-a-vodafone-dispute-a-final-determination>
<https://www.comreg.ie/publication-download/cloud-9-a-eircom-dispute-a-final-determination>

Regulation are mainly useful tools to promote competition and enable NRAs to resolve differences between operators as well as prevent misuse on the wholesale roaming market.

6.4. Situation for MVNOs

In this subchapter, BEREC aims to assess:

- The competitive situation for MVNOs and small operators²⁵, including the competition effects of commercial agreements and the degree of interconnection between operators.
- Possible regulatory measures to improve the situation for MVNOs and small operators.

6.4.1. Wholesale access for full and light MVNOs

There are various ways of establishing wholesale roaming access agreements for MVNOs. Article 3 of Regulation (EU) No 531/2012 imposes an obligation for MNOs to meet all reasonable requests for wholesale roaming access, comprising of direct wholesale roaming access²⁶ and wholesale roaming resale access²⁷.

Full MVNOs have their own IMSI range and can negotiate direct bilateral agreements with MNOs. They can also buy wholesale resale access via their domestic host MNO, from another MNO, a hub²⁸, a MVNO or a MVNE. Light MVNOs use the same IMSI as their host and must rely on a form of wholesale resale access. It should be noted that these categories may not be strictly black-and-white and that overlaps between them may occur. The figure below shows the distribution of types of access among the full and light MVNOs that responded to the questionnaire.

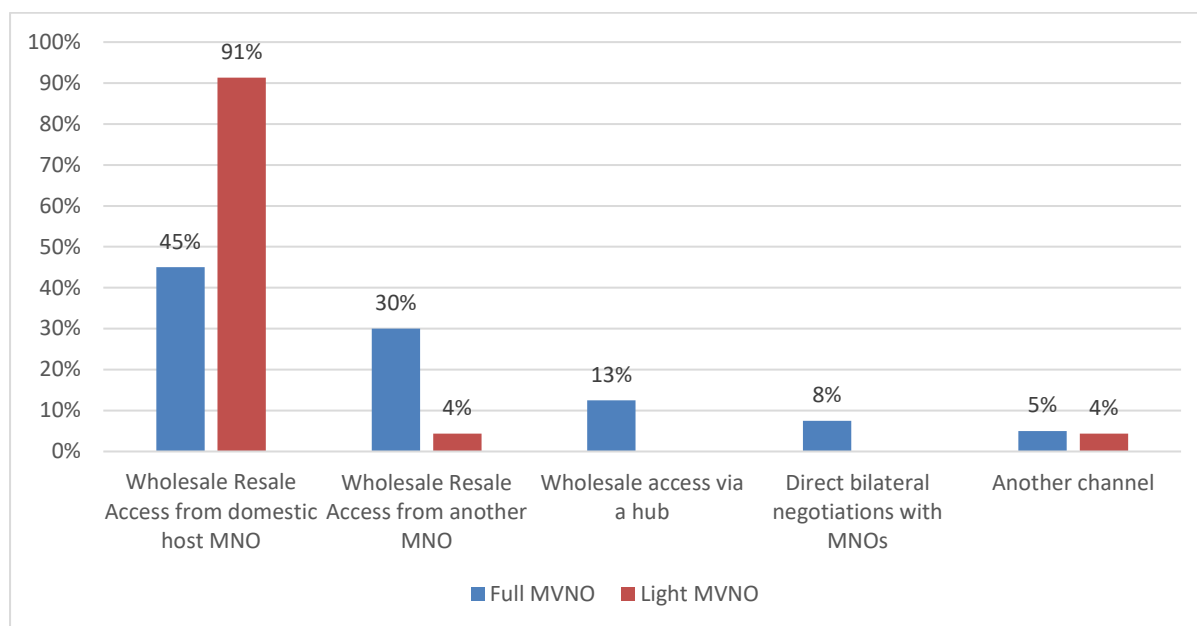
²⁵ 50 % of the responding MVNOs have less than 100,000 customers: the assessment in this chapter therefore also represents small operators

²⁶ Direct access means that the retail provider contracts directly with a foreign network in the EEA, allowing its roaming customers to use roaming services when they visit this network.

²⁷ Resale access means that the retail provider bases its retail service on the wholesale service provided by an MNO, usually, but not necessarily, in the end user's home country.

²⁸ A hub will handle the technical set up for roaming. Each operator that is connected to the hub has to sign agreements with the other operators connected to the hub and prices for traffic are negotiated between each of the connected operators.

Figure 17: Type of wholesale access for full and light MVNOs



6.4.2. Challenges related to entering into wholesale roaming agreements

6.4.2.1. Providers with direct bilateral agreements

The customer base for 3 MVNOs negotiating direct bilateral agreements range between 35,000 and 520,000 subscribers. They are not the largest MVNOs among the respondents, as several respondents had over one million customers.

One of them referred to specific problems when signing such agreements, naming lack of 4G access from the MNOs, no discounts, delaying of negotiations and delaying of technical implementations. None of the MVNOs were obliged to pay other wholesale charges in addition to the regulated wholesale roaming charges.

6.4.2.2. Providers with wholesale roaming access through hubs

None of the respondents had problems to get wholesale access via hubs. One of them expressed that they would prefer direct bilateral negotiations with MNOs, but this, however, was too complicated to manage. 2 of the responding MVNOs provided information about other wholesale charges (e.g. annual platform fixed costs) in addition to the regulated wholesale roaming charges.

6.4.2.3. Providers with wholesale resale access from domestic host MNO

Wholesale resale access from domestic host MNOs is the most common type of wholesale access, both among full MVNOs and light MVNOs. Nearly all light MVNOs used an IMSI range within the range of the domestic host MNO. 3 full MVNOs stated that they have their own IMSI range for domestic traffic and another IMSI for roaming (dual IMSI). For most of the full

MVNOs, this was their preferred solution for wholesale access. However, 1 MVNO stated that they might want to use a roaming hub, but have not integrated it yet due to high costs. 2 full MVNO says they had problems to get the access: One was charged a surcharge by the host in the beginning and the other had to renegotiate the agreement to get better prices than the caps to make their retail offer sustainable.

All light MVNOs with wholesale resale access from domestic host MNOs use the same IMSI range as their host. For nearly 19 % (8) of the responding light MVNOs, resale access from a domestic host is not their preferred solution because of the level of the wholesale prices. Some of them stated that they would prefer to be a full MVNO with their own IMSI and independent routing of traffic, however this requires larger volumes. Two of them also stated that a dual IMSI solution would be preferred. Around 16 % (7) of the responding light MVNOs had problems to get wholesale access from domestic host MVNOs. Problems mentioned were large access fees and bank guaranties to get started. Several respondents also indicated that MNOs were not willing to offer anything better than maximum wholesale caps. One respondent referred to lack of 4G access. 12 % (7) of MVNOs with resale access from domestic host MNOs (full and light MVNOs) paid other wholesale charges in addition to the regulated wholesale roaming charges.

6.4.2.4. Providers with resale access from another MNO

The MVNOs which reported buying wholesale resale access from an MNO other than their domestic host MNO were to a large degree from the same group (10 respondents), in addition to which were 2 other full MVNOs and 2 light MVNOs. For all of them, this was the preferred solution and there was no problem to get such wholesale roaming access. 10 of these MVNOs paid other wholesale charges in addition to the regulated wholesale roaming charges.

6.4.2.5. Providers with other channels for wholesale access

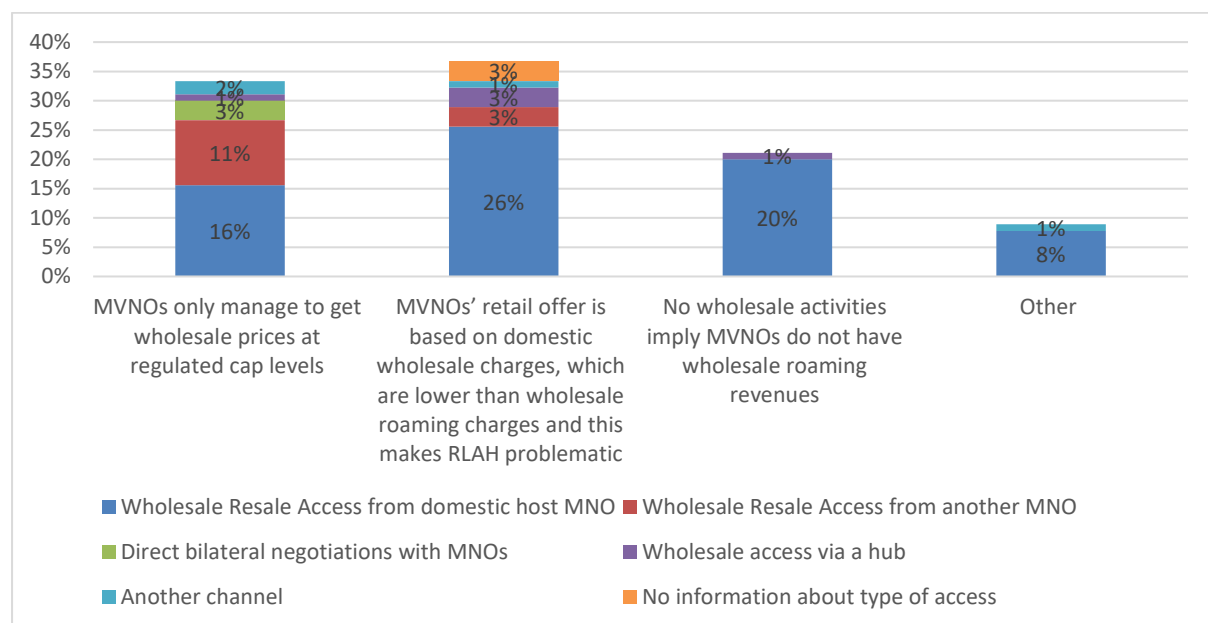
Other solutions cited were access from an MVNO enabler (MVNE) and access from another MVNO. One of the respondents stated that they would have preferred wholesale resale access from a domestic host MNO, however, the setup of the project was too high for their volume. Another respondent noted problems to get wholesale access due to MNOs with their own IoT business tending to block MVNOs by e.g. not offering anything other than maximum wholesale caps and not allowing access to new technologies (4G/5G). They pointed to possible uncertainties should IoT/M2M wholesale rates fall under the EU regulated wholesale rates.

One of these MVNOs pays other wholesale charges in addition to the regulated wholesale roaming charges.

6.4.3. Main challenges for MVNOs to compete in the retail market

MVNOs were asked to indicate the most important impediment to compete in the retail roaming market. The figure below shows their answers distributed by type of access.

Figure 18: Most important impediments for MVNOs to compete



The main challenge for MVNOs consisted of retail offers being based on domestic wholesale charges, which are lower than wholesale roaming charges. 37 % of the respondents stated that this made RLAH problematic for them. 33 % stated that they only managed to get wholesale prices at regulated cap levels. Many MVNOs claimed that they have limited negotiation power.

Lack of wholesale activities, resulting in a lack of wholesale roaming revenues, was considered another challenge by many of the respondents (19 %). According to them, MVNOs only have additional costs but no additional revenues if they adhere to RLAH.

In addition, 6 MVNOs mentioned wholesale roaming rates for voice and SMS above regulated cap levels as a challenge. Some of them were of the understanding that the regulated caps do not apply to MVNOs. Moreover, 1 MVNO stated that the derogation mechanism, provided as a safeguard, may easily have a negative impact. They were at that point the only provider with derogation in their country. They believed that regulation does not protect MVNOs at all on the roaming market. 1 MVNO highlighted that these challenges for MVNOs are exacerbated by zero-rating offers, which are gaining more and more importance and which, at least partly, can be used in roaming cases. MVNOs cannot provide offers similar to those of MNOs. 2 MVNOs claimed that access to new technologies (4G/5G) is restricted.

1 MVNO summarises their situation in relation to roaming: *“Applying the same regulation on all players, MNOs, MVNOs and OTT-players, doesn't take into account the different roles and structures of each of these companies. MVNOs need to challenge the market; therefore they operate in a leaner model with a lower cost structure. They need to compete with strong MNOs which have big organisations, big budgets and a big install base. RLAH basically reduces the roaming margin for an MNO but for an MVNO it introduces a new cost which needs to be compensated by revenues generated by the domestic traffic.”*

6.4.4. Measures to improve the situation for MVNOs

BEREC assessed wholesale measures proposed by the MVNOs to improve their situation and foster competition in the wholesale market.

First of all, BEREC believes there is a need to clarify that regulated maximum caps also applies for wholesale resale access to MVNOs. The obligation follows from article 3 (4) and article 2 (o) of the Roaming Regulation, however, there seems to be a need for clarification of this obligation for MNOs. Some MVNOs suggested to include obligations for MNOs to offer wholesale access to dedicated IoT technologies. This topic is further analysed in chapter 7.

The table below summarises BEREC's assessment on other proposed wholesale measures for MVNOs. The measures should especially address data roaming services, as this is the main and long-term issue.

Reduce wholesale caps	
Pros	<p>Beneficial both for MNOs outbound traffic and MVNOs.</p> <p>Predictable, amending wholesale caps is one possible outcome mentioned in amendments to article 19 (3) in the Roaming Regulation (EU) 2017/920.</p> <p>BEREC Benchmark Data Reports shows that average wholesale rates are below the caps and continue to decrease. In 2018, they are already below the caps foreseen in the glide-path for 2021 especially for MNOs.</p> <p>The EC currently analyses the wholesale roaming costs, the results can be taken into account for the definition of new wholesale roaming caps.</p> <p>Transparent and can easily be monitored.</p> <p>Might reduce the need for MVNOs to apply for derogation.</p>
Cons	<p>Wholesale rates need to be at a level that covers efficiently incurred costs that operators bear to offer wholesale roaming services.</p>
MNOs obliged to pass the discounts for roaming services they get from the visited networks on to the MVNOs	
Pros	<p>Allows MVNO benefiting from volume discounts that the host obtains by aggregating its traffic to their MVNOs when the host negotiates with the visited network.</p> <p>Automatically adapts to the evolution of the negotiated prices.</p> <p>Equal terms for competition between MVNOs and MNOs.</p>

Cons	<p>MNOs have several bilateral roaming agreements in each Member State, often with complex price structures. This measure might be very demanding to monitor, both for MNOs, MVNOs and NRAs. However, to make it less complex, average prices could be used.</p> <p>Discounts often depend on volume usage and are granted in most cases at the end of specified periods. This entails difficulties in the application of this obligation.</p> <p>Absence of level playing field as some discounts may not be representative of the expected level of discounts in a competitive market (MNOs might have an incentive to set high prices for balanced traffic or traffic within group companies).</p>
Align wholesale roaming charges to national wholesale rates (which means domestic wholesale access rates for EEA roaming) ²⁹	
Pros	Easier for MVNOs to calculate their retail bundle prices, no differences between domestic and roaming wholesale rates.
Cons	Does not take into account the MNOs roaming cost, therefore the wholesale roaming price could be below the wholesale roaming costs.
Make sure that wholesale caps also apply to alternative wholesale roaming solutions, like sponsored roaming ³⁰ (not preventing the provider of such solutions from charging for additional services)	
Pros	<p>More equal terms for competition in the retail market for MVNOs independent of type of access.</p> <p>It does not prevent providers of such wholesale solutions from charging additional for other services they offer.</p>
Cons	
Include measures in the Roaming Regulation for incoming roaming calls for MVNOs	
Pros	Create a level playing field for MVNOs
Cons	
Lower FUP limit for MVNOs (alternative FUP formula).	
Pros	Lower FUP limit for MVNOs would compensate for the fact that MVNOs do not get discounts and have no inbound roaming. The CIR underlies the multiplier of two partly by the fact that operators often negotiate wholesale data prices below applicable caps. This is not true for MVNOs and removing the multiplier would then adapt the formula to their situation.

²⁹ See also previous BEREC Report on wholesale roaming, https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/5745-berec-report-on-the-wholesale-roaming-market

³⁰ Sponsored roaming is a wholesale solution where the applicant uses a dual IMSI solution, where one IMSI range belongs to the sponsored network. The effect is that the applicant's end users have a second identity while roaming and they can make use of all the roaming agreements belonging to the sponsor network. Traffic prices are set by the sponsor network.

Cons	A different and separate FUP for MVNOs would be complicated for consumers and could not be useful for MVNOs in competitive markets.
MNOs should be obliged to give non-discriminatory access to new technologies (e.g. 4G, 5G) also to MVNOs for roaming.	
Pros	Level playing field for MVNOs and MNOs.
Cons	In the case of resale roaming access, MNOs should offer at least the technologies agreed at domestic level.
Include an obligation for MNOs to sign roaming agreements and technical implementation within acceptable timeframe	
Pros	<p>Predictable: this is already a measure in BEREC Wholesale Guidelines 41 and 42 (a contract should be made available to the access seeker for signature within one month of the access request and that the access agreement should be implemented as soon as possible but in any case within 3 months of contract signature, subject to any delays on the part of the access seeker).</p> <p>To include time limits in the Roaming Regulation would strengthen the requirements that are in the BEREC Wholesale Guidelines.</p>

6.4.5. Conclusion

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. 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. This group of operators furthermore have no wholesale roaming revenues to balance the wholesale cost, which makes their situation challenging and very different from MNOs. BEREC considers possible measures that the Commission could introduce in any update of the Roaming provisions to increase the competitive strength for MVNOs:

- Reducing wholesale caps, taking into account that MNOs need to recover their efficiently incurred costs to provide wholesale roaming services. This is considered an efficient and transparent measure.
- Obliging the host MNOs to pass the discounts they get for wholesale roaming services on to the MVNOs. Although this measure would ensure equal terms for competition between MVNOs and MNOs, BEREC considers that this measure is very complex to implement and would require the definition of a monitoring process by NRAs.

In addition, BEREC believes there is a need to clarify that regulated maximum caps also applies for wholesale resale access to MVNOs. BEREC would also like to support the following proposed measures to be considered by EC:

- Make 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.

- Include measures for incoming roaming calls for MVNOs.
- Include an obligation for MNOs to give non-discriminatory access to new technologies (see also Chapter 7).
- Include time limits for signing of roaming agreements and technical implementation.

6.5. Issues of misuse and value added services

In the survey, BEREC collected the following information from operators:

- Whether operators faced any abusive situations attributable to users and which could not be mitigated by the provisions related to the FUP foreseen in the Roaming Regulation and in the CIR.
- The impact of the referred issues of misuse on the activity of the operators as regards revenues, traffic, and the period involved.
- The measures that the operators that reported these issues have taken or consider that need to be taken in order to solve the problem and to avoid it from happening again.
- If these operators have reported the occurrence to the NRAs and what the result was.
- Any issues that operators had to deal with regard to the value-added services (VAS).

6.5.1. Cases of abusive use and proposed measures by operators

Almost 25 % of the respondents stated that they were aware of abusive usage of SIM cards in voice and/or SMS roaming communications in the EEA, which cannot be mitigated by the FUP foreseen in the Regulation. The most frequent situations indicated were: i) resale of SIM cards; ii) usage of RLAH by permanent roamers, iii) intensive use of SIM cards in roaming for sending high volumes of SMS or for making/receiving high volumes of calls in roaming to other EEA countries, including, for example:

- Revenue shared fraud by generating artificial roaming traffic for voice and/or SMS to number ranges with high MTR in other countries in the EEA, including number ranges associated to premium rate services/value-added services;
- Abusive use for marketing purposes (as this was cheaper than using an official SMS aggregator) or for abroad called centers or M2M subscriptions.

Although most respondents could not indicate the losses incurred, according to the answers received from 14 MNOs, these abusive situations originated losses for the operators varying from 1,000 Euro within a month to 1,000,000 Euro within a month. Some respondents also indicated that the number of abusive cases is increasing.

Some respondents suggested, among other tools/actions, to act more effectively and proactively to solve/prevent these situations. In particular, the following suggestions were proposed:

- i) to promote transparency via a European database including the premium number ranges in each EEA Member State. This database would enable MNOs and MVNOs to consult, prior to the billing of the roaming communications.;
- ii) periodical review by the NRAs of high interconnection cost for international numbers;
- iii) defining roaming allowances (i.e. similar to FUP for open data bundles) also for voice and SMS (e.g.: for pre-paid offers, allowances in correlation with period of time, etc.);
- iv) limiting the number of active pre-paid cards per subscriber;
- v) implementing real time billing.

For more detailed information on the relevant answers received, please consult the Annex.

6.5.2. Issues regarding value-added services and proposed measures by operators

Value added service is another issue covered in the survey. It should be noted that according to the BEREC Guidelines, the Roaming Regulation does not apply to the whole tariff that is charged for value added services but only to the tariff component corresponding to the connection to such services. According to the feedback from the survey, there is a lack of transparency both at retail and wholesale level concerning these services. Regarding retail level, 14 % of the respondents stated having received complaints from their customers about value-added communications while roaming in the EEA. According to the answers received, most complaints received by operators were about higher charges than at home, lack of transparency on the higher charges applied and calls to VAS numbers being charged above RLAH level. As regards the wholesale level, 23 % of the respondents referred having incurred extra costs from unexpected termination rates related to value-added roaming communications within the EEA.

It could also be highlighted that most of the operators that described such situations stated that VAS/premium numbering ranges cannot be recognized in all countries in advance, resulting in unexpected termination costs and/or degradation of customer experience. In fact, operators are not able to give their customers transparent information on charges as they do not know the cost applied by foreign operators for the service component of each type of VAS/premium ranges. It was also mentioned that even when operators have the numbering plans, they still do not know the termination rates for valued-added communications.

Some operators have taken measures to tackle this situation. For example: i) negotiated wholesale agreements; ii) obtained information about numbering ranges of other EEA countries; and iii) blocked value-added communications to their customers while roaming.

The suggestions provided for these issues included: i) definition of premium harmonized number ranges regulated and used at an EU level; ii) preparing and publishing a table of the number ranges associated to VAS in different countries; iii) an authority/institution (e.g. BEREC) should gather all numbering blocks with the relevant details (eg the relevant termination rate), which would be publicly open to operators and others.

For more information on the answers received on value-added complaints and costs incurred, please consult the Annex.

6.5.3. Conclusions

Taking into account operators' input it could be concluded that, in fact, the misuse of SIM cards in voice and/or SMS roaming communications in the EEA cannot, in the situations presented above, be effectively prevented/tackled by the current FUP foreseen in the Roaming Regulation. If measures are not taken, BEREC alerts to the possibility of a rise in domestic prices (spill over effect) in order to make up for losses or even the withdrawal of pre-paid offers from the market. In addition, there seems to be a general lack of transparency regarding charges for value-added services and premium rate services. Therefore, to prevent any misuse and increase transparency, BEREC suggests the following measures to be considered by EC:

- Making the registration/identification of subscribers of pre-paid tariffs available for roaming compulsory. However, before imposing such obligation, the proportionality of this measure needs to be examined as well as national circumstances pertaining especially in countries that have not yet implemented such a measure.
- Making it compulsory to apply the regulated wholesale termination rates to all numbering resources for the conveyance part of the calls, in order to reduce potential losses incurred by the operators having to terminate roaming calls in which high termination rates apply.
- Publication of a European database with VAS/premium number ranges.³¹
- BEREC considers that some additional transparency measures should also be taken to protect consumers as regards value-added/premium rate communications in roaming, namely, by obliging operators to include in the "Welcome SMS" an alert informing that these types of communications may not be under RLAH principles.

As highlighted by the ECC/WG NaN's³² and Europol's Cyber-Telecom Crime report,³³ the issue of fraud/misuse is difficult to tackle without the collaboration, cooperation, and sharing of information among all stakeholders.

7. Technological issues and their impact on roaming

This chapter discusses whether the technological developments taking place in the mobile networks might influence current roaming solutions. Topics include the market players' feedback to questions relating to the introduction of 5G, the expected growth of M2M-traffic based on roaming, as well as any need to adapt or replace the current Roaming Regulation charging schemes with something that better fits IoT.

³¹ One NRA, ComReg, publishes such information on its website. <https://www.comreg.ie/premium-rate/about-premiumrate-services/what-are-premium-rate-services/>

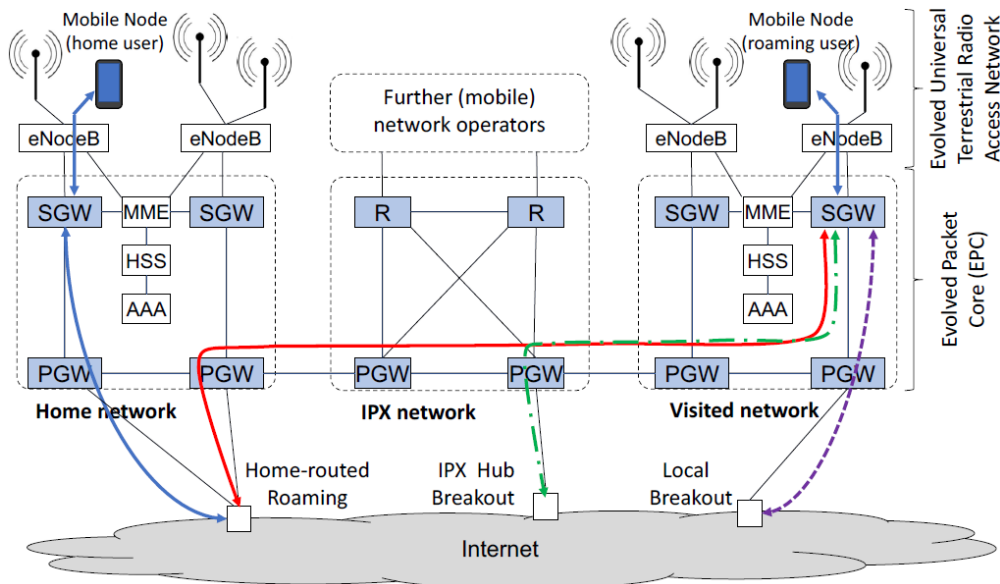
³²ECC/WG NaN (30 May 2018). "The role of E.164 numbers in international fraud and misuse of electronic communications services". Last accessed on 19 April 2019 at <https://www.ecodocdb.dk/download/e2070f50-a63b/ECCRep275.pdf>

³³ Craig Gibson. (January 2019). Europol - Trend Micro. "Cyber-Telecom Crime Report 2019". Last accessed on 19 April 2019 at https://www.europol.europa.eu/sites/default/files/documents/cyber-telecom_crime_report_2019_public.pdf The report examines the motives, methods and opportunities for committing fraud and presents an inventory of known fraud and misuse techniques particularly where E.164 numbers play a role. The report also looks at the administrative and technical tools that are being developed and deployed to tackle fraud and misuse both in Europe and beyond.

7.1. Technical solutions for Internet access while roaming

The figure shows different options for how a mobile user can reach the Internet when its phone is connected to a 4G network.

Figure 19: Options for how a device can reach Internet at home and when roaming³⁴



In general, there are three options when connecting a roaming user to the Internet:

- Local Breakout uses the shortest path available from the local, visited network and into Internet.
- The user's data connects to the Internet somewhere between the visited network and the home network. A third party will then handle the connection. This solution is called Intermediate or IPX Hub Breakout.
- Data gets transported back to the home network by one or more intermediate providers. Such providers are often referred to as transit providers although they can have different roles. As of now, this is the preferred solution by providers. This option is called Home-routing.

7.2. Alternatives to classical roaming solutions

In addition to the topics covered in chapter 6.3, MNOs and MVNOs were asked if they expect new technological solutions to develop in 5G, and whether such solutions could play a role when it comes to new roaming solutions. Such developments can be interesting when it comes to reducing the total cost of providing roaming services and/or open up for new players.

³⁴ Mandalari et.al: Experience: Implications of Roaming in Europe (Mobicom 2018)

7.2.1. Separate sale of regulated data

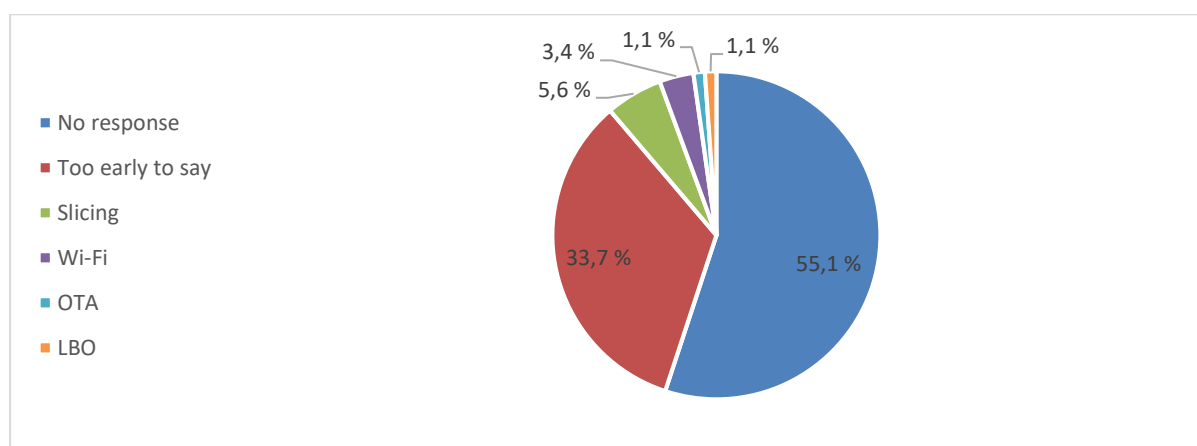
Although separate sale of regulated data was introduced by Article 4 of the Roaming Regulation in 2012, this structural measure has not had a relevant impact on the roaming market. Since RLAH entered into force on 15 June 2017, more than 90 % of mobile subscribers have RLAH in their domestic tariffs and when travelling in the EU/EEA there is not much incentive to seek an alternative roaming provider for data services. Roaming subscribers should identify a very significant improvement from their home operator such as a better price for data when the fair use limit is exceeded in order to change data provider.

In total, 41 of the MNOs (about 45 %) taking part in the survey responded to the following question:

With the deployment of the new 5G networks, what technologies or techniques do you think can work as alternatives to the classic data roaming services (For example, OTA (Over the air) functionalities to use local IMSI card, etc.)?

The distribution of feedback from the responses of the participants is presented in the following figure.

Figure 20: Will 5G introduce new roaming options?



The majority (about 55 %) of the respondents did not express any opinion on this. Of those actually providing feedback, it is clear that they did not yet know how 5G could introduce alternative roaming solutions.

Several mention that they see 5G as a pure technological development mostly on the part of radio access. According to them, the current roaming regime will continue.

Some respondents (about 6 %) mentioned network slicing as a function that could be used in cooperation with local breakout in order to provide alternative roaming solutions. They claimed that this might secure roaming users the lowest possible latency when accessing services located in the internet. The use of Wi-Fi, OTA or LBO as alternative roaming solutions/implementations currently seems interesting to only a few MNOs.

BEREC also asked the following:

In addition to LBO, are you planning to substitute S8 Home Routing with solutions that will allow break out to the Internet directly from the visited network?

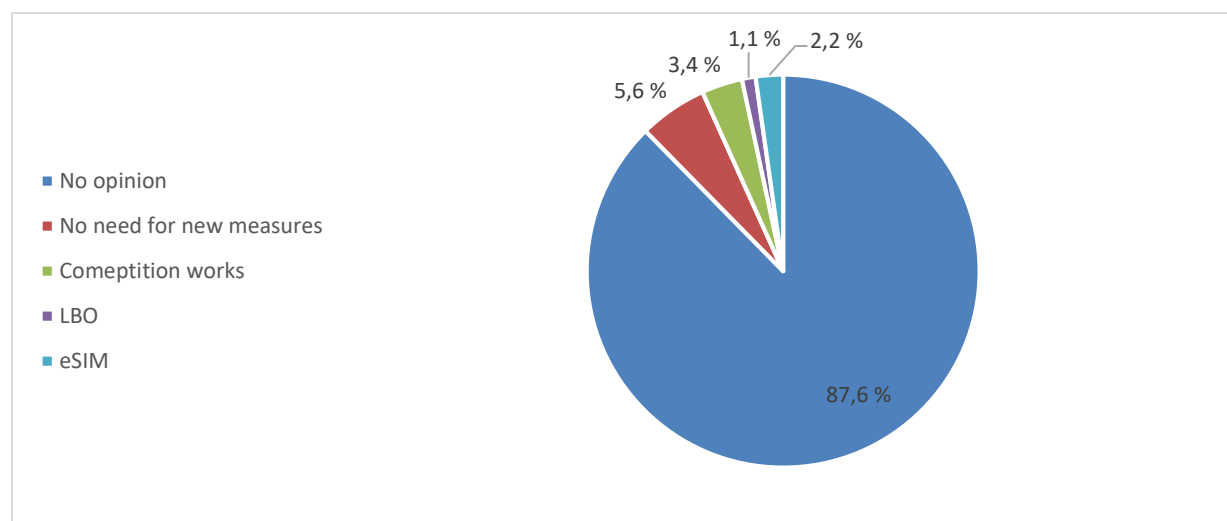
Almost 98 % of the MNOs foresee that the existing technical solution for roaming, in which roaming users' data traffic is routed back to the home network before it enters the Internet, will continue in the future. Not much reasoning behind this view was provided. However, one respondent points to compliance with Legal Interception (LI) as a motivation.

The survey provided a follow-up question to the respondents:

What other techniques do you think can be implemented to foster competition in the roaming market?

About 12% of the operators provided relevant feedback and their answers exhibit some differentiation between the respondents.

Figure 21: Could other techniques foster competition?



According to the majority of the respondents competition works and, as a consequence, there is no need to introduce new measures. Some respondents specifically mention that the alternative roaming provider/decoupling mechanisms brought costs to the operators and were not finally used by customers and such situation must be avoided if regulation is updated.

7.3. Challenges due to network developments

As operators are preparing for the introduction of 5G, there is a need to analyse how to best utilise their licensed radio spectrum. Of the existing generations of mobile technology, it seems to be a trend that 3G (UMTS) is the one that operators consider removing in order to reuse the spectrum for 4G. There may be several reasons for this. One is the added complexity of maintaining different radio technologies when it comes to planning, coordination and maintenance. Another and perhaps the most pressing motivation is that 3G/UMTS is a rather inefficient radio technology compared to its successor, 4G.

According to the Global Mobile Suppliers Association's (GSMA) latest status report³⁵ for VoLTE, 184 operators in 87 countries have commercially launched VoLTE-HD voice services. In addition, more than 70 operators worldwide are in the process of planning and testing for introduction of this technology. GSMA further reports that there are currently close to 2,000 devices of which 90 % are phones, which support VoLTE. From this, one would expect that many EEA end-users have access to VoLTE while in their home network. This translates to short set-up times and a better subjective sound quality due to support from more effective codecs.

Today, international voice roaming is heavily based on circuit switched technology. This means that a roaming user enjoying 4G will be directed to either 3G or 2G prior to receiving or making a voice call. In this process, there is also risk of breaking or pausing any ongoing data sessions. Therefore, roaming users might experience lower quality than when they are in their home network. This could be mitigated if VoLTE roaming was more widespread. At the same time, VoLTE roaming would aid operators in the process of re-farming their spectrum from 3G to 4G – an important activity in preparing the introduction of 5G into networks across the EEA.

According to one of the responding MNOs, Europe struggles to commercialise and adopt VoLTE roaming while both the North American and the Asian market has already taken a “big leap”. The operator also sees VoLTE roaming as a tool to address some of the challenges posed by OTT-providers.

7.4. IoT and international roaming

We are probably still only on the threshold of development when it comes to IoT and M2M communications. Since global connectivity lies in the nature of many IoT usage scenarios in order to make them work as intended, it is important to uncover whether the current regulation is seen as fit to support this development.

7.4.1. Development and projections

Depending on the sources consulted, projections of connected devices in the future vary greatly, as IoT Analytics³⁶ points out when comparing different reports on the growth of connected devices. However, all reports agree on IoT as an important worldwide phenomenon that is expected to grow exponentially in a short span of time, and because of this, it may eventually place important demands on the deployment and capabilities of communication infrastructures and services, as concluded in the BEREC Report on Internet of Things indicators³⁷.

³⁵ VoLTE and ViLTE: Global Market Update, GSA, February 2019.

³⁶ <https://iot-analytics.com/iot-market-forecasts-overview/>

³⁷ BEREC Report on Internet of Things indicators, BoR (19) 25.

https://berec.europa.eu/eng/document_register/subject/berec/reports/8464-berec-report-on-internet-of-things-indicators

In the responses to the public consultation on the BEREC draft on IoT indicators³⁸, MVNO Europe and ECTA agree that IoT MVNOs (and all IoT market participants, such as MNOs, MVNOs or others) require pan-European coverage on all technology generations (2G to 5G) to be able to provide innovative solutions integrating connectivity and IT, and their own unique solutions, across the EU (and indeed globally) for all types of connected objects/devices. In order to get this “global” connectivity, it is very likely that IoT devices will use roaming services and if they have only one IMSI profile, they will work on permanent roaming basis in the visited networks.

Some of the MNOs (about 18 %) explained in the survey that they have experienced issues with M2M-based permanent roaming from foreign SIM cards in their networks. Several of them pointed out that it is not easy to identify those SIM cards in permanent roaming from a technical point of view. The main effects of permanent roaming traffic mentioned are impacts on the signalling resources in certain specific cells, an increase of the costs and low revenues. When MNOs detected permanent roaming, they mentioned that they try to get a commercial agreement with the home operator to include specific clauses aimed to oblige partners to give each other transparency in case of conscious permanent roaming and in case a contract cannot be terminated.

The cases of permanent roaming detected so far do not seem to be creating serious problems in the visited networks because when the operators identify them they reach commercial agreements for this type of traffic. It can be expected that business models based on permanent roaming in the future might grow hand in hand with the IoT services so it would be appropriate for the Roaming Regulation to take into account that roaming services would need to respond to two main needs: The user traveling within EEA periodically and new business models with permanent roaming whose consumption patterns may be very different from the current ones.

7.4.2. IoT and its impact on RLAH

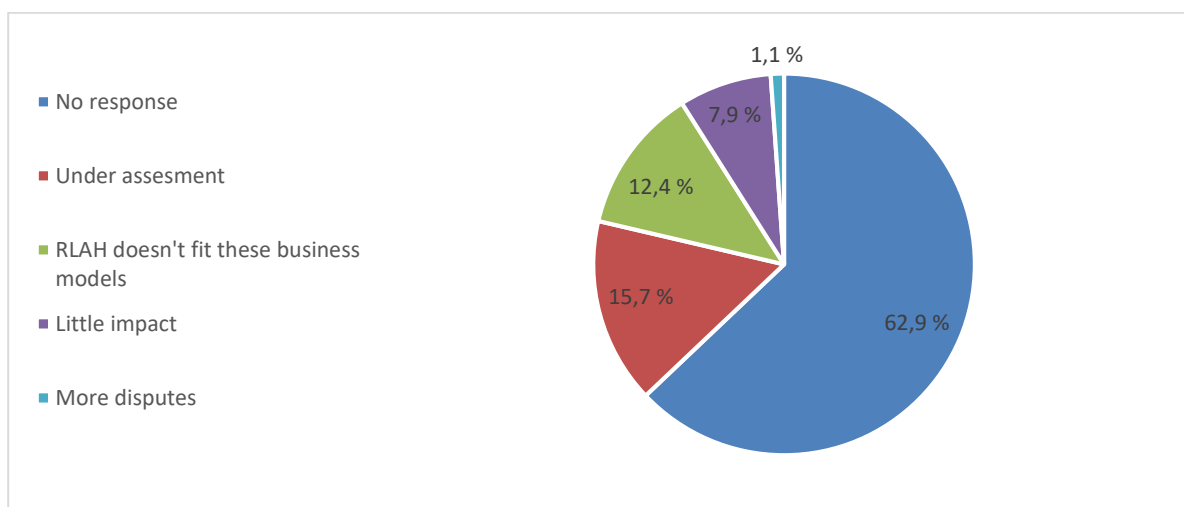
In order to understand if MNOs and MVNOs see the current RLAH regulation as a challenge to the evolving IoT market, BEREC asked the following question:

The new 5G networks include technical specifications for IoT and M2M services such as LTE-M (Long Term Evolution for Machines) or NB-IoT (NarrowBand IoT). What impact do you expect the M2M and IoT business models to have on current RLAH regulation?

The responses are summarised in the following figure.

³⁸BEREC Report on the outcome of the public consultation on the draft BEREC Report on Internet of Things Indicators...., BoR (19) 24 .https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8463-berec-report-on-the-outcome-of-the-public-consultation-on-the-draft-berec-report-on-internet-of-things-indicators

Figure 22: How will M2M and IoT impact RLAH?



About 62 % of the 91 respondents did not express their opinion. The next group consisted of operators that said this issue was still under assessment; they represent about 15 % (14 MNOs) of the total. Generally, this group stated it is a bit too early to conclude how IoT roaming will influence their B2B agreements and whether this market will need any specific regulatory measures.

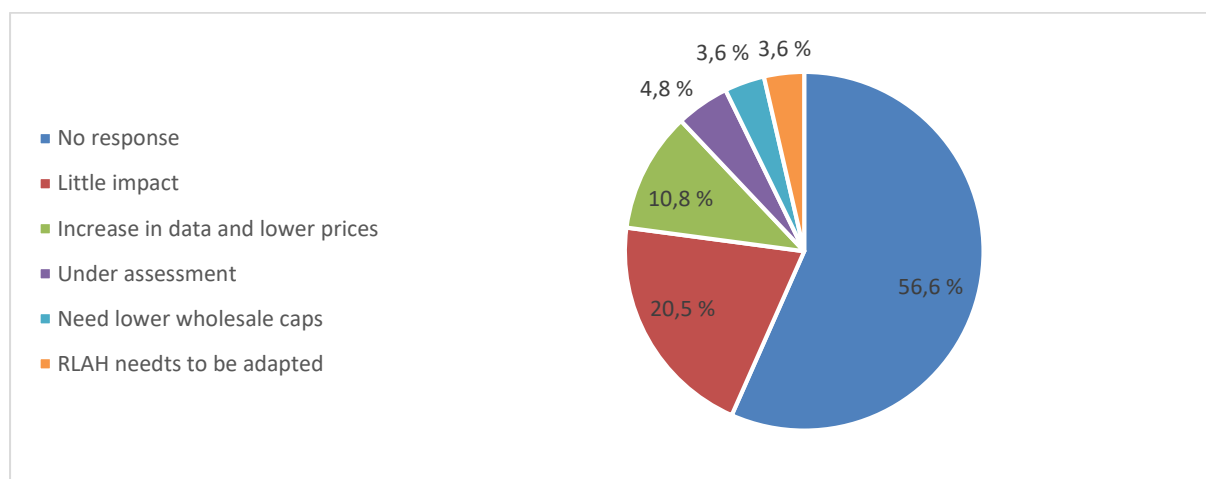
About 14 % (13 MNOs) expressed quite clearly that the current regulation does not fit the business models for international M2M-roaming. They say volume-based charging like in RLAH are unfit to cover the real costs of the visited networks, since signalling load and location updates are the main components – not ordinary data. Some advocated for models for charging signalling traffic and QoS-levels instead.

The next group of answers (7 MNOs, about 8 %) believed that international M2M-roaming will not have any special influence on the current regulation. They state that since permanent roaming (one of the challenges associated with M2M) remain outside of the applicability of the Regulation, operators will come up with suitable solutions. A bigger problem will probably be devices/traffic coming in from outside the EEA. One of the respondents clearly states that since the Regulation remains open for other charging models provided both parties agree, providers will find reasonable solutions themselves. Finally, 1 respondent said they have plans to introduce differential prices for M2M-traffic but expect this to introduce reactions from their roaming partners and possibly disputes that will involve the NRAs.

7.4.2.1. Feedback from the MVNOs

The MVNOs were asked the same question, in order to see if there are differences between how these two categories of operators analyse the regulatory framework. Their feedback is presented in the chart below.

Figure 23: As MVNO, how will M2M and IoT impact RLAH?



A somewhat larger part of the MVNOs chose to share their views on this topic. About 21 % (of a total of 89 respondents) argued that RLAH will probably see only limited impact due to the development of M2M. Some stated that they do not expect advances in technology to influence the regulation, while others considered the M2M market as hard to compete in since they do not have their own radio network.

Close to 10 % (9) of the responding MVNOs expected an increase in overall data usage due to M2M and new IoT-devices. In their view, increased data traffic means that the overall resource utilisation of the radio networks gets better and therefore wholesale prices will drop.

It is notable that some of the responding MVNOs strongly argued for reduction in wholesale rates as well as tailoring of the regulation to make it fit with the peculiarities of the M2M-market. IoT devices and their nature of communication are very different from how human end-users behave when it comes to functionalities and objects they connect to. This requires a different set of rules compared to RLAH.

7.5. New services competing with ordinary voice and message services

OTT (Over-The-Top) voice and messaging services can be viewed by certain users as substitutes for conventional voice and SMS services. Thus, OTT services could compete with traditional voice and SMS services and this trend could be extended to the roaming market.

When BEREC asked mobile operators about this, most of MNOs pointed out several levels of impact on their revenues and they considered OTT services as substitutive of roaming regulated services from the end-user perspective, especially for international/roaming voice and SMS OTT services. Some MNOs claimed there is no impact because their subscribers have increased their consumption of roaming voice and SMS volumes.

Half of MVNOs responding considered there to be an impact on voice and messaging services by OTT providers on regulated voice and SMS roaming services, because at the domestic and roaming level both of these services are disappearing from the customer preferences in

favour of OTT services. The example most frequently used is that there has been a very significant decrease in SMS services. These MVNOs thought this trend will continue. However, the other half of MVNOs claimed there will be no such impact given that OTT providers reduce the usage of SMS and voice but increase the overall mobile data usage. They further added that OTT services may reduce the usage of voice and SMS services, but they cannot replace them because they do not provide access to the public telephone network and their users do not have a number to be called. Instead, users must have the same application on both ends.

According to the latest data from the International Roaming BEREC Benchmark Data Report³⁹, the consumption of roaming minutes, SMS and data since the entry into force of the RLAH has not stopped growing so no conclusion can be reached on the impact of OTT services on roaming voice and SMS services. However, this situation may change when roaming voice and SMS traffic becomes more stable and users replicate the same behaviours that have appeared in some domestic markets.

7.6. 5G as enabler of new structural measures

The 5G technology promises 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 one of the most 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.

These clients may either be companies that require services over a virtual private network, or the network could be configured to provide wholesale access services for MVNOs or wholesale roaming access services for roaming providers (access seekers).

In addition, those services that may require seamless connectivity and have the need to cross country borders (such as V2X) need to roam from one operator to another: in that scenario, the same “slice” configuration must be available on the visited network, as the GSMA document on network slicing and its possible business models⁴⁰ points out.

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 should improve and make more efficient the provision of wholesale services to access seekers.

A widespread introduction of slicing in 5G will mean that clients (end-users, devices etc.) expect 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. To take full advantage of

³⁹ International Roaming BEREC Benchmark Data Report April 2018 - September 2018, BoR (19) 21. https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8468-international-roaming-berec-benchmark-data-report-april-2018-september-2018

⁴⁰ 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>

slicing, strong bindings are required between the 5G core network and the 5G radio network (New Radio, NR). It is still unclear how this could influence the competition possibilities that providers without their own radio network (MVNOs) have, especially in the IoT segment.

7.7. Will 5G change international roaming?

In the short term 5G technology will mainly mean improved mobile broadband. This is because of the developments at the radio interface, which will provide roaming users with faster data access.

In the longer term, when 5G technology is fully implemented at the core of the network, functions such as network slicing will open the door to offering technical solutions that can be used at the wholesale level to offer access and/or separate sale by the visited networks. This is evident from the fact that 3GPP in TS 23.501 specifies 5G architecture solutions for both Home routing and local breakout scenarios, also for non-3GPP access types.

Further, 5G networks – through their ability to differentiate – offer features that can solve communication needs of both human end users as well as IoT devices. In light of this, it will be relevant to consider whether the Roaming Regulation should cover both consumption and traffic patterns, or whether it needs adaption to the specifics of each category. Regardless, there is a need to monitor the development closely.

7.8. Summary and conclusions

The respondents are still sampling the water when it comes to introduction of new functionalities and measures for handling roaming in 5G. Few plan to substitute Home routing with other solutions, partly due to compliance with Legal Interception. When asked about new measures to facilitate competition in the wholesale roaming market, the MNOs remain sceptical and points to the costly but not very sought after solution of LBO.

Spectrum is very valuable for the operators. They need to make sure spectrum is utilised in the best possible way, using modern and effective radio solutions. A more widespread use of VoLTE roaming agreements would be beneficial for re-farming spectrum from 3G to 4G and later 5G. Faster rollout of VoLTE across EU/EEA may help the market players increase the momentum of the implementation process (for VoLTE), and in BEREC's view there are no regulatory barriers to adoption of the latest technologies by operators once such technologies comply with the relevant technical/harmonised standards.

IoT and M2M traffic is expected to see a very rapid growth over the next years. Global connectivity through international roaming is a success factor for many services and applications belonging to this market. Some MVNOs express difficulties getting wholesale access to dedicated IoT technologies. BEREC believes there is a need for more clarity regarding the applicability of the Roaming Regulation for IoT and M2M.

Further, MNOs argue that the current volume-based charging model like in RLAH is not fit for covering network costs like signalling and location updates. They argue for a different charging model to foster sustainable solutions, although no specific charging model has been proposed.

Either way, BEREC supports the feedback suggesting that the regulation should be adapted to better capture this development. However, this might need a closer monitoring of the roaming market and these services in the next two or three years.

Current architecture for 5G builds on the same mechanisms for roaming that we see deployed in 4G, i.e. Home routing. At the same time, solutions for integrating local breakout scenarios are considered. Combined with network slicing, such solutions can very well prove to become important for serving applications and users that depend on low latency when accessing resources. Developments on different “slicing” configurations may modify roaming wholesale agreements on data services, so they should be monitored and regulation should be adapted if expedient.

ANNEX

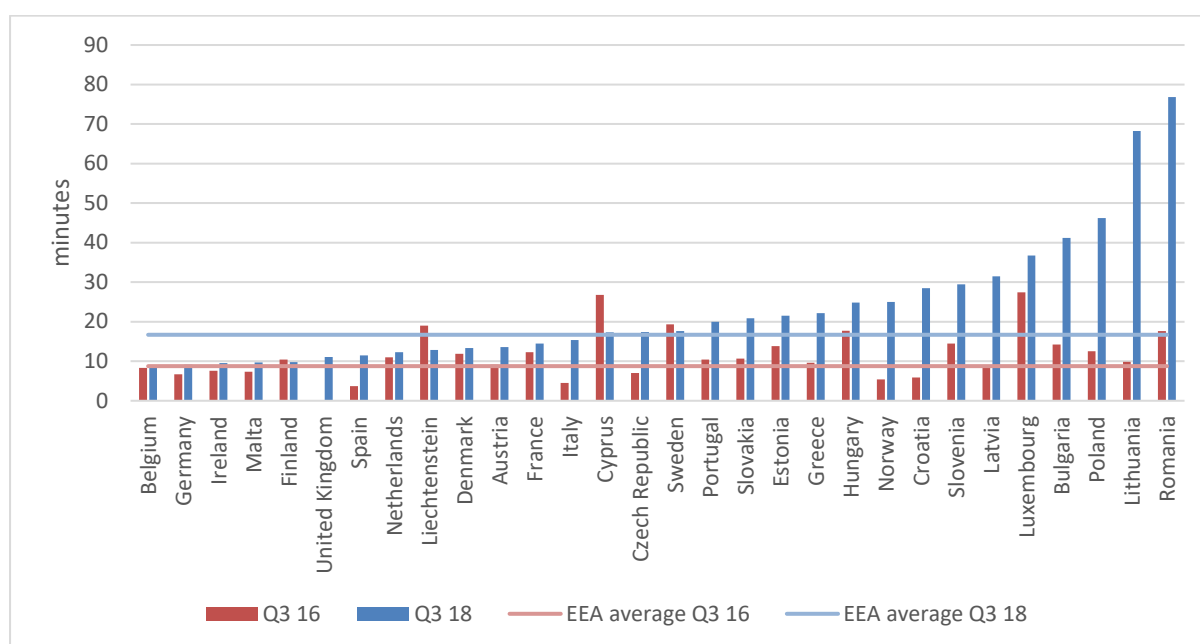
Analysis of Retail Roaming Developments – Voice and SMS

Voice roaming services

For voice roaming services the overall trend in consumption has been positive and growing steadily during the period.

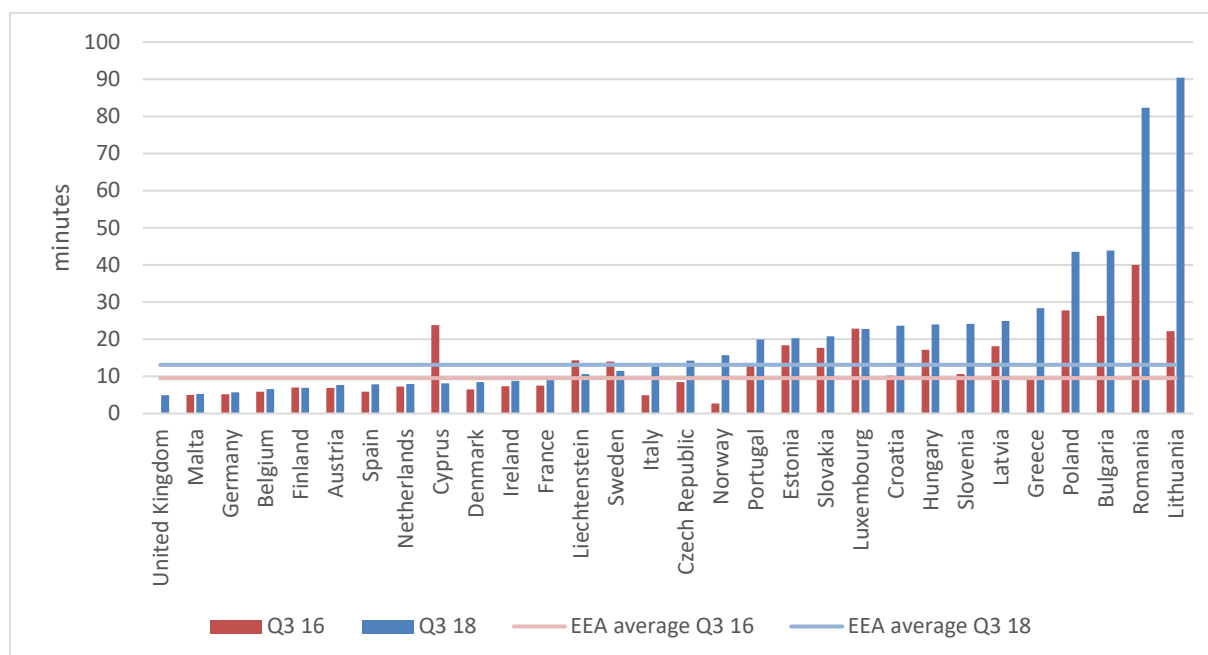
In Figure 24, the average number of minutes calls made in Q3 2016 was compared to Q3 2018 in relation to the EEA average for the same periods. According to the figure below, the volumes of EU calls made per user during Q3 2018 have grown substantially since Q3 2016, mainly depending on the introduction of RLAH in Q2 2017. Some countries have more than tripled their consumption during this period.

Figure 24 Average number of minutes per subscriber calls made



The same pattern as above is repeated in the figure below, which shows the volumes of EU calls received per user during the same period. For Q3 2018, Romania, Lithuania, Bulgaria and Poland had the largest consumption per user in relation to Q3 2016 and to both EEA averages.

Figure 25 Average number of minutes per subscriber calls received

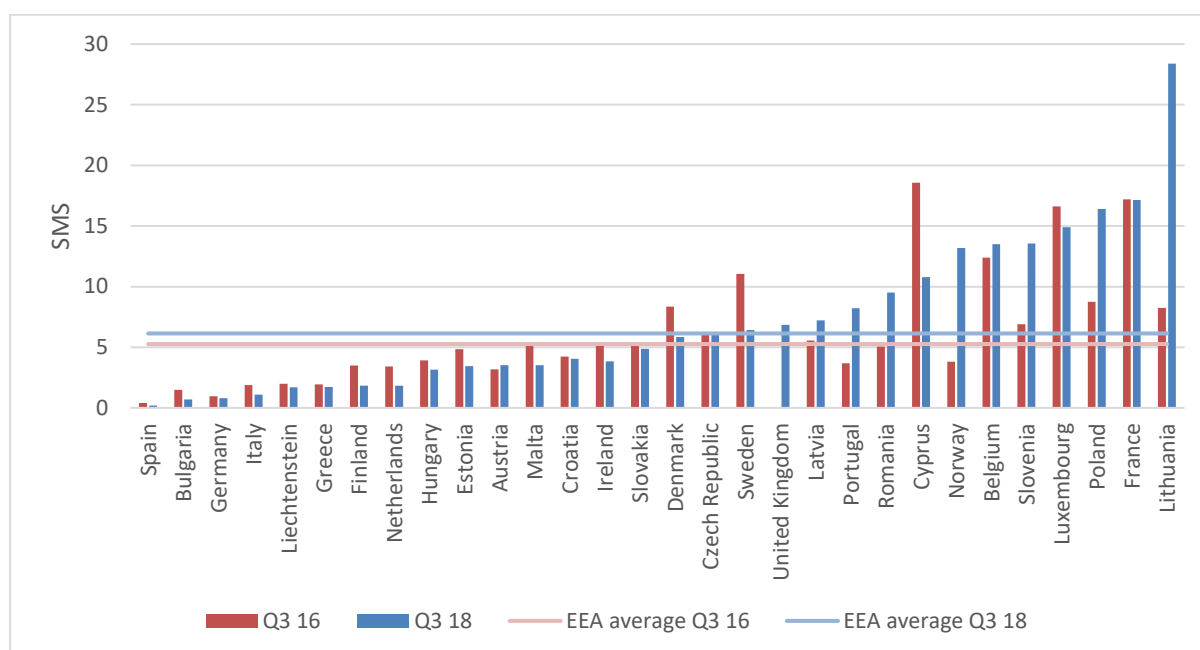


SMS roaming services

For SMS roaming services, the overall trend in consumption has in many cases been the same, whereas some countries had a great increase in consumption between Q3 2016 and Q3 2018 and in relation to the EEA averages.

Figure 26 displays the average SMS consumption per subscriber per month per country during Q3 2018 in relation to Q3 2016 and to the EEA average for the same period. In many countries, the SMS consumption has declined during this period. Some countries have had an increase in consumption both in relation to the EEA averages and between the both quarters (Norway, Slovenia, Poland, Portugal, Romania and Lithuania).

Figure 26 Average retail SMS volumes per user



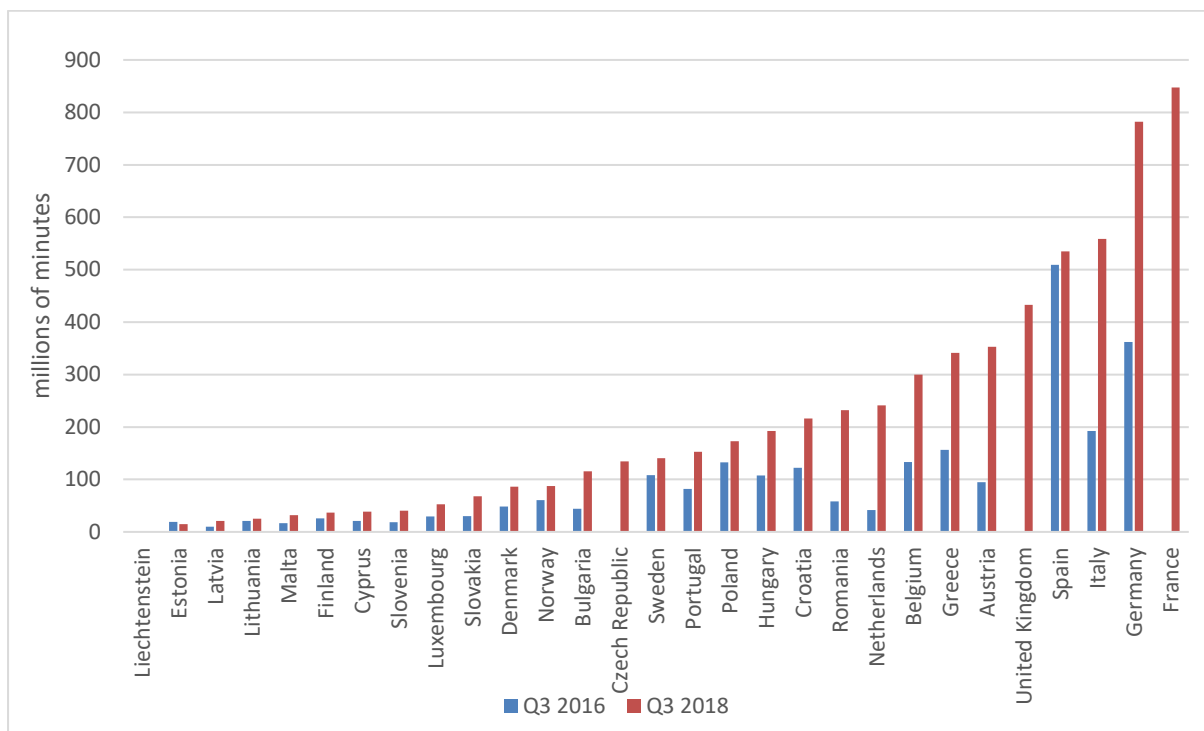
Analysis of wholesale roaming services – development – Voice and SMS

Voice roaming services

As in retail voice roaming services, the trend in wholesale roaming voice minutes is positive and increasing.

In Figure 27, the volumes of wholesale roaming voice minutes (total traffic) for Q3 2018 were compared to Q3 2016. The comparison shows a steady growth in wholesale voice volumes between Q3 2016 and Q3 2018.

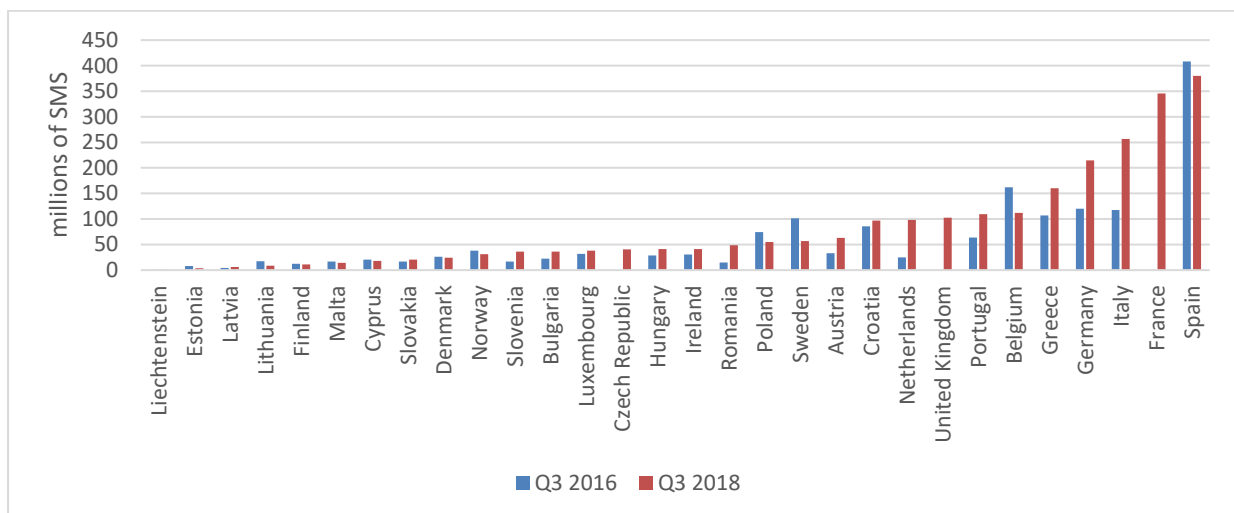
Figure 27 Wholesale roaming voice minutes-total traffic



SMS roaming services

The trend is also positive for wholesale SMS services. In Figure 28 below, volumes of wholesale roaming SMS (total traffic) in Q3 2018 were compared to Q3 2016.

Figure 28 Wholesale roaming SMS volumes-total traffic



Misuse – detailed summary of answers

Answers received from MNOs

31 out of 91 MNOs are aware of abusive use of SIM cards in voice and/or SMS roaming communications in the EEA which cannot be mitigated by the FUP control mechanisms foreseen in the regulation. These MNOs also described those situations:

- 10 MNOs are aware of abusive use of RLAH by permanent roamers, which is enabled by the four-month observation window that is too long.
- A Swedish MNO has reported that the RLAH rules are enabling the resale of their SIM cards in other EEA countries and a Maltese MNO is aware of foreign SIM cards being sold to local residents. A Portuguese MNO has strong suspicions of traffic resale.
- 6 MNOs out of 91 detected organised resale. Of those 6 MNOs, 5 MNOs implemented a FUP and 1 MNO did not. In one case SIM cards were sold via online platforms and in another case, SIM cards have been used to call PRS (Premium Rated Services) in another country. In a third case the traffic of SIM cards was monitored and the relevant SIM cards were blocked.
- 2 MNOs explicitly considered having encountered a situation of IRSF (International Revenue Share Fraud) for voice (or voice and SMS), where typically prepaid SIM cards were used to artificially generate traffic towards international destination ranges (from EEA) with high termination rates that are subject to revenue share. Several other MNOs, although not explicitly referring the IFRS, consider (or in some cases strongly suspect) that fraudulent activity was perpetrated with the use of some of their SIM cards. Some of these MNOs have mentioned for example that:
 - a) some of their (usually unregistered) prepaid SIM-cards with RLAH tariffs (and also typically with high allowances or with unlimited voice and/or SMS):
 - i) have been fraudulently used to make calls/send SMS in roaming to other EEA country, where operators are charging high interconnection costs, which cannot be recovered by home operator;
 - ii) and/or have been fraudulently used to make calls to VAS and PRS in roaming (in these cases, some of the respondent MNO claim that they are not able to previously identify the numbering ranges that in the several EEA countries are associated to those VAS and PRS communications);
 - b) or they have strong suspicious of resale of traffic and/or SIM boxes used to offer services at lower rates than the ones offered in the country where cards are being used.
- Other MNOs, though without explicitly relating it to fraudulent activity, also reported the abusive use (not for periodic travels), in a short time frame (in certain cases, in a few minutes or hours), of large volumes of SMS and/or minutes allowances (typically prepaid) for sending in the EEA a large number of roaming SMS to other EEA countries, or for making a high volume of roaming calls to other EEA countries, namely:

- a) 2 MNOs reported the use of their SIM cards to send a large quantity of roaming SMS, although not identifying the purpose of this abusive use;
 - b) 1 MNO identified the use of SIM cards for sending high volumes of roaming SMS to other EEA destinations, essentially for marketing purposes as this was cheaper than using an official SMS aggregator;
 - c) One of the Finnish MNOs reported that its prepaid SIM cards were abusively associated to call centers abroad and M2M subscriptions;
 - d) One of the Romanian MNOs indicated that a significant quantity of pre-paid roamers used all the national SMS allowance to send, in a very short period of time, Application-to-Person (A2P) messages (notifications, PINs, Google, WhatsApp etc.) to numbers from operators of other EEA countries;
 - e) One of the Austrian MNOs indicated that some unregistered pre-paid cards use the free units for roaming conference calls.
- According to the answers received, revenue losses diverged significantly depending on the operator, having roughly varied between 1,000 € in a month (answer referring to the interconnection costs registered in February 2019) and 1,000,000 € in a month (in one situation it referred to the annualised impact on revenues since June 2017 and in another to the wholesale costs in June 2018). The values indicated by the different MNOs do not necessarily refer to the same period, to a period with the same extent or to the same indicator (e.g. revenue losses, costs, margin “revenues-costs”).

For instance, considering the situations explicitly identified as the abusive usage of RLAH for non-periodic travel in combination with the four-month observation window, the impact on revenues varied between 70,000 € and 270,000 € (neither of them referred the time involved). For the situations clearly identified as IRSF, it varied from 16,400 € (this answer referred 4 cases that occurred in 2018) to 1,000,000 € (it referred to the wholesale costs in June 2018). For the increase in SMS clearly identified as for marketing purposes, 1 MNO reported an impact of 564,000 € (referring to the period between June and December 2017). As for the cases clearly identified as cases of SIM cards resale, the impact varied between 170,000 € (it referred to the period of four months) and 1,000,000 (it referred to the annualised impact on revenues happening since 2017).

- 7 out of the 31 MNOs that reported being aware of abusive usage that cannot be mitigated by the FUP control mechanisms mentioned that traffic had increased.
- 7 out of the 31 MNOs that reported being aware of abusive usage that cannot be mitigated by the FUP control mechanisms mentioned that these situations of misuse happen regularly or on a continuous base. It is further notable that some operators did not answer this question and some said that the impact is still to be assessed. From those operators that answered the question but did not give an estimation, 3 MNOs specifically mentioned that the situation has a substantial impact on revenues.

- 22 out of the 31 MNOs being aware of abusive misuses that cannot be mitigated by the FUP control mechanisms stated that they had taken measures to solve/reduce the problem, namely:
 - Blocking of numbering ranges, namely in case of fraud and/or implementation/improvement of Fraud Detection Systems (although some MNO have indicated that this is a reactive proceeding, not allowing to totally prevent the abuses);
 - Suspension of service to all SIM cards detected or/and contract termination based on contract provisions regarding fraudulent use and criminal prosecution as well as withholding of payments to the carriers involved;
 - Set restrictions to limit the use of call conference service while in roaming (to reduce the losses resulting from fraud);
 - Terms and conditions included in the retail contract (normal use, in case of unlimited traffic);
 - Limit of active prepaid cards per subscriber and contract provisions regarding fraudulent use;
 - Amendments of prepaid tariffs/add-ons' terms and conditions, limitation of the maximum number of sent SMS per hour;
 - Implementation of 'real time rating';
 - Domestic FUP;
 - Anomalous use info and warning messages sent to the customers;
 - Introduction of stable links on prepaid.
- Some MNOs have also suggested some measures to overcome/reduce the abusive usages that cannot be mitigated by the FUP control mechanisms, namely:
 - More transparency (e.g. database created by BEREC) to consult the premium number ranges in each EU Member State;
 - High interconnection cost: international numbers should be periodically reviewed by the NRAs and possibly categorised as premium or special services, in order to help operators to charge correctly certain number ranges and reduce this type of fraud.
 - Concerning the roaming FUP, reasonable volumes should be set over EEA for voice, SMS and data, regardless of the subscription type.

It should also be noted that only 11 out of those 31 MNOs reported this situation to the NRAs. Most of these MNOs reported that despite recognizing and reporting the problem, no solution or resolution had so far been found.

Answers received from MVNOs

13 out of 89 MVNOs were aware of abusive use of SIM cards in voice and/or SMS roaming communications in the EEA, which cannot be mitigated by the FUP control mechanisms foreseen in the Regulation. However, only 3 out of the referred 13 MVNOs, described those abuses:

- one MVNO indicated that the current rules cannot mitigate the abusive use in the case of customers buying new SIM cards and that, even in other cases, traffic indicators are too complex and the period of 4 months is too long, permitting that customers entirely avoid it;

- another MVNO considers that the typical fraud issues are not mitigated by the current rules because, though the FUP or control mechanisms might allow to limit abuse, they do not help to prevent initial abuse nor recuperate the costs incurred and in a fraud-case, the use fraudster typically circumvented the onboarding checks in place; and,
- the 3rd MVNO indicated the abusive use related to value-added communications (VAS) in roaming.

MVNOs were also requested to provide information about whether any organised resale of their SIM cards for permanent roaming occurred. Most MVNOs (69 out of 89) could not report such a practice by their customers.

12 out of the 13 MVNOs that were aware of abusive misuse which cannot be mitigated by the FUP control mechanisms indicated to have taken measures to solve the problem, of which only 2 specified the measures taken. In both cases, those measures were: i) applying for a derogation; and ii) blocking identified VAS numbers abroad (only possible ex-post).

MVNOs observing organised resale of their SIM cards require their customers to activate their SIM card domestically prior to roaming abroad and included this requirement in the contracts. Other MVNOs disabled those SIM cards or informed their customers about additional charges. Another MVNO reported organised resale before the derogation was granted and blocked those SIM cards.

Only 1 MVNO stated to have reported the situation of the abusive use to the NRA which resulted in the granted derogation.

Value-added services – detailed answers from questionnaires

Answers received from MNOs

24 out of the 91 replies received from the MNOs mentioned having received complaints from their clients about value-added communications while roaming in the EEA. In particular:

- 7 MNOs out of the referred 24 stated that they were about higher charges than at home and lack of transparency on the higher charges applied.
- 7 MNOs answered that the complaints were about higher charges than at home.
- 3 MNOs indicated that the complaints were about other subjects (calls to VAS numbers charged above RLAH level, unintentionally use of value-added services by the customer while in roaming).
- 2 MNOs stated that the complaints were about blocking of those communications.
- 2 MNOs mentioned that the complaints were about higher charges than at home and lack of transparency on the higher charges applied and other.
- 1 MNO answered that the complaints were about higher charges than at home and blocking of those communications.

- 1 MNO answered the complaints were about higher charges than at home and lack of transparency on the higher charges applied and blocking of those communications.
- 1 MNO answered the complaints were about lack of transparency.

From the 5 MNOs that briefly described the complaint, most said that consumers were expecting to be able to call free of charge to toll-free numbers outside home country while roaming.

35 MNOs out of the referred 91 reported having incurred extra costs resulting from unexpected termination rates related to value-added roaming communications in the EEA.

3 MNOs of those stated that premium numbers dialed by a visitor to another EEA country became a problem in terms of fraud and prevention. They added that originating calls has been more complex due to A-number charges at the interconnect level. 2 MNOs referred that value-added services/premium ranges cannot be recognized in all countries in advance.

Other MNOs mentioned that:

- Value-added services are excluded from the wholesale contract negotiations. The charges for the premium services are not harmonized nor public and entail as a result unexpected costs;
- While roaming, hosted networks decide the policy on value-added services. This may lead to less transparency. This MNO highlighted that it would be helpful if EEA-harmonized numbering ranges would be available;
- The enormous lack of transparency regarding the numbering ranges applied in other Member States has led to serious losses by other operators as well as to the degradation of customer experience. They also mentioned that they have repeatedly called for the creation of a common database on VAS numbering ranges, but the topic continues to be ignored;
- It is impossible for them to provide transparency on costs for their customers as they have no view on the cost applied by foreign operators for the service component of each type of premium rate service;
- They have been facing for years unregulated intra EU termination rates corresponding to national numbering ranges from some EU Member States not only related to VAS, which has jeopardizing their business case, in parallel with the misuse of numbering ranges in cases of fraud.

Other references were made, such as: difficulty in charging VAS for prepaid customers since they are charged real time, Wangiri fraud, use of SIM cards for sending SMS SPAM, inbound RLAH fraud calls to EU special numbers, pre-paid SIM-cards abusively used for terminating calls to high costs destinations (intra EU calls).

40 MNOs out of the 91 replies received, informed that they have taken measures as regards value-added communications while roaming in the EEA. In fact, 17 MNOs said they obtained information about numbering ranges of other EEA countries, 8 stated that they negotiated wholesale agreements and 15 stated "other". Of those that replied "other", the following can be highlighted, for instance:

- Informed customers that retail prices are higher/much higher than local retail prices;
- Blocked numbers and VAS ranges;

- Refunded end-customers;
- Their roaming contracts, only for fraudulent traffic, require operators to give back the margin generated by this kind of traffic;
- Premium rate services cannot be reached from abroad, in general;
- Negotiated wholesale agreements and in the same time implemented special follow up on VAS numbering ranges;
- Requested support to operators (with limited success either because they got no replies or the different replies were not consistent among them);
- Negotiated wholesale agreements, obtained information about numbering ranges of other EEA countries and dynamic changes of VAS numbers. It is essential to make one single European database off VAS/premium services numbers.

10 MNOs out of 43 (which are those that received complaints from their clients plus those that did not receive complaints but incurred extra-costs resulting from unexpected termination rates related to value-added roaming in EEA) said that they reported the situations previously mentioned to the NRAs and most said that there were no results from this reporting. The suggestion given, namely that the definition of premium number ranges in advance is regulated and imposed at an EU level, would address this problem.

From those MNOs that answered the question about the timing of the issues on value-added (21 MNOs), it is worth mentioning that most MNOs said that these situations happen regularly or for relatively large periods of time, and 1 MNO said that this continues and is clearly the result from current regulation.

Answers received from MVNOs

Only 2 out of the 89 replies received from MVNOs reported having received complaints from their clients about value-added communications while roaming in the EEA. One complaint was about higher charges than at home and the other on lack of transparency of the higher charges applied.

7 out of the 89 total number of answers received from MVNOs reported that they incurred extra costs resulting from unexpected termination rates related to value-added roaming communications in the EEA. The three answers given referred to that in roaming the international VAS numbering ranges cannot be detected. Customers used allowances on voice and SMS to call intra-EEA destinations while roaming. As in roaming, international VAS cannot be detected and the only thing the MVNO could do was to bar the ex-post identified numbers.

12 out of the 89 answers received from MVNOs informed that they have taken measures for value-added communications while roaming in the EEA: i) negotiated wholesale agreements; ii) obtained information about numbering ranges of other EEA countries; and, iii) blocked value-added communications to their customers.

1 MVNO suggested that some authority/institution (e.g. BEREC) should gather all numbering blocks with the relevant details, which would be publicly open to operators and another added that there is a transparency problem with the numbering plan for EEA countries (even when they have the numbering plans, they still don't know the termination rates for valued-added communications).

No MVNO reported such situations to the NRAs.